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Analysis Of Physical Conditions On The Speed Of Pencak Silat Sickle Kick In Makassar City Athletes

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Abstract. The purpose of this study is to (1) ascertain the connection between Makassar City athletes' pencak silat crescent kick speed and flexibility. (2) ascertain the correlation between Makassar City athletes' pencak silat crescent kick speed and explosive leg muscular power. (3) ascertain the connection between Makassar City athletes' abdominal muscular strength and their pencak silat crescent kick speed. (4) ascertain how Makassar City athletes' flexibility, explosive leg muscular power, and abdominal muscle strength relate to their pencak silat crescent kick speed. A "correlational" research design was employed in this quantitative investigation. The athletes from Makassar City Pencak Silat made up the study's population. There were 20 athletes in the sample. Descriptive and inferential analysis with a 95% error rate of 0.05 were employed in the data analysis. The study's findings (1) demonstrated a 67.70% correlation between flexibility and the pencak silat crescent kick's speed. (2) demonstrated a 61.40% correlation between explosive leg force and pencak silat crescent kick speed. (3) The speed of the pencak silat sickle kick (59.70%) is correlated with the strength of the abdominal muscles. (4) The speed of the pencak silat sickle kick (80.70%) is correlated with flexibility, leg explosiveness, and abdominal muscle strength combined.
Keywords: Physical condition, sickle kick speed

1 Introduction

Pencak Silat is a martial technique that the Indonesian people acquired from their forefathers. Only when the Indonesian Pencak Silat Association (IPSI) was established was the term "Pencak Silat" adopted in Indonesia. In the past, Pencak Silat was referred to as Silat in Sulawesi and just Pencak in Java. Nowadays, Pencak Silat is becoming more and more well-liked both domestically and abroad.

The world of Pencak Silat boasts numerous styles, including PSHT, Merpati Putih, Persinas ASAD, SMI, Perisai Diri, Putra Betawi, Tapak Suci, and many more. Tapak Suci, in particular, has been part of the 10 historical schools of the Indonesian Pencak Silat Association (IPSI). Tapak Suci is based on Islam, based on the Quran and Sunnah, fosters a spirit of brotherhood, and is under the auspices of the Muhammadiyah organization.

Furthermore, Pencak Silat is a sport with benefits including self-defense, health, and the highest achievement. Achieving high achievement in Pencak Silat is the dream of every

Pencak Silat athlete. Achieving high achievement in Pencak Silat requires several aspects, including excellent physical condition, technique, tactics, and mental fortitude. Mastery of basic techniques is crucial in Pencak Silat, without neglecting other aspects such as physical condition, tactics, and mental fortitude. To achieve good performance, mastery of technique is crucial. Broadly speaking, Pencak Silat techniques consist of punches, kicks, blocks, dodges, sweeps, step patterns, and so on. Therefore, to achieve good performance in Pencak Silat, athletes must master these techniques as thoroughly as possible.

Kicking is an important and frequently used technique in Pencak Silat. According to (Erwin Setyo Kriswanto, 2015), kicks are more valuable than punches in Pencak Silat competitions. A kick that hits the target earns 2 points, while a punch earns 1 point. Therefore, kicks are more frequently used in Pencak Silat competitions. Furthermore, kicks have greater power and reach than hand kicks. There are several types of kicking techniques in Pencak Silat, including the front kick, T-kick, crescent kick, and so on. The crescent kick is one of the most frequently used kicks in Pencak Silat competitions. This is because the crescent kick is easy to execute and easy to hit, making it more effective in Pencak Silat competitions.

Pencak Silat as a sport that really requires aspects of physical condition to carry out all activities, so that Pencak Silat develops a relationship between the three aspects of flexibility, explosive power of leg muscles, and strength of abdominal muscles. Each variable has its own role in increasing the speed of the sickle kick. Therefore, the relationship of each variable with the Speed of the sickle kick is not yet known, so it is necessary to conduct a study to determine how big the relationship between them. With the basis to determine the magnitude of the relationship between the aspects of flexibility, explosive power of leg muscles, and strength of abdominal muscles on the Speed of the sickle kick, a study will be conducted on Pencak Silat athletes in Makassar.

2 Method

A method is an approach or strategy used to look for scientific evidence that is carried out methodically to identify and address issues raised in a study. To accomplish the desired results, the direction and purpose of disclosing facts or truths are modified to match those discovered in the study.

1. Research Location

The study was carried out at Makassar State University's Faculty of Sports and Health Sciences.

2. Kinds of Studies

This study is an example of an experimental study. In order to determine the effects of a treatment, researchers intentionally eliminate or reduce other interfering factors in order to establish a causal relationship between two factors (Arikunto, 2020:9).

3. Research factors

One dependent variable and two independent variables were included in this investigation. Anything that the researcher choose to investigate in order to gather data and subsequently make conclusions is considered a research variable (Sugiyono, 2015:2). The dependent variable (crescent kick) is the variable affected by or the outcome of the independent variable, whereas the independent factors (flexibility, leg muscle explosiveness, and abdominal muscle strength) are referred to as influencing variables.

4. Population and Sample

To obtain research data, a data source is required. (Arikunto, 2017:173) explains that the population is all the research subjects being studied. The population is limited to the

population or the number of people who share at least the same characteristics. The population for this study was Pencak Silat athletes in Makassar City.

According to (Arikunto, 2017:173) a sample is a portion of the population to be studied. (Arikunto, 2017:173) states that if the population subject to be studied is less than 100, then the entire population will be the research sample. Based on the explanation above, the sample I will use is 20. In this study, the sample is 20 Pencak Silat athletes from Makassar City.

5. Methods for Data Analysis

The SPSS software will be used to process the gathered data in order to guarantee data accuracy prior to analysis. In addition, the following techniques are used for data analysis:

1. Analytical Description

With regard to the measurement data of flexibility, leg muscle explosive power, abdominal muscle strength, and sickle kick speed of Pencak Silat athletes in Makassar city, descriptive analysis seeks to obtain a general overview of the research data that will be interpreted and given meaning in the form of mean, median, and standard deviation.

2. Test of Normalcy

To ascertain whether the data being processed is regularly distributed, this normality test is employed. This test will look at the Makassar Pencak Silat competitors' abdominal muscle strength, leg muscle explosiveness, flexibility, and sickle kick speed. SPSS version 16 will be used for the data normality test.

3. Test of linearity To ascertain whether there is a linear relationship between the independent and dependent variables, a linearity test is performed. This linearity test looks at the relationship between the speed of the sickle kick of BKMF Pencak Silat competitors in Makassar City and the variables of flexibility, leg muscle explosive power, and abdominal muscle strength. The SPSS application will be used for the data normalcy test.Hypothesis Testing

The purpose of hypothesis testing is to confirm the veracity of the theories put forward in this research. A correlation test, which is used to ascertain if the independent and dependent variables are related, will be performed to test the hypotheses. This hypothesis will investigate the connection between Makassar Pencak Silat athletes' sickle kick speed and their flexibility, leg muscle explosiveness, and abdominal muscular strength.

3 Results

1. Descriptive Analysis

In addition to measurements of the frequency distribution, the data description from the research findings attempts to give a broad picture of the distribution of data on flexibility, leg muscle explosiveness, and abdominal muscle strength in relation to the speed of sickle kicks in Makassar Pencak Silat athletes. Descriptive statistics, such as the mean, standard deviation, mode, median, and frequency distribution, are used to process the numbers displayed from the raw data.

Below is a synopsis of the descriptive statistics computations' outcomes:

Table 1. Summary of descriptive data analysis

Statistics	Variable			
	Flexibility	Leg Explosive Power	Abdominal Strength	Sickle Kick Speed
Number of Samples (n)	20	20	20	20

Minimum Value	0	159	65	12
Maximum Value	6	230	80	18
Range	6	71	15	6
Mean	3,90	186.65	70.00	15.25
Median	4.00	186.50	70.00	15.00
Standard Deviation (s)	1.714	16.359	3.418	1.773
Variance (S^2)	2.937	267.608	11.684	3.145

2. Data Normality Test

Analysis requirements tests must be performed because statistical regression is used in this assessment's data processing. The requirements test in question is a Kolmogorov-Smirnov test for normalcy.

The following was shown by the Kolmogorov-Smirnov (KS-Z) test findings for data normalcy:

1) The flexibility data was found to follow a normal distribution, as indicated by the KS-Z value of 0.173 (P = 0.118 > α 0.05).

2) The KS-Z value for the leg explosive power data was 0.107 (P = 0.200* > α 0.05), indicating that the data is normally distributed.

3) The KS-Z value for the leg muscle strength data was found to be 0.135 (P = 0.200* > α 0.05), indicating that the data is either normally distributed or follows a normal distribution.

4) The KS-Z value for the sickle kick speed data was 0.138 (P = 0.200* > α 0.05), indicating that the data is either normally distributed or follows a normal distribution.

3. Hypothesis Testing

1. The relationship between flexibility and sickle kick speed in Pencak Silat athletes from the Pencak Silat Foundation (BKMF) of the Faculty of Economics and Business (FIKK) of the State Islamic University of Makassar.

Based on the results of a simple linear regression analysis between the research data pairs, flexibility and sickle kick speed yielded a constant (a) of 11.930 with a regression direction coefficient (b) of 0.851. Thus, the regression equation between flexibility and sickle kick speed was obtained: $\hat{Y} = 11.930 + 0.851\ X1$. Furthermore, to examine the contribution of flexibility and sickle kick speed in Makassar Pencak Silat athletes, the correlation coefficient obtained can be seen. A summary of the results of the correlation coefficient calculation and F-test can be seen in Table 2.

Table 2. Significance Test of the Coefficient of Determination between Flexibility and Speed of Pencak Silat BKMF Athletes in Makassar

Number of Observations (n)	Correlation Coefficient (r_{y1})	F_{hit}	F_{tab} α=0,05
20	0,677	37.681	4,16

F count = 37.681, which is higher than F table = 4.16 at α = 0.05, according to the correlation coefficient significance test results. These findings suggest that there is a strong

association between flexibility and sickle kick speed (ry2) of 0.677. Therefore, it is considered that Makassar Pencak Silat competitors' sickle kick speed and flexibility are significantly correlated. Put another way, the capacity to sickle kick increases with flexibility.
2. The connection between Makassar Pencak Silat competitors' leg explosive power and sickle kick speed

Flexibility has a value of 0.599 if the leg explosive power variable is zero, as indicated by the constant value of 0.599 in the regression equation above. Additionally, a positive regression coefficient shows that the contribution of leg explosive force and sickle kick speed is directly proportional. This indicates that the sickle kick speed score will grow by 0.085 at a constant of 0.599 for every point increase in the leg explosive power score.

Additionally, the correlation coefficient obtained can be used to assess the role of sickle kick speed and leg explosive power in Makassar Pencak Silat athletes. Table 3 provides an overview of the correlation coefficient computation and F-test results.

Table 3. Significance Test of the Coefficient of Determination between Leg Explosive Power and Pencak Silat Silat Speed in Makassar Pencak Silat Athletes

Number of Observations (n)	Correlation (r_{y1})	Coefficient	F_{hit}	F_{tab} α=0,05
20	0,614		28,582	4,16

According to the results of the correlation coefficient significance test, F count = 28.582 is greater than F table = 4.16 at $\alpha = 0.05$. These findings indicate that the correlation coefficient of 0.614 between leg explosive power and sickle kick speed (ry2) is substantial. Therefore, it is considered that there is a substantial correlation between Makassar Pencak Silat competitors' leg explosive force and sickle kick speed. In other words, sickle kick ability increases with leg explosive force.

3. The connection between Makassar Pencak Silat competitors' core muscular strength and sickle kick velocity

The constant (a) was 12.813 and the regression direction coefficient (b) was 0.401 based on the findings of a straightforward linear regression analysis between paired research data on abdominal muscle strength and sickle kick speed. As a result, the following regression equation was found between sickle kick speed and abdominal muscle strength: Ψ□ = 12.813 + 0.401 X3.

The regression equation above has a constant value of 12.813, which means that if the variable for abdominal muscle strength is zero, the value of abdominal muscle strength will be 0.599. Additionally, a positive regression coefficient shows that sickle kick speed and abdominal muscular strength are positively correlated. This indicates that there is a 0.401 increase in sickle kick speed at a constant of 12.813 for every point increase in abdominal muscular strength.

Additionally, the correlation coefficient obtained can be used to analyze the influence of sickle kick speed and abdominal muscle strength in Makassar Pencak Silat athletes. Table 4 displays an overview of the correlation coefficient computation and F-test results.

Table 4. Significance Test of the Coefficient of Determination between Abdominal Muscle Strength and Pencak Silat Silat Speed in Makassar Pencak Silat Athletes

Number of	Correlation	Coefficient	F_{hit}	F_{tab}

Observations (n)	(r_{y1})		α=0,05
20	0,597	26,683	4,16

According to the results of the correlation coefficient significance test, F count = 26.683 is greater than F table = 4.16 at α = 0.05. These findings indicate that the correlation value of 0.597 between sickle kick speed (ry2) and abdominal muscular strength is substantial. Therefore, it is considered that there is a substantial correlation between Makassar Pencak Silat athletes' abdominal muscular strength and sickle kick speed. Put another way, the ability to perform a sickle kick increases with the strength of the abdominal muscles.

4. The correlation between Makassar Pencak Silat athletes' flexibility, leg explosive power, and core muscle strength and the pencak silat sickle kick speed

The constant (a) was 1.771 with regression direction coefficients for flexibility (b1) = 0.453, leg explosive power (b2) = 0.038, and abdominal muscle strength (b3) = 0.117, according to the findings of a multiple regression analysis between the research data pairs of flexibility (X1), leg explosive power (X2), and abdominal muscle strength (X3) with the speed of the pencak Silat athletes.Thus, the influence of flexibility, leg explosive power, and abdominal muscle strength together on the speed of the pencak silat sickle kick was obtained by the regression equation $\hat{Y} = 1.771 + 0.453\ X1 + 0.038\ X2 + 0.117\ X3$.

Table 5. Significance Test of the Correlation Coefficient between Flexibility, Explosive Leg Power, and Abdominal Muscle Strength Together on the Speed of the Pencak Silat sickle kick.

Number of Observations (n)	Correlation Coefficient ($R_{y1.2.3}$)	Coefficient of Determinatio ($r_{y1.2.3}$)	F_{hit}	F_{tab} α=0,05
20	0,899	0,807	22.370	4,16

The Fcount value obtained is 22,370 and the Ftable value at α = 0.05 is 4.16. The Fcount value > Ftable so it can be concluded that the correlation coefficient between flexibility, explosive leg power, and abdominal muscle strength together with the speed of the pencak silat sickle kick which has a correlation coefficient (Rx.1.2.3.y) = 0.807 is significant. With this correlation coefficient, the determination coefficient can be known from R Square = 0.807 (80.70%). This means that the contribution of flexibility, explosive leg power, and abdominal muscle strength together with the speed of the pencak silat sickle kick can be explained by agility and ankle coordination by 80.70%.

4 Discussion

a. The Relationship between Flexibility and Pencak Silat Crescent Kick Speed

The first hypothesis test revealed a correlation between flexibility and pencak silat crescent kick speed in Makassar athletes. The calculation yielded a correlation coefficient of 0.677, explained by the regression equation $\hat{Y} = 11.930 + 0.851\ X1$. This finding suggests that greater flexibility leads to better pencak silat crescent kick speed in Makassar athletes. Conversely, poorer flexibility leads to poorer pencak silat crescent kick speed in Makassar athletes.

Flexibility is a biomotor component that determines explosive movement ability involving joints, as it facilitates synchronization and coordination of movement between antagonist (opposing muscles) and agonist (opposing muscles). In the crescent kick, flexibility helps the

hamstrings and adductor muscles stretch optimally, thus preventing rapid contraction of the quadriceps and gluteus maximus. If flexibility is not optimal, athletes may:
1. Be unable to achieve the ideal hip position for kicking, thereby reducing potential power and rotational speed.
2. Experience braking action from stiff muscles, which inhibits kick acceleration.
Therefore, structured and regular flexibility training is essential in a pencak silat training program to optimize sickle kick performance.
b. How Leg Explosive Power and Pencak Silat Crescent Kick Speed Are Related In Makassar athletes, the second hypothesis test found a relationship between leg explosive power and pencak silat crescent kick speed. The regression equation−= 0.599 + 0.085 X2 explains the correlation coefficient of 0.614 obtained from the computation. According to this research, Makassar athletes' pencak silat crescent kick speed increases with leg explosive force. In contrast, Makassar athletes' pencak silat crescent kick speed decreases with decreasing leg explosive force.
Leg explosive power is the muscles' capacity to produce the greatest amount of force in the least amount of time (where is Power, is Force, and is Velocity).

The greater the leg explosive power, the greater the force an athlete can generate at the start of a movement and the faster they can reach maximum leg velocity before contact.

b. The Relationship Between Abdominal Muscle Strength and Pencak Silat Crescent Kick Speed

The results of the third hypothesis test revealed a correlation between abdominal muscle strength and pencak silat crescent kick speed in Makassar athletes. The calculation yielded a correlation coefficient of 0.597, explained by the regression equation $\hat{Y} = 12.813 + 0.401$ X3. This finding suggests that the stronger the abdominal muscle strength, the better the pencak silat crescent kick speed in Makassar athletes. Conversely, the weaker the abdominal muscle strength, the worse the pencak silat crescent kick speed in Makassar athletes.

The abdominal muscles serve as the center of stability for the entire body. In a crescent kick, when the kicking leg is lifted and the hips are rotated explosively, the abdominal muscles must contract strongly to maintain balance on the supporting leg. This stability ensures that the energy generated by the hip rotation is fully transferred to the leg, rather than lost due to swaying or imbalance.

c. The Relationship between Flexibility, Leg Power, and Abdominal Muscle Strength and Pencak Silat Crescent Kick Speed.

The fourth hypothesis test found that flexibility, leg power, and abdominal muscle strength were related to pencak silat crescent kick speed in Makassar athletes. The calculation yielded a correlation coefficient of 0.807, explained by the regression equation $\hat{Y} = 1.771 + 0.453$ X1 + 0.038 X2 + 0.117 X3. This finding suggests that the better the flexibility, leg power, and abdominal muscle strength, the better the pencak silat crescent kick speed in Makassar athletes. Conversely, the worse the flexibility, leg power, and abdominal muscle strength, the worse the pencak silat crescent kick speed in Makassar athletes.

Overall, it can be concluded that after statistical testing was carried out on the empirical data obtained from the field, it can be said that the three independent variables of flexibility, explosive leg power, and abdominal muscle strength, which were proposed, have a significant relationship with the speed of the sickle kick in athletes from Makassar city.

5 Conclusion

The following research results are based on the data analysis and discussion: The speed of the sickle kick of Makassar City's pencak silat athletes is significantly correlated with flexibility; the speed of the sickle kick of Makassar City's pencak silat athletes is significantly correlated with flexibility; the speed of the sickle kick of Makassar City's pencak silat athletes is significantly correlated with flexibility, leg muscle explosiveness, and abdominal muscle strength.

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