

The Correlation of Leg Muscle Power with the Frequency of Sickle Kicks of Pencak Silat Athletes



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ABSTRACT: There are many factors that affect Pencak Silat skills, namely the elements of physical condition and kicks. Based on the background in the introduction, it was found that the frequency of sickle kicks is related to the power of the leg muscles.

Purpose. Thus, the purpose of this study is to find out how much there is a correlation between leg muscle power and the frequency of sickle kicks in pencak silat athletes.

Material and methods. This type of research is correlational research using a quantitative approach. The population in this study is all pencak silat athletes in the Muna Regency Pencak Sor La Ode Pandu Organization. There were 30 male athletes who were taken as samples through purposive sampling techniques. There are several instruments used to collect data: the vertical jump test to measure leg muscle power and the sickle kick test by counting the number of left and right foot kicks for 30 seconds each to measure the frequency of sickle kicks.

Results. The results showed that there is a significant correlation between leg muscle power and sickle kick frequency; this can be seen from the acquisition of sig values. $0.019 < 0.05$, and the calculated r value = $0.425 > r$ table ($0.05 = 0.361$), while the determinant coefficient (R^2) = 0.18 , which means that the power of the limb muscles contributes to the frequency of sickle kicks by 18%. While 82% is influenced by other elements of physical conditions.

Conclusions. Based on the research that has been done, it can be concluded that there is a significant correlation between leg muscle power and the frequency of pencak silat sickle kicks. The sickle kick is a kick that is often used in matches. A good sickle kick certainly requires elements of good physical condition as well. Leg muscle power is one of the elements of physical condition that most determine the outcome of a sickle kick. Good leg muscle power requires a well-defined form of exercise. Exercises such as polymetrics and ballistics can increase leg muscle power. The authors emphasize the importance of further research to expand what they did in this study, including expanding the sample size, other influencing variables, and the role of teachers and trainers in Pencak Silat learning. This needs to be done in depth to validate the results of this study.

KEYWORDS: Power leg muscles, sickle kick, pencak silat

I. INTRODUCTIONS

Sport is crucial to human existence because it allows people to take care of their physical needs. Additionally, exercise is a physical activity for people to develop a total person who is physically, spiritually, and mentally well (Juwanda et al. 2020). In Law of the Republic of Indonesia No. 3, Article 4, concerning the National Sports System (Peraturan Pemerintah RI 2005) that: "National sports strive to preserve and enhance physical fitness, accomplishment, and human quality; impart moral principles; create sportsmanship; instill discipline; strengthen national unity; and boost the nation's honor, dignity, and honor."

The martial arts activity known as pencak silat has its roots in Indonesia. It is a sport that has been passed down through generations with enduring moral, aesthetic, spiritual, and social qualities (Ihsan et al. 2022). While the complete definition of pencak silat that has been compiled by the PB. IPSI with Bakin in 1975 was as follows: "Pencak Silat is a product of Indonesian human culture's efforts to preserve its integrity (manunggal) and independence (independence) toward the environment and the natural world in order to establish harmony in life and deepen faith and devotion to God Almighty". Pencak Silat is one of the 14 top sports represented by Indonesia in the Olympic and Paralympic Games, according to the Minister of Youth and Sports of the Republic of Indonesia. (Sudiana et al. 2023). In countries such as the Belgium, Denmark, Germany, Australia, France, United States, and the Netherlands, pencak silat also flourished outside of Indonesia (Juwanda et al. 2020). The great level of difficulty

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and complexity required by martial arts emphasizes the symbiotic practice of the body, mind, and spirit (Reishehrei and Soleimani 2014). The maneuvers and techniques utilized in pencak silat martial arts are numerous (Tack 2013).

Pencak Silat is a martial art that affects how well athletes perform by using a number of fundamental methods (Nugroho 2017). Since it may affect a warrior's effectiveness when attacking and defending, kicking is one of the essential abilities that must be taught and performed in Pencak Silat (van der Kruk et al. 2016). The kicking technique has a significant impact on the game since kicks score more points in all sorts of pencak silat bouts (Suwirman et al. 2019). The kick method in pencak silat is a sophisticated sequence that combines a number of different movements into one (Quinzi et al. 2016). The four most popular kicks in martial arts competitions are T kicks, front kicks, back kicks, and roundhouse kicks (Hariono et al. 2017). The most popular kick in contests is also this difficult kick.

A raised-leg kick that swings the foot forward is known as a sickle kick. According to (Juwanda et al. 2020), When performing a sickle kick, one leg acts as a brace and the other serves as the actual kick. A third perspective defines a sickle kick or side kick as an attack done with one foot that travels forward in a semicircular motion and hits the back of the foot (Suwirman et al. 2019). In the game of pencak silat, a kick that hits the "togok," which is the part of the body other than the neck up and from the midsection to the genitals, is evaluated as having been successful. Chest, Middle to Upper Abdomen (Arsyad et al. 2018). Athlete physical condition affects various aspects of an accurate sickle kick (Ihsan et al. 2017).

Physical condition is one of the supporting indicators of the performance of the ultimate athlete during training or competition (Saputra et al. 2016). Teachers and trainers must give substantial consideration to physical condition when developing training and teaching programs (Ihsan et al. 2020). A supporting component in figuring out how well an athlete performs in a sport is how physically and physiologically they are feeling (Bridge et al. 2014). Technique mastery necessitates repeated application of the learnt procedures in addition to physical fitness. Exercise is a scheduled, systematic learning activity. Exercise's opening phase focuses more on physical condition (Saputra and Ihsan 2020).

Endurance, explosive power, strength, speed, agility, coordination of motion, flexibility, balance, and other physical attributes are factors that impact the sickle kick (Saputra and Ihsan 2020). According to (Sepriadi 2020) because it influences how well a person can punch and kick, how far they can stretch, and how rapidly they can run, explosive power is an essential biomotor skill in sports. Speed and strength, such as those used in jumping, striking, and fast sprinting, are the foundation of explosive power (Sampaio et al. 2014), throwing, and kicking (Ozbar 2015). The crescent kick requires a lot of muscle power, and completing other sorts of motor abilities in different sports requires a lot of strength as well (Juwanda et al. 2020). A lot of strategies make use of explosive power (Suwirman et al. 2019).

A pencak silat competitor must be proficient in the sport's skills and in top physical shape to succeed. Hanifan Yudani Kusumah, who won a gold medal in the pencak silat competition at the 2018 Asian Games, is one of the excellent athletes who is proud of the Indonesian nation. In international competitions, the martial arts discipline of pencak silat has frequently brought honor to Indonesia (Ilahi et al. 2023). Hanifan Yudani Kusumah made a quick sickle kick, making it hard for the opponent to evade. This is as a result of Hanifan Yudani Kusumah's strong leg muscles, which he acquires via training. It has been demonstrated that he not only kicks well and quickly, but also powerfully. It is uncommon for martial arts competitors nowadays to resemble Hanifan Yudani Kusumah.

Based on the description stated above, the author took the initiative to raise research entitled The Correlation of Limb Muscle Power with the Frequency of Sickle Kicks of Pencak Silat Athletes.

II. MATERIAL AND METHODS

Participants

The population in this study is all pencak silat athletes in the Muna Regency Pencak Sor La Ode Pandu Organization, which was 50 people. Purposive sampling was utilized as the sample method in this investigation, namely taking samples with the consideration of male sex obtained by 38 people, then selecting based on skilled sickle kicks obtained by 30 people who were the research sample.

Procedure

Leg muscle power is measured using a vertical jump test. The first movement begins with the testee reaching as high as possible using one hand to the measuring board that has been made on the wall in centimeters. Then take a squat prefix to jump as high as possible. Data from the vertical jump test is taken by subtracting the jump height from the achievement height. Then, weight measurements are also made, and then the data is processed using Lewis nomograms with the formula:

$$P = \sqrt{4.9 \cdot \text{Weight} \cdot vD},$$

Remark: P = Power (kg.m/s), Weight = Sampel Weight (kg), D = Score Vertical Jump (m)

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The frequency of sickle kicks is measured by counting the number of left and right foot kicks. The testee performs a sickle kick preceded by the left or right foot and returns to the starting position by touching the floor behind the line, one meter away from the punching bag. The testee kicks the right foot as much as possible for 30 seconds, followed by the left foot for 30 seconds as well.

Statistical analysis

This investigation on the correlation between pencak silat sickle kick frequency and leg muscle power is called a correlational research. The purpose of correlation study is to ascertain whether there is a link between two or more variables. Data analysis techniques are implemented for hypothesis testing. Data analysis techniques use normality tests, linearity tests, and product moment correlations using the SPSS application version 26.

Results

The goal of descriptive analysis in the study data is to explain how the athletes that compete in Pencak Silat differ from the average value, standard deviation, minimum value, maximum value, and total number in terms of their ability to kick sickles and their frequency of doing so. The following table displays the findings of the descriptive analysis of the data for each variable.:

Table 1. Descriptive analysis

Details	Leg Muscle Power	Sickle Kick
Amount	2459	1931
Mean	81,97	64,37
st. deviasi	10,695	2,977
Maximum	95	69
Minimum	60	58

The data for limb muscle power has a mean value of 81,96 and a st. deviation of 10,695, as shown in the table above. The sickle kick frequency data has a mean value of 64.36 and a st. deviation of 2.977. The average histogram of the values of the two variables can be seen below :

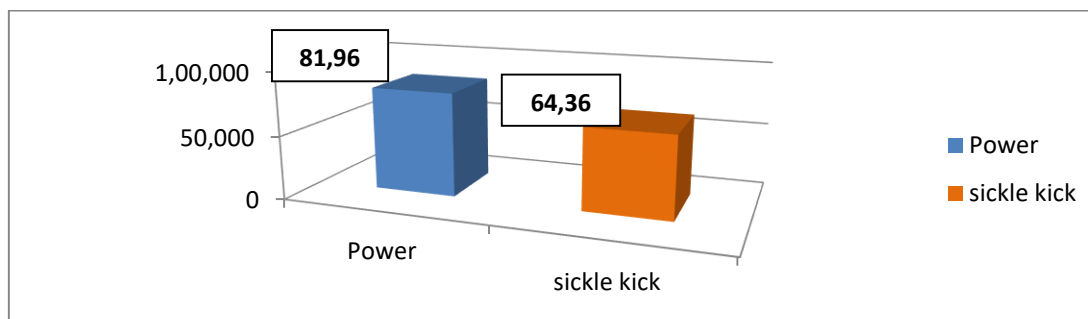


Figure 1. Variable average histogram data

Table 2. Power leg muscles

No	Interval Class	Frequency		
		Absolute	Cumulative	Relative
1	60 - 65	3	3	10%
2	66 - 71	2	5	7%
3	72 - 77	3	8	10%
4	78 - 83	9	17	30%
5	84 - 89	2	19	7%
6	90 - 95	11	30	37%
Total		30		100%

According to the table above, the interval class 66-71 has the lowest frequency and the interval class 90-95 has the highest frequency. The following histogram shows the frequency distribution of the data for leg muscle power:

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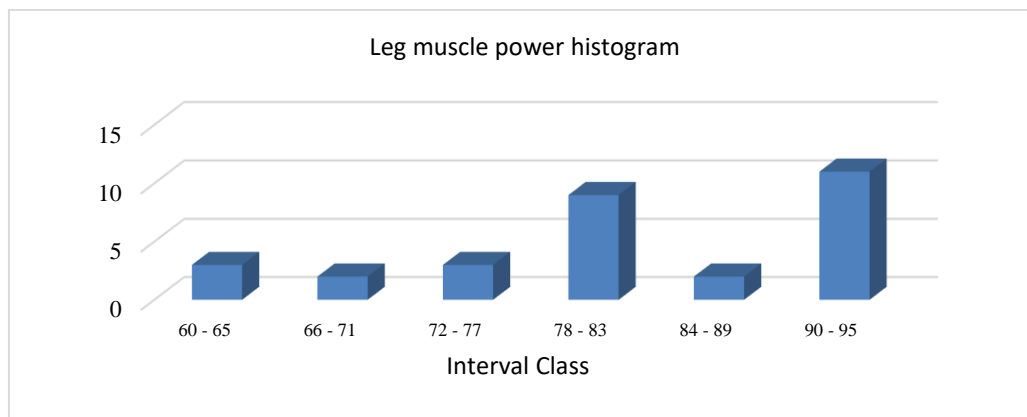


Figure 2. Histogram distribution of frequency distribution of Leg muscle power

Table 3. Sickle kick

No	Interval Class	Frequency		
		Absolute	Cumulative	Relative
1	58 – 59	2	2	7%
2	60 – 61	3	5	10%
3	62 – 63	8	13	27%
4	64 – 65	4	17	13%
5	66 – 67	9	26	30%
6	68 – 69	4	30	13%
Total		30		100%

According to the table above, interval class 58-59 has the lowest frequency while interval class 66-67 has the greatest frequency. The following histogram displays the frequency distribution of the kick frequency data:

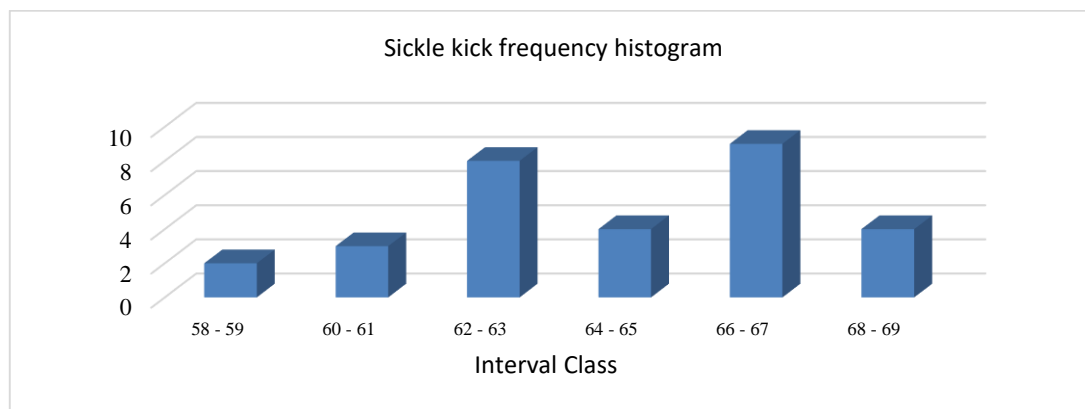


Figure 3. Frequency spread histogram sickle kick frequency data

Table 4. Normality test

One-Sample Kolmogorov-Smirnov Test			
		Leg muscle power	Sickle kick
N		30	30
Normal Parameters ^{a,b}	Mean	81,97	64,37
	Std. Deviation	10,695	2,977
Most Extreme Differences	Absolute	,145	,142
	Positive	,111	,110
	Negative	-,145	-,142
Test Statistic		,145	,142
Asymp. Sig. (2-tailed)		,110 ^c	,128 ^c

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The normality test of the two variables (leg muscle power and sickle kick) obtained the value of Asymp . Sig (2-tailed) variable leg muscle power = 0.110 and value Asymp . Sig (2-tailed) variable sickle kick = 0.128 Hence the value of Asymp . Sig (2-tailed) of both variables > 0.05, then the data on the two variables are normally distributed.

Table 5. Linearity test

ANOVA TABLE			Sum of Squares	df	Mean Square	F	Sig.
Leg muscle power*sickle kick	Between Groups	(Combined)	174,350	15	11,623	1,970	,106
		Linearity	46,413	1	46,413	7,865	,014
		Deviation from Linearity	127,937	14	9,138	1,549	,212
	Within Groups		82,617	14	5,901		
	Total		256,967	29			

The linearity test of the two variables (leg muscle power and sickle kick) obtained deviation values from linearity 0.212 > 0.05, which means that the correlation between the variable leg muscle power and the frequency of sickle kicks is linear

Table 6. Product moment correlation test

Correlations			
		Leg muscle power	Sickle kick
Leg muscle power	Pearson Correlation	1	,425*
	Sig. (2-tailed)		,019
	N	30	30
Sickle kick	Pearson Correlation	,425*	1
	Sig. (2-tailed)	,019	
	N	30	30

*. Correlation is significant at the 0.05 level (2-tailed).

The correlation test of the two variables (leg muscle power and sickle kick) obtained the sig value. 0.019 > 0.05 and the calculated R value is 0.425 > the R table is 0.361, given by the sig value. > 0.05 and the R value is calculated > the R table, it can be concluded that the power of the leg muscles and the frequency of sickle kicks have a significant relationship. While the R-square value is 0.18.

III. DISCUSSION

The purpose of this research is to ascertain the association between sickle kick frequency and leg muscle strength. Strength, quickness, and muscle endurance are a few physical attributes that affect how powerful the Sickle Kick is. Physical components including as strength, speed, explosive power, agility, endurance, and flexibility are all necessary for a good and accurate kick (Anwarudin et al. 2020). The goal of this study is to determine the association between leg muscle power and frequency of sickle kicks.

Based on statistical analysis with the product moment correlation test, It was discovered that the frequency of sickle kicks and the strength of the leg muscles correlated significantly, this can be seen from the acquisition of sig values. 0.019 < 0.05, and the calculated r value = 0.425 > r table (α 0.05 = 0.361), while the determinant coefficient (R²) = 0.18, which means that the power of the limb muscles contributes to the frequency of sickle kicks by 18%. While 82% is influenced by other elements of physical conditions.

Pencak silat is a phrase currently used by Malaysians and Indonesians to refer to both a historic and modern martial art as well as a cultural practice that combines combat and art (Mulyana et al. 2021). The most crucial skill to perfect when battling in this sport is proper kicking technique (Soo et al. 2018). This is because using legs to attack is more common in martial arts fights, and using legs to gather points and get to an attack target is also more successful (Amrullah et al. 2020). This kick has the property of moving in a circular motion toward the target while using the rear of the foot (Sinulingga et al. 2023).

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Physical skills (such as stamina, strength, muscular endurance, and speed) are needed to support the pencak silat martial art during practice and competition (Lenetsky and Harris 2012). An athlete should be in good physical shape in order to perform at their best (Shin et al. 2016). According to another research, an athlete's stability and technical performance are influenced by their physical capabilities (Lipowski et al. 2019). The match's outcome is significantly influenced by the technical and physical aspects (Corrêa et al. 2016).

Speed and force are the physical requirements for the sickle kick (Doewes et al. 2022). Power is a function of speed and power times (Bompa and Haff 2019). Power also defines an athlete's quality since an opponent may more readily catch and react to kicks if an athlete has very weak limbs (Zulfikar and Purwanto 2020). The explosive strength of an athlete's foot muscles is frequently a key component of their ability to perform well in sports at the highest level of competition (James et al. 2016). The capacity to kick is tied to how the lower limb muscles work (Ihsan et al. 2022). According to previously conducted study, the strength of the leg muscles affects the sickle kick's capacity (Ihsan et al. 2022). The cross-sectional area of the muscles and the types of fibers have an impact on the athlete's ability to produce more power (Haff and Stone 2015).

However, the reality is that many players continue to have above-average kicking skills, particularly when it comes to the sickle kick, making them qualified to use the technique (Lihawa et al. 2022). A few factors that might affect the sickle kick are the distance to the target, the balance of the legs it supports, the body's position, straight-leg kicks, the direction of the kick, and hip rotation (Hölbling et al. 2017). The posture of the feet must be properly educated in order to generate automatic motions that are effective and efficient in the application of power. Because the technique's success in terms of reaction, responsiveness, and performance times will affect the outcome of the kick (Sant'Ana et al. 2017).

To increase athletic performance effectiveness, training is crucial (Peráček et al. 2018). It must be executed through a regular workout regimen, especially on the leg muscles, to produce a good and powerful fundamental kicking technique (Rodica and Nurmai 2020). Strong, swift, and purposeful kicking calls for specialized workouts that emphasize leg muscles, leg length, leg muscle endurance, and the use of suitable training methods (Pomatahu 2018). Speed-based training, ballistic, and plyometric can be used to enhance the performance of high-power kicks (Da Silva Santos et al. 2020). This viewpoint is used as a guide to carry out the training process and as a benchmark to enhance each athlete's potential so they may afterwards win championships in competitions held at various levels.

IV. CONCLUSIONS

Based on the research that has been done, it can be concluded that there is a significant correlation between leg muscle power and the frequency of pencak silat sickle kicks. The sickle kick is a kick that is often used in matches. A good sickle kick certainly requires elements of good physical condition as well. Leg muscle power is one of the elements of physical condition that most determine the outcome of a sickle kick. Good leg muscle power requires a well-defined form of exercise. Exercises such as plyometrics and ballistics can increase leg muscle power. The authors emphasize the importance of further research to expand what they did in this study, including expanding the sample size, other influencing variables, and the role of teachers and trainers in Pencak Silat learning. This needs to be done in depth to validate the results of this study.

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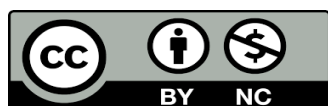
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