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The Relationship Between The Explosive Power Of The Leg Muscles And The Speed And Accuracy Of The A (Straight) Kick In Pencak Silat Athletes

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Abstract
The primary objective of this empirical study was to investigate and quantify the correlation between the explosive power of the leg muscles and the velocity of straight kicks among Pencak Silat practitioners affiliated with the Persaudaraan Setia Hati Terate in the Bancar District of Tuban. The study involved a cohort of 20 athletes, representing the entire population of the branch, who were selected through a total sampling (saturated sampling) technique to ensure data integrity. To gather precise physical and technical data, two validated instruments were employed: the vertical jump test, utilized as a metric for lower-body explosive power, and a specialized timed-kick test designed to evaluate the rapid execution of straight kicking maneuvers. The collected data underwent rigorous statistical processing using the Pearson Product Moment correlation formula. The analytical results revealed a calculated r-coefficient of 0.815, which significantly exceeds the critical r-table value of 0.444 at a 5% significance level. Furthermore, the observed significance value (2-tailed) was recorded at 0.000, which is well below the established alpha threshold (α = 0.05). These metrics provide conclusive evidence of a positive, significant, and remarkably strong relationship between the explosive capacity of the leg musculature and the resulting speed of the athlete's straight kick. Based on these findings, it can be inferred that the explosive power of the lower extremities serves as a critical determinant of kicking performance; as an athlete's power output increases, there is a commensurate and linear improvement in the acceleration and impact speed of their straight kicks. Consequently, this study offers a strategic recommendation for coaching staff: to achieve peak competitive performance, training curricula must prioritize plyometric and explosive strength conditioning. Integrating targeted leg power exercises into regular practice sessions is essential for optimizing the technical efficiency and offensive capabilities of Pencak Silat athletes in competitive settings.
Keywords: Leg Muscle Explosive Power, Pencak Silat, Straight Kick

INTRODUCTION

Pencak silat is a traditional sport as well as a cultural heritage of the Indonesian nation that has many benefits, both as a health sport, martial arts, and achievement sports (Priyohutomo & Hariyanto, 2023). In modern developments, pencak silat has been competed at various levels, ranging from regional, national, regional, to international, and attended by early, adolescent, to adult athletes (Rosmawati & Darni, 2019). Pencak silat has four classes that are contested, namely the categories of competition, singles, doubles, and groups or squads (Wahyudi & Fajar, 2022).

The success of an athlete in achieving peak achievement is highly determined by the integration of four main pillars, namely physical endurance, technical proficiency, tactical intelligence, and mental readiness (Gustama et al., 2021). In the context of pencak silat, mastery of basic technical instruments is an absolute requirement when competing. Referring to Ari (2022), this spectrum of techniques includes various crucial elements, ranging from attacks such as punches and kicks, to defensive aspects that include parrying, evasion, falling, and sweeping techniques.

In the dynamics of pencak silat matches, the technical aspect plays a vital role as the main attack instrument that significantly determines the success of a silat fighter in conquering the opponent (Yasin Ilmansyah Hakim et al., 2023). The treasures of leg attack techniques in pencak silat are very varied, including the categories of side kicks, bow kicks, and back kicks, each of which has unique characteristics. However, among these variations, proficiency in executing straight kicks is one of the most crucial technical indicators to achieve maximum achievement (Gustama et al., 2021).

The strategic advantage of the straight kick, or often known as the front kick, lies in its mechanism that prioritizes speed, movement efficiency, and a high level of effectiveness when penetrating the opponent's defense (Djoronga & Saiman, 2025). Tactically, this technique functions as a quick penetrating attack directed directly at fatal anatomical points, such as the heart and chin area. Therefore, a deep mastery of the front kick technique is not just a complement but the main foundation for an athlete to dominate the course of the match and secure victory points (Djoronga & Saiman, 2025; Gustama et al., 2021).

A number of previous studies have shown that the performance of straight kicks places great emphasis on the physical state of the athlete, especially the explosive power of the leg muscles. Gustama et al., (2021) explain that the explosiveness of the leg muscles plays a role as the main physical component that determines the strength of the kick. Jein Katiandagho & Saiman, (2023) assert that explosive power is directly related to the ability to produce a shock and the speed of movement, especially when kicking. In addition, research by Afrizaldy, (2022) shows that leg length and muscle strength contribute to kick speed, which has an impact on the effectiveness of attacks in matches. These findings reinforce that the correlation between the explosiveness of leg

muscles and kicking ability is an important aspect of pencak silat. The importance of the elements of physical condition, the explosive power of the leg muscles can even be said to be one of the supporting factors in the movements carried out and even one of the main factors in the effort to achieve ideal movement ability (Yunica et al., 2023).

In theory, the explosive power of the leg muscles is defined as the ability of muscles to generate maximum strength in a short period of time through explosive contraction (Gustama et al., 2021). This component becomes an important physical basis in the straight kick movement, as it requires a combination of impulsive strength between muscle strength and execution speed. In straight kick techniques, movement coordination, reaction speed, and leg thrust strength are the determining factors for the accuracy and effectiveness of the attack (Yunica et al., 2023). Thus, the explosiveness of the leg muscles is conceptually closely related to the ability to produce fast, strong, and on-target straight kicks.

Different from the previous research, this study focuses on Pencak Silat athletes of the Setia Hati Terate Brotherhood of Bancar Tuban who have different characteristics, training patterns, and quality of kick performance from previous research subjects. The novelty of this study lies in the use of a combination of the vertical jump test and the straight kick speed test as an objective instrument in measuring the relationship between leg muscle explosiveness and the effectiveness of straight kicks in a specific population of college athletes. In addition, the urgency of this study increased because the observation results showed the low effectiveness of athletes' front kicks, which was characterized by the ease with which kicks were anticipated and thwarted by opponents. This research is important because it contributes to the evaluation of the physical condition of athletes specifically and is the basis for the development of training programs to increase explosive power and the quality of kick techniques.

Previous studies have examined the relationship between leg muscle explosiveness and kick performance, but the majority have focused on additional variables such as leg explosive power, general muscle strength, or comparisons between kick techniques. The research gap can be seen in the lack of studies that specifically analyze the relationship between the explosive power of leg muscles and the speed of straight kicks in athletes from the Pencak Silat Brotherhood of Setia Hati Terate, especially in the Bancar Tuban Branch. In addition, there have not been many studies that integrate observational field findings regarding low kick effectiveness with quantitative analysis of the relationship between physical ability and technique. This is a research gap that this study wants to answer, so as to make an original contribution to the development of pencak silat science, especially in the aspects of physical condition and kick technique.

METHODOLOGY

The research population consisted of all pencak silat athletes of the Setia Hati Terate Brotherhood of Bancar Tuban which amounted to 20 male athletes. Given the relatively small population of less than 30 people, this study applied a total sampling technique. The use of total sampling is intended to ensure that all members of the population are used as research samples so that generalization of research results can be made with a very small error rate. With this method, all athletes who actively participated in pencak silat training activities in the branch automatically became research respondents.

This study uses a quantitative approach with a correlational research design. The correlational method aims to identify and measure the degree of relationship between two or more variables, so this study falls under the category of associative research. The quantitative approach is used because the research focuses on numerical data analysis through statistical techniques to test the correctness of previously formulated hypotheses (Sugiyono, 2019). Thus, this study not only describes the phenomenon, but also evaluates the relationships that occur between variables in an objective and measurable manner. The research methodology was carried out through two types of tests that are relevant to the research variables. First, the explosive power of the leg muscles is measured using the vertical jump test, which is a standard instrument for evaluating the explosive capabilities of the legs. Second, the speed of a straight kick is measured through a straight kick performance test. The quantitative data obtained from the test were then analyzed using the product moment correlation technique using SPSS Version 25 software to test the relationship between leg muscle explosiveness and straight kick speed.

RESULTS

Based on the results of data processing carried out using certain assessment categories, a maximum score of 62 and a minimum score of 31 were obtained. The range of scores is then classified into five groups of intervals so that the distribution of athletes' abilities can be analyzed in a more systematic and structured manner. In the first interval, which is the 31–37 score range, there is 1 athlete in this group, which is equivalent to 5% of the total athlete population. This group represents the athlete with the lowest score in measurement. The second interval, or the 38–44 score range, included 3 athletes or about 15% of the overall participants. Athletes in this group show abilities that are still in the low to medium category. Furthermore, the third interval with a score range of 45–51 is inhabited by 5 athletes or 25% of the total population. This group shows that some athletes have had quite good abilities and are starting to get close to the optimal category. In the fourth interval, which is the score range of 52–58, there were 9 athletes or 45% of all participants. This interval is the group with the largest number of athletes, so it can be concluded

that the majority of athletes are in the high performance category. Finally, in the fifth interval with a score range of 59–65, there were 2 athletes or about 10% of the total population. Athletes in this group represent the highest achievement and demonstrate excellent ability based on the scoring parameters used.

This classification comprehensively describes the variation in athletes' abilities and provides a solid basis for further analysis of the effectiveness of training and the factors that affect athlete performance.

Table 1. Frequency Distribution of Leg Muscle Power Test Results

Interval Classes	Frequency	Presentase
31 - 37	1	5%
38 - 44	3	15%
45 - 51	5	25%
52 - 58	9	45%
59 - 65	2	10%
Jumlah	20	100%

Athlete Straight Kick Speed Test Results Data

The tests used to measure the ability of straight kick speed in athletes are carried out through a straight kick performance testing procedure. In its implementation, each athlete is given three opportunities to show their best abilities. Each attempt is calculated based on the number of straight kicks that can be taken in a predetermined amount of time. Of the three test results, the highest score was chosen as a representation of the athlete's maximum ability to make straight kicks quickly and consistently. The selection of the best value aims to minimize the influence of fatigue, technical errors, and other non-technical factors that can reduce the accuracy of the measurement. After all the data is collected, the test results are processed using descriptive statistical analysis techniques to determine the distribution of athletes' performance. Based on the calculation process, the highest score of 34 kicks and the lowest score of 22 kicks were obtained. This range of scores is then grouped into five class intervals with two-digit interval widths, so that the distribution of athletes' abilities can be mapped more systematically and easily analyzed.

In the first interval, which is 32–34 kicks, there are 3 athletes who are able to reach that range, which represents 15% of the total sample. This group describes the athletes with the best performance in the aspect of straight kick speed. The second interval, which was 29–31 kicks, included 7 athletes or about 35% of the total participants. The same number was also found in the third interval, namely 26–28 kicks, which again showed 7 athletes or 35% of the sample population.

These two intervals describe the majority of athletes who have the ability to kick speed in the medium to good category. Meanwhile, in the fourth interval of 23–25 kicks, there were 2 athletes, or 10% of the total athletes, which showed that the level of performance was below the group average. In the fifth interval, which is ≤ 22 kicks, there was only 1 athlete or 5% of the total participants, which shows that very few athletes are in the low kick speed category.

This overall distribution gives an idea that the majority of athletes have the ability to have a medium to good straight kick speed, with a small percentage of athletes in the very high and low categories. The data can then be used as a basis for evaluating training and skill development, especially in increasing the speed of execution of straight kicks.

Table 2. Athlete Straight Kick Speed Test Results Data

Interval Classes	Frequency	Presentase
32 - 34	3	15%
29 – 31	7	35%
26 – 28	7	35%
23 -25	2	10%
≤22	1	5%
Quantity	20	100%

Table 3. Product Correlation Test Results Moment Explosive Leg Muscles - straight kick speed

Variabel	N	Rhitung	Rtabel	Sig. (2-tailed)	Sign.	Remarks
Leg muscle explosiveness straight kick speed	20	0.815	0.444	0.000	0.05	Signifikan

Based on the results of *the product-moment* analysis, it was found that the significance value was 0.000. Since the figure is below the threshold of α = 0.05, it can be concluded that the explosive power of the leg muscles has a pronounced correlation with the speed of a straight kick. The strength of this relationship is very high, as shown by the correlation coefficient of 0.815. The positive nature of the relationship indicates a unidirectional pattern; this means that any improvement in the *power ability* of the leg muscles will be followed linearly by an improvement in the quality of the athlete's front kick speed.

DISCUSSION

The basic technique of kicking, especially the straight kick in pencak silat, requires optimal speed and strength. These two components are the main factors that produce explosive power or strong impulses when a kick is released by an athlete (Pratiwi et al., 2018). The explosiveness of the leg muscles plays an important role in supporting the speed of the front kick, because this ability allows athletes to maintain and improve the quality of their kick execution so that the performance achieved can be maximized. The explosive power of the leg muscles is evident both in the preparation phase and in the final phase of the execution of the straight kick. In these phases, athletes need sufficient muscle strength so that the kick made is able to reach the target precisely and provide a strong impact, so that the opponent has difficulty parrying. Kicks that are carried out with high speed and power have the potential to produce the maximum score in the match, which is immediately getting a score of two (2) in the scoring system.

In addition to the explosive power of the leg muscles, coordination of movement and body balance are also supporting factors that are no less important in the implementation of straight kicks. Good coordination between the muscles of the lower and upper body allows the kick movement to be carried out effectively and efficiently, while balance plays a role in maintaining the stability of the body during the kicking process so that athletes do not easily lose control of movement.

In addition, proper technique and systematically programmed training also affect the quality of the kicks produced. Athletes who have a good mastery of technique and are supported by continuous training tend to be able to significantly increase the speed and power of the kick, so that performance in the match can be more optimal.

The front kick or straight kick is a basic technique that is carried out by moving the kicker's leg forward. The movement begins with maximum knee flexion until the thighs are raised, then continues by straightening the lower legs to produce a forward shock. After the shock is made, the leg is immediately retracted through knee flexion movements to return to the starting position. During the kicking process, both hands are positioned relaxed but remain functional to help maintain stability and balance of the body. Technically, the execution of the front kick begins with lifting the kicker's leg so that the knee position is parallel or slightly above the abdomen, while the lower leg is left hanging naturally. The kick movement is then executed by pushing the leg forward on a straight or slightly uphill trajectory, adjusted to the target or target.

In addition to the technical aspect, the success of the execution of the straight kick is also influenced by the flexibility and strength of the leg muscles. Flexibility allows the joint to be wider so that the kick movement can be performed to the maximum, while muscle strength plays a role in producing a strong and stable thrust when striking forward.

In addition, balance and coordination of movements are important factors in maintaining the quality of kicks to remain effective and efficient. Athletes who have good balance will be able to maintain their body position during the kick, while optimal coordination helps synchronize between the movements of the legs, body, and hands so that the resulting kick is more directed and on target.

The effectiveness of this technique is strengthened by research findings (Siswara & Mardius, 2021) which show that the explosiveness of leg muscles has a positive and significant influence on the accuracy of straight kicks. Thus, the better the explosive power of an athlete's legs, the more optimal the speed and accuracy of the straight kick produced.

CONCLUSION

Based on the findings of the study regarding the contribution of leg muscle explosiveness to straight kick speed in Pencak Silat athletes of the Setia Hati Terate Branch Bancar Tuban Brotherhood College, it can be concluded that there is a significant and meaningful relationship between the explosive power of leg muscles and the performance of straight kick speed. These findings suggest that the increase in the explosive capacity of the leg muscles has a direct effect on the increase in the speed of kick motion. Thus, the higher the explosive power of the leg muscles that an athlete has, the more optimal the speed of the straight kick that can be produced.

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