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The effect of zig-zag and ladder drill training on sickle kick speed at the gsc pencak silat club

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ABSTRACT
The speed of the sickle kick is an important component of pencak silat that greatly affects the effectiveness of an attack and an athlete's performance. Proper physical exercises, such as zigzag running and ladder drills, are believed to increase agility and movement speed, ultimately contributing to increased kick speed. However, the effectiveness of these training methods still needs to be scientifically proven. This study aims to determine the effect of zigzag running and ladder drills on sickle kick speed and to compare the effectiveness of these training methods for pencak silat athletes. The study employed a quantitative experimental approach. The study population was participants in pencak silat training at Gisting Silat Club (GSC) in Tanggamus Regency. A sample of 30 people was taken using an ordinal pairing technique and divided into two treatment groups. The instrument used was a sickle kick speed test, and the data were analyzed using a t-test. The results showed that the zig-zag running exercise significantly increased the speed of the sickle kick (t-count: 8.411 > t-table: 2.145). Ladder drills also significantly increased speed (t count 4.063 > t table 2.145). However, there was no significant difference between the two training methods (t-count: 2.032 < t-table: 2.048).In conclusion, both types of exercise are effective in increasing the speed of the sickle kick; however, neither method is significantly superior. It is recommended that trainers use both methods in combination for optimal results.
Keywords: zig-zag run; ladder drill; sickle kicks; pencak silat

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INTRODUCTION

Physical education is an integral part of the educational process, aiming to develop students' potential in sports. It plays a significant role in boosting student achievement, particularly for those active in extracurricular activities. Through this education, students can hone the physical skills needed in various sports (Bompa & Buzzichelli, 2019). This aligns with Law Number 11 of 2022 concerning Sports, which regulates the comprehensive and sustainable implementation of sports. The aim of this law is to improve the physical and mental fitness of the community, develop national

sporting achievements, and create an active, creative, disciplined, and competitive society (Tomasoa & Trianggara, 2022).

Martial arts are a sport that holds a special place in the hearts of Indonesians. This activity is not only popular among certain groups but has become part of a sporting culture enjoyed by people of all ages, from children to adults (Muslihin et al., 2021). One of the important contributions of martial arts is in shaping individual character, particularly in terms of discipline, courage, and mental and physical strength. Martial arts have experienced developments in the competition system, dividing competition categories based on age and clarifying competition rules, making them more attractive and easier to understand (Indonesian Pencak Silat Association National Conference 2012). The developed competition system and competition rules have led many parties to organize martial arts events, which has become a driving force for athletes to train diligently and achieve success (Sutopo, 2021).

Pencak silat is one of the native cultures of the Indonesian nation where it is strongly believed by its warriors and pencak silat experts that the Malay people today created and used this martial art since prehistoric times (Setiawan, 2011). The popularity of pencak silat is increasing along with the increasing number of practitioners, both from within the country and from abroad, who are studying and preserving this sport.

A kick or attack using the foot that is valued in pencak silat is an attack that is right on target, namely hitting the opponent's body protector with a crescent kick technique that is carried out quickly, strongly, and accurately, without being accompanied by a catching or holding movement, and is not blocked by a block or dodge (Sceisarriya et al., 2022). Based on these observations, the idea emerged that the effectiveness of the crescent kick can be influenced by various factors. One of them is the athlete's physical condition which directly contributes to the quality of the kick. (Linas et al., 2022) stated that this physical condition includes body mass, readiness of muscle joints, and body adjustments to be ready for active movement.

Another factor that may play a role is the training method used, which may not optimally support or align with the training goals and objectives. Therefore, the implementation of training methods such as zigzag runs and ladder drills is expected to be an effective alternative for increasing the speed of pencak silat athletes' crescent kicks, thus achieving maximum results in training and competitions (Perera & Joniton, 2023; Soemardiawan et al., 2025).

Based on observations conducted by researchers at the Gisting Silat Club (GSC) pencak silat club in Tanggamus Regency, it was found that during training sessions and practice matches, several participants still showed weaknesses in terms of speed when executing kicks, especially crescent kicks. This suboptimal speed made kicks easy to read and catch by opponents, thus providing opportunities for opponents to counterattack in the form of throws. Furthermore, when executing the crescent kick technique, several participants appeared unable to direct their kicks perfectly at the intended target, resulting in low attack effectiveness.

Based on the background of the study, the research problems can be formulated as follows. First, whether zig-zag run training has a significant effect on improving the speed of sickle kicks in pencak silat athletes. Second, whether ladder drill training has a significant effect on improving the speed of sickle kicks in pencak silat athletes. Third, whether there is a significant difference in effectiveness between zig-zag run training and ladder drill training in improving the speed of sickle kicks in pencak silat athletes.

Research related to agility training such as zig-zag run and ladder drill has been widely conducted to improve agility, speed, and coordination in athletes. These training methods are considered effective in developing lower limb explosive power and neuromuscular coordination,

which are essential components in many sports, including pencak silat (Ahmad, 2018; Okanansa et al., 2022). However, most previous studies only focused on improving general agility performance and did not specifically examine their effect on the speed of specific kicking techniques. In pencak silat, the sickle kick is one of the most frequently used attacking techniques that requires high speed and accuracy in order to be effective during matches. Therefore, improving the speed of the sickle kick is an important aspect in enhancing athletes' performance (Rosmawati & Darni, 2019). Until now, research that directly compares the effectiveness of zig-zag run training and ladder drill training on the speed of sickle kicks in pencak silat athletes is still limited. Based on this gap, this study aims to analyze and compare the effects of zig-zag run training and ladder drill training on improving the speed of sickle kicks in pencak silat athletes (Hidayat & Haryanto, 2022).

METHOD

The research method used in this study was an experimental method with a two-group pretest–posttest design. This design was used to determine the effect of two different training methods on improving the speed of sickle kicks in pencak silat athletes. The subjects were divided into two experimental groups. The first group received zig-zag run training, while the second group received ladder drill training. Before the training program was implemented, both groups were given a pretest to measure the initial speed of the sickle kick. After completing the training program for a predetermined period, a posttest was conducted to determine the improvement in sickle kick speed after the treatment was given (Ackerly, 2018).

The training program was conducted for several weeks with a frequency of three training sessions per week. Each session consisted of warm-up activities, core training using zig-zag run or ladder drill exercises, and cooling down. The zig-zag run exercise was designed to train agility and rapid changes in direction, while the ladder drill exercise focused on improving foot speed, coordination, and neuromuscular control. These exercises were expected to contribute to improving the speed of kicking movements in pencak silat athletes (Aslam et al., 2023; Kumar et al., 2024).

The instrument used in this study was a sickle kick speed test to measure the athletes' ability to perform kicks in a certain period of time. The test measured the number of sickle kicks performed within a predetermined duration. This instrument was used because it is able to represent the speed and effectiveness of the sickle kick technique performed by the athletes. The results of the test were recorded and used as data for analysis to determine the improvement in kick speed before and after the training program (Hakim, 2023; Siswara & Mardius, 2021)

The research took place at the PKU Muhammadiyah Gisting Hospital Building in Tanggamus. The study was conducted three times per week for four weeks, totaling 12 sessions. Data collection in this study was carried out through tests and measurements to obtain accurate information related to the speed of sickle kicks performed by the athletes. Researchers directly observed the implementation of tests and measurements in the field using a sickle kick speed test instrument. The use of tests and measurements in sports research is important to obtain objective and measurable data related to athletes' physical performance (Lestari et al., 2025). The collected data were then analyzed to determine the effect of zig-zag run training and ladder drill training on improving the speed of sickle kicks in pencak silat athletes.

RESULTS

This study was carried out by conducting a sickle kick training experiment with a zig-zag run and ladder drill training model on the results of sickle kick speed in Gisting Silat Club (GSC) pencak

silat club in Tanggamus Regency. Overall this activity was carried out in three stages, first pre-test to determine the initial ability of the sample, from the results of the pre test then sample selection was carried out using ordinal pairing to determine 2 groups to be given treatment. After the group was obtained, they were given training in both the zig-zag run group and the ladder drill group. To obtain an overview of the distribution of data from this study which includes average, standard deviation, maximum value and minimum value.

A. Normality Test

Tabel 1. Normality Test

Group	Test	Speed of Crescent Kick		Conclusion
		L Value	L Table	
Zig-Zag Run	*Pretest*	0,088	0,300	Normal
	Posttest	0,061	0,285	Normal
Ladder Drill	*Pretest*	0,166	0,300	Normal
	Posttest	0,174	0,285	Normal

From the table above, the normality test value of the zig-zag run group was obtained, namely for the pretest Lcal = 0.088 < Ltable = 0.300 and the posttest Lcal = 0.061 < Ltable = 0.285, while the ladder drill group was for the pretest Lcal = 0.166 < Ltable = 0.300 and the posttest Lcal = 0.174 < Ltable = 0.285.

B. Homogenity Test

Table 2. Homogenity Test

Variable	F value	F table	Conclusion
Pretest zig-zag run group* dan *ladder drill	1,033	2,484	Homogen
Posttest zig-zag run group* dan *ladder drill	1,056	2,484	Homogen

From the table above, the homogeneity test value of the pretest of the zigzag rung and ladder drill groups was Fcal = 1.033 < Ftabel = 2.484, while the posttest of the zig-zag rung and ladder drill groups was Fcal = 1.056 < Ftable = 2.484.

C. Hypothesis Test

Table 3. Hypothesis Test 1

Variable	Mean		t value	t table	Sig	Conclusion
ZigZag Run group	*Pretest*	19,4	8,411	2,145	0,000	There is significant difference
	Posttest	21				

Hipotesis : The significant influence of zig-zag run training on the results of sickle kick speed in Gisting Silat Club (GSC) pencak silat club in Tanggamus Regency?. Test criteria: If the tcount ≥ t

table, then the hypothesis is accepted, while the tcount ≤ t table, then the hypothesis is rejected. Conclusion: Based on the value of ttable (n-1) = (15 - 1) = 14 with a 2-way test, a = 0.05 obtained the value of ttable = 2.145. So for the analysis test on the speed of the tcal sickle kick = 8.411 > ttable = 2.145, so that it can be concluded that the hypothesis that reads "there is a significant influence of zig-zag run practice on the results of sickle kick speed in Gisting Silat Club (GSC) pencak silat club in Tanggamus Regency". Accepted. That is, there is an increase in the speed of the crescent kick from the influence of the zig-zag run exercise to be greater.

Tabel 4. Hypotesis Test 2

Variable	Mean		t value	t table	Sig	Conclusion
Ladder Drill group	*Pretest*	20,33	4,063	2,145	0,001	There is significant difference
	Posttest	22				

Hipotesis : What is the significant influence of ladder drill training on the results of sickle kick speed in Gisting Silat Club (GSC) pencak silat club in Tanggamus Regency?. Test criteria:If the tcount ≥ ttable, then the hypothesis is accepted, while the tcount ≤ ttable, then the hypothesis is rejected. Conclusion:Based on the value of ttable (n-1) = (15 - 1) = 14 with a 2-way test, a = 0.05 obtained the value of ttable = 2.145. So for the analysis test on the speed of the sickle kick = 4.063 > ttable = 2.145, so that it can be concluded that the hypothesis that reads "there is a significant influence of ladder drill training on the results of the speed of the sickle kick in the club of pencak silat Gisting Silat Club (GSC) in Tanggamus Regency". Accepted. This means that there is an increase in the speed of the sickle kick from the influence of ladder drill training to be greater.

Table 5. Hypotesis Test 3

Variable	Mean		t value	t table	Sig	Conclusion
zigzag run group	*Posttest*	21	2,032	2,048	0,014	No Significant difference
ladder drill group	*Posttest*	22				

Hipothesis : significant differences between zig-zag run and ladder drill exercises on the results of sickle kick speed in Gisting Silat Club (GSC) pencak silat club in Tanggamus Regency. Test criteria:If the tcount ≥ ttable, then the hypothesis is accepted, while the tcount ≤ ttable, then the hypothesis is rejected. Conclusion:Based on the value of the table (n1 + n2 - 2) = (15 + 15 - 2) = 28 with a 2-way test, a = 0.05 obtained the value of the table = 2.048. So for the analysis test of the speed of the tcal sickle kick = 2.032 < ttable = 2.048, so that it can be concluded that the hypothesis that reads "there is no significant difference between zig-zag run and ladder drill exercises on the results of the speed of the sickle kick in the club of pencak silat Gisting Silat Club (GSC) in Tanggamus Regency". Accepted.

Based on the formulation of the problem, the hypotheses proposed in this study are as follows. First, zig-zag run training has a significant effect on improving the speed of sickle kicks in pencak silat athletes. Second, ladder drill training has a significant effect on improving the speed of sickle kicks in pencak silat athletes. Third, there is a significant difference between zig-zag run training and ladder drill training in improving the speed of sickle kicks in pencak silat athletes.

DISCUSSION

The results of data analysis were carried out to determine the effect of zig-zag run and ladder drill exercises on the results of sickle kick speed in Gisting Silat Club (GSC) pencak silat students in Tanggamus Regency, it was found that the t-count value was greater than the t-table, besides that the average value during the posttest was greater than during the pretest. Partially, the first group of zig-zag run exercises indicated that the exercise had a significant influence on increasing the speed of the sickle kick in the pencak silat students of the Gisting Silat Club (GSC) in Tanggamus Regency. The zig-zag run exercise is an exercise with a movement pattern that changes the direction of the body by twisting as quickly as possible following the trajectory (Asrida & Saputra, 2024). This exercise is effective in improving neuromuscular abilities and accelerating reaction time to stimuli (Priadana & Saifuddin, 2023). In (Tofikin & Sinurat, 2020) study, the zig-zag run exercise had an effect on the agility of the sickle kick. In practice, the sickle kick requires speed and precision of movement by relying on the reaction of the leg muscles and body coordination. So that the zig-zag run movement pattern requires athletes to move quickly and change direction agilely, this is in accordance with the characteristics of the sickle kick movement, where the silat must be able to respond to the opponent's position and the direction of the target quickly.

The results of the second analysis in the ladder drill training group indicated that the exercise had a significant influence on increasing the speed of the sickle kick in the Ginsting Silat Club (GSC) pencak silat students in Tanggamus Regency. This is in line with (Ali et al., 2020) who stated that ladder drill training is a useful exercise method to improve leg speed, agility, coordination and overall speed. Another opinion that is in line also says that ladder drill training is a form of jumping exercise using one or two legs by jumping over a rope in the form of a ladder placed on the floor or on the ground, this exercise is an excellent form of exercise to improve agility, speed, and coordination (Soemardiawan et al., 2025). This is in line with the research of (Herdiman et al., 2022) that exercises using ladder aids can train and increase agility in the sickle kick. In pencak silat, especially the scythe kicking movement, the ability to set a quick and precise step is important, so that the kick can be done at speed without losing balance and accuracy. Thus, ladder drill exercises are effective in increasing the speed of the sickle kick, because the movement patterns in this exercise stimulate the neuromuscular system and strengthen coordination between the legs and the body as a whole.

Then the third hypothesis results indicate that zig-zag run and ladder drill exercises have the same effect in increasing the speed of the sickle kick. Both exercises are a form of exercise that focuses on increasing agility, reaction speed, and footwork coordination, which are important components of the sickle kick in pencak silat. The zig-zag run exercise emphasizes the ability to change direction quickly, thus training the muscles' response to changes in position and direction of movement. Meanwhile, ladder drill exercises train fast step patterns, movement rhythms, and coordination between feet and body. Thus, the results of the above study show that there is no significant difference between zig-zag run and ladder drill in increasing the speed of the sickle kick. But in this study, researchers suggest putting more emphasis on ladder drill exercises in increasing the speed of the sickle kick.

The results of this study indicate that agility training using zig-zag run and ladder drill exercises can improve the speed of sickle kicks in pencak silat athletes. This improvement can be explained through physiological and neuromuscular adaptations that occur as a result of repeated agility training. Exercises such as zig-zag run and ladder drill stimulate the activation of motor units and improve coordination between muscles involved in kicking movements. In addition, repeated

explosive movements during training activate the stretch-shortening cycle of the muscles, which contributes to faster and more efficient kicking movements.

These findings are consistent with previous studies which state that agility-based exercises are effective in improving speed, coordination, and explosive power of the lower limbs. Improved neuromuscular coordination allows athletes to perform movements more quickly and efficiently, which ultimately enhances their ability to execute kicking techniques during matches.

This study has several limitations that should be considered when interpreting the results. First, the number of participants involved in the study was relatively limited, which may affect the generalization of the findings. Second, the duration of the training program was relatively short, so the long-term effects of the training methods could not be fully observed. Third, external factors such as nutrition, recovery, and additional physical activities performed outside the research program were not fully controlled during the study.

The results of this study provide practical implications for coaches and practitioners in the field of pencak silat training. Zig-zag run and ladder drill exercises can be used as effective training methods to improve the speed of sickle kicks in athletes. Coaches can incorporate these exercises into regular training programs to enhance athletes' agility, coordination, and kicking performance during competitions.

CONCLUSION

Based on the results of the research and discussion in the previous chapter, conclusions can be obtained, namely: There is a significant influence of zig-zag run training on the results of sickle kick speed in Gisting Silat Club (GSC) pencak silat students in Tanggamus Regency. There is a significant influence of ladder drill practice on the results of sickle kick speed in Gisting Silat Club (GSC) pencak silat students in Tanggamus Regency. There was no significant difference between zig-zag run and ladder drill exercises on the results of sickle kick speed in Gisting Silat Club (GSC) pencak silat students in Tanggamus Regency.

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