

Influence of Shuttle Run and Zig-Zag Run Training on Crescent Kick Speed in Pencak Silat Athletes

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Keywords

Shuttle run; zig-zag run; crescent kick speed; pencak silat; agility.

Abstract

This study aims to determine the effect of shuttle run and zig-zag run training on improving the speed of the crescent kick among pencak silat athletes at SMP Negeri 1 Bawang. Crescent kick speed enhances attack effectiveness in pencak silat. This study employs a quantitative approach using a quasi-experimental design with a pre-test post-test model. The study population consisted of all pencak silat athletes at SMP Negeri 1 Bawang who actively participated in training activities. Total sampling was used (N=8), divided into two groups: the shuttle run training group and the zig-zag run training group. Data collection was conducted using a crescent kick speed test through pre-test and post-test administrations. Data analysis was performed using normality tests, homogeneity tests, and the Independent Samples t-test with the assistance of SPSS software. The results showed a significance value of 0.003 (<0.05), indicating a significant difference in the effects of shuttle run training and zig-zag run training on the crescent kick speed of pencak silat athletes. Shuttle run training was proven to yield higher improvements compared to zig-zag run training. Thus, shuttle run training is more effective for improving the crescent kick speed of student-aged pencak silat athletes.

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INTRODUCTION

Pencak silat is a traditional Indonesian martial art that embodies cultural values, philosophy, and athletic achievements, and is rapidly gaining prominence at both the national and international levels (Syah & Irawan, 2023; Saputra et al., 2025). The development of pencak silat has expanded beyond its role as a traditional martial art, a competitive sport contested in various official sporting events (Prayogi & Rahayuni, 2026). Combat sports athletes, particularly those in pencak silat, are required to possess integrated technical, tactical, physical, and mental abilities to achieve optimal performance during competitions (Mustaqim et al., 2026). Competitive pencak silat matches are fast-paced, requiring explosive and responsive movement (Rima et al., 2026). These conditions make biomotor components such as speed, agility, coordination, and power key factors in supporting athletes' performance (Mardius et al., 2026).

In pencak silat matches, kicking techniques are among the most commonly used offensive techniques by athletes to score points (Rachmawati et al., 2026). Kicks have the advantage of a wide range of attack, great power, and the potential to yield higher scores compared to striking techniques (Gautam et al., 2026). One of the kicking techniques frequently used in matches is the crescent kick (Ahmad et al., 2026). The crescent kick is executed with a curved trajectory directed toward the opponent's body quickly and under control (Islam & Hasna, 2025). This technique is considered effective because it can produce attacks that are difficult to anticipate when performed at high speed (Idrus et al., 2026). In addition to requiring good technical mastery, the crescent kick also requires optimal physical condition so that the movement can be performed quickly, accurately, and efficiently (Aljuklan & Sukarmin, 2023). Therefore, the crescent kick is one of the important techniques that must be developed in the training of pencak silat athletes (Pratama et al., 2026).

The speed of a crescent kick refers to an athlete's ability to execute a kicking motion rapidly from the start of the movement until it strikes the target (Ansyah, 2026; Akbar et al., 2026). Kick speed is a critical factor because attacks executed quickly are harder for opponents to read and anticipate (Nurlativa & Pratiwi, 2026). In modern pencak silat matches, athletes must be able to execute combinations of attack and defense in a very short time, making kick speed a key indicator of the success of attacking techniques (Mihmidati & Wahyudi, 2021). Slow kicks tend to be easily avoided and may even be caught by opponents, which can be detrimental to athletes in competition (Juliansyah & Mashud, 2025). Kick speed is influenced by neuromuscular ability, lower-body muscle strength, movement coordination, and the ability to change body direction quickly (Nasyiri et al., 2026). The speed of a crescent kick is inextricably linked to an athlete's physical condition, particularly speed and agility (Palgunadi et al., 2021). Agility is the ability to quickly change direction and body position without losing balance (Rosmawati et al., 2019). In pencak silat, athletes must be able to change positions, evade, and attack quickly in response to the dynamic nature of the match (Yakin & Hasibuan, 2021).

Athletes with good agility tend to be able to produce faster and more effective kicks because their bodies can adapt to changes in movement efficiently (Putra & Wahid, 2026). In addition to agility, motor coordination and muscle contraction speed also influence the quality of the crescent kick (Herdiman et al., 2022). Kicks executed by teenage athletes tend to lack speed, making them easy for opponents to anticipate during practice and simulated matches (Putri et al., 2025). Furthermore, the training programs currently implemented still place greater emphasis on mastering basic techniques rather than on the specific development of physical conditioning (Novita & Sumartiningsih, 2025). Training in agility and movement speed has not yet been provided in a structured and continuous manner, so the development of athletes' kicking speed has not reached its full potential (Panggih Setiawan et al., 2020). In fact, junior high school aged athletes are in a phase of motor development that is ideal for improving biomotor abilities such as speed and agility (Lloyd et al., 2016). This situation indicates a gap between the performance demands of pencak silat competitions and the training programs implemented in practice (Yakin & Hasibuan, 2021).

One type of exercise that can be used to improve athletes' agility and speed is the shuttle run and zig-zag run (Ikhsan & Umar, 2019). The shuttle run is a back and forth running

exercise involving rapid changes in direction, designed to improve acceleration, deceleration, and body movement response (Trisnowiyanto, 2016). Meanwhile, the zig-zag run is performed with a zigzagging movement pattern along a specific course, thereby training coordination, balance, and the ability to change direction. Both forms of exercise are widely used in elite sports training because their movement characteristics align with the needs of dynamic sports such as pencak silat. Several studies indicate that shuttle runs and zig-zag runs can improve agility, speed, and the quality of kicking movements in combat sports athletes. Several studies indicate that shuttle runs and zig-zag runs can improve agility, speed, and the quality of kicking movements in combat sports athletes (Abduloh et al., 2025; Rosmawati et al., 2019).

Previous studies have examined the influence of agility training on kicking ability in pencak silat. However, the effectiveness of these two training methods for junior high school-aged pencak silat athletes still requires further scientific validation. Other studies have also shown that shuttle runs are effective in improving speed and agility in combat sports athletes. Nevertheless, research specifically comparing the effects of shuttle run and zig-zag run training on the speed of crescent kicks in junior high school-aged pencak silat athletes remains very limited. Therefore, this study is important to determine the effects of shuttle run and zig-zag run training on the speed of crescent kicks in pencak silat athletes at SMP Negeri 1 Bawang. The results of this study are expected to serve as a reference for coaches in designing physical training programs that are more effective, systematic, and appropriate for the characteristics of student-aged athletes.

METHODS

This study employed a quantitative approach using a quasi-experimental design with a pre-test post-test model. The study aimed to determine the effect of shuttle run and zig-zag run training on improving the speed of the crescent kick among pencak silat athletes at SMP Negeri 1 Bawang. The study population consisted of all pencak silat athletes at SMP Negeri 1 Bawang who actively participated in training activities. There were 8 active pencak silat athletes participating in training activities. Therefore, total sampling was used, meaning the entire population of 8 athletes served as the study sample. The sample was then divided into two treatment groups: 4 athletes in the shuttle run training group and 4 athletes in the zig-zag run training group.

Data collection was conducted using a crescent kick speed test, measured by the number of kicks hitting the target within a specific time frame. Measurements were taken twice: before the treatment (pre-test) and after the treatment (post-test). The first group was given a shuttle run training program consisting of back-and-forth running with rapid changes in direction, while the second group was given a zig-zag run training program involving running in a zig-zag pattern along a specific course. The training programs were carried out regularly according to a predetermined schedule throughout the study period.

Data analysis was performed using SPSS. Prerequisite tests included a normality test using the Shapiro-Wilk test and a homogeneity test using Levene's test. Subsequently, hypothesis testing was conducted using an independent samples t-test to determine the difference in the effects of shuttle run and zig-zag run training on the speed of pencak silat athletes' crescent kicks.

RESULTS AND DISCUSSION

The results of this study were obtained based on a statistical analysis of the crescent kick speed data of pencak silat athletes in the shuttle run and zig-zag run training groups, as presented below:

Table 1. Pre-test and post-test results of the zig-zag run group

Athlete	Pre-test (Left)	Pre-test (Right)	Post-test (Left)	Post-test (Right)
A1	22	23	24	26
A2	19	19	21	22
A3	21	23	22	26
A4	20	22	22	24
Mean	20.50	21.75	22.25	24.50

Based on **Table 1**, the pre-test and post-test results for the zig-zag run training group showed that all athletes experienced an increase in the speed of their crescent kicks with both the right and left legs. The average speed of the right-leg kick increased from 21.75 to 24.50, while the average speed of the left leg kick increased from 20.50 to 22.25. These results indicate that the zig-zag run training had a positive effect on improving the speed of the crescent kick in pencak silat athletes. This improvement occurred because the zig-zag run training was able to enhance agility, movement coordination, and the ability to change body direction quickly during kicking movements.

Table 2. Normality test result

Variabel	Ltable	Description
Shuttle Run	.624	Normal
Zig-Zag Run	.368	Normal

Based on the **Table 2**. results of the normality test in Table 2, the p-values were .624 for the shuttle run group and .368 for the zig-zag run group. Since both p-values are > 0.05 , it can be concluded that the research data are normally distributed.

Table 3. Descriptive statistics result

Amount of data (N)	Minimum value	Maksimum value	Mean	Std Deviasi
16	16	27	22.06	3.276

Based on the descriptive statistics in **Table 3**, it is evident that the dataset consists of 16 data points, with a minimum value of 16 and a maximum value of 27. The mean value of 22.06 indicates that the athletes' speed in the scissor kick falls into the moderate category. Meanwhile, the standard deviation of 3.276 indicates that the data distribution is relatively homogeneous and does not vary significantly across the research samples.

Table 4. Homogeneity test results

Test	Sig	Description
Levene test	.758	Homogen

Based on the results of the homogeneity test in **Table 4**, the p-value was $0.758 > 0.05$, so the data was deemed homogeneous.

Table 5. Hypothesis test results

t	Sig.	Mean Difference
-3.550	.003	-3.625

Based on the results of the homogeneity test in **Table 5**, the results of the hypothesis test using an independent-samples t-test showed a significance value of 0.003 (< 0.05), indicating a significant difference in the effects of shuttle run and zig-zag run training on the

speed of pencak silat athletes' crescent kicks. The mean difference of -3.625 indicates that the shuttle run training group showed a greater improvement in results compared to the zig-zag run group.

The study results indicate that shuttle run training has a more significant effect on improving the speed of the crescent kick compared to zig-zag run training. These results are demonstrated by a significance value of 0.003 (<0.05) and a mean difference of -3.625, indicating a higher improvement in the shuttle run group. This improvement occurs because shuttle run training emphasizes acceleration, deceleration, and rapid changes in direction characteristics that align with the movement patterns of the crescent kick in pencak silat. The back-and-forth running motion in shuttle run training enhances neuromuscular response and leg muscle contraction speed, thereby supporting faster and more effective execution of kicks (Hernandez-martinez et al., 2025; Thapa & Ramirez-campillo, 2023). Additionally, this exercise also helps improve body movement coordination when changing positions during pencak silat matches (Anastasiou et al., 2024).

The shuttle run exercise emphasizes the ability to accelerate, decelerate, and change direction rapidly, which aligns with the characteristics of the crescent kick movement (Adnadia et al., 2022; Cid-calfucura et al., 2023). Meanwhile, the zig-zag run exercise also improves the speed of the crescent kick, although the improvement is not as significant as that of the shuttle run group (Sayfullah et al., 2023). This is because zig-zag run training focuses more on improving agility, movement coordination, and body balance rather than maximizing movement speed (Wicaksono et al., 2026). This improvement occurs because zig-zag run training enhances athletes' agility, movement coordination, and body balance during changes in direction (Iqram et al., 2025). These improvements occur because zig-zag run exercises enhance athletes' agility, motor coordination, and body balance when changing direction (Iqram et al., 2025).

In pencak silat matches, the ability to change direction quickly is essential for effective attacks and defense (Muliawan et al., 2025). Athletes with good agility tend to adjust their body position more easily before executing a kick, resulting in more effective and controlled movements (Pryimakov et al., 2022). Therefore, the zig-zag run exercise can still be used as a form of supplementary training to improve the quality of pencak silat athletes' crescent kicks (Lubis et al., 2024). The results of this study align with several previous studies stating that agility training influences the improvement of kicking ability in combat sports (James et al., 2016).

Research Mustaqim et al., (2026) shows that agility training can significantly improve the kicking speed of pencak silat athletes. Additionally, Juliansyah & Mashud (2025) explains that shuttle run training effectively improves the speed and agility of combat sports athletes, while zig-zag run training can enhance the ability to change direction and movement coordination in pencak silat athletes. The study Sudirman & Muhammad Qasash Hasyim (2025) also explains that training focused on changing direction can improve the effectiveness of combat sports athletes' kicks. These findings reinforce the theory that kicking speed is influenced by physical factors such as speed, coordination, and agility. However, research comparing shuttle run and zig-zag run training on the speed of crescent kicks in junior high school-aged athletes remains limited.

The results of this study also have important implications for the design of training programs for pencak silat athletes, particularly at the student level. Coaches can use the shuttle run as the primary training method to improve athletes' speed in executing crescent kicks, as it has been shown to be more effective than the zig-zag run. Additionally, the zig-zag run can still be used as a supplementary exercise to enhance athletes' agility, coordination, and balance. A combination of these two training methods can help athletes develop their physical abilities more comprehensively to meet the demands of modern pencak silat competition. A structured and consistent training program will have a positive impact on improving athletes' technical performance. Therefore, selecting training methods that align with the characteristics of pencak silat movements is a critical factor in enhancing athletes' performance.

CONCLUSION

The conclusion is that both shuttle run and zig-zag run exercises have an effect on improving the speed of the crescent kick among pencak silat athletes at SMP Negeri 1 Bawang. The results of the hypothesis test showed a significance value of 0.003 (<0.05), indicating a significant difference in effect between the two training methods. The shuttle run exercise was proven to provide a higher increase in crescent kick speed compared to the zig-zag run exercise. This indicates that exercises emphasizing acceleration, changes in direction, and leg speed are more effective in improving the crescent kick performance of student-age pencak silat athletes. Thus, the shuttle run exercise can be used as an effective training method in pencak silat athlete development programs to improve crescent kick speed.

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