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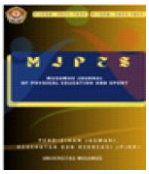

The Effects of Ankle Weight and Circuit Training on Crescent Kick Speed among Pencak Silat Extracurricular Students at MAN 2 OKI

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Abstract

Objectives: This study aimed to determine the effects of ankle weight training and circuit training on crescent kick speed among pencak silat extracurricular students at MAN 2 OKI.

Materials and Methods: This study employed a quantitative experimental method using a two-group pretest–posttest design. The participants were 20 pencak silat extracurricular students who were divided into two groups: the ankle weight training group and the circuit training group. The training program was conducted over 14 sessions, with a frequency of four sessions per week. Crescent kick speed was measured before and after the intervention. The data were analyzed using paired sample t-tests and independent sample t-tests with SPSS version 26.

Results: The results showed that ankle weight training increased the mean crescent kick speed from 16.10 to 22.70, while circuit training increased the mean score from 16.50 to 20.50. Both training methods had a significant effect on improving crescent kick speed. However, ankle weight training was more effective than circuit training, as indicated by the independent sample t-test result with a significance value of 0.007 < 0.05.

Conclusions: Ankle weight training and circuit training are effective methods for improving crescent kick speed in pencak silat extracurricular students. However, ankle weight training provides a greater improvement and can be recommended as a practical training method for coaches to enhance kicking speed performance in school-based pencak silat programs.

Keywords: Ankle Weight Training; Circuit Training; Crescent Kick Speed; Pencak Silat; Extracurricular Students

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Introduction

Pencak silat is a traditional Indonesian martial art that has developed not only as a form of self-defense but also as a competitive sport, cultural identity, and character-building activity among students. In school contexts, pencak silat is commonly implemented through extracurricular programs because it provides students with opportunities to improve physical fitness, discipline, self-confidence, and sport-specific skills. As a combat sport, pencak silat requires athletes to perform rapid, accurate, and well-coordinated movements during attacking and defensive actions. Therefore, the quality of technical execution is closely related to the athlete's physical condition, particularly speed, strength, balance, coordination, and lower-limb explosive power.

One of the important attacking techniques in pencak silat is the crescent kick, locally known as tendangan sabit. This technique is performed through a curved kicking trajectory toward the opponent's target area, usually using the instep as the contact point. In competition, kicking techniques are highly valuable because they can generate points when executed accurately, powerfully, and without being successfully blocked or anticipated by the opponent. However, the effectiveness of the crescent kick is not determined only by technical form. It also depends on how quickly the athlete can initiate, swing, and return the kicking leg while maintaining body balance and readiness for the next action. A slow kick provides the opponent with more time to anticipate, avoid, block, or counterattack. For this reason, crescent kick speed becomes one of the essential performance components that should be developed systematically in pencak silat training.

Kick speed in pencak silat is influenced by several physical and neuromuscular factors, including leg muscle strength, explosive power, movement coordination, flexibility, balance, and muscular endurance. Recent findings indicate that leg muscle explosive power has a significant relationship with sickle kick speed among pencak silat athletes, suggesting that athletes with better lower-limb power tend to perform faster kicking actions (Islam & Octavia, 2025). This is consistent with the characteristics of striking-based combat sports, in which attack actions are performed explosively and repeatedly in short time intervals. Strength and power training are therefore important components in the physical preparation of martial arts athletes because they support the ability to produce force quickly during sport-specific movements (Cid-Calfucura et al., 2023). In addition, the principle of training specificity emphasizes that training adaptations will be more transferable to performance when the selected exercises reflect the movement demands, muscle actions, and energy requirements of the target skill (Stone et al., 2022).

Two training methods that are relevant to the development of crescent kick speed are ankle weight training and circuit training. Ankle weight training uses external resistance attached to the ankle so that the lower-limb muscles must work harder during kicking or kicking-related movements. When applied appropriately, this form of resistance training can stimulate the muscles involved in hip flexion, knee extension, and leg swing, which are important for producing a faster and more explosive kick. The rationale behind ankle weight training is that repeated movements under additional load may improve the strength and contraction capacity of the working muscles. After the external load is removed, the kicking movement may become lighter, faster, and more explosive. Therefore, ankle weight training can be considered a specific resistance-based approach for improving kicking performance.

Circuit training, on the other hand, is a structured training model consisting of several exercise stations performed sequentially with specific repetitions, duration, or intensity. This training method is commonly used to improve multiple physical components at the same time, including muscular strength, power, agility, coordination,

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speed, and endurance. In pencak silat, circuit training may be useful because athletes are required to perform repeated high-intensity actions during a match while maintaining technical quality under fatigue. Previous review evidence also suggests that circuit training can consistently improve leg muscle strength, agility, and the quality of sickle kick performance in pencak silat athletes (Juliansyah & Mashud, 2025). Thus, while ankle weight training is more specific to loaded lower-limb movement, circuit training provides a broader conditioning stimulus that supports repeated kicking performance.

Several previous studies have examined training methods to improve kicking performance in pencak silat and other martial arts. Studies on pencak silat have reported that speed is an important factor for successful kicking because faster attacks are more difficult for opponents to anticipate and are more likely to contribute to scoring opportunities (Syaifullah et al., 2023). Other studies have shown that various physical training methods, such as plyometric training, resistance-based training, core stability exercises, and circuit training, may improve kicking speed and lower-limb performance in martial arts athletes. In the Indonesian pencak silat context, Lestari et al. (2023) reported that ankle weight training had a positive effect on crescent kick speed among adolescent pencak silat athletes. Meanwhile, Nurhasanah et al. (2020) found that circuit training improved the crescent kick speed of students participating in a pencak silat extracurricular program. These findings indicate that both ankle weight training and circuit training have potential benefits for improving kick speed.

However, several research gaps remain. First, most previous studies investigated ankle weight training or circuit training separately, so comparative evidence regarding which method produces greater improvement in crescent kick speed is still limited. Second, many studies focused on general martial arts athletes or athletes from sport clubs, while evidence from school-based pencak silat extracurricular programs remains relatively underdeveloped. Third, the physical and technical characteristics of students in extracurricular settings may differ from those of trained club athletes because students often have varied levels of experience, fitness, and training consistency. Therefore, research involving pencak silat extracurricular students is important to provide practical evidence for coaches and teachers in designing training programs that are effective, simple, and suitable for school contexts.

The pencak silat extracurricular program at MAN 2 OKI has shown positive development through student participation and achievements in several competitions. However, based on preliminary observation, several students still experienced difficulty performing crescent kicks quickly during sparring activities. Their kicks were often anticipated by opponents, reducing the effectiveness of attacking actions. This condition indicates the need for a structured training program that can improve crescent kick speed through appropriate physical conditioning. Ankle weight training and circuit training were selected in this study because both methods are practical, applicable in school extracurricular settings, and theoretically relevant to the physical demands of the crescent kick.

Based on the background above, this study aimed to determine the effects of ankle weight training and circuit training on crescent kick speed among pencak silat extracurricular students at MAN 2 OKI. In addition, this study compared the effectiveness of both training methods to identify which intervention produced a greater improvement in crescent kick speed. The findings are expected to provide practical recommendations for pencak silat coaches, physical education teachers, and extracurricular trainers in developing more effective training programs for improving students' kicking performance.

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Materials and Methods

Study Design

This study used a quantitative experimental method with a two-group pretest–posttest design. This design was selected to examine the effects of two different training interventions, namely ankle weight training and circuit training, on crescent kick speed among pencak silat extracurricular students. The pretest was conducted before the intervention to determine the initial ability of the participants, while the posttest was conducted after the training program to measure changes in crescent kick speed. The first experimental group received ankle weight training, whereas the second experimental group received circuit training.

The research design can be described as follows:

Pretest → Training Intervention → Posttest

Group A: Pretest → Ankle Weight Training → Posttest

Group B: Pretest → Circuit Training → Posttest

This design enabled the researchers to compare the improvement within each group and to determine the difference in effectiveness between ankle weight training and circuit training.

Study Participants

The participants of this study were 20 students who participated in the pencak silat extracurricular program at MAN 2 OKI, Ogan Komering Ilir Regency, Indonesia. The participants were selected because they were actively involved in pencak silat training and had basic experience in performing crescent kick techniques. The sample was divided into two experimental groups using an ordinal pairing technique based on the pretest results. This technique was used to ensure that both groups had relatively balanced initial abilities before receiving the training intervention.

The first group consisted of 10 students who received ankle weight training, while the second group consisted of 10 students who received circuit training. All participants followed the same general training schedule and were assessed using the same crescent kick speed test before and after the intervention.

Study Organization

The study was conducted at MAN 2 OKI over a one-month training period. The training program consisted of 16 sessions, with a frequency of four sessions per week. The implementation stages included orientation, pretest, group allocation, training intervention, and posttest.

At the beginning of the study, the participants were given an orientation regarding the research procedures, training schedule, test implementation, and safety instructions. After the orientation, the pretest was administered to measure the initial crescent kick speed of each participant. Based on the pretest results, the participants were divided into two groups using ordinal pairing. Group A received ankle weight training, while Group B received circuit training.

The ankle weight training program was conducted using additional weights attached to the participants' ankles during kicking-related exercises. This intervention was intended to increase lower-limb resistance, strengthen the muscles involved in kicking movements, and improve the speed of leg swing after repeated training adaptation. Meanwhile, the circuit training program consisted of several exercise stations designed to improve physical components related to crescent kick performance, including speed, strength, agility, coordination, and muscular endurance. Participants moved from one station to another and performed the assigned exercises according to the training procedures.

The instrument used in this study was the crescent kick speed test. The equipment included a stopwatch, measuring tape, cones, whistle, kicking pad target, and

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score sheet. In the test procedure, the participant stood behind the target with the supporting foot placed behind the designated line. The distance of the supporting foot was 50 cm for female participants and 60 cm for male participants. The kicking target was positioned at a height of 75 cm for female participants and 100 cm for male participants. When the command "start" was given, the participant performed as many crescent kicks as possible within 10 seconds. The participant kicked using one leg, returned the foot to the initial position behind the line, and repeated the movement as quickly as possible. The test was performed for both the right and left legs. Each participant was given three trials, and the best score was recorded as the final test result. The scoring was based on the highest number of successful crescent kicks performed within the specified time.

The data collection process consisted of two main stages. The first stage was the pretest, which was conducted before the training intervention to obtain the baseline data of crescent kick speed. The second stage was the posttest, which was conducted after the completion of the training program to determine the improvement in crescent kick speed after the ankle weight and circuit training interventions.

Statistical Analysis

The data were analyzed using SPSS version 26. Descriptive statistics were used to describe the characteristics of the data, including mean, median, mode, standard deviation, minimum score, and maximum score. Before hypothesis testing, normality and homogeneity tests were conducted. The normality test was performed using the Shapiro–Wilk test because the sample size was relatively small. The data were considered normally distributed if the significance value was greater than 0.05. The homogeneity test was conducted using Levene's test to determine whether the variance between groups was homogeneous. The data were considered homogeneous if the significance value was greater than or equal to 0.05.

After the assumption tests were fulfilled, hypothesis testing was conducted using paired sample t-tests and independent sample t-tests. The paired sample t-test was used to examine the difference between pretest and posttest scores within each group. Meanwhile, the independent sample t-test was used to compare the effectiveness of ankle weight training and circuit training in improving crescent kick speed. The level of statistical significance was set at $p < 0.05$.

Results

This study aimed to determine the effects of ankle weight training and circuit training on crescent kick speed among pencak silat extracurricular students at MAN 2 OKI. The study involved 20 students who were divided into two groups: the ankle weight training group and the circuit training group. The intervention was conducted over 14 training sessions, and crescent kick speed was measured before and after the intervention using a 10-second crescent kick speed test.

Descriptive Statistics of Crescent Kick Speed

Table 1 presents the descriptive statistics of crescent kick speed before and after the training intervention in both groups.

Table 1. Descriptive Statistics of Crescent Kick Speed

Group	Test	N	Minimum	Maximum	Mean	Standard Deviation
Ankle weight training	Pretest	10	14	19	16.10	1.663
Ankle weight training	Posttest	10	20	26	22.70	2.003
Circuit training	Pretest	10	14	19	16.50	1.581
Circuit training	Posttest	10	19	22	20.50	1.080

Table 1 shows that both training groups experienced an increase in crescent kick speed after the intervention. The mean score of the ankle weight training group increased

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from 16.10 to 22.70, while the mean score of the circuit training group increased from 16.50 to 20.50. These results indicate that both training methods improved crescent kick speed, although the increase in the ankle weight training group was higher than that in the circuit training group.

Improvement in Crescent Kick Speed

The improvement in crescent kick speed for each group is presented in Table 2.

Table 2. Improvement in Crescent Kick Speed after Training Intervention

Group	Pretest Mean	Posttest Mean	Mean Difference	Percentage Increase
Ankle weight training	16.10	22.70	6.60	40.99%
Circuit training	16.50	20.50	4.00	24.24%

Table 2 shows that the ankle weight training group obtained a mean improvement of 6.60 kicks, equivalent to a 40.99% increase. Meanwhile, the circuit training group obtained a mean improvement of 4.00 kicks, equivalent to a 24.24% increase. This finding suggests that ankle weight training produced a greater improvement in crescent kick speed than circuit training.

The comparison of mean scores showed a clear increase in both groups. The ankle weight training group improved from 16.10 to 22.70, while the circuit training group improved from 16.50 to 20.50. This pattern indicates that both interventions were effective, but ankle weight training resulted in a higher posttest score and greater overall improvement.

Assumption Testing Before hypothesis testing, normality and homogeneity tests were conducted. The results are presented in Table 3.

Table 3. Results of Normality and Homogeneity Tests

Test	Group	Statistical Test	Sig. Value	Interpretation
Normality	Ankle weight training	Shapiro–Wilk	0.656	Normal
Normality	Circuit training	Shapiro–Wilk	0.258	Normal
Homogeneity	Both groups	Levene's test	0.113	Homogeneous

Table 3 shows that the significance values of the Shapiro–Wilk test were 0.656 for the ankle weight training group and 0.258 for the circuit training group. Since both values were greater than 0.05, the data were normally distributed. The homogeneity test also showed a significance value of 0.113, which was greater than 0.05, indicating that the variance between the two groups was homogeneous. Therefore, the data met the requirements for parametric testing using paired sample t-tests and independent sample t-tests.

Hypothesis Testing

The results of hypothesis testing are presented in Table 4.

Table 4. Results of Paired Sample t-Test and Independent Sample t-Test

Analysis	Group/Comparison	t-value	df	Sig. (2-tailed)	Interpretation
Paired sample t-test	Ankle weight training	15.416	9	0.000	Significant
Paired sample t-test	Circuit training	10.954	9	0.000	Significant
Independent sample t-test	Ankle weight vs. circuit training	3.057	18	0.007	Significant

Table 4 shows that ankle weight training had a significant effect on crescent kick speed, as indicated by the paired sample t-test result of $t = 15.416$, $df = 9$, and $p = 0.000$.

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Circuit training also had a significant effect on crescent kick speed, with t = 10.954, df = 9, and p = 0.000. The independent sample t-test showed a significant difference between the two training methods, with t = 3.057, df = 18, and p = 0.007. Since the posttest mean score of the ankle weight training group was higher than that of the circuit training group, ankle weight training was more effective than circuit training in improving crescent kick speed among pencak silat extracurricular students at MAN 2 OKI.

Discussion

The findings of this study showed that both ankle weight training and circuit training significantly improved crescent kick speed among pencak silat extracurricular students at MAN 2 OKI. The increase in the ankle weight training group was higher than that in the circuit training group, indicating that training with additional resistance attached to the ankle produced a stronger effect on the speed of the crescent kick. These findings answer the objective of the study and support the assumption that specific lower-limb training can improve kicking performance in pencak silat.

The significant improvement in the ankle weight training group can be explained by the principle of overload and training specificity. During ankle weight training, the lower-limb muscles work against additional resistance placed near the distal segment of the leg. This condition requires greater muscular effort during hip flexion, knee extension, and leg swing, which are essential components of the crescent kick movement. Repeated kicking movements with additional load may stimulate neuromuscular adaptation, including improved motor unit recruitment, better intermuscular coordination, and stronger contraction of the muscles involved in the kicking action. When the external load is removed, the leg can move more rapidly because the muscles have adapted to a higher resistance demand.

This finding is consistent with previous studies showing that resistance-based lower-limb training can improve kicking speed in pencak silat. Lestari et al. (2023) reported that ankle weight training significantly improved crescent kick speed among adolescent pencak silat athletes. Similarly, Eko Randy Prasetiawan et al. (2025) found that ankle weight training had a significant effect on crescent kick speed among PSHT athletes. The results of the present study strengthen these previous findings by showing that ankle weight training is also effective in a school-based extracurricular pencak silat setting. This suggests that ankle weight training is not only relevant for club athletes but can also be applied to student athletes with appropriate supervision and training progression.

The improvement found in the circuit training group also indicates that circuit training is an effective method for developing crescent kick speed. Circuit training involves several exercise stations that can develop multiple physical components, such as muscular strength, agility, speed, coordination, and endurance. In pencak silat, athletes need to perform fast attacks repeatedly while maintaining balance and technical quality. Therefore, circuit training can support kicking performance by improving general physical readiness and the ability to perform repeated movements under fatigue. The result of this study is in line with Nurhasanah et al. (2020), who found that circuit training improved crescent kick speed among students participating in pencak silat extracurricular activities. Kodir et al. (2023) also showed that strength training in the form of circuit training could improve the frequency and speed of pencak silat crescent kicks.

Although both training methods were effective, ankle weight training produced a greater improvement than circuit training. This difference may be caused by the more specific nature of ankle weight training. The ankle weight intervention directly loaded the kicking limb during movements that were closely related to the crescent kick pattern.

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This means that the muscles, movement direction, and technical execution were trained in a way that closely resembled the actual skill used in pencak silat competition. In contrast, circuit training provided broader physical conditioning. While this approach improved general fitness components, the transfer to crescent kick speed may not have been as direct as ankle weight training.

From a practical perspective, the results suggest that coaches and physical education teachers should include specific resistance-based kicking drills in pencak silat training programs, particularly when the goal is to improve crescent kick speed. Ankle weight training can be used as a practical method because the equipment is simple, relatively affordable, and easy to apply in school extracurricular settings. However, coaches must ensure that the load is appropriate, the movement technique remains correct, and sufficient recovery is provided to prevent excessive fatigue or movement compensation. Circuit training can also be used as a complementary method to improve general physical components such as endurance, agility, coordination, and repeated-action capacity.

The findings of this study also have implications for training program design. For school-based pencak silat extracurricular programs, ankle weight training may be prioritized during sessions focused on improving kicking speed, while circuit training may be used to support overall physical conditioning. Combining both methods in a periodized training program may provide a more balanced approach because ankle weight training develops specific kicking speed, whereas circuit training supports broader physical readiness. Therefore, coaches are encouraged to design training programs that integrate both specific and general conditioning components according to the needs of the athletes.

However, this study has several limitations. First, the sample size was relatively small and limited to pencak silat extracurricular students at MAN 2 OKI, so the findings may not be generalized to all pencak silat athletes. Second, the intervention period was limited to one month, which may not fully reflect long-term training adaptation. Third, this study focused only on crescent kick speed and did not measure other important performance variables such as kicking accuracy, kicking power, balance, reaction time, or match performance. Future studies are recommended to involve larger samples, longer intervention periods, and additional performance indicators to obtain a more comprehensive understanding of the effects of ankle weight and circuit training on pencak silat performance.

Conclusions

This study concluded that ankle weight training and circuit training both had significant effects on improving crescent kick speed among pencak silat extracurricular students at MAN 2 OKI. The ankle weight training group showed an increase from 16.10 to 22.70, while the circuit training group increased from 16.50 to 20.50. The independent sample t-test showed a significant difference between the two training methods, with $p = 0.007$, indicating that ankle weight training was more effective than circuit training in improving crescent kick speed.

The practical implication of this study is that ankle weight training can be recommended as an effective method for improving crescent kick speed in school-based pencak silat extracurricular programs. Circuit training remains useful as a supporting method to develop general physical conditioning, including endurance, agility, coordination, and repeated-action capacity. Future research is recommended to examine the combined effects of ankle weight training and circuit training on broader pencak silat performance variables, such as kick accuracy, kick power, reaction speed, and competition performance.

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Conflict of Interest

The authors declare no conflict of interest.

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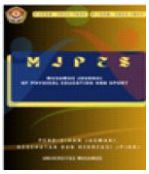

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