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## THE EFFECT OF PLYOMETRICS TRAINING ON CRESCENT KICK SPEED AMONG BINTANG SELATAN PENCAK SILAT ATHLETES

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### Keywords:

plyometrics training,  
crescent kick, pencak  
silat, kicking speed,  
martial arts.

### Abstract

**Objectives:** This study aimed to determine the effect of plyometrics training on crescent kick speed among Bintang Selatan pencak silat athletes.

**Materials and Methods:** This study used a pre-experimental method with a one-group pretest-posttest design. The participants were 10 pencak silat athletes selected through purposive sampling. The intervention consisted of plyometrics training using double-leg speed hop and single-leg hop exercises, conducted three times per week for approximately five weeks. Crescent kick speed was measured using a 10-second kicking test for the right and left legs. Data were analyzed using descriptive statistics, the Shapiro-Wilk normality test, homogeneity test, and paired sample t-test.

**Results:** The mean right-leg crescent kick score increased from  $19.80 \pm 1.87$  to  $23.40 \pm 1.58$ , while the mean left-leg score increased from  $17.70 \pm 1.42$  to  $21.50 \pm 1.18$ . The paired sample t-test showed significant improvements for the right leg,  $t(9) = 16.282$ ,  $p < .001$ , and the left leg,  $t(9) = 15.234$ ,  $p < .001$ .

**Conclusions:** Plyometrics training significantly improved crescent kick speed among Bintang Selatan pencak silat athletes. Double-leg speed hop and single-leg hop exercises can be recommended as practical training methods to enhance lower-limb explosive performance and kicking speed in pencak silat.

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A - Conception and design of the study; B - Acquisition of data; C - Analysis and interpretation of data; D - Manuscript preparation; E - Obtaining funding

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## INTRODUCTION

Pencak silat is a traditional Indonesian martial art that combines physical performance, technical skill, tactical decision-making, and cultural values. In competitive pencak silat, kicking techniques are important attacking skills because they can generate points when performed accurately, quickly, and effectively. Among several kicking techniques, the crescent kick is frequently used because it



allows athletes to attack the opponent from a curved trajectory with strong and fast leg movement.

Crescent kick performance is strongly influenced by lower-limb power, speed, coordination, balance, and neuromuscular control. Athletes who are unable to generate rapid force through the lower limbs may produce kicks that are slow, weak, and easy for opponents to anticipate. Therefore, physical training programs for pencak silat athletes should not only focus on technical repetition but also on developing explosive power that supports faster kick execution.

Plyometrics training is widely used to improve explosive movements through the stretch-shortening cycle, in which rapid eccentric muscle action is followed by powerful concentric contraction. Previous studies have shown that plyometrics training can improve lower-limb power, jumping ability, agility, and sport-specific explosive actions in athletes (Ramirez-Campillo et al., 2018; Moran et al., 2018; Chen et al., 2023). In martial arts, plyometrics has also been associated with improved kicking performance because kicking requires rapid force production, dynamic balance, and fast leg acceleration (Fajar et al., 2023; Lengo et al., 2023).

Initial observation at Bintang Selatan Pencak Silat Club, Bukit Siguntang Branch, Palembang, indicated that athletes had adequate basic crescent kick technique, but several athletes still showed limitations in kick speed and power. These limitations may reduce the effectiveness of attacks during sparring and competition. Therefore, a structured plyometrics program using double-leg speed hop and single-leg hop exercises was applied to improve crescent kick speed. This study aimed to examine the effect of plyometrics training on crescent kick speed among Bintang Selatan pencak silat athletes.

## **METHOD**

### **Study Design**

This study used a quantitative pre-experimental method with a one-group pretest-posttest design. The participants were measured before the intervention, received plyometrics training, and were measured again after the intervention. The design can be described as O1–X–O2, where O1 represents the pretest, X represents plyometrics training, and O2 represents the posttest.

### **Participants**

The participants were 10 pencak silat athletes from Bintang Selatan Pencak Silat Club, Bukit Siguntang Branch, Palembang. The sample was selected using purposive sampling based on athlete availability, active participation in training, and suitability for the intervention program.

### **Training Intervention**

The intervention consisted of plyometrics training using double-leg speed hop and single-leg hop exercises. The training was conducted three times per week for approximately five weeks. The exercises were designed to improve lower-limb

explosive power, coordination, and rapid leg movement, which are important for crescent kick speed. Training sessions were supervised to ensure that athletes performed the movements correctly and consistently.

### Instrument and Data Collection

Crescent kick speed was measured using a 10-second crescent kick test. Each athlete performed three trials for the right leg and three trials for the left leg. The highest number of successful kicks within 10 seconds was recorded as the final score for each leg. The test was conducted before and after the plyometrics training intervention.

### Data Analysis

Data were analyzed using descriptive statistics, including mean, standard deviation, minimum, and maximum scores. The Shapiro-Wilk test was used to examine data normality. Homogeneity was tested before hypothesis testing. The paired sample t-test was used to determine the difference between pretest and posttest scores. The level of significance was set at  $p < .05$ .

The descriptive results showed an increase in crescent kick speed after the plyometrics training intervention. The right-leg mean score increased from 19.80 to 23.40, while the left-leg mean score increased from 17.70 to 21.50.

## RESULTS

Table 1.  
Descriptive statistics of crescent kick speed

| Leg       | Test     |    | Mean  | SD   | Minimum | Maximum |
|-----------|----------|----|-------|------|---------|---------|
| Right leg | Pretest  | 10 | 19.80 | 1.87 | 17      | 23      |
| Right leg | Posttest | 10 | 23.40 | 1.58 | 21      | 26      |
| Left leg  | Pretest  | 10 | 17.70 | 1.42 | 16      | 20      |
| Left leg  | Posttest | 10 | 21.50 | 1.18 | 19      | 23      |

The paired sample t-test showed a significant difference between pretest and posttest scores for both legs. The right-leg crescent kick improved significantly,  $t(9) = 16.282$ ,  $p < .001$ . The left-leg crescent kick also improved significantly,  $t(9) = 15.234$ ,  $p < .001$ .

Table 2.  
Paired sample t-test results

| Variable                | Mean Difference | t      | df | Sig. |
|-------------------------|-----------------|--------|----|------|
| Right-leg crescent kick | 3.60            | 16.282 | 9  | .000 |
| Left-leg crescent kick  | 3.80            | 15.234 | 9  | .000 |

These findings indicate that plyometrics training had a significant effect on increasing crescent kick speed among Bintang Selatan pencak silat athletes.

## DISCUSSION

The findings of this study showed that plyometrics training significantly improved crescent kick speed in both the right and left legs. The increase in kicking speed can be explained by the nature of plyometrics training, which stimulates the stretch-shortening cycle and improves the ability of the lower-limb muscles to produce force rapidly. Exercises such as double-leg speed hop and single-leg hop require athletes to perform repeated explosive movements, which are similar to the rapid force demands of pencak silat kicking techniques.

The improvement in the right-leg score from 19.80 to 23.40 and the left-leg score from 17.70 to 21.50 indicates that the intervention contributed positively to the athletes' kicking performance. This result supports previous research showing that plyometrics training improves lower-limb explosive strength, agility, and speed-related performance in athletes (Ramirez-Campillo et al., 2018; Chen et al., 2023). In martial arts contexts, explosive lower-limb ability is essential because kicking performance depends on rapid hip flexion, knee extension, balance control, and precise foot contact.

The results are also consistent with studies in pencak silat and taekwondo, which reported that plyometrics-based training improved kicking performance. Fajar et al. (2023) found that plyometrics training contributed to improvements in leg power and dollyo chagi kick speed among taekwondo athletes. Similarly, Lengo et al. (2023) reported that plyometric training improved T-kick speed in pencak silat athletes. These findings suggest that plyometrics training is not only effective for general explosive performance but also relevant for sport-specific kicking actions.

From a practical perspective, the use of double-leg speed hop and single-leg hop exercises is suitable for pencak silat athletes because these movements develop both bilateral and unilateral lower-limb power. Double-leg speed hop emphasizes explosive movement using both legs, while single-leg hop challenges balance, stability, and unilateral force production. This combination may help athletes produce faster and more controlled crescent kicks during training and competition.

However, this study has several limitations. The study used a one-group pretest-posttest design without a control group, so improvements cannot be compared with athletes who did not receive plyometrics training. The sample size was also small, involving only 10 athletes from one pencak silat club. Future studies should involve larger samples, control groups, and longer intervention periods to strengthen the evidence regarding the effectiveness of plyometrics training in pencak silat.

## CONCLUSION

Plyometrics training significantly improved crescent kick speed among Bintang Selatan pencak silat athletes. The right-leg and left-leg crescent kick scores both increased after the intervention. Therefore, double-leg speed hop and single-leg hop

exercises can be recommended as practical training methods to improve lower-limb explosive ability and crescent kick speed in pencak silat athletes.

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