Musamus Journal of Physical Education and Sport (MJPES)
http://ejournal.unmus.ac.id/index.php/physical
Volume, 8 No 3, July , Pg. 1072-1078
DOI: 10.35724/mjpes.v8i3.7816

The Effect of Plyometric Training on Sabit Kick Speed in Pencak Silat Athletes: A One-Group Pretest-Posttest Study at Denny Wewey Club

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Abstract

Objectives: This study examined the effect of a structured plyometric training program on sabit kick speed among pencak silat athletes at Denny Wewey Club.
Materials and Methods: A quantitative quasi-experimental design with a one-group pretest-posttest approach was used. Thirty male pencak silat athletes participated through total sampling. Sabit kick speed was assessed using a 10-second kicking test before and after a 16-session plyometric intervention conducted over four weeks. The program included progressive lower-limb explosive exercises, technical integration with sabit kicks, warm-up, and cool-down under coach supervision. Data were analyzed using descriptive statistics, the Kolmogorov-Smirnov normality test, and a paired-samples t-test at a significance level of 0.05.
Results: The mean sabit kick speed score increased from 19.50 +/- 2.35 at pretest to 22.73 +/- 2.45 at posttest. The mean improvement was 3.23 scores, equivalent to a 16.58% increase. Normality testing showed that both pretest and posttest data were normally distributed ($p = 0.200$). The paired-samples t-test indicated a significant improvement after the intervention, $t(29) = 24.33$, $p < 0.001$, with a very large within-subject effect size (Cohen's $dz = 4.44$).
Conclusions: The plyometric training program significantly improved sabit kick speed in the pencak silat athletes. These findings support the integration of progressive plyometric exercises into supervised pencak silat conditioning programs, particularly when the objective is to develop lower-limb explosiveness and faster kicking execution.

Keywords: pencak silat; plyometric training; sabit kick; kick speed; explosive power

Introduction

Pencak silat is an Indonesian martial art and competitive sport that combines physical performance, self-control, cultural values, and technical mastery (Asyhari, 2025; Bara et al., 2025; Frengki A. Awiryanto et al., 2025). In the sport-performance context, successful athletes are expected to execute attacking and defensive actions quickly, accurately, and efficiently. Among attacking techniques, kicking actions are especially important because they provide scoring opportunities and can reach the opponent from a longer distance than several hand-based actions. The sabit kick, also known as a crescent or sickle kick, is one of the most

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frequently used kicking techniques in pencak silat because its curved trajectory allows athletes to target the body while maintaining balance and tactical readiness.

Speed is a decisive biomotor component in pencak silat. A technically correct kick may lose its effectiveness when it is delivered too slowly, because the opponent has more time to evade, block, or counterattack. Conversely, faster kicking execution can improve scoring potential, tactical pressure, and the athlete's ability to respond during short attacking windows. Prior studies in pencak silat have emphasized the importance of agility, lower-limb explosive power, and kicking speed for technical performance (Hidayat & Haryanto, 2021)

Plyometric training is commonly used to develop explosive lower-limb performance because it stimulates the stretch-shortening cycle and improves the ability of muscles to generate force rapidly. In martial arts and combat sports, this mechanism is relevant to actions that require fast ground contact, rapid hip-leg coordination, and explosive kicking. Recent evidence from pencak silat, taekwondo, and broader combat-sport research indicates that plyometric training can support improvements in kicking performance, lower-limb power, agility, and movement speed (Fajar et al., 2023; Ojeda-Aravena et al., 2023; Yuan et al., 2025).

Preliminary observation at Denny Wewey Club indicated that several adolescent athletes still showed limitations in sabit kick speed during training and competition preparation. This condition may reduce attacking effectiveness despite the athletes' technical familiarity with the movement. Therefore, this study was conducted to determine whether a structured plyometric training program could significantly improve sabit kick speed among pencak silat athletes at Denny Wewey Club.

Materials and Methods

Research Design

This study used a quantitative quasi-experimental design with a one-group pretest-posttest model. All participants completed the same sabit kick speed test before and after the plyometric training intervention. The design allowed comparison of athletes' performance before and after treatment, although it did not include a separate control group.

Participants and Setting

The participants were 30 male pencak silat athletes from Denny Wewey Club. The study used total sampling because all available athletes who met the research context were included. The research activities were conducted from 25 November to 24 December 2025. The pretest was conducted before the intervention, the training program was implemented over 16 sessions, and the posttest was conducted after the training period.

Instrument and Measurement Procedure

The main instrument was a pencak silat sabit kick speed test adapted from the pencak silat skill assessment procedure. The equipment included a target or hand box, measuring tape, stopwatch, and observation sheet. Each athlete stood behind the test line and performed repeated sabit kicks for 10 seconds. The score represented the number of valid kicks performed during the test period; therefore, a higher score indicated faster kicking performance. The test was administered at pretest and posttest under similar procedures.

Plyometric Training Intervention

The intervention consisted of 16 supervised sessions over four weeks. Each session followed three stages: warm-up, core plyometric training integrated with sabit-kick movement patterns, and cool-down. The training

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content emphasized lower-limb explosive actions such as squat jumps, box jumps, double-leg speed hops, lateral bounds, and single-leg hurdle hops. Intensity was progressed gradually from approximately 60% in the first week to approximately 90% in the final session. All activities were conducted under coach supervision and adjusted to the athletes' readiness to maintain safe and appropriate training loads.

Table 1. Summary of the plyometric intervention program

Week	Sessions	Approximate intensity	Main training emphasis
Week 1	5 sessions	60-70%	Adaptation to squat jump, double-leg speed hop, lateral bound, and basic technical integration
Week 2	4 sessions	70-75%	Progressive box jump, single-leg hurdle hop, lateral bound, and double-leg speed hop
Week 3	4 sessions	75-85%	Increased intensity and technical integration with sabit-kick execution
Week 4	3 training sessions + posttest	80-90%	Peak training intensity, active recovery, technique evaluation, and final testing

Data Analysis

The data were analyzed using descriptive statistics, including minimum score, maximum score, mean, standard deviation, and category distribution. Data normality was tested using the Kolmogorov-Smirnov test. Because the data were normally distributed, the difference between pretest and posttest scores was examined using a paired-samples t-test. The level of significance was set at $p < 0.05$. Cohen's dz was calculated to estimate the within-subject effect size.

Results

Descriptive Statistics

The descriptive results showed improvement in sabit kick speed after the plyometric training intervention. The pretest mean score was 19.50, while the posttest mean score increased to 22.73. The minimum score increased from 15 to 18, and the maximum score increased from 24 to 26.

Table 2. Descriptive statistics of sabit kick speed scores

Test	N	Minimum	Maximum	Mean	SD
Pretest	30	15	24	19.50	2.35
Posttest	30	18	26	22.73	2.45

Category Distribution

The category distribution also shifted positively after the intervention. Before training, most athletes were in the Good category (50.00%) and Moderate category (40.00%), with 10.00% in the Poor category. After training, no athlete remained in the Poor category, while 56.67% were in the Good category and 30.00% reached the Very Good category.

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Table 3. Category distribution before and after the intervention

Category	Pretest frequency	Pretest %	Posttest frequency	Posttest %
Very poor	0	0.00	0	0.00
Poor	3	10.00	0	0.00
Moderate	12	40.00	4	13.33
Good	15	50.00	17	56.67
Very good	0	0.00	9	30.00

Normality and Hypothesis Testing

The Kolmogorov-Smirnov normality test indicated that both pretest and posttest data were normally distributed, with Asymp. Sig. (2-tailed) values of 0.200 for both tests. The paired-samples t-test showed a significant increase in sabit kick speed from pretest to posttest, $t(29) = 24.33$, $p < 0.001$. The mean improvement was 3.23 scores, with a 95% confidence interval from 2.96 to 3.51. The within-subject effect size was very large (Cohen's dz = 4.44).

Table 4. Paired-samples t-test results

Comparison	Mean difference	SD difference	95% CI lower	95% CI upper	t(df)	p
Posttest - Pretest	3.23	0.73	2.96	3.51	24.33 (29)	<0.001

Discussion

The findings demonstrate that a four-week supervised plyometric training program significantly improved sabit kick speed among Denny Wewey Club pencak silat athletes. The increase from 19.50 to 22.73 indicates a practical improvement in the athletes' ability to execute repeated kicks within the same 10-second testing period. This result suggests that the intervention enhanced the speed-related capacity of the lower limbs and supported more efficient technical execution of the sabit kick.

The improvement is consistent with the physiological basis of plyometric training. Plyometric exercises emphasize rapid eccentric-concentric muscle actions through the stretch-shortening cycle, which can improve neuromuscular coordination, force production, and rate of force development. These adaptations are highly relevant to pencak silat kicking, because the athlete must quickly stabilize the support leg, rotate the hip, accelerate the kicking leg, and return to a balanced stance. Systematic review evidence in combat sports also supports the beneficial role of plyometric-jump training for physical fitness variables associated with explosive sport actions (Ojeda-Aravena et al., 2023; Yuan et al., 2025).

The present results align closely with previous pencak silat research.(Sudirman et al., 2022) reported that plyometric training improved sabit kick speed in pencak silat athletes, with the average kicking time decreasing from 1.45 seconds to 1.30 seconds after training. (Hayati & Endriani, 2021) also found that double-leg speed hop and single-leg bounding exercises improved sabit kick speed in male pencak silat athletes. Similarly, (Sinulingga et al., 2023) reported that plyometric exercise and speed-related training contributed to sabit kick power, supporting the idea that explosive lower-limb conditioning is central to high-quality attacking performance in pencak silat.

The finding is also supported by studies on similar martial arts. (Fajar et al., 2023) found that plyometric, speed-agility-quickness, and circuit training methods improved leg power and dollyo chagi kick speed in taekwondo athletes, although differences among training methods were not significant. Messaoudi et al. (2024) further showed that plyometric-based conditioning activity could improve taekwondo-specific agility and frequency-speed kick performance under certain warm-up conditions. Although pencak silat and taekwondo have different rules and technical demands, both sports require rapid lower-limb acceleration, balance, and repeated kicking ability, making these comparisons relevant.

The magnitude of improvement in the current study was very large. However, this should be interpreted carefully because the design did not include a control group. Factors such as repeated exposure to the test, technical correction during training, motivation, and normal training adaptation may have contributed to the observed improvement. Nevertheless, the consistent increase across descriptive statistics, category distribution, and paired-test results indicates that plyometric training was a meaningful component of the athletes' performance development during the intervention period.

From a practical perspective, coaches may integrate progressive plyometric exercises into pencak silat conditioning programs when the goal is to improve sabit kick speed. The program should be supervised, adjusted to athletes' readiness, and combined with technical feedback so that increases in explosive power are transferred into effective kicking mechanics. Future studies should use randomized controlled designs, larger samples, female and male groups, biomechanical analysis, and follow-up testing to determine whether the improvement is retained over time.

Conclusions

The study concluded that plyometric training had a significant positive effect on sabit kick speed among pencak silat athletes at Denny Wewey Club. The athletes' mean score increased from 19.50 at pretest to 22.73 at posttest, with a significant paired-samples t-test result, $t(29) = 24.33$, $p < 0.001$. These findings indicate that a structured, progressive, and supervised plyometric program can be used as an effective conditioning strategy to improve lower-limb explosiveness and repeated sabit kick execution in pencak silat athletes.

Practical Recommendations

Pencak silat coaches are encouraged to include plyometric training periodically within weekly conditioning plans, especially during general and specific preparation phases. The training should be progressive, supervised, and integrated with technical sabit-kick practice so that improvements in lower-limb power are transferred into faster and more accurate competition-related movement. Clubs should also provide adequate training facilities and monitoring procedures to support safe and consistent athlete development.

Limitations

This study used a one-group pretest-posttest design without a control group; therefore, causal interpretation should be made cautiously. The study was limited to 30 male athletes from one pencak silat club, which may restrict generalization to other age groups, female athletes, or athletes from different competitive levels. Future research should apply randomized controlled designs, compare different plyometric models, and include biomechanical or physiological measurements to explain the mechanisms behind changes in kick speed.

Acknowledgments

The authors thank Denny Wewey Club, the coach, and the participating athletes for their cooperation during the research process.

Conflicts of Interest

The authors declare no conflicts of interest.

Funding

Funding information was not declared in the original thesis document.

Data Availability

The research data are available from the corresponding author upon reasonable request.

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