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EXTENDED ABSTRACT

Acute Effect of Plyometric Training on Kicking Speed and Jump Performance Among Youth Silat Athletes

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I. Introduction

Pencak Silat, a traditional Southeast Asian martial art, demands high levels of explosive power, particularly for jumping and kicking manoeuvres that are critical in both offensive and defensive action [1]. Among various training modalities, plyometric training has gained attention for its effectiveness in enhancing neuromuscular performance by utilizing the stretch-shortening cycle (SSC) to improve power output [2][3]. While the chronic effects of plyometric training on athletic performance have been widely documented across sports disciplines, including improvements in vertical jump height, sprinting speed, and muscular strength, its acute effects hosted immediately after a training session remain underexplored, especially within the context of martial arts such as Pencak Silat [4].

Understanding the acute responses to plyometric exercise is crucial for coaches and practitioners who aim to optimize short-term performance, particularly during competition phases or preparatory warm-ups [2][3]. Current literature examines long-term training adaptations, offering limited guidance for designing effective acute interventions that can yield immediate improvements in performance metrics relevant to Pencak Silat [4]. Moreover, existing studies often lack a sport-specific focus, thus reducing the ecological validity of the findings when applied to Silat athletes.

This study aims to fill this gap by examining the acute effects of a single bout of plyometric training on two key performance indicators: jumping performance and kicking speed among youth Pencak Silat athletes. By offering insight into the short-term physiological responses induced by plyometric exercises, this research aims to provide practical applications for training periodization, warm-up strategies, and performance enhancement in competitive Silat settings.

II. Methods

This study employed a quasi-experimental, pre- and post-test design to investigate the acute effects of plyometric training on jumping performance and kicking speed. A total of 30 youth Pencak Silat athletes, aged between 13 and 18 years, were selected based on inclusion criteria requiring at least one year of basic Silat training. Athletes with current injuries or scheduled for upcoming competitions were excluded to avoid performance bias and health risks. The sample size was determined through power analysis using G*Power software, indicating that 30 participants [5] would be sufficient to detect a large effect size (*Cohen's d* = 0.95) with 80% statistical power.

This study included 30 participants (22 males and 8 females), divided into a Control Group (15) and an Experimental Group (15). The Experimental Group did both a Silat routine and plyometric exercises (box jumps, skater jumps, and jumping lunges), while the Control Group only did the Silat routine. Researchers compared both groups' performance on the standing broad jump, vertical jump, and kicking speed before and after the training. Data was analysed using SPSS version 25, and included tests for normality, descriptive statistics, and independent T-tests.

III. Results and Discussion

Objective 1: To Determine the Acute Effect of Plyometric Training on Jump Performance

Table I
Comparison Between Two Means Jump Performance of the Standing Broad Jump and the Vertical Jump (N=30)

		Independent T-Test	
Assessment	**Group**	**Mean (SD)**	***p* value**
Standing Broad Jump	Experimental	217.18 ± 63.02	0.375
	Control	198.88 ± 46.9	
Vertical	Experimental	27.4 ± 7.32	0.608
	Control	23.41 ± 6.31	

**p-value ≤ (α) 0.05, reject Ho.*

Table I shows the comparison of jump performance between the Experimental and Control groups. The Experimental group for the standing broad jump had a mean score of (217.18 ± 63.02), while the Control group had a mean score of (198.88 ± 46.9). The *p*-value was 0.375, which is greater than 0.05, indicating no significant difference between the groups. For the vertical jump, the Experimental group had a mean of (27.4 ± 7.32), and the Control group had a mean of (23.41 ± 6.31). The *p*-value was 0.608, also above 0.05, showing no significant difference between the groups.

Objective 2: To Evaluate the Acute Effect of Plyometric Training on Kicking Speed

TABLE II
COMPARISON BETWEEN TWO MEANS OF KICKING SPEED RIGHT AND LEFT

		Independent T-Test	
Assessment	**Group**	**Mean (SD)**	***p* value**
Kicking Speed Right	Experimental	217.18 ± 63.02	0.375
	Control	198.88 ± 46.9	
Kicking Speed Left	Experimental	27.4 ± 7.32	0.608
	Control	23.41 ± 6.31	

**p-value ≤ (α) 0.05, reject Ho.*

Table II presents a comparison of right and left kicking speed between the Experimental and Control groups. For right kicking speed, the Experimental group recorded a mean score of (7.35 ± 0.83), while the Control group recorded a mean score of (7.05 ± 0.85). The *p*-value obtained was 0.375, which exceeds the significance threshold of 0.05, indicating that the difference between the groups is not statistically significant. Regarding left kicking speed, the Experimental group achieved a mean of (7.32 ± 0.95), compared to the Control group's mean of (6.77 ± 0.85). The *p*-value of 0.608 is also greater than 0.05, signifying no significant difference between the two groups.

A. Discussion

In terms of jumping performance, the experimental group showed slightly higher mean values in both the standing broad jump and the vertical jump compared to the control group. However, these differences were not statistically significant ($p > 0.05$). This may be attributed to post-training fatigue or insufficient recovery time before testing, which can acutely mask performance improvements [6]. Additionally, the measurement tools used, while practical, may lack the resolution to detect small yet meaningful changes in jump performance over a single session [7]. These findings highlight the complexity of capturing acute neuromuscular responses immediately following high-intensity plyometric exercises in youth athletes.

For kicking speed, the experimental group exhibited higher post-test mean scores than the control group for both dominant and non-dominant legs. Nevertheless, these increases were not statistically significant ($p > 0.05$). This result may reflect a lack of specificity in the plyometric exercises selected, which may not have directly mimicked the dynamic and rotational patterns characteristic of Silat kicks [8]. Furthermore, the short-term intervention limited to a single session will likely constrain the degree of neuromuscular adaptation possible, as plyometric benefits typically emerge after repeated exposures over multiple weeks [4]. This underscores the need for more tailored and longitudinal training programs in sport-specific contexts.

IV. CONCLUSIONS

The study found that although a single session of plyometric training combined with a Silat routine did lead to some increases in jump performance and kicking speed, these changes were not statistically significant and did not result in notable acute improvements among Silat athletes. Several factors are likely to have contributed to these findings. First, the brief duration of the intervention may not have provided sufficient stimulus for measurable improvements to occur. Second, the principle of training specificity suggests that the exercises performed may not have precisely matched the requirements for the tested performance outcomes. Additionally, the sensitivity of the measurement tools and methods used could have limited the ability to detect subtle changes in performance. Finally, factors related to athlete recovery, such as fatigue or inadequate rest between assessments, may have influenced the results. Altogether, these considerations may help to explain why statistically significant immediate effects were not observed in this study.

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