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The Effect Of Split Squat Jump And Tuck Jump With Heel Kick Training On Leg Muscle Power Among LMVC Labuapi Volleyball Players

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Abstract

Objectives: This study aimed to determine the effect of split squat jump and tuck jump with heel kick training on increasing leg muscle power among LMVC Labuapi volleyball players.

Materials and Methods: This study used an experimental method with a pretest-posttest design. The sample consisted of 22 LMVC Labuapi volleyball players, divided into two groups. Group A received split squat jump training, while Group B received tuck jump with heel kick training. Leg muscle power was measured using the vertical jump test before and after the training program. The data were analyzed using normality tests, homogeneity tests, paired sample t-tests, and independent t-tests.

Results: The results showed that split squat jump training significantly improved vertical jump performance, with a significance value of p = 0.007. Tuck jump with heel kick training also significantly improved vertical jump performance, with a significance value of p = 0.000. However, the comparison between the two groups showed no significant difference, with p = 0.281. These findings indicate that both plyometric training methods are effective for improving leg muscle power.

Conclusions: Split squat jump and tuck jump with heel kick training significantly increased leg muscle power among LMVC Labuapi volleyball players. Although tuck jump with heel kick showed a higher average improvement, the difference between the two training methods was not statistically significant. Therefore, both exercises can be used as alternative plyometric training programs to improve jumping ability in volleyball players.

Keywords: split squat jump, tuck jump with heel kick, plyometric training, leg muscle power, volleyball

Introduction

Volleyball is a sport that requires strong physical ability, technical mastery, and tactical understanding. (Bachtiar et al., 2024; González-Silva et al., 2020; Sutiyono et al., 2021). One of the most important physical components in volleyball is leg muscle power because many volleyball skills, such as spiking, blocking, and jump serving, depend on explosive jumping ability(Bean et al., 2022; Oliinyk & Doroshenko, 2017; Salles et al., 2017). A player with good leg power can reach a higher point during attack and defense, making movement more effective during the game.

Leg muscle power refers to the ability of the muscles to produce maximum force in a short period of time. In volleyball, this ability is highly related to vertical jump performance. Therefore, training programs for volleyball players should include exercises that develop explosive lower-limb strength.

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One training method commonly used to improve explosive power is plyometric training. Plyometric exercises use rapid eccentric and concentric muscle actions through the stretch-shortening cycle. This type of training helps athletes produce greater force in a shorter time. A systematic review by Ramirez-Campillo et al. reported that plyometric jump training is effective in improving vertical jump height in volleyball players.

Split squat jump and tuck jump with heel kick are two forms of plyometric training that emphasize lower-limb explosive movement(Hammami et al., 2018; Markovic, 2007; Ojeda-Aravena et al., 2023). Split squat jump trains leg strength, coordination, and unilateral jumping control, while tuck jump with heel kick emphasizes fast repeated jumps, knee flexion, and explosive lower-body movement. Previous research by Suriatno and Yusuf also found that split squat jump training improved leg muscle power and smash accuracy in volleyball.

Based on preliminary observations, LMVC Labuapi volleyball players still showed limited leg muscle power, especially during jumping movements for spiking and blocking. Therefore, this study was conducted to examine the effect of split squat jump and tuck jump with heel kick training on increasing leg muscle power among LMVC Labuapi volleyball players.

Materials and Methods

Study Participants

(Sugiyono, 2012)The population of this study consisted of all LMVC Labuapi volleyball players. The sample included 22 players selected using total sampling because all members of the population were used as research participants. The participants were divided into two groups, with 11 players in each group.

Study Organization

This study used an experimental method with a pretest-posttest design. Group A received split squat jump training, while Group B received tuck jump with heel kick training. Before the treatment, all participants completed a vertical jump pretest. After the training program, the participants completed a posttest using the same instrument.

The training program was conducted for several meetings and focused on developing leg muscle power through plyometric movement patterns. The split squat jump group performed jumping movements from a split-stance position, while the tuck jump with heel kick group performed explosive jumps combined with heel-kick movement during the airborne phase.

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Instrument

The instrument used in this study was the vertical jump test. This test was used to measure leg muscle power by assessing the height of the jump achieved by each participant.

Statistical Analysis

The data were analyzed using descriptive and inferential statistics. Normality was tested using the Shapiro-Wilk test, while homogeneity was tested using Levene's test. Paired sample t-tests were used to determine the effect of each training method from pretest to posttest. An independent sample t-test was used to compare the improvement between the split squat jump group and the tuck jump with heel kick group. The level of significance was set at $p < 0.05$.

Results

Descriptive Results of the Split Squat Jump Group

The split squat jump group showed an increase in vertical jump performance after the training program. The mean pretest score was 32.00, while the mean posttest score increased to 36.09. The average improvement was 4.09.

Table 1. Pretest and Posttest Scores of the Split Squat Jump Group

Group	Pretest Mean	Posttest Mean	Mean Difference
Split Squat Jump	32.00	36.09	4.09

Descriptive Results of the Tuck Jump with Heel Kick Group

The tuck jump with heel kick group also showed an increase in vertical jump performance. The mean pretest score was 37.45, while the mean posttest score increased to 42.22. The average improvement was 7.27.

Table 2. Pretest and Posttest Scores of the Tuck Jump with Heel Kick Group

Group	Pretest Mean	Posttest Mean	Mean Difference
Tuck Jump with Heel Kick	37.45	42.22	7.27

Normality and Homogeneity Tests

The Shapiro-Wilk test showed that all pretest, posttest, and gain score data were normally distributed because all significance values were greater than 0.05. The homogeneity test also showed that the data were homogeneous, with significance values greater than 0.05.

Hypothesis Testing

The paired sample t-test showed that split squat jump training had a significant effect on increasing leg muscle power, with $t = 4.235$ and $p = 0.007$. The tuck jump with heel kick group also showed a significant increase, with $t = 6.211$ and $p = 0.000$.

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Table 3. Paired Sample t-Test Results

Training Method	t-count	t-table	p-value	Interpretation
Split Squat Jump	4.235	2.228	0.007	Significant
Tuck Jump with Heel Kick	6.211	2.228	0.000	Significant

The independent t-test comparing the improvement between the two groups showed t = 1.385 and p = 0.281. Since p > 0.05, there was no significant difference between the two training methods.

Table 4. Comparison of Improvement Between Groups

Comparison	t-count	t-table	p-value	Interpretation
Split Squat Jump vs Tuck Jump with Heel Kick	1.385	2.086	0.281	Not significant

Discussion

The results of this study showed that both split squat jump and tuck jump with heel kick training significantly improved leg muscle power among LMVC Labuapi volleyball players. This finding confirms that plyometric training is effective for developing explosive lower-limb ability, especially in sports that require repeated jumping movements such as volleyball.

The improvement in the split squat jump group can be explained by the movement characteristics of the exercise. Split squat jump requires players to generate explosive force from a split-stance position, involving the quadriceps, hamstrings, gluteal muscles, and calf muscles. This movement pattern helps improve lower-limb strength, balance, and coordination. The finding is consistent with the study by Suriatno and Yusuf, which reported that split squat jump training significantly improved leg muscle power and smash accuracy in volleyball players.

The tuck jump with heel kick group also showed significant improvement. This exercise requires rapid jumping, knee flexion, and explosive movement during the airborne phase. These movements stimulate the stretch-shortening cycle, which is important for improving jump performance. Similar findings were reported in studies showing that tuck jump or knee tuck jump training can improve vertical jump ability and leg muscle power in volleyball athletes.

Although the tuck jump with heel kick group showed a higher average improvement than the split squat jump group, the difference between the two groups was not statistically significant. This means that both exercises can be considered effective and may be used interchangeably depending on the training goals, athlete condition, and training variation needed by the coach.

These results are also supported by broader evidence on plyometric training. Ramirez-Campillo et al. found that plyometric jump training significantly improves vertical jump height in volleyball players, and such improvements can occur across different age groups and training conditions. Therefore, the

findings of the present study strengthen the argument that structured plyometric training is suitable for improving explosive power in volleyball.

However, this study had several limitations. The sample size was relatively small, and athlete attendance during the training program was not fully consistent. In addition, the study only measured vertical jump performance and did not assess other volleyball-specific skills such as smash accuracy, blocking effectiveness, or jump serve performance. Future studies are recommended to use a larger sample, longer intervention period, and more complete performance indicators.

Conclusions

Split squat jump training significantly increased the leg muscle power of LMVC Labuapi volleyball players. Tuck jump with heel kick training also significantly improved leg muscle power. Although tuck jump with heel kick produced a higher average improvement, the difference between the two training methods was not statistically significant. Therefore, both plyometric exercises can be used as effective training alternatives to improve vertical jump ability in volleyball players.

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