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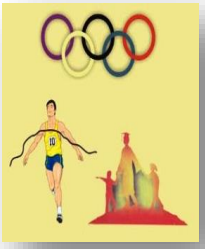

The Effect of Mud Jump Exercise Variations on The Leg Muscle Power of Beginner Players of The Rottan Volleyball Club, Kuala Betara District

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Abstract

This study was conducted to address the problem of low leg muscle power among beginner volleyball players, which negatively affects the effectiveness of smash and block techniques. The purpose of this study was to examine the effect of mud jumping exercise variations on leg muscle power in beginner players of the Rottan Volleyball Club, Kuala Betara District. This study employed a quasi-experimental method using a one-group pre-test–post-test design. The research participants consisted of all beginner players at the Rottan Volleyball Club, totaling 13 athletes, selected using a total sampling technique. The training intervention involved structured mud jumping exercise variations as a modified plyometric program. Leg muscle power was measured using a vertical jump test, and the data were analyzed using descriptive statistics and a paired-sample t-test at a significance level of 0.05. The results showed a significant increase in leg muscle power following the mud jumping training program. The average post-test vertical jump scores were higher than the pre-test scores, and the results of the paired-sample t-test indicated a statistically significant difference between pre-test and post-test measurements. It can be concluded that mud jumping exercise variations have a significant effect on improving leg muscle power in beginner volleyball players. Therefore, mud jumping exercises can be recommended as an effective and practical training method to enhance lower limb explosive power in beginner volleyball athletes

.**Keywords**: Exercise Variations, Mud Jumping, Leg Muscle Power

INTRODUCTION

Volleyball is a sport that requires a high level of physical fitness, technical mastery, and coordination. One of the most important physical components determining performance in volleyball is leg muscle power, particularly in executing jumping-based techniques such as smashing and blocking. Leg muscle power refers to the ability of muscles to generate maximum force in a short period of time (Suharno, 1993), which aligns with Bompa's (1994) concept of power as a combination of strength and speed that is essential for explosive movements.

In beginner volleyball players, insufficient leg muscle power is a common problem that negatively affects performance. Initial observations conducted at the Rottan Volleyball Club, Kuala Betara District, indicated that most beginner players demonstrated jump heights below the expected performance standard for their age and training level. This condition resulted in ineffective smash execution and suboptimal blocking performance, characterized by unstable take-off and landing phases. Such limitations suggest that the training methods applied have not yet optimally stimulated explosive muscle development.

According to Harsono (1988), low physical performance in beginner athletes is often caused by inappropriate training methods and a lack of training variation that can stimulate neuromuscular adaptation. One effective method for developing leg muscle power is plyometric training, which emphasizes rapid stretching and shortening of muscles to enhance explosive strength. Sukadiyanto and

Muluk (2011) stated that jumping exercises are a fundamental form of plyometric training and are highly effective in improving leg muscle explosive power.

Mud jumping variations represent a modified form of plyometric exercise in which jumps are performed on muddy or unstable surfaces. This modification increases external resistance and instability, forcing the neuromuscular system to work harder to maintain balance, coordination, and force production. Physiologically, mud jumping enhances muscle activation, joint stabilization, and force output during both take-off and landing phases. As a result, this exercise not only improves explosive power but also contributes to better movement control and injury prevention, especially for beginner athletes.

Previous studies have demonstrated that plyometric training significantly improves vertical jump performance and explosive power in volleyball players (Markovic & Mikulic, 2010; Slimani et al., 2016). However, empirical studies specifically examining mud jumping variations as a modified plyometric method remain limited, particularly in the context of beginner players at regional volleyball clubs. This research gap highlights the need for scientific investigation to evaluate the effectiveness of mud jumping exercises in enhancing leg muscle power.

Therefore, this study aims to examine the effect of mud jumping exercise variations on the leg muscle power of beginner players at the Rottan Volleyball Club in Kuala Betara District. The findings of this study are expected to provide empirical evidence and practical recommendations for coaches in designing effective, innovative, and scientifically grounded training programs for beginner volleyball players.

METHOD

This study employed a quasi-experimental research design using a one-group pre-test–post-test design. This design was selected to examine the effect of mud jumping exercise variations on leg muscle power by comparing participants' performance before and after the training intervention. The absence of a control group was due to practical limitations in the field, where all available beginner players were required to follow the same training program (Sugiyono, 2011).

The research participants were all beginner players of the Rottan Volleyball Club in Kuala Betara District. A total sampling technique was applied, involving the entire population of beginner players, totaling 13 athletes. This approach ensured that the sample accurately represented the characteristics of the population under study (Arikunto, 2010).

The independent variable in this study was mud jumping exercise variations, while the dependent variable was leg muscle power. The training program consisted of several mud jumping variations designed as a modified plyometric exercise. The program was conducted in a structured and systematic manner over a predetermined training period, following basic training principles such as progression, repetition, and recovery (Bompa & Buzzichelli, 2019).

Mud jumping exercises were performed on muddy ground to increase external resistance and instability. This condition required greater neuromuscular activation, balance control, and force production during take-off and landing phases. Each training session included a warm-up phase, a core training phase consisting of mud jumping variations, and a cool-down phase to reduce the risk of injury.

Leg muscle power was measured using the vertical jump test, which is widely recognized as a valid and reliable instrument for assessing lower limb explosive power (Markovic et al., 2004). Measurements were conducted twice:

a pre-test prior to the training intervention, and

a post-test after the completion of the training program.

Prior to hypothesis testing, the data were analyzed using descriptive statistics to determine mean and standard deviation values. Assumption testing was conducted using the Liliefors normality test to assess data distribution and a homogeneity test to examine variance equality. Hypothesis testing was performed using a paired-sample t-test to determine whether there was a significant difference between pre-test and post-test leg muscle power scores. All statistical analyses were conducted at a significance level of $\alpha = 0.05$ (Sugiyono, 2011).

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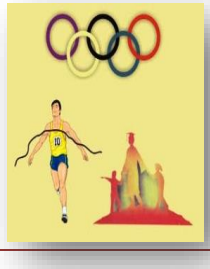

RESULT AND DISCUSSION

research result

The results of the study showed an increase in leg muscle power in novice players at the Rottan Volleyball Club in Kuala Betara District after being given a variety of mud jump exercises. Based on measurements using the vertical jump test, the average post-test score was higher than the average pre-test score. This indicates that mud jump exercises have a positive impact on the players' leg muscle explosive power.

The results of the prerequisite analysis test showed that the pre-test and post-test data were normally distributed and homogeneous, thus meeting the requirements for hypothesis testing. Furthermore, the t-test results showed a calculated t value greater than the t table at a significance level of 0.05, thus the hypothesis stating that there is an effect of mud jump exercises on leg muscle power. Therefore, it can be concluded that mud jump exercises have a significant effect on increasing leg muscle power in novice players at the Rottan Volleyball Club in Kuala Betara District.

Tabel 1. Pre-Test Data Description

No	Norma	Prestasi	FI	%
1.	>73,5	Baik Sekali	0	0
2.	60 – 72,5	Baik	13	100
3.	50 – 59,5	Sedang	0	0
4.	39 – 49,5	Kurang	0	0
5.	0 – 38,5	Kurang Sekali	0	0
Jumlah			13	100

Table 2. Post-Test Data Description

No	Norma	Prestasi	FI	%
1.	>73,5	Baik Sekali	3	23
2.	60 – 72,5	Baik	10	77
3.	50 – 59,5	Sedang	0	0
4.	39 – 49,5	Kurang	0	0
5.	0 – 38,5	Kurang Sekali	0	0
Jumlah			13	100

Table 3. Normality Test

Sumber variasi	L hitung	L table	Kriteria
Tes awal	0,1372	0,234	Norma
Tes akhir	0,1711		Norma

Table 4. T-Test Analysis

Sumber variasi	N	Mean	Standar deviasi	T hitung	T tabel	Ket
Tes awal dan tes akhir	13	5,85	2,61	8.08	1,7829	signifikan

Discussion

The findings of this study indicate that mud jumping exercise variations significantly improved leg muscle power in beginner players of the Rottan Volleyball Club, Kuala Betara District. This improvement was evidenced by the increase in average vertical jump scores from pre-test to post-test and further confirmed by the paired-sample t-test results, which showed a statistically significant difference at the 0.05 significance level. These results demonstrate that the training intervention effectively enhanced lower limb explosive power in beginner volleyball players.

The increase in leg muscle power can be explained by the physiological demands imposed by mud jumping exercises. Performing jumps on muddy and unstable surfaces increases external resistance and requires greater neuromuscular activation to maintain balance, coordination, and force production. According to Slimani et al. (2016), plyometric training performed under increased resistance and instability conditions enhances motor unit recruitment and improves the rate of force development, which directly contributes to improved vertical jump performance.

Furthermore, recent studies emphasize that modified plyometric exercises performed on unstable or resistant surfaces are particularly effective for beginner athletes. Ramirez-Campillo et al. (2020) reported that plyometric training adaptations are influenced by surface conditions, with softer or unstable surfaces promoting greater muscle activation and joint stabilization. This supports the present findings, where mud jumping exercises stimulated both concentric and eccentric muscle actions during take-off and landing phases, leading to improved explosive strength.

In addition, Chaabene et al. (2021) stated that structured plyometric programs significantly improve lower-body power, balance, and movement efficiency when applied progressively and systematically. The mud jumping program used in this study followed basic training principles such as repetition, progression, and adequate recovery, which likely contributed to the observed performance gains. This is especially relevant for beginner players, whose neuromuscular systems are highly responsive to appropriately designed training stimuli.

The results of this study are also consistent with recent volleyball-specific research. A study by Hernández-Davó et al. (2022) found that improvements in vertical jump ability are closely associated with better smash and block performance in volleyball players. Therefore, the increase in leg muscle power observed in this study has practical implications, as it may enhance the effectiveness of technical skills that rely heavily on jumping ability.

Moreover, the use of training variations, such as mud jumping, plays an important role in maintaining motivation and engagement among beginner players. According to Bompa and Buzzichelli (2019), variation in training stimuli prevents monotony and promotes continuous adaptation, which is essential for long-term athletic development. The novelty and challenge of mud jumping exercises may have contributed to higher training adherence and effort among participants.

Overall, the findings of this study confirm that mud jumping exercise variations, as a modified form of plyometric training, are effective in increasing leg muscle power in beginner volleyball players. These results strengthen previous research on plyometric training while providing new empirical evidence on the effectiveness of mud-based jumping exercises in a real-field training context at the club level.

CONCLUSION

Based on the research results and discussion regarding the Effect of Mud Jump Training Variations on Leg Muscle Power in Beginner Volleyball Players at the Rottan Volleyball Club in Kuala Betara District, it can be concluded that mud jump training variations significantly increased leg muscle power in beginner players.

Data analysis showed a significant difference between pre-test and post-test leg muscle power scores after the mud jump training variations. This improvement indicates that mud jump training effectively trains the strength and speed of leg muscle contractions, thus supporting the improvement of jumping ability, which is crucial in volleyball, particularly in smash and block techniques.

Therefore, mud jump training variations can be used as an alternative, effective and efficient training method to increase leg muscle power in beginner volleyball players, particularly at the Rottan Volleyball Club in Kuala Betara District.

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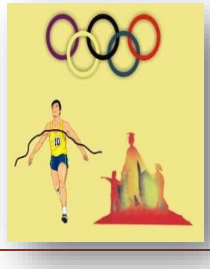

REFERENCES

Arikunto, S. (2010). *Prosedur penelitian: Suatu pendekatan praktik*. Rineka Cipta.

Bompa, T. O. (1994). Theory and methodology of training. Kendall/Hunt Publishing.

Bompa, T. O., & Buzzichelli, C. (2019). *Periodization: Theory and methodology of training (6th ed.). Human Kinetics.*

Chaabene, H., Negra, Y., Ramirez-Campillo, R., Bouguezzi, R., Hachana, Y., & Granacher, U. (2021). *Effects of plyometric training on physical fitness in team sport athletes: A systematic review.* Frontiers in Physiology, 12, 655484. https://doi.org/10.3389/fphys.2021.655484

Hanafi, M., & Prastyana, B. R. (2020). Metodologi kepelatihan olahraga: Tahapan dan penyusunan program latihan. *Jakad Media Publishing.*

Harsono. (1988). Coaching dan aspek-aspek psikologis dalam coaching. CV Tambak Kusuma.

Hernández-Davó, J. L., Sabido, R., & Morán-Navarro, R. (2022). Relationship between vertical jump performance and volleyball-specific skills. *International Journal of Sports Science & Coaching,* 17(3), 1–9. https://doi.org/10.1177/17479541221089431

Markovic, G., Dizdar, D., Jukic, I., & Cardinale, M. (2004). Reliability and factorial validity of squat and countermovement jump tests. *Journal of Strength and Conditioning Research,* 18(3), 551–555.

Markovic, G., & Mikulic, P. (2010). Neuro-musculoskeletal and performance adaptations to lower-extremity plyometric training. *Sports Medicine*, 40(10), 859–895. https://doi.org/10.2165/11318370-000000000-00000

Ramírez-Campillo, R., Andrade, D. C., & Izquierdo, M. (2020). Effects of plyometric training volume and training surface on explosive strength. *Journal of Strength and Conditioning Research*, 34(9), 1–10. https://doi.org/10.1519/JSC.0000000000002910

Slimani, M., Chamari, K., Miarka, B., Del Vecchio, F. B., & Chéour, F. (2016). Effects of plyometric training on physical fitness in team sport athletes: A systematic review. *Journal of Human Kinetics*, 53, 231–247. https://doi.org/10.1515/hukin-2016-0026

Sugiyono. (2011). *Metode penelitian kuantitatif, kualitatif, dan R&D*. Alfabeta.

Suharno. (1993). *Metodologi pelatihan olahraga*. IKIP Yogyakarta.

Sukadiyanto, & Muluk, D. (2011). *Pengantar teori dan metodologi melatih fisik*. CV Lubuk Agung.

CONFESSION

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