

THE EFFECT OF STANDING JUMP EXERCISE ON JUMP HEIGHT IN VOLLEYBALL CLUB PLAYERS

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ABSTRACT

Background: Volleyball is played by 2 teams of 6 players each, with a focus on physical quality to achieve the best athletic performance. Jump height is important for players when doing smash and block movements, physiotherapy plays a role in increasing jump height in volleyball players by paying attention to the physiological adaptation of the athlete's body and minimizing the risk of injury during training. Physiotherapy can increase jump height with Standing Jump Exercise which is proven to increase player jump height. **Objective:** To determine the effect of Standing Jump Exercise intervention on the jump height of volleyball players. **Method:** This research design is quasi-experimental, using a two group pretest-posttest approach. The number of samples for each group amounted to 13 respondents with purposive sampling. The intervention group was given Standing Jump Exercise and routine exercise while the control group was only routine exercise. Measurement of jump height using the Vertical Jump Test. **Results:** In the paired t test, the mean jump height before intervention was 40.69 cm and after 49.85 cm in the intervention group. **Conclusion:** There is a significant effect on the treatment group with the intervention of Standing Jump Exercise can increase jump height in Volleyball players.

Keywords: Standing Jump Exercise; Jump Height; Volleyball; Sports

ABSTRAK

Latar Belakang: Voli adalah suatu permainan yang dimainkan dengan 2 regu dimana setiap regunya terdiri dari 6 orang pemain, dengan fokus pada kualitas fisik untuk mencapai performa terbaik atlet. Tinggi lompatan penting bagi pemain saat melakukan gerakan *smash* dan block, fisioterapi berperan dalam meningkatkan tinggi lompatan pada pemain voli dengan memperhatikan adaptasi fisiologi dari tubuh atlet dan meminimalisir risiko cedera pada saat latihan. Fisioterapi dapat meningkatkan tinggi lompatan dengan *Standing Jump Exercise* yang terbukti meningkatkan tinggi lompatan pemain. **Tujuan:** Untuk mengetahui pengaruh intervensi *Standing Jump Exercise* terhadap tinggi lompatan pemain voli. **Metode:** Rancangan penelitian ini quasi eksperimental, dengan menggunakan pendekatan two group pretest-posttest. Jumlah sampel setiap kelompok berjumlah 13 responden dengan pemilihan purposive sampling. Kelompok perlakuan yang diberikan intervensi *Standing Jump Exercise* dan latihan rutin sedangkan kelompok kontrol hanya latihan rutin. Pengukuran tinggi lompatan menggunakan *Vertical Jump Test*. Intervensi dilakukan selama 2 kali seminggu selama 4 minggu. **Hasil:** Pada uji paired t test didapatkan rerata tinggi lompatan sebelum intervensi 40.69 cm dan setelah 49.85 cm pada kelompok perlakuan. **Kesimpulan:** Terdapat pengaruh yang signifikan pada kelompok perlakuan dengan intervensi *Standing Jump Exercise* dapat meningkatkan tinggi lompatan pada pemain Voli.

Keywords: Standing Jump Exercise; Tinggi Lompatan; Voli; Olahraga

INTRODUCTION (12 pt)

Physical exercise has become a fundamental component for individuals seeking to fulfill physical needs and improve overall health, with the ultimate goal of enhancing human resource quality (Rismayanthi, 2018). Regular exercise positively impacts muscle mass by stimulating muscle cells, leading to increased muscle size and strength (Rismayanthi, 2018). According to data from SumberDataIndonesia released on November 14, 2022, volleyball ranks as the fourth most popular sport, with 9.8% of 1,220 respondents expressing an interest in it.

Volleyball is a sport that requires various fundamental techniques, including the forearm pass, overhead pass, underhand serve, overhand serve, spike, and block (Paud and Dikmen, 2020). These techniques involve the entire body, demanding maximum muscle strength for optimal performance. Muscle strength is critical in determining jump height in volleyball players, as explosive power greatly influences jump effectiveness (Barlian, 2020). Observations of the Physiotherapy Department's Volleyball Club at Poltekkes Kemenkes Jakarta III in November 2023 revealed that, over the past three years, the club has not won first place in inter-departmental tournaments hosted by the Student Executive Board (BEM). This is attributed to factors such as poor jump accuracy, limited flexibility when intercepting or blocking shots, and a lack of speed and fluidity in executing smashes and returning opponent's attacks, all of which are essential for scoring points and winning matches.

Jump height is strongly supported by several physical components. Key physical factors include muscle strength, explosive leg power, and overall leg strength (Komala Sari & Rahayu, 2008:145). Proper training is essential to develop these jump-related components, and exercises must be targeted, systematic, and well-structured. One effective training method for improving jump height in volleyball is the standing jump exercise.

Standing jump exercise is a type of training that involves jumping with both feet positioned in front of the chest to overcome obstacles (Johansyah Lubis, 2009). The goal of this exercise is to combine speed and strength, producing repetitive jumping movements that serve as reflexive stretch training to promote explosive responses. Standing jump exercise stimulates the muscle spindles and Golgi tendons, resulting in neuromuscular adaptation and stretch reflex. When performed consistently over a set period, this exercise can lead to significant changes in jump height for trained players (Permatasari, Intan et al., 2019).

Physiotherapy plays a vital role in sports, including the prevention, assessment, management, and treatment of injuries or physical issues associated with athletic activities. One of the key roles of physiotherapy is performance enhancement, focusing on improving volleyball players' jump height while addressing physiological adaptations in athletes and minimizing the risk of injury during training (Permatasari, Intan et al., 2019).

Based on this background, the research question of this study is: "Does standing jump exercise impact jump height improvement in volleyball players from the Physiotherapy Department Volleyball Club at Poltekkes Kemenkes Jakarta III?" This study aims to investigate the effect of

standing jump exercise on jump height in volleyball players from the Physiotherapy Department Volleyball Club at Poltekkes Kemenkes Jakarta III.

METHOD (12 pt)

This study employed a quasi-experimental research design with a two-group control group approach. The independent variable was the standing jump exercise, and the dependent variable was jump height. The study was conducted over a four-week period at the Cipayung Setu Sports Center, Cipayung District, East Jakarta, Jakarta Special Capital Region, from January to February 2024. The Lemeshow formula was used for sampling, yielding 13 respondents per group, resulting in a total sample size of 26 participants.

The results of the study that vertical jump measurements exhibited excellent reliability. Intra-rater reliability, as indicated by an Intraclass Correlation Coefficient (ICC) ranging from 0.903 to 0.934, revealed a high degree of agreement between repeated measurements made by the same rater. Furthermore, inter-rater reliability, with an ICC ranging from 0.823 to 0.926, indicated substantial to excellent agreement between different raters. These findings suggest that vertical jump measurements are reliable and consistent, regardless of whether the measurements were conducted by the same or different evaluators. The high reliability of this measure makes it a valuable tool for assessing (e.g., lower limb power, neuromuscular function) in various populations.

A purposive sampling technique was applied with inclusion and exclusion criteria as follows:

A. Inclusion Criteria

1. Members of the Physiotherapy Department Volleyball Club at Poltekkes Kemenkes Jakarta III
2. Willingness to participate as research respondents
3. Male and female participants
4. Age range of 17-23 years

B. Exclusion Criteria

1. Presence of bruises, edema, or other injuries
2. Fractures
3. Consumption of pain-relief medication
4. Current participation in another study
5. Dropout (failure to complete the research program)

Univariate analysis was used to describe variable characteristics such as gender, age, height, and weight. Bivariate analysis was performed to assess the relationship between the two groups using a normality test via the Shapiro-Wilk test. If the data were normally distributed, the Paired Sample T-test was applied. To ensure data grouping consistency, the Levene's Test for homogeneity was used. Subsequently, the Independent Sample T-test was conducted to identify significant differences in effects between the intervention and control groups. This study was

approved by the Health Ethics Committee at Universitas Negeri Semarang with the approval number: 017/KEPK/FK/KLE/2024.

RESULTS AND DISCUSSION (12pt)

A. Univariate Analysis

1. Gender

Table 1. Respondent Characteristic Gender

Group	Male		Female		Total	
	n	%	n	%	n	%
Treatment	8	61.5	5	38.5	13	100
Control	7	53.8	6	46.2	13	100

According to the table, the respondents were predominantly male, with 8 males in the treatment group and 7 in the control group, while the female count was 5 in the treatment group and 6 in the control group.

Group	Min	Max	Mean	Median	±SD	CI 95%
Treatment	18	20	19.15	19.00	0.801	18.67-19.64
Control	19	20	19.23	19.00	0.439	18.97-19.50

The table shows that the average age in the treatment group was 19.15 years, while in the control group it was 19.23 years..

2. Height

Table 2. Respondent Characteristic Height

Group	Min	Max	Mean	Median	±SD	CI 95%
Treatment	152	179	165.85	169.00	8.285	160.84-170.85
Control	153	180	165.54	169.00	9.234	159.96-171.12

The table shows an average height of 165.85 cm for the treatment group and 165.54 cm for the control group..

3. Weight

Table 3. Respondent Characteristic Weight

Group	Min	Max	Mean	Median	±SD	CI 95%
Treatment	42	90	63.77	65.00	12.125	56.44-71.10
Control	42	88	60.85	58.00	14.639	52.00-69.69

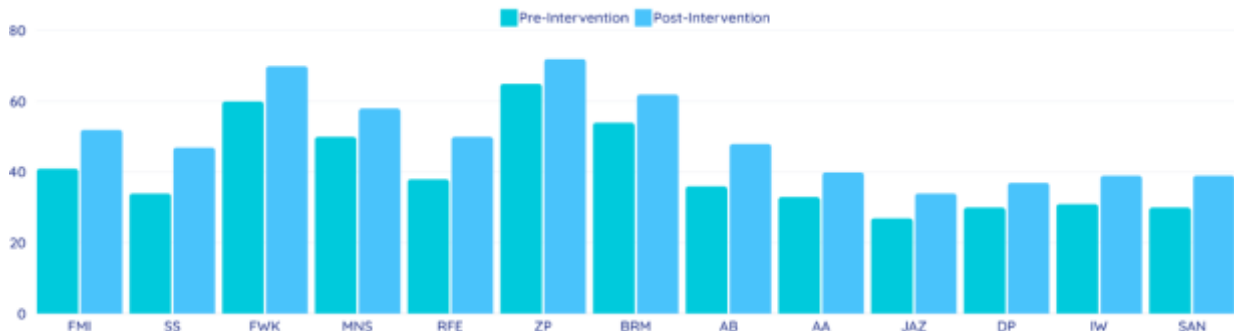
The average weight for the treatment group was 63.77 kg, while for the control group it was 60.85 kg.

4. Jump Height

Table 4. Jump Height

Group	Variabel	Mean ±SD	Min-Max	95%CI
Treatment	Pre-Intervention	40.69±12.486	27 - 65	33.15 – 48.24
	Post-Intervention	49.85±12.502	34 - 72	42.29 – 57.40

Control	Pre-Intervention	33.31±10.554	16 - 49	26.93 – 39.69
	Post-Intervention	34.15±10.908	16 - 50	27.56 – 40.75



Picture 1. Jump Height

Based on the table above, the average jump height for respondents in the Treatment group before the intervention was 40.69 cm, which increased to 49.85 cm after the intervention. In the Control group, the average jump height before the intervention was 33.31 cm, which slightly increased to 34.15 cm after the intervention. The chart suggests that the intervention had a positive impact on the jump height of all the participants. However, the individual responses varied. Some participants showed a more significant improvement than others.

B. Bivariate Analysis

1. Normality Test

Table 5. Normality Test

Group	Jump Height	P Value	Explanation
Treatment	Pre	0.062	Normal
	Post	0.275	Normal
Control	Pre	0.286	Normal
	Post	0.307	Normal

Based on the table above, after testing both groups using the Shapiro-Wilk test, the results showed a p-value > 0.05, indicating that the data is normally distributed.

2. Paired Sample T-Test

Table 6. Paired Sample T-Test

Group	Jump Height	Mean ±SD	ΔMean±SD	CI 95%	t	P Value
Treatment	Pre	40.69±12.486	-	(-10.479)	-15.052	0.000
	Post	49.85±12.502	9.154±2.193	(-7.829)		
Control	Pre	33.31±10.554	-	(-1.262) –	-4.430	0.001
	Post	34.15±10.908	0.846±0.689	(-0.430)		

Based on the table above, it shows that the treatment group yielded a p-value of 0.000, indicating that $p < 0.05$, which signifies a significant change in jump height among the respondents in the treatment group. In the control group, the p-value was 0.001, also less than 0.05, indicating a change in jump height before and after the intervention. Although both groups exhibited effects, the independent test results revealed a p-value of 0.000, suggesting a notable difference between the two groups, with a mean increase of 9.1538 in the treatment group compared to 0.8462 in the control group. This difference in mean improvement indicates a substantial effect in the treatment group.

3. Uji Hipotesis

Table 7, Uji Hipotesis

<i>Levene Test</i>		
Jump Height	F	P Value
	0.19	0.892

Based on the hypothesis test results, the p-value between the two groups was 0.892, indicating that $p > 0.05$. This suggests that the data from both groups are homogeneous.

4. Independent T-test

Table 8. Independent T-Test

Jump Height				Explanation
Group	Mean	SD	P Value	
Treatment	9.1538	2.19265	0.000	There is a Significant Difference
Control	0.8462	0.68874		

Based on the table above, the p-value obtained was 0.000, which indicates $p < 0.05$. This confirms that there is a significant difference between the treatment and control groups, as reflected by the substantial difference in mean scores between the treatment and intervention groups.

CONCLUSION (12pt)

The sample for this study consisted of members of the Volleyball Club from the Physiotherapy Department at Poltekkes Kemenkes Jakarta III. The intervention program was conducted over four weeks, with training sessions twice per week. Before the intervention, respondents' jump heights were measured, and after the intervention, they were re-measured to assess the effect of the standing jump exercise on jump height. In this study, jump height was measured using a vertical jump test.

In terms of gender, the sample was predominantly male, with eight males and five females in the treatment group, and seven males and six females in the control group. According to Sandbakk et al. (2018), male and female hormones affect jump height; testosterone in males can increase muscle strength and mass, impacting jump ability. The average age was 19.15 years for the treatment group and 19.23 years for the control group. Physical abilities like muscle strength, explosive power, and flexibility peak at certain ages before declining. In youth, the body is still developing, so jump height may not be fully optimized (Lloyd et al., 2020). The average height was 165.85 cm for the treatment group and 165.54 cm for the control group. According to Papalada et al. (2021), taller individuals tend to have longer limbs, providing greater range and allowing for higher jumps. The average weight was 63.77 kg for the treatment group and 60.85 kg for the control group. According to Comfort et al. (2021), individuals with a higher muscle-to-weight ratio tend to have better jumping ability, with lower weight and equal muscle strength leading to higher jumps.

The Paired Sample T-Test results indicate a significant effect in the treatment group, with a p-value of 0.000 ($p < 0.05$). The control group also showed a significant effect with a p-value of 0.001. This suggests that the standing jump exercise effectively improved jump height among volleyball players in the Physiotherapy Department Volleyball Club at Poltekkes Kemenkes Jakarta III. This aligns with research by Fernanda et al. (2018), which showed that standing jump exercises serve as an effective stimulus for enhancing jump accuracy, optimizing spike and blocking performance in volleyball players. Although both groups showed effects, the independent test revealed a p-value of 0.000, indicating a difference between the groups, with a mean increase of 9.1538 in the treatment group and 0.8462 in the control group. This indicates a significant improvement in the treatment group, as standing jump exercises specifically target muscles essential for vertical jump performance, such as the hip flexors, gastrocnemius, gluteals, quadriceps, and hamstrings. In contrast, the control group's general exercise routine was not specifically designed to enhance jump height (Negra et al., 2020).

Standing jump exercises improve jump height by stimulating muscle spindles and Golgi tendons, leading to neuromuscular adaptation and stretch reflex. With consistent practice, these exercises can significantly improve jump height in trained players (Permatasari, Intan et al., 2019). Neurological adaptations, such as motor learning and coordination improvements, increase the number of motor units, nerve conduction speed, and movement synchronization. These changes occur due to reduced inhibition from the central nervous system and decreased sensitivity of the Golgi tendon organ (Permatasari, Intan et al., 2019). The conclusions of the above discussion are:

1. The sample characteristics included a gender composition of 8 males and 5 females in the treatment group, and 7 males and 6 females in the control group. Respondent age averaged 19.15 years for the treatment group and 19.23 years for the control group. Average height was 165.85 cm in the treatment group and 165.54 cm in the control group, with an average weight of 63.77 kg in the treatment group and 60.85 kg in the control group.
2. The paired sample T-test results showed a significant increase in jump height in the treatment group with a p-value of 0.000 (<0.05), proving that standing jump exercise significantly improves jump height.
3. The mean jump height in the treatment group before the intervention was 40.69 cm, which increased to 49.85 cm after the intervention.
4. The mean jump height in the control group before the intervention was 33.31 cm, which increased to 34.15 cm after the intervention.
5. The training program involves performing standing jumps 3 times a week at a moderate intensity for 5 minutes. Each session consists of 3 sets of 8 repetitions. This program is based on research by Faigenbaum et al. in 2020.
6. Conducting a study with a larger sample size can increase the statistical power and provide more robust results.
7. Investigating the long-term effects of standing jump exercises on jump height and other performance parameters.

These physiological theories support the study's findings, as regular standing jump exercises stimulate muscle spindles and Golgi tendons, creating neuromuscular adaptation and stretch reflex, leading to improvements in jump height over time. This study faced some limitations, such as respondent commitment to punctuality due to varying class schedules. Additionally, factors like respondents' diets, activity levels, and habits, which could affect the results, were beyond the researchers' control.

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