

## The Effect of Plyometrics Training Methods and Height on Leg Power, Volleyball Smash Ability on Christian University Athlete Club Artha Wacana Kupang

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### Abstract

The purpose of this study was to determine and analyze: 1) the difference in the effect of depth jump and jump to box training on volleyball smash ability in athletes of Club Universitas Kristen Artha Wacana Kupang. 2) the difference in the effect between above-average and below-average height and low leg power in the athlete club of Universitas Kristen Artha Wacana Kupang. 3) the interaction between training methods and height on volleyball smash ability in athletes of Club Universitas Kristen Artha Wacana Kupang. This study used an experimental method with a design with a factorial 2x2. Data analysis technique using Analysis of Variance (Anova) At significant level ( $\alpha$ ) 0.05. The independent variable in this study is the depth jump and jump to box training methods. Height above average and below average as attribute variables and dependent variables are volleyball smash ability at the Artha Wacana Christian University Kupang club. The results of this study (1) There is a significant difference in the influence between depth jump and jump to box training methods on smash ability with sig values  $(0.04) < \alpha (0.05)$  and  $F_{\text{calculate}}$  values  $(7.027) > F_{\text{table}} (4.49)$ , (2) There is a difference in the influence of height above average and height below average on smash ability where the significance value is  $(0.030), < \alpha (0.05)$  and  $F_{\text{calculate}} (5.317) > F_{\text{table}} (4.49)$ , (3) There is an interaction between plyometrics training methods and height on smash ability with sig  $(0.027) < \alpha (0.05)$  and  $F_{\text{calculate}} (8.603)$  values  $> F_{\text{table}} (4.49)$ . Conclusions from this study: (1) There is a significant difference in influence between depth jump and jump to box training methods on volleyball smash ability, 2) There is a significant difference in influence between height above average and height below average on volleyball smash ability, 3) There is an interaction between pliometric training methods and height on volleyball smash ability.

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## INTRODUCTION

Smash is a very dynamic movement that can be done anywhere, both on the attack line and on the back line, a volleyball athlete must do his best to jump high or set the jump height that will be able to find gaps to add points to the team (Sahabuddin, 2012:160). Then it is corroborated by argumentation (Suhadi, 2009:40-41) In theory, smashing is a basic technique in volleyball games that must be able to pass the ball over the net, with the highest jump to be able to pass through the block and enter the target, namely the opponent's defense area. Therefore, smashing players must be supported by the maximum jumping ability.

Most of the literature that has studied volleyball has a strong focus on suppressing the ability of athletes to jump vertically and in conjunction with this the height of their jump throughout. The ability to jump up is very useful and supportive when athletes perform resistance / blocking and smash. A good vertical jump is strongly supported by several components, including power or leg explosive power and leg muscle strength (Bakar, 2021). Jump power or explosive power has two components, namely strength and speed which is an important ability to support activities in sports (Widiastuti, 2015:107). Volleyball is a sport played by 2 opposing groups, each group consisting of 6 players. There is also another variation, namely beach volleyball where each group only has 2 players. The volleyball court has a size of 9 x 18 meters with a limit line of attacking defenders 3 meters from the center line. For the outline, it should be 5 cm in size (Stephane Yane, 2014).

Based on the statement above, it can be concluded that height is one of the absolute factors needed for sports that have height characteristics such as volleyball. Therefore, a volleyball player who has a height above average will have many advantages, one of which is in smashing the opponent's court.

Plyometrics training is one activity strategy that can be utilized to work on the novelty of competitors' biomonitors, including speed and strength, which have very wide applications in sports training (Mertayasa, Rahayu, and Soenyoto

2016). The exercise has depth jump exercises in it using the whole body mainly to train the muscles of the legs, thighs, hips, and lower back. This exercise is very good if applied in volleyball games because it can increase leg strength and speed, resulting in maximum power (Arrahman Z, 2017). Some state that box to jump training is a block box jumping exercise then jumping back to back like the initial posture by using both legs at the same time more effectively (Sryanto W, 2018).

## METHODS

This research is a type of experimental research with a 2 x 2 factorial design with a population used by the Artha Wacana Kupang University Club which amounted to 24 athletes. The population in this study was 24 athletes from the Artha Wacana Kupang Christian University Club. Samples were obtained by purposive sampling techniques based on characteristics or characteristics set by researchers totaling 24 people. The sample measures height above average and below average. The sample was divided into two groups, namely group A and group B consisting of 12 athletes whose height was above average and 12 athletes whose height was below average. Then the treatment was given to each group.

Samples in groups A and B were each given the same training method, namely the dept jump exercise method and the jump to box exercise method. The exercises provided apply the principles of exercise and the systematics of exercises. The frequency of exercise is 3 times a week for 6 weeks. After completion of treatment, each group did a post-test.

The instrument in this study used a stadiometer tool with a unit of centimeters (cm) and the level of accuracy reached 0.1 cm. Implementation of height test to improve limb power ability in volleyball smash of Christian club athlete artha wacana kupang. The sampling technique in this study was to use purposive sampling Sugioyono (2015). The number of athletes as many as 24 people was then tested and measured height, height data was used to group samples who had height above average and height below average. Furthermore, it is ranked, from

these results all samples are taken. So that the sample used in this study was 24 athletes above the average height of 12 people and athletes of height below the average amounted to 12 participants

**RESULT AND DISCUSSION**

**Result**

Description of the results of the second pre-test and post-test data analysis there is a difference in the effect between athletes who have a height above average and athletes of height below average on smash ability. The results of the analysis show

that there is a difference in influence between athletes who have a height above average and athletes who have a height above average on smash ability, proven and can be seen in the table as follows:

**Hypothesis Testing I**

Test the hypothesis using an analysis test using a two-path ANOVA with the help of SPSS 16.0. What is the accepted hypothesis if the ANOVA test has a significance smaller than  $\alpha$  ( $\text{sig} < 0.05$ ), while the calculated significance value is greater than  $\alpha$  ( $\text{sig} > 0.05$ ) hypothesis is rejected.

**Table 1.** Test Between Subject Effect, The Effect Of Exercise And Height On Smash Ability

Source	Df	Mean Square	F	Sig
<i>Corrected Model</i>	3	6.778	5.215	.016
Intercept	1	64480.667	4.90383	.000
exercise	1	13.500	7.027	.004
height	1	8.167	5.317	.030
exercise * height	1	9.667	8.603	.027
Error				
Total	20	13.150		
<i>Corrected Total</i>	24			
	23			

The results of the analysis stated that there was a significant difference in the effect between the depth jump and jump to box training methods on smash proficiency tested using the ANOVA test and obtained  $F_{\text{calculate}} = 7.027$  with a significance value of 0.04. The results of my fortune are consulted with table F with numerator  $dk = 1$  ( $b-1$ ) and denominator  $dk$  ( $kb(n-1)$ ), with a significance level of 0.05 obtained  $F_{\text{table}} = 4.44$ , because  $F_{\text{calculate}} > F_{\text{table}}$  or  $7.027 > 4.44$  with a significance level of  $0.004 < 0.05$  then  $H_a$  which reads: "there is a difference in influence between significant training methods between depth jump and jump to box methods is accepted.

**Hypothesis Testing II**

Stated that there was a difference in the effect of height above average and height below average on the ability to smash volleyball in club athletes of Universitas Artha Wacana Kuapang, which was tested using the ANOVA test and obtained  $F_{\text{calculate}} = 5.317$  with a significance of 0.030. The results of this calculation are consulted with table F with numerator  $dk = 1$  ( $b-1$ ) and denominator  $dk$  ( $kb(n-1)$ ), with a significance rate of 0.05 allowed  $F_{\text{table}} = 4.44$ , because  $F_{\text{calculate}} > F_{\text{table}}$  or  $5.317 > 4.44$  with a significance level of  $0.030 < 0.05$  then  $H_a$  which reads: "there is a difference in the influence between height above average and height below average on volleyball smash ability at the Artha Wacana Kuapang Christian University club" is accepted.

**Table 2.** Estimated Marginal Means for Training Against Increased Smash Ability

Training Method Exercise	Mean	Std. Error	95% Confidence Internal	
			Lower Bound	Upper Bound
Depth Jump	52.583	1.047	50.400	54.767
Jump To Box	51.083	1.047	48.900	53.267

Table 2 shows that depth jump training is better than jump to box training to improve smash ability, judging from the mean in Table 2. The depth jump group has a mean of 52.583 while the jump to box group has a mean of 51.083.

**Hypothesis Testing III**

Stated the interaction between plyometric depth jump and jump to box training methods above average height and below average height on smash ability in volleyball club athletes of Artha

Wacana Christian University Kupang, used ANOVA test,  $F_{calculate} = 8.603$  with a significant value of 0.027. The results of the fortune were consulted with table F with numerator dk = (b-1) and denominator dk (kb(n-1)), with a significance level of 0.05 obtained  $F_{table} = 4.44$ , because  $F_{calculate} > F_{table}$  or  $8.603 > 4.44$  with a significance direction between plyometric training methods and height on smash ability in volleyball club athletes of Artha Wacana Christian University Kupang" accepted.

**Table 3.** Estimated marginal means for plyometric training and height against smash ability

Training Method * Height				95% Confidence internal	
Exercise <i>Pliometric</i>	Height	Mean	Std. Error	Lower Bound	Upper Bound
<i>Depth Jump</i>	Tall	52.667	1.480	49.579	55.755
	Low	52.500	1.480	49.412	55.558
<i>Jump To Box</i>	Tall	51.833	1.480	48.754	54.921
	Low	50.333	1.480	47.245	53.421

Table 3, shows that the Depth Jump exercise group consisting of the height group above average has a mean of 52,667, the Depth Jump exercise group consisting of height below average has a mean of 52,500, the Jump To Box exercise group consisting of the height group above the average has a mean of 51,833, the Jump To Box group consisting of the height group below average has a mean of 50,333, looking at table 4.7, Depth Jump exercises with above average height are better than those with Depth Jump exercise groups with below average height.

**DISCUSSION**

Volly is a sport played in pairs (6 vs. 6) on a small court (18 x 9 m), involving high physical fitness demands for its players Therefore, this study aims to improve the game by using two 8-week training programs in one season on the athletic

performance of male volleyball players (Saez de Villarreal, 2023). Between depth jump and jump to box exercises on the results of volleyball club smashes Universitas Kristen Artha Wacana Kupang, why plyometric dept jump exercises affect leg power because it is the most effective method to develop the reactive ability of the neuromuscular system. The box jump is a special exercise to increase leg muscle power. The muscles developed in box jumping include: thigh flexion, knee extension, adduction, and abduction involving the gluteus medius and minimus muscles, adductor longus, brevis, Magnus, minimus, and hallucis (Hasanuddin, M. I. 2023). The goal of depth jump training is to increase an athlete's reactive strength, the less time the foot is in a box with the ground the more effective it will be. Altitude control to measure synthesis is also necessary as long as it does not reduce its usefulness, and movement is required as quickly as possible. The key to

establishing this exercise and decreasing the amortization phase is to suppress the "touch and go" action of landing on the ground (Bakar A, 2019). The goal of the triphasic training method is to maximize sports performance by enhancing all three muscle actions to create a strong connection between eccentric, isometric, and concentric phases (Rebelo A, 2023). The results of the first hypothesis show that there is an influence on the posture and body parts that each athlete has become one of the influential factors in the appearance of exercise. In some sports, high posture with ideal body weight and physical condition will support the achievement of high sports prestige (Sri Haryono, 2008:3).

## CONCLUSION

Based on the data obtained, the results of hypothesis testing and discussion of research results can be concluded as follows:

There is a significant difference in the influence between depth jump and jump to box training methods on the results of volleyball smashes at the Artha Wacana Christian University Kupang club. Volleyball smash results in athletes with a depth jump training method obtained higher result increases compared to volleyball smash results with a jump to box training method.

There is a significant difference in the influence between height above average and height below average on the results of volleyball smash in volleyball club athletes of Artha Wacana Christian University Kupang. Volleyball smash results in athletes of above-average height obtain higher results than athletes of below-average height.

There is an interaction between training methods with above-average height to volleyball smashes. Athletes who have a height above average with the depth jump method have a better effect than jump to box, athletes with a height below average who use the jump to box training method have a better influence on depth jump.

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