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The Effect of Plyometric Exercise Combination on Leg Muscle Strength Reviewed from Body Mass Index at Pjkr Volleyball Club at Artha Wacana Christian University Kupang

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Abstract

The purpose of this study was to examine the effect of a combination of plyometric exercises on leg muscle strength, reviewed from (BMI) at the Volleyball Club (PJKR) at UKAW. This study used a quantitative method with a descriptive pretest-posttest experimental approach. The population of this study consisted of 54 students who joined the PJKR volleyball club at Artha Wacana Christian University, Kupang. Of the 54 populations, only 30 samples met the research criteria. The selected sample was from PJKR students who joined the PJKR Volleyball Club at Artha Wacana Christian University, Kupang. The results of this study indicate that the box jump and depth jump training methods in the normal BMI category that are more effective are the depth jump training method with an N-gain value or average of 0.3920 while the box jump N-gain value or average is 0.2034 and the sig value of the depth jump and thin BMI is sig 0.000 <0.05 and the box jump and thin BMI group is sig 0.007 <0.05, while the box jump and depth jump training in the normal BMI category is more effective than the depth jump training method with an N-gain value or average of 0.4387, while the box jump has an N-gain value or average of 0.3581, with a sig depth jump value of sig 0.000 <0.05 and the box jump sig value of 0.001 <0.05, and the box jump and depth jump training method in the obese BMI category is more effective than the box jump with an N-gain value or average of 0.3559 while depth jump with N-gain value or average of 0.3065, with sig box jump value of 0.001 <0.05 while depth jump 0.000 <0.05. Based on the results of this study it can be concluded that plyometric training must be adjusted to individual attributes, especially those related to BMI

Keywords: Plyometric, BMI, Leg Muscle Strength, Volleyball.

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INTRODUCTION

Sport is a deliberate and planned physical activity starting from the direction, purpose, time, and location and Sport can be done individually or in groups. Sport is not only a competitive physical activity that aims to improve physical abilities and skills but also functions as a holistic health tool that promotes overall well-being, mental health, and social interaction (Murtadho et al., 2023). Volleyball is known as a sport played by two opposing groups of six players each, emphasizing the importance of physical fitness, psychological traits, and injury prevention (Šadrincevaitė & Griciūtė, 2023). To excel in volleyball, players must master various techniques such as serving, down pass, top pass, block, and smash (Topan Arisandi et al., 2023). Leg strength is the ability of the leg muscles or soles of the feet to produce power or energy in performing various physical activities, such as running, jumping, or kicking (Radulović et al., 2022). Lower extremity endurance training effectively improves explosive power in track and field athletes, as demonstrated by increased jump distance and sprint time (Litao et al., 2023). Leg muscle strength plays a critical role in improving volleyball athlete performance, affecting a variety of essential skills for the game. Plyometric training is a type of training in which the movement requires jumping or active movement. The combination of plyometric training significantly improves leg muscle strength in volleyball athletes, which is important for improving explosive power and overall performance, but has limited impact on arm muscle strength (Muhammad et al., 2023). Two types of plyometric training that are similar to this explanation are plyometric box jump and depth jump training. Plyometric training is characterized by a unique combination of rapid muscle stretching and explosive contraction, making it important for improving athlete performance.

Box jump training Box jump training is jumping from the floor onto a box or platform and then landing safely. Box jump training, a form of plyometric training, involves jumping from the floor onto a box or platform and landing safely back on the ground (Ma et al., 2024). This exercise is commonly performed by athletes in various sports, and should be performed with correct technique and supervised by a trained coach to prevent injury and achieve optimal training results. The goal of this exercise is to improve muscle strength, speed, and explosiveness. Depth jump training is a type of plyometric exercise in which athletes jump from a high height, then land quickly and perform a vertical jump quickly. Depth jump training, a form of plyometric training, involves athletes jumping from a high position and quickly transitioning to a vertical jump upon landing (THAKUR et al., 2016). This method not only increases muscle strength but has also been shown to be effective in certain sports contexts, such as volleyball, where plyometric training such as depth jumps can lead to substantial increases in extremity muscle strength (Hidayat et al., 2018). Based on the description of the problems above, it is necessary to evaluate the problems currently being faced by the PJKR UKAW volleyball club, namely that physical abilities are not in accordance with what is desired in the sense that they are still low, resulting in low leg muscle strength which has an effect on the height of the jump in doing a smash. Based on the problems described in the background above, in accordance with the researcher's observations, it is seen that the training program is not appropriate so that it can cause a decrease in endurance and leg muscle strength. PJKR students at Artha Wacana Christian University Kupang want to achieve their goals because of training, so the researcher will follow up on this study with the title "The Effect of Plyometric Exercise Combination on Leg Muscle Strength in Terms of Body Weight at the PJKR Volleyball Club at Artha Wacana Christian University Kupang"

METHODS

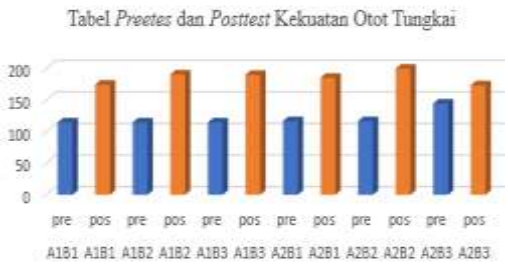
The type of research used is experimental research. According to Budiwanto, (2017) experimental research is a method that tests the relationship between cause and effect variables. In this study, one or more variables are manipulated to see their effect on other variables, while variables that are not related to the problem being studied are controlled as much as possible. The data in this study were compiled into a research design framework with a 3x2 factorial design, with the division of participants who had

thin weight, normal weight and overweight each divided into 3 groups by matching ABABAB determined into 6 groups graphically. According to Budiwanto, (2017) "population is the total number of objects or subjects that have certain characteristics and qualities determined by researchers to be investigated, and then conclusions are drawn from the results of the study". The population used in this study was the PJKR Volleyball Club at Artha Wacana Christian University, Kupang, with a total of 56 students. According to Sugiyono, (2013) Sampling technique is a way or method of taking samples from the population to be used as research objects. Some commonly used sampling techniques include simple random sampling, stratified sampling, systematic sampling, cluster sampling, and purposive sampling. So in this study the researcher used a purposive sampling technique with a total of 30 students with several factors that need to be considered. The data collection technique in this study was a test and measurement before the pretest and posttest samples were given, the body mass index was first measured, to determine the weight of each category. The study was conducted 3 times in 1 week for 30 volleyball club participants. The meeting was held 3 times in 1 week for 30 volleyball club participants, by looking at the leg strength ability, held on Monday, Wednesday and Friday. The meeting in this training was held in the morning between 07:30 - 08:30 WITA, the training activities were carried out in 16 meetings.

Data analysis was carried out by examining the influence or difference in the results of the pretest and posttest of leg muscle strength. The data analysis technique used in this study using the SPSS 22 system, namely using ANOVA with two paths, namely (two-way ANOVA) at a significance level of 0.05. Furthermore, in order to be able to compare the same treatment, it is necessary to use the Tukey Test (Rusydi Ananda & Muhammad Fadhli, 2018). Before conducting the hypothesis test, the researcher conducted a prerequisite analysis test with the Kolmogorov Smirnov non-parametric statistical test, the method is to first determine the test hypothesis, namely: Data from the decision making above is then calculated using the SPSS program with the Kolmogorov Smirnov method based on the magnitude of the probability or asymp.sig value (2-tiled), the α value used is 0.05 with decision making guidelines are:

RESULTS AND DISCUSSION

The data from this study are in the form of pretest data and posttest data of leg muscle strength. The research steps will be carried out in three stages, namely in the first stage a pretest will be carried out to determine the initial data of leg muscle strength at the PJKR UKAW volleyball club on November 25, 2024. The second stage of this study will last for 1 month and 2 weeks starting from November 25, 2024 to January 3, 2025. The implementation will last for 6 weeks with a frequency of 3 times a week. The pretest and posttest data of leg muscle strength are presented in the following table:



Gambar 4.1 Tabel *preetes-posttest* kekuatan otot tungkai

Dari tabel deskriptif

NO	*Box jump* (A1B1)			*Depth jump* (A2B1)		
	Preetest	*Posttest*	N.Gain	*Preetest*	*Posttest*	N.Gai
1	119	183	.29	123	200	.35
2	117	140	.11	121	192	.32
3	110	174	.30	100	185	.43
4	100	195	.48	113	214	.47
5	126	180	.24	126	214	.39
			.2834			.3920

NO	*Box jump* (A1B2)			*Depth jump* (A2B2)		
	Preetest	*Posttest*	N.gain	*Preetest*	*Posttest*	N.gain
1	119	199	.37	123	215	.41
2	117	183	.30	121	204	.38
3	110	193	.40	100	222	.61
4	100	200	.50	113	208	.45
5	126	177	.23	126	205	.35
			.3581			.4387

NO	*Box jump* (A1B3)			*Depth jump* (A2B3)		
	Preetest	*Posttest*	N.gain	*Preetest*	*Posttest*	N.gain
1	119	180	.28	123	178	.25
2	117	198	.37	121	200	.36
3	110	175	.31	100	175	.38
4	100	207	.54	113	179	.31
5	126	190	.28	126	181	.24
			.3559			.3065

Figure 4.2 Results of the N-gain value test

Keterangan

A1B1	The training group used the Box Jump training method and a thin BMI to increase leg muscle strength
A1B2	The training group used the Box Jump training method and a normal BMI to increase leg muscle strength.
A1B3	The training group used the Box Jump training method and an Obese BMI to increase leg muscle strength.
A2B1	The training group used the depth jump training method and a thin BMI to increase leg muscle strength.
A2B2	The training group used the depth jump training method and a normal BMI to increase leg muscle strength.
A2B3	The training group used the depth jump training method and an excessive BMI to increase leg muscle strength.

This normality test is conducted to determine whether the data obtained is normally distributed or not. This normality test uses the Shapiro-Wilk test because the observation data is less than 50.

Kelompok	P	Keterangan
Pre_A1B1	.955	Normal
Pos_A1B1	.875	Normal
Pre_A1B2	.940	Normal
Pos_A1B2	.935	Normal
Pre_A1B3	.947	Normal
Pos_A1B3	.927	Normal
Pre_A2B1	.944	Normal
Pos_A2B1	.965	Normal
Pre_A2B2	.972	Normal
Pos_A2B2	.919	Normal
Pre_A2B3	.900	Normal
Pos_A2B3	.919	Normal

Figure 4.3 Normality Test.

Based on the results of the statistical analysis of the normality test that has been carried out using the Shapiro-Wilk test on all pretest and posttest data of leg muscle strength, it is known that the normality test results have a significant value of > 0.05 so that it can be concluded that the data is normally distributed because the P value is greater than 0.05. Homogeneity test is conducted to determine whether the variance of the compared data groups shows homogeneity (equality) or heterogeneity (disparity). In this investigation, the assessment of homogeneity is conducted in relation to leg muscle strength. The homogeneity test of this study is the Levene Test, the test results are presented in the table

F	DF	DF	Sig
2.856	1	28	.102

Figure 4.4 Homogeneity test

Based on the results of the homogeneity test carried out using the Levene Test, the final data from the calculation results were 0.102 > 0.05. These results explain that each group has homogeneous variance data.

Hypothesis Testing.

The results of the hypothesis testing of this study were conducted through data analysis and one-way Paired Sample Test ANOVA. The following is the sequence of hypothesis testing results. The first hypothesis in this study states that "There is an influence of the training group using the box jump training method and thin BMI on increasing leg muscle strength". Based on the results of the analysis, the following data was obtained. The data

Kelompok	Mean	SD	Lower	Upper	T	Df	Sig
A1B1_PrePost	-60,000	25,797	-92,032	-27,968	-5,201	4	0,007

Figure 4.5 Hypothesis testing (1)

Hypothesis Testing.

The results of the hypothesis testing of this study were conducted through data analysis and one-way Paired Sample Test ANOVA. The following is the sequence of hypothesis testing results. The first hypothesis in this study states that "There is an influence of the training group using the box jump training method and thin BMI on increasing leg muscle strength". Based on the results of the analysis, the following data was obtained. The data

Kelompok	*Mean*	SD	*Lower*	*Upper*	T	Df	Sig
A1B2_*PrePost*	-76,000	18,480	-98,946	-53,054	-9,196	4	0,001

Figure 4.6 Hypothesis testing (2)

From the results of the Paired Sample Test box jump and Normal BMI in the table, it can be seen that the significant p value is 0.001 and the t value is -9.196. Because the significant p value is 0.001 <0.05, it means that H0 is rejected. Thus, it can be seen that there is a significant difference in influence. Based on the findings obtained from this paired sample test, the significance value (0.001) was observed to be less than 0.05, indicating a statistically significant difference between the Pretest and Posttest measurements in the box jump and Normal BMI groups. The third hypothesis in this study states that "There is an influence between the training group using the box jump training method and Obesity BMI on increasing leg muscle strength. Based on the results of the analysis, the following data were obtained. The data can be seen in the table

Kelompok	*Mean*	SD	*Lower*	*Upper*	T	Df	Sig
A1B3_*PrePost*	-75,600	17,387	17,387	-54,011	-9,723	4	.001

Figure 4.7 Hypothesis test (3)

From the results of the Paired Sample Test box jump and Normal BMI in the table, it can be seen that the significant value of p is 0.015 and the t value is -9.723. Because the significant value of p is 0.001 <0.05, it means that H0 is rejected. Thus, it can be seen that there is a significant difference in influence. Based on the findings obtained from this paired sample test, the significance value (0.001) was observed to be less than 0.05, indicating a statistically significant difference between the Pretest and Posttest measurements in the box jump and Normal BMI groups. The fourth hypothesis in this study states that "There is an influence of the training group using the depth jump training method and thin BMI on increasing leg muscle strength. Based on the results of the analysis, the following data were obtained. The data can be seen in the tableari

Kelompok	*Mean*	SD	*Lower*	*Upper*	T	Df	Sig
A2B1_*PrePost*	-68,800	10,354	-81,656	-55,944	-14,859	4	0,000

Figure 4.8 Hypothesis testing (4)

From the results of the Paired Sample Test depth jump and thin BMI in the table, it can be seen that the significant p value is 0.017 and the t value is -14.859. Because the significant p value is 0.000 <0.05, it means that H0 is rejected. Thus, it can be seen that there is a significant difference in influence. Based on the findings obtained from this paired sample test, the significance value (0.000) was observed to be less than 0.05, indicating a statistically significant difference between the Pretest and Posttest measurements in the depth jump and thin BMI groups. The fifth hypothesis in this study states that "There is an influence of the training group using the depth jump training method and normal BMI on increasing leg muscle strength. Based on the results of the analysis, the following data were obtained.

Kelompok	*Mean*	SD	*Lower*	*Upper*	T	Df	Sig
A2B2_*PrePost*	-83,200	9,628	-95,155	-71,245	-19,323	4	0,000

Figure 4.9 Hypothesis testing

From the results of the Paired Sample Test depth jump and Normal BMI in the table, it can be seen that the significant value of p is 0.000 and the t value is -19.323. Because the significant value of p is 0.000 <0.05, it means that H0 is rejected. Thus, it can be seen that there is a significant difference in influence. Based on the findings obtained from this paired sample test, the significance value (0.000) was observed to be less than 0.05, indicating a statistically significant difference between the Pretest and Posttest measurements in the depth jump and Normal BMI groups. The sixth hypothesis in this study states that "There is an influence of the training group using the depth jump training method and normal BMI on increasing leg muscle strength. Based on the results of the analysis, the following data were obtained.

Kelompok	*Mean*	SD	*Lower*	*Upper*	T	Df	Sig
A2B3_PrePost	-64,200	13,737	-81,257	-47,143	-10,450	4	0,000

Figure 4.10 Hypothesis testing

D From the results of the Paired Sample Test depth jump and BMI Obesity in table 4.10 it can be seen that the significant value of p is 0.000 and the t value is -47.143. Because the significant value of p is 0.000 <0.05 means H0 is rejected. Thus it can be seen that there is a significant difference in influence. Based on the findings obtained from this paired sample test, the significance value (0.000) was observed to be less than 0.05, indicating a statistically significant difference between the Pretest and Posttest measurements in the depth jump and BMI Obesity groups. The seventh hypothesis in this study states that "There is a significant interaction of the Plyometric method (box jump and depth jump training) and BMI (thin, Normal and Obese) on increasing leg muscle strength. Based on the results of the analysis, the following data were obtained.

Source	*Type III Sum of Squares*	Df	*Mean Square*	*F*	*Sig.*
Metode_Latihan	1381.122	1	1381.122	7.972	.010
Kelompok	1317.562	2	658.781	3.802	.037
Metode_Latihan * Kelompok	**1714.054**	**2**	**857.027**	**4.947**	**.016**

R Squared = ,512 (*Adjusted R Squared* = ,406)

Figure 4.11 Hypothesis Testing

The exercise method variable shows a significant effect on the results, with an F value of 7.972 and a Sig. value of 0.010 (p <0.05). This value can be seen that there are differences in the methods used that have a significant impact on the results. Showing that the group variable has a significant effect on the dependent variable (research results) with an F value of 3.802 with a significant level (Sig 0.037 <p 0.005) this explains that there is a significant difference in the results of the study based on the exercise group. In addition, the interaction between the Group and Method variables also has a significant effect on the results, with an F value of 4.947 and a significance level of 0.016 (p <0.05). This shows that there is a significant interaction effect between the two variables. This significance shows that the combination of group and method gives significantly different results. In other words, the effectiveness of the method can vary depending on the particular group. This study aims to analyze the effect of plyometric training methods, especially box jump and depth jump, on increasing leg muscle strength based on BMI categories, namely thin, normal, and obese.

Discussion of the study based on the results of the study Thin BMI (A1B1) There was a significant increase in leg muscle strength. Box jump training with a significance value of 0.007 (<0.05). This shows that training with the box jump method is more effective in increasing leg muscle strength in individuals with thin BMI. This is supported by previous studies which state that individuals with lighter body mass tend to more easily utilize elastic energy in the eccentric contraction phase in depth jumps compared to box jumps (Markovic & Mikulic, 2010). Normal

BMI (A1B2) The increase in leg muscle strength was greater compared to the thin BMI group with a significance value of 0.001. These results indicate that individuals with normal BMI are more responsive to box jump training compared to those with thin BMI. This finding is in line with research by Slimani et al. (2016) which states that plyometric training with a depth jump model is more effective in increasing leg muscle strength compared to box jump training. Obese BMI (A1B3) The increase in leg muscle strength was also statistically significant with a significance value of 0.001, but slightly lower than the normal BMI group. This suggests that although box jumps are effective, obese individuals may face biomechanical barriers that affect their response to exercise.

So it can be concluded that box jump training is proven to be effective in increasing leg muscle strength in all BMI groups (thin, normal, and obese), with various levels of significance. In individuals with a thin BMI, the increase in leg muscle strength was significant ($p = 0.007$), but lower than the normal BMI and obese groups. Individuals with a normal BMI showed the greatest response to training ($p = 0.001$), consistent with previous studies highlighting the effectiveness of jumping in increasing muscle strength. Meanwhile, the obese group also experienced a significant increase ($p = 0.001$), although slightly lower than the normal BMI group, due to biomechanical limitations.

Based on the results of the study of thin BMI (A2B1) depth jump training method there was a significant increase in the significance value of 0.000. This increase was higher than box jump training in the same group, which indicates that the depth jump training method is more effective for individuals with thin BMI. This study shows that the depth jump training method shows superior improvement in increasing leg muscle strength compared to the box jump training method, especially among individuals with thin BMI. This finding is in line with the statement put forward by Markovic & Mikulic (2010), which shows that individuals with reduced body mass are more adept at utilizing elastic energy during the eccentric contraction phase, thus increasing the efficiency of muscle contraction during the execution of the depth jump. Normal BMI (A2B2) The increase in leg muscle strength was also statistically significant at a significance value of 0.000. These results are consistent with the group with normal BMI in box jump training, except that depth jump gave slightly better results. In the normal BMI group, experiencing a statistically significant increase in leg muscle strength ($p = 0.000$) indicates that the depth jump training method has slightly superior results compared to the box jump training method. This observation confirms what was stated by Suleimani et al. (2016), which showed that the jump training method that focuses on depth jumps is more effective than box jumps in increasing lower extremity muscle strength. BMI in obese individuals (A2B3) Although the increase was significant at a significance value of 0.000, these results indicate that individuals with obese BMI still experienced a smaller increase compared to the normal and thin BMI groups. Biomechanical factors such as body weight may be a limiting factor. For individuals with obese BMI, while the increase in leg muscle strength was statistically significant ($p = 0.000$), the results were relatively lower when compared to normal and lean BMI groups. (Peng et al., 2017). So it can be concluded that the depth jump training method is more effective than box jump in increasing leg muscle strength, especially for individuals with lean and normal BMI. Depth jump allows for more optimal utilization of elastic energy, increasing the efficiency of muscle contraction. However, for individuals with obese BMI, although there is an increase in muscle strength, the response tends to be lower due to the biomechanical obstacles faced when performing plyometric training.

Two-way ANOVA analysis showed a significant interaction between the plyometric training method and BMI on increasing leg muscle strength with a significance value of 0.016 (<0.05). This shows that the effect of training varies depending on a person's BMI category. The results of the Tukey post-hoc test showed that significant differences occurred between several groups, especially between the group with normal BMI and the group with obese BMI. This confirms that BMI plays a role in determining the

effectiveness of plyometric training. The group with a thin BMI showed a greater increase than the other groups. This is due to biomechanical factors, because individuals with a thin BMI have a lighter body mass, making it easier to perform explosive movements that are the basis of plyometric training. The group with a normal BMI showed a significant increase, indicating that they were in ideal condition to get maximum benefits from plyometric training. The obese BMI group experienced a significant increase but was lower than the other two groups. The factor of a larger body mass can be an obstacle in performing explosive training, so that the adaptation response to plyometric training tends to be slower.

CONCLUSION

The results of this study found that the increase in leg muscle strength was not the same in all categories of Body Mass Index (BMI). Individuals with a lean BMI experienced a greater increase in muscle strength compared to individuals with normal and obese BMI. This may be due to body composition factors, where individuals with a lean BMI have a lighter body weight so that the additional load received during exercise is relatively smaller compared to individuals with an obese BMI. Thus, plyometric training is more optimal in increasing leg muscle strength in individuals with a low BMI.

REFERENCES

Budiwanto. (2017). *Metode statistika untuk mengolah data keolahragaan*. UNM Press.

Hidayat, T., Saichudin, & Kinanti, R. G. (2018). Pengaruh latihan plyometric depth jump dan jump to box terhadap power otot tungkai pada pemain ekstrakurikuler bolavoli smk teknologi nasional malang. *Jurnal Sport Scienc*, *7*(2), 120–128.

Litao, G., Jintian, Y., & Xutao, L. (2023). Influence of Lower Limb Resistance Training on the Explosive Quality of Athletes. *Revista Brasileira de Medicina Do Esporte*, *29*, 86–89. https://doi.org/10.1590/1517-8692202329012023_0015

Ma, D., Silva, R. M., Xu, Q., Wang, K., & Zhao, Z. (2024). Jumping Interval Training: An Effective Training Method for Enhancing Anaerobic, Aerobic, and Jumping Performances in Aerobic Gymnastics. *Journal of Sports Science & Medicine*, *23*(2), 410–417. https://doi.org/10.52082/jssm.2024.410

Muhammad, Kusnanik, N. W., & Pramono, B. A. (2023). Effect of 8 Weeks of Combined Plyometric Training on Increasing Lower and Upper Body Muscle Power in Student Volleyball Athletes. *Physical Education Theory and Methodology*, *23*(3), 333–338. https://doi.org/10.17309/tmfv.2023.3.03

Murtadho, S. M., Hidayat, W., Abidin, D., & Ridlo, A. F. (2023). Sosialisasi Penanganan Dan Pencegahan Cedera Dalam Olahraga. *An-Nizam*, *2*(1), 84–90. https://doi.org/10.33558/an-nizam.v2i1.6576

Radulović, N., Vukadinović-Jurišić, M., Pavlović, R., Obradović, J., & Mihajlović, I. (2022). The effects of experimental program on the explosive strength of lower limbs in male adolescents. *Pedagogy of Physical Culture and Sports*, *26*(5), 311–318. https://doi.org/10.15561/26649837.2022.0505

Šadrincevaitė, S., & Griciūtė, A. (2023). Volleyball Players Pre-Competitive Anxiety: Sex-Based Differences and Relationship with Sport Characteristics. *Baltic Journal of Sport and Health Sciences*, *3*(130), 32–44. https://doi.org/10.33607/bjshs.v3i130.1419

THAKUR, J. S., MISHRA, M. K., & RATHORE, V. S. (2016). Impact of plyometric training and weight training on vertical jumping ability. *Turkish Journal of Sport and Exercise*, *18*(1), 31. https://doi.org/10.15314/tjse.20098

Topan Arisandi, Indri Susilawati, & Maulidin. (2023). Survey Tingkat Kemampuan Teknik Dasar Bermain Bola Voli. *JOURNAL SPORT SCIENCE, HEALTH AND TOURISM OF MANDALIKA (JONTAK) e-ISSN 2722-3116*, *4*(1), 31–40. https://doi.org/10.36312/jontak.v4i1.343