



The Effect of Hurdle Hopping and Burpees Exercises on Vertical Jump Ability in Volleyball Games of Extracurricular Students at SMPN 6 Palu

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ABSTRACT

This study aims to determine the effect of hurdle hopping and burpees training on vertical jump ability in volleyball games of extracurricular students at SMPN 6 Palu. This study used an experimental method with a quantitative approach. The subjects of the study were students who participated in the volleyball extracurricular activities at SMPN 6 Palu. Data collection was carried out through vertical jump ability tests before and after being given a hurdle hopping and burpees training program. The data obtained were analyzed to determine the increase in vertical jump ability after being given the treatment. The results of the study are expected to show that hurdle hopping and burpees training can have a positive effect on increasing students' vertical jump ability. Hurdle hopping training can increase explosive power of leg muscles through repeated jumping movements, while burpees train strength, coordination, endurance, and explosive ability of the body. Thus, the application of both forms of training is expected to be an effective training method in improving students' vertical jump ability in volleyball games.

Keywords: Hurdle Hopping, Burpees, Vertical Jump, Volleyball, Extracurricular Students.

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INTRODUCTION

Sport, as a physical activity, can provide satisfaction to those involved, fulfilling individual needs. Sport plays such a significant role in human life that it can be used as a means for sports education, health, recreation, achievement, and even as a cultural tool. "Sport is a physical and psychological activity that improves and maintains one's health after the activity." (Khairuddin, 2017) One example of a sport that is still very popular today is volleyball. Volleyball is a type of large ball game that uses a net as a barrier, and is carried out in groups with a ball used as the game medium. Volleyball is a sport played by two opposing groups and consists of two to six people in one team, the game of volleyball has developed from year to year, in line with the development of this sport, new training methods have also developed with a combination of new techniques that are more effective and efficient. The physical training method in volleyball aims to increase the stamina, strength, and flexibility of players.

Physical conditioning is a crucial factor and forms the basis or foundation for the development of skills, tactics, mentality, and strategy. If you start By exercising at a young age and sticking to the basic principles of exercise throughout the year, you can achieve optimal fitness levels, (Supriyoko & Mahardika, 2018), stated that physical condition is the most important component in achieving performance, physical condition is an absolute must for athletes to develop and improve optimal sports performance.

In volleyball, there are several basic techniques that must be mastered, namely serving, passing, smashing, and blocking. Of these techniques, smashing and blocking are attack techniques in volleyball that have a complex series of movements and are one of the most efficient attacks for scoring points. Therefore, good vertical jump strength is very necessary to maximize these movements. (Irwanto & Nuriawan, 2021) explains that, attack is a strategy used by players to get points, attack also plays an important role in winning during a match.

Having a good vertical jump ability in volleyball is very beneficial to be able to produce points, because having a good vertical jump is very beneficial when doing a dash and block in volleyball, this ability is a series of movements carried out by involving the strength of the quadriceps femoris muscle as the main driver that can make physical abilities more efficient with perfect mastery of technique, then when doing a vertical jump can use minimal energy with maximum results, therefore in this study tried to develop a form of hurdle hopping training and burpees training, on extracurricular participants of SMPN 6 PALU, the results of this study are expected to provide a significant contribution in the field of sports coaching, especially in developing effective training methods for young athletes to improve their performance in volleyball games.

METHOD

This research is classified as a quantitative research using an experimental method due to the treatment imposed on the research population. Because it is impossible to control all activities carried out by the research population, this research uses an experimental research type (quasi-experiment). Experimental research is research conducted strictly to determine the cause and effect between variables. One of the main characteristics of experimental research is the presence of treatment (Maksum, 2012). This quantitative method is validating or testing, namely testing one or more variables against another variable. Variables that have an influence are grouped as independent variables and variables that are influenced are grouped as dependent variables. In this study, the author used an experimental research method. Experimental research is research conducted on variables whose data is not yet known, so it is necessary to carry out a manipulation process by administering certain treatments to research subjects, whose impact is then observed/measured (future data).

This research uses a Pretest-Posttest Control Group Design. According to (Sugiyono, 2017) *Pretest-Posttest Control Group Design* There are two groups selected randomly, then given a pretest to determine the initial conditions, whether there is a difference between the experimental group and the control group. Thus the results of the treatment can be known more accurately, then the results of the pretest become the initial assessment in providing treatment until the posttest (final test). With the given training method, a causal relationship will be seen as the influence of the implementation of the training. In this study the author wants to determine whether there is an effect of hurdle hopping and burpees training on vertical jump ability in volleyball games in extracurricular students at SMP Negeri 6 Palu City.

RESULT AND DISCUSSION

This study was conducted 18 times with a training frequency of three times a week, namely Tuesday, Wednesday, and Friday. This study used two groups, one of which was given treatment with Hurdle Hopping training and the other group was given training with Hurdle Hopping. (group A) and the other group was given Burpees training (group B). The group division used original pairing, and the results of the original pairing group division can be seen in the table below.

Table 1. Division of AB groups

Name	Initial test data	Group division
Al	42	A
Ls	51	B
Gl	42	B
Noodles	49	A
Af	35	A
Yr	41	B
Kc	35	B
Ra	40	A
Rm	39	A
Hr	56	B
Bl	52	B
Ln	51	A
Ro	42	A
Dv	44	B
Rl	40	B
Ki	50	A
Fn	34	A
M N	34	B
Dm	43	B
Yl	39	A

The final test data from the results of the Hurdle hopping and Burpees training ability on vertical jump ability can be described as follows.

Final test data of group A with Hurdle hopping exercise

Group A was the group given treatment using Hurdle Hopping exercises. The statistical results of the research data in Group A can be described as follows:

Table 2. Research data for group A

Name	Initial test data	Final test data
Al	42	47
Noodles	49	55
Af	35	39

Ra	40	44
Rm	39	43
Ln	51	55
Ro	42	47
Ki	50	54
Fn	34	38
Yi	39	43
Mean	42.1	46.5
Median	41	45.5

Final test data of group B with Burpees exercise

Group B was given treatment using Burpees exercises. The statistical results of the research data in Group A can be described as follows:

Table 3. Research Data Group B

Name	Initial test data	Final test data
Ls	51	56
Gi	42	46
Yr	41	46
Kc	35	38
Hr	56	61
Bl	52	56
Dv	44	48
Rl	40	45
M N	34	39
Dm	43	47
Mean	42.1	48.2
Median	42.5	46.5

Normality Test

A normality test was conducted to determine whether the data obtained from the research results were normally distributed. The data in question were the pre-test and post-test scores for vertical jump ability. This test was based on the Kolmogorov-Smirnov statistical test. The criteria used were: if the significance value was <0.05 , the data were not normally distributed. Conversely, if the significance value was >0.05 , the data were normally distributed.

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Posttest1	.182	10	.200 [*]	.897	10	.205
Prettest1	.207	10	.200 [*]	.908	10	.266
Posttest2	.211	10	.200 [*]	.927	10	.417
Prettest2	.189	10	.200 [*]	.941	10	.568

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Figure 1. Tests of Normality

Paired Sample Test Results

Paired Samples Test									
		Paired Differences				t	df	Sig. (2-tailed)	
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower Upper				
Pair 1.	Posttest1 - Prettest1	4.40000	.69921	.22111	3.89982	4.90018	19.900	9	<.001
Pair 2.	Posttest2 - Prettest2	4.40000	.69921	.22111	3.89982	4.90018	19.900	9	<.001

According to the image above, it can be seen that the calculated t value is 19,900 and the t table is 2.262, so the value of $19,900 > 2.262$, so it can be concluded that H₀ is rejected and H_a is accepted, meaning that Hurdle hopping and Burpees training have a significant influence on the Vertical Jump abilities of extracurricular students at SMP Negeri 6 Palu.

Based on the comparison, it is known that the significant value is $0.01 < 0.05$ according to the basis of decision-making ability in the paired samples test, so it can be concluded that the Hurdle hopping and Burpees training methods have a significant influence on the Vertical Jump ability of extracurricular students at SMP Negeri 6 Palu.

Hypothesis Testing

To determine whether or not there was a significant influence and difference from the treatments given to each sample group in this study, an analysis was conducted using a t-test. Furthermore, the data on the results of vertical jump ability in volleyball before and after being given the Hurdle hopping and Burpees training treatment were grouped in one table and the difference was calculated.

Description of the initial and final tests of groups A and B

Name	Initial test data	Final test data	Group division
Al	42	47	A
Ls	51	56	B
Gl	42	46	B

Noodles	49	55	A
Af	35	39	A
Yr	41	46	B
Kc	35	38	B
Ra	40	44	A
Rm	39	43	A
Hr	56	61	B
Bl	52	56	B
Ln	51	55	A
Ro	42	47	A
Dv	44	48	B
Rl	40	45	B
Ki	50	54	A
Fn	34	38	A
M N	34	39	B
Dm	43	47	B
Yl	39	43	A
Mean	43	47.05	

Discussion

The results of the study showed that there was a significant difference in the Vertical jump ability of volleyball after being given hurdle hopping and Burpees training treatment. The average jump height before being given treatment was 42.1 for experimental group A and 42.1 for experimental group B. Furthermore, after being given treatment, there was a change in jump height. This can be shown from the results of the average final test with a jump height in experimental group A of 46.5 and experimental group B of 48.2.

The results of the t-test calculation, where the calculated $t = 19,900$, obtained t table = 2,262 because the calculated t is greater than the t table or $19,900 > 2,262$ at a significance level of 5% with a degree of difference $(dp) = N-1 = 10-1 = 9$. Then the alternative hypothesis (H_a) which states that there is an influence is accepted, so the null hypothesis (H_o) is rejected. Thus, the hypothesis that states that there is a significant influence of Hurdle hopping and Burpees exercises on the Vertical Jump ability of volleyball games in extracurricular students at SMP Negeri 6 Palu.

The results of the study indicate that there is an influence of Hurdle hopping and Burpees training on the Vertical Jump ability of volleyball games in extracurricular students of SMP Negeri 6 Palu. The existence of this influence shows that Hurdle hopping and Burpees training can be used as training to improve Vertical jump ability in volleyball games. Hurdle hopping and Burpees training materials can affect Vertical jump ability in volleyball games because the training materials provided in the implementation of the study meet or are in accordance with the principles of training.

Hurdle hopping is a form of plyometric exercise that involves jumping over several small obstacles or hurdles in sequence, usually with one or two feet, to train the explosive power of the leg muscles, coordination, balance, and the body's reactive ability when landing and then immediately jumping again; in practice, this exercise requires fast and rhythmic movements because the body must absorb the load when landing and then immediately

generate power to jump to the next obstacle, so it is very effective for increasing leg power in sports that require jumping, sprinting, changing direction, or acceleration. The main principle is not just jumping as high as possible, but jumping with the correct technique, namely a stable start, balanced arm swing, slightly bent knees when taking a run-up, a good landing with the sole of the front foot or the entire sole in a controlled manner, then continuing to the next jump without losing rhythm, so this exercise not only builds leg muscle strength, but also trains courage to move, concentration, and movement efficiency, if applied in physical education learning, this exercise can also be an interesting activity because it provides a challenging yet structured movement experience.

Exercise Burpees Burpees are a highly beneficial full-body exercise for improving leg strength, endurance, and vertical jump ability because the movement combines a squat, a handstand, a backward leg push, a return to a squat position, and then an explosive upward jump. When the burpee ends with a vertical jump, the quadriceps, hamstrings, and calves work to propel the body upward, thus strengthening the leg power component, which is crucial for vertical jumping. Furthermore, because burpees are performed repeatedly, the leg muscles are trained to continue producing power even after fatigue begins, thus improving muscular endurance and the ability to maintain jumping performance. The movement from a squat to a jump also trains coordination, balance, and reaction time of the leg muscles to move quickly and efficiently. In the context of sports such as volleyball, burpees can be a good supporting exercise to help athletes or students improve leg explosiveness, especially when performed with correct technique, a stable landing, and an intensity adjusted to their abilities. This exercise is also easy to implement in physical education lessons because it does not require special equipment, making it an effective exercise variation to gradually build leg strength and vertical jump ability.

The training principles that must be considered when carrying out sports training are as follows: 1) continuous training, 2) the training dose must be appropriate to the athlete's ability, 3) the training load must increase, 4) exercise variations, 5) warming up, and 6) cooling down.

CONCLUSION

Based on the research results and discussions that have been presented, it can be concluded that the results of this study indicate that the calculated t is greater than the t table with the difference between the calculated t and the t table = 2.262 greater than the 5% significance level. The calculated t value is 19.900 while the t table at the 5% significance level $df (N-1) = 10-1 = 9$ is 2.262. So H_0 in this study it was rejected and H_1 accepted, which means that Hurdle hopping and Burpees training can have an effect on increasing Vertical jump ability in volleyball games of extracurricular students of SMP Negeri 6 Palu. In connection with the results of research on Hurdle hopping and Burpees training on Vertical jump ability in volleyball games of extracurricular students of SMP Negeri 6 Palu.

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