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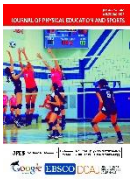

The Effect of Leg Length Plyometric Exercise on Increasing Volleyball Jump Power at Public Senior High School 1 Parigi Motong

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Abstract

The purpose of this study was to analyze the difference in effect between plyometric depth jump over barrier hops, and single leg box jumps on power jumps, analyzing the difference in effect between long legs and short legs to power jumps, analyze the interaction between plyometric exercise and leg length to power jump. The method used is a two-factor design 2 x 2 design experiment, dependent variables and effects caused by interaction, the sample used is purposive sampling 24 players in a total population of 30 players, criteria for men aged 17-20 years. MANOVA test analysis technique with SPSS 20 program and a significant level of 0.05%. The results of the study have an effect between plyometric depth jump over barrier hops, and single leg box jumps on the increase in power of significant value 0.00; there is influence between players who have leg length to increase the power jump ability of significant value 0.00; there is an interaction between plyometric exercise and leg length to increase the power jump capability of significant value 0.04. This data provides new findings on the exercises used in increasing power jumps, based on this data it can be concluded that there is an influence between plyometric depth jump over barrier hops and single leg box jumps on increasing power jumps and plyometric depth jump over barrier hops, there is the influence of players who have long legs better jump than players who have short legs, there is a plyometric exercise interaction to increase the player's power jump capability. The benefits can contribute to knowledge, especially understanding of the plyometric training method, against the power of volleyball player jumps in Public Senior High School 1 Parigi Motong Regency.

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INTRODUCTION

Sport is a requirement sports performance cannot be achieved quickly. This is in line with Ambarukmi et al. opinion (2007) that in order to achieve a maximum achievement, a theory of practice that is supported by various disciplines, including philosophy, sports psychology, biomechanics, history, sports nutrition, PPPK, growth and development, anatomy, physiology and training skills.

The most important physical, various sports such as volleyball are a form of sport that is very popular with people in Maninili village, Parigi Moutong Regency. This sporting activity often gets a warm welcome from the community in every sports activity that is carried out, one of which is volleyball open tournament most often competed both among students and the general public. Volleyball is very popular because adults and children can do this game. Not only that, volleyball games today are not only a recreational sport but have become a sport of excellence. Volleyball for achievement is a sport that develops the talents of athletes to be able to perform at the regional, national and even international levels. This can be seen in the presence of volleyball competitions in Indonesia, such as Li-Voli and Proliga.

The training process carried out to be achieved in the world of sports; achievement is a unique job because the object being trained is human. The existence of humans in the training process cannot be treated like robots but is influenced by factors of feelings, thoughts, emotions and physical conditions (Sukadiyanto, and Muluk, 2011). Physical conditions are very important to note because these physical conditions will affect the athlete's bio motoric abilities.

Sports achievements cannot be achieved quickly. This is in line with Ambarukmi et al. opinion (2007) that in order to achieve a maximum achievement, a theory of practice that is supported by various disciplines, including philosophy, sports psychology, biomechanics, history, sports nutrition, PPPK, growth and development, anatomy, physiology and training skills.

Harsono (2015) the components of physical conditions that need to be considered to be developed are cardiovascular endurance, strength resistance, muscle strength (strength), flexibility, speed, stamina, agility, explosive muscle power (power), and durability power (strength endurance). These components are the main ones that must be trained and developed by athletes, especially sports athletes who need these components.

Volleyball is a team game sport. However, the mastery of basic techniques is absolute and indispensable. This means that in the initial stages of training it is necessary to emphasize the mastery of basic game techniques. (Umi, and Dwi, 2008), Volleyball sports have many factors that influence the success of a team achieving victory, including the individual's ability to master technical skills and abilities and physical endurance.

Leg length is something that must be considered in volleyball games, especially for smasher. To produce a punch that kills the opponent's game, the player must smash when the ball is at maximum altitude to avoid blocking by the opponent.

Power jump or explosive power has two components, namely strength, and speed, which is an important motion capability to support activities in each sport (Widiastuti, 2015). Therefore the development of power leaps is a component of motion that is very important to develop because almost all sports need it. So that power can be developed by exercising systematically, specifically, varied and oriented to the leg muscles which leads to an increase in smash movement techniques on volleyball games.

Latihan derived from the word exercise is the main tool in the daily exercise process to improve the quality of the organ system's human body function, making it easier for athletes to improve their movements (Sukadiyanto, and Muluk, 2011). *Latihan* from the word training is the application of a plan to improve the ability to exercise which contains material theory and

practice, methods, and implementation rules by the goals and objectives to be achieved. (Sukadiyanto, and Muluk, 2011).

Plyometric training is an exercise program to increase the power and speed of athletes (Chu, and Myer, 2013). Plyometric is a form of training to develop the explosive power that combines methods and techniques to increase strength, speed, and maximum mileage (Furqon, and Doewes, 2002).

Plyometric training is to combine strength and speed to produce power jumps. Also, the nature of muscle elasticity causes some functional adaptation of the muscles, so that muscle coordination is better and can make the power more explosive (Chu, and Myer 2013).

Plyometric training is a variety of exercises and quite a lot. Therefore, the researchers tried to use two forms of exercise namely the depth jump over barrier hops and single leg box jumps. The reason researchers used the exercise is that most of the depth jump over barrier hops and single leg box jumps leads to limb and hip movements because this muscle group is a power center for sports movements and has a major involvement in sports especially when doing block jumping and smash volleyball movements.

Observation data was done at Public Senior High School 1 South Tinombo, Parigi Moutong Regency, Central Sulawesi Province, male volleyball club Public Senior High School 1 South Tinombo when doing games and matches there was a problem when the volleyball player made a smash. One of them is when smashing some players fail to penetrate the opponent's defense.

This can be seen when the ball can be blocked or blocked by the opponent and the ball cannot cross the net, so it falls in the game area itself. Apart from that, another thing that becomes a problem is the leap of players who are not good. This is based on preliminary observational data conducted at the club Public Senior High School 1 South Tinombo on male volleyball players.

Based on the background described above the author wants to analyze by giving an alternative method of plyometric training specifically on leg muscle power to power jump at club Public Senior High School 1 South Tinombo, Parigi Motong Regency.

METHODS

This type of research is an experimental study with a quantitative approach. According to Sugiyono (2015), Experimental research methods can be interpreted as research methods that are used to find the influence of specific treatments on others in the same conditions. The approach used to answer the formulation of the research problem.

The research design used in this study was two-factor design. The usual two-factor design is called 2 x 2 factorial.

The design or design in the study is 2 x 2, namely two variables manipulated simultaneously to investigate the effect of each level on the dependent variable and the effects caused by the interaction between variables. More details can be seen in table 1 below:

Table 1. 2 x 2 Factorial Design

Leg length (B)	Plyometric training (A)	
	Depth jump over barrier hops (A_1)	Single Leg Box Jumps (A_2)
Long category (B_1)	A_1B_1	A_2B_1
Short category (B_2)	A_1B_2	A_2B_2

Source: Researcher design

Information:

A_1B_1 : Exercise method depth jump over barrier hops with long legs

A_2B_1 : Single Leg Box Jumps exercise method with long leg length

A_1B_2 : Exercise method depth jump over barrier hops with short legs

A_2B_2 : Single Leg Box Jumps exercise method with short leg length

The population consisted of 30 students, a sample of 24 technical students who used purposive sampling. This research variable consists of:

Independent Variables: depth jump over barrier hops, single leg box jumps

Attribute variable: leg length and short legs

The design variables consist of: external validity in the form of the subject, pretest sensitivity, overgeneralizing, experiment effect

Internal variables consist of history, pretest, and posttest, instrument, differential selection of subjects, experimental mortality, administration, treatment, experimental treatment diffusion

Data collection techniques in this research instrument use three types, namely: (1) The

training program consists of depth jump training over barrier hops in groups with long legs and short legs and training single leg box jumps in groups with short legs and long legs. (2) Tests and measurements of limb length are done by standing test with the anatomical position on a flat floor without using footwear. (3) The length of the legs is measured from the lower spine or trochanter to the floor, using a tool as shown in the figure below.

Figure 1. Anthropometer

The purpose of this tool is to obtain data related to leg length test, while for the leap test, the tool uses the tools as shown in the figure below.

Figure 2. Jump DF

The purpose of this tool is to get a power jump test with good results.

Instrument reliability test to get the accuracy of the measurement results through the correlation count using the numeric formula:

$$R_{xy} = \frac{N.\sum XY - (\sum X)(\sum Y)}{\sqrt{\{N.\sum X^2 - (\sum X)^2\}\{N.\sum Y^2 - (\sum Y)^2\}}}$$

Information:

R_{xy} : the correlation coefficient between x and r_{xy}

N : number of samples

X : first test

Y : second test

$\sum X$: number of first tests

$\sum Y$: number of second tests

$\sum X^2$: the sum of squares of the first test

$\sum Y^2$: the sum of squares of the second test

Normality test

The normality test data in this research data use the Kolmogorov-Smirnov normality test. Test criteria if the significance > 0.05 data is declared normal, otherwise if the significance < 0.05 is declared not normal.

Homogeneity test

Variance, the homogeneity test of variance, is used to determine the homogeneity of the sample variance taken from the same population in the study. The variance homogeneity test is calculated using the Levene test or F test. Test criteria if the significance > 0.05 data is declared homogeneous, otherwise if significance < 0.05 is declared not homogeneous (I Made Candiasa, 2010).

RESULTS AND DISCUSSION

The following are the results of the power research using a jump DF test given to experimental group 1, and experimental group 2. In this chapter, we will describe the data description, hypothesis test requirements and the results of hypothesis testing. Description of the data that will be presented in the form of data on the leg muscle power test before (pretest) and after (posttest) is given treatment for each group that includes: group I plyometric depth jump over barrier hops group II single leg box jumps. This research was conducted on club volleyball player at Public Senior High School 1 South Tinombo totaling 24 people and divided into 4 experimental groups by looking at the length of the legs, each group consisted of 12 people for the depth jump over barrier hops training by seeing long legs and short legs and 12 people to practice single leg box jumps by looking at the long legs and short legs and 12 people for, so the results of the tests were done the recapitulation result is:

The First Hypothesis Testing is That There is The Effect of Depth Jump Over Barrier Hops and Single Leg Box Jumps on Power Jumps on Volleyball Players Club at Public Senior High School 1 South Tinombo, Parigi Moutong Regency

Hypothesis 1 which states that there is influence There is a different effect between depth jump over barrier hops and single leg box jumps on power jumps on volleyball players club at Public Senior High School 1 South Tinombo, Parigi Moutong Regency tested using ANOVA test and obtained F_{value} = 29.449 with a significance value of 0.000.

The results of this calculation are consulted with F_{table} and numerator = 1 (b-1) and d denominator (kb (n-1)), with a significance level of 0.05 obtained F_{table} = 3.33, because $F_{value} > F_{table}$ or 29.444 > 3.33 with a significance level of 0.000 < 0.05. Then H_a, which reads: "There is a difference in the effect between depth jump over barrier hops and Single leg box Jumps on power jumps at volleyball player club at Public Senior High School 1 South Tinombo, Parigi Moutong Regency, "accepted." Judging from the average shows that there are different effects between depth jump over barrier hops and single leg box jumps on power jumps on volleyball players club at Public Senior High School 1 Tinombo Selatan Parigi Moutong Regency.

Testing The Second Hypothesis is That There is an Influence Between Long Legs and Short Legs on Power Jumps on Volleyball Players Club at Public Senior High School 1 Tinombo Selatan, Parigi Moutong Regency

Hypothesis 2 which states that there is an influence between long legs and short limbs on the results of the power jump on the volleyball player club at Public Senior High School 1 South Tinombo, Parigi Moutong Regency was tested using ANOVA test and obtained F_{value} = 49.237 with a significance value of 0.000. The results of this calculation are consulted with the F_{table} and the numerator = 1 (b-1) and the denominator (kb (n-1)), with a significance level of 0.05 obtained F_{table} = 3.19, because $F_{value} > F_{table}$ or 49.237 > 3.19 with a significance level of 0.000 < 0.05. Then H_a, which reads: "There is a difference in the effect between long legs and short limbs on power jumps on volleyball players club at Public Senior High School 1 South Tinombo, Parigi Moutong Regency "accepted." Judging from the average, it shows that there is a different effect between long legs and short legs on the increase in power leaps on players of the club at Public Senior High School 1 South Tinombo, Parigi Moutong Regency.

Judging from The Average, It Shows That There is a Different Effect Between Long Legs and Short Legs on The Increase in Power Leaps on Players of Club at Public Senior High School 1, South Tinombo, Parigi Moutong Regency

The third hypothesis calculates that there is an interaction between plyometric exercise and leg length to power jumps on volleyball players club at Public Senior High School 1 South Tinombo, Parigi Moutong Regency which was tested using ANOVA test and obtained F_{value} = 4.822 with a significance value of 0.040. The results of this calculation are consulted with the F_{table} and the numerator = 1 (b-1) and the denominator (kb (n-1)), with a significance level of 0.05 obtained F_{table} = 3.35, because $F_{value} > F_{table}$ or 18.415 > 6.94 with a significance level of 0.040 < 0.05 so the alternative hypothesis which states the difference in the effect of interaction between plyometric training and leg length on power jumps on volleyball players club at Public Senior High School 1 South Tinombo, Parigi Moutong Regency was "accepted".

CONCLUSION

The conclusion of the research Analysis and discussion carried out then concluded that this research conducted as many as 16 meetings for 4 weeks with a frequency of 4 times a week for the following differences: (1) There is a difference in effect between plyometric depth jump over barrier hops and single leg box jumps on improved power jumps moreover, Plyometric depth jump over barrier hops exercises are better, (2) There is a difference in influence between players who have long legs to increase the power

jump ability of players who have long legs better than players who have short legs, (3) There is an interaction between plyometric exercises to increase the player's power jump capability.

Suggestions submitted: (1) Researchers suggest using an alternative method of depth jump over barrier hops and single leg box Jumps to increase power jump, (2) For athletes who want to increase power jumps, it is recommended to use a form of depth jump over barrier hops, and single leg box jumps.

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