The Effect of Double Leg Bound Exercise Technique to the Muscle's Explosive Power of the Male Students of SMK Negeri 1 Tondano

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Abstract: Explosive power is one of the elements of physical fitness needed by most sports, especially those that require strength and speed. Double leg bound is part of plaiometric training that is useful for increasing explosive power. To find out how far the training can improve leg muscle explosive power, a randomized pre-test control group design test design was conducted involving 20 male students in grade 1 of SMK Negeri 1 Tondano aged between 15-18 years. The treatment group was given a double leg bound. The exercise was held for 6 weeks. The results of the measurements showed that the average explosive limb muscle power before exercise was 3.516 cm and after exercise 4,107 cm. Differences before practice and after practice level of significance (p >0.5). This study concluded that double leg bound increased the leg muscle explosive power of the male students of SMK Negeri 1 Tondano.

1 INTRODUCTION

Physical fitness is one of the factors that influence sports performance. Physical fitness is the development of every part of the body, namely the ability of the muscles to move or contract, the circulatory system, the respiratory system, nervous system and others, in order to work optimally to meet the body's needs for activities due to environmental demands. Having a higher physical fitness during one's life can improve his appearance. For athletes or sportsmen, physical fitness determines the success of achieving optimal performance.This is too, say that if one had low physical fitness even high appearance of skills, the skills have no meaning at all, he will be weak and lose (Nala, 1998).

Each component or elements of physical freshness cannot be equated with its function, work and burden. Each sport has a dominant percentage of physical fitness. Based on these differences, it is necessary to find the dominant physical freshness component or the most widely displayed in the sports that are occupied. The higher the level of physical fitness that is owned will be more supportive of the achievement of specific techniques, and the faster the skills can be mastered (Sajoto, 1988).

Leg muscle explosive power is one of the components or important elements in many sports that require strength and speed (Nala, 1998). Muscle explosive power is the ability of muscle contraction in the shortest possible time (Sajoto, 1998). Explosive power is a component or element of motion that is very important for carrying out very heavy activities and can determine how hard a person can hit, how far it can throw, how high it can jump, how fast it can run and swim. Therefore athletes or sportsmen who have high leg muscle explosive power will be able to jump higher. This explosive power measurement can be carried out in athletic power measurement. Based on this measurement, professional trainers who want to find candidates for athletes, and athletes can analyze and make good training programs according to what sports are trained, without neglecting other supporting aspects, such as knowledge about physiology, biomechanics, anatomy, nutrition and others.

Special physical fitness training for leg muscles explosive power has not received significant attention from trainers in the field. Observations in the field most of the trainers in exercising physical fitness (explosive power) of the leg muscles directly entered into the exercise technique pursued. Athletes immediately conduct certain sports without preparing the physical fitness elements adequately.

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So that the results are not optimal and sports injuries occur which of course are very detrimental to the athlete itself, so that all efforts become futile. In addition, the trainer does not pay attention to the dosage which is a parameter to determine the quantity and quality.

Therefore, this research is formulated around is how much influence the jump training technique soars upwards with the same dose increasing the leg muscles' explosive power of SMK Negeri 1 Tondano in 2018.

Radcliffe and Farentinos (1985) distinguished three groups of plaiometric exercises, namely: a) exercise for lower limbs, b) exercise for the torso, c) exercise for upper limbs. Exercises for downward motion consist of bounds, hops, jumps, leaps, skips, ricochets. So in principle, plaiometric training is an exercise that has a special characteristic, which is to build strong muscle contraction as a response to dynamic loading or rapid strain of the muscles involved. This training is commonly known as stretch reflex.

According to Harre (1982), training for the hips and legs consists of bounding exercises and depth. Meanwhile, according to Chu (1992), the training consists of jumping-in-a place, bounding box drills and depth jumps. So the goal of plaiometric training is to allow the muscles to achieve maximum strength in the shortest possible time. Stretch shortening cycle is another term for plaiometrics. The definition stated in principle is the same.

Plaiometric is a training method that is intended to increase explosive power or explosive power. Nala (1998) as quoting Radcliffe and Farentinos (1985), plaiometry has leg and hip muscles, by:

a. Jump with both footprints on the floor, soaring maximum upwards to achieve a horizontal jump (tread with two feet) as far as (bounds);
b. Maximum vertical jump (two footprints) by first bending the knee, which is important is the extent of the knee joint movement;
c. Jump (two feet) wherever possible regardless of how far horizontally jumps forward;
d. Jump as vertical and horizontal as possible, with two jumps or one leg;
e. Jump or step alternately, with both jump height (one foot) and horizontal jump distance;
f. Jumping up and down (two footprints) quickly, where height and distance jump to a minimum.

Upward jumping training techniques are included in plaiometric training that emphasizes leg muscles (Nala, 1998). Upward jumping is a specialization of training, due to an adaptation that changes the shape and function of the body system, especially those that are closely related to the sport involved (Nala, 1998). Likewise the vertical form of plaiometric training jumps with repulsion of both feet, the position of the knees folded and lift high and the palms touching the knees (Radcliffe and Farentinos, 1985). Where the movement jumps from both feet simultaneously.

Pliometric training will stretch the muscles. The aim of administering stretch before contracting physiologically is to give the optimum initial length to the muscle, obtaining elastic power, causing a stretch reflex. Plyometric training must be applied specifically which is to train muscle groups or neuromuscular specificities. It is specific to the main energy system and to the pattern of exercise movements.

Anatomically, the main muscles involved in jumping upward and jumping exercises are not different in the lower limbs (upper leg muscles and lower limb muscles).

a. Upper limb muscles: gluteus maximus, biceps femoris, semi tendinosus, semimembranosus, gluteus medius, gluteus minimus, adductur magnus);
b. Lower leg muscles: gastrocnemius, soleus, perineus longus, peroneus brevis, calcaneus, plantaris (Jensen and Fisher, 1979).

Judging from the principles of training, the type of jump training soars upwards more in accordance with its movements with the measuring instrument to be used (upright jump). In addition, the movement from jump training soars up higher than the runway surface. With a high jump distance, the speed of free fall from the jump training is higher.

The more frequent jumping up training is done the stronger is patterned in the nervous system. With this training, physiologically there will be a process of conditional reflex formation, process of learning to move and process of adaptation.

The aim for this study is to prove whether jumping training techniques soar upwards with the same dose can increase the leg muscles' explosive power of SMK Negeri 1 Tondano in 2018.

2 RESEARCH METHODS

This experimental research method uses the Randomized Pre-test Post-test design (Zainuddin, 1988) with the male student population of SMK Negeri 1 Tondano in 2018. Those taken as samples are 20 people aged 15-18 years, simple random and divided into two groups equally based on the initial test results.

The research variables are as follows:

1) The independent variable (independent variable) that will be studied is jump training soar up.
2) Dependent variable (dependent variable) is the explosive power of the leg muscles.

Upward jumping training is a training in which the someone tries to jump as high as possible in the future with repulsion of both feet, the position of the knees folded high and the palms touching the knees and landing with both feet pressed and not ignoring the principles of training. In the preliminary study, the maximum ability to jump students was 32 times. To measure the jump a rope was used with a height of 44 cm. Upward jumping training was carried out with explosive motion, 6 weeks training time with a frequency of 3 times per week, an intensity of 80% of maximum ability, repetition 26, rest between sets was 2 minutes, weight was the body weight itself.

Leg muscle explosive power is the ability of the leg muscles to contract with maximum strength and is quick to jump upright on two legs. The strength of the explosive muscles of the leg muscles is proportional to the height of the jump ability. The units are centimeters (cm) which is the difference in the upright jump minus the upright gain. The tool used is a cm scale board with an accuracy of 0.1 cm. This exercise was based on the athletic power measurement (Nurhasan, 1989).

3 RESULTS AND DISCUSSION

The results showed that there was a very good change of increase in the average value for students who were made into the experimental group or treatment, the average score of 3.516 in the initial test increased to 4,107 in the final test.

The results of the statistical tests showed a very significant increase, namely the change in the average value of the final test in the experimental group, which was very good.

This study concluded that the increase in leg muscle explosive power due to jumping upward training in students of SMK Negeri 1 Tondano had a better positive effect.

Characteristics of the study subjects before exercise included age, height, weight, leg muscle explosive power and physical fitness before being given training, the data were tested for normality and homogeneity, as in the Table 1.

Table 1: Normality and homogeneity of variance characteristics of research subjects.

Variable	P value One-sample Kolmogorof-Smirnov test		P value Leven test equality of variance
	*Group 1	**Group 2	
Age (years)	0.70	0.70	0.855
Height (cm)	0.617	0.816	0.805
Kg body weight)	0.553	0.948	0.664
Leg muscle explosive power (Cm)	0.964	0.622	0.408
Physical Freshness (s)	0,987	0.967	0.979

*Group 1 = Leg Bound Exercise
**Group 2 = No treatment (control)

From the table above, the p value of the normality test (Kolmogorof-Smirnof) from the characteristics of age, height, weight, leg muscle explosive power, physical fitness obtained $p > 0.5$, so that it can be concluded that the characteristic data in group 1 and group 2 normal distribution. Likewise, p value equality of variance from age, height, weight, leg muscle explosive power and physical fitness between groups was obtained $p > 0.5$. It can be concluded that there is an increase in variance characteristic of age, height, weight, leg muscle explosive power and physical fitness between groups is homogeneous.

To determine the comparability of the characteristics of the research subjects between groups before being given the treatment results as in the following Table 2.

Table 2: Comparison of characteristics of research subjects by treatment group.

Variable		*Group 1	**Group 2	Anova	
				F	p
Age (year)	Mean	13.58	13.58	0.104	0.902
	SD	0.51	0.51		
Height (CM)	Mean	151.42	150.58	0.109	0.897
	SD	4.50	4.10		
Weight (Kg)	Mean	47.74	47.17	0.059	0.943
	SD	5.18	4.69		
Leg muscle explosive power (CM)	Mean	77.67	76.50	0.596	0.557
	SD	4.107	3.516		
Physical Freshness (S)	Mean	13.5558	13.4767	0.017	0.983
	SD	1.0672	1.0568		

*Group 1 = Leg Bound Exercise
**Group 2 = No treatment (control)

The results showed that the characteristics of the subject before exercise included age, height, weight, leg muscle explosive power and physical fitness in group 1 and group 2 could show an increase as presented in table 2. This was evidenced from the normality and homogeneity tests obtained $p > 0.5$. This means that all characteristic data are normally distributed and there is an increase in variance between groups 1 and group 2.

With the data above, shows that the initial condition of the subject of each group before treatment is in a balanced state. And when there is an increase, it is due to the treatment given to each group. Physical training that is given regularly and measured in sufficient doses and time can result in greater energy abilities and influence in improving physical appearance (physiological changes). This is evidenced from the normality and homogeneity tests, so that $p > 0.5$. The results showed that the characteristics of the subjects before exercise included age, height, weight, leg muscle explosive power and physical fitness in group 1 showed an increase as presented in table 2.

Differences before practice and after practice level of significance ($p > 0.5$).

This study concluded that double leg bound increased the leg muscle explosive power of the male students of SMK Negeri 1 Tondano.

4 CONCLUSION

Explosive power is one of the elements of physical fitness needed by most sports, especially those that require strength and speed. Double leg bound exercise technique can be used as a training guide to foster physical fitness, especially to increase the explosive power of leg muscles. Double leg bound is part of plaiometric training that is useful for increasing explosive power. Plaiometric is a training method that is intended to increase explosive power or explosive power.

REFERENCES

Bompa, T.O., 1990. *Theory and Methodology of Training: The Key to Athletic Performance*, Kendall Hunt Publishing. Dubuque. 2nd ed.

Brooks, G.A, Fahey, T.D., 1984. *Execise of Phsicology: Human Bioenergetics and Its Application*, Jhon Vihtley and Sons. New York.

Chu. D. A., 1992. *Jumping into Plyometrics*, Leisure Press Champign. California.

Fox E.L, R.W Bowers, 1984. *Sport Physicology*, Saunders College. Philadelphia.

Harre, D., 1982. *Principles of Sport Training: Introduction to the Theory and Methods of Training*, Sport Verlag, Berlin.

Jensen, C. R, Fisher., 1979. *Applied Kinesiology and Biomechancs*, McGraw-HilL Book Company. New york.

Langitan, F., 2013. The Relationship among Reaction Speed and Pull Speed of Floret Number Atlet of Nort Sulawesi, *Proceeding, Fourth PPSPP Internastional Conference.* National University of Malaysia.

McArdle, W.D., Katch, F.L., 1986. *Exercise Physiology: Energy, Nutrition and Human Performance*, Lea & Febriger. Philadelphia. 2nd edition.

Nala, G.N, 1998. *Prinsip Pendataan Fisik Olahraga Denpasar: Bahan ajar Program Studi Fisiologi Olahraga*. Program Pasca Sarjana Universitas Udayana.

Nurhasan, 1989. *Tes dan Pengukuran*, Karunika Universitas Terbuka. Jakarta.

Radcliffe, J.C, Farentinos, R.C., 1985. *Plyometrics: Esplosive Power Training,* Human Kinetics Publishers, Inc. Champaign, Illinois. 2nd Edition.

Reinoud J, Bootsma R, Houbiers M, Whiting H, and Wieringen P., 1991. "Acquiring an Attacking Forehand Drive: The Effects of Static and Dynamic Environmental Conditions Research Quarterly for Exercise and Sport". Vol. 62, No. 3.

Rudiyanto, 2012. "Hubungan Berat Badan, Tinggi Badan dan Panjang Tungkai Dengan Kelincahan". *Journal of Sport Sciences and Fitnes*. Vol 1, No. 2, pp. 1-6.

Sajoto, 1988. *Peningkatan dan Pembinaan Kondisi Fisik dalam Olahraga*. Depdikbud. Jakarta.

Setyaningsih, S., 2012. *Tingkat Kesegaran Jasmani*. Artikel. http://sbitloguwaru.sch.id/index.php?option=com_content&view=article&id=tingkatkesegaranjasmani&catid=23:artikel&itemid=109.html. Retrieved on 2 december 2013.

Zainuddin, M., 1988. *Rancangan Penelitian*, Pascasarjana Unair. Surabaya.