

Plyometric Training Effects on Volleyball Athletes Power

Mansur¹, Risti Nurfadhila¹

¹*Sport Sciences Study Program, Graduate School Yogyakarta State University, Colombo Street, Yogyakarta, Indonesia*

Keywords: Plyometric, Power, Volleyball athletes

Abstract: The purpose of this study was to determine the effects of plyometric training, consisting of both dynamic and static plyometric training, on power of volleyball athletes. Eight-teen volleyball athletes were recruited as samples. The sample consisted of two groups, namely dynamic plyometric and static plyometric group. In addition, power performance was assessed by standing broad jump test. This study used experimental research design. Paired *t*-test was employed to find out the effects of plyometric training, which consists of dynamic and static plyometric training, on power of volleyball athletes while independent *t*-test was used to find out different effect of dynamic and static plyometric training. The result showed that there was a significant effect of dynamic plyometric training on power ($p= 0.028$); no significant effect of static plyometric training on power ($p= 0.540$), and a significant different effect of dynamic and static plyometric training on power ($p= 0.000$). The result suggests that dynamic plyometric training is effective to improve power.

1 INTRODUCTION

Volleyball is a sport that has complex movements. Many factors influence the success of volleyball achievement, which is based on several aspects including physical exercise, technique, tactics, and mental training (Bompa & Haff, 2009). Physical condition is one of the most important factors in volleyball achievement. In order to achieve high performance in competitive sports, a prime physical condition is needed according to the needs and demands of the sport. The prime physical condition is needed by every athlete, especially for sports that demand long-term heavy performance. Many benefits are obtained from prime physical conditions such as: easy to master complex skills, reduce the risk of injury, maintain physical performance, accelerate recovery after exercise, and increase self-confidence.

According to Bompa (2000), physical condition is an important element and becomes the basis for developing techniques, tactics, strategies and mental development. Physical condition status can reach the optimal point if it is started from an early age, carried out continuously throughout the year, tiered and guided by the principles of training correctly. In addition, the development of physical conditions must be planned periodically based on the stages of exercise, the status of the athlete's physical condition, the needs of each number / class / sport, the fulfilment

of balanced nutrition, adequate facilities and equipment, a healthy environment, and the level of training of athletes. Anderson, D., Tharp, T., Elsberry, C., Best, A., Barr, R., and Legg, B., (2011) state that physical ability consists of strength, endurance, speed, agility, flexibility, coordination, power, and stamina.

Volleyball is a team sport which is a non-cycle or acyclic sport in which a motion is carried out intermittently. The load given for power training for acyclic sports between 50-80% is done with rapid movements, and given intervals of 3-5 minutes and full recovery or complete recovery (Bompa, 1999). Volleyball is an open exercise in which the movements are made in a moving environment or using unknown objects. In volleyball, the rhythm of motion requires an explosive power from the muscles of both the upper and lower extremities. The movements in volleyball games are very anaerobic, with an average of 7-9 seconds rally. Setting, spiking, jumping, and blocking are all anaerobic power movements (Bertucci, 1982; Stone & Kroll., 1991). The players are also required to always move along in one rally. The ball known as ball out-of-play is not played in less than 20 seconds. Meanwhile, the ball is played in an average of 7 minutes during a set. It is not played on average 17 minutes in one set (24 minutes). The game of volleyball requires a large leg of power to jump and also able to continue playing at

high levels for several hours. Active players must jump vertically once in 43 seconds on average, sometimes they also jump 2 to 3 times in a row. Therefore, power is a very important physical aspect of volleyball.

In order to achieve excellent power, the right practice is needed. There are several types of physical training methods. Plyometric training is one type of exercise that can be used to improve physical condition. Lubis (2005) states that plyometric training is one of the exercises carried out by the trainers specifically to sports that require the ability of the explosive leg and arm muscles. Dynamic and static plyometric exercises are a form of plyometric exercise. Both of these types of exercises have advantages and disadvantages. There have not been detailed studies discussing the comparison and the influence of the two plyometric exercises which are the focuses in this study.

2 METHOD

This study employed an experimental method, which investigated the possibility of interconnected cause and effect by using one or more treatment conditions to one experimental group. The population in this study included Yuso Sleman volleyball athletes. To determine the sample, the purposive sampling technique was used in the present study. This technique was chosen specifically based on the research objectives.

Furthermore, in this study the data were collected through testing and measurement techniques. The data from this study were taken directly through tests and measurements with power test. Meanwhile, data analysis techniques carried out in this study were quantitative analysis. Paired *t*-test and independent *t*-test were used in this study.

The plyometric training programs used in this study were both dynamic and static plyometric program. The subject warmed up for 15 minutes and directly performed the plyometric exercise for 20 minutes before technique and tactic exercise.

3 RESULT AND DISCUSSION

Both paired *t*-test and independent *t*-test of this study are presented in table. The results of paired *t*-test showed that the dynamic plyometric training was significant ($p= 0.028$) and had an effect on power. In contrast, constant plyometric exercises were not

significant ($p= 0.1540$) yet had an effect on increasing power. The independent results of the *t*-test showed that there was a significant difference between dynamic and the static plyometrics exercise with $p= 0.000$. Dynamic plyometric exercises, therefore, have a better effect than static plyometric on increasing power.

Tabel 1: Paired and Independent T Test Result

Variables	Sig
Dynamic Plyometric	0.028
Static Plyometric	0.540
Dynamic Plyometric* Static Plyometric	0.000

Plyometrics, also known as "jump training" or "plyos", are exercises involving maximum muscles force exerted in a short interval of time to increase muscle power. This training focuses on learning to move from a muscle extension to a contraction in a rapid or "explosive" manner, for example with specialized repeated jumping.

It was evident that after six weeks of plyometric and resistance training, young volleyball players have had great improvement in their skeletal strength and explosive power. In comparison to different training methods, the highest improvement was observed in resistance training group and then in plyometric group. Bosco (1982) believes that the increase in explosive power is the result of two factors: adaptation in bio motor organs and the improvement in skeletal functions to store motor energy in elastic elements. In other words, the role of plyometric training is feasible in neural- skeletal system which results in the fast transference from external constriction to internal one. Therefore, increase in the strength as a result of plyometric training, might be because of the increase in the size of muscle fibres. Adaptation in the production of skeletal power is in close association with the increase in muscle fibres. Plyometric training programs might cause a significant increase at the first and second type of skeletal muscle fibres.

Dynamic plyometric exercises are the types of plyometric exercises with a front and side direction, while static plyometric exercises are plyometric exercises with a forward direction. The results of the study showed that dynamic plyometric exercises had a better effect on power than static plyometric exercises. Dynamic plyometric exercises have a better effect because physiologically a stretch reflex or myotatic reflex is a response to a given level of muscle stretching and is one of the fastest reflexes in

the human body so that dynamic plyometric exercises are more effective than static plyometric exercises.

4 CONCLUSIONS

The result showed that there was a significant effect of dynamic plyometric training on power ($p= 0.028$); no significant effect of static plyometric training on power ($p= 0.540$), and a significant different effect of dynamic and static plyometric training on power ($p= 0.000$). This result, therefore, suggests that dynamic plyometric training is effective to improve power.

REFERENCES

- Anderson, D., Tharp, T., Elsberry, C., Best, A., Barr, R., and Legg, B., 2011. High School Strength Training. IOWA High School Athletic Association. (515) 432.
- Bompa TO, and Haff GG., 2009. *Periodization: Theory and Methodology of Training*. Champaign, IL: Human Kinetics Publishers.
- Bompa, T.O., 2000. *Total Training for Young Champions*. United States of America: Human Kinetics.
- Faigenbaum, Avery D. & Westcott, Wayne L. (2009). *Youth Strength Training*. USA: Human Kinetics.
- Lubis, J. 2005. Plyometric Training. 24 februari 2016.