



URL:

<https://ijptrs.com/view-issue/105/Fulltext>

DOI:

<https://ijptrs.com/public/images/content/239N1.pdf>

1. Principal, K.G. College of Physiotherapy, 2. Assistant Professor, K.G. College of Physiotherapy, 3. BPT Intern, K.G. College of Physiotherapy (Affiliated to the Tamilnadu Dr. M.G.R Medical University), Coimbatore, Tamilnadu, India

Corresponding Author's Email:
nithyadinesh59@gmail.com

Submission: 24th July 2023

Revised: 9th August 2023

Publish: 20th August 2023

©2023 Association of Health and Wellness Providers

Table of content

[Introduction](#)

[Methodology](#)

[Result](#)

[Discussion](#)

[Conclusion](#)

[References](#)

Effect of Plyometric training versus Calisthenics training on Vertical jump performance in Collegiate Volleyball players

Manoj Abraham M¹, Nithya N^{2*}, Sri Ram Kumar S G³

ABSTRACT

Background: Volleyball players need greater amount of physical fitness components as the game involves sudden change in directions inside the volleyball court. The training program for Volleyball players should enhance the sport – specific skills. As far as volleyball players are concerned, vertical jump is one of the most important physical fitness components. The effect of different training protocols on vertical jump performance has to be identified. The aim of the study was to analyse the effect of Plyometric training versus Calisthenics training on Vertical jump performance in collegiate volleyball players.

Materials and Methods: 30 collegiate volleyball players were selected according to the selection criteria and were divided into two groups with 15 subjects in each group. Subjects in Group A received Plyometric training and Subjects in Group B received Calisthenics training. Sargent jump test was used to measure vertical jump performance.

Results: An Independent sample ‘t’ test was used to compare the two groups. The Statistical Analysis showed a significant difference in Sargent jump scores in Group A (M=55.09, SD=1.67) and in Group B (M=50.36, SD=1.35), $t(28) = 8.54$. The result suggests that Plyometric training group have shown significant improvement following training.

Conclusion: The study concludes that the Plyometric training is more effective in improving Vertical jump performance than Calisthenics training in collegiate volleyball players.

Keywords: Calisthenics training, Plyometric training, Volleyball players, Vertical jump performance.

INTRODUCTION

Volleyball is considered to be the famous team sport which is played in multi-direction. It is a very explosive and high paced sport in which the players are continuously moving inside the volleyball court.

Volleyball is a limited-contact sport that is played at all levels of skill and on multiple surfaces. The volleyball training programme requires a combination of aerobic fitness, flexibility, strength and power for enhanced sport-specific skills. Since the game is point-oriented, the player hits the ball in a fast pace between each other for gaining a point, the team who lets the ball down offers a point to the opponent. Volleyball involves many movements, like diving, short sprinting, lateral change of direction and most importantly, vertical jumping. Therefore, increasing vertical jump height is a critical factor for improving performance¹.

Volleyball is a very complex physically enduring sport that requires enough amounts of core strength as well as lower body strength to produce powerful vertical jumps as well as coordination for landing back on the ground due to the rapid postural movements and sway. Calisthenics is the form of an exercise training program based around your body weight, using minimal equipment².

The ultimate goal of Plyometric training is to improve the dynamic muscle performance and it can be accomplished by various exercises like hopping, skipping and jumping. Volleyball players do the movements like jumps, hops and lunges in a repeated manner. 6 weeks of Plyometric training has increased the root mean square EMG of vastus medialis, lateralis and

hamstring muscles during countermovement jump (CMJ). Therefore, it was concluded that Plyometrics increases the dynamic athletic performance in terms of speed, agility, vertical jump and lower limb muscle activity³.

Calisthenics are aerobic and dynamic exercises and are suitable for sedentary and also for older people. They are rhythmic, smooth, enjoyable exercises that are easy to perform alone or in a group format and can be modified according to subject's fitness levels. Calisthenics consist of a variety of simple movements that are intended to increase body strength and flexibility using the weight of one's own body as resistance⁴.

The Vertical jump is most commonly related and highly necessary for the basic three skills in volleyball like blocking, serving and spiking. Vertical jump height plays a considerably different role in each of the three skills such as the vertical jump height during blocking action is a crucial part, whereas the vertical jump height during serving or spiking is a determinant for the sports success⁵.

The effect of various training programs in volleyball players have been analysed in many studies but the effect of different training programs in player's vertical jump performance have not been identified. The aim of the study was to evaluate the effect of Plyometric training versus Calisthenics training on Vertical jump performance in collegiate volleyball players.

MATERIALS AND METHODS

It is a pre-test and post-test experimental study design. This study was conducted on 30 subjects at play-ground of

K.G College of Physiotherapy, Saravanampatti, Coimbatore under the supervision of team trainer. The purpose and nature of the study was explained to each subject. A clear explanation was given about the procedures and a written consent form was obtained from each subject.

The subjects were included in this study based on the inclusion criteria [Collegiate volleyball players who were playing volleyball since 1 year, Male volleyball players, Age group of the subjects ranging between 18-26 years, BMI of the subjects ranging between 19-24, Subjects who were not involved in any specific training program for the past 6 months, No history of any injury for the past 2-3 months] and exclusion criteria [Subjects with cardio respiratory disorders, Subjects with orthopaedic and neurological impairments, Unwilling and uncooperative subjects]. The subjects were divided into two groups of 15 in each based on the purposive sampling method.

Subjects in Group A received Plyometric training in addition to their regular volleyball training, whereas the subjects in Group B received Calisthenics training in addition to their routine volleyball training. A standardized protocol for both Plyometric training and Calisthenics training were adopted and the players were trained accordingly. Each subject in both groups underwent training for 45 minutes per day for 3 days in a week for 12 weeks. Each subject had 10 minutes of warm up session and 10 minutes of cool down session.

The entire study was carried out for a period of 6 months and each subjects received training for twelve weeks. The baseline characteristic were similar in both groups. Pre and posttest evaluation of Vertical jump was measured using Sargent

baseline characteristics were similar in both Jump test.

RESULTS

The demographic characteristics of all subjects including their age, height, weight, body mass index and the baseline values of Sargent Jump test scores are included in Table 1.

A comparison of the Sargent Jump Test scores measured at the baseline and during the final training session for both groups revealed that the Group A (subjects who received Plyometric training) has increased Vertical jump performance significantly when compared with Group B (subjects who received Calisthenics training) ($p < 0.05$). A significant ($p < 0.05$) increase in Vertical jump performance was observed by the end of the training session in both the groups (Table 2) (Figure 1).

DISCUSSION

A volleyball player who is inside the court has to be alert always to perform the necessary skills to remain active inside the court.

The purpose of the study was to compare the effect of Plyometric training and Calisthenics training on Vertical jump performance in collegiate volleyball players. 30 active collegiate volleyball players were selected according to the selection criteria and were divided into 2 equal groups in such a way that players in Group A received Plyometric training and players in Group B received Calisthenics training in addition to their routine volleyball training. Statistical analysis was done Independent sample 't' test.

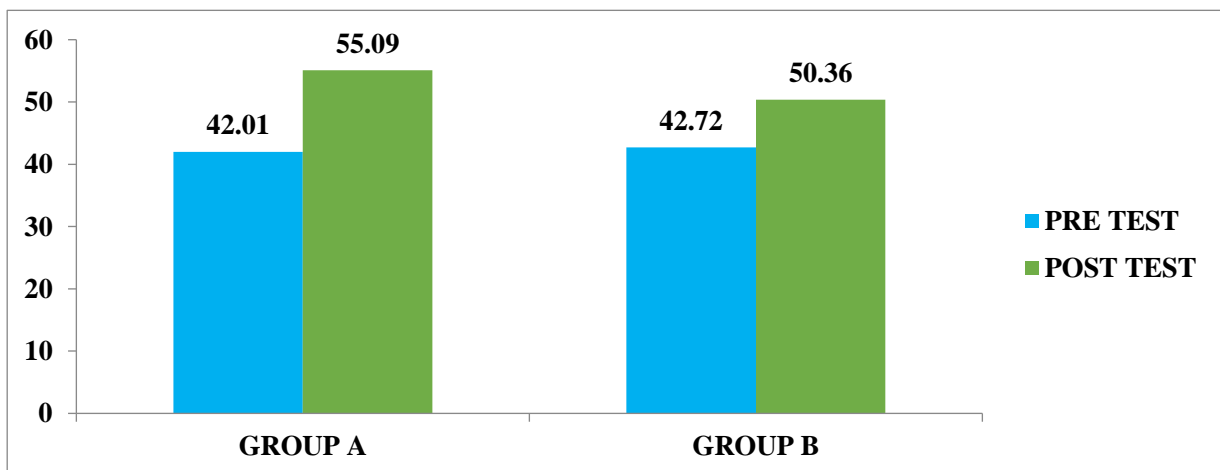
Table 1: Comparison of demographic characteristics of subjects in the Group A and Group B

Subject Characteristics	Group A Mean \pm Standard Deviation	Group B Mean \pm Standard Deviation
Age (years)	22.00 \pm 2.54	22.40 \pm 3.02
Height (cm)	177 \pm 4.82	179.27 \pm 4.23
Weight (kg)	79.47 \pm 3.74	82.73 \pm 5.56
Body Mass Index	23.31 \pm 1.17	23.91 \pm 1.07
Sargent Jump Test Score	42.01 \pm 1.64	42.72 \pm 1.52

Table 2: Comparison of Sargent jump test scores between the Group A and Group B using the independent t-test

Subject Characteristics	Group A Mean \pm Standard Deviation	Group B Mean \pm Standard Deviation
Sargent Jump Test Score	55.09 \pm 1.68	50.36 \pm 1.34

Figure 1: Comparison of the pre-test and post-test values of Sargent Jump Test Score in Group A and Group B



Based on the results, paired 't' test have shown that there was a significant improvement in Vertical jump performance in both Plyometric training group and in Calisthenics training group following the respective training. Unpaired 't' test have shown that there was a significant difference between both Plyometric training group and Calisthenics training in their Vertical jump performance.

Sargent jump test used in this study is directly proportional to vertical jump measures. An alteration in the jump height will show a comparative change. These results support the earlier findings of a study which was done in 2012 and it proposed that the efficiency of the composed Plyometric training program on youth volleyball players improves the force capabilities in their usual training period⁶. Another study which was done in 2005, evaluated the correlation of 3 different parameters using various methods of Plyometric training in university level undergraduates. The study proved that Plyometric training can make the leg muscle stronger and increase the power significantly⁷.

A study was conducted in 2013 which analysed about the AAHPER fitness test and Volleyball skills in players who had Calisthenics training. Seventy-six tenth-grade boys participated in one of the following three physical education classes for five weeks. The calisthenics consisted of strength, agility and flexibility exercises similar to a program warm-up of a high school volleyball classes consisted of drills and competition adapted within the scope of this study, it is concluded that daily Calisthenics class or a combination of Calisthenics and volleyball class caused greater improvements in muscular endurance, as measured by sit-ups and pull-ups than an all-volleyball class⁸.

Plyometric training usually excites the muscle fibers (elastic part) and the connective tissue. This mechanism allows the muscle to store the energy during the entire deceleration phase and produce that same energy during the acceleration phase^{9,10}. A study which was done in 2000, stated that Plyometric training increases the leg strength and also the vertical jump ability of players⁹.

A previous study done in 2010, postulated that as a result of Plyometric training, one can find improved stretch-shortening cycle of the muscle, which in turn results in the enhancement of the musculotendinous and the neural unit and thereby produces maximum force in the shortest time¹¹.

The mechanism of adaptation which occurs following Plyometric training includes lengthening of both muscles and the tendons, considerable increase in the quantity of stored energy during the eccentric loading phase, stimulation of more number of motor units, improved neural firing rate and a consequent production of greatest power in the concentric phase and also improved joint proprioception¹².

A study was conducted about the effect of calisthenics exercises on the vertical jump height on intermediate female volleyball players. They added that in any sporting activity, the performance is influenced by the psychological status of that athlete. Calisthenics exercises helps in concentrating mind and body coordination. If done properly, it can reduce anxiety and enhance athletic performance. They stated that as a result, Calisthenics exercises show a significant effect on the strength of the vertical jump height of the female volleyball players when trained for 4 weeks under the fixed protocol³.

Both groups had a better outcome because of the training regimen, but the group trained with Plyometric training is more effective than Calisthenics training on vertical jump performance.

The limitations of the study are as follows. The study was conducted on a smaller sample size and it included only male collegiate volleyball players. The scope of the study was limited due to short duration, it focused on two training techniques and one outcome measure was analyzed.

Further studies are recommended to include female volleyball players. Larger sample size and different training programs can be included. Elite volleyball players can be included in further studies. Other parameters like Agility and Flexibility can also be included.

CONCLUSION

In conclusion, Plyometric training is more effective in increasing vertical jump performance than Calisthenics training in collegiate volleyball players.

ACKNOWLEDGEMENT

The authors sincerely thank Dr. G. Bakthavathsalam, Chairman, Mrs. Vasanthi Raghu, Vice Chairman and Prof. V. Mohan Gandhi, CEO, KG Hospital, Coimbatore, Tamilnadu, India for their support and logistical help to conduct this research.

ETHICAL CLEARANCE – Institutional Ethical Committee, K.G. College of Physiotherapy, Coimbatore, Tamilnadu, India.

SOURCE OF FUNDING – Self.

CONFLICT OF INTEREST – Nil.

REFERENCES

1. Kumar A, Jadiya MK. The Effect of Plyometric Training and Strength Training among Male College Volleyball Players - A Comparative Study. *Indian J Youth Adol Health.* 2021;8(3):15-19. DOI: <http://doi.org/10.24321/2349.2880.202114>.
2. Niharika V Ramanarao Cintre, Dr. Ronald Prabhakar, Dr. Archana Methé. Effect of calisthenics exercises on the vertical high jump on intermediate female volleyball players. *Int J Phys Edu Sports Health* 2022;9(3):93-96.
3. Sozbir Kerim. (2016). Effects of 6-Week Plyometric Training on Vertical Jump Performance and Muscle Activation of Lower Extremity Muscles. *The Sport Journal.*
4. R Srivastava, Effect Of Pilates, Calisthenics And Combined Exercises On Selected Physical Motor Fitness, 1st edition Isara Publications. 2016.
5. [Lian O, Refsnes PE, Engebretsen L, Bahr R. Performance characteristics of volleyball players with patellar tendinopathy. *Am J Sports Med* 31: 408-413, 2003.](#)
6. Vassil, K., & Bazanovk, B. (2012). The effect of plyometric training program on young volleyball players in their usual training period. *Journal of Human Sport and Exercise*, 7(1), S34-S40.
7. Abass AO. Correlational effects of plyometric training on leg muscle strength, endurance and power characteristics of Nigerian University undergraduates. *Int J African African Am Studies* 2005; 4(1): 42-52.
8. B Don Franks A, George C, Moore B. Effect of calisthenics and volleyball on the

AAHPER fitness test and volleyball skill. American journal of health, physical education, and Recreation. 2013;40(2):288-292.

9. Fatouros IG, Jamurtas AZ, Leontsini D, Taxildaris K, Aggelousis N, Kostopoulos N, et al. Evaluation of Plyometric Exercise Training, Weight Training, and Their Combination on Vertical Jumping Performance and Leg Strength. *J Strength Cond Res.* 2000;14(4):470-6.

10. Markovic G. Does plyometric training improve vertical jump height? A meta-analytical review. *Br J Sports Med.* 2007;41(6):349-55.

11. Markovic G, Mikulic P. Neuro-musculoskeletal and performance adaptations to lower-extremity plyometric training. *Sport Med.* 2010;40(10):859-95.

12. Moran J, Sandercock GRH, Ramirez-Campillo R, Todd O, Collison J, Parry DA. Maturation-related effect of low-dose plyometric training on performance in youth hockey players. *Pediatr Exerc Sci.* 2017;29(2):194-202.