



The Effectiveness of Lower Limb Plyometric Exercises on Vertical Jump Performance in Young Basketball Players: A Randomized Controlled Trial

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Abstract

Background: Plyometrics is a well-known form of ballistic training, designed to improve performance of jump capabilities. It is an training that uses both the speed and force with various movements which improves muscle power. Vertical jump is raising his or her center of gravity in a vertical plane. Plyometric exercise training improves vertical jump height. In basketball a vertical leap is involving rapid and repeated muscle contraction and stretching.

Aim: To determine the effect of plyometric exercises on vertical jump height in young basketball players and compare them with their untrained counterparts.

Design: Randomized control trial with pre and post test.

Methodology: 20 students who play basketball around age 14-17 years, who fulfilled the inclusion criteria were randomly divided into Group A (experimental group) and group B (control group). The untrained group was asked to perform the general warm up prior to the vertical jump. Cool down exercises. The experimental group was given plyometric exercises for 6-8 weeks and vertical jump height pre and post training were recorded and compared.

Results: Vertical jump height improved significantly post plyometric in Group A compared to the control group. Statistically analysis was done using paired 't' test, the results indicated that there was significant improvement in subjects who received plyometric training.

Conclusion: Plyometric training brought significant changes in vertical jump height. This study concludes that plyometric training is effective in improving vertical jump height among young basketball players.

Keywords: Vertical Jump Height; Sargent Jump Test; Plyometric Training

Introduction

In Basketball the game is between two teams each team has five players each which is on a court, usually outdoors. Each team tries scoring by tossing the ball to the opponent's basket, an elevated horizontal hoop or net. (William George Mokray, 1965).

It is a game played between two teams of five members each, the object being to throw a ball through an elevated basket on the opponent's side of a rectangular court.

The ball is moved by dribbling and tossing with the hand, from the American Heritage, 5th edition Dictionary of the English Lan-

guage. The aim of the game is for each team to stop a goal and tries to score goals at the opponent court. The team has 5 players with 2 forwards, 2 guards and a middle with each player having to play in both attack and also to defend.

Basketball requires speed, explosive power and sustenance of maximum performance throughout the entire game. (Chhaya verma 2014) [1].

Plyometrics is a form of training, which is focused to improve-jump ability (Ives,2013).

Vertical Jump (VJ) is measure of athletic performance and activities. Previous studies stated. Conflicting results on anthropometric influence. (Hanjabam Barun Sharma., *et al.* 2017).

Plyometrics is a an exercise training program which use both speed and force of movements to increase the muscle power [3]. Plyometrics training can improve the physical performance and ability to do various activities [15].

Plyometrics can include different types of exercises, like push ups, throwing, running, jumping, and kicking etc. Plyometrics can be used as part of their regular training by athletes but any individual or post traumatic injury can do these workouts. to get back into good shape and physical function. (Kara Mayer Robinson,2020) Plyometrics is an high-impact activity that takes impact to another level. It's not just jumping jacks, it involves various movements like jumping,¹⁶bounding, and pushing these exercises mostly focus on increasing the stretch reflex of the muscles. This stretch reflex is also called as stretch-shortening cycle (SSC). It happens when a you lengthen a muscle then followed by an immediate contraction of the same muscle.(Paige Waehner, Reviewed by Michael Lau, PT, DPT on February 11, 2020) Vertical Jump is increasing a individuals centre of gravity (COG) little higher in vertical plane. solely with the use of one's own muscles.

The vertical jump is divided into 2 types: Standing vertical jump: it is a vertical jump done from a standstill position without any steps involved.

Running Vertical jump: vertical jump after you run which helps to add energy to the jump. (Chhaya., *et al.* 2014)

Methods

20 subjects fulfilled inclusion and exclusion criteria. The selected players were divided into two groups GROUP A (experimental group) and GROUP B (control group). The training session consisted of

- Warm up exercises: 10-15 minutes of stretching done for hamstrings, tendoachilles, iliopsoas, adductors and mobility exercises of the lower limb.
- stretching of upper limb biceps, triceps, pectorals, trunks were done.
- Slow skipping and marching were included too.
- Plyometric training: 30-45 minutes including arm Plyometric and lower body plyometrics

Cool down is done for 10 minutes including slow jogging, walking, lying down back, stretch, deep breathing, and relaxation.

Training program

The conventional group was asked to perform the general warm exercises up prior to the vertical jump. Cool down exercises were performed by them after the jump height was recorded. For trained group: the exercises included were, Lower body Plyometric; Rocket jump, squat jump, lateral bound, Double leg speed hop, pogo.

Outcome measure

Jump and reach test (sargent test)

A test of muscular power, often used in fitness testing. The Sargent jump is the measurement of the difference between a person's maximum vertical reach before jumping and at the maximum point during a jump [14].

Typically, the person swings his or her arms downwards and backwards, assumes crouching position, pauses in between to get balance, and then leaps as high as possible, while swinging the arms forcefully forwards and upwards. Usually, the fingers are covered in chalk so that a mark can be made on a board to record the heights reached before and after jumping. (Michael kent, published by oxford university press, 2016) [1,11].

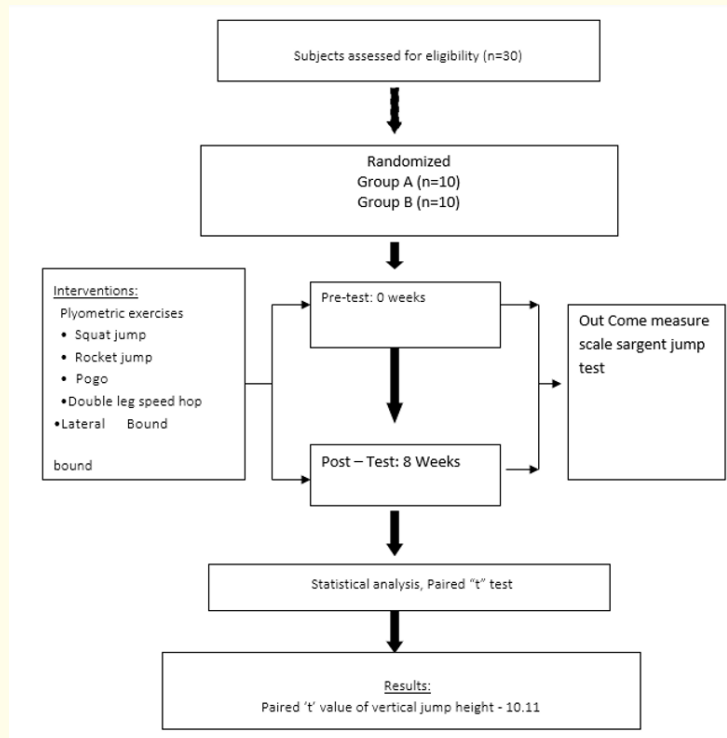


Figure 1: Research flowchart.

Results

The collected data is analysed by paired ‘t’ test to find out if any significant difference between pre and post test value from the study samples. 20 basketball players who fulfilled the inclusion and exclusion criteria were selected and divided into two groups (control group and experimental group). Experimental group was given plyometric exercises for 6-8 weeks. Vertical jump was assessed before and after intervention by sargent jump test.

The calculated paired ‘t’ value is 10.11 and ‘t’ table value is 3.250 at 0.005 level of significant. Since the calculated value is more than ‘t’ table value. It shows that there is significant difference in vertical jump height following plyometric exercises for 6-8 weeks for basketball players.

Discussion

The aim of this study was to find out the effect of plyometric exercises on Basketball players by sargent jump test. The results

Measurement	Mean value	Mean Difference	Standard deviation	Paired ‘t’ test value
Pre-test	30.25	2.1	0.658	10.11
Post-test	32.35			

Table 1

of this study shows that there is significant increase in vertical jump performance following plyometric training program for 6-8 weeks. The result was supported by Chhaya verma., *et al.* (2014), in this study subjects who play basketball were given plyometric exercises for 6-8 weeks and concluded that plyometric exercise are effective in improving vertical jump performance [6]. Francesco Fischetti, *et al.* (2019), conducted a study to find the effect of lower limb plyometric training in vertical jump agility abilities in adult female soccer players and they concluded that plyometric training can improve strength in female soccer players [4]. Usman Thattarauthodiyil, *et al.* (2019), conducted a study to find the ef-

fects of lower body plyometrics and stretching on vertical jump in female collegiate volleyball players and concluded dynamic stretching along with plyometric exercises can be more advantageous training program for a better vertical jump performance in female college student volleyball athletes [5,9,10]. Hence the hypothesis was rejected.



Figure 2: Rocket Jump.



Figure 5: Double leg speed hop



Figure 3: Squat Jump.

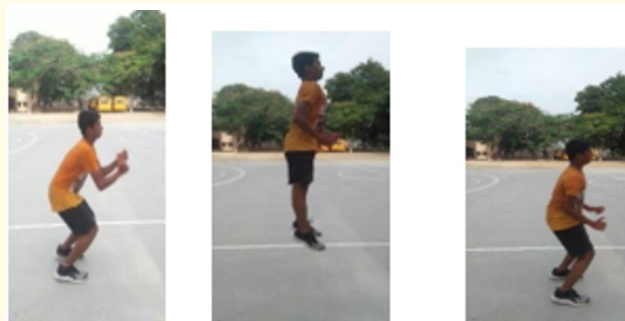


Figure 6: Lateral Bound.



Figure 4: Lateral Bound.

Limitations

- The study was limited to an age group of 14-17 years.
- The study included only boys.
- Number of subjects were small.
- Short term study.

Suggestion

- More number of variable can be added.
- Further studies should have different age group as this study was considered only for age group between 14-17 years.

- Further studies should have girls as this study was considered only for boys.

Conclusion

A randomised control trial study was conducted to investigate the effect of plyometric exercises on vertical jump measurement in basketball players. Vertical jump was assessed before and after 6-8 weeks sargent jump test. As per the statistical result it shows that there is significant improvement in vertical jump following plyometric exercises for basketball players.

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