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**Hardeep Kaur Saini**  
Research Scholar  
Desh Bhagat University,  
Mandi Gobindgarh, Punjab,  
India

## **Effect of plyometric and circuit training programme on explosive strength of male basketball players of Punjab**

**Hardeep Kaur Saini**

### **Abstract**

The purpose of this study was to compare the effect of plyometric and circuit training programme on explosive strength. For this study, one hundred twenty (120) male basketball players were selected from Punjab, age ranging between 12 to 16 years. These players were divided into two groups: Experimental Group (n=60) and Control Group (n=60). The Explosive strength was measured before and after a six-week training period. The players of Experimental group were trained for six days per week on alternative days (Plyometric Training on Monday, Wednesday and Friday whereas Circuit Training on Tuesday, Thursday, and Saturday), whereas Control Group did not participate in any training activity. The Explosive Strength was measured through standing broad jump. Mean and Standard Deviation of the standing broad jump were calculated. However, the Experimental Group showed a sign of improvement in standing broad jump that was significantly greater than Control Group. It was analysed through statistical procedure by using 't-test'. Result of this study showed significant difference between Experimental and Control Groups in pre-test and post-test for dependent measurements ( $p < 0.05$ ).

**Keywords:** Basketball, plyometric training, circuit training, explosive strength

### **Introduction**

Basketball is a sport with various complicated demands that need an aggregation of fitness, skill, team tactics and strategies, as well as motivational attitude. The ability to generate top strength level has been estimated as the key to get high sports feat. However, main areas that are likely to play an implicating role in a basketball player's achievement are muscular strength, fitness and body size. Methods of assessing and extending these qualities have been sparsely tested by controlled research setting, but there is a scarcity of research investigating the value of, and methods of improving muscular strength, fitness and body size of basketball players. It is a very demanding and physically challenging game. The ability of athletes has far exceeded the limits of the game put on them by the original inventors. The skills required by today's players are extremely different than those of yesterday. Basketball allows for individual athletes to exhibit physical aptitude within the context of an offence or defence. The attributes of change of direction and power are rules of the game. The athlete should be concerned with developing strength, agility and speed that enable the player to sustain maximum performance for the duration of the game. Explosive Strength is the capacity of the individual to release maximum force in the shortest period of time and agility plays important role in all games and sports, because when a player participates in the game then he/she has to bring about a purpose of fast change in direction and movement of different parts of the body.

Plyometric training is an excellent way to train for the players' demands of basketball. Training programmes should include repeated high intensity work, followed by period of recovery that imitates the specific tasks related to basketball. Other terms used in combination with Plyometric training are depth jump, box jump and jump training. Plyometric training has been used in basketball training program as a useful method for improving motor performance. These exercises are used mainly to increase the maximal power output and jumping ability. It includes training loads with a number of rebounds and intervals between sets of exercises and drills. In plyometric training, athletes perform

**Correspondence**  
**Hardeep Kaur Saini**  
Research Scholar  
Desh Bhagat University,  
Mandi Gobindgarh, Punjab,  
India

In plyometric training, athletes perform stopping, starting, and changing directions in an explosive way, which help to improve agility. Plyometric training is ranked as the most often used method for improvement in team games and is also included in rehabilitation programmes. These abilities are the necessary skills in many team games including basketball because they enable players to do activity during the game at the required height, speed and at the right moment. Several researchers have used Plyometric training in their research and have shown that it improves power output and increases explosiveness by training the muscles to do more work in a shorter amount of time (Adams, *et. al.*,1992; Holcomba, 1996) [1, 5]

Circuit training is a term that is usually linked with strength building but the principles that apply to building strength also apply to improving the basketball. When a player undergoes circuit training, he/she goes to various stations that are set up so that he/she can work on a variety of skills throughout the practice session. Circuit training refers to a number of specially selected exercises arranged consecutively. In the original format, there are 9-12 stations which comprised the circuit; this number may vary according to the circuit's design. Each circuit training participant moves from one station to the next with little (15-30 seconds) or no rest, performing a 15 to 45 second work session of 8-20 repetitions at each station using a resistance of about 40%-60% of One Repetition Maximum (1RM). The Circuit Training workout program may be performed with exercise machines, hand held weight, elastic resistance, calisthenics or any combination of any of these. Jumping is a complex multi-joint action that demands not only force production but also a high power output. Numerous investigators have underlined the significance of maximal rate of force development in the improvement of explosive jumping performance (Hakkinen & Komi, 1985) [6]. The power that an individual can develop depends on both force and velocity, as determined by friction-loaded ergometer. Both linear force and parabolic power velocity are increased after heavy Resistance Training. Strength Training is thus popular as a means of augmenting muscular power and performance (Chelly, 2009; Ronnestad, 2008) [3, 9].

## Objectives

- ❖ To prepare a Plyometric Training, Circuit Training programme for enhancing the performance of the subjects in basketball game.
- ❖ To find out the effect of Plyometric Training, Circuit Training programme on explosive strength of male basketball players of experimental group.

## Hypothesis

1. There is no significant difference in Plyometric Training, Circuit Training programme on Explosive Strength between Experimental group and Control group.
2. There is no significant difference of Plyometric Training, Circuit Training programme on Explosive Strength between pre- test and post-test of Experimental Group.

## Delimitations

1. The research was delimited to male basketball players of Punjab.
2. The study was delimited to one hundred twenty male basketball players (sixty in Experimental Group and sixty in Control Group).
3. All the subjects who have participated in interschool, district and state competition, age ranging from 12 to 16 years, selected randomly.
4. The training programme of plyometric training, circuit training was restricted to one hour for six weeks in which subjects attended the training for three days each in a week on alternate days.

## Training Schedule

The Plyometric Training, Circuit Training Programme will be administrated thrice a week on alternate days. Plyometric Training Programme would be on Monday, Wednesday, Friday and Circuit Training Programme on Tuesday, Thursday, Saturday per week for six weeks. The load for the training programme will be progressively increased from beginning to the end of the training session.

**Table 1:** Plyometric Training Programme

	Week 1 & Week 2		Week 3		Week 4 & Week 5		Week 6	
	Repetition	Sets	Rep	Sets	Rep	Sets	Rep	Sets
<b>Monday</b>								
Jump Squat	15	2	20	2	20	3	20	4
Box Jump	15	2	20	2	20	3	20	4
Side Jump	15	2	20	2	20	3	20	4
Strides	15	2	20	2	20	3	20	4
Skipping	15	2	20	2	20	3	20	4
<b>Wednesday</b>								
Side way box jump	15	2	20	2	20	3	20	4
Jump over to tuck jump	15	2	20	2	20	3	20	4
Sumo Jump	15	2	20	2	20	3	20	4
Hamstring curl fast	15	2	20	2	20	3	20	4
Jumping on Toes	15	2	20	2	20	3	20	4
<b>Friday</b>								
One Leg Hop jump	15	2	20	2	20	3	20	4
Box Jump	15	2	20	2	20	3	20	4
Side Way Jump	15	2	20	2	20	3	20	4
Depth jump	15	2	20	2	20	3	20	4
Scissor Jump	15	2	20	2	20	3	20	4

**Table 2:** Circuit Training Programme

	Week 1 & Week 2		Week 3 & Week 4		Week 5 & Week 6	
	Duration(sec)	Sets	D (sec)	Sets	D (sec)	Sets
<b>Tuesday, Thursday, Saturday</b>						
Jumping Jacks	20	3	30	3	45	3
Kicking back	20	3	30	3	45	3
High knee strides	20	3	30	3	45	3
Side hops	20	3	30	3	45	3
Squat	20	3	30	3	45	3
Flutter kick	20	3	30	3	45	3
Pilates Leg Pulls	20	3	30	3	45	3
Pilates Leg Pulls	20	3	30	3	45	3

**Method and Procedure**

The study is experimental in nature. In this study, the sample of one hundred and twenty male basketball players were selected from Punjab, age ranging between 12 to 16. The selected male basketball players were further divided into two groups (one is Experimental Group and second is Control Group) with sixty players in each. Experimental group went through Plyometric and Circuit Training Programme for one hour, after 15 minutes of warm-up and stretching exercise, for six weeks, whereas the control group did not undergo any special training programme. Explosive Strength was measured with the help of standing broad jump and the score was recorded in centimetres. The data would be collected by the pre- test (T1) and the post-test (T2) after six week training programme. The score was collected for

all the above mentioned categories of Controlled and Experimental Group.

**Statistical Techniques**

For analysis of the data collected from pre and post-test of Control Group and Experimental Group of basketball players, Mean and Standard Deviation were computed. For this purpose ‘t-test’ was applied and for testing the hypothesis, the level of significance was set at 0.05%.

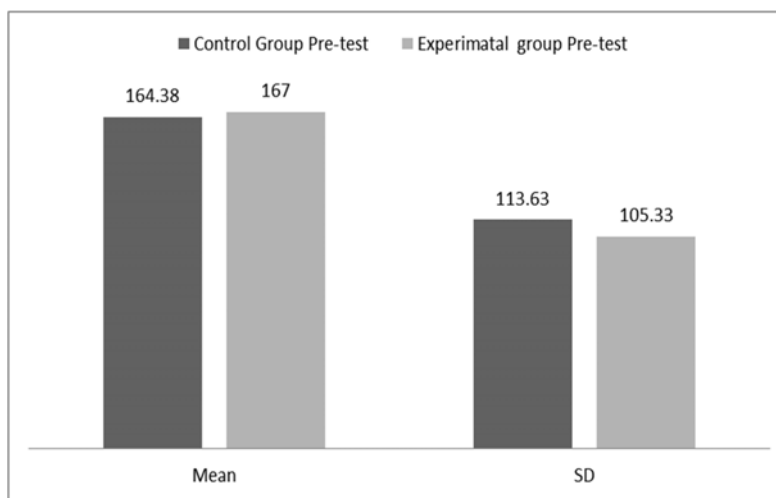
**Findings and Discussion**

The statistical analysis on significance of the mean made between pre-test of CG & EG, post-test of CG & EG and pre-test & post-test of EG for six weeks Explosive strength are presented in the table-3, table-4 and table-5 respectively.

**Table 3:** Mean, S.D and t-value of pre-test on Explosive Strength between Control Group and Experimental Group

Groups		N	Mean	SD	Dm	t-test
Control Group	Pre-test	60	164.38	113.63	2.62	0.31*
Experimental Group	Pre-test	60	167	105.33		

\*Level of Significance – 1.96



**Fig 1:** Comparison of Mean and S.D of pre-test on Explosive Strength between CG and EG.

Figure 1 shows the mean value of pre-test of Control Group as 164.38 and Experimental Group as 167. The calculated value of explosive strength is less than the table value

(1.96), hence we accept the null hypothesis. There is no significant difference between CG and EG of male basketball players of Punjab.

**Table 4:** Mean, S.D and t-value of post-test on Explosive Strength between Control Group and Experimental Group

Groups		N	Mean	SD	Dm	t-test
Control Group	Post-test	60	168.43	111.15	28.87	3.96*
Experimental group	Post-test	60	197.3	58.94		

\*Level of significance – 1.96

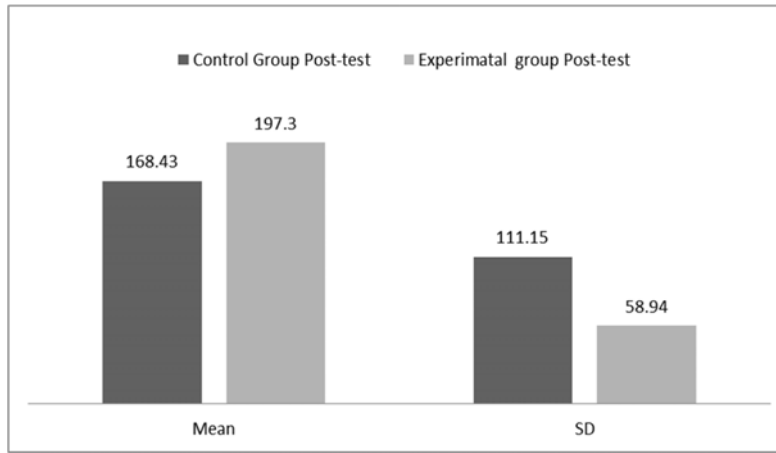


Fig 2: comparison of Mean and S.D of post-test on explosive strength between CG and EG.

Figure 2 shows the mean value of post-test of Control Group is 168.43 and Experimental Group is 197.3. The calculated value of explosive strength (3.96) is more than the table

value (1.96), we reject the null hypothesis. There is a significant difference of post-test between CG and EG of Punjab basketball players.

Table 5: Mean, S.D and t-value between pre-test & post-test on Explosive Strength of Experimental Group

Groups		N	Mean	SD	MD	t-test
Experimental group	Pre-test	60	167	105.33	30.3	5.49*
Experimental group	Post-test	60	197.3	58.94		

\*level of significance – 1.96

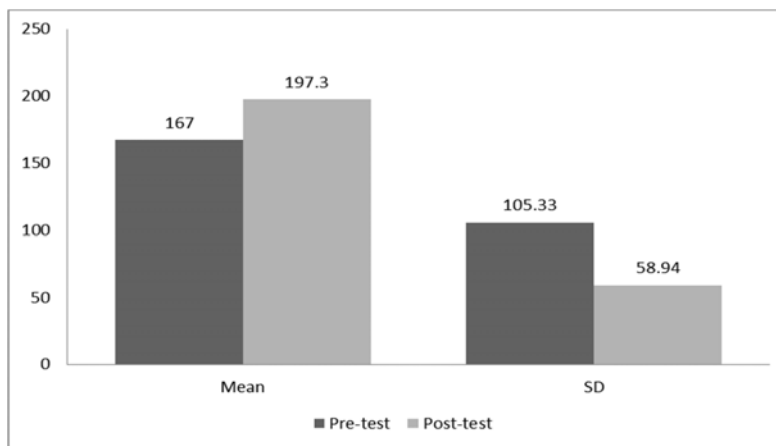


Fig 3: Shows the comparison of mean and S.D between pre-test and post-test on explosive strength of Experimental Group

Figure 3 the mean value of pre-test of Experimental Group is 167 and post-test of Experimental Group is 197.3. The calculated value of explosive strength (5.49) is more than the table value (1.96), we reject the null hypothesis. There is a significant difference between pre-test and post-test of experimental group of Punjab basketball players.

**Discussion and Conclusion**

The Plyometric training and circuit training improved or increased lower body muscular strength from pre to post training. The plyometric and circuit training programme brings positive effect on standing broad jump of explosive strength on Punjab basketball players.

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