



**COMPARITIVE STUDY OF ISOMETRIC CORE STRENGTHENING EXERCISE AND  
PLYOMETRIC EXERCISE TO IMPROVE CORE MUSCLE STRENGTH IN  
COLLEGIATE CRICKETERS**

<sup>1</sup>\*G. Vaishnavi, <sup>2</sup>V. Suryaprakash, <sup>3</sup>G. Tharani, <sup>4</sup>G. Yuvarani and <sup>5</sup>K. Kamatchi

<sup>1,3,4,5</sup>Assistant Professor, Faculty of Physiotherapy, Dr. MGR Educational and Research Institute, Velappanchavadi, Chennai – 600077, Tamilnadu, India.

<sup>2</sup>Bpt Student, Faculty of Physiotherapy, Dr. MGR Educational and Research Institute, Velappanchavadi, Chennai – 600077, Tamilnadu, India.

**\*Corresponding Author: Dr. G. Vaishnavi**

Assistant Professor, Faculty of Physiotherapy, Dr. MGR Educational and Research Institute, Velappanchavadi, Chennai – 600077, Tamilnadu, India.

Article Received on 27/12/2018

Article Revised on 16/01/2019

Article Accepted on 05/02/2019

**ABSTRACT**

**Objective of the study:** The aim of the study is to compare the isometric core strengthening exercise and plyometric exercise to improve core muscle strength in collegiate cricketers. **Background of the study:** Cricket is an international game. Core strengthening required for cricket throwing, bowling, batting events in cricketers. Muscle strength refers to the amount of force a muscle can produce with a single maximal effort. The purpose of the study is comparing the effectiveness of isometric core strengthening and plyometric exercise on collegiate cricketers. **Methodology:** For the purpose of the present comparative work a total of 20 collegiate cricketers were randomly selected. The age of subjects were ranging from (17-25) years. Core muscle strength test was selected as a dependent variable. And 12 weeks of isometrics core strengthening and plyometric are given to group A and group B of 10 individuals in each group was considered as an independent variable. Core muscle strength was measured by core strength test. **Procedure:** 20 subjects were taken that is 10 in group A and 10 in group B collegiate cricketers. Cricketers with age (17-25) years. They underwent isometric core strengthening and plyometric exercise respectively for 12 weeks. Isometric core strengthening exercise like elbow to knee crunch, Pilates hundred, planic toes, bridge with leg lift and plyometric exercises like scissors jump, plyo push jump, kneeling jump squat, timed work out are given in order to improve the core muscle strength in collegiate cricketers and a comparative study is done. **Results:** There was a significant difference among the mean values of the core strength test of Group A and Group B (“p” >0.1).The mean of Group B is greater than Group A. **Conclusion:** Result of this study shows that plyometric core strengthening exercise improve the outcome measure in collegiate cricketers, when compared to isometric core strengthening exercise. Therefore, the study concluded that plyometric core strengthening is more effective than isometric core strengthening.

**KEYWORDS:** Collegiate cricketers, core muscle strength, plyometrics, isometric strengthening exercise.

**INTRODUCTION**

Cricket is an international game. This game was played by many people professionally and non-professionally. In a team there are 10 players with batsman, keeper and fielders. Mostly running, throwing and forceful trunk rotations occurs. Therefore core muscles play an important role on cricket players.

The core musculature in concludes the muscles of trunk and pelvis that are responsible for the maintenance of stability of spine and pelvis. The Core strengthening required for cricket throwing, bowling, batting events in cricketers. Some of the core muscles are thoracolumbar fascia, Paraspinalis, Abdominalis, Hip girdle musculature, Diaphragm and Pelvic floor muscles they are mostly involved in sports activities of cricketers. Spines and pelvis are centrally located to be able to

perform many of the stabilizing functions that the body will require in order for the distal segments. To do specific function providing the proximal stability for distal mobility and function of limbs.

Core muscle strengthening training is widely practiced by professionals with the goals entrancing core stability and increase core muscular strength thereby improves performance of cricketers. Plyometric and isometric core strengthening is widely used as a method of developing explosive strength capacity in those sports that require jumping ability such as athletics, basketball and volleyball.

Plyometric is a type of exercise training designed to produce fast, powerful movements and improve function of nervous system generally for purpose of improving

performance in sports. Plyometric exercise may be referred to as explosive exercise. Plyometric strengthening is a type of muscle strength exercise that can improve basic physical strength and exercise performance ability. The term plyometric can be used to describe any exercise that allows the athletics and sports players to take advantage of stretch shortening cycle to produce an explosive movement. Plyometric is a type of exercise that can provide the muscle strength and explosive reactive type of movement. It's the key for improving the muscle strength in a short period of time.

## METHODOLOGY

Study was conducted on department of physiotherapy A.C.S. medical college and hospital. From the collegiate cricketers 20 subjects were taken and divided into two groups, each group contains 10 individuals.

GROUP A--- control group

GROUP B--- control group

## OUTCOME MEASURE

### CORE MUSCLE STRENGTH AND STABILITY TEST

The assistant is responsible for instructing the athlete as to the position to assume the appropriate stage. Throughout the test the back, neck and head should be maintained in the posture as per figure below. If the athlete is unable to hold this position, then the test is to be stopped.

#### Stage 1

- The athlete warms up for 10 minutes.
- The athlete, using the mat to support their elbows and arms, assumes the Start Position.
- Once the athlete is in the correct position the assistant starts the stopwatch.
- The athlete is to hold this position for 60 seconds.

#### Stage 2

- The athlete lifts their right arm off the ground and extends it out in front of them parallel with the ground.
- The athlete is to hold this position for 15 seconds.

#### Stage 3

- The athlete returns to the Start Position, lifts the left arm off the ground and extends it out in front of them parallel with the ground.
- The athlete is to hold this position for 15 seconds.

#### Stage 4

- The athlete returns to the Start Position, lifts the right leg off the ground and extends it out behind them parallel with the ground.
- The athlete is to hold this position for 15 seconds.

#### Stage 5

- The athlete returns to the Start Position, lifts the left leg off the ground and extends it out behind them parallel with the ground.
- The athlete is to hold this position for 15 seconds.

#### Stage 6

- The athlete returns to the Start Position, lifts the right leg and left arm off the ground and extends them out parallel with the ground.
- The athlete is to hold this position for 15 seconds.

#### Stage 7

- The athlete returns to the Start Position, lifts the left leg and right arm off the ground and extends them out parallel with the ground.
- The athlete is to hold this position for 15 seconds.

#### Stage 8

- The athlete returns to the Start Position.
- The athlete is to hold this position for 30 seconds.

#### Stage 9

End of test.

## PROCEDURE

For the purpose of comparative work subjects are selected from the A.C.S. medical college and hospital. once the subjects gets medically stable the exercise program was started. 20 subjects were taken in group A and group B with collegiate cricketers. The age of subjects were ranging from 17-25 years. Once the subjects were based on inclusion assessment form the subjects were selected and informed consent has taken from the subjects. The subjects were examined by the 'core strength test'. Before the test subject must warm up for 10 minutes for good result. After that isometric core strengthening exercises like elbow to knee crunch, Pilates hundred, planic toes bridge with leg lift, reverse crunch, leg slide and reach were given for Group A up to 12 weeks. On the other hand plyometric exercises like scissors jump, plyo push up, kneeling jump squat, timed work out and split jump squats are given to Group B for 12 weeks.

The exercise program lasts for 60 minutes which include the exercise duration and resting period. The exercise program was given for 5 days a week for 12 weeks. The exercise program used in this study works on all core muscles. After this subjects were evaluated by core strength test. The data's were evaluated and statistically analysed.

## EXERCISE PROTOCOL

### GROUP A: ISOMETRIC CORE STRENGTHENING

#### ELBOW TO KNEE CRUNCH

Lie flat on your back and place your hands behind your head. Bend your knees and bring them up so that your

thighs and hips form a 90 degree angle, calves parallel to the floor. Repeats for 4 times and hold it's for 25-30 sec.

#### **PILATES HUNDERD**

Lie on your back with your knees bent and up in the air, your knees and hips forming 90-degree angles. Reach your arms back down to the floor, lift your head and roll up to the Pilates Abdominal Position with your shoulder blades just off the mat.

#### **PLANIC TOES BRIDGE WITH LEG LIFT**

Lie on your back with your arms by your sides, knees bent and feet flat on the floor. Raise your one leg and lift your hips as high as you can lower your hips, repeat and then switch legs. Repeats it for 4 times and holds for 15-30 sec.

#### **REVERSE CRUNCH**

Lie on the ground in a traditional crunch position, your feet flat on the floor and hands underneath your head. Press your lower back into the floor and pull in your belly button to lift your feet off of the floor. Repeats it for 4 times and holds for 15-30 sec.

### **5.11.2 GROUP B: PLYOMETRIC CORE STRENGTHENING**

#### **SCISSORS JUMP**

Stand in a position where the right foot is at the back and left foot is in the front. Jump off the floor, and land after your legs have swapped positions in the air. The right foot should be in front, and the left foot should be behind. Get back to the first position- as in, the left foot forward and the front foot behind. This rhythm should be

repeated a number of times. Make sure the landing area is not stacked. Done with 4 repetitions and each 25 counts.

#### **PLYO PUSH UPS**

Perform a standard push-up, but as you push-up, push with enough force that both hands leave the ground and you are able to quickly clap them together before landing. Done with 4 repetitions and each 25 counts.

#### **KNEELING JUMP SQUAT**

Begin this advanced move kneeling on the ground with the legs spread a littler wider than the hips. Draw the arms back and then forcefully swing them forward to generate enough momentum to jump into a squatting position, landing on both feet. Think about using your core and gluteus to help generate power for this move. Step your right foot back, coming down onto your right knee; then your left foot back and down onto your left knee, to return to start position. Done with 4 repetitions and each 25 counts.

#### **SPLIT JUMP SQUAT**

Stand tall with your feet hip distance apart. Hands are in front of the chest hand on fist. Take a large step forward with one foot and lower your body toward the floor. Both legs should be bent at a 90-degree angle at the bottom of the lunge. Lower the back knee slightly and jump to switch the feet. While in the air front foot comes back and back foot comes to the front. Land in a bent knee lunge. Done with 4 repetitions and each 25 counts.

### **DATA ANALYSIS**

**Table-1: Comparison of Mean Value Between Group A and Group B (Pre And Post Test) Core Strength Test.**

#CORE STRENGTH TEST	GROUP A		GROUP B		t-TEST	df	SIGNIFICANCE
	Mean	S.D	Mean	S.D			
PRE-TEST	120.6	13.32	127.5	10.29	1.288	9	0.214
POST-TEST	127.9	11.46	139.8	10.62	2.391	9	0.028

( $P \leq 0.05$ )

GROUP-A ISOMETRIC CORE STRENGTHENING

GROUP-B PLYOMETRIC CORE STRENGTHENING

The above table reveals the Mean, standard deviation (S.D), t-test, degree of freedom (df) and p value of the core strength test between Group A and Group B in pre-test and post-test weeks.

This table shows that there is significance difference between pre-test and post-test values of the core strength test between group A and group B ( $*P \leq 0.01$ ).

**Table 2: Comparison Of Mean Value Within Group- A And Group-B (Pre And Post Test) Core Strength Test.**

#CORE STRENGTH TEST	PRE TEST		POST TEST		t-TEST	df	SIGNIFICANCE
	Mean	S.D	Mean	S.D			
GROUP A	120.6	13.32	127.9	11.46	-7.508	9	0.000
GROUP B	127.5	10.29	139.8	10.62	-12.54	9	0.000

( $P \leq 0.05$ )

GROUP-A ISOMETRIC CORE STRENGTHENING

GROUP-B PLYOMETRIC CORE STRENGTHENING

The above table reveals the Mean, standard deviation (S.D), student t - test, degree of freedom (df) and p value of the core strength test between Group A and Group B in pre-test and post-test weeks.

This table shows that there is significance difference in pre test and post test values of the core strength test between group A and group B ( $P \leq 0.05$ )

## RESULT

There is significant difference in pre-test and post-test values of core strength test between the Group A and Group B. Hence the null hypothesis is rejected.

On comparing the mean values of core strength test between Group A and Group B. Both the Groups have showed improvement in post-test mean value but group B (mean=139.8) showing higher mean values is more effective than Group A (mean=127.9).

## DISCUSSION

Core muscle strengthening plays an importance role in collegiate cricketers. While during throwing, bowling, hating and other sports activities. The present study compare the effectiveness of isometric core strengthening on group A and plyometric strengthening on group B. Isometric core strengthening Group A with 10 students and plyometric core strengthening given to group B with 10 students. Pre and post-test were taken by using core strength test. This study improves the core muscle strength of collegiate cricketers.

In this study result shows statistical significance of isometric core strengthening and plyometric core strengthening within group analysis pre and post intervention of both group shows the improvement in core muscle strength.

Between group analysis of post intervention shows there is more improvement in core muscle strength. According to the result plyometric core strengthening improves the core strength.

The table reveals means, standard deviation, independent t-test and p-test values of core strength test between group A and group B.

The table shows that statistically significance difference in post - test value of core strength test between group A and group B. Both the group shows significant increases in the post- test means values but group B which has higher means value is more effective than Group A.

On comparing the mean values of core strength test between Group A and Group B. Both the Groups have showed improvement in post-test mean value but group B (mean=139.8) showing higher mean values is more effective than Group A (mean=127.9). There is significant difference in pre-test and post-test values of

core strength test between the Group A and Group B. Hence the null hypothesis is rejected.

## CONCLUSION

This study concluded that both the interventions namely isometric core strengthening exercise and plyometric core strengthening exercise on collegiate cricket players. When the both the groups were compared, group B (mean=139.8) showed better improvement in core strengthening.

## 11. REFERENCES

1. Athanasios, K. and Eleftherio, K. Effects of small-sided games on physical Conditioning and performance in young soccer players. *Journal of Sports Science And Medicine*, 2009; 8: 374–380.
2. Impellizzeri, F. M., Rampinini, E. and Castagna, C. Effect of plyometric training on sand versus grass on muscle soreness and jumping and sprinting ability in soccer players. *British Journal of Sports Medicine*, 2007; 42: 42–46.
3. Lee, C. S. and Choi, S. N. The effects of 12 weeks plyometric training on the Muscular functions of lower extremities of jumpers. *Korea Sport Research*, 2005; 16: 897–908.
4. Lee, K. B. Effect that Plyometric Training gets 100 m running. *Graduate School Suwon University*, 2005; 23–28.
5. Kim, H. Y. Effects of plyometric training on ankle joint motion and jump Performance. *Korean Journal of Sports Medicine*, 2012; 30: 47–54.
6. Park, J. H. The Effect of short term Plyometric & Isotonic Training on Power Abilities. *Graduate School Chosun University*, 2000; 15–18.
7. Komi, P. V. *Strength and power in sports*. Champaign: Human Kinetics, 1992; 113–117.
8. Rolf, S. and Rhondda, J. The effect of core and lower limb exercises on trunk Strength and lower limb stability on Australian soldiers. *Journal of Military and Veterans' Health*, 2012; 20: 4
9. Wilmore, J. H., Costil, D. L. and Keney, W. L. *Physiology of sport and exercise*, 4th ed. Champaign: Human Kinetics, 2008; 56–58.
10. Yang, J. H., Park, C. U. and Choi, J. H. Effect of 24-week weight training and Plyometric training on the physique, body composition and fitness of male high School students. *Journal of Sport Leis Stud*, 2007; 30: 583–593.
11. Dr. Devaraju, K. Impact of Plyometric Training on Selected Physical Fitness Variables among Ball Badminton Players. *International Journal of Advanced Research in Engineering & Technology*, 2014; 5(2): 173–176.
12. Naik, V., Patil, P. and Chikaraddi, V. Action Event Retrieval from Cricket Video Using Audio Energy Feature for Event Summarization. *International journal of Computer Engineering & Technology*, 2013; 4(4): 267–274.
13. Athanasios, K. and Eleftherio, K. Effects of small-sided games on physical Conditioning and

- performance in young soccer players. *Journal of Sports Science And Medicine*, 2009; 8: 374–380.
14. Impellizzeri, F. M., Rampinini, E. and Castagna, C. Effect of plyometric training on sand versus grass on muscle soreness and jumping and sprinting ability in soccer players. *British Journal of Sports Medicine*, 2007; 42: 42–46.
  15. Lee, C. S. and Choi, S. N. The effects of 12 weeks plyometric training on the Muscular functions of lower extremities of jumpers. *Korea Sport Research*, 2005; 16: 897–908.
  16. Lee, K. B. Effect that Plyometric Training gets 100 m running. Graduate School Suwon University, 2005; 23–28.
  17. Kim, H. Y. Effects of plyometric training on ankle joint motion and jump Performance. *Korean Journal of Sports Medicine*, 2012; 30: 47–54.
  18. Park, J. H. The Effect of short term Plyometric & Isotonic Training on Power Abilities. Graduate School Chosun University, 2000; 15–18.
  19. Komi, P. V. Strength and power in sports. Champaign: Human Kinetics, 1992; 113–117.
  20. Rolf, S. and Rhondda, J. The effect of core and lower limb exercises on trunk Strength and lower limb stability on Australian soldiers. *Journal of Military and Veterans' Health*, 2012; 20: 4.
  21. Wilmore, J. H., Costil, D. L. and Keney, W. L. *Physiology of sport and exercise*, 4th ed. Champaign: Human Kinetics, 2008; 56–58.
  22. Yang, J. H., Park, C. U. and Choi, J. H. Effect of 24-week weight training and Plyometric training on the physique, body composition and fitness of male high School students. *Journal of Sport Leis Stud*, 2007; 30: 583–593.
  23. Dr. Devaraju, K. Impact of Plyometric Training on Selected Physical Fitness Variables among Ball Badminton Players. *International Journal of Advanced Research in Engineering & Technology*, 2014; 5(2): 173–176.
  24. Naik, V., Patil, P. and Chikaraddi, V. Action Event Retrieval from Cricket Video Using Audio Energy Feature for Event Summarization. *International journal of Computer Engineering & Technology*, 2013; 4(4): 267–274.