International Journal of Yoga, Physiotherapy and Physical Education
www.sportsjournal.in
ISSN: 2456-5067
Received: 15-03-2022, Accepted: 01-04-2022, Published: 16-04-2022
Volume 7, Issue 2, 2022, Page No. 65-68

Efficacy of plyometrics versus elastic band exercises on distance of throwing in amateur cricket players

Ritwik Rupam Kheria[1], Nayana Sambrani[2], Chaitra Bhat[3*]
[1] Masters in Physiotherapy, Florence College of Physiotherapy, Bengaluru, Karnataka, India
[2]Assistant Professor, Florence College of Physiotherapy, Bengaluru, Karnataka, India
[3] Assistant Professor, College of Physiotherapy, Sanjay Gandhi Institute of Trauma & Orthopaedic, Bengaluru, Karnataka, India

Abstract
Background: Throwing is important in cricket to return the ball from the field after it has been hit, to reduce the runs scored by the opponent. Resistance exercises and plyometric trainings are typical weight training methods for increasing muscle strength of players. Plyometric training uses the physiological phenomenon of a stretch-shortening cycle to enhance the ability of the neuromuscular system to generate maximal force in shortest possible time. The objective of this study was to evaluate and compare the effectiveness of elastic band exercises and plyometric exercises on distance of throwing in amateur cricket players.
Methodology: 40 subjects were included who met the inclusion criteria (20 in each group). Pre intervention throwing distance was measured for both the groups. Both the groups received exercises for thrice a week for 6 weeks. Post intervention throwing distance was measured after 6 weeks.
Results: The mean age for the plyometric group was calculated to be 21.05±2.31, and for the elastic band group was 20.45±2.44. Data were analysed for throwing distance for both the groups. This study shows that the plyometric group was more effective in improving the throwing distance than the elastic band group with a significant mean and SD of throwing distance (32.90±2.50, 30.82±2.84) respectively.
Conclusion: Individually both the groups were found to be effective in improving the throwing distance. However, when both groups were compared, there was a significant improvement in the plyometric group with greater mean and SD than the elastic band group.

Keywords: plyometric; elastic band; throwing distance

Introduction
The individual's performance in cricket is measured by the ability to throw the ball at high speed and with maximum accuracy. The throwing motion can be divided into 5–6 individual phases. The preparation phase, stride, arm cocking, acceleration, deceleration, and follow through [1]. The shoulder of the overhead throwing athlete, because of the nature of its performance demands, must provide enough mobility to allow maximal external rotation during the late cocking phase of throwing and enough stability to allow forceful accelerations as high as 7,510º/s [2, 3]. This fine balance of sufficient mobility and stability has been referred to as the "thrower's paradox" [2]. The mobility-stability balance is frequently compromised, which can in some instances result in throwing related pain (TRP) and a drop in performance [4]. Instances of spikes in throwing load (a sudden acute increase in load) occur frequently at the beginning of a competitive season or during a transition from a longer match format to short-form cricket. These spikes tend to coincide with increased reports of TRP and may be attributed to a lack of strength, mobility, or exposure to specific throwing-based conditioning.
Thus there is a need of specialized and target oriented training sessions to increase the physical and mental elements in the game of cricket. Resistance exercises and plyometric trainings are the frequently employed weight training protocols to increase the muscle strength among the cricket players [5]. Previously, the resistance exercise is performed using gym equipment, but currently it has been replaced by elastic bands. However, elastic bands are more widely used due to its simplicity, affordable cost and portability. The resistance elicited by elastic bands is generated by tensile properties of latex rather than gravitational forces [6]. In a study done by Aloui *et al*. elastic band training performed twice a week for 8 weeks improves measures relevant to game performance, particularly strength, power, and ball throwing velocity [7].
On the other hand, plyometric training is defined as a quick, effective movement concerning an eccentric contraction, followed immediately by way of an explosive concentric contraction. Plyometric training improves each neuromuscular efficiency and the variety of speeds set via the critical worried gadget. Plyometric training utilizes the *stretch-shortening cyc*le (SSC) by using a lengthening movement (eccentric) which is quickly followed by a shortening movement (concentric) [8]. In this backdrop, the present study was conducted to

compare the efficacy of Plyometric and Elastic band exercises on the distance of throwing in amateur cricket players.

Materials and methods

This was a pre and post intervention experimental study conducted among the Amateur cricket players aged between 18-24 years. The study was conducted on 40 Amateur cricket players for a period of 4-6 months. The study participants were grouped as follows,

Group A (n=20): Received the Elastic band exercises for bilateral upper limbs and lower limbs, thrice a week for 6 week.

Group B (n=20): Received the Plyometric exercises for bilateral upper limbs and lower limbs, thrice a week for 6 week.

Inclusion criteria

Participants involved in playing cricket 3-7 hours in a week for more than 1 year.

Male right hand dominant subjects aged between 18-24 years having 4-5 muscle power as per manual muscle testing.

Exclusion criteria

Participants with recent fractures of any bone and bone diseases.

Participants with musculoskeletal injury or deformity of the upper or lower limbs.

Participants with joint dislocation or subluxation of the upper limbs and any other significant joint pain.

Professional players or players involved in fitness training.

Procedure

Ethical clearance was obtained from the ethical committee of Florence College of Physiotherapy and from the academies. All the subjects fulfilling the inclusion criteria were informed about the study and written consent was taken. Instructions were given to the subjects about training and distance measurement test. And each subject was checked with their health history, sports participation and year of experience, demographic data and hand dominance.

A single session for both the programs lasted up to 60 minutes (10-15 mins of standardized warm-up, 25-40 mins of elastic band exercises or plyometric training depending on program, and 10-15 mins of cool-down and stretching). Post six weeks of training, distance of throwing was measured again and compared and analysed using statistical tools.

For plyometric training single leg half squat without pain, Balance-Eyes open (30 seconds), Balance-Eyes closed (30 seconds) was evaluated.

Outcome measures

Distance of throwing

The distance was measured by using standard measurement tape. Standard leather cricket ball (156 g) will be used. Subject was allowed to 5 mins warm up. A line will be marked using two witches hats/cones as the line from which the subject has to throw. Subjects were allowed a 10 m run-up. Following the run-up, subjects must throw the ball without crossing the line. If the line was crossed the throw was deemed a foul. Two practice throws were allowed and three measurements are made.

Scoring

The distance from the starting line to where the ball first lands was recorded. The best result of the three throws was recorded.

Data Analysis

Descriptive statistics was performed to find out mean, standard deviation for the demographic variable and outcome variables. Unpaired t test was used to find out difference in scores between groups for throwing distance. Paired t test was used to find out significant difference within groups for throwing distance. A $p<0.05$ was considered as statistically significant.

Results

In this study, there was no significant difference in the demographics variable, muscle power (MMT) and years played between the groups. The results were shown in table 1.

Table 1: Comparison of baseline values between the groups

Variable	Group A (Mean + SD)	Group B (Mean + SD)	Þ-value
Age	20.45±2.44	21.05±2.31	>0.429
MMT (4/5)	7/13	9/11	>0.748
Height	167.90±4.47	168.80±4.70	>0.539

Duration (Week)	5.20±1.47	5.40±1.19	>0.639
Years Played	5.45±2.44	5.90±2.34	>0.555

In group A the pre-throwing distance improved after elastic band exercises of 6 weeks from 28.10±2.75 meters to post throwing distance of 30.82±2.84 meters which was statistically significant (p =0001). In the group B the pre-throwing distance improved after plyometric exercises of 6 weeks from 29.03±3.23 meters to post throwing distance of 32.90±2.50 meters which was statistically significant (p=0001). The results were shown in table 2.

Table 2: Comparison of pre and post intervention throwing distance between the groups

Variable (Throwing)	Pre (Mean + SD)	Post (Mean + SD)	Þ-value
Group A	28.10±2.75	30.82±2.84	<0.0001
Group B	29.03±3.23	32.90±2.50	<0.0001

Meanwhile, throwing distance in group A has improved with mean and SD of 30.82±2.84 meters after 6 weeks of elastic band exercises and the throwing distance in group B improved to 32.90±2.50 meters and it was found to be significant (p=0.01). The results were shown in table 3.

Table 3: Comparison of post intervention throwing distance between the groups

Variable	Group A (Mean + SD)	Group B (Mean + SD)	Þ-value
Throwing	30.82±2.84	32.90±2.50	<0.019

Discussion

Recently, plyometrics and elastic band have gained much attention for the training among contact and non-contact athletes. Mounting literatures have displayed the efficacy of plyometrics on throwing velocity of the ball, however the studies are limited on its efficacy on various sports such as handball, tennis, cricket etc. on athletic performance variables. So the present study was carried out to determine whether plyometrics exercise or elastic band exercises are better to improve distance of throwing in amateur cricket players. The outcome of the present study showed that the throwing distance of ball by amateur cricket players had significantly improved with both plyometrics as well as elastic band exercises. Meanwhile, greater improvement was achieved with the plyometric exercises as compared to the elastic band exercises.

In cricket, increased throwing velocity is effective parameters for a successful cricketer. Throwing in cricket, needs an adequate rotator muscle strength balance between agonist and antagonist muscle group in order to maintain shoulder joint stability.[9] Previously it has been considered that throwing velocity solely depend on the upper extremity strength but in a study a done by Chelly *et al*. there was a significant relationship between handball throwing velocity and the power of the upper and lower limbs [10].

Although plyometrics exercises showed greater result in this study, even the subjects in elastic band exercise showed significantly better post intervention values. In past, Myers *et al*. described the effectiveness of twelve elastic resistance exercises and showed that external rotation at 90 degrees of abduction and at 0 degrees of abduction resulted in a high level of external rotator activation. [11] Another study reported that a significant increase in ball speed of the tennis serve could be after 4-week of TheraBand and dumbbell strength training to the shoulder in collegiate players [12]. Carter *et al*. also conducted a similar study in past and concluded that although both resistance training and plyometric training for upper extremity after 8-week resulted in strength gains, only the plyometric training group improved their throwing velocity by 2.0 mph in collegiate baseball players [13].

Elastic band exercises can increase muscular strength against the retraction force of the band and have been found to be effective. Elastic band exercises stimulate the proprioception and deliver information about the position and movement of joints to the cerebrum to help maintain more accurate positions [14]. Elastic band resistance exercise can improve muscular strength and increase the range of motion of the joints by stretching the rigid tissues. As a result, normal movements are promoted and the proprioceptive sense stimulates normal nerve firing before perception of hazardous stimuli [14].

The increased throwing velocities could be due to the gains of peak power output in both upper and lower limbs. Possible causes include not only a selective increase in cross sectional area of the fast-twitch fibers but also more effective neural activation, changes in intrinsic muscular properties, an increase in myosin-adenosine triphosphatase activity, better synchronization of motor units, and a higher firing frequency [15].

Plyometric exercise assists in the improvement of physiologic muscle performance in several ways. While increasing the speed of the myotatic stretch-reflex response may increase performance, such information has not been documented in the literature. Research does support that the faster a muscle is loaded eccentrically, the greater the concentric force produce [16]. Eccentric loading places stress on the elastic components, thereby increasing the tension of the resultant rebound force. The another mechanism by which plyometric training may increase muscular performance centres on neuromuscular coordination. The ultimate speed of movement may be limited by neuromuscular coordination. Explosive plyometric training may improve neural efficiency and increase neuromuscular performance.

Conclusion

The results from the present study were very encouraging and demonstrate the benefits of Plyometric exercises in improving the throwing distance in amateur cricket players as compared to the Elastic Band exercises. Thus, Plyometric exercises can be incorporated into the training programs of cricketers for enhancing their performance levels.

Acknowledgments: Nil

Conflict of interest: Nil

References

1. Petersen C, Pyne DB, Portus MR, Dawson B. Quantifying positional movement patterns in Twenty20 cricket. Int J Perform Anal Sport,2009:9(2):165–70.
2. Mihata T, McGarry MH, Kinoshita M, Lee TQ. Excessive Glenohumeral Horizontal Abduction as Occurs during the Late Cocking Phase of the Throwing Motion can be Critical for Internal Impingement. Am J Sports Med,2010:38(2):369–74.
3. Fleisig GS, Andrews JR, Dillman CJ, Escamilla RF. Kinetics of Baseball Pitching with Implications About Injury Mechanisms. Am J Sports Med,1995:23(2):233–9.
4. Wilk KE, Meister K, Andrews JR. Current Concepts in the Rehabilitation of the Overhead Throwing Athlete. Am J Sports Med,2002:30(1):136–51.
5. Singla D, Hussain ME. Adaptations of the Upper Body to Plyometric Training in Cricket Players of Different Age Groups. J Sport Rehabil,2020:29(6):697–706.
6. Hughes CJ, Hurd K, Jones A, Sprigle S. Resistance Properties of Thera-Band® Tubing During Shoulder Abduction Exercise. J Orthop Sport Phys Ther,1999:29(7):413–20.
7. Aloui G, Hermassi S, Hammami M, Gaamouri N, Bouhafs EG, Comfort P, *et al*. Effects of an 8-Week In-Season Upper Limb Elastic Band Training Programme on the Peak Power, Strength, and Throwing Velocity of Junior Handball Players. Sport · Sport,2019:33(03):133–41.
8. Chmielewski TL, Myer GD, Kauffman D, Tillman SM. Plyometric Exercise in the Rehabilitation of Athletes: Physiological Responses and Clinical Application. J Orthop Sport Phys Ther,2006:36(5):308–19.
9. Edouard P, Degache F, Oullion R, Plessis J-Y, Gleizes-Cervera S, Calmels P. Shoulder Strength Imbalances as Injury Risk in Handball. Int J Sports Med,2013:34(07):654–60.
10. Chelly MS, Hermassi S, Shephard RJ. Relationships between power and strength of the upper and lower limb muscles and throwing velocity in male handball players. J strength Cond Res [Internet],2010:24(6):1480–7.
11. Shrier I. On-the-Field Resistance-Tubing Exercises for Throwers: An Electromyographic Analysis. Yearb Sport Med [Internet],2006:2006:137–9.
12. Treiber FA, Lott J, Duncan J, Slavens G, Davis H. Effects of Theraband and Lightweight Dumbbell Training on Shoulder Rotation Torque and Serve Performance in College Tennis Players. Am J Sports Med,1998:26(4):510–5.
13. Carter AB, Kaminski TW, Douex JR AT, Knight CA, Richards JG. Effects of high volume upper extremity plyometric training on throwing velocity and functional strength ratios of the shoulder rotators in collegiate baseball players. J Strength Cond Res [Internet],2007:21(1):208–15.
14. Kim G-J, Oh H, Lee S, Lee K, Kim K. Effects of resistance exercise using the elastic band on the pain and function of patients with degenerative knee arthritis. J Phys Ther Sci [Internet],2020:32(1):52–4.
15. Gorostiaga EM, Granados C, Ibañez J, González-Badillo JJ, Izquierdo M. Effects of an Entire Season on Physical Fitness Changes in Elite Male Handball Players. Med Sci Sport Exerc [Internet],2006:38(2):357–66.
16. Johnson BA, Salzberg CL, Stevenson DA. A systematic review: plyometric training programs for young children. J strength Cond Res [Internet],2011:25(9):2623–33.