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Effect of thrower's ten exercise along with plyometric weight training on throwing distance and hand grip strength among shot put players

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Abstract

The shot put is one of the throwing events. It is regular track and field competition along with the discus throw, hammer throw and javelin. The study was designed as a pilot study conducted at Sri Venkateshwara College of physiotherapy, Puducherry. The study population comprised young adults aged between 18 to 26 years. A total of 15 shot put players were included in the study, with a duration spanning six months. The outcome measure was Hand grip strength & throwing distance. Two primary tools were utilized for assessment: Modified sphygmomanometer & medicine ball put test. These tools were chosen to comprehensively evaluate the Grip strength and throwing distance of the participants over the course of the study. This study has concluded that thrower ten exercise along with plyometric weight training exercise shown more effective on improvement on throwing distance and hand grip strength among shot put players.

Keywords: Hand grip strength, throwers ten exercise, medicine ball put test, modified sphygmomanometer test

1. Introduction

The shot put is one of the throwing events. It is regular track and field competition along with the discus throw, hammer throw and javelin. The two most widely used throwing techniques are the conventional glide and the rotational technique of the right-handed shot putter. This technique differs in the preliminary movement that the athlete makes to move across throwing circle, but the delivery phase is similar in both. During the delivery phase, the athlete exerts force on the shot with the explosive straightening of the legs coupled with a raising and rotation of the trunk followed by a rapid extension of the arm in the direction. During first stage of techniques improvement the push was mainly executed by the hand. During the second stage, involve the upper body as well as hand ^[1].

To achieve the greatest possible flight distance the athlete most project the shot with the optimum combination of release speed, angle and height release speed strongly correlated with throwing distance and is undoubtedly the most important factor. World class short put have release speed of 12.5 ± 14.5 m' S-1 and achieve distance of 19 ± 23 m ^[2]. 75% of the throwers presented one or more injuries of the throwing arm during their careers. The shoulder was the most injured body part ^[3].

1.1 Thrower's ten exercise

Muscle power is considered as an important parameter responsible for successful rapid movements performed with maximum efforts such as throwing. All exercise included are specific to the thrower and are designed to improve strength, power, endurance of musculature of the shoulder complex ^[4]. Throwers ten program incorporates throwing motion specific exercise and movement pattern performed in a discrete series, utilizing principles of co-activation, high level neuro muscular control, dynamic stabilization, muscular facilitation, strength, endurance, coordination which all serve to restore muscle balance and symmetry in overhead athlete ^[5].

1.2 Plyometric

The word plyometric is derived from the Greek word “plaything” means increase, metric means to measure. The term plyometric was first introduced in the united stated by track and field coach by the name of Fred wilt in 1975 [6]. Plyometric exercise is a popular form of training commonly used to improve athletic performance. Plyometrics are training techniques used to all types of sports to increase strength and explosiveness. Plyometrics consists of a rapid stretching of a muscle (Eccentric action) immediately followed by a concentric (or) shortening action of the same muscle and connective tissue. Plyometric usually involve stopping, starting and changing directions in an explosive manner. These movements are components that can assist in developing agility and speed. Agility is the ability to maintain control body position which quickly changing direction during a series of movements. It has been suggested that increases in power and efficiency due to plyometric may increase agility training and plyometric activities have been used in sports.

1.3 Sphygmomanometer

Modified sphygmomanometer test is a method applied in clinical settings for the assessment of muscle strength [7]. The MST involves an aneroid sphygmomanometer, a device that is portable, feasible and easily obtained. Some studies provided adequate measurement properties for the assessment of strength of various muscle. The MST is adapted in assessment of muscular strength since it shows adequate reliability and validity. In addition, a single trial is sufficient to generate valid and reliable measure [8].

1.4 Medicine ball put test

This test measures upper body (arm) strength and explosive power by keeping the back in contact with the wall the strength of the arms only is tested. The use of medicine balls in sports training is growing as practitioners see the wide range of skills that can be trained or simulated. To make training programs more sport specific, strength and conditioning coaches are continuously exploring new ways of using medicine balls to train the specific physiologic or biomechanical variables required for success in their particular sport [10].

As there has not been any significant study addressed to find the effect of thrower ten exercise and plyometric weight training for throwing distance and hand grip strength among shot put players. A desired step to conduct a pilot study on this realm taken.

2. Materials and Methodology

The study was designed as a pilot study conducted at Sri Venkateshwara College of physiotherapy, Puducherry. The study population comprised young adults aged between 18 to 26 years. A total of 15 shot put players were included in the study, with a duration spanning six months. Data collection focused on both male & female subjects. The outcome measure was Hand grip strength & throwing distance. Two primary tools were utilized for assessment: Modified sphygmomanometer & medicine ball put test. These tools were chosen to comprehensively evaluate the Grip strength and throwing distance of the participants over the course of the study. Moreover, all participants needed to demonstrate the ability to follow commands effectively, ensuring their cooperation throughout the duration of the study. Participants with specific characteristics were excluded player with any

fracture and dislocation, as were those with any shoulder pathology and players who are not willing to participate.

2.1 Procedure

In this study 15 shot put players were taken as a sample with the age group of 18-26 years through convenient sampling method after screening inclusion and exclusion criteria. All the participants were given informed consent form, and a demographical detail of the subjects was collected. Sphygmomanometer is used to measure the hand grip and medicine ball is used to measure the throwing distance before and after the 6 weeks of intervention for all the participants. The interventions such as thrower ten exercises and plyometric training.

2.2 Sphygmomanometer

The device design is like that of a sphygmomanometer. It has an inflatable cuff and mechanical movements to measure pressure for measurement tied cuff and placed in palmar aspect of the hand and asked the subject to close the hand (i.e.) the base line pressure is measured then asked to contract the fingers as like first making against the cuff then the pressure s maintained. The mechanical manometer calculator and reports or pressure value which is a result subtracting the baseline pressure from the peak pressure.



Fig 1: Shows that measure the hand grip by using sphygmomanometer

2.3 Medicine ball put test



Fig 2: Shows that measure the throwing distance by using medicine ball

Medicine ball throw test was used to assess upper-body explosive power. Many athletic skills also involve generating or transferring explosive power through the upper extremities. Throwing distance was measured by using the medicine ball throw test. In this test, participant was instructed to throw a medicine ball as far as they could, in a crouching position, holding the ball overhead with the dominant hand. The medicine ball used had a mass of 2 kg and diameter 56 cm each subject performed 5 trials with 1 min rest between trials. The distance in meter to which the subject threw the medicine ball was measured with the measuring tape. The best of 5 trials was taken and used for further analysis.

3. Exercise training

2.4 Thrower's ten exercise

2.4.1 Diagonal extension (D2)



Fig 3: Diagonal extension

Involved hand will grip Thera Band overhead and out to the side. Pull the Thera Band done across your body to the opposite side of leg, during the motion lead with them. It is done in frequency about 3 sets alternate days per week with 15 repetitions for 6 weeks of duration.

2.4.2 Diagonal flexion (D2)



Fig 4: Diagonal flexion

Gripping in the hand of involved arm, begin with the arm out from side 45 degree and palm facing backward. After turning palm forward, proceed to flex elbow and bring arm up and over involved shoulder. Turn palm down and reverse to take arm to starting position. It is done in frequency about 3 sets alternate days per week with 15 repetitions for 6 weeks of duration.

2.4.3 External rotation at 0 degree abduction



Fig 5: External rotation at 0 degree abduction

Stand with the involved elbow fixed at the side, elbow at 90 degree and involved arm across front of body. Grip the TheraBand while other end is fixed, pullout the arm, and keeping elbow at side. Return slowly and controlled. It is done in frequency about 3 sets alternate days per week with 15 repetitions for 6 week of duration

2.4.4 Internal rotation at 0 degree abduction



Fig 6: Standing with elbow at side fixed at 90 degree and shoulder rotated out

Standing with elbow at side fixed at 90 degree and shoulder rotated out. Grip Thera band while another end is fixed. Pull arm across body keeping elbow at side. Return slowly and

controlled. It is done in frequency about 3 sets alternate days per week with 15 repetitions for 6 weeks of duration.

2.5 Plyometric exercise

2.5.1 Push up on the bar

Start by positioning under the center of a pull up bar. Reach up and grip the bar with both hands. The arms should be extended straight over head. Make sure the hands are a little more than shoulder width apart presses the shoulder down, than lift the feet completely off the floor, crossing your ankles, lift the chest slightly and pull. Draw the elbows down to the body until the chin is above the bar, and then reach the starting position. It is done in frequency about 3 sets alternate days per week with 15 repetitions for 6 weeks of duration.



Fig 7: Push up on the bar

Begin with the chest and stomach flat on the floor. The legs should be straight out behind you and the palms should be at chest level with the arms bent out at a 45° angle with use of push up bar. It is done in frequency about 3 sets alternate days per week with 15 repetitions for 6 weeks of duration

2.5.2 Pull up on bar



Fig 8: Pull on the bar

2.5.3 Medicine ball chest press



Fig 9: Medicine ball chest press

3. Statistical analysis

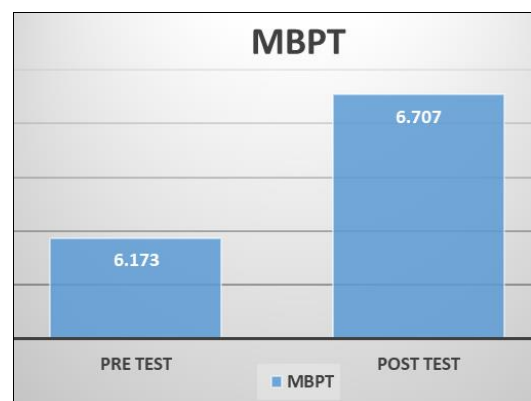
In this study, pre and post intervention difference within groups were analysed, using paired 't' test and within the groups were analysed for each of the outcome measures. Statistical significance was set at $p < 0.001$

3.1 Within the group analysis of medicine ball put test

Table 1: Showing pre and posttest value of medicine ball put test (paired 't' test value)

Group A	Mean	SD	t- value	p-value
Pre-test	6.173	1.000	13.8072	<0.0001
Post-test	6.707	0.993		

The p value of medicine ball put test in group is <0.0001 considered as significant. The t value of medicine ball put test in group is 13.8072.



Graph 1: Within the group analysis of medicine ball put test of group

3.2 Within the group analysis of sphygmomanometer test

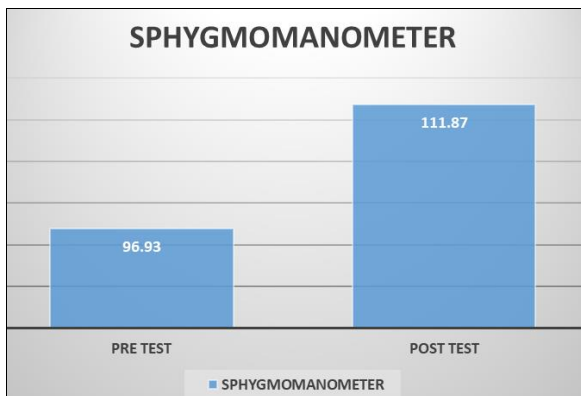
Table 2: Showing pre and post-test value of sphygmomanometer (paired 't' test value)

Group A	Mean	SD	t- value	p-value
Pre-test	96.93	13.29	9.6496	<0.0001
Post-test	111.87	13.15		

4. Results

In this study, 15 shot put players were taken with the age group of 22 ± 4 mean and SD. The mean and standard deviation of the medicine ball put test for the pre and post-test are 6.173 ± 1 and 6.707 ± 0.993 and the t-value is 13.8072 and the mean and SD of sphygmomanometer for the pre and post-test are 96.93 ± 13.29 and 111.87 ± 13.15 and the t-value is 9.6496. The outcome statistical analysis is done with paired 't'

test within the group analysis shows that significance of ($p < 0.0001$) and ($p < 0.0001$). The p value of sphygmomanometer in group is $p < 0.0001$ considered as significant. The t value of sphygmomanometer in group is 9.6496.



Graph 2: Within the group analysis of sphygmomanometer test of group

5. Discussion

The present study is the pilot study to find out the throwers ten exercises along with plyometric weight training for throwing distance and hand grip strength among shot-put players. This study was selected for the purpose to improve the throwing distance and hand grip strengthening among short put players. In this study who fulfilled the inclusion criteria were taken with age group between 18-26. They were randomly allocated. Throwers ten exercise and plyometric hand grip strengthening exercise were given for the group. The outcome measure was assessed medicine ball put test to assess the throwing distance. The sphygmomanometer was used to assess the hand grip strength of the player. Throwers ten exercise program is designed to work out the major muscle for throwing and this exercise strengthen the major muscle around the shoulder joint. Newton (1995) stated that muscle power is considered as an important parameter responsible for successful rapid movements performed with maximum efforts such as throwing. All exercise included are specific to the thrower and are designed to improve strength, power, endurance of musculature of the shoulder complex.

Kevin E Wilk (2008) stated that throwers ten program incorporates throwing motion specific exercise and movement pattern performed in a discrete series, utilizing principles of co-activation, high level neuro muscular control, dynamic stabilization, muscular facilitation, strength, endurance, coordination which all serve to restore muscle balance and symmetry in overhead athletes.

Dr. K. Palanisami (2021) states that both resistance and plyometric training alone may potentially increase power output. And proves that combined plyometric training with weight training is good enough to develop the skill performance of hand grip strength.

The result of this study demonstrated that 6 week of throwers ten exercise along with plyometric weight training exercise shown an improvement on throwing distance and hand grip strength of the shot-put players.

6. Conclusion

This study concludes that the throwers ten exercise along with plyometric weight training exercise shown more effective on improvement in throwing distance and hand grip strength among shot put players. Only shot-put players were selected

in this study. Age group was 18-26 were taken. The study analysed only the short-term benefits with respect to distance only. We recommend that further study can done with Javelin players.

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