ISSN: 0976-3031

Available Online at http://www.recentscientific.com

CODEN: IJRSFP (USA)

International Journal of Recent Scientific Research
Vol. 8, Issue, 12, pp. 22466-22469, December, 2017

International Journal of Recent Scientific Research

DOI: 10.24327/IJRSR

Research Article

EFFECTIVENESS OF THROWER'S TEN PROGRAM ON PERFORMANCE OF HAMMER THROWERS

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DOI: http://dx.doi.org/10.24327/ijrsr.2017.0812.1270

ARTICLE INFO

Article History:

Received 17th September, 2017
Received in revised form 12th October, 2017
Accepted 04th November, 2017
Published online 28th December, 2017

Key Words:

Thrower's Ten Program, Scapular retractor strength,Throwing distance, Hammer throwers,SPADI index.

ABSTRACT

An inadequate strength and repetitive nature of the game predisposes hammer throwers at the risk of injury. Aim of the study was to evaluate the effectiveness of Thrower's Ten Program on improvement of scapular retractor strength and throwing distance in hammer throwers. Total 50 players aged 18 to 29 years were approached from various sports academy in and around Pune. Among these 30 players satisfying inclusion criteria were recruited and randomly allotted into two groups, Intervention group (n=15, mean age 20.13±2.64) and Control group (n=15, mean age 19.93±1.49). A 4 week Thrower's Ten Program was administered to Intervention group where as Control group followed their routine training. All the participants were assessed for scapular retractor strength using modified sphygmomanometer, throwing distance and SPADI index pre and post intervention. Intervention group showed significant improvement in throwing distance (m) from 37.73±12.70 to 42.13±12.63 as compared to Control group from 27.33±7.11 to 28.63±7.28.Scapular retractor strength (mmHg) in Intervention group improved from73.1±21.91to 87.22±18.88as compared to Control group from 71.44±13.52 to 76.88±15.11. The Intervention group showed significant reduction in SPADI score from 8.14±2.31to 4.93±1.14as compared to controlled group from 7.8±2.14 to 6.2±1.73.The study concluded that Thrower's Ten Program is effective in improving performance of hammer throwers with increase in scapular retractor strength and throwing distance.

INTRODUCTION

The hammer throw game is considered under throwing events in regular track and field competitions along with the discus throw, shot put and javelin. Hammer throw is one of the oldest Olympic Games, first included at the 1900 games in Paris, France. The man's hammer throw has been part of the Olympics since 1900; however the international association of athletics federations did not start approving women's marks until 1995. Women's hammer throw was first included in the Olympic at the 2000 summer games in Sydney, Australia, after having been included in the world championships.[1]

While considering India's representation for hammer throw game, the men's Indian record stands at 72.86 metres set by Kamalpreet Singh in 2015 during Tucson Elite Classic Championship, (United State) and the women's Indian record stands at 65.25 metres set by Sarita Singh in 2017 during 21st Federation Cup Championships (Patiala, India). However till today no single Indian hammer throwers won any medal at international level and not even qualify for it. This could be correlated with inadequate structured training program targeting individual throwing performance, improper diet and lack of proper coaching etc.

The contributing factors for poor performance may be improper rest time after throwing session, inadequate treatment after the injury, psychological training. Many players were found to be continuing their practice sessions and events even after the injury so this is going to worsen the condition. Players are also found to perform inadequate warm-up and stretching before and after the session so incidence of injuries is even more.

Various studies have shown that throwing athletes are more prone to shoulder injuries as a result of the high forces placed on the shoulder during the throwing motion. While a single traumatic event may cause injury, more commonly it is repetitive overuse that leads to failure of one or more of these structures.

Thrower's Ten Program was designed by Kevin E. Wilk.(2011) to exercise the major muscles necessary for throwing. The exercises included are specific to the thrower and are designed to improve strength, power and endurance of the musculature of the shoulder complex.This protocol has been found to

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improve the performance in tennis, javelin and badminton. Myers *et al* (2005) suggested that exercises used in Thrower's Ten Program are most effective in activating the scapular retractor muscle and may be beneficial for athlete's pre throwing warm-up routine. HardikPatel *et al* (2014) suggested that Thrower's Ten Program was effective on improvement of retractor muscle strength, joint position error, throwing distance and throwing accuracy in recreational overhead athletes.

The muscle power is considered an important parameter responsible for successful rapid movements performed with maximum effort, such as throwing. However, due to repetitive nature of the thrower game, athletes frequently exhibit a posture of rounded shoulders and a forward head may associate with weakness of the scapular retractors and deep neck flexor muscles, which may change the resting position of the scapula. Although Thrower's Ten Programme is found to be effective in overhead athletes, no research has been found evaluating its effect in hammer throwers performance.

Aim

To evaluate the effectiveness of Thrower's Ten Program on performance of hammer throwers.

Objectives

- To evaluate the effectiveness of Thrower's Ten Program on Scapular Retractor muscle strength using Modified Sphygmomanometer Test.
- To evaluate the effectiveness of Thrower's Ten Program on throwing distance.
- To evaluate the effectiveness of Thrower's Ten Program on Shoulder pain and disabilities using SPADI Index.

MATERIALS AND METHODS

Study design: Randomized control trial

***Study duration*:** 6 months

Study setting: Sports academies in and around Pune

Target population: State level hammer throwers around Pune

Sample size: 30

Sampling method: Random sampling.

Procedure

The study design was a Randomized control trial. Ethical committee approval was obtained from the institute. Various Sports academies and Training institutes across the city were approached for state level hammer throwers. Total 50 hammer throwers, aged 18 to 29 years, practicing since minimum 1 year, were screened. Players were assured that their identity will be preserved and a written informed consent was taken. The players reporting history of any shoulder pathology with in past 6 months were excluded. Among these 30 players satisfying inclusion criteria were recruited and randomly allotted into two groups, Intervention group (n=15, mean age 20.13±2.64) and Control group (n=15, mean age 19.93±1.49).They were explained about the aim, objectives, and protocol of the study. A 4 week Thrower's Ten Program was administered to Intervention group where as Control group followed their routine training. All the players were assessed for Scapular retractor strength using modified sphygmomanometer, Throwing distance and SPADI Index pre and post intervention.

Scapular retractor strength

Measurement of scapular retractor strength on dominant side was taken using Modified Sphygmomanometer Test in (mmHg). This test has shown to have moderate reliability for assessing scapular retractor strength of healthy adult who did not practice physical activity regularly (ICC=0.690 to 0.724). Players were asked to be in supine with the arm in slight of abduction and the elbow in 90° of flexion. The cuff was placed beneath the scapula and players were instructed to "squeeze their shoulder blades together" so as to retract the scapula. During testing, the players were instructed to perform a maximal isometric contraction for 5 s, and the peak force value was recorded. Three trials were noted for each player, and a 15 sec. rest-interval was provided between the repetitions. Before each measurement, we ensured that pre-inflation of the equipment was 20 mmHg.[7]

Throwing distance

Throwing distance was measured by using the upper-limb explosive power (medicine ball throw) test (ICC=0.80). In this test, players were instructed to throw a medicine ball as far as they could, in a kneeling position on the floor, holding the ball overhead with the dominant hand. The medicine ball used had mass of 2 kg & diameter 56 cm. Each subject performed three trials with a one-minute rest between trials. The distance to which the subject threw the medicine ball was measured with a measuring tape. The best of three trials was taken and used for further analysis.

SPADI index

SPADI index was used to evaluate the shoulder pain and disability (ICC ≥0.89). SPADI Index consists of 2 components primarily pain score and disability score. Pain score ranges from 0-10scale based on quality of pain, 0 shows no pain and 10 shows worst pain. For pain there are 5 components with the maximum score 50. Disability score also ranges from 0-10 scale based on quality of disability. For disability there are 8 components with the maximum score 80. Total maximum SPADI score is 130.

Thrower's Ten Program

The intervention group received Thrower's Ten Program as per the standardised protocol by Kevin E. Wilk.[5] In this study protocol, 6 exercises were included such as D2 PNF flexion and extension, IR and ER, push up and press ups. Based on the collective information derived from electromyographic research of numerous investigators from the Thrower's Ten Program, it is accepted that these 6 exercises show similar results as seen with complete set of 12 exercises of the standard protocol. In shoulder internal and external rotation theraband was secured to the stable base at a height equal to the height of each subject's elbow from the ground when standing position, (D2) extension the theraband was secured at a height equal to the height of each subject's fingertips touch the bar (wall) in

full shoulder flexion. The intervention was carried out for thrice a week for 4 weeks. Initially during 1st and 2nd week all the exercises started with low training intensity using green colour theraband. The players were asked to perform exercises with 10 repetitions per set including 3 set of all exercises per session followed by a 30 seconds rest period in between set of exercise. Further training intensity was progressed by changing the Theraband colour from green to blue during 3rd and 4th week

RESULTS

Statistical analysis was done using paired t-test. Between group comparisons Intervention group showed significant improvement in throwing distance as compared to Control group.Scapular retractor strengthshowed higher improvement in Intervention group as compared to Control group. The Intervention group showed significant reduction in SPADI scoreas compared to controlled group. (Table 1, Fig 1).

Table 1 Pre and Post intervention measures.

Groups		Intervention Group (n=15)	Control Group (n=15)
Age in years (mean±SD)		19.93±1.49	20.13±2.64
Gender		13 males, 2 females	10 males, 5 females
Scapular retractor strength in (mmHg) (Mean±SD)	Pre	73.1±21.91	71.44±13.52
	Post	87.22±18.88	76.88±15.11
	P value	0.0007	0.0001
Throwing Distance in (m) (Mean±SD)	Pre	37.73±12.70	27.33±7.11
	Post	42.13±12.63	28.63±7.28
	P value	0.0001	0.0001
SPADI index (Mean±SD)	Pre	8.14±2.31	4.93±1.14
	Post	7.8±2.14	6.2±1.73
	P value	0.0001	0.0001

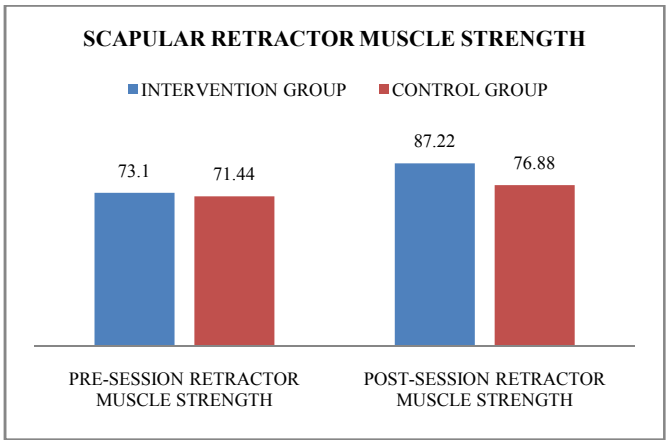

Fig 1 Comparison of Retractor muscle strength pre and post session

DISCUSSION

At the end of four weeks, the Intervention group showed significant improvement in throwing distance (m) from 37.73±12.70 to 42.13±12.63 as compared to Control group from 27.33±7.11 to 28.63±7.28. Scapular retractor strength (mmHg) in Intervention group improved from73.1±21.91 to 87.22±18.88 as compared to Control group from 71.44±13.52 to 76.88±15.11. The Intervention group showed significant reduction in SPADI score from 8.14±2.31to 4.93±1.14 as compared to controlled group from 7.8±2.14 to 6.2±1.73.

In our protocol 6 exercises were included, which was D2 PNF flexion and extension, IR and ER, push up and press ups.[13] Strength and power production is greatly reduced when an athlete is unable to place the shoulder blades in a properly retracted position. So the normal function of the scapular retractor muscle is required to achieve the necessary scapular positioning. However, increased in strength in Intervention group could be because of increased neural response as has been shown after exercises regimen of three times per week for 4 weeks. Further, the improvement in the muscle strength gain may have also been achieved through improvement in intermuscular coordination. Swanik *et al* suggested that rubber tubing resistance exercise will benefit all throwing athletes by improving strength, proprioception, muscle performance characteristics, and injury prevention. One of the study showed that a significance improvement in retractor muscle strength and throwing distance in 4 week Thrower's Ten Program with the use of theraband. They said it is because of increase power, increased motor unit recruitment and increase neural adaptation. Also external rotation exercises with theraband have shown 38% - 21% increases in electromyographic activation of scapular retractor muscle.[14]

In our study after 4 week of Thrower's Ten Program showed a significant improvement in throwing distance as compared to controlled group. Thrower's Ten Program have been shown to improve posture and kinematic of the glenohumeral rhythm, by placing the scapula in favourable position, which enhances the throwing mechanics. Thrower's Ten Program improves proper position of scapula which facilitates the kinetic chain and transfer the energy from the trunk to the upper limb.

The Intervention group showed significant reduction in SPADI score as compared to controlled group this could be because the exercise used in Thrower's Ten Program increasesstrength, power and endurance of the musculature of the shoulder complex.[5]

Based on the findings of the current study, the results provide a valuable framework for how the exercise program could be modified to benefit hammers throwers. Modifications to the strengthening components of the program may provide better results.

CONCLUSION

Thrower's Ten Program is effective in improving performance of hammer throwers with increase in scapular retractor strength, throwing distance and significant reduction in SPADI score.

Limitiation

The study was conducted on smaller sample size. No follow up was done after the study.

Scope

The study can be doneon larger sample size. Follow up can be done after 2 months to determine the conditioning of the strength as well as adherence of the players towards the exercise program.

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How to cite this article:

Ujwal L Yeole *et al*.2017, Effectiveness of Thrower's Ten Program on Performance of Hammer Throwers. *Int J Recent Sci Res.* 8(12), pp. 22466-22469. DOI: http://dx.doi.org/10.24327/ijrsr.2017.0812.1270

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