

A Study to Compare the Effect of Derby Shoulder Instability Rehabilitation Program and Theraband Exercises on Shoulder Instability among Rifle Shooters

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1. Introduction

Rifle shooting is a traditional sport that comes a long way India. This is a game in which outstanding performance was delivered by the Indian shooters which have been witnessed in various National and International platforms. Rifle shooting is collective group of competition and recreational sports. It includes activity like accuracy, precision and speed of shooting. Indian shooters are putting strenuous muscular effect to exceed in game and gain recognition both in National and international platforms.

In Rifle shooter shooting or firing produce a sudden counterforce against the body though the anterior shoulder this result a distressing injury in shooter¹. The impact against the body when shooting in standing position exceed the forces from the Rifle is transferred to shoulder joint then other this counterforce may lead to shoulder instability¹. Shoulder instability constitutes a spectrum of problems that consists of dislocation, subluxation and laxity. Anterior instability is most common then posterior instability, occurs due to traumatic injury which due to repetitive micro trauma and development of posterior rotator cuff weakness².

WOSI (Western Ontario shoulder instability index) In 1998 Kirlkey developed a self administrated Western Ontario shoulder instability index; it has a quality of life measurement tool specific to shoulder. It consist of 21 items, the question were divided into 4 sections (domain). There are 10 questions which address physical Symptoms and pain, 4 question addressing sports recreational and work¹⁶. There is a domain dealing with lifestyle and social function which has been addressed by 4 questions. Another domain with 3 question addressing emotional well being. Each question result in a number between 0-100 and total score may present as a number between 0 - 2100 points. The WOSI has desirable validity, a excessive degree of reliability and a excessive degree of responsiveness, WOSI has advise for evaluating shoulder instability problem¹⁷.

Modified Sphygmomanometer Test (MST) is another method that can be applied in clinical setting for assessment of muscle strength. MST has demonstrated

adequate measurement properties for the assessment of strength of various muscles¹⁴. It can be used by applying simple adaption of very common, portable, low - cost equipment the conventional sphygmomanometer¹³. It is commonly used by health professional for assessment for blood pressure. MST was found excellent test for finding adequate muscle strength.

Theraband was invented in 1896 by Mr. Gustav Gossweiler in Sweden. Theraband is a thick elastic band that provides strengthening the muscles by using resistance, it is made of latex rubber and but there are non-latex varieties are also available for those people who are allergic to latex. The resistance of Theraband depends on the color of band, yellow band offers lightest resistance of 1-6 pounds, red band offers light resistance of 2-7 pound, green band offers light-medium resistance of 2-10 pounds blue band offers resistance of 3-14 pounds, black band offers resistance of 4-18 pounds, silver/gold band offers resistance of 10-40 pounds⁶.

Derby shoulder instability rehabilitation program consist of only one exercise from each section at any one time. In this rehabilitation program resistance is given to the muscles to strength muscles. It was designed to incorporate all the aspect of strength, proprioception, and polymeric training within a specific target driven exercises regime¹⁰.

Hence, this study is to compare the effects of Derby shoulder instability rehabilitation program and Theraband exercises on shoulder instability among Rifle shooters.

2. Method

A total of 30 (both male and female) subjects were participated in this Comparative study and they are divided into two groups by randomized sampling, the duration of study is for about 3month sample size is about 30 rifle shooters from VAJRA Shooting Academy in and around Pondicherry region. The treatment duration is about 30 minutes per session, days a week, for 4 weeks. In this study the group A subject are given with shoulder instability rehabilitation program and group B is given with Theraband exercises.

Inclusion Criteria: Both male and female Age group 18 - 25, WOSI questionnaire cleared with moderate value (500-1050), People who are willing to participate, People involved in Rifle shooting for more than a year.

Exclusion Criteria: Shooters who are not willing to participate, History of recent surgeries of shoulder, History of trauma and shoulder fracture, Signs of serious pathology in shoulder joint, Signs of radiculopathy.

3. Procedure

Rifle Shooters who satisfied the inclusion criteria and showed willingness to participate were selected for the study. Pretest scores of shoulder strength using sphygmomanometer; shoulder instability using WOSI (Western Ontario shoulder instability index) was recorded. Rifle shooters were allocated into two groups by randomized sampling method.

From 30 Rifle shooters, 15 were allocated to GROUP A: Derby Shoulder Rehabilitation Program, 15 were allocated to GROUP B: Theraband Exercises. Each Rifle shooters received their allocated group protocol.

Post test score were taken at the end of the treatment on shoulder strength using sphygmomanometer, shoulder instability using WOSI (western Ontario shoulder instability index).

Outcome Measures:

Shoulder Strength Using Modified Sphygmomanometer Test:

The assessment of shoulder strength using modified Sphygmomanometer test. Shoulder abductor -the subject sat next to the wall with arm in 10 degree of abduction elbow flexed at 90 degree and forearm midprone wrist in neutral with finger flexed. The subject is asked to push the cuff which was above the elbow joint on lateral aspect of arm.

Shoulder internal rotator - subject at the door way with the arm in 10 degree of abduction elbow flexed at 90 degree forearm in midprone wrist neutral and finger flexed. Subjects is composd 4 domain names, were asked to push against the cuff which was above the wrist joint on the volar aspect of forearm.

WOSI (Western Ontario Shoulder Instability Index)

The WOSI was used as outcome measure to assess self reported shoulder instability in Rifle shooters. The 21 object questionnaire is composed 4 domain names is, referring to physical signs, game/activity/work feature, life-style function, and emotional function. Initially responses are given on a one hundred mm visible analogue scale, ranging from no court cases (zero mm) to intense proceedings (one hundred mm). Items were summarized in four Domain sub scores as a total score, ranging from 0 to 2100, where 0 indicated no limitations

in shoulder-related quality of life and 2100 indicated extreme limitations.

Intervention:

Group A: Derby Shoulder Instability Rehabilitation Program¹⁰

Only prescribe on exercising from each section at any individual time. Each set of sporting event is listed so as of treatment progression and can also be used for practical assessment. If the affected person can obtain the target then progress to the next following exercise.

Section 1: running on velocity of muscle activation, plyometrics, deceleration of fast movement. Prescribe maximum repetitions until fatigue or the specified target.

Drop & catch 1kg weight at 90° scaption	100
Drop & catch 1kg weight at 90° scaption on 1 leg (opposite side)	100
Drop & catch 1kg weight at 90° scaption with eyes closed	100
Drop & catch 1kg weight in AER/AIR	100
Drop & catch 1kg weight in AER/AIR	50
Falling press up to waist level	50
Plyometric push up with hand clap	20
Doorway fall	20

Drop & catch kg weight at 90° scaption. AIM-100 reps.



Figure 1: Drop & Catch

Drop & catch 1 kg weight in AIR (posterior instability) or AER (anterior instability) AIM-100 reps



Figure 2: Drop & Catch AER

Section 2: Working on proprioception, muscle balance, trunk stability. Prescribe 5 repetitions of the patient's maximum ability or specified target time.

Two sessions per day

Exercise	Target Time
Single handed ball roll on wall	60 sec
Single handed kneeling crosses	60 sec
Kneeling single handed ball roll	60 sec
Single handed crosses in push up position	60 sec
Double handed ball roll in push up position	60 sec
Double ball roll in push up positions	60 sec

Assumptions: No neurological muscle weakness
 No true scapula winging
 Normal gym ball sitting balance
 Able to achieve 90° s caption

Single Hand Ball Roll on Wall
 Aim - 60 Seconds

Patient leans on the ball in standing position. They roll the ball up and down slowly and as smoothly as possible. Once they can do this easily for 60 seconds they progress to next exercise



Figure 3: Hand ball roll on wall

Single Handed Kneeling Crosses

Aim-60 Seconds: The patient kneels and shifts their body weight through the affected arm in shape of cross



Figure 4: Single hand kneeling

Group B: Theraband Exercise:

The resistance of the Theraband is color-coded in progressive strengths. The resistance began with light (yellow band) and increased progressively. In strength (yellow, red, green, and blue) based on the ability of the subject to properly complete the prescribed sets and repetitions without soreness or perceived excess fatigue. Shoulder abduction was performed by having participant elevate the arms against Theraband from side to 90 degree. Shoulder abduction in scapular plane.



Figure 5: Theraband exercise - shoulder abductors

In shoulder internal rotation the Theraband in attached to the doorknob or other. Grab the Theraband by your hand and with elbow flexed 90 degree, stand straight, with feet are shoulder width apart. Now taking the cord in hand move towards the chest as far as it feels comfortable return to starting position.



Figure 6: Theraband exercise - Internal Rotation

Treatment Protocol ⁽⁶⁾

Theraband color	Red
Exercise	5-repetition
hold time	25 seconds
Duration	3 weeks / alternative days
Frequency	3 times / week

Statistical Analysis

A study to compare the effect of derby shoulder instability rehabilitation program and Therband exercises on shoulder instability among Rifle shooters was founded by

comparing the significance difference between the two groups.

The pre and post test interventional differences within the group were analyzed using paired t test for outcome measure. Statistical significance was set at $p < 0.05$ was considered as a significant difference.

The p-value was chosen as per the description given by research book.

4. Result

Paired t test.

WOSI for group A

The pre test and post test value of WOSI for group A is analyzed using paired t test. For 14 degree of freedom and at 5% level of significance the table value is 2.145 and the calculated value is 24.48 since the calculated t value is greater than the table t value the null hypothesis is rejected. Hence, there is significant effect of Derby shoulder instability rehabilitation program on WOSI.

WOSI for Group B

The pre test and post test value of WOSI for group B is analyzed using paired t test. For 14 degree of freedom and at 5% level of significance the table value is 2.145 and the calculated value is 13.27. Since the calculated t value is greater than the table t value the null hypothesis is rejected. Hence, there is significant effect of Theraband exercises on WOSI.

Strength for Group A

The pre test and post test value of strength for group A is analyzed using paired t test. For 14 degree of freedom and at 5% level of significance the table value is 2.145 and the calculated value for abduction is 15.81 and internal rotation is 14.52. Since both the calculated t value is greater than the table t value the null hypothesis is rejected. Hence there is significant effect of derby shoulder rehabilitation program on strength.

Strength for Group B

The pre test and post test value of strength for group B is analyzed using paired t test. For 14 degree of freedom and at 5% level of significance the table value is 2.145 and the calculated value for abduction is 16.02 and internal rotation is 10.10. Since both the calculated t value is greater than the table t value the null hypothesis is rejected. Hence, there is significant effect of Theraband exercises on strength.

Unpaired t - test

The pre and post value of T test for Rifle shooters between group A and B is analyzed using unpaired T test for 28 degree of freedom and at level 5% of significance the table value 2.048 is and the calculated t value for WOSI is

2.224301 and for strength the calculated T value for abduction is 2.73861 internal rotation is 5.022. Since all the calculate value are greater from the table t value the null hypothesis is rejected. Hence, between the groups shows significant.

5. Discussion

The study were selected for the purpose of comparing the effectiveness of Derby shoulder instability rehabilitation program and Theraband exercise on shoulder instability among Rifle shooters and it shows there was significant effect in statistical analysis with p value (0.05) within the Group A and B. The outcome measures are WOSI questionnaire and modified sphygmomanometer test. The present data indicate that both the training were effective in improving shoulder instability among Rifle shooters.

There are more studies which prove that Derby shoulder instability rehabilitation program and Theraband exercise shows high impact on improving shoulder instability among various instability patient. In my study, I compare both the training on Rifle shooters to find which is more effective in improving shoulder instability and reducing the pain.

JAE-HO CHO, et al., (November 2012), Rifle shooting produce a sudden counterforce against the body through, the anterior shoulder, which may produce a traumatic injury in shoulder. Posterior instability of the shoulder can occur in soldier who practices Rifle shooting.

Ladislav Kovacic, et al., (2016), this study says that rotator cuff muscles are dynamic stabilizer in preventing posterior shoulder instability. From four of the rotator cuff muscle subscapularis provide the greatest resistance to posterior subluxation.

Marcus Bateman, et al., (2015), the study was done on the effect of Derby shoulder instability program on eighteen consecutive patient over a 15 month period to assess current treatment protocol used in the management of patient a traumatic recurrent shoulder instability. The study concluded that Derby shoulder instability rehabilitation program produced statistically significant improvement for the patient with shoulder instability.

S. Harishkumar et al., (September 2017), the study was done on the effect of Theraband strengthening with conventional exercise on pain, function & range of motion in patient with adhesive capsulitis. In this study 30 patients with adhesive capsulitis were selected based on the inclusion and exclusion criteria. Group A received Theraband strengthening with conventional exercise and Group B received conventional exercise and the Group A is more statistically significant then Group B.

I approached the head coach of Pondicherry VAJRA Shooting Academy and I requested for best trained Rifle shooters from there Academy. I got 50 subjects from them and 30 were selected according to the inclusion criteria within age limit of 18-25 and WOSI score of 500-1050. They were randomly divided into two groups, 15 subjects

on each group. Group A performed Derby shoulder instability rehabilitation program and Group B performed Theraband exercise. 30 minutes per session 6 days per week. WOSI questionnaire and strength was assessed by using Modified Sphygmomanometer test was taken before and after 4 week of training. Statistically analysis done on both groups, within the group analysis, both Group A and Group B showed significant improvement. When comparing between the groups, Group-A (Derby shoulder instability rehabilitation program) showed more improvement than Group-B (Theraband exercise).

6. Conclusion

The study concludes that (GROUP-A) Derby shoulder instability rehabilitation program and (GROUP-B) Theraband exercise shows significant effect on improving shoulder instability. When comparing both groups Derby shoulder instability rehabilitation program (GROUP-A) shows more improvement than (GROUP-B) Theraband exercises on shoulder instability among Rifle shooters.

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