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## Rasika Panse

Assistant Professor,  
Department of Physiotherapy,  
Vidyapeeth Pune Tilak  
Maharashtra, India

## Ujwal Yeole

Associate Professor,  
Department of Physiotherapy,  
Vidyapeeth Pune Tilak  
Maharashtra, India

## Krishna Pawar

Department of Physiotherapy,  
Vidyapeeth Pune Tilak  
Maharashtra, India

## Pournima Pawar

Assistant Professor,  
Department of Physiotherapy,  
Vidyapeeth Pune Tilak  
Maharashtra, India

## Effects of Blackburn exercises in shoulder impingement on pain and disability in rock climbers

Rasika Panse, Ujwal Yeole, Krishna Pawar and Pournima Pawar

### Abstract

**Background:** Rock climbing places physical and mental demand which often requires strength, endurance, agility and balance. Tremendous muscular activity is required for Pulling and pushing activity whereas very few movements relies heavily on the pectoral muscles and serrates anterior causing imbalances in shoulder rotation and alteration in scapula-thoracic motions. Aim: to study the effects of Blackburn exercises in shoulder impingement on pain and disability in rock climbers. Objectives: To evaluate the effects of Blackburn exercises in shoulder impingement in rock climbers on pain and disability using SPADI scale.

**Material and methodology:** Total number of 30 professional rock climbers between age group of 18-35 years including genders with at-least 2 years of experience were selected by simple random sampling. SPADI scale was used as outcome measure to assess the pre and post intervention. Intervention included Blackburn exercises of shoulder, scapular muscles which was given thrice a week with each session lasting for 30 minutes.

**Results:** Comparing pre and post intervention data using student paired t test results showed that there was significant improvement in SPADI total score ( $p < 0.0001$ ). Conclusion: There is significant decrease in pain and disability in professional rock climbers.

**Keywords:** Rock climbers, shoulder impingement, SPADI, Blackburn exercise, pain, disability

### 1. Introduction

An activity which include climbing up, down or across natural rock or artificial rock are known as rock climbing<sup>[1]</sup>. Rock climbing is a physically and mentally challenged sports that often tests a climber's strength, endurance, agility and balance along with mental control. It can be dangerous activity and needs knowledge of proper climbing techniques with use of specialized climbing equipment which is crucial for the safe completion of routes<sup>[2]</sup>.

Incidence of shoulder injuries were particular of shoulder among rock climbers 30-75%<sup>[4]</sup>. Mainly sports injuries that occur in rock climbing are due to falls or overuse. The vast majority of injuries from overuse are most often occurring in the fingers, elbows, and shoulders. Shoulder impingement is a condition where shoulders rotator cuff tendons are trapped and compressed during shoulder movements. The injury to the shoulder tendons and bursa results in painful shoulder movements. It can also occur from repetitively moving the shoulder into a stressful (abnormal) position common in climbers<sup>[3]</sup>.

The pulling muscles, such as the elbow flexors and shoulder extensors, are extensively used during climbing to translate the body vertically and horizontally. The less "pushing" muscles, such as the shoulder internal rotators, adductors and elbow extensors must also be acknowledged. Some movements relies heavily on the pectoral muscles and serrates anterior causing imbalances in shoulder rotation and alteration in scapula thoracic motions<sup>[5]</sup>. Training the shoulder rotators and abductors and help prevent muscles imbalances and injuries.

Physical therapists may undergo treatment techniques to improve pain and function, with joint mobilization, interferential therapy, acupuncture, soft tissue therapy, therapeutic taping, rotator cuff strengthening, and education regarding the cause and mechanism of the condition. NSAIDs and ice packs may be used for pain relief<sup>[4]</sup>. There is dearth in literature on exercises regimen on shoulder impingement in rock climbers. Hence we conducted study to evaluate the effectiveness of Blackburn exercises on shoulder impingement in rock climbers.

### Correspondence

#### Rasika Panse

Assistant Professor,  
Department of Physiotherapy,  
Vidyapeeth Pune Tilak  
Maharashtra, India

**2. Methods**

A Pre-Post experimental study was conducted where in 30 rock climbers with shoulder impingement were selected according to inclusion criteria using simple random sampling. Active young adults who participated in rock climbing at least 4 times a year of both genders were included. Participants with Recent fracture or Trauma or any other known medically diagnosed orthopaedic, neurological cardiovascular disorder affecting upper extremity function.

**3. Procedure**

Synopsis was submitted to Institutional Ethical clearance to Tilak Maharashtra Vidyapeeth Department of Physiotherapy. Different trekking groups were approached and 30 samples were randomly selected. Informed consent was taken and subjects were explained the aim and objectives of the study. Demographic data is obtained by using data collection sheet. The subjects were made to do warm up and cool down exercises before the treatment. SPADI was taken pre and post intervention outcome measure. Intervention will be in form of black burn exercises.

**4. Blackburn Exercises: 6 Positions**

**A: Prone Horizontal Abduction (Neutral):** Lie on the table, face down, with arms hanging straight down to the floor and palms facing down. Raise arms out to the side, parallel to the floor. Hold for 2 seconds and lower slowly.

**B: Prone Horizontal Abduction (Full ER):** Lie on the table, face down, with arms hanging straight to the floor, and thumbs rotated up (hitch-hiker position). Raise arms out to the side with slightly in front of shoulder, parallel to the floor. Hold for 2 seconds and lower slowly.

**C: Prone Horizontal Scaption (Neutral):** Lie on the table, face down, with arms hanging straight down to the floor and palms facing down. Raise your arms to the side but slightly forward by about 30 compared to horizontal abduction. Hold for 2 seconds and lower slowly.

**D: Prone Horizontal Scaption (Full ER):** Lie on the table, face down, with arms hanging straight to the floor, and thumbs rotated up (hitch-hiker position). Raise your arms to the side but slightly forward by about 30 compared to horizontal abduction. Hold for 2 seconds and lower slowly.

**E: Prone Horizontal External Rotation:** Lie on the table, face down, with arms abducted horizontal to side and elbows bent 90 pointing down. Rotate arms externally so that forearms come parallel to ground point forward. Hold for 2 seconds and lower slowly.

**F: Prone Horizontal Extension:** Lie on the table, face down, with arms hanging straight down to the floor and palms facing forward. Raise your arms to the horizontal parallel the thorax. Hold for 2 seconds and lower slowly.

The treatment protocol started with simple warm up and cools down exercises as it is crucial for optimizing climbing performances. Then we proceeded with Blackburn exercises which were given 3 times a week with 10 repetitions and hold for 5 seconds.

**5. Statistical Analysis**

Microsoft office excel 2010 was used and statistical analysis was done by Instat. Paired Student t test was used for

normalised the data with  $p < 0.001$  Mean age 22.63 Total number of 21 Males and 9 females participated in study.

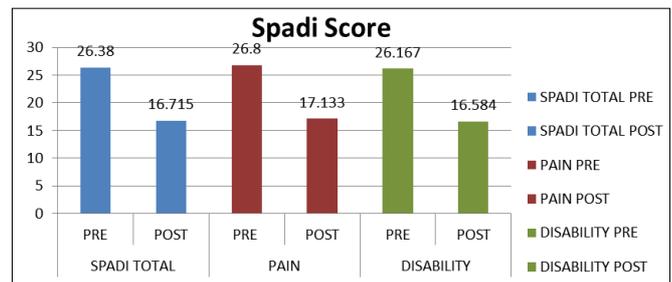
**6. Result**

**Table 1**

Results	Mean±SD
Age	22.63±3.57
BMI	21.50±1.81
Years Of Experience	4.46±0.74
Gender	Male- 21 \ Female- 9

**Table 2**

Outcome Measures	Pre	Post	P-Value
Pain	26.8	17.13	0.0001
Disability	26.16	16.58	0.0001
Spadi Total Score	26.38	16.71	0.0001



**Interpretation:** This table describes the SPADI total, pain and disability score pre and post treatment and shows significant improvement.

**7. Discussion**

In this study the effectiveness of Blackburn exercises in shoulder impingement in rock climbers was checked. Shoulder impingement syndrome is a common cause of shoulder pain. The Impingement occurs when the space between the bones in this passageway is reduced. This can occur from repetitively moving the shoulder into a stressful or suboptimal position—common in climbing, due to this the bones in the shoulder moves down on the tendons and cause shoulder impingement.

Normal shoulder motion: The shoulder complex is comprised of several joints, including the stenooclavicular, acromioclavicular joint, glenohumeral joint, etc. These components provide a great amount of shoulder mobility with limited stability. Static stabilizers include bony structures, labrum, GH ligaments, and joint capsule.

Rotator cuff injuries are a common cause of shoulder pain in people of all age groups. They represent a spectrum of diseases, ranging from acute reversible tendinitis to massive tears involving the supraspinatus, infraspinatus, and subscapularis.

This study was conducted using Shoulder pain and disability index (SPADI) scale and was used to measure current shoulder pain and disability in an outgoing setting. Subjects were selected according to their age group which was young adults (18-30) and specifically rock climbers with 3 and more years of experience. The subjects were then divided with using the SPADI scale with positive and negative result of shoulder pain according to the rock climbers.

Then the subjects with shoulder pain were given proper treatment for atleast 3 times per week to decrease their complain. The treatment given was blackburn exercises to decrease their pain and improve range of motion of shoulder.

There were some articles that showed different treatment procedures like Impingement syndrome is usually treated conservatively.

Warm up and cool down exercises were also taken prior the treatment. The Warm up period is necessary for the numerous adjustments that must take place before physical activity which creates an increase in muscle temperature. The higher temperature increases the efficiency of muscular contractions by reducing muscle viscosity with increasing rate of nerve conduction. Low-intensity, active exercises, stretching like brief walk, stationary bicycle, active heel raises, or few minutes of active arm exercises.

The cool down period is similar to warm up that lasts about 5 to 10 minutes. The purpose of cool down is to maintain the venous return. And prevent fainting by increasing the return of blood to heart and brain and decrease the cardiac output and venous return.

The result of this study of Blackburn exercises in shoulder impingement was positive and patient's pain in certain shoulder movements had decreased after the treatment. The SPADI scale was taken for the checking the pain percent which also showed improvement during the treatment procedure. Hence the Blackburn exercises could be one of way to treat shoulder pain, impingement and to regain proper mobility and decrease pain full movements.

## 8. Conclusion

Our study concluded that the Blackburn exercises is a effective way of treating patients of shoulder impingement.

## 9. Limitations

This study evaluated the effects of Blackburn exercises in shoulder impingement with pain, disability in rock climbers. But with this study it would be difficult to know whether the effect was long term after the exercise program stopped, and no shoulder muscles were considered.

## 10. Future Scope of Study

Further study can be done with a follow-up intervention to evaluate the long term effects of the Blackburn exercises, and can consider shoulder muscles.

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