



EFFECTIVENESS OF BLACKBURN EXERCISES IN SCHOOL TEACHERS FOR SUBACROMIAL IMPINGEMENT BETWEEN THE AGE GROUP 35 TO 45 YEARS OVER THE PERIOD OF 4 WEEK

-AN EXPERIMENTAL STUDY

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INTRODUCTION

Subacromial impingement is a common disorder of the shoulder that results in loss of function and disability in affected patients. The subacromial space is the area between the head of the humerus inferiorly and the underside of the anterior third of the acromion process. The tissues that pass through the subacromial space include the supraspinatus tendon, the subacromial bursa, the long head of the biceps brachii tendon, and the capsule of the shoulder joint^[1]

There are two predominant mechanistic theories that cause the narrowing of the subacromial space in subacromial impingement:

1. Intrinsic impingement
 2. Extrinsic impingement
1. Intrinsic Impingement:

Intrinsic impingement is characterized by partial or full-thickness tendon tears that occur due to a degenerative process over time, often resulting from overuse, tension overload, or trauma to the tendon. Osteophytes, acromial changes, muscle imbalance and weakness, and altered kinematics can also contribute to impingement^[1]

2.Extrinsic Impingement:

Extrinsic impingement involves inflammation and degeneration of the tendon due to mechanical compression by structures external to the tendon^[1]. The extrinsic mechanisms causing subacromial impingement can include faulty posture, changes in scapular kinematics, and posterior capsular tightness^[1].

Proper positioning of the scapula, along with the humerus, helps maintain shoulder strength, stability, and range of motion for daily activities. Altered scapular kinematics can lead to the development of subacromial impingement^[1].

In the teaching profession, changes in scapular position are seen in teachers with more experience^[2]. These changes can happen due to scapular movements such as upward rotation and posterior tilting, which occur alongside a decrease in muscle strength and an increase in overhead activities^[2]. Reduced arm elevation causes narrowing of the subacromial space, potentially leading to the development of impingement^[2]. Studies have shown that shoulder pain is more common in female teachers compared to male teachers^[2].

Studies have shown that teachers exhibit significant alterations in the position of the scapula while using the board^[2].

The Blackburn exercise is a scapular stabilization exercise that helps improve the strength of the rotator cuff muscles in the shoulder joint^[3].

There are a total of six positions that help to^[4]:

1. Decrease pain
2. Improve range of motion
3. Improve mobility

NEED OF STUDY

As teaching experience increases, changes in scapular position also increase. This can be due to muscle strength imbalances, primarily reduced serratus anterior and increased trapezius activation, pectoralis minor or posterior shoulder tightness, or thoracic kyphosis^[2].

It is believed that a reduction in scapular upward rotation and posterior tilt during arm elevation could reduce the available subacromial space, which can lead to the development of impingement^[2].

The Blackburn exercise for subacromial impingement helps decrease pain and improve the range of motion^[4]. It also helps improve the muscle strength of the rotator cuff in the

shoulder joint. This study focuses on the effect of the Blackburn exercise on shoulder impingement in school teachers.

AIM

To determine the effectiveness of the Blackburn exercise protocol in school teachers aged 35 to 45 years with subacromial impingement over a period of 4 weeks.

OBJECTIVES

1. To determine the effectiveness of Blackburn exercises in school teachers with subacromial impingement by using VAS (Visual Analog Scale) as an outcome measure for pain over a period of 4 weeks.
2. To determine the effectiveness of Blackburn exercises in school teachers with subacromial impingement by using SPADI (Shoulder Pain and Disability Index) as an outcome measure for pain and disability over a period of 4 weeks.
3. To determine the effectiveness of Blackburn exercises in school teachers with subacromial impingement by using a handheld dynamometer as an outcome measure for shoulder muscle strength.

HYPOTHESIS

1. Null Hypothesis (H₀):

There will be no effectiveness of the Blackburn exercise protocol in school teachers for subacromial impingement.

2. Alternate Hypothesis (H₁):

There will be effectiveness of the Blackburn exercise protocol in school teachers for subacromial impingement.

REVIEW OF LITERATURE

1. Lori A. Michener, Philip W. McClure, Andrew R. Karduna studied the anatomical and biomechanical mechanisms of subacromial impingement syndrome. The research indicates that subacromial impingement is a common cause of shoulder pain. It highlights changes in glenohumeral and scapular kinematics, such as reduced scapular motions like posterior tilting, external rotation, and upward rotation, along with increased anterior and superior humeral head translation. Patients with subacromial impingement syndrome often exhibit muscle weakness or fatigue in the muscles that control these movements. Postural, kinematic, and muscular alterations contribute to the narrowing of the subacromial space and affect structures within it.
2. Niloofar Rahman and Deeptee Walikoo investigated the association of blackboard teaching with scapular positioning, shoulder pain, and disability among school teachers in Dehradun. Their study demonstrated that prolonged use of a blackboard can alter scapular position, leading to scapular dyskinesia, which is associated with shoulder pain and disability among teachers.
3. Beril Dogu, Fusun Sahin, Figen Yilmaz, and Banu Kuran conducted a study comparing the effectiveness of different questionnaires for follow-up diagnosis of subacromial impingement syndrome. They evaluated the Shoulder Disability Questionnaire (SDQ), Shoulder Pain and Disability Index (SPADI), and Western Ontario Rotator Cuff Index (WORC). Their findings suggest that all three scales are useful for assessing changes in patients with subacromial impingement syndrome. However, the SPADI scale is particularly suitable for rapid assessment within a short period of time.
4. Rasika Panse, Ujwal Yeole, Krishna Pawar, and Pournima Pawar investigated the effects of Blackburn exercises on shoulder impingement in rock climbers. Their study implemented a 4-week protocol involving Blackburn exercises performed three days a week. The research demonstrated that these exercises significantly reduce pain and improve shoulder range of motion. Additionally, Blackburn exercises enhance shoulder mobility, making them beneficial for individuals with shoulder impingement.

METHODOLOGY

Study Design: Experimental study

Study Population: School teachers

Sample size: 54

Study setting: in and around Pune

Study duration: 6 Months

Sampling Method : Convenient sampling

Intervention duration: 4 Weeks

CRITERIA

A] Inclusion Criteria:

1. Age group: 35 to 45 years.
2. Presence of shoulder pain during and after teaching on the dominant side.
3. Teaching Experience: Should have at least 5 years of experience.
4. Positive Neer's test or Hawkins-Kennedy test or Jobe's test/Empty Can test (at least one of the following tests should be positive).
5. Presence of a painful arc during elevation of the arm from 60 to 120 degrees.
6. VAS score should be in the moderate range (4 to 7).

B] Exclusion Criteria:

1. Recent history of shoulder fracture or surgery.
2. Shoulder dislocation.
3. Neurological disorders related to the upper limb.
4. Any regional tumor in the upper limb.

Diagnostic Criteria:-

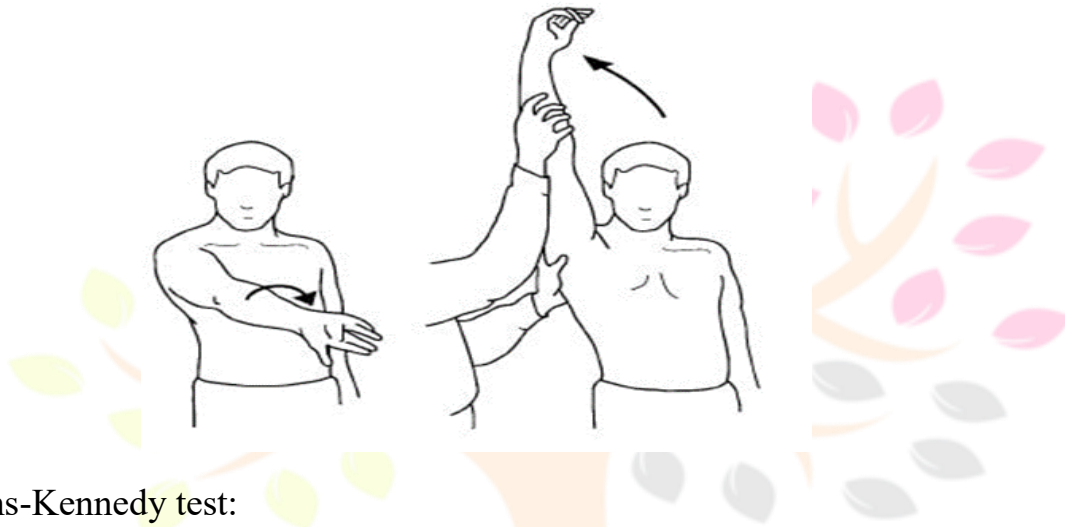
A]Special test:-

1]Neer test:-

Patient position:- Standing

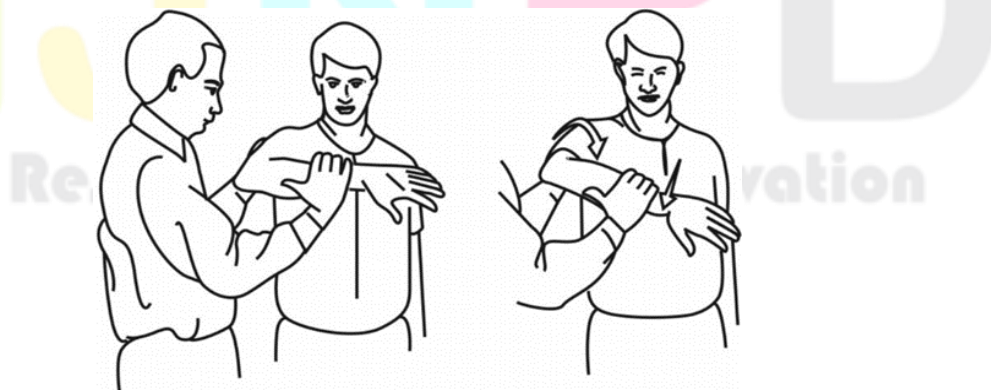
Procedure:- The patients arm is passively and forcefully fully elevated in the scapular plane with arm medially rotated by the examiner. This passive stress causes the greater tuberosity to jam against the anteroinferior border of the acromion.

Result:-The positive test indicates an overuse injury to the supraspinatus muscle.



2]Hawkins-Kennedy test:

- Patient position: Standing.
- Procedure: The examiner forward flexes the arm 90 degrees and then forcibly medially rotates the shoulder.
- Result: Pain indicates a positive test for supraspinatus tendonitis or secondary impingement.

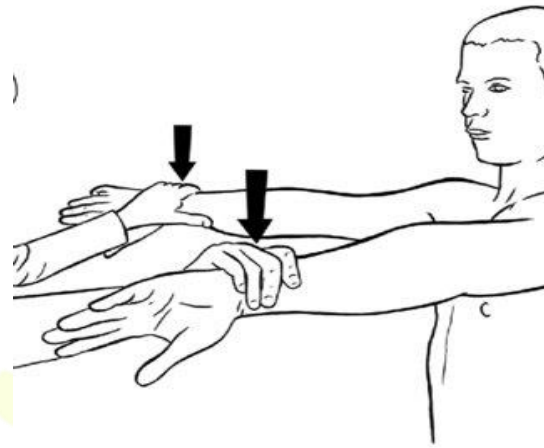


3] Jobe's test:

Patient position: Standing.

Procedure: The patient's arm is abducted to 90 degrees with neutral rotation, and the examiner provides resistance to abduction. Then, the shoulder is medially rotated and angled forward 30 degrees so that the patient's thumb points toward the floor. Resistance to abduction is given while the examiner looks for weakness or pain reflecting a positive test.

Result: A positive test indicates a tear of the supraspinatus tendon or muscle.

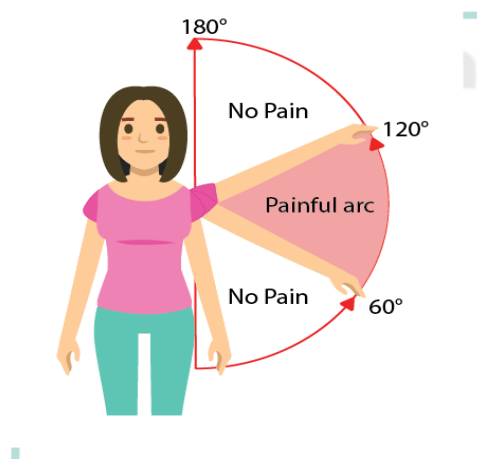


4] Painful arc syndrome:

Patient position: Ask the patient to elevate the upper extremity by abducting the shoulder.

Procedure: The examiner should note whether a painful arc is present. As the patient abducts further (60 to 120 degrees), the structures (e.g., subacromial bursa, rotator cuff tendon insertions, especially supraspinatus) become pinched, and the patient is often unable to abduct fully due to pain.

Result: A positive test indicates impingement of the rotator cuff tendon, especially the supraspinatus.



MATERIALS

Pen

Consent form

Mat

SPADI score sheet

Baseline hydraulic dynamometer

OUTCOME MEASURES

1. Visual Analog Scale (VAS) [moderate range: 4 to 7]

- Reliability: 0.99

2. Shoulder Pain and Disability Index (SPADI)

- Reliability: >0.89

3. Handheld Dynamometer

- Reliability: 0.865



PROCEDURE

The study commenced with the presentation of a synopsis to the Ethical Committee of P.E.S. Modern College of Physiotherapy.

Ethical clearance from the committee was obtained before the study began.

Participants were chosen based on inclusion and exclusion criteria.

The purpose of the study was explained to the subjects, and written consent was obtained.

Pre- and post-assessments of strength, pain, and disability were conducted using a Handheld Dynamometer, Visual Analog Scale (VAS), and Shoulder Pain and Disability Index (SPADI).

Half of the patients in the sample size received the Blackburn Exercise Protocol.

Data were collected, and pre-post data were statistically analyzed.

PROTOCOL

Blackburn exercises :- 6 positions [3 times a week with 10 repetitions]

A) Prone Horizontal Abduction (Neutral):

- Lie face down on a table with your arms hanging and palms facing the floor. Raise your arms out to the sides until they are level with the floor, hold for 2 seconds, then lower them slowly.



B) Prone Horizontal Abduction (Full External Rotation):

- Lie face down on a table with your arms hanging and thumbs pointing up. Lift your arms out to the sides, slightly in front of your shoulders, until they are level with the floor, hold for 2 seconds, then lower them slowly.



C) Prone Horizontal Scaption (Neutral):

- Lie face down on a table with your arms hanging and palms facing the floor. Raise your arms to the sides, angled forward by about 30 degrees, hold for 2 seconds, then lower them slowly.



D) Prone Horizontal Scaption (Full External Rotation):

- Lie face down with arms down and thumbs up. Lift arms to the sides, angling them forward by 30 degrees. Hold for 2 seconds, then lower.



E) Prone Horizontal External Rotation:

- Lie face down with arms abducted and elbows bent at 90 degrees. Rotate arms outward to be parallel to the ground. Hold for 2 seconds, then lower.



F) Prone Horizontal Extension:

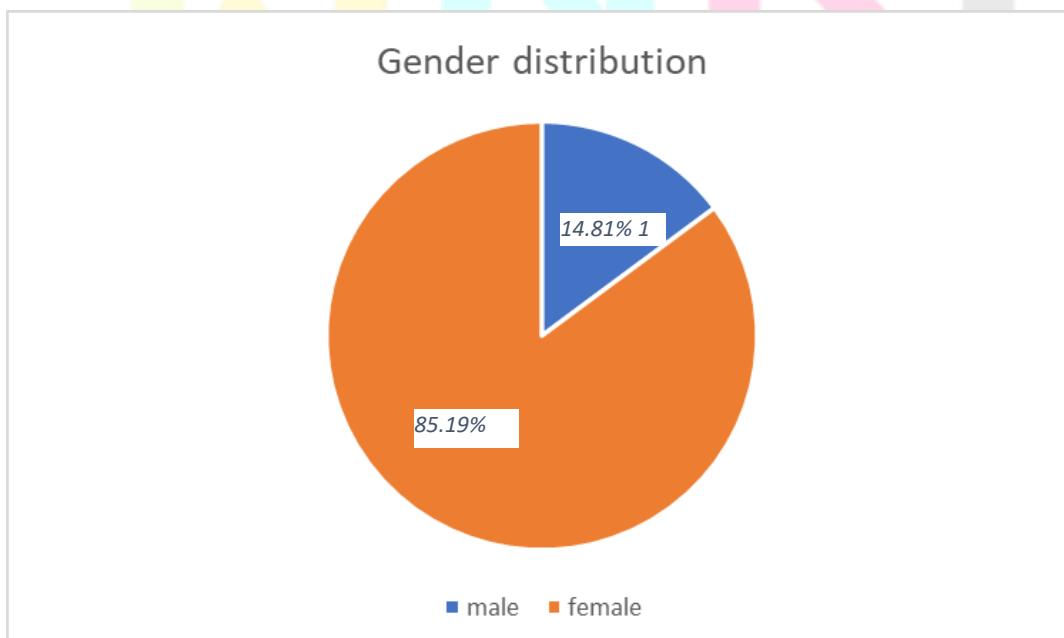
- Lie face down with arms down and palms forward. Lift arms to a horizontal position. Hold for 2 seconds, then lower.



Data Analysis

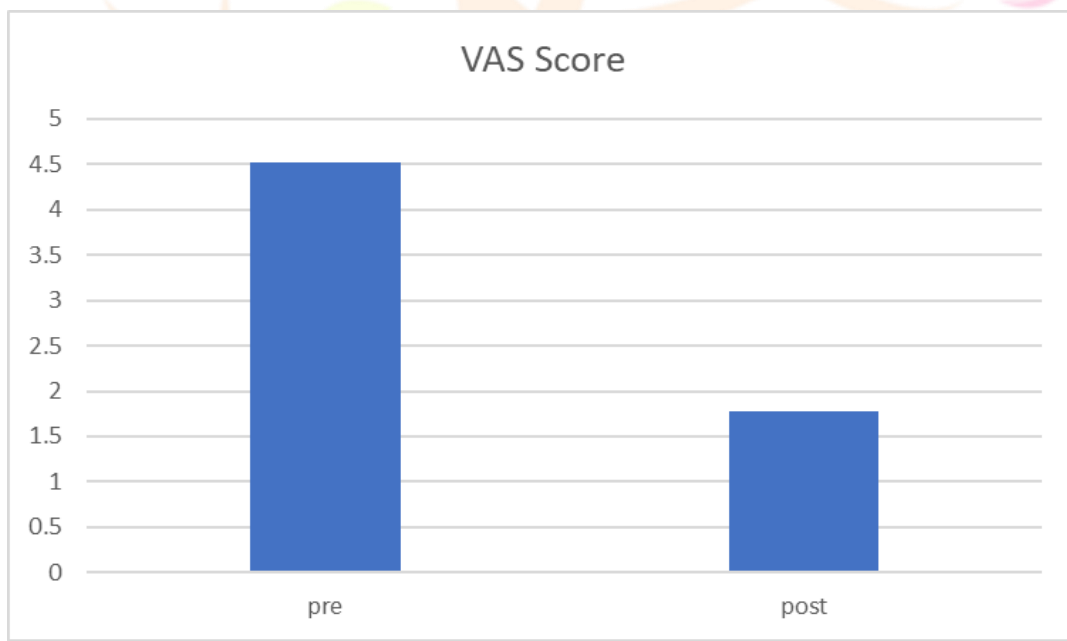
Effectiveness of blackburn exercises in school teachers for subacromial impingement between the age group 35 to 45 years

Table 1:-Shows gender distribution



Pre score Mean + SD	Post score Mean + SD	t – value	p – value	Results
4.52 + 0.75	1.78 + 0.57	21.42	< 0.0001	Extremely significant

Table 2 :- Comparison of Pre and Post VAS Score



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Table 3 :- Comparison of Pre and Post SPADI Score

Pre score Mean + SD	Post score Mean + SD	t – value	p – value	Results
67.90 + 11.31	30.87 + 5.20	18.96	< 0.0001	Extremely Significant

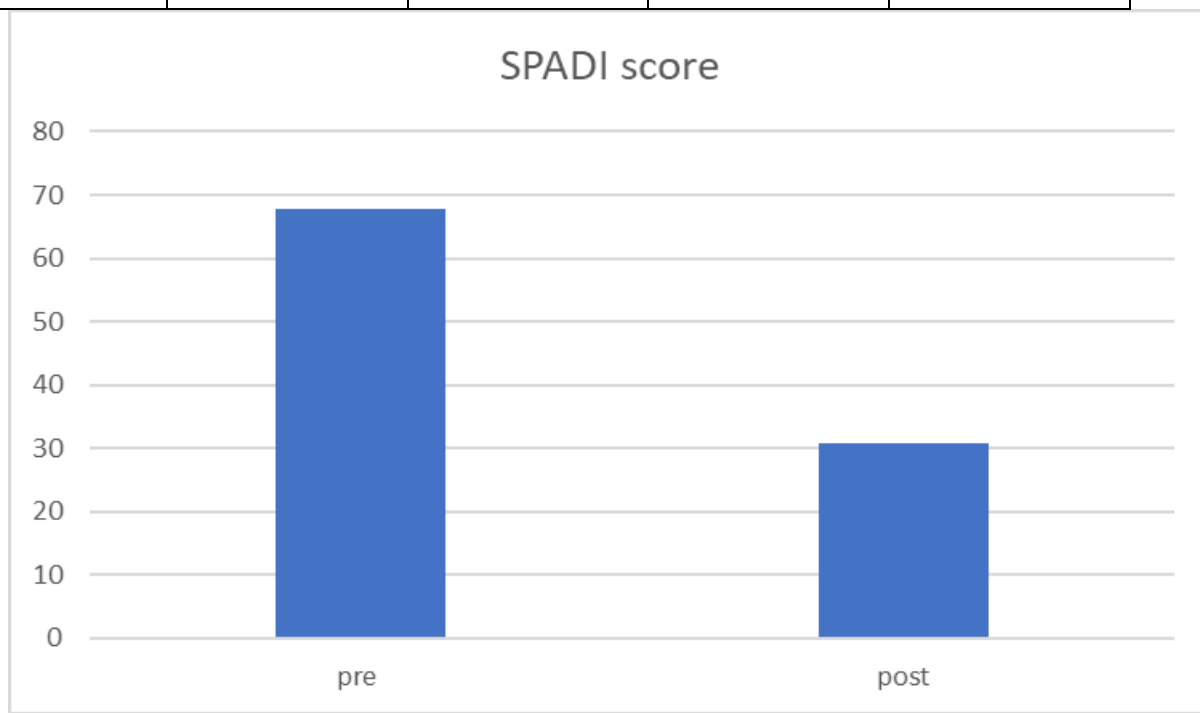


Table 4 :- Comparison of Pre and Post strength of Deltoid muscle

Pre score Mean + SD	Post score Mean + SD	t – value	p – value	Results
5.43 + 0.54	7.41 + 0.50	19.94	< 0.0001	Extremely Significant

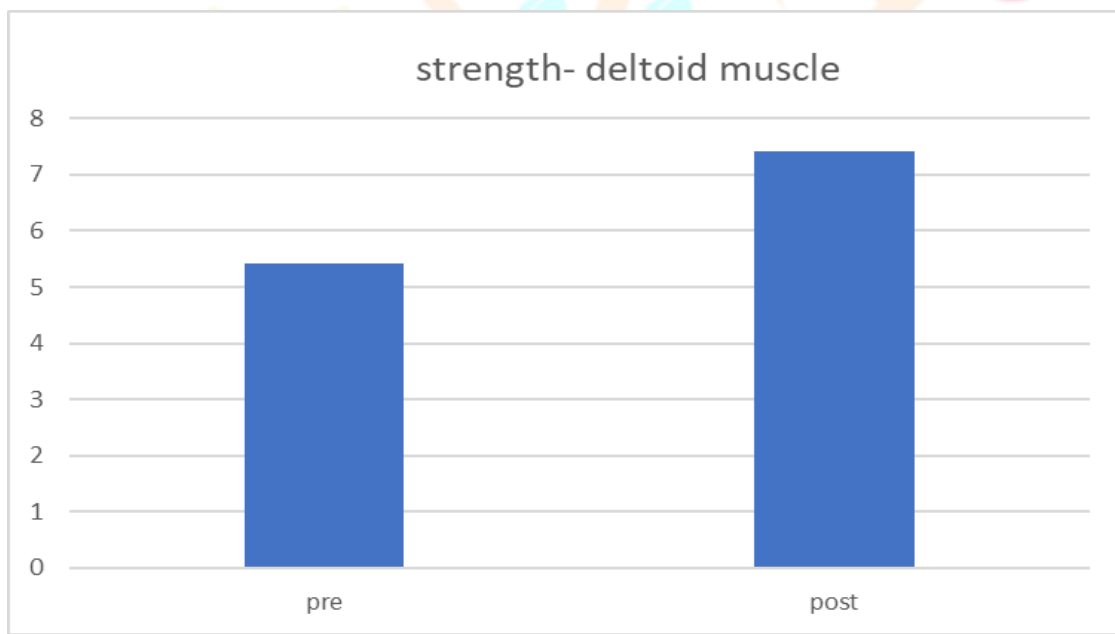
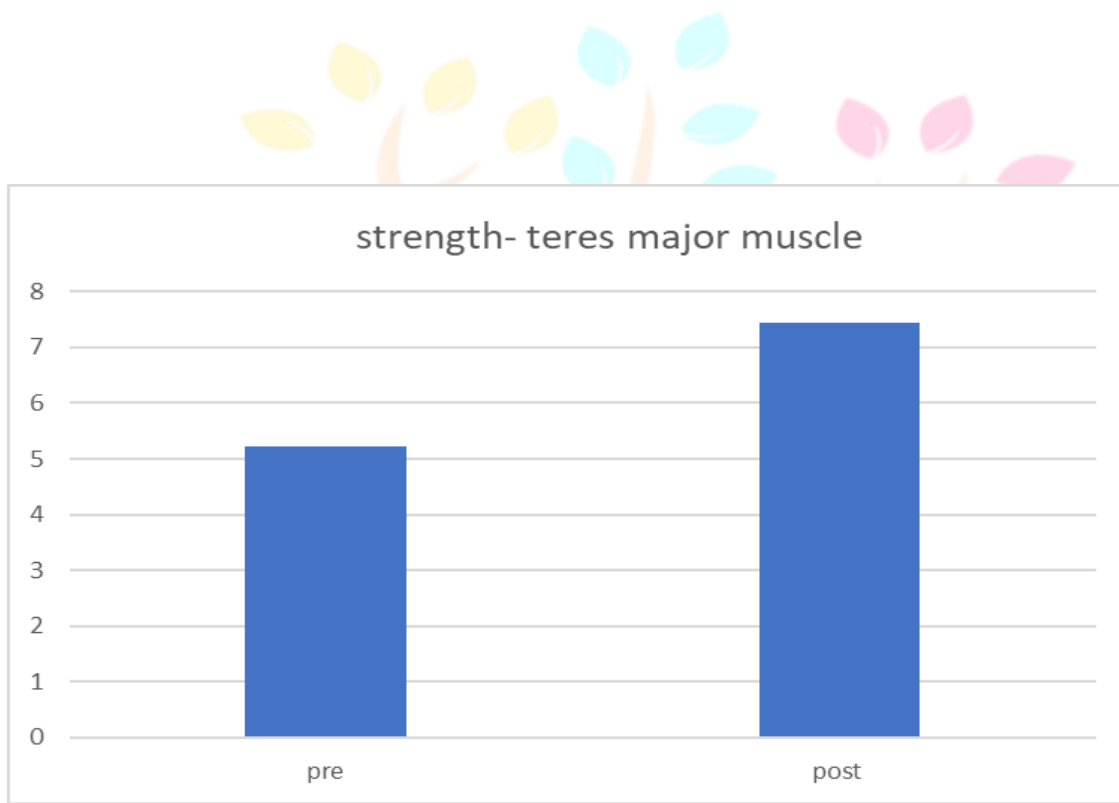


Table 5 :- Comparison of Pre and Post strength of teres major muscle

Pre score Mean + SD	Post score Mean + SD	t – value	p – value	Results
5.22 + 0.72	7.43 + 0.50	18.51	< 0.0001	Extremely Significant



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Table 6 :-Comparison of Pre and Post strength of supraspinatus muscle

Pre score Mean + SD	Post score Mean + SD	t – value	p – value	Results
5.13 + 0.58	7.48 + 0.50	22.39	< 0.0001	Extremely Significant

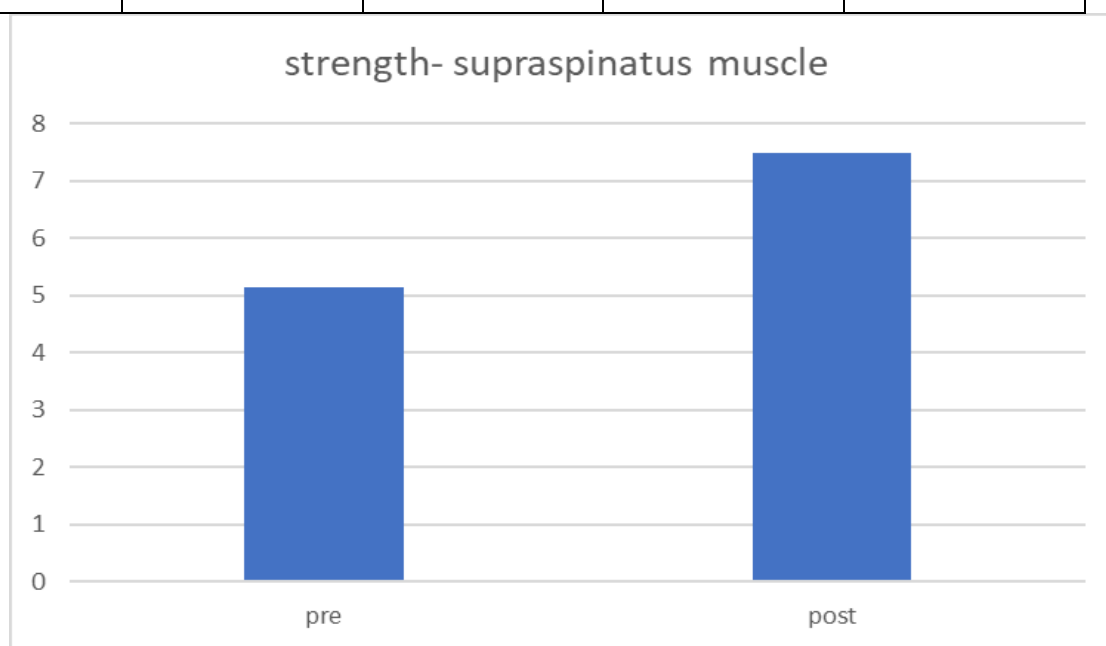
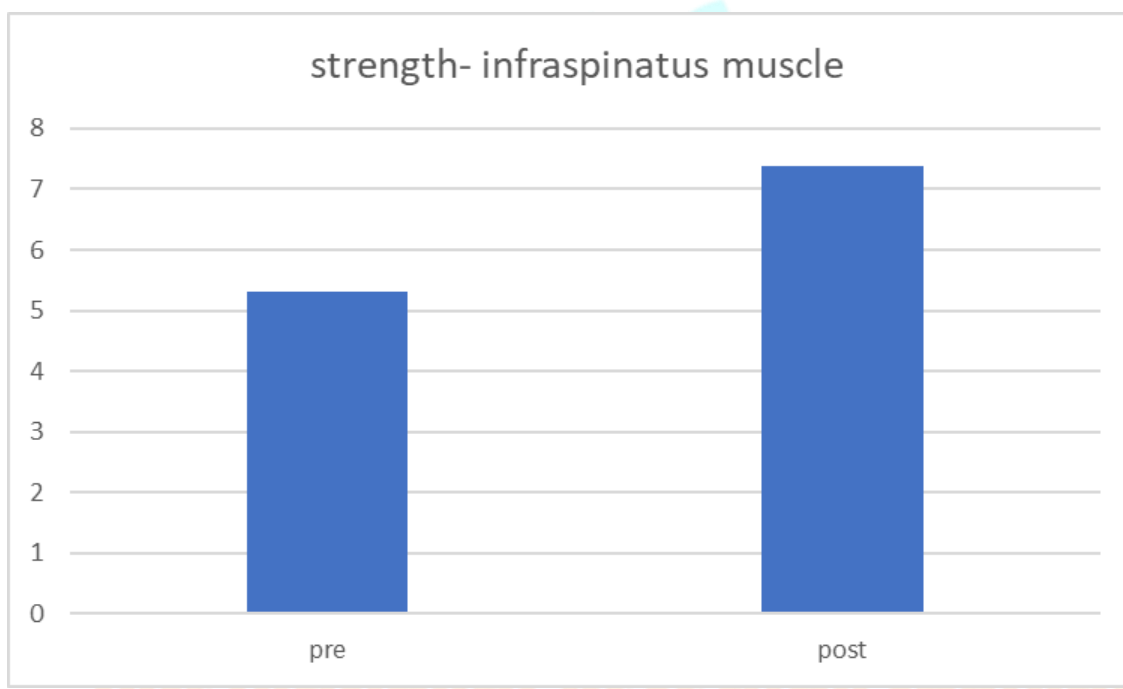


Table 7:- Comparison of Pre and Post strength of infraspinatus muscle

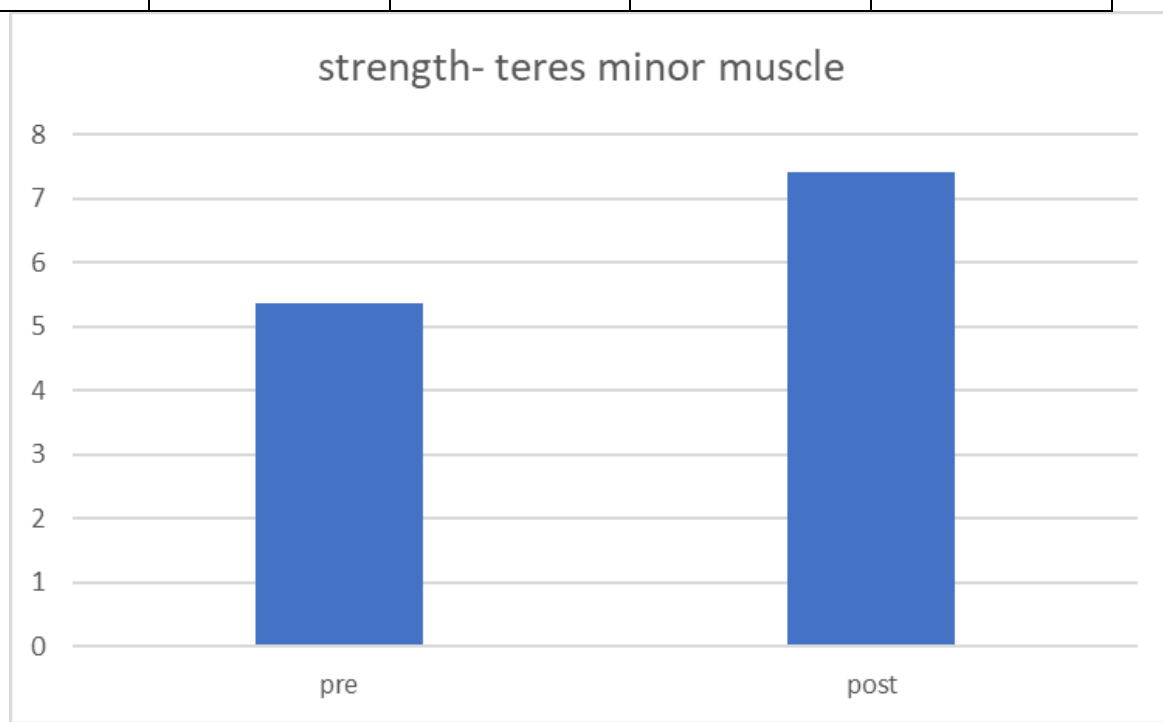
Pre score Mean + SD	Post score Mean + SD	t – value	p – value	Results
5.31 + 0.47	7.39 + 0.49	22.42	< 0.0001	Extremely Significant



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Table 8:- Comparison of Pre and Post strength of teres minor muscle

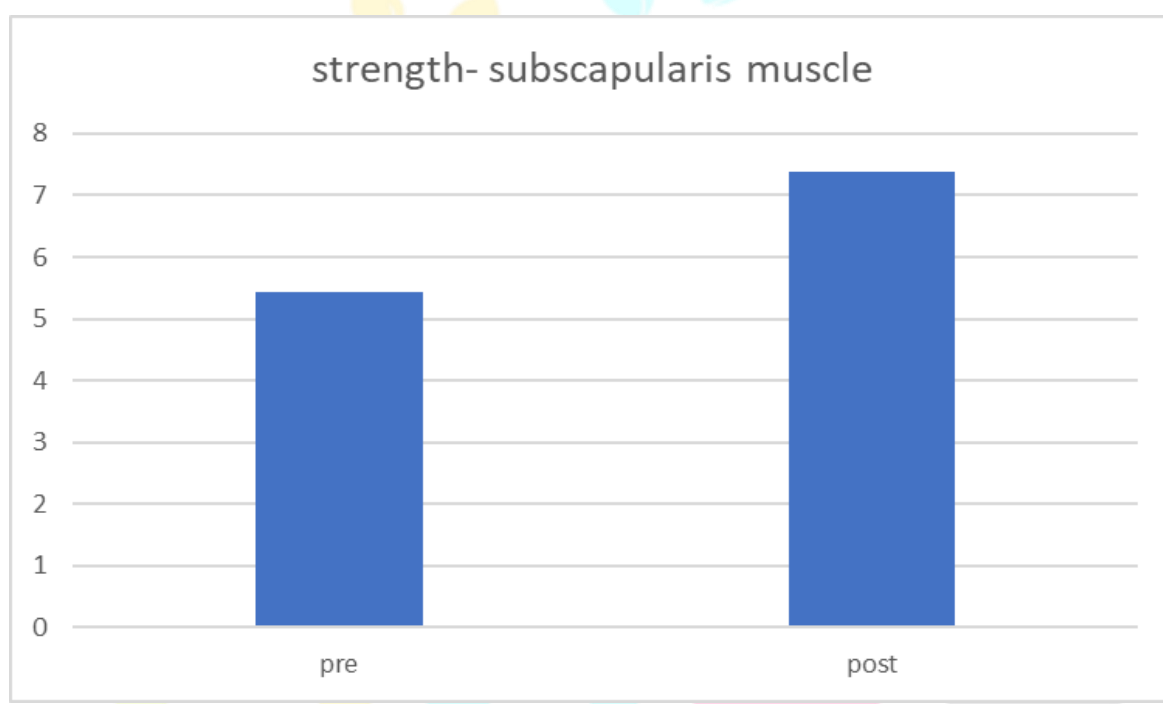
Pre score Mean + SD	Post score Mean + SD	t – value	p – value	Results
5.37 + 0.49	7.41 + 0.50	21.52	< 0.0001	Extremely significant



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Table 9 :- Comparison of Pre and Post strength of subscapularis muscle

Pre score Mean + SD	Post score Mean + SD	t – value	p – value	Results
5.43 + 0.50	7.39 + 0.49	20.58	< 0.0001	Extremely significant



Results

In this study, 54 subjects, both male and female, were selected using a convenience sampling method. The outcome measures, including VAS, SPADI scores, and shoulder muscle strength, were assessed at the start of the intervention and after 4 weeks.

Tables 2 and 3 show a p-value of < 0.0001 for pre- and post-intervention VAS and SPADI scores, indicating that Blackburn exercises significantly reduce pain after 4 weeks.

Tables 4 through 9 demonstrate a significant difference (p-value < 0.0001) in muscle strength for the deltoid, teres major, supraspinatus, infraspinatus, teres minor, and subscapularis muscles before and after the intervention. This indicates that Blackburn exercises significantly improve shoulder muscle strength over 4 weeks.

Discussion

The present study was conducted to evaluate the effectiveness of Blackburn exercises in school teachers aged 35 to 45 years with subacromial impingement over a period of 4 weeks.

Subacromial impingement is a common shoulder disorder that results in loss of function and disability in affected patients. The subacromial space is the area between the head of the humerus inferiorly and the underside of the anterior third of the acromion process. The tissues that pass through the subacromial space include the supraspinatus tendon, subacromial bursa, long head of the biceps brachii tendon, and the shoulder joint capsule.

Proper positioning of the scapula along with the humerus helps maintain shoulder strength, stability, and range of motion for daily activities. Altered scapular kinematics can lead to the development of subacromial impingement.

In teaching profession, the changes in scapular position are seen in teachers who are having more teaching experience^[2]. This can happen due to decrease in muscle strength, increase in overhead activities^[2]. Reduced scapular movements such as upward rotation, posterior tilting while doing arm elevation causes narrowing of subacromial space which can lead to the development of impingement^[2].

The majority of overuse injuries most frequently affect the fingers, elbows, and shoulders^[4].

When a person moves their shoulders, the rotator cuff tendons get caught and compressed, a condition known as shoulder impingement. Shoulder aches are caused by damage to the bursa and tendons of the shoulder. It can also happen when the shoulder is repeatedly moved into an uncomfortable (abnormal) position^[4].

Physical therapists may utilize joint mobilization, acupuncture, soft tissue therapy, therapeutic taping, rotator cuff strengthening, and education on the underlying causes and mechanisms of their conditions to enhance pain and function. Pain treatment options include NSAIDs and cold packs. There is limited research on shoulder impingement exercise regimens specifically tailored for school teachers. Therefore, we conducted this

study to investigate the effectiveness of Blackburn exercises for treating shoulder impingement in school teachers.

In the present study, a total of 54 subjects, both male and female aged between 35 to 45 years, were selected using a convenient sampling method. Ice packs were advised for pain relief, and Blackburn exercises were explained to the subjects. The outcome measures VAS and SPADI scores, as well as shoulder muscle strength, were assessed at the beginning and after 4 weeks, at the end of the intervention.

The study included school teachers experiencing pain from repeated overhead activities, such as writing on a board. The significant difference (p -value < 0.0001) in pre- and post-intervention VAS and SPADI scores indicates a reduction in pain at the end of the 4 weeks.

The baseline hydraulic handheld dynamometer was used as an outcome measure before and after the intervention to assess shoulder muscle strength. A significant difference (p -value < 0.0001) was observed in the pre- and post-intervention scores for muscle strength, including deltoid, teres major, supraspinatus, infraspinatus, teres minor, and subscapularis. This indicates that Blackburn exercises effectively enhance shoulder muscle strength by the end of the 4-week period.

According to Annika Taulaniemi et al., exercise is widely recognized as the most effective treatment for managing and preventing pain. Regardless of the type of physical activity, exercise activates natural pain inhibitory pathways and reduces sensitivity to unpleasant stimuli. Blackburn exercises similarly demonstrate these pain-relieving effects.

As highlighted by Ujwalla Garad and Dr. Unika Purohit et al., maximizing the effectiveness of Blackburn exercises involves focusing on tightly squeezing the shoulder blades. This isometric exercise targets muscle endurance and strength by stimulating the Golgi tendon organ, which is located at the tendon-muscle fiber junction and increases muscle tension in response to contraction.

Overall, the study's findings provide valuable insights into the efficacy of Blackburn exercises as an intervention strategy for alleviating pain and improving muscle strength among school teachers. The statistically significant improvements observed in VAS and SPADI scores underscore the program's potential to enhance individuals' overall condition.

Conclusion

In this study, pre-assessment and post-assessment showed significant results when treating school teachers experiencing pain and strength issues within the age group of 35 to 45 years.

Blackburn exercises have been proven effective in reducing pain and improving muscle strength among school teachers over a period of 4 weeks.

Therefore, the Null Hypothesis H₀ is rejected, and the Alternate Hypothesis H₁ is accepted.

Limitations

Gender distribution was not equal due to less number of male teachers as compared to female teachers in school.

Future scope

Could assess patients with severe pain (VAS:- 8 to 10)

Could assess patients having work experience of more than 5 years.

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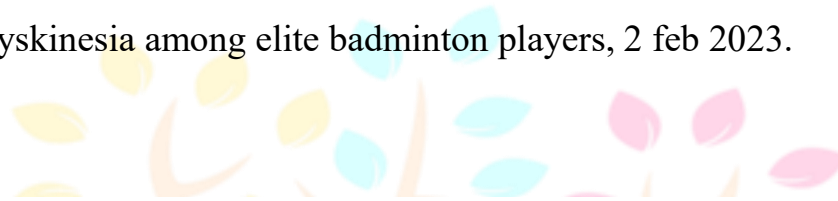
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ANNEXURE

Title: Effectiveness of Blackburn Exercises in school teachers for subacromial impingement between the age group 35 to 45 years over the period of 4 weeks – An experimental study

Site Address: _____

Patients Initial: _____

I _____, Age _____ years, hereby, having fully understood the procedure willingly give the consent for the above titled clinical study. I affirm that there has been no compulsion in my agreeing for the same. By this consent I agree to comply with the procedure explained to me as a volunteer, which I do of my own free will. I have been explained the general purpose of the experiment that it is for the benefit of science and mankind. I hereby declare that all the information given is correct to the best of my knowledge.

Patient's Name: _____

Patient's Address: _____
