



EFFECTIVENESS OF BLACK BURN EXERCISE VS SHOULDER ISOMETRIC EXERCISE ON PAIN, STRENGTH AND DISABILITY IN PARTICIPANTS WITH FROZEN SHOULDER: A COMPARATIVE STUDY

Physiotherapy

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ABSTRACT

Background: Frozen shoulder, or adhesive Capsulitis, is a painful condition characterized by progressive stiffness and restricted shoulder movement. It commonly affects middle-aged individuals and significantly impairs daily functioning. Among physiotherapeutic interventions, Blackburn and isometric exercises are frequently used to enhance shoulder mobility and strength. However, direct comparative evidence of their effectiveness is limited. **Method:** Twenty-six participants diagnosed with frozen shoulder were randomly assigned to two groups: Group A (n=13) received Blackburn exercises. Group B (n=13) received isometric exercises. Outcome measures included the Numerical Pain Rating Scale (NPRS), Shoulder Pain and Disability Index (SPADI), and Manual Muscle Testing (MMT), assessed pre- and post-intervention. Data were analyzed to assess within-group and between-group difference. **Results:** Both groups showed significant improvements in pain (NPRS, $p<0.001$), Disability (SPADI, $p<0.001$), and muscle strength ($p<0.05$). Group A had greater pain reduction ($p=0.05$) and better SPADI scores ($p=0.10$). Shoulder flexor strength gains marginally favoured Group A ($p\approx 0.055$). **Conclusions:** Both exercise programs improved pain, disability, and strength but Blackburn exercises (Group A) led to greater pain relief and stronger shoulder flexors, suggesting they may be more effective for managing frozen shoulder.

KEYWORDS

Frozen Shoulder, Blackburn Exercises, Isometric Exercises, NPRS, SPADI, MMT

INTRODUCTION

Adherent Capsulitis, occasionally known as firm shoulder, is a common shoulder disease marked by defined and excruciating exertion and unresisting range of movement (ROM) as well. According to reports, between 2 and 5 of people in the general population get firm shoulder, but in cases with diabetes and thyroid conditions, the frequency rises to 10 to 38. People with main frozen shoulder frequently range in age from 40 to 65, and it seems that women are more likely than men to have it^[1].

Habitual capsular inflammation with fibrosis, adhesion and annihilation of common depression are the significant pathological changes in tenacious Capsulitis. Sequence of events occurs gradually. Micro trauma or any pouring factor that leads to degenerative changes in the structure of the capsule. As a result, the elastic element of the capsular collaenous Atkins is lost and autonomic dysfunction may affect. And this may lead to inflammation of the capsule. Tenacious Capsulitis can be primary or secondary. Immediate or idiopathic adherent Capsulitis can near down spontaneously without any unique trauma or stimulating episode. After particular fracture disturbance of the glenohumeral junction or unlike serious articular trauma, secondary convert Capsulitis is continually caught^[2].

Blackburn exercises have been studied for their ability to reduce shoulder discomfort and impairment in rock stars. Ascent enthusiasts and they have concluded that the Blackburn exercises are a successful treatment for shoulder impingement. In The literature suggests that patients' chronic or recurrent shoulder pain may be caused by unusual scapular biomechanics. The goal should be to treat and prevent scapular dyskinesia by stabilizing and enhancing the scapular muscles. Black burn exercise includes Six various steps^[3].

Isometric exercise is applied a Continuum of veritably gentle to Maximum compression, and they are applied at varying muscle lengths by changing common angles. Choice of the intensity, muscle length or common angle and the number of repetition is grounded on current strength, and stages of recovery^[4].

Need Of Study

The efficiency of the black burn exercises and shoulder isometric exercise in participants with the frozen shoulder is compared in the study in order to produce the best outcomes and obtain the maximum benefits. According to previous researches there is no evidence that

this type of research has provided enough evidence. So the need of the study is to assess which exercise is more beneficial in participants with frozen shoulder.

Aim Of The Study

The aim of the study is to evaluate the effectiveness of Blackburn exercises and shoulder isometric exercises on pain, muscle strength, and disability in participants with frozen shoulder.

Objectives Of The Study

- To evaluate the effectiveness of Blackburn exercises and shoulder isometric exercises on pain in participants with frozen shoulder using the NPRS scale.
- To evaluate the effectiveness of Blackburn exercises and shoulder isometric exercises on muscle strength in participants with frozen shoulder using MMT.
- To evaluate the effectiveness of Blackburn exercises and shoulder isometric exercises on disability in participants with frozen shoulder using the Shoulder Pain and Disability Index (SPADI).

HYPOTHESES

Null Hypothesis [H0]

There will be no significant effect of the Blackburn exercise and shoulder isometric exercise program on reducing pain, improving muscle strength, or reducing shoulder disability in participants with frozen shoulder.

Experimental Hypothesis [H1]

There will be a significant effect of the Blackburn exercise and shoulder isometric exercise treatment program in reducing shoulder pain, improving muscle strength, and reducing shoulder disability in participants with frozen shoulder.

REVIEW OF LITERATURE

- Vaishnavi Raut et al. (2023) conducted an experimental study titled "Effectiveness of Blackburn Exercise on Pain, ROM, and Disability in Shoulder Impingement Syndrome among Construction Workers." this study conclude that the Blackburn exercises effectively reduce pain and improve shoulder ROM and functional disability in this population^[5].
- Dr. Sanket Parekh et al. (2024) conducted a comparative study on Effectiveness of Black Burn Exercises Vs Conventional Physiotherapy Exercises in Patients with Shoulder Pain and this

study concluded that the Black burn exercises have showed superior results compared to conventional exercises in improving all three outcomes of Pain, Disability and Functions in patients of shoulder pain^[6].

MATERIALS AND METHODOLOGY

Type of Research - Interventional study

Study Design - Comparative study

Sample Design - Convenience sampling

Study Population - Participants with frozen shoulder.

Sample Size - 26 participants [Group A – 13 participants, Group B – 13 participants]

Study Setting - Multi-centre clinics, in Visnagar and Patan.

Study Duration - 6 months

Treatment Duration - 4 weeks

Sampling Criteria

Inclusion Criteria

- Both male and female
- Frozen shoulder with or without painful arc syndrome
- Age: 40 to 65^[1]
- People who are willing to take part in this study
- Acute and Chronic condition
- Patient with Diabetes mellitus

Exclusion Criteria

- Arthroplasty
- Patient who have undergone recent a surgical procedure
- Cervical radiculopathy
- Participants with secondary to brachial plexus injury, parkinsonism
- Ankylosis infection

Outcome Measures

- Intensity of pain -NPRS (Numerical Pain Rating Scale)
- Shoulder pain and disability index [SPADI]
- Manual muscle testing technique

NPRS [Numerical pain rating scale]

- Numerical Pain Rating Scale that is a unidimensional measure of pain intensity in adults, including those with chronic pain. The 11-point numeric scale ranges from '0' representing one pain extreme (e.g. "no pain") to '10' representing the other pain extreme (e.g. "pain as bad as you can imagine" or "worst pain imaginable")^[7].
- Scores range from 0-10 points, with higher scores indicating greater pain intensity.

Shoulder Pain And Disability Index [SPADI]

- The shoulder pain and disability index is a self administered questionnaire of two dimensions one for pain and other for functional activities. Pain dimension consists of five questions regarding to severity of an individual's pain and functional activities are assessed with eight questions with various ADLs^[7].
- Interpretation of score: Total pain score: $\frac{\text{score}}{50} \times 100 = \%$.
- Total Disability score: $\frac{\text{score}}{80} \times 100 = \%$.
- Total SPADI score: $\frac{\text{score}}{130} \times 100 = \%$.
- The means of the two subscales are averaged to produce a total score ranging from 0 (best) to 100 (worst). Minimum

Manual Muscle Testing Technique

Grades for a manual muscle test are recorded as numerical scores ranging from Zero (0), which represents a no activity, to five (5), Which represents a "normal" or best possible response to the test or as great a response as can be evaluated by a manual muscle test^[8].

Data Collection Procedure

After Ethical approval, the patients with frozen shoulder were identified from multi-centre clinics. Individuals who fulfilled the selection criteria were informed about the study and were requested to sign written consent forms. Patients who signed the consent forms underwent pre-evaluation. The pre-evaluation form consisted of the

SPADI, MMT, and pain assessment using the NPRS. The participants were divided into two groups, i.e., Group A and Group B, by convenient sampling. Group A was given Blackburn exercises, and Group B was given shoulder isometric exercises. This protocol was followed for 5 days per week for 4 weeks.

Treatment Protocol

Duration and Procedure

Group A -Black burn exercise Repeating 10 times in each set of exercise^[3] Hold for 3-6 sec at each Repetition ,Do 3 sets per day, Do 5 sessions per Week, Hold which gradually progress to the 10 secs hold after 2 Weeks, 2 min Rest will be given after 1 set.

There are six key steps in the Blackburn exercise, which are:

1. Prone Horizontal Abduction (Neutral): Lie flat on your stomach with your arms hanging straight down and your palms facing the floor. Raise your arms slowly out to the sides until your body forms a T shape. Hold for a couple of seconds, then lower back down.
2. Prone Horizontal Abduction (Full ER): Same starting position, but this time turn your thumbs up (like a thumbs-up sign). Lift your arms out to the side, but a little bit in front of your shoulders. Pause at the top, then lower slowly.
3. 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.
4. 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.
5. Start lying on your stomach with your arms out to the sides, elbows bent so your hands are pointing toward the floor. Rotate your arms up so your forearms come level with the ground. Hold, and then slowly rotate back down.
6. Prone Horizontal Extension: With your arms hanging down and palms facing forward, lift your arms straight back until they're level with your sides. Pause briefly, then lower with control^[3].

Group B – Shoulder Isometric Exercise Group Position: Seated or standing with wall or manual resistance, Shoulder isometric exercise repeating 10 times in each set of exercise^[8], Hold for 10 sec at each Repetition, Do 3 sets per day, Do 5 sessions per Week.

Both groups received no other physical therapy treatments during the intervention period to avoid confounding effects. All exercises were performed under supervision to ensure safety and consistency.

1. Shoulder isometric flexion.
2. Shoulder isometric extension.
3. Shoulder isometric internal gyration.
4. Shoulder isometric external gyration
5. Shoulder isometric hijacking.
6. Shoulder isometric adduction^[8] (Self isometric exercise)

RESULTS

Table 1: Mean Age And Gender Data Of Participants In Group A And Group B

Demographic Details		Group A	Group B
Age	Mean	52.61	58.15
	SD	7.32	6.29
Gender	Male	5	6
	Female	8	7

Table 2: Findings Output Of Pre And Post NPRS Data Score In Group A And Group B

Outcome	Pre-Treatment		Post-Treatment		t value	P value
	Mean	SD	Mean	SD		
NPRS (Group A)	7.46	± 9.67	4.79	± 1.79	2.17	0.00
NPRS (Group B)	7.61	± 9.60	5.69	± 8.54	2.17	0.000

Table 3: Findings Output Of Pre And Post SPADI Data Score In Group A And Group B

Outcome	Pre-Treatment		Post-Treatment		t value	P value
	Mean	SD	Mean	SD		
SPADI (Group A)	74.41	± 6.75	54.32	± 11.12	2.17	0.00
SPADI (Group B)	72.06	± 7.78	59.15	± 7.94	2.17	0.00

Table 4: Findings Output Of Pre And Post MMT Data Score In Group A And Group B

Outcome		Pre-Treatment		Post-Treatment		t value	P value
		Mean	SD	Mean	SD		
MMT (Group A)	Flexion	2.846	0.688	4.153	0.554	2.178	0.00
	Extension	2.923	0.640	4.153	0.375	2.178	0.00
	Abduction	2.615	0.650	3.846	0.688	2.178	0.00
	Adduction	3.846	0.554	4.923	0.277	2.178	0.00
	In. rotation	2.538	0.877	3.692	0.630	2.178	0.00
	Ex. rotation	2.769	0.599	3.692	0.461	2.178	0.00
MMT (Group B)	Flexion	3.153	0.800	3.538	0.660	2.178	0.10
	Extension	2.692	0.751	3.846	0.688	2.178	0.00
	Abduction	2.846	0.688	3.846	0.554	2.178	0.00
	Adduction	3.692	0.630	4.692	0.480	2.178	0.00
	In. rotation	2.615	0.869	3.461	1.050	2.178	0.00
	Ex. rotation	2.538	0.660	3.307	0.751	2.178	0.00

DISCUSSION

This study aimed to find out which type of exercise works better for people with frozen shoulder: Blackburn exercises or shoulder isometric exercises. 26 participants were divided into two groups. One group received Blackburn exercises (Group A) and other group received isometric exercises (Group B). We have measured each participant's pain (using the Numerical Pain Rating Scale), shoulder function (using the Shoulder Pain and Disability Index), and muscle strength (using Manual Muscle Testing) before and after the treatment.

Both groups saw improvements after the four weeks. However, the group that performed Blackburn exercises had greater reductions in pain and disability. This suggests that these exercises may be more effective for treating frozen shoulder. Muscle strength improved in both groups, but those doing Blackburn exercises showed better gains in important movements like arm flexion and internal rotation-motions needed for daily tasks.

Blackburn exercises target shoulder stability and strengthen the rotator cuff muscles using controlled, active movements. This likely helps improve how the shoulder moves, which can reduce pain and restore function better than isometric exercises. In contrast, isometric exercises involve holding the muscle in a Contracted position without moving the joint, which helps build strength but may not improve mobility as much. Overall, this study supports the idea that frozen shoulder is best managed with Exercise programs that combine movement and strength-building. It also highlights the importance of focusing on shoulder blade (scapular) stability for better recovery outcomes.

Vaishnavi Raut and Golhar (2023) evaluated the efficacy of Blackburn exercises in a 6-week intervention among 64 construction workers with confirmed shoulder impingement syndrome via Neer's, Hawkins–Kennedy, and painful arc tests. Using VAS, SPADI, and goniometer measures, the study assessed changes in pain, shoulder disability, and ROM. This study concluded that Blackburn exercises are effective in reducing pain and enhancing both ROM and functional shoulder performance in this occupational group.

Dr. Sanket Parekh and colleagues (2024) conducted a study comparing the effectiveness of Blackburn exercises versus conventional physiotherapy exercises in patients experiencing shoulder pain. This study concluded that Blackburn exercises are more effective than conventional physiotherapy for managing Shoulder.

CONCLUSION

The study compared two intervention protocols for treating frozen shoulder. Both groups showed significant improvements in pain, function, and muscle strength after 4 weeks. However, Group A had greater pain reduction and slightly better shoulder flexion strength. Only the difference in pain scores between groups was statistically significant, favoring Group A. Overall, both treatments were effective, but Group A protocol more beneficial.

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Conflict Of Interest- None declared

Limitation Of The Study

- Small sample size

- Short duration
- No control group
- Limited outcome measures

Future Recommendations Of The Study

- Future studies should use different outcome measures.
- Larger sample size can also be taken.
- In this study, we can also use different exercise protocols."

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