



Effectiveness of Post-Isometric Relaxation Technique on Shoulder Range of Motion and Muscle Strength in Patients with Rotator Cuff Tear: A Pilot Study

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Abstract

Background: Rotator cuff tear is one of the most common musculoskeletal disorders affecting the shoulder and is characterized by pain, reduced range of motion (ROM), muscle weakness, and functional limitations. Conservative physiotherapy plays a vital role in restoring shoulder function. Post-Isometric Relaxation (PIR), a Muscle Energy Technique, is widely used to improve muscle flexibility, neuromuscular function, and joint mobility. However, limited evidence is available regarding its effectiveness in patients with rotator cuff tear.

Objective: To evaluate the effectiveness of the Post-Isometric Relaxation (PIR) Technique on shoulder range of motion and muscle strength in patients with rotator cuff tear.

Methods: A pilot one-group pretest-post-test study was conducted among ten participants clinically diagnosed with rotator cuff tear. Participants received the Post-Isometric Relaxation Technique for two consecutive weeks. Shoulder range of motion was measured using a universal goniometer, and muscle strength was assessed using Manual Muscle Testing (MMT). Pre- and post-intervention data were analysed using the paired t-test, with statistical significance set at $p < 0.05$.

Results: Significant improvements were observed following the intervention. The mean muscle strength increased from 2.5 to 4.4 ($t = 10.53, p < 0.005$), while the mean shoulder range of motion improved from 108° to 141.7° ($t = 17.93, p < 0.005$).

Conclusion: The findings of this pilot study suggest that the Post-Isometric Relaxation Technique may improve shoulder range of motion and muscle strength in patients with rotator cuff tear. However, due to the small sample size and the absence of a control group, the findings should be interpreted with caution. Further randomized controlled trials with larger sample sizes are recommended.

Keywords: Rotator Cuff Tear; Post-Isometric Relaxation; Muscle Energy Technique; Shoulder Rehabilitation; Range of Motion; Muscle Strength; Pilot Study

Introduction

Rotator cuff tear is one of the most common causes of shoulder pain and dysfunction, affecting individuals across different age groups, particularly those involved in repetitive overhead activities and older adults with degenerative changes. The rotator cuff comprises four muscles—supraspinatus, infraspinatus, teres minor, and subscapularis—which work together to stabilize the glenohumeral joint and facilitate coordinated shoulder movements. Injury or degeneration of these muscles can result in pain, reduced range of motion (ROM), muscle weakness, and difficulty performing activities of daily living.

The etiology of rotator cuff tear includes acute trauma, repetitive overhead movements, sports-related injuries, occupational stress, and age-related degeneration. Patients commonly present with shoulder pain, weakness during arm elevation, restricted ROM, and impaired functional performance. If left untreated, rotator cuff tears may progress to chronic pain, persistent disability, and reduced quality of life.

Conservative physiotherapy is widely recommended for the management of rotator cuff tear, particularly in patients who do not require immediate surgical intervention. The primary goals of rehabilitation are to reduce pain, restore joint mobility, improve muscle strength, enhance shoulder stability, and improve functional performance. Various physiotherapy interventions, including therapeutic exercises, manual therapy, stretching, strengthening programmes, and Muscle Energy Techniques (MET), have been used to achieve these goals.

Post-Isometric Relaxation (PIR) is a manual therapy technique within the Muscle Energy Technique framework that involves a gentle isometric contraction of the target muscle followed by relaxation and passive stretching. The technique is believed to reduce muscle hypertonicity, improve muscle extensibility, increase joint mobility, and facilitate neuromuscular function. Previous studies have reported beneficial effects of PIR in improving flexibility, reducing pain, and enhancing range of motion in musculoskeletal conditions.

Although PIR is widely used in clinical physiotherapy practice, evidence regarding its effectiveness in patients with rotator cuff tear remains limited. Therefore, the present pilot study was

undertaken to evaluate the effectiveness of the Post-Isometric Relaxation Technique on shoulder range of motion and muscle strength in patients with rotator cuff tear.

Materials and Methods

Study design

A pilot one-group pretest–post-test study was conducted to evaluate the effectiveness of the Post-Isometric Relaxation (PIR) Technique on shoulder range of motion and muscle strength in patients with rotator cuff tear.

Study setting

The study was conducted at the Outpatient Department of RVS College of Physiotherapy, Sulur, Coimbatore, Tamil Nadu, India.

Participants

Ten participants who fulfilled the inclusion and exclusion criteria were recruited using a convenience sampling method. All participants were clinically diagnosed with rotator cuff tear and voluntarily participated in the study after receiving a detailed explanation of the study procedures.

Eligibility criteria

Inclusion criteria

- Clinically diagnosed rotator cuff tear.
- Male and female participants.
- Age between 20 and 30 years.
- Positive Drop Arm Test and Apley Scratch Test.
- Participants willing to participate in the study.

Exclusion criteria

- Shoulder pain due to trauma.
- History of shoulder fracture or dislocation.
- Degenerative joint disease of the shoulder.
- Previous shoulder surgery or shoulder arthroplasty.
- Recurrent shoulder dislocation.
- Shoulder arthritis.
- Metastatic lesions.
- Cervical radiculopathy.
- Shoulder impingement syndrome.
- Frozen shoulder.

Outcome measures

Shoulder range of motion (ROM) and rotator cuff muscle strength were selected as the primary outcome measures. Shoulder ROM was measured using a universal goniometer following standard goniometric procedures, while muscle strength was assessed using the Medical Research Council (MRC) Manual Muscle Testing (MMT) grading system. Outcome measures were recorded before the commencement of the intervention and reassessed after completion of the two-week treatment programme.

Intervention

The Post-Isometric Relaxation (PIR) Technique was administered to all participants by a qualified physiotherapist for two consecutive weeks. Participants were positioned according to the muscle being treated, and the affected muscle was first brought to a gentle stretch within the pain-free range. A submaximal isometric contraction (approximately 25% of the participant’s maximum effort) was then performed against the therapist’s resistance while the participant held their breath. This was followed by complete relaxation and a gentle passive stretch to the new barrier. Each contraction–relaxation cycle was repeated three to five times. The intervention included PIR techniques targeting shoulder internal rotation, external rotation, and abduction. Treatment was provided twice daily, five days per week, for two consecutive weeks.

Statistical analysis

The collected data were analysed using descriptive statistics and the paired t-test to compare the pre-intervention and post-intervention values of shoulder range of motion and muscle strength. The results are presented as mean and standard deviation. A p-value of less than 0.05 was considered statistically significant.

Results

A total of ten participants completed the study. Shoulder range of motion (ROM) and rotator cuff muscle strength were assessed before and after the two-week Post-Isometric Relaxation (PIR) intervention. The findings demonstrated significant improvements in both outcome measures following the intervention.

A statistically significant improvement in rotator cuff muscle strength was observed following the intervention. The mean muscle strength increased from 2.5 in the pre-test to 4.4 in the post-test ($t = 10.53$, $p < 0.005$), indicating that the Post-Isometric

Relaxation Technique was associated with improved muscle strength in patients with rotator cuff tear.

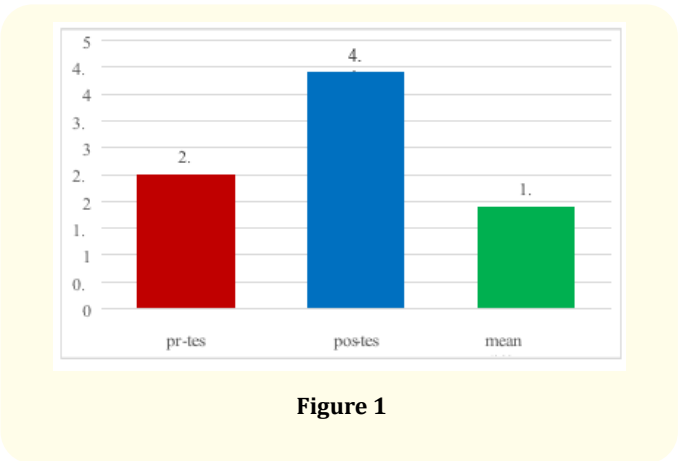


Figure 1

Measurement	Mean	Mean difference	Standard deviation	Paired 't' value
Pre-test	2.5	1.9	0.57	10.53*
Post-test	4.4			

Table 1: Comparison of Pre-and Post -Intervention Rotator cuff muscles strength.

*0.005 level of significance.

A statistically significant improvement in shoulder range of motion was observed following the intervention. The mean shoulder range of motion increased from 108° in the pre-test to 141.7° in the post-test ($t = 17.93$, $p < 0.005$), indicating that the Post-Isometric Relaxation Technique was associated with improved shoulder mobility in patients with rotator cuff tear.

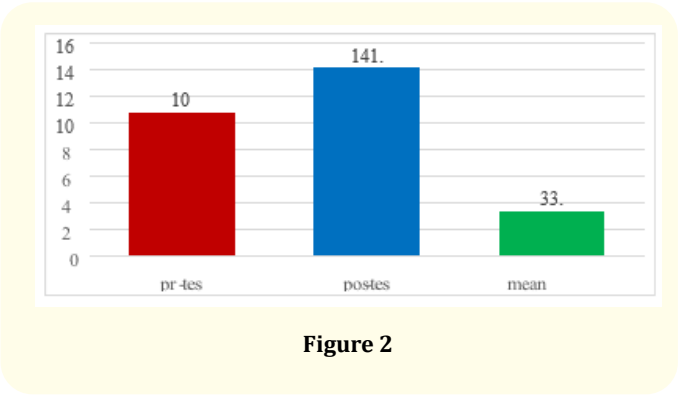


Figure 2

Discussion

The present pilot study evaluated the effect of the Post-Isometric Relaxation (PIR) Technique on shoulder range of motion and muscle strength in patients with rotator cuff tear. The results demonstrated significant improvements in both outcome measures following the intervention. These findings suggest that the PIR Technique may be associated with short-term improvement in shoulder function.

The improvement in shoulder range of motion and muscle strength may be attributed to reduced muscle tightness, improved flexibility, and better muscle activation following the PIR Technique. These findings are consistent with previous studies reporting beneficial effects of muscle energy techniques in patients with musculoskeletal disorders.

However, the findings should be interpreted with caution because this study included a small sample size and did not include a control group. Therefore, the observed improvements cannot be attributed solely to the intervention. Further randomized controlled studies with larger sample sizes are recommended to confirm these findings [1-25].

Conclusion

The findings of this pilot study suggest that the Post-Isometric Relaxation (PIR) Technique may be associated with improvements in shoulder range of motion and muscle strength in patients with rotator cuff tear. However, due to the small sample size and the absence of a control group, the results should be interpreted with caution. Further well-designed randomized controlled studies with larger sample sizes are required to confirm these findings.

Limitations

This study has certain limitations. The sample size was small, and no control group was included, which limits the generalizability of the findings. In addition, only short-term outcomes were assessed. Future studies should include larger sample sizes, control groups, and long-term follow-up to provide stronger evidence regarding the effectiveness of the Post-Isometric Relaxation (PIR) Technique.

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