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EFFECTIVENESS OF MUSCLE ENERGY TECHNIQUES VS STATIC STRETCHING IN FROZEN SHOULDER

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ABSTRACT

Background of the study: Frozen shoulder was defined as an idiopathic condition of the shoulder characterized by the spontaneous onset of pain along with restriction of movement in all directions. It was considered a distinct clinical diagnosis involving painful limitation of shoulder motion resulting from capsular fibrosis. In this study, two groups were treated using different techniques: one group received Muscle Energy Technique (MET), while the other group underwent Static Stretching. Objective of the study is **to** find the effect of muscle energy techniques over static stretching among patients with frozen shoulder. **Methodology:** A group of 30 participants full filling the inclusion criteria were selected and divided into two groups A and B. All participants of Male subjects were with Age between 40 – 60 years, Pain in the shoulder region, Patient with frozen shoulder were included in the study. The study design was quasi-experimental. The study type was comparative. The study was conducted in the outpatient department of the Faculty of Physiotherapy at ACS Medical College and Hospital Campus. The sample size consisted of 30 subjects. The sampling method used was random sampling. The study duration was 6 months. The treatment duration was 6 weeks, Each subject received three treatment sessions per week. Outcome tools used were Goniometer, VAS and SPADI scale. **Result:** On comparing pre and post test using MET and Static Stretching, 30 within group A and group B. both groups showed statistically significant improvements in all measured outcomes with P-values < 0.0001, indicating that both interventions were effective. However, Group A (MET) demonstrated greater mean differences across all variables, with statistically significant superiority over Group B. **Conclusion:** From the research and stastiscal analysis , the study concluded that Muscle Energy Techniques is more effective than Static Stretching in reducing pain , improving Rom and enhance functional activity.

Keywords: Met Exercise, Frozen Shoulder, Static Stretching, Range of Motion

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INTRODUCTION

Frozen shoulder is a progressive onset of pain and restricted movement of the Glenohumeral joint in person aged 40-60 years.It is a common shoulder disorder manifesting as pain and progressive loss of shoulder movement. The lifetime prevalence of frozen shoulder is estimated at 2-5% of the overall population; with approximately 8% of males and 10% of women affected frozen shoulder is more common in the fifth and sixth decades of life. Peaking in the mid -50s, up to 17% of opposite shoulder becomes affected within 5 years [1].

MET involves voluntary isometric muscle contractions against a therapist's resistance, followed by stretching of the target tissue. It is theorized to enhance ROM and reduce pain through mechanisms such as post-isometric relaxation and reciprocal inhibition **[2].** Several studies have explored the comparative benefits of MET and static stretching, with evidence suggesting that MET may produce superior improvements in shoulder mobility and functional recovery in patients with adhesive capsulitis [3, 4.]

Conservative physiotherapy approaches, particularly static stretching, are commonly used in early-stage frozen shoulder treatment to reduce pain, improve range of motion, and restore function by elongating the tight joint capsule and surrounding soft tissues [5]. Muscle Energy Technique (MET) is a manual therapy approach used for musculoskeletal issues like frozen shoulder. It involves the patient contracting their muscles against the therapist's controlled resistance, followed by a passive stretch. By leveraging neurophysiological principles, MET aims to improve joint mobility and reduce muscle tightness more effectively than static stretching[6,7].

A structured MET protocol for the shoulder, has demonstrated promising outcomes in terms of pain relief, improved range of motion (ROM), and functional recovery in several randomized trials[8]. Frozen shoulder (FS), is a common musculoskeletal condition characterized by pain and progressive loss of both active and passive range of motion in the glenohumeral joint, often severely limiting function and quality of life[9]. This condition can occur idiopathically or secondary to trauma, surgery, or systemic conditions like diabetes, and typically progresses through painful, frozen, and thawing phases[10].

Traditional treatments for frozen shoulder include medication, physical therapy, and stretching to improve mobility and reduce pain. Static stretching is commonly used, but its effectiveness can be limited due to patient discomfort and slow progress [11]. The main objective of static stretching for adhesive capsulitis is to increase joint mobility, reduce stiffness, and enhance flexibility by stretching the joint capsule and surrounding tissues[12]

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Research shows static stretching can improve range of motion and reduce pain in frozen shoulder patients. Combining it with heat or ultrasound therapy can enhance joint mobility and functional outcomes[13]. Static stretching is a common physiotherapy technique used to treat frozen shoulder by targeting the fibrotic thickening of the joint capsule, aiming to restore normal joint mobility[14].

Static stretching involves holding a muscle or joint in a stretched position for a prolonged time, increasing tissue flexibility and reducing stiffness [15]. Regular static stretching can improve shoulder mobility in frozen shoulder patients, increasing range of motion for abduction and external rotation within weeks[16]. Static stretching enhances blood flow, reduces joint stiffness, and prevents shortening of the joint capsule and surrounding tissues[17]. Additionally, static stretching is often paired with thermotherapy to improve its efficacy. Application of hot packs before stretching has been shown to increase the elasticity of collagen fibers, allowing for safer and deeper tissue elongation during the stretching procedure[18].

Aim of the Study: The aim of this study is to compare the effectiveness of Muscle Energy Techniques (MET) versus static stretching in improving range of motion (ROM), reducing pain, and enhancing functional ability in patients with frozen shoulder.

Need of the Study: The study is to evaluate pain and functional activity among frozen shoulder. Frozen shoulder is a prevalent condition that leads to pain, stiffness, and limited shoulder mobility, significantly impacting daily activities and overall quality of life. That will affect the functional activities of an individual. There is n number of treatment to reduce the pain, to improve functional activities.

But one of the most effective treatments in physiotherapy techniques such as Muscle Energy Techniques (MET) and static stretching are commonly used to improve range of motion and alleviate pain. However, there is a lack of direct comparison between these two approaches in the management of frozen shoulder. This study is essential to identify which technique is more effective in reducing pain, enhancing shoulder mobility, and improving functional performance.

METHODOLOGY

A group of 30 participants full filling the inclusion criteria were selected and divided into two groups A and B. All participants of Male subjects were with Age between 40 – 60 years, Pain in the shoulder region, Patient with frozen shoulder were included in the study. The study design was quasi-experimental. The study type was comparative. The study was conducted in the outpatient department of the Faculty of Physiotherapy at ACS Medical College and Hospital Campus. The sample size consisted of 30 subjects. The sampling method used was random sampling. The study duration was 6 months. The treatment duration was 6 weeks, each subject received three treatment sessions per week. Outcome tools used were Goniometer, VAS and Spadi scale. Special test: Apley's scratch test positive subject was included in this study.

Outcome measures: To reduce pain on the shoulder, to enhance functional ability of shoulder joint and to improve range of motion.

Outcome Tools:

1. Goniometer: goniometer is a widely used clinical tool for measuring joint angles and Range of Motion (ROM). In the assessment and rehabilitation of frozen shoulder , a goniometer plays a crucial role in evaluating the effectiveness of interventions such as Muscle Energy Techniques (MET) and static stretching.

2. VAS (visual analog scale): The Visual Analog Scale (VAS) is a widely used subjective pain assessment tool in evaluating the effectiveness of Muscle Energy Techniques (MET) and static stretching in patients with frozen shoulder . It helps measure pain intensity before and after treatment, providing an objective way to track patient progress. .The scale range of 0 (no pain at all) to 10 (worst possible pain). Patient were asked to mark a line point referring to their perceived quantity of pain during the evaluation.

2. Spadi tool (Shoulder Pain and Disability Index):The Shoulder Pain and Disability Index (SPADI) is a self-reported questionnaire used to assess pain and functional disability in patients with frozen shoulder . It is an effective tool for evaluating the impact of Muscle Energy Techniques (MET) and static stretching on shoulder function and quality of life.

The SPADI consists of two subscales: 1.Pain Subscale (5 items) – Assesses pain intensity during various activities. 2. Disability Subscale (8 items) – Evaluates functional limitations in daily activities.

Each question is scored on a visual analog scale (VAS) or numeric scale (010): 0 = No pain or difficulty, 10 = Worst pain or extreme difficult

Procedure: This study was a quasi-experimental study with a comparative design. It was conducted in the physiotherapy Outpatient department of A.C.S. Medical College and Hospital. A total of 30 subjects were randomly divided into two groups based on the inclusion criteria. The study included male patients aged 40–60 years who tested positive on Apley's scratch test. The study began with a baseline assessment of all participants diagnosed with frozen shoulder to evaluate their pain, Range of Motion (ROM), and functional ability. Pain levels were measured using the Visual Analog Scale (VAS), shoulder mobility was assessed with a goniometer, and functional limitations were recorded using the Shoulder Pain and Disability Index (SPADI). Participants were divided into two groups to compare the effectiveness of Muscle Energy Techniques (MET) and static stretching.

Group A

Muscle Energy Techniques: In the MET Group A, 15 participants received muscle energy techniques targeting the shoulder joint, focusing on contract-relax and post-isometric relaxation techniques. These techniques were applied with the aim of improving Range of Motion (ROM) and reducing stiffness. The intervention was conducted 5 times per week for 6 weeks.

Group B:

Static Stretching: In the static stretching Group B, 15 participants performed structured stretching exercises designed to target capsular tightness and muscle stiffness, with each stretch held for 30 seconds and repeated 5 times per session. After completing the intervention period, all participants underwent a post-treatment evaluation using the same outcome measures—VAS for pain intensity, Goniometer for ROM improvement, and SPADI for functional outcomes. The collected data were then analyzed to determine which intervention was more effective in reducing pain, improving ROM, and enhancing

functional ability in patients with frozen shoulder.

Intervention groups

Group A: Muscle Energy Technique (Met) Intervention

MET will be applied 3 sessions per week for 6 weeks using the following techniques:

1. **Post-Isometric Relaxation (PIR) Technique:**

- Moves the patient's shoulder joint to its pain-free limit.
- The patient is asked to gently contract the restricted muscle (e.g., external rotators or abductors) against resistance for 5 seconds.
- patient relaxes, and the therapist stretches the muscle further for 10 seconds.
- This cycle is repeated 5 times for each movement restriction.

2. **Contract-Relax (CR) Technique:**

- The patient is positioned in supine or seated.
- Passively moves the arm into resistance, and the patient contracts against resistance for 10 seconds.
- The patient relaxes, and the therapist moves the shoulder into a new, increased ROM.
- Repeated 5 times per session.

Group B: Static Stretching Intervention

Static stretching exercises will be performed 3 session per week for 6 weeks with the following techniques:

1. **CROSS-BODY SHOULDER STRETCH**

- The patient pulls the affected arm across the chest with the opposite hand.
- Hold for 30 seconds, repeated 5 times per session.

2. **Towel Stretch (Internal Rotation STRETCH)**

- Hold a towel behind your back with one hand from above and one hand from below
- Gently pull the affected arm upward using the Good arm.
- Hold : 30 seconds
- Reps: 5 times

3. **External Rotation Stretch (Using A Cane/Stick)**

- Hold a stick with both hands.
- Keep elbows close to the body.
- Push the affected arm outward gently with the good arm.
- Hold: 30 seconds.
- Reps: 5 times.

4. **Sleeper Stretch (For Internal Rotation**)

- lie on your affected side.
- Bend the elbow to 90°.
- Use the other hand to gently push the affected forearm downward.
- Hold: 30 seconds.
- Reps: 5 times.

Data Analysis: The collected data were tabulated and analyzed using both descriptive and inferential statistics. All the parameters were assessed using Graph Prism Pad version 8.4.3, with a significance level of p value less than 0.05 and a 95% confidence interval set for all analysis. The Shapiro Wilk test was used to determine the normality of the data. In this study, Shapiro Wilk test showed that the

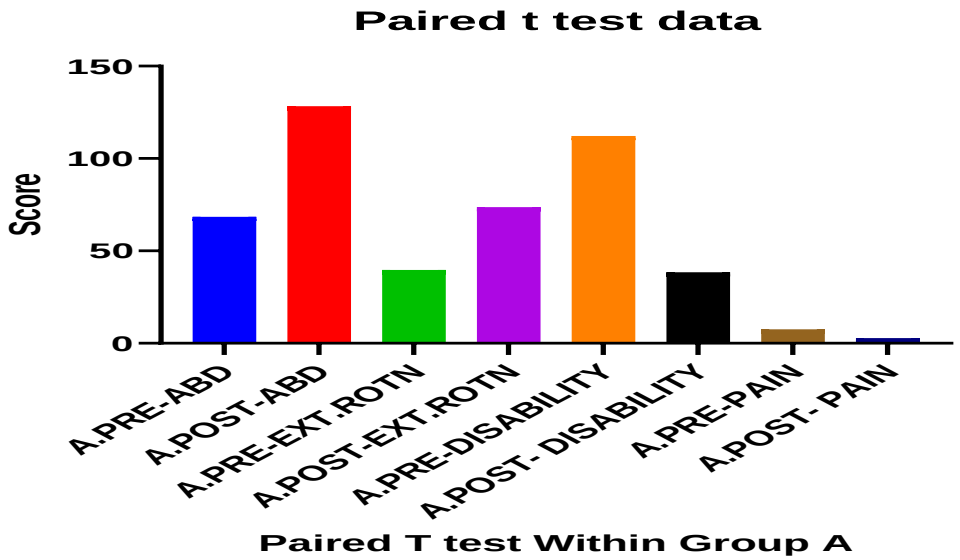
data was normally distributed on the dependent values at P > 0.05. Hence parametric test was adopted. Paired t-test was adopted to find the statistical difference within the groups & Independent t-test (Student t-Test) was adopted to find statistical difference between the groups.

Group A: Muscle Energy Techniques

Table 1: Paired t test within Group A on ABD, EXT.ROTN, DISABILITY AND PAIN

ABD	**15**	**59.93**	**0.26 0.07**	**14**	**899.0**	**<0.0001**	********
Group A	**Number of Pairs**	**Mean Diff.**	**SD, SEM**	**Df**	**t**	**P value**	**Sig.Diff. (P < 0.05)**
EXT.ROTN	**15**	**33.93**	**0.88 0.23**	**14**	**148.7**	**<0.0001**	********
DISABILITY	**15**	**73.67**	**11.94 3.08**	**14**	**23.89**	**<0.0001**	********
PAIN	**15**	**4.8**	**0.68 0.17**	**14**	**27.50**	**<0.0001**	********

The above table 1 shows significant difference in ABD, EXT.ROTN, DISABILITY AND PAIN within Group A with P value >0.0001



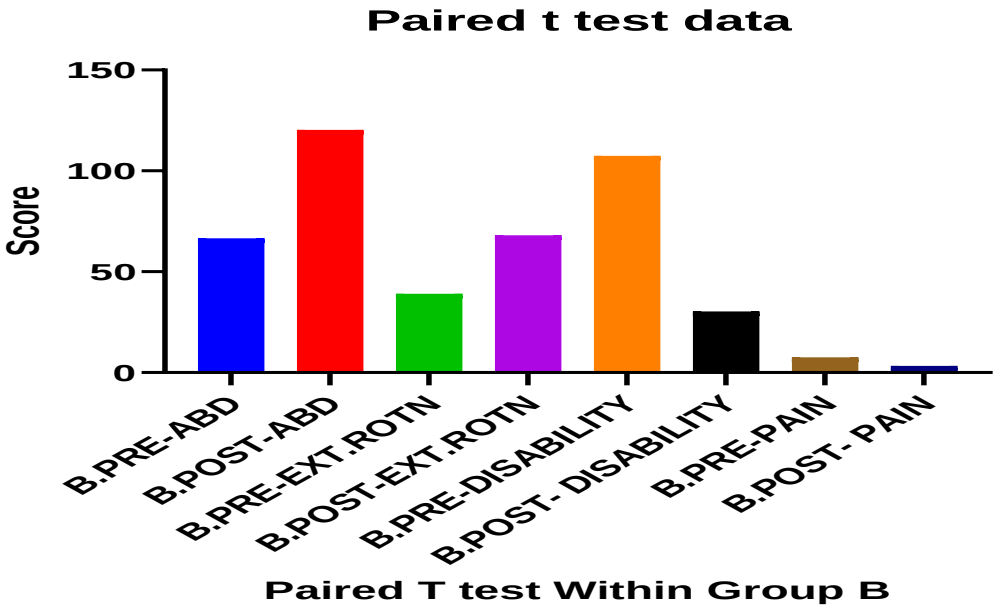
Graph 1: Presentation of Presentation Of Abd, Ext.Rotn, Disability And Pain Within

Group B: Static Stretching

Table 2: Paired t test within Group B on ABD, EXT.ROTN, DISABILITY AND PAIN

Group A	Number of Pairs	Mean Diff.	SD, SEM	Df	t	P value	Sig. Diff. (P < 0.05)
ABD	15	53.73	5.80 1.49	14	35.88	<0.0001	****
EXT.ROTN	15	29.00	5.87 1.52	14	19.14	<0.0001	****
DISABILITY	15	77.13	10.99 2.84	14	27.18	<0.0001	****
PAIN	15	4.20	1.01 0.26	14	16.04	<0.0001	****

The above table 2 shows significant difference in ABD, EXT.ROTN, DISABILITY AND PAIN within Group B with P value >0.0001

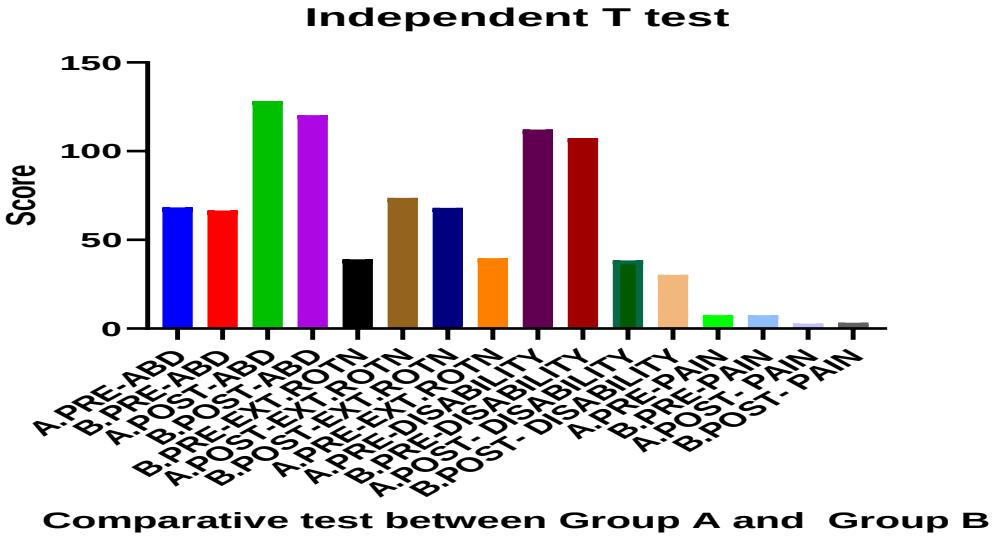


Graph 2: Presentation of ABD, EXT.ROTN, DISABILITY AND PAIN within Group B

Table 3 : Comparative Test between Group A and Group B

Group A & B		Number of Pairs	Mean Diff. ± SEM	R	DF	t	P value	Sig. Diff. (P < 0.05)
Pre test	ABD	30	1.733 1.899	0.029	28	1.913	0.369	NS
	EXT.ROTN	30	0.067 1.756	0.005	28	0.379	0.707	NS
	DISABILITY	30	4.66 4.31	0.04	28	1.082	0.288	NS
	PAIN	30	0.067 0.303	0.001	28	0.219	0.828	NS
Post test	ABD	30	8.00 1.84	0.404	28	4.355	0.0002	***
	EXT.ROTN	30	5.60 1.52	0.327	28	3.688	0.001	***
	DISABILITY	30	8.13 2.01	0.368	28	4.04	0.0004	***
	PAIN	30	0.533 0.236	0.154	28	2.256	0.032	*

The above table 3 shows NO significant difference on Pre Test of ABD, EXT.ROTN, DISABILITY AND PAIN between Group A and Group B with P value 0.369, 0.707, 0.288 and 0.828 Post Test of ABD,EXT.ROTN, DISABILITYAND PAIN between Group A and Group B, shows significance on P value with 0.0002, 0.001, 0.0004 and 0.032 respectively.



Graph 3: Presentation of Abd, Ext.Rotn, Disability and Pain between Group A and Group B

RESULT

Total 30 male participants were included in the study based on specific selection criteria and divided in to 15 samples in each Group A and Group B. Participants were with age group between 40 and 60 years. Group A found effective on ABD, EXT.ROTN, disability and pain with mean score difference of 59.93, 33.93, 73.67 and 4.8 respectively with P value <0.0001. Group B also found effective on ABD, EXT.ROTN, DISABILITY AND PAIN with mean score difference of 53.73, 29.00, 77.13 and 4.20 respectively with P value <0.0001.

Group A intervention found more effective over Group B intervention on ABD, EXT.ROTN, disability and pain with significance difference in P value of 0.0002, 0.001, 0.0004 and 0.032 respectively.

DISCUSSION

Frozen shoulder is a common musculoskeletal condition characterized by pain, stiffness, and significant limitation of both active and passive movements of the shoulder joint. It typically affects individuals in the 40–60 year age group and can severely impact daily functioning and quality of life. Conservative physiotherapy interventions are crucial in managing this condition effect

The purpose of this study was to evaluate the efficacy of static stretching and muscle energy techniques (MET) in treating patients with adhesive capsulitis, often known as frozen shoulder, which is characterized by discomfort, limited active and passive shoulder range of motion, and capsular rigidity. With a sample size of 30 individuals, the investigation was carried out over a 6-week period using a comparative experimental study design. Participants were split into two groups at random: Group B received static stretching, and Group A received MET. The investigation was carried out in an outpatient physiotherapy setting.

Frozen shoulder develops in three distinct phases—freezing, frozen, and thawing—each presenting specific clinical features. Conservative physiotherapy remains the primary approach to treatment, aiming to improve range of motion, alleviate pain, and restore normal shoulder function. Among the commonly used techniques to reduce joint stiffness and muscle tightness are Muscle Energy Technique (MET) and static stretching, though their relative effectiveness continues to be a topic of discussion.

Muscle Energy Technique (MET) is a type of manual therapy that uses the patient's active muscle contractions against a therapist-applied resistance. This technique helps in enhancing joint mobility, increasing muscle flexibility, and alleviating pain through mechanisms like reciprocal inhibition and post-isometric relaxation. Contrast, static stretching is a passive technique where a muscle is held in a stretched position for a set period, aiming to lengthen the muscle fibers and enhance flexibility, as noted by Bandy and Irion [19, 20].

In this research, participants in Group A (who received MET) showed more significant improvements in active range of motion (AROM) and pain relief than those in Group B (who received static stretching). A study reported that MET effectively enhanced ROM and reduced pain in individuals with adhesive capsulitis. The superior results of MET may be attributed to its direct neuromuscular impact

on tight or restricted tissues, making it particularly beneficial for reducing capsular stiffness[21].

Although static stretching proved to be helpful, its effects were more gradual. This is in line with the findings observed that while static stretching can enhance flexibility over time; it may be less effective in relieving joint pain or stiffness in cases of adhesive capsulitis. Since static stretching primarily relies on the mechanical lengthening of soft tissues, its benefits tend to accumulate slowly, which could account for the comparatively moderate outcomes observed in Group B[22].

Highlighted the role of end-range mobilization and stretching as essential components in managing frozen shoulder. However, they also pointed out that interventions involving active muscle engagement—such as MET—may lead to better long-term results due to their influence on the neuromuscular system [23].

A study comparing proprioceptive neuromuscular facilitation (PNF)-a technique closely related to MET-with static stretching, and found that PNF led to greater improvements in both range of motion and pain relie[23]. MET is resulted in quicker functional gains than passive stretching in shoulder-related disorders. MET has been shown to improve proprioceptive awareness and muscular coordination, which are key factors in rehabilitating frozen shoulder[24].

Both groups showed statistically significant improvements in all measured outcomes with P-values < 0.0001, indicating that both interventions were effective. However, Group A (MET) demonstrated greater mean differences across all variables, with statistically significant superiority over Group B.

Group A found effective on ABD, EXT.ROTN, disability and pain with mean score difference of 59.93, 33.93, 73.67 and 4.8 respectively with P value <0.0001

Group B also found effective on ABD, EXT.ROTN, disability and pain with mean score difference of 53.73, 29.00, 77.13 and 4.20 respectively with P value <0.0001.

Group A intervention found more effective over Group B intervention on ABD, EXT.ROTN, DISABILITY AND PAIN with significance difference in P value of 0.0002, 0.001, 0.0004 and 0.032 respectively.

The findings from this study suggest that Muscle Energy Technique is a more effective intervention than static stretching in improving shoulder abduction, external rotation, reducing pain, and lowering disability in frozen shoulder. Incorporating MET into rehabilitation protocols may accelerate recovery and improve functional outcomes more efficiently than passive stretching alone.

Ethical Clearance: Ethical clearance has obtained from Faculty of Physiotherapy, Dr. MGR. Educational and Research Institute, Chennai, Tamil Nadu, India. Reference number: No: BPT IV Year-A Sec, 41/ PHYSIO/ IRB/ 2024-2025, dated: 16/12/ 2024.

Conflict of interest: There was no conflict of interest to conduct and publish this study.

Fund for the study: It was a self-financed study.

CONCLUSION

This study concluded that Effectiveness of Muscle Energy Techniques vs Static Stretching in frozen shoulder of group A and group B is effective in both groups. On comparing the mean values there is a significant improvement in ROM, enhance functional ability and reduce pain. The group A muscle energy techniques shows more effective than group B static stretching among subject of frozen shoulder.

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