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Efficacy of Active Exercises and Maitland Mobilization in Adhesive Capsulitis: A Comparative Study

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Abstract:

- ***Background:***

Adhesive capsulitis is a painful shoulder condition associated with progressive restriction of active and passive glenohumeral movement. It can interfere with dressing, grooming, reaching, lifting, and sleep. Physiotherapy commonly combines education, therapeutic exercise, manual therapy, and symptom-modulating modalities. The relative contribution of mobilization and active exercise when each is combined with superficial heat remains clinically relevant.

- ***Objective:***

To compare the effects of Maitland mobilization plus hot-pack therapy, active shoulder exercises plus hot-pack therapy, and hot-pack therapy alone on pain intensity and shoulder-related pain and disability over six weeks.

- ***Methods:***

A comparative pre-test–post-test study included 60 participants aged 40–60 years with adhesive capsulitis. Twenty participants were included in each group. Group A received Maitland glenohumeral mobilization with hot-pack therapy; Group B received active or assisted shoulder exercises with hot-pack therapy; and Group C received hot-pack therapy alone. Treatment was scheduled five days per week for six weeks. Pain was assessed using a 0–10 Visual Analog Scale (VAS), and shoulder-related pain and disability were assessed using recorded SPADI totals. Within-group changes were assessed using paired-samples t-tests and post-treatment group means were compared using one-way ANOVA.

- ***Results:***

All groups showed statistically significant pre-test to post-test reductions in VAS and recorded SPADI totals (reported $p < 0.001$). VAS decreased from 7.95 ± 0.94 to 2.05 ± 0.83 in Group A, from 7.75 ± 1.16 to 4.70 ± 0.92 in Group B, and from 8.20 ± 0.77 to 6.95 ± 0.76 in Group C. Recorded SPADI totals decreased from 76.00 ± 8.79 to 28.15 ± 9.21, from 79.45 ± 6.93 to 51.25 ± 7.98, and from 80.10 ± 6.96 to 70.10 ± 6.46, respectively. Post-treatment ANOVA was reported as significant for VAS ($F = 171.02$, $p < 0.001$) and SPADI ($F = 139.25$, $p < 0.001$).

- ***Conclusion:***

The largest descriptive improvements were observed in the Maitland mobilization plus hot-pack group, followed by the active-exercise plus hot-pack group and the hot-pack-only group. Interpretation is limited by uncertainty about allocation procedures, the non-standard 0–130 SPADI raw-total reporting, and the absence of numerical range-of-motion data. These issues should be resolved before submission.

Keywords: *Adhesive Capsulitis; Frozen shoulder; Maitland Mobilization; Active Shoulder Exercises; Hot-Pack Therapy; Visual Analog Scale; Shoulder Pain and Disability Index.*

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I. INTRODUCTION

Adhesive capsulitis, commonly known as frozen shoulder, is characterized by progressive shoulder pain and restriction of both active and passive glenohumeral movements, particularly external rotation, abduction, and flexion. These limitations can significantly interfere with daily activities and quality of life. The condition involves capsular inflammation, thickening, and fibrosis, with clinical progression commonly described through freezing, frozen, and thawing phases. Physiotherapy plays an important role in conservative management by reducing pain, improving mobility, and restoring functional ability. Treatment approaches include graded Maitland mobilization, active and active-assisted shoulder exercises, and superficial heat. Maitland techniques aim to address pain and joint stiffness through controlled accessory glides, while therapeutic exercises promote movement and functional recovery. Superficial heat may provide short-term comfort and improve tolerance to exercise and manual therapy. Considering the clinical importance of these interventions, the present study compared the effects of Maitland mobilization and active shoulder exercises, each combined with hot pack application, against hot pack alone over six weeks in individuals with adhesive capsulitis, using pain and shoulder-related disability as outcome measures.

➢ *Objectives:*

- To assess pre-test and post-test pain intensity using the Visual Analog Scale in each group.
- To assess pre-test and post-test shoulder-related pain and disability using the recorded SPADI totals in each group.
- To compare the post-treatment outcome scores among the three intervention groups.
- To describe which intervention group demonstrated the greatest mean pre-test to post-test improvement in the supplied dataset.

II. METHODOLOGY

➢ *Design and Participants*

- *Study Design:*

A comparative pre-test–post-test study was conducted at Dasmesh College of Physiotherapy, Faridkot, Punjab, India. The study included 60 male and female participants aged 40–60 years with a clinical diagnosis of adhesive capsulitis. Eligible participants were enrolled after screening according to the inclusion and exclusion criteria. The study compared the effects of Maitland mobilization and active shoulder exercises, each combined with hot-pack therapy, against hot-pack therapy alone over six weeks.

➢ *Inclusion Criteria:*

- Male and female participants aged 40–60 years.
- Clinically diagnosed adhesive capsulitis.
- Shoulder pain with restricted range of motion.
- Restriction consistent with a capsular pattern.
- Difficulty performing daily activities involving shoulder movement.
- Participants with diabetes mellitus were eligible.

➢ *Exclusion Criteria:*

- Previous shoulder dislocation or fracture.
- Previous shoulder surgery or arthroplasty.
- Cervical spondylosis associated with referred shoulder pain.
- Clinically diagnosed soft-tissue injury around the shoulder.
- Rheumatoid arthritis.
- Post-traumatic painful shoulder stiffness.
- Shoulder impingement syndrome.
- Sensory deficits.
- Other significant orthopaedic abnormalities affecting the shoulder.

➢ *Sampling and Group Allocation*

A total of 60 participants were divided into three groups, with 20 participants in each group. The source documentation mentions convenient sampling and random allocation; however, the exact allocation procedure requires verification before the study can be classified as randomized.

➢ *Group Allocation*

Participants were assigned to the following treatment groups:

- Group A (Maitland Mobilization Group): Maitland glenohumeral mobilization combined with hot-pack therapy.
- Group B (Active Exercise Group): Active and assisted shoulder exercises combined with hot-pack therapy.
- Group C (Control Group): Hot-pack therapy alone.

➢ *Assessments*

Assessments were conducted before and after six weeks of intervention using the following outcome measures:

- Visual Analog Scale (VAS): Used to assess pain intensity on a 0–10 scale, where 0 indicates no pain and 10 indicates the worst pain.
- Shoulder Pain and Disability Index (SPADI): A 13-item questionnaire comprising five pain-related and eight disability-related items to evaluate shoulder pain and functional limitations. The supplied data were recorded as raw totals on a 0–130 scale; the scoring procedure requires

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verification before standardized SPADI scores are reported.
- Shoulder Range of Motion (ROM): Shoulder mobility was considered in the study; however, numerical pre- and post-treatment goniometric measurements were unavailable in the supplied dataset.

➢ *Interventions*

All groups received treatment five days per week for six weeks, with a planned total of 30 sessions.

- Group A: Maitland Mobilization Group

✓ *Hot-Pack Therapy:*

- Moist heat was applied to the affected shoulder for approximately 15–20 minutes.
- Mobilization was performed following heat application.

✓ *Maitland Glenohumeral Mobilization:*

- Anteroposterior glides.
- Posteroanterior glides.
- Caudal glides.

- Group B: Active Exercise Group

✓ *Hot-Pack Therapy:*

- Moist heat was applied to the affected shoulder for approximately 15–20 minutes.

✓ *Shoulder Exercises:*

- Pulley-assisted shoulder flexion.
- Pulley-assisted shoulder abduction.
- Pendular exercises.
- Shoulder-wheel exercises.

- Group C: Control Group

✓ *Hot-Pack Therapy:*

- Moist heat was applied to the affected shoulder for approximately 15–20 minutes.
- No additional study-specific mobilization or exercise intervention was provided.

Note: Exact mobilization grades, exercise repetitions, sets, treatment duration beyond hot-pack application, and progression criteria were not available in the supplied records and should be verified before publication.

➢ *Statistical Analysis*

Data were summarized using mean and standard deviation. Within-group pre- and post-treatment comparisons were performed using the paired-samples t-test. Between-group comparisons at baseline and post-treatment were assessed using one-way analysis of variance (ANOVA). A p-value of less than 0.05 was considered statistically significant.

III. RESULTS

➢ *Baseline Characteristics*

The study included 60 participants, with 20 participants in each group. The mean ages were 51.80 ± 5.17 years in Group A, 53.60 ± 4.87 years in Group B, and 51.30 ± 4.95 years in Group C. Gender distribution was comparable across the groups.

Table 1 Demographic Characteristics of Participants

Characteristic	Group A (n=20)	Group B (n=20)	Group C (n=20)
Mean age, years	51.80	53.60	51.30
Standard deviation of age	5.17	4.87	4.95
Male, n	9	10	10
Female, n	11	10	10

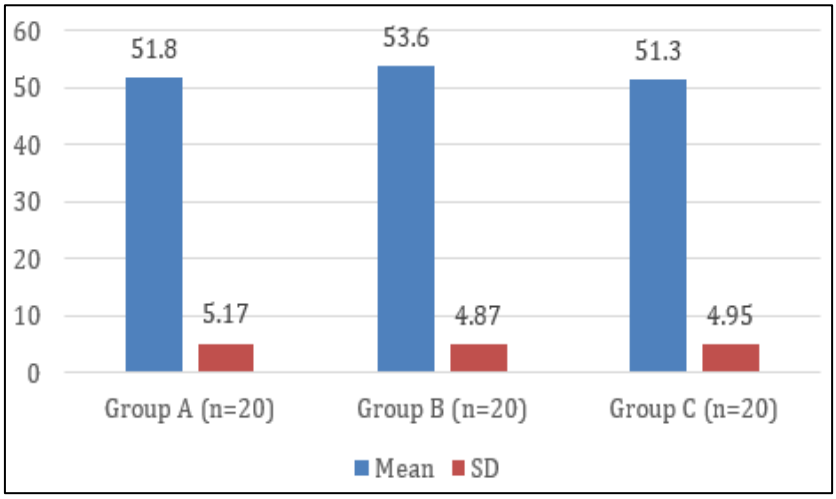


Fig 1 Gender Distribution of Participants of Groups

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➢ *Visual Analog Scale (VAS)*

- Within-group analysis: All three groups demonstrated significant reductions in pain after six weeks ($p < 0.001$). Group A showed the greatest mean reduction (5.90), followed by Group B (3.05) and Group C (1.25).
- Between-group analysis: Baseline differences were not statistically significant ($F = 1.08$, $p = 0.348$), whereas post-treatment differences were statistically significant ($F = 171.02$, $p < 0.001$).

Table 2 Comparison of Pre- and Post-Intervention VAS Scores Within the Three Treatment Groups

Group	Pre-test mean ± SD	Post-test mean ± SD	Mean reduction
A: Mobilization + hot pack	7.95 ± 0.94	2.05 ± 0.83	5.90
B: Active exercises + hot pack	7.75 ± 1.16	4.70 ± 0.92	3.05
C: Hot pack alone	8.20 ± 0.77	6.95 ± 0.76	1.25

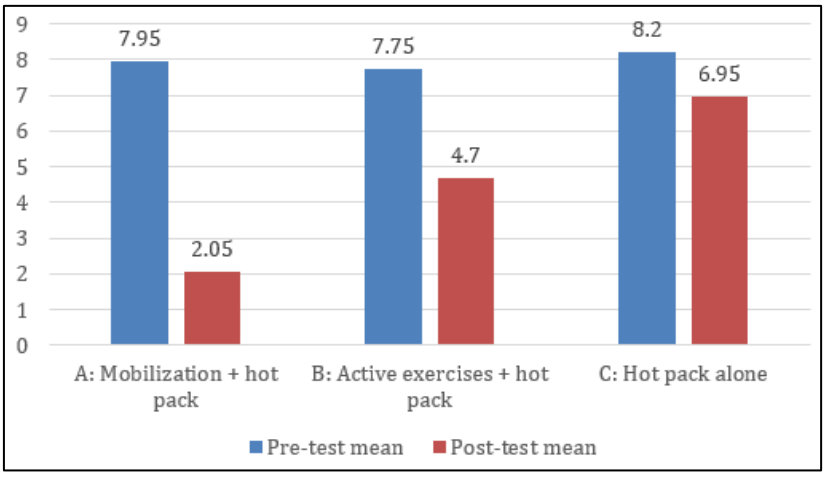


Fig 2 Comparison of Mean VAS Scores Before and After Six Weeks of Intervention

➢ *Shoulder Pain and Disability Index (SPADI)*

- Within-group analysis: Recorded SPADI raw totals decreased significantly in all three groups ($p < 0.001$). The greatest mean reduction was observed in Group A (47.85), followed by Group B (28.20) and Group C (10.00).
- Between-group analysis: Baseline differences were not statistically significant ($F = 1.68$, $p = 0.196$), while post-treatment differences were statistically significant ($F = 139.25$, $p < 0.001$).

Table 3 Comparison of Pre- and Post-Intervention SPADI Scores Within the Three Treatment Groups

Group	Pre-test mean ± SD	Post-test mean ± SD	Mean reduction
A: Mobilization + hot pack	76.00 ± 8.79	28.15 ± 9.21	47.85
B: Active exercises + hot pack	79.45 ± 6.93	51.25 ± 7.98	28.20
C: Hot pack alone	80.10 ± 6.96	70.10 ± 6.46	10.00

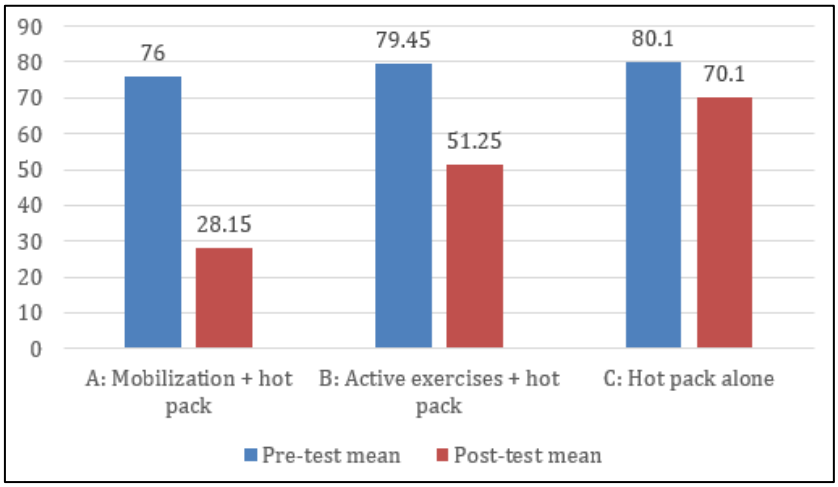


Fig 3 Comparison of Mean SPADI Scores Before and After Six Weeks of Intervention

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IV. DISCUSSIONS

The principal findings of the present study demonstrated significant improvements in pain and shoulder-related disability across all three groups following six weeks of intervention. However, Group A, which received Maitland mobilization combined with hot-pack therapy, showed the greatest improvement, followed by Group B, which received active shoulder exercises with hot-pack therapy. Group C, receiving hot-pack therapy alone, demonstrated the smallest improvement. These findings suggest that combining manual therapy or therapeutic exercises with heat may provide greater benefits than heat alone in managing adhesive capsulitis.

The superior outcomes in Group A may be associated with the use of graded Maitland glenohumeral mobilization, which aims to reduce pain and improve joint mobility. Similarly, active and assisted shoulder exercises in Group B may promote movement and functional recovery. Hot-pack therapy may provide short-term comfort and improve tolerance to movement-based treatment.

The findings are clinically consistent with previous research by Vermeulen et al., who investigated different grades of mobilization in adhesive capsulitis, and Johnson et al., who examined the effects of glenohumeral glide techniques on shoulder mobility. These studies support the clinical relevance of manual mobilization in managing restricted shoulder movement. Overall, the present findings indicate that Maitland mobilization combined with hot-pack therapy produced the greatest reduction in pain and recorded disability scores among the three treatment groups.

V. CONCLUSION

All three treatment groups demonstrated significant improvements in pain and recorded shoulder disability after six weeks. However, the greatest improvement was observed in the group receiving Maitland mobilization combined with hot-pack therapy, followed by active shoulder exercises with hot-pack therapy. These findings suggest that Maitland mobilization with heat may be a beneficial approach for adhesive capsulitis, although further studies with standardized outcome measures and rigorous statistical analysis are needed to confirm its effectiveness.

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