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The Effectiveness of Modified Posterior Capsular Stretching VS Grade 3 Maitland Mobilization Among Patients with Periarthiritis Shoulder A Quasi Experimental Study

Kshtrashal Singh[1], Yu Chye Wah[2], Elanchezian Chinnavan[3], Suchitra Solomon J Raja[4*]

[1,2,3,4]School of Physiotherapy, Faculty of Allied Health Professions, AIMST University, Malaysia
Email:kshtrashal@aimst.edu.my[1], chyewah@aimst.edu.my[2], elanchezian@aimst.edu.my[3], suchitra@aimst.edu.my[4]
*Corresponding Author

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ABSTRACT

Introduction: Periarthiritis shoulder (PA) is a condition marked by pain, stiffness, and restricted mobility in the shoulder joint. This study aimed to compare the effectiveness of Modified Posterior Capsular Stretching and Grade 3 Maitland Mobilization in treating patients with Periarthiritis shoulder (PA).

Methods: The study utilized a quasi-experimental, non-randomized clinical design. Ninety participants aged 40-60 with mild to moderate PA were allocated into two groups. Group 1 received four weeks of modified posterior capsular stretching with hot pack application, while Group 2 underwent four weeks of Grade 3 Maitland mobilization with hot packs. Pain levels, range of motion (ROM), and DASH functional outcomes were assessed before and after treatment.

Discussion: Both interventions significantly improved pain reduction, ROM, and function. However, Grade 3 Maitland mobilization demonstrated superior results to modified posterior capsular stretching. The Maitland group showed statistically greater improvements in shoulder flexion, extension, abduction, adduction, and internal and external rotation.

Conclusion: Both treatments were similarly effective in enhancing overall function, as measured by the DASH questionnaire. The Maitland technique produced superior and more consistent outcomes, particularly for pain relief and ROM gains. These findings highlight the importance of considering physical and psychological factors when managing this condition.

Keywords: Pain, Range of Motion, VAS, DASH Outcome Measure.

INTRODUCTION

Upper limb musculoskeletal disorders are a significant occupational health concern for healthcare workers, especially those frequently using microscopes in clinical laboratories. The prevalence is alarmingly high, with studies showing over 80% at risk and more than half experiencing neck, shoulder, or other upper limb pain. Risk factors include prolonged static postures, repetitive tasks, awkward positions, high workload, and psychosocial stressors like job demands and lack of support. To prevent and manage ULMSDs, a comprehensive approach addressing physical and psychosocial factors is needed. Interventions may include ergonomic improvements in workstation design, regular break schedules, raising awareness about proper posture and techniques, and tackling workplace stress. Given the high prevalence and multifactorial nature of these disorders, prioritizing prevention is crucial to protect this vulnerable occupational group and mitigate the impact on their health and work[10.]

The shoulder is a highly complex biomechanical structure involving the coordinated interaction of four joints: glenohumeral, acromioclavicular, scapulothoracic, and sternoclavicular. The glenohumeral joint, the most mobile joint in the human body, allows for a wide range of hand positions but is prone to instability. Shoulder function relies on the integrated and synchronized action of 18 muscles, making precise kinematic analysis and clinical examination challenging. The glenohumeral joint is subject to significant bony and muscular changes and frequent tendon overuse as a non-weight-bearing joint. Effective shoulder function requires all anatomical components to work seamlessly together, with the central nervous system signalling the muscle-tendon unit to generate tension, which is transmitted through the tendon acting as a joint lever. Joint stability, essential for efficient function, is provided by static and dynamic factors such as bony contours, ligaments, labrum, and capsule. However, evaluating critical biomechanical parameters like joint reaction forces in vivo remains difficult without invasive procedures.[3]

Periarthritis of the shoulder, also known as adhesive capsulitis or frozen shoulder, is a common and debilitating condition characterized by progressive pain and restricted shoulder motion. The overall incidence in the general population is estimated at 2-5%, with a one-year prevalence of 0.35% among adults aged 65 and older in the United States. Women are disproportionately affected, comprising 59-70% of cases, and the condition typically occurs between ages 40-60. Significant risk factors include diabetes and Parkinson's disease, particularly in the elderly population. Other potential contributors include a sedentary lifestyle, systemic inflammation, and oxidative stress. While some studies suggest a slight seasonal trend with more cases from August through December, this pattern must be firmly established. The specific triggers for primary (idiopathic) periarthritis remain unclear, with inconclusive evidence regarding potential causes such as certain medications, infections, and traumas. Further research is needed to fully understand this condition's epidemiology and underlying causes, which affects approximately 142,000 older adults in the US annually.[1]

Diabetes, a group of chronic conditions characterized by high blood sugar levels, includes type 1 and type 2 diabetes, which account for 8% and 90% of cases, respectively. While diabetes is known for causing cardiovascular, ocular, neurological, and renal complications, its musculoskeletal effects, such as frozen shoulder, often receive less attention. Frozen shoulder, linked to diabetes, may result from glycation processes or inflammatory responses leading to capsular fibrosis and joint contracture. Understanding the temporal association between diabetes and frozen shoulder through longitudinal studies is crucial to establishing a causal relationship. If diabetes contributes to a frozen shoulder, early intervention and targeted treatments could prevent or mitigate this condition in diabetic patients. This understanding could also enhance screening protocols and early detection of musculoskeletal complications in diabetes. Therefore, further investigation into the temporal relationship between diabetes and frozen shoulder is essential for improving patient care and outcomes.[2]

Periarthritis typically begins with mild shoulder discomfort that intensifies over time, potentially radiating to the arm or neck. Patients experience significant stiffness and reduced range of motion as the condition advances, particularly in external rotation and abduction. Severe night pain often disrupts sleep, and daily activities like dressing or reaching overhead become challenging. The condition evolves through three stages: the Freezing Stage (3-9 months), with intense pain and increasing stiffness; the Frozen Stage (4-12 months), where pain may subside but stiffness persists, and the Thawing Stage (12-24 months) characterized by a gradual improvement in joint mobility. The duration and severity of symptoms can vary widely among individuals, with some experiencing prolonged discomfort or incomplete resolution. Understanding these phases is crucial for proper management and patient expectations throughout the condition.

The pathophysiology of periarthritis shoulder involves a complex interplay of inflammatory and fibrotic processes within the shoulder joint capsule. It progresses through three main phases: inflammatory, fibrotic, and pathological changes. In the inflammatory phase, synovial inflammation infiltrates inflammatory cells and releases pro-inflammatory cytokines and growth factors. The fibrotic phase is characterized by fibroblast proliferation and differentiation into myofibroblasts, leading to excessive collagen production and capsular thickening. Pathological changes result in a thickened, inflamed, and contracted joint capsule, particularly in the anterosuperior and rotator interval regions. Histologically, dense collagen deposition and inflammatory cell infiltration are observed. Various factors contribute to the development of periarthritis shoulder, including genetic predisposition, hormonal factors, metabolic disorders (e.g., diabetes), immobilization, trauma, and potential autoimmune mechanisms. Understanding this complex pathophysiology is crucial for developing effective management strategies for this condition.

MATERIALS AND METHODS

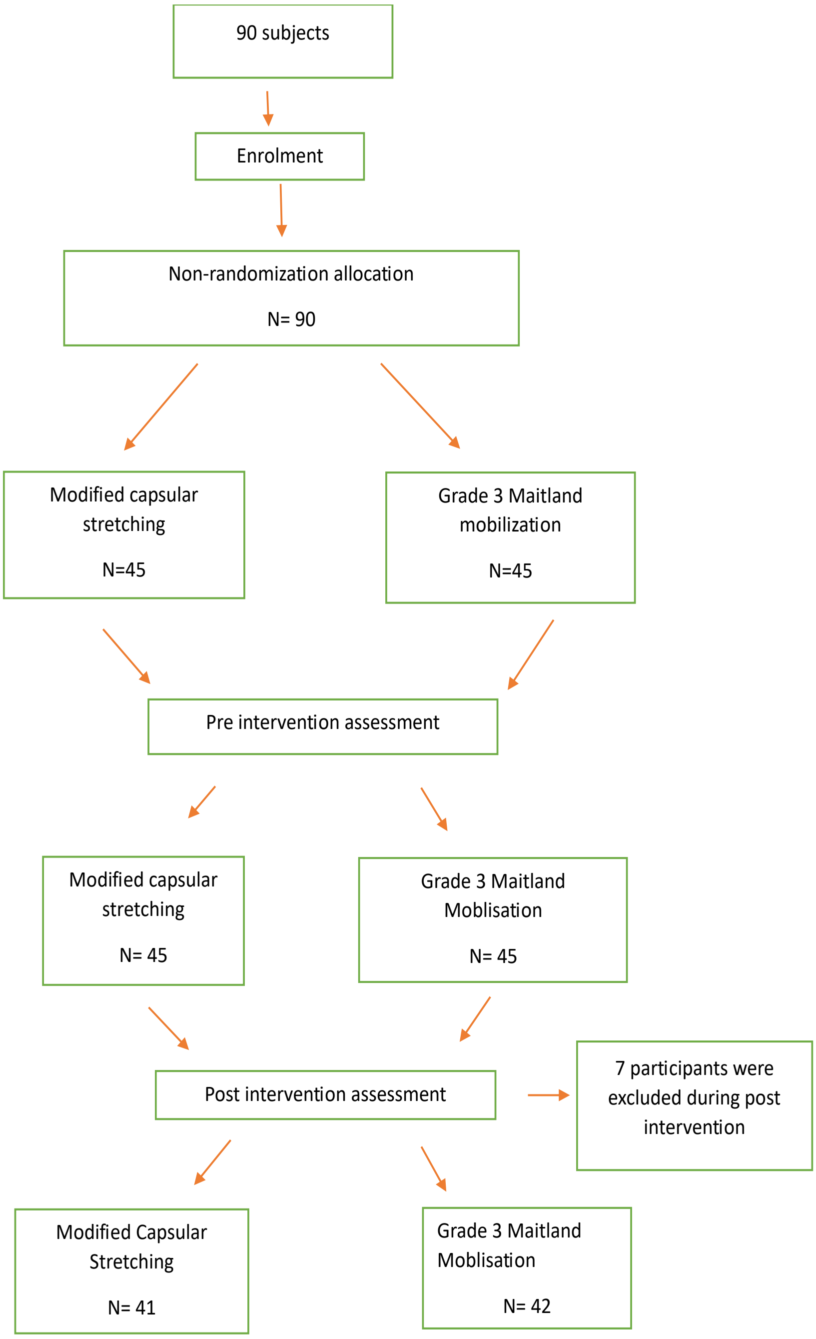
The study was conducted at the AIMST Physio Clinic within AIMST University in Bedong, Kedah, from June to July 2023, with ethical approval from the university's Research Ethics Committee. Ninety participants, aged 40 to 60 and diagnosed with periarthritis shoulder, were screened and recruited based on specific inclusion criteria. These participants were randomly divided into groups of 45: one receiving hot pack application combined with modified posterior capsular stretching, and the other receiving hot pack application followed by grade 3 Maitland mobilization. Pre- and post-intervention assessments measured pain levels using the Visual Analog Scale (VAS) and shoulder range of motion with a goniometer, ensuring a robust evaluation of treatment effectiveness.

Selection criteria, inclusion criteria

- Patients who are Medically diagnosed cases of Periarthritis Shoulder
- Pain and stiffness over shoulder joint
- Age group above 40 – 60 years
- Tested positive in Apley's scratch test
- Both males and females were included
- Willing to participate

The criteria for exclusion were:

- Any shoulder surgery, fractures, dislocation or stroke[8]
- Pregnant or lactating females[8]
- History of previous periarthritis shoulder treatment[4]
- Systemic inflammation or osteoarthritis in other joints



Participant Recruitment and Group Assignment Flowchart

Modified Posterior Capsular Stretching Protocol

The Modified Posterior Capsular Stretching Protocol involves using a moist hot pack for 10 minutes in a supine-lying position, followed by a specific stretching exercise performed in a side-lying position to restrict scapular abduction and target the posterior capsule. The patient aligns their forearms with the non-affected arm on top, limiting external rotation, and uses the top arm to gently move the affected arm's humerus into horizontal adduction, holding the stretch for 30 seconds and repeating it 5 times per session. This exercise is to be performed once daily, three days per week, for four weeks. Ensuring controlled movements and proper technique is crucial to maximize therapeutic benefits and avoid injury, promoting gradual improvement in shoulder flexibility and function.[11]

Fig 1.1 Modified Posterior Capsular Stretching

Hot Pack Protocol and Glenohumeral Caudal Glide protocol

Begins with a moist hot pack applied for 10 minutes while the patient lies in a supine position. Following this, the Glenohumeral Caudal Glide technique is performed. The patient remains supine with the affected arm relaxed and supported between the trunk and elbow. The therapist places one hand in the patient's axilla for support and the other just distal to the acromion process. The therapist then applies a mobilizing force to glide the humerus downward. This involves a sustained stretch of at least 6 seconds, followed by partial releases and rhythmic stretches at 3-4 second intervals. This mobilization is performed once daily, three times a week, for four weeks to improve joint mobility, reduce pain, and enhance shoulder function.[6]

Fig 1.2 Glenohumeral Caudal Glide

The Glenohumeral Anterior Glide Protocol

The patient lies prone with their arm hanging off the table edge, supported by the therapist's thigh. With one hand near the acromion, the therapist stands facing the table to apply a gentle inferior glide to the humerus, beginning with a sustained stretch for at least 6 seconds, followed by a partial release, repeating with rhythmic stretches every 3-4 seconds. This mobilization is performed once daily, three times a week, for four weeks, aiming to enhance joint mobility, reduce pain, and improve shoulder function.

Fig 1.3 Glenohumeral Anterior Glide

Glenohumeral Posterior Glide Technique protocol

In the Glenohumeral Posterior Glide technique, the patient lies supine with the affected arm relaxed alongside the body for comfort and optimal access to the shoulder joint. The therapist stands at the head of the table between the patient's trunk and arm, supporting the arm against their trunk for stability. One hand grasps the distal humerus to apply a gentle grade 1 distraction, creating space within the joint, while the other hand is placed distal to the anterior margin of the shoulder joint with fingers pointing towards the patient's head. The therapist then applies a mobilizing force to glide the humeral head posteriorly, targeting restrictions in the anterior capsule and surrounding structures. The mobilization starts with a sustained stretch for at least 6 seconds, followed by a partial release to a Grade 2 force level, and is repeated with slow, rhythmic stretches at 3-4 second intervals to enhance tissue flexibility and joint mobility. This technique is performed once daily, three times a week, over a 4-week period, aiming to improve shoulder joint mobility, address anterior capsule restrictions, reduce pain, and enhance overall shoulder function.[6]

Fig 1.4 Glenohumeral Posterior Glide Technique

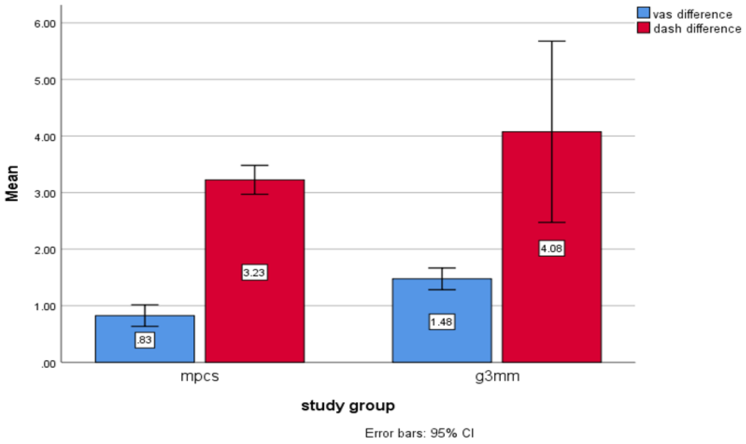
RESULTS

Baseline data of study samples

	Overall (n=90) N (%)	**Modified posterior capsular stretching group (n=45) N (%)**	**Grade 3 Maitland mobilization group (n-45) N (%)**
Gender			
Male	32	17	15
Female	51	25	26
Age			
<40	3	3	-
41-45	8	5	3
46-50	19	7	12
51-55	19	9	10
56-60	34	19	15
Ethnicity			
Malay	28	18	10
Chinese	27	13	14
Indian	28	11	17

The baseline data presented in Table 3.1 provides a comprehensive overview of the demographic characteristics of 90 participants, divided into two groups: the Modified Posterior Capsular Stretching Group and the Grade 3 Maitland Mobilization Group, each consisting of 45 individuals. The analysis reveals that the overall sample comprises 56.7% females and 35.6% males, with the Modified Posterior Capsular Stretching Group having 17 males (37.8%) and 25 females (55.6%), while the Grade 3 Maitland Mobilization Group includes 15 males (33.3%) and 26 females (57.8%). This predominance of female participants could influence study outcomes, particularly if gender-specific responses to interventions are anticipated. In terms of age distribution, participants are categorized into five groups, with the largest segment being those aged 56-60 years (34 participants, 37.8%). The Modified Posterior Capsular Stretching Group has 42.2% in this age range, whereas the Grade 3 Maitland Mobilization Group has the largest proportion (26.7%) in the 46-50 age group, indicating that the study predominantly involves middle-aged to older adults, which is crucial given the potential differences in treatment responses based on age. Ethnically, the sample shows approximately equal representation of Malay (31.1%), Chinese (30.0%), and Indian (31.1%) participants, with the Modified Posterior Capsular Stretching Group comprising 40.0% Malay, 28.9% Chinese, and 24.4% Indian, while the Grade 3 Maitland Mobilization Group has a higher proportion of Indian participants (37.8%). This balanced ethnic distribution enhances the generalizability of the study findings, although slight variations between groups should be acknowledged. Overall, the predominance of female and older participants underscores the necessity of considering gender-specific and age-related responses in the analysis, while the nearly equal ethnic representation supports the applicability of findings to a diverse population, making it essential to adopt a nuanced approach to these demographic factors to ensure the robustness and reliability of the study's conclusions.

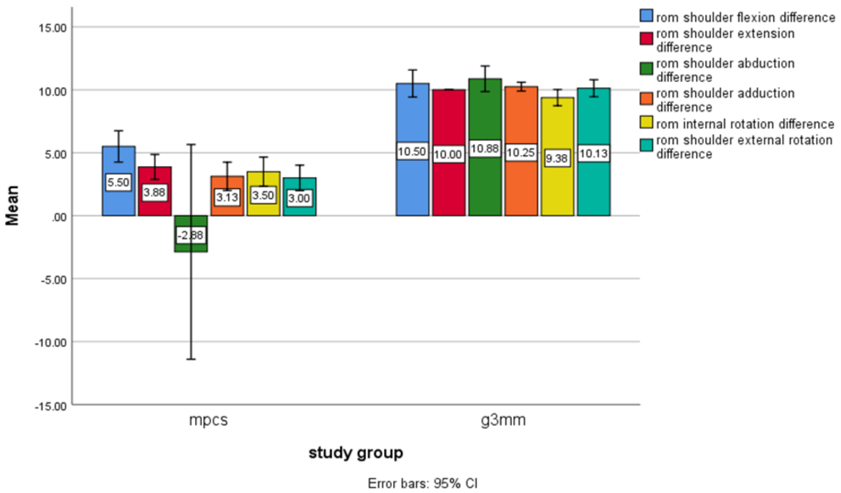
Effect of Visual Analogue Scale and DASH between Modified Posterior Capsular Stretching group and Grade 3 Maitland Mobilization group



Note: MPCS: Modified posterior capsular stretching; G3MM: Grade 3 Maitland mobilization; DASH: Disability of the Arm, Shoulder and Hand
Graph 1.1

The Grade 3 Maitland Mobilization (G3MM) group demonstrated a greater reduction in pain compared to the Modified Posterior Capsular Stretching (MPCS) group, with a difference of 1.48 versus 0.83 on a 10-point Visual Analog Scale (VAS), indicating that the Maitland technique may be more effective for pain relief. Both groups showed improvements in function as measured by the Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire, but the difference in scores (4.08 for G3MM vs. 3.23 for MPCS) was less pronounced, and neither group achieved the minimal clinically important difference of 10-15 points. The G3MM group had smaller error bars, suggesting consistent pain reduction across participants, while the larger error bars for G3MM in functional outcomes indicate greater variability in individual responses. This variability suggests that although Maitland mobilization may be preferred for pain reduction, functional improvement outcomes are less predictable, emphasizing the need for careful patient selection and monitoring when employing this technique. Overall, while G3MM appears superior for pain reduction and slightly better for functional improvement, treatment choices should consider individual patient factors and treatment goals.

Effect of shoulder range of motion between Modified Posterior Capsular Stretching group and Grade 3 Maitland Mobilization group



Note: MPCS: Modified posterior capsular stretching; G3MM: Grade 3 Maitland mobilization
Graph 1.2

The histogram demonstrates the consistent superiority of Grade 3 Maitland Mobilization (G3MM) over Modified Posterior Capsular Stretching (MPCS) in enhancing shoulder mobility, with the G3MM group exhibiting higher mean improvements across all six shoulder movement measurements. Specifically, G3MM achieved improvements of 10.50° in shoulder flexion compared to 5.50° for MPCS, 10.00° versus 3.88° in shoulder extension, and a striking 10.88° in shoulder abduction, where MPCS showed a decrease of -2.88°. Additionally, G3MM outperformed MPCS in shoulder adduction (10.25° vs. 3.13°), internal rotation (9.38° vs. 3.50°), and external rotation (10.13° vs. 3.00°), indicating more than three times greater improvement in several categories. Although the histogram does not directly indicate statistical significance, the substantial differences suggest clinical relevance, with G3MM's improvements translating to meaningful functional gains for patients. The concerning negative mean value for shoulder abduction in the MPCS group highlights the potential detriment of this technique for some patients, warranting further investigation. Overall, the G3MM group exhibited consistent improvements across all movements, supported by smaller error bars indicating reliable outcomes, reinforcing the recommendation for G3MM as the preferred technique in clinical practice for addressing shoulder mobility limitations.

DISCUSSION

These findings suggest that the effects of two interventions on patients with periarthritisshoulder, modified posterior capsular stretching and grade 3 Maitland Mobilization. Both interventions were hypothesized to reduce pain and improve range of motion significantly. The alternative hypothesis for modified posterior capsular stretching was accepted, showing statistically significant evidence of its effectiveness. Similarly, the alternative hypothesis for grade 3 Maitland Mobilization was also accepted, confirming its efficacy. Overall, the findings indicate that modified posterior capsular stretching and grade 3 Maitland Mobilization significantly reduce pain and enhance range of motion in patients with periarthritis shoulder.

CONCLUSIONS

In conclusion, this study provides valuable evidence supporting the use of Grade 3 Maitland mobilization and modified posterior capsular stretching in the management of periarthritis of the shoulder. Both interventions were effective in reducing pain and improving shoulder range of motion, with Grade 3 Maitland mobilization showing a slight edge in efficacy. These findings can inform clinical practice, guiding physiotherapists in selecting appropriate interventions for their patients. However, further research with larger sample sizes, longer follow-up periods, and more diverse populations is necessary to validate these results and explore the long-term benefits of these treatments.

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