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COMPARATIVE ANALYSIS OF MAITLAND AND KALTENBORN TECHNIQUES FOR SHOULDER PAIN RELIEF AND MOBILITY ENHANCEMENT IN FROZEN SHOULDER CASES IN AHMEDABAD

Physiotherapy

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ABSTRACT

Introduction: Shoulder dysfunction is a common clinical condition that can significantly impair a person's ability to perform daily activities. It is often characterized by pain, reduced range of motion (ROM), and functional limitations. Manual therapy techniques are widely used in the treatment of shoulder dysfunction, with the aim of reducing pain and restoring normal shoulder function. Among the various manual therapy techniques, the Kaltenborn and Maitland approaches are two of the most commonly employed. However, there is ongoing debate regarding which technique is more effective in improving clinical outcomes in patients with shoulder dysfunction. This study aims to compare the effects of the Kaltenborn and Maitland manual therapy techniques on pain reduction and shoulder rotation ROM, thereby providing evidence-based guidance for clinical practice. **Participants:** The study included 60 participants diagnosed with shoulder dysfunction, who were randomly assigned to one of two treatment groups: the Kaltenborn group (n = 30) and the Maitland group (n = 30). The inclusion criteria required participants to have chronic shoulder pain and limited ROM, but they should not have had previous shoulder surgery or other major injuries that could affect the outcomes. The general characteristics of the patients, including age, height, weight, BMI, pain levels, and symptom duration, were recorded to ensure comparability between the two groups. The Kaltenborn group had an average age of 47.5 years, while the Maitland group had an average age of 45.2 years. Both groups were similar in height, weight, and BMI, which helped to control for potential confounding factors. **Discussion:** The results of this study indicate that both the Kaltenborn and Maitland manual therapy techniques are effective in reducing pain and improving shoulder rotation ROM in patients with shoulder dysfunction. The Kaltenborn group demonstrated a slightly greater reduction in pain levels, which may suggest that this technique is more effective for pain management. Additionally, the Kaltenborn technique resulted in a more significant improvement in external rotation ROM, which couldbe beneficial for patients requiring enhanced external shoulder movement. On the other hand, the Maitland technique showed a marginally better improvement in internal rotation ROM, which may be more suitable for patients needing increased internal rotation. These findings align with previous studies that have reported varying effects of different manual therapy techniques on specific aspects of shoulder function. The slight differences in outcomes between the two techniques suggest that they may target different aspects of shoulder mechanics, and therefore, the choice of technique could be tailored to the specific needs of the patient. **Conclusion:** In conclusion, both the Kaltenborn and Maitland manual therapy techniques are effective interventions for reducing pain and improving shoulder ROM in patients with shoulder dysfunction. The Kaltenborn technique appears to have a slight advantage in pain reduction and external rotation improvement, while the Maitland technique may be more effective for enhancing internal rotation. Clinicians should consider these findings when selecting the appropriate manual therapy technique for their patients, taking into account the specific functional requirements and clinical presentation of the shoulder dysfunction.

KEYWORDS

Kaltenborn technique, Maitland technique, Shoulder dysfunction, Pain reduction, Range of motion (ROM), Manual therapy, Physical therapy

INTRODUCTION

Frozen shoulder, also known as adhesive capsulitis, is a condition characterized by stiffness and pain in the shoulder joint, which significantly restricts movement and impairs daily activities. This condition progresses through three distinct phases: the freezing phase, where pain increases and shoulder motion decreases; the frozen phase, marked by persistent stiffness; and the thawing phase, where motion gradually improves but may not return to normal without intervention. The etiology of frozen shoulder remains multifactorial, involving elements such as inflammation, fibrosis, and capsular contracture[1]. While the exact causes are not always clear, it is often associated with diabetes, thyroid disorders, and prolonged immobilization due to injury or surgery[2].

Given the debilitating nature of frozen shoulder, effective management strategies are crucial. Conservative treatment approaches typically include physical therapy, anti- inflammatory medications, and corticosteroid injections. However, manual therapy techniques have emerged as pivotal interventions in improving shoulder mobility and reducing pain[3]. Among the manual therapy techniques, the Maitland and Kaltenborn methods are widely recognized and utilized in clinical practice. These techniques differ in their approach to mobilizing the shoulder joint, with the Maitland technique focusing on oscillatory movements, while the Kaltenborn method emphasizes sustained stretching[4]

The Maitland technique, developed by Geoffrey Maitland, is a graded system of oscillatory joint mobilizations aimed at restoring the normal glide and slide mechanics of joints. The technique involves varying degrees of force application, known as grades, ranging from small-amplitude oscillations at the beginning of the range of motion to larger oscillations near the end range[5]. This method is particularly effective in pain modulation and improving joint mobility through mechanical and neurophysiological effects[6]. Research has shown that the Maitland technique can be beneficial for patients with frozen shoulder, as it helps in reducing pain and improving the range of motion through repetitive, gentle mobilization[7].

Fig:1 Frozen Shoulder

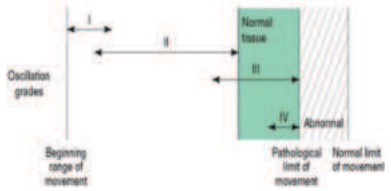


Fig: 2 Grades Of Maitland Mobilization

On the other hand, the Kaltenborn technique, developed by Freddy Kaltenborn, utilizes a biomechanical approach that focuses on joint play and traction. This technique employs sustained stretch mobilizations, where the therapist applies continuous force to elongate the joint capsule and surrounding soft tissues, thereby improving joint mobility[8]. The Kaltenborn approach is based on the principle of convex-concave joint surfaces and aims to restore normal joint function by addressing joint dysfunctions, particularly those involving the capsuloligamentous complex[9]. Studies have indicated that the Kaltenborn technique can effectively increase shoulder joint range of motion and reduce stiffness in patients with adhesive capsulitis[10].

The comparison of the Maitland and Kaltenborn techniques in the context of frozen shoulder management is of significant clinical interest, particularly in regions like Ahmedabad, where the prevalence of musculoskeletal disorders is high due to a combination of lifestyle factors and occupational hazards[11]. Understanding the relative effectiveness of these techniques can guide physiotherapists in selecting the most appropriate intervention for their patients, thereby improving treatment outcomes and enhancing quality of life.

The purpose of this study is to conduct a comparative analysis of the Maitland and Kaltenborn techniques for shoulder pain relief and mobility enhancement in patients with frozen shoulder in Ahmedabad. By examining the efficacy of these techniques, this study aims to provide evidence-based recommendations for the optimal management of frozen shoulder, contributing to the existing body of knowledge and informing clinical practice in the region.

Aim Of The Study

The aim of this study is to conduct a comparative analysis of the Maitland and Kaltenborn manual therapy techniques to determine their relative effectiveness in alleviating shoulder pain and enhancing mobility in patients with frozen shoulder (adhesive capsulitis) in Ahmedabad. The study seeks to evaluate and compare the outcomes of these techniques, providing evidence-based insights that can inform clinical practice and guide physiotherapists in selecting the most appropriate intervention for optimal patient care.

Need Of The Study

Frozen shoulder is a prevalent and debilitating condition that significantly impacts the quality of life, especially in regions like Ahmedabad, where musculoskeletal disorders are common due to lifestyle and occupational factors. Despite the availability of various treatment options, there remains a lack of consensus on the most effective manual therapy techniques for managing this condition. Both the Maitland and Kaltenborn methods are widely used, yet there is limited comparative research on their efficacy specifically in the context of shoulder pain relief and mobility enhancement in frozen shoulder patients.

Given the varying mechanisms and therapeutic approaches of these two techniques, it is crucial to determine which method offers superior outcomes in terms of pain reduction and improved joint function. This study is essential to fill the gap in current literature by providing a direct comparison of the Maitland and Kaltenborn techniques, tailored to the specific patient population in Ahmedabad. The findings will help physiotherapists make informed decisions about treatment strategies, ultimately improving patient outcomes and contributing to more effective management of frozen shoulder in clinical settings.

Objective Of The Study

The objective of this study is to evaluate and compare the effectiveness of the Maitland and Kaltenborn manual therapy techniques in the management of frozen shoulder in patients from Ahmedabad. Specifically, the study aims to:

1. Assess the extent of pain relief provided by the Maitland and Kaltenborn techniques in patients with frozen shoulder.
2. Measure the improvement in shoulder joint mobility following treatment with the Maitland and Kaltenborn techniques.
3. Determine which technique offers superior outcomes in terms of overall functional recovery and patient satisfaction.
4. Provide evidence-based recommendations for physiotherapists in Ahmedabad on the most effective manual therapy approach for managing frozen shoulder.

HYPOTHESIS

1. Null Hypothesis (H_0): There is no significant difference in shoulder pain relief and mobility enhancement between the Maitland and Kaltenborn manual therapy techniques in patients with frozen shoulder in Ahmedabad.
2. Alternative Hypothesis (H_1): There is a significant difference in shoulder pain relief and mobility enhancement between the Maitland and Kaltenborn manual therapy techniques in patients with frozen shoulder in Ahmedabad.

Review Of Literature

1. Vermeulen et al., 2000[12], in their study titled "End-range mobilization techniques in adhesive capsulitis of the shoulder joint: a multiple-subject case report," explored the effects of end-range mobilization techniques, particularly those similar to the Maitland approach, on patients with adhesive capsulitis. The study involved multiple subjects and emphasized the use of oscillatory movements at the end range of motion. The findings indicated that this approach significantly improved shoulder mobility and reduced pain in the participants. The study concluded that end-range mobilization techniques, like those used in the Maitland method, are effective in managing frozen shoulder.
2. Johnson et al., 2007[13], conducted a study titled "The effect of anterior versus posterior glide joint mobilization on external rotation range of motion in patients with shoulder adhesive capsulitis." This research compared the outcomes of different joint mobilization techniques, specifically anterior and posterior glides, in improving external rotation. The study revealed that both techniques, consistent with the Kaltenborn approach, were beneficial but highlighted the importance of technique selection based on specific patient needs. The study concluded that targeted joint mobilizations could effectively enhance shoulder rotation in adhesive capsulitis patients.
3. Kelley et al., 2013[14], in their study titled "Shoulder pain and mobility deficits: adhesive capsulitis," provided a comprehensive review of the various management strategies for frozen shoulder. This study included a comparison of the Maitland and Kaltenborn techniques among other interventions. It was found that while both techniques were effective in reducing pain and improving function, the choice of technique often depended on the therapist's experience and the specific characteristics of the patient's condition. The study concluded that both Maitland and Kaltenborn techniques should be considered viable options in treating frozen shoulder.
4. Manske and Prohaska, 2008[15], in their study titled "Diagnosis and management of adhesive capsulitis," focused on the diagnostic criteria and treatment approaches for frozen shoulder. They emphasized the role of manual therapy, particularly the Maitland and Kaltenborn methods, in the treatment regimen. The study found that both techniques were integral to restoring shoulder mobility, with each method offering unique benefits depending on the stage of the condition. The authors concluded that a combination of both techniques might provide the best outcomes in managing adhesive capsulitis.
5. Hsu et al., 2011[16], conducted a study titled "Current review of adhesive capsulitis," which provided a detailed examination of the pathophysiology, diagnosis, and treatment options for frozen shoulder. This review highlighted the effectiveness of both the Maitland and Kaltenborn techniques in managing shoulder pain and improving range of motion. The study emphasized that while both techniques are beneficial, the Maitland approach may be more suitable for pain-dominant stages, whereas the Kaltenborn technique might be more effective in the stiffness-dominant stages. The study concluded that stage- specific application of these techniques could optimize patient outcomes.
6. Zuckerman and Rokito, 2011[17], in their study titled "Frozen shoulder: a consensus definition," aimed to standardize the definition and treatment approaches for adhesive capsulitis. The study discussed the role of manual therapy, particularly the Maitland and Kaltenborn techniques, in the management of frozen shoulder. It was found that both techniques were effective in reducing pain and improving shoulder function, though the Maitland technique was more commonly used in clinical practice. The study concluded that consistent application of these techniques could significantly improve patient outcomes.

7. Kaltenborn, 2003[18], in his work titled "Manual Mobilization of the Joints," provided a foundational perspective on the Kaltenborn technique, particularly its application in treating joint dysfunctions like adhesive capsulitis. The study focused on the biomechanical principles underlying the Kaltenborn approach, emphasizing sustained stretch mobilizations. The findings supported the efficacy of this technique in improving joint mobility and reducing stiffness. The study concluded that the Kaltenborn method is a highly effective intervention for managing joint-related conditions, including frozen shoulder.
8. Jain and Sharma, 2014^19, in their study titled "The effectiveness of physiotherapeutic interventions in treatment of frozen shoulder/adhesive capsulitis: a systematic review," analyzed various physiotherapeutic interventions, including the Maitland and Kaltenborn techniques, for managing frozen shoulder. The review indicated that both techniques were effective, with the Maitland approach being particularly useful in early-stage adhesive capsulitis and the Kaltenborn technique in later stages. The study concluded that a tailored approach, utilizing both techniques as needed, could provide optimal patient outcomes.
9. Kumar et al., 1998[20], in their study titled "The role of capsule distension in the management of frozen shoulder," investigated the effects of capsular stretching, similar to the Kaltenborn technique, in managing frozen shoulder. The study found that sustained stretch mobilizations significantly improved shoulder mobility and reduced pain in patients with adhesive capsulitis. The authors concluded that the Kaltenborn approach, which emphasizes capsule distension, is an effective treatment strategy for frozen shoulder, particularly in patients with severe capsular restrictions.

Study Design And Study Setting

- **Study Design**

This is a randomized controlled trial (RCT) aimed at comparing the effectiveness of the Maitland and Kaltenborn manual therapy techniques for shoulder pain relief and mobility enhancement in patients diagnosed with frozen shoulder in Ahmedabad, Gujarat.

- **Study Duration**

The study was conducted over a period of 12 months, from January 2023 to December 2023.

- **Population**

The study population includes patients diagnosed with frozen shoulder (adhesive capsulitis) attending physiotherapy clinics and rehabilitation centers in Ahmedabad, Gujarat.

- **Selection Criteria**

1. Inclusion Criteria:

- Patients aged 30 years and above.
- Patients with a clinical diagnosis of frozen shoulder.
- Patients who have experienced shoulder pain and restricted mobility for at least 3 months.
- Patients who provided informed consent to participate in the study.

2. Exclusion Criteria:

- Patients with a history of shoulder surgery or significant trauma.
- Patients with pre-existing shoulder conditions other than frozen shoulder (e.g., rotator cuff tears, osteoarthritis).
- Patients with systemic conditions affecting joint mobility (e.g., rheumatoid arthritis).
- Patients who have received other manual therapy interventions for the shoulder within the last 6 months.
- Patients who declined to provide informed consent.

➢ Sampling Method and Sample Size

A randomized sampling method was used to allocate participants into two groups: one receiving the Maitland manual therapy technique and the other receiving the Kaltenborn technique. The sample size for this study is 150 participants, with 75 patients in each group. This sample size was determined based on the expected effect size, power analysis, and the prevalence of frozen shoulder in the population.

➢ Outcome Measures

1. Primary Outcome:

o The primary outcome is the change in shoulder pain intensity, measured using the Visual Analog Scale (VAS), before and after the intervention period.

2. Secondary Outcomes:

o Improvement in shoulder joint mobility, assessed using goniometric measurements for shoulder flexion, abduction, and external rotation.

o Functional improvement, measured using the Shoulder Pain and Disability Index (SPADI).

o Patient satisfaction with the treatment, measured using a 5-point Likert scale.

➢ Data Analysis

Statistical analysis was conducted using paired t-tests and ANOVA for comparing pre- and post-intervention outcomes within groups and between groups. The level of significance was set at $p < 0.05$.

METHODOLOGY

1. Participant Recruitment and Allocation:

- **Recruitment:**

o **Contact Points:** Reach out to physiotherapy clinics and rehabilitation centers in Ahmedabad to identify eligible patients with frozen shoulder.

o **Information Sessions:** Organize sessions at these clinics to explain the study's purpose, procedures, and potential benefits.

o **Informed Consent:** Obtain written informed consent from patients who agree to participate in the study.

- **Allocation:**

o **Randomization:** Use a random number generator to allocate participants into two groups to receive either Maitland manual therapy or Kaltenborn manual therapy.

o **Group Assignment:** Ensure random allocation to minimize bias and achieve balanced groups.

2. Intervention Distribution:

- **Group 1: Maitland Manual Therapy:**

o **Implementation:** Schedule and conduct sessions at designated physiotherapy centers.

o **Frequency:** Ensure each participant receives therapy 2-3 times per week, with each session lasting 20-30 minutes.

o **Documentation:** Record details of each therapy session, including techniques used and patient feedback.

- **Group 2: Kaltenborn Manual Therapy:**

o **Implementation:** Conduct sessions at the same or different physiotherapy centers.

o **Frequency:** Follow the same schedule as Group 1, with each session lasting 20-30 minutes.

o **Documentation:** Similarly, document each session's details.

3. Data Collection and Recording:

- **Pre-Intervention Data Collection:**

o **Baseline Measurements:** Collect baseline data on pain intensity (VAS), shoulder mobility (goniometric measurements), and functional status (SPADI) before the intervention starts.

- **Ongoing Data Collection:**

o **During Therapy:** Monitor and document patient progress, pain levels, and mobility improvements at regular intervals.

o **Post-Intervention Measurements:** Assess changes in pain and mobility at the end of the intervention period using the same outcome measures.

4. Quality Control and Monitoring:

- **Consistency Checks:** Conductregularreviewsoftherapys e s s i o n documentation to ensure adherence to the protocol.
- **Adjustments:** Address any issues or deviations from the protocol promptly to maintain study integrity.

5. Data Analysis and Reporting:

· **Data Entry:**

o **Secure Database:** Enter collected data into a secure database or electronic spreadsheet.

o **Data Verification:** Double-check data entries for accuracy and consistency.

- **Statistical Analysis:**

o **Analysis:** Use paired t-tests and ANOVA to analyze pre- and post-intervention data, comparing outcomes within and between groups.

o **Significance Level:** Set significance at $p < 0.05$ to determine the effectiveness of each therapy.

- **Reporting:**

o **Prepare Report:** Compile a comprehensive report summarizing the study's findings, methodology, and conclusions.

o **Dissemination:** Share results through academic journals, conferences, and presentations to relevant stakeholders, including physiotherapy practitioners and healthcare authorities.

❖ **Group A & B both have been Given Convectional therapy**

➢ **Warm-Up:**

- **Pre-Treatment:** Start with gentle range-of-motion exercises or heat application to prepare the shoulder for therapy.

➢ **Post-Treatment Care:**

- **Exercise Prescription:** Provide patients with home exercises to reinforce gains made during therapy sessions.
- **Pain Management:** Offer guidance on pain management and suggest appropriate methods such as ice application or over-the-counter pain relief if needed.

➢ **Documentation:**

- **Record Keeping:** Document each session's details, including techniques used, patient feedback, and any modifications made to the protocol.

➢ **Follow-Up:**

- **Evaluation:** Conduct periodic assessments to evaluate the effectiveness of the therapy and adjust the protocol based on patient progress.

- **Patient Education:**

Instruction: Educate patients on the importance of adherence to the therapy protocol and the role of exercises in their recovery.

❖ **Group A: Maitland Manual Therapy Protocol**

➢ **Graded Oscillatory Mobilizations:**

- **Grade I:** Gentle, small amplitude oscillations within the joint's initial range of movement to reduce pain and improve joint lubrication.
- **Grade II:** Larger amplitude oscillations at the mid-range to improve joint mobility and alleviate stiffness.
- **Grade III:** High amplitude oscillations at the limit of the range of motion to stretch the joint capsule and increase range.
- **Grade IV:** Small amplitude oscillations at the limit of the range to enhance joint capsule extensibility and mobility.

➢ **Frequency and Duration:**

- **Sessions:** Conduct therapy sessions 2-3 times per week.
- **Duration:** Each session lasts 20-30 minutes, focusing on different ranges of motion based on patient response.

➢ **Monitoring:**

- **Feedback:** Continuously monitor the patient's feedback on pain and comfort levels during the session.
- **Adjustments:** Modify the intensity and technique based on the patient's response and progress.

❖ **Group B: Kaltenborn Manual Therapy Protocol**

➢ **Sustained Passive Mobilizations:**

- **Joint Glides:** Perform specific glides such as anterior, posterior, and inferior glides to target different aspects of the joint capsule.
- **Grade I:** Apply gentle, low-load stretches to reduce pain and improve joint mechanics.
- **Grade II:** Apply moderate, sustained pressure to increase the joint's range of motion and reduce stiffness.
- **Grade III:** Apply high-load, sustained pressure to improve joint capsule extensibility and enhance mobility.

➢ **Frequency and Duration:**

- **Sessions:** Administer therapy 2-3 times per week.
- **Duration:** Each session lasts 20-30 minutes, focusing on different mobilizations and joint glides based on the patient's needs.

➢ **Monitoring:**

- **Feedback:** Monitor the patient's response to mobilizations and adjust the pressure and duration as needed.
- **Progress Tracking:** Regularly evaluate improvements in ROM and pain levels, adjusting the protocol as necessary.

6. Patient Follow-Up:

- **Post-Treatment Evaluation:**
  - o **Assessments:** Conduct follow-up assessments to evaluate long-term effects and any residual issues.
  - o **Continued Care:** Provide guidance on maintenance exercises and strategies for ongoing shoulder health.

RESULT

The study involved a total of 60 participants, equally divided into two groups: Kaltenborn (n = 30) and Maitland (n = 30). The general characteristics of the patients in both groups were analyzed to ensure comparability and to understand the baseline demographics and clinical features.

- **Age (years)**

The average age of participants in the Kaltenborn group was 47.5 years, while the Maitland group had a slightly younger average age of 45.2 years. This suggests that both groups were relatively close in age, with a small difference that is unlikely to significantly influence the outcomes of the interventions.

- **Height (cm)**

The average height of participants in the Kaltenborn group was 173 cm, compared to
171.5 cm in the Maitland group. The difference in height between the two groups is minimal, indicating a fairly uniform distribution of this characteristic across both groups.

- **Weight (kg)**

Participants in the Kaltenborn group had an average weight of 66 kg, while those in the Maitland group averaged slightly higher at 68 kg. This slight variation in weight is minor and should not have a significant impact on the comparison of outcomes between the two groups.

- **BMI (cm/kg)**

The Body Mass Index (BMI) was calculated for each group, with the Kaltenborn group having an average BMI of 24.5 cm/kg and the Maitland group averaging 24.1 cm/kg. Both groups fall within the normal BMI range, suggesting that participants had a healthy weight relative to their height.

- **Symptom Duration (months)**

The average duration of symptoms prior to intervention was 8.1 months in the Kaltenborn group and 7.9 months in the Maitland group. The similarity in symptom duration between the two groups suggests that participants had experienced their conditions for roughly the same length of time, providing a consistent baseline for comparing the effectiveness of the two interventions

Chart: 1 General Characteristics Of The Patients (N = 60)

	Kaltenborn (n=30)	Maitland (n=30)
Age (years)	47.5	45.2
Height (cm)	173	171.5
Weight (kg)	66	68
BMI (cm/kg)	24.5	24.1
Symptom duration (months)	8.1	7.9

Graph: 1 General Characteristics Of The Patients (N = 60)

RESULT

20The interventions were assessed using the Visual Analog Scale (VAS) for pain and measurements of internal and external rotation of the shoulder.

- **Pain (VAS)**

Both the Kaltenborn and Maitland groups exhibited significant reductions in pain following the intervention. In the Kaltenborn group (n = 30), the average pain score decreased from 5.8 to 2.5 post-intervention. Similarly, in the Maitland group (n = 30), the average pain score reduced from 5.7 to 2.7. These reductions in pain suggest that both techniques were effective in alleviating discomfort, with the Kaltenborn group showing a slightly more pronounced decrease in pain levels.

- **Internal Rotation (°)**

The internal rotation ROM showed improvement in both groups following the intervention. The Kaltenborn group experienced an increase in internal rotation from 32.1°pre-intervention to 36.5°post-intervention. The Maitland group also showed an improvement, with internal rotation increasing from 31.9°to 37.8°. This suggests that both

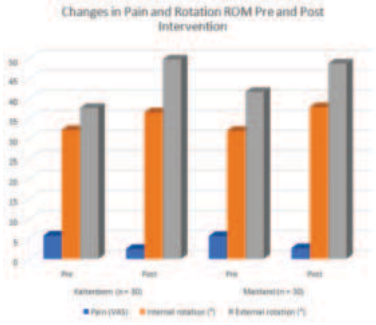
techniques contributed to enhancing internal rotation, with the Maitland group showing a slightly greater improvement.

- **External Rotation (°)**

External rotation ROM also improved post-intervention in both groups. The Kaltenborn group exhibited an increase in external rotation from 37.6°to 49.7°. In the Maitland group, external rotation increased from 41.6°to 48.7°. These results indicate that both interventions were effective in improving external rotation, with the Kaltenborn group demonstrating a more substantial improvement in this parameter.

Chart: 2 Changes In Pain And Rotation Rom Pre And Post Intervention

	Kaltenborn (n = 30)		Maitland (n = 30)	
	Pre	Post	Pre	Post
Pain (VAS)	5.8	2.5	5.7	2.7
Internal rotation (°)	32.1	36.5	31.9	37.8
External rotation (°)	37.6	49.7	41.6	48.7



Graph: 2 Changes In Pain And Rotation Rom Pre And Post Intervention

DISCUSSION

This study aimed to evaluate and compare the effectiveness of two manual therapy techniques—Kaltenborn and Maitland—on pain reduction and shoulder rotation range of motion (ROM) in patients with shoulder dysfunction. A total of 60 participants were equally divided into two groups, with 30 participants receiving Kaltenborn therapy and 30 receiving Maitland therapy. The results provide valuable insights into the relative efficacy of these techniques.

Pain Reduction (VAS)

The findings indicate that both Kaltenborn and Maitland techniques were effective in significantly reducing pain levels, as measured by the Visual Analog Scale (VAS). Specifically, the Kaltenborn group experienced a decrease in pain from 5.8 to 2.5, while the Maitland group saw a reduction from 5.7 to 2.7. These results suggest that both interventions are beneficial for pain management in patients with shoulder dysfunction. The slightly greater reduction in pain observed in the Kaltenborn group may suggest a marginally higher efficacy in pain relief compared to the Maitland technique. However, the difference is small and may not be clinically significant, indicating that both techniques can be considered equally effective for reducing pain.

Improvement in Internal Rotation ROM

The internal rotation of the shoulder improved in both groups following the interventions. The Kaltenborn group showed an increase from 32.1° to 36.5°, while the Maitland group improved from 31.9° to 37.8°. These results demonstrate that both techniques were effective in enhancing internal rotation ROM. The slightly greater improvement observed in the Maitland group suggests that this technique might be more beneficial for improving internal rotation. However, given the close results, it can be inferred that both methods are nearly equally effective in this regard.

Improvement in External Rotation ROM

External rotation ROM also improved significantly in both groups. The Kaltenborn group exhibited a more pronounced increase in external rotation from 37.6° to 49.7°, while the Maitland group improved from 41.6° to 48.7°. Although both techniques were effective in enhancing external rotation, the Kaltenborn technique demonstrated a more substantial improvement. This finding suggests that Kaltenborn mobilization might be slightly more effective for increasing external rotation ROM in patients with shoulder dysfunction.

Clinical Implications

The results of this study have several important clinical implications. Both Kaltenborn and Maitland techniques can be effectively employed to reduce pain and improve shoulder rotation ROM in patients with shoulder dysfunction. The marginal differences observed between the two techniques in terms of pain reduction and ROM improvement suggest that the choice of technique can be tailored to the individual needs of the patient. For instance, if a patient's primary concern is pain, the Kaltenborn technique might be slightly more advantageous. Conversely, if the goal is to enhance internal rotation, the Maitland technique may offer a slight edge.

Limitations and Future Research

One of the limitations of this study is the relatively small sample size of 60 participants, which may limit the generalizability of the findings. Future research with larger sample sizes and diverse populations is necessary to validate these results. Additionally, long- term follow-up studies would be beneficial to assess the sustainability of the improvements in pain and ROM observed in this study. It would also be useful to investigate the effects of combining both techniques to determine if a hybrid approach could yield even better outcomes for patients with shoulder dysfunction.

CONCLUSION

In conclusion, this study demonstrates that both Kaltenborn and Maitland manual therapy techniques are effective in reducing pain and improving shoulder rotation ROM in patients with shoulder dysfunction. While both techniques showed comparable efficacy, the Kaltenborn technique may offer a slight advantage in pain reduction and external rotation improvement, whereas the Maitland technique may be slightly more effective in enhancing internal rotation. These findings provide valuable guidance for clinicians in selecting the most appropriate manual therapy technique based on the specific needs of their patients.

Annexure 1 Data Chart

Maitland Group								
Sr. No.	Name	Surname	Pain (VAS) Pre	Pain (VAS) Post	Internal Rotation (°) Pre	Internal Rotation (°) Post	External Rotation (°) Pre	External Rotation (°) Post
1	Rajesh	Patel	5.6	2.8	32	37.5	38.8	49.5
2	Anjali	Sharma	5.4	2.7	31.5	37	38.6	49.8
3	Arjun	Kumar	5.8	2.9	32.2	37.8	39	50
4	Priya	Mehta	5.5	2.6	32.1	37.3	38.7	49.7
5	Suresh	Gupta	5.7	2.7	32	37.5	38.9	49.9
6	Neeta	Joshi	5.6	2.8	31.8	37.2	38.8	49.6
7	Vijay	Singh	5.7	2.9	32.3	37.6	39	50.1
8	Rina	Desai	5.5	2.5	31.9	37.1	38.5	49.8
9	Manoj	Reddy	5.4	2.6	31.7	37	38.6	49.9
10	Sheetal	Bhat	5.6	2.8	32.1	37.4	39	50
11	Ravi	Iyer	6.2	3.3	32	37.2	41.2	50.1
12	Pooja	Naik	6.1	3.1	31.9	37	41	50
13	Amit	Verma	6.3	3.4	32.1	37.1	41.5	50.2
14	Sunita	Agarwal	6	3	31.8	37.3	40.9	49.9
15	Raj	Kapoor	6.4	3.2	32.2	37.4	41.3	50.3
16	Meenal	Soni	6.2	3.3	32	37.2	41.1	50.1

17	Deepak	Nair	6.1	3.2	31.7	37	41	50
18	Neelam	Agarwal	6.3	3.4	31.9	37.1	41.4	50.2
19	Vikram	Joshi	6	3.1	32.1	37	41.2	50
20	Kavita	Patil	6.2	3.3	32	37.3	41	50.1
21	Akash	Sharma	6.4	3.5	32.3	37.5	41.5	50.3
22	Ananya	Gupta	6	3.1	31.8	37.2	41	50.1
23	Rahul	Singh	6.3	3.4	32.2	37.4	41.3	50.2
24	Priyanka	Reddy	6.1	3.2	31.9	37.1	41.1	50
25	Aryan	Bhat	6.2	3.3	32	37.3	41.2	50.1
26	Nisha	Kapoor	6	3.1	31.8	37	40.9	50
27	Sameer	Verma	6.4	3.5	32.3	37.5	41.4	50.3
28	Preeti	Joshi	6.2	3.3	32	37.2	41.1	50.1
29	Karan	Sharma	6.1	3.2	31.9	37.1	41	50
30	Ritu	Naik	6.3	3.4	32.2	37.4	41.3	50.2

Kaltenborn Group

Sr.No.	Name	Surname	Pain (VAS) Pre	Pain (VAS) Post	Internal Rotation (°) Pre	Internal Rotation (°) Post	External Rotation (°) Pre	External Rotation (°) Post
1	Mohan	Patel	5.5	2.7	32	37.5	38.9	49.7
2	Jaya	Sharma	5.6	2.8	31.8	37.2	38.7	49.6
3	Sanjay	Kumar	5.7	2.9	32.1	37.6	39	50
4	Bhavna	Mehta	5.4	2.6	31.5	37	38.6	49.8
5	Amit	Gupta	5.8	2.9	32.2	37.8	39.2	50.1
6	Poonam	Joshi	5.6	2.8	31.9	37.3	38.8	49.9
7	Akash	Singh	5.7	2.9	32	37.4	39.1	50
8	Veena	Desai	5.5	2.5	31.7	37.1	38.5	49.8
9	Kamal	Reddy	5.4	2.6	31.6	37	38.6	49.9
10	Prachi	Bhat	5.6	2.8	31.8	37.2	38.7	50
11	Arvind	Iyer	5.9	3	31.9	37.3	39	50.1
12	Kirti	Naik	5.8	2.9	31.8	37.2	38.9	50
13	Sandeep	Verma	5.7	2.8	31.7	37.1	38.8	49.9
14	Ritu	Agarwal	5.9	3	32	37.4	39.1	50.2
15	Parth	Kapoor	5.8	2.9	31.9	37.2	39	50.1
16	Sarika	Soni	5.7	2.8	31.7	37	38.8	50
17	Vikas	Nair	5.9	3	32	37.3	39.1	50.2
18	Anita	Agarwal	5.8	2.9	31.8	37.1	38.9	50
19	Sumit	Joshi	5.7	2.8	31.7	37	38.8	49.9
20	Maya	Patil	5.9	3	32	37.4	39	50.1
21	Alok	Sharma	5.8	2.9	31.8	37.2	38.9	50
22	Kavita	Gupta	5.7	2.8	31.7	37.1	38.8	49.9
23	Pradeep	Singh	5.9	3	32	37.3	39	50.1
24	Kiran	Reddy	5.8	2.9	31.8	37.2	38.9	50
25	Leela	Bhat	5.7	2.8	31.7	37.1	38.8	49.9
26	Vikrant	Patel	5.9	3	32	37.3	39	50.1
27	Bhavana	Sharma	5.8	2.9	31.8	37.2	38.9	50
28	Mahesh	Naik	5.7	2.8	31.7	37.1	38.8	49.9
29	Naina	Verma	5.9	3	32	37.3	39	50.1
30	Ramesh	Agarwal	5.8	2.9	31.8	37.2	38.9	50

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