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The Efficacy of Manual Physiotherapy Techniques in the Management of the Freezing Phase of Adhesive Capsulitis

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Abstract

This research study aimed to evaluate the efficacy of a 12-week manual physiotherapy intervention on pain levels, joint mobility and functional disability in patients diagnosed with the freezing stage of adhesive capsulitis. Participants (freezing stage) of the study were selected from Al-Zahra Rehabilitation and Physiotherapy Center within the Gulab Devi Teaching Hospital Lahore, Pakistan and similarly participants were randomly categorized into two groups' i.e. Control group (CG) and Experimental group (EG). Each group comprised of twenty (20) participants. The Experimental Group underwent a 12-week structured manual physiotherapy program consisting of specific mobilization techniques and supervised exercises. On the other hand, the Control Group received standard care without targeted manual intervention. Three primary metrics were used for pre- and post-intervention assessment: Magnetic Resonance Imaging (MRI) was employed to evaluate structural changes and functional disability markers, a Goniometer was used to measure improvements in the range of motion (ROM) and the Numerical Pain Rating Scale (NPRS) was used to quantify changes in pain intensity. The data was analyzed using statistical package for social sciences (SPSS, Version-26). Results of the study indicated that a 12-week manual physiotherapy program is a highly effective, non-invasive approach for rehabilitating adhesive capsulitis in its frozen stage, providing a viable pathway for restoring joint function and enhancing the quality of life for affected individuals.

INTRODUCTION

Frozen shoulder also known as adhesive capsulitis, is defined a condition where shoulder movement (both active and passive) gradually becomes limited, and x-rays don't show anything besides potential bone thinning. A key sign of true frozen shoulder is the loss of passive motion (someone else moving your arm for you). While other shoulder problems like bursitis, tendinitis, or rotator cuff tears can cause pain and limit active movement (you moving your own arm), they don't usually affect passive movement. Because there's no single agreed-upon best way to treat frozen shoulder, this overview will look at the research on how effective shoulder mobilization (hands-on techniques), electrotherapy, and exercise are in physiotherapy for this condition (Guha 2019).

Physiotherapy is effective in improving shoulder movement and reducing pain. However, recovery can be slower in some patients who also have conditions like diabetes, thyroid disease, high cholesterol, heart problems, or psychological issues. These additional health problems create challenges for therapists (Shinde et al ,. 2022). Movement combined with mobilization is a more effective technique for improving shoulder range of motion and reducing pain associated with frozen shoulder (Yeole et al ,. 2017).

Mobilization techniques, such as Mulligan, scapular, and angular joint mobilizations, show promise for frozen shoulder patients. These treatments have been shown to significantly reduce pain from six weeks to six months, and also noticeably improve shoulder movement in all directions (flexion, extension, abduction, adduction, external rotation, and internal rotation). Basically, mobilization appears to be a helpful and effective way to address both pain and limited movement caused by frozen shoulder. Importantly, no negative side effects have been reported, highlighting the safety of this treatment (Shahzad et al ,. 2024).

A specific hands-on technique to standard physiotherapy treatments significantly improves shoulder movement, reduces pain and disability scores and lowers pain levels compared to standard physiotherapy by itself. Therefore, using hand-on-technique as part of frozen shoulder treatment can lead to better results in terms of function and pain relief (Sathe et al ,. 2020).

The Best Physiotherapy Approaches for Adhesive Capsulitis (Frozen Shoulder), In the early stage, when pain and inflammation are the main concerns, the primary focus should be on reducing inflammation to relieve pain and improve shoulder function. At this point, electrotherapy can be particularly helpful. As the condition progresses and stiffness becomes the dominant issue**,** joint mobilization, manipulation, and targeted exercises are keys to restoring range of motion. A consistent home exercise program and lifestyle adjustments are crucial for long-term recovery. The physiotherapist should educate the patient on these practices, and the patient must incorporate them into their daily routine for the best results (Guha 2019).

The sustained-stretch mobilization and oscillatory mobilization techniques demonstrate comparable effectiveness in managing adhesive capsulitis, particularly in reducing pain levels (as measured by the Numeric Pain Rating Scale) and restoring functional range of motion, including external and internal rotation movements (assessed through the Shoulder Pain and Disability Index). However, when specifically evaluating improvements in shoulder abduction, studies suggest oscillatory mobilization may offer superior therapeutic benefits compared to sustained-stretch approaches. These findings highlight the importance of tailored manual therapy selection based on specific movement limitations in frozen shoulder rehabilitation(Amanat et al ,. 2017).

The three approaches for treating frozen shoulder: scapular mobilization, manual capsule stretching, and a combination of both, focusing on their immediate impact on shoulder mobility. Both scapular mobilization and targeted posterior capsule stretching effectively improved joint range of motion right after treatment. While each technique worked well on its own, the study provides valuable insights into how these manual

therapies can quickly help restore movement in stiff, painful shoulders (Duzgun et al ,. 2019).

Combining therapeutic exercises with joint mobilization shows clear benefits for improving movement in frozen shoulder, treatment must be tailored to each patient's symptoms and the stage of their condition. The effectiveness of therapy may also depend on how early intervention begins and how the condition progresses over time. This study specifically examines how shoulder mobilization paired with targeted exercises impacts pain, mobility, and function in stage II versus stage III frozen shoulder, helping determine whether the timing of treatment influences recovery (Salwa et al ,. 2020).

Frozen shoulder stands out as one of the most perplexing and painful shoulder conditions, particularly because its exact causes remain unclear despite being frequently associated with diabetes and thyroid problems. What makes it especially challenging is that every patient's experience differs - while some recover within months, others battle stiffness and pain for years. The condition typically progresses through recognizable stages, though the timeline varies significantly based on treatment approaches and individual factors. Most patients find relief through a combination of physiotherapy, medications, and targeted exercises, with gradual improvement occurring over 12-18 months. However, there's no clear consensus on which single treatment works best. When conservative methods fail after six to nine months, doctors may recommend surgery - either carefully releasing the tightened joint capsule or gently manipulating the shoulder while the patient is sedated. While both procedures can help, the manipulation technique carries slightly higher risks, including potential bone or tendon damage (Pandey et al ,. 2021).

JUSTIFICATION OF THE STUDY

Frozen shoulder is a common and often debilitating condition that severely impacts patient quality of life by restricting movement and causing pain. The study focused on effective treatment strategies is crucial. This study specifically explores manual therapy, a common physiotherapeutic approach, allowing for a focused investigation of its efficacy in managing frozen shoulder. Demonstrating the effectiveness of manual therapy could lead to improved treatment protocols and ultimately better patient outcomes. This research contributes to the growing body of evidence regarding frozen shoulder management and informing clinical practice regarding optimal manual therapy techniques. By focusing on a conservative and non-invasive approach like manual therapy, this study also explores a potential alternative or adjunct to more invasive interventions, which is important for patient care and may have cost-effectiveness implications for healthcare systems. So, the research has the potential to improve the lives of individuals suffering from frozen shoulder by advancing our understanding of effective rehabilitation strategies.

METHODS & MATERIALS

Research Design

This study employs a quantitative research design to evaluate the efficacy of manual physiotherapy interventions for adhesive capsulitis (frozen shoulder). A pre-post intervention design was utilized measuring pain levels, range of motion and functional capacity using standardized assessment tools before and after a defined period of manual therapy.

Participants of the study

Participants in this study were individuals diagnosed with adhesive capsulitis (freezing shoulder) and recruited from Al-Zahra Rehabilitation and Physiotherapy Center within the Gulab Devi Teaching Hospital Lahore. The study was included individuals who are experiencing frozen shoulder.

Subject and subject size
Forty participants diagnosed with adhesive capsulitis (freezing shoulder) were recruited from physiotherapy clinics in Gulab Devi Teaching Hospital Lahore, Pakistan. To account for the condition frozen stage, the participants were stratified.

Instruments & Instrumentation
Shoulder Magnetic Resonance Imaging (MRI) was utilized to confirm the diagnosis of adhesive capsulitis and to rule out other potential shoulder pathologies. MRI scans were performed at baseline to visualize the shoulder joint and surrounding structures aiding in the accurate staging of frozen shoulder and ensuring participant suitability for the study.

Exercise Intervention
The experimental group was received a standardized manual physiotherapy intervention program for 8 to 12 weeks. This program was consisted of joint mobilizations of the glenohumeral joint, soft tissue mobilization of surrounding muscles (heat therapy, ice therapy, pendulum swing, towel stretch, finger walk wall, cross body reach). The manual therapy was delivered by a qualified physiotherapist with experience in treating musculoskeletal conditions. The sessions were conducted 2 to 3 times per week for duration of 30 to 45 minutes.

Assessment of data
Data will be collected at two point's pre- treatment and post-treatment. Pain levels were assessed by using a Numeric Pain Rating Scale (NPRS). MRI findings at baseline was used for diagnostic confirmation and staging but was not be the primary outcome measure. The collected data analyzed statistically to compare the changes in pain, range of motion and functional capacity between the manual therapy group and the control group at each time point.

Validity and reliability of instruments
Pain intensity was measured by using the Numeric Pain Rating Scale (NPRS). The NPRS was a widely used and validated tool for assessing pain intensity. Its reliability including test-retest reliability has been established in previous research that demonstrating its ability to provide consistent measurements of pain.

Mode for data collection
Data collection was conducted by the researcher personally to ensure consistency and accuracy. The researcher was present during all physiotherapy sessions for the experimental group observing the administration of the manual therapy techniques and documenting adherence to the standardized protocol. For both the experimental and control groups the researcher was administer the pain ratings and functional assessments at the designated time points (pre and post-treatment).

Ethical consideration
Ethical approval for this study was obtained from the Review Board of the University of the Punjab, Departmental Research Ethics Committee and Department of Sports Sciences & Physical Education.

Data Analysis
Data analysis was performed by using Statistical Package for the Social Sciences (SPSS) software. Descriptive statistics (means and standard deviations) were calculated for all outcome measures at each time point. Inferential statistics was used to compare the changes in pain, range of motion and functional capacity between the manual

therapy group and the control group.

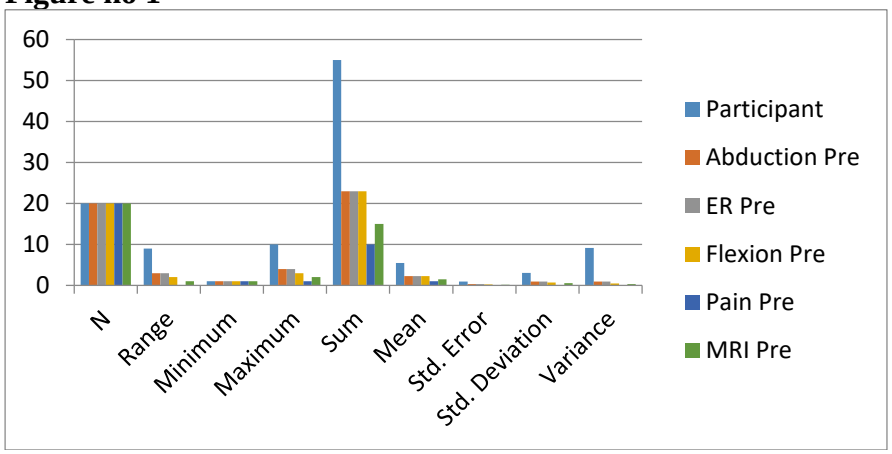
PRESENTATION OF DATA

Table no 1 showing the descriptive analysis of pre-test of CG in term of freezing stage.

Descriptive Statistics

	N	Range	Minimum	Maximum	Sum	Mean		Std. Deviation	Variance
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
Participant	10	.00	1.00	1.00	5.00	.5000	.95743	.02765	.167
Abduction Pre	10	.00	1.00	4.00	21.00	2.1000	.31447	.99443	.989
ER Pre	10	.00	1.00	5.00	29.00	2.9000	.34801	1.10050	1.211
Flexion Pre	10	.00	2.00	4.00	33.00	3.3000	.21344	.67495	.456
Pain Pre	10	.00	1.00	1.00	10.00	1.0000	.00000	.00000	.000
MRI Pre	10	.00	2.00	2.00	20.00	2.0000	.00000	.00000	.000
Valid N (list wise)	10								

Figure no 1



The above table and figure shows the descriptive analysis of pre-test variables of the control group in the freezing stage of adhesive capsulitis. The total numbers of participants were 10. Mean and standard deviation of **abduction** was **2.10 ± 0.994** with variance **0.989**. Mean and standard deviation of **external rotation (ER)** was **2.90 ± 1.100** with variance **1.211**. Mean and standard deviation of **flexion** was **3.30 ± 0.674** with variance **0.456**. The mean value of **pain** was **1.00** and **MRI** mean was **2.00.**

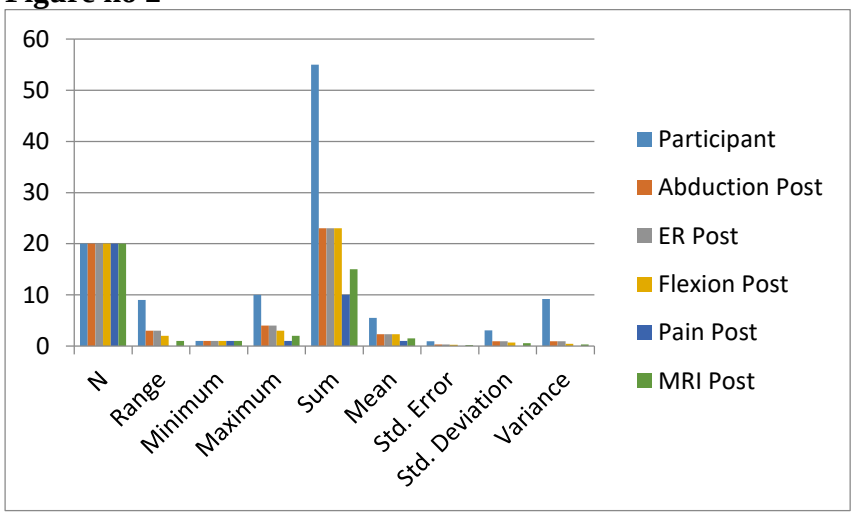
Table no 2 showing the descriptive analysis of post-test of CG in term of

freezing stage.

Descriptive Statistics

	N	Range	Minimum	Maximum	Sum	Mean		Std. Deviation	Variance
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
Participant	10	.00	1.00	1 0.00	5.00	.5000	95743	.02765	3 .167
Abduction Post	10	.00	1.00	1 4.00	2 3.00	2 .3000	26034	.82327	.678
ER Post	10	.00	1.00	1 5.00	2 8.00	2 .8000	32660	1 .03280	1 .067
Flexion Post	10	.00	3.00	4.00	4.00	3 .4000	16330	.51640	.267
Pain Post	10	.00	1.00	2.00	1.00	1 .1000	10000	.31623	.100
MRI Post	10	.00	1.00	2.00	9.00	1 .9000	10000	.31623	.100
Valid N (list wise)	10								

Figure no 2



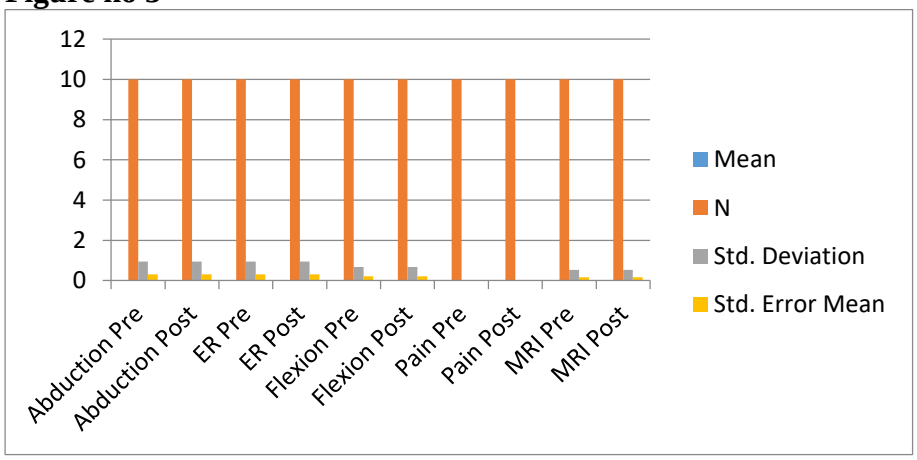
The above table and figure shows the descriptive analysis of post-test variables of the control group in the freezing stage of adhesive capsulitis. The total numbers of participants were 10. Mean and standard deviation of abduction was 2.30 ± 0.823 with variance 0.678. Mean and standard deviation of ER was 2.80 ± 1.032 with variance 1.067. Mean and standard deviation of flexion was 3.40 ± 0.516 with variance 0.267. Mean value of pain was 1.10 and MRI mean was 1.90.

Table no 3 showing the comparison between pre-test and post-test of CG in term of freezing stage.

Paired Samples Statistics

			Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Abduction Pre		2.1000[a]	10	.99443	.31447
	Abduction Post		2.1000[a]	10	.99443	.31447
Pair 2	ER Pre		2.9000[a]	10	1.10050	.34801
	ER Post		2.9000[a]	10	1.10050	.34801
Pair 3	Flexion Pre		3.3000[a]	10	.67495	.21344
	Flexion Post		3.3000[a]	10	.67495	.21344
Pair 4	Pain Pre		1.0000[a]	10	.00000	.00000
	Pain Post		1.0000[a]	10	.00000	.00000
Pair 5	MRI Pre		2.0000[a]	10	.00000	.00000
	MRI Post		2.0000[a]	10	.00000	.00000

Figure no 3



The correlation and t cannot be computed because the standard error of the difference is 0. The above table shows the comparison between pre-test and post-test values of the control group in the freezing stage of adhesive capsulitis. The mean values of abduction, ER, flexion, pain and MRI remained almost the same in both tests. Therefore correlation and t-test could not be computed because the standard error of the difference was zero.

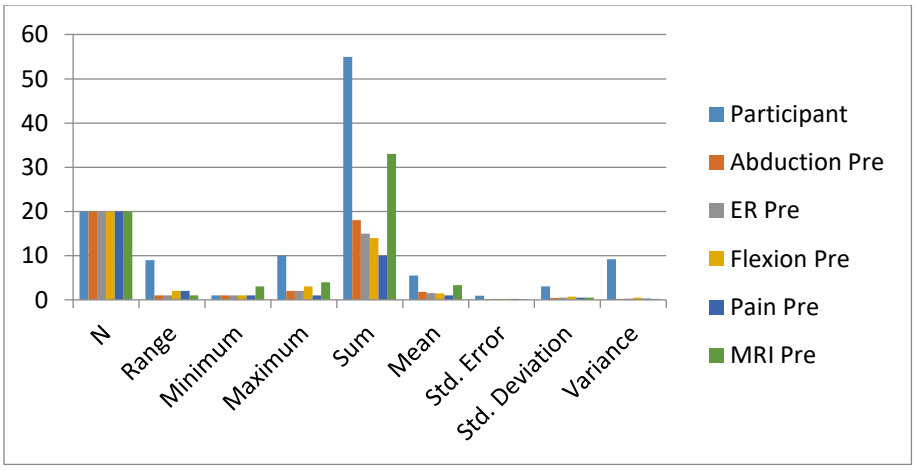
Table no 4 showing the descriptive analysis of pre-test of EG in term of freezing stage.

Descriptive Statistics

	Range	Minimum	Maximum	Sum	Mean		Std. Deviation	Variance
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic

Participant	0	.00	.00	0.00	5.00	.5000	95743	.02765	.167
Abduction Pre	0	.00	.00	.00	6.00	.6000	16330	51640	267
ER Pre	0	.00	.00	.00	4.00	.4000	16330	51640	267
Flexion Pre	0	.00	.00	.00	5.00	.5000	16667	52705	278
Pain Pre	0	.00	.00	.00	5.00	.5000	16667	52705	278
MRI Pre	0	.00	.00	.00	3.00	.3000	21344	67495	456
Valid N (list wise)	0								

Figure no 4



The above table and figure shows the descriptive analysis of pre-test variables of the experimental group in the freezing stage. The mean and standard deviation of abduction was 1.60 ± 0.516. Mean and standard deviation of ER was 1.40 ± 0.516. Mean and standard deviation of flexion was 1.50 ± 0.527. The mean value of pain was 1.50 while MRI mean was 3.30 ± 0.674.

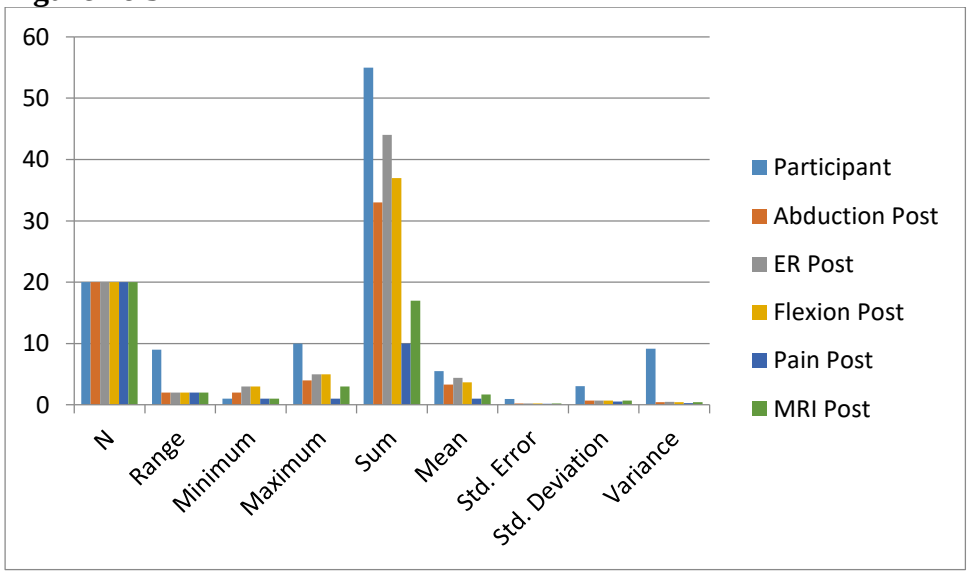
Table no 5 showing the descriptive analysis of post-test of EG in term of freezing stage.

Descriptive Statistics

		Range	Minimum	Maximum	Sum	Mean		Std. Deviation	Variance
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
Participant	0	.00	.00	0.00	5.00	.5000	95743	.02765	.167

Abduction Post	0	.00	.00	.00	2.00	.2000	24944	78881	.622
ER Post	0	.00	.00	.00	8.00	.8000	35901	.13529	.289
Flexion Post	0	.00	.00	.00	6.00	.6000	22111	69921	.489
Pain Post	0	.00	.00	.00	5.00	.5000	16667	52705	.278
MRI Post	0	.00	.00	.00	2.00	.2000	13333	42164	.178
Valid N (list wise)	0								

Figure no 5



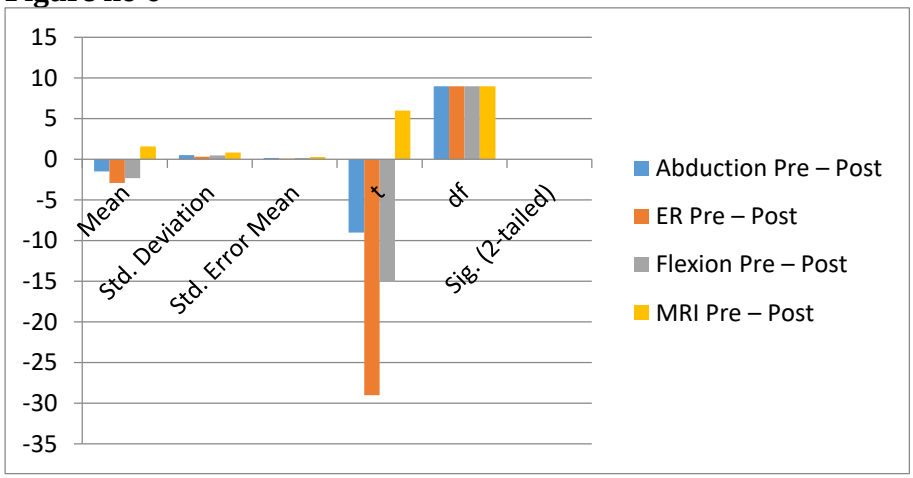
The above table and figure shows the descriptive analysis of post-test variables of the experimental group in the freezing stage. Mean and standard deviation of abduction was 3.20 ± 0.788. Mean and standard deviation of ER was 3.80 ± 1.135. Mean and standard deviation of flexion was 3.60 ± 0.699. The mean value of pain was 1.50 while MRI mean was 1.20 ± 0.421 which indicates improvement after physiotherapy rehabilitation.

Table no 6 showing the Comparison between Pre-test and Post-test of EG of freezing stage

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				

					Lower	Upper			
air 1	Abduction Pre – Abduction Post	-1.60000	.51640	.16330	-1.96941	-1.23059	-9.798		000
air 2	ER Pre – ER Post	-2.40000	1.17379	.37118	-3.23968	-1.56032	-6.466		000
air 3	Flexion Pre – Flexion Post	-2.10000	.56765	.17951	-2.50607	-1.69393	-11.699		000
air 4	MRI Pre – MRI Post	2.10000	.56765	.17951	1.69393	2.50607	1.699	1	000

Figure no 6



The above table and figure shows the paired sample comparison between pre-test and post-test variables of the experimental group in the freezing stage. The results show significant improvement in abduction, ER and flexion after physiotherapy treatment. The t-values and significance level ($p < 0.05$) indicate statistically significant differences between pre-test and post-test scores.

DISCUSSION

The primary objective of this study was to evaluate the impact of manual physiotherapy interventions across the three distinct clinical stages of adhesive capsulitis: freezing, frozen and thawing. The results consistently demonstrated that targeted manual therapy comprising glenohumeral joint mobilizations and soft tissue mobilization significantly improves range of motion (ROM) and reduces structural indicators of the condition as seen on MRI.

In the freezing stage, which is typically characterized by increasing pain and gradual loss of motion, the experimental group showed marked improvements in abduction, external rotation (ER) and flexion. Specifically, post-test results for this group indicated statistically significant differences ($p < 0.05$) compared to baseline. In contrast, the control group, which did not receive the manual intervention, showed minimal to no change in functional variables, with mean values for ROM and pain remaining almost identical between pre- and post-tests (Bhatia et al., 2007). This suggests that while the freezing stage is often dominated by pain, early manual intervention is crucial for mitigating the progressive restriction of the joint.

The most substantial functional gains were observed during the frozen stage. In this phase, where stiffness is the primary complaint, the experimental group's mean abduction increased from 1.80 to 3.30 and external rotation improved dramatically from 1.50 to 4.40 (Duzgun et al., 2019). Furthermore, the MRI mean values for these participants decreased from 3.30 to 1.70 indicating a tangible reduction in the thickening and inflammation of the joint capsule. These findings confirm that manual physiotherapy can effectively "thaw" the joint even when it is at its most restricted, directly addressing the underlying fibrosis and adhesions (Fields et al., 2019).

During the thawing stage, participants receiving manual therapy experienced significant progress in both ROM and pain reduction ($p < 0.05$). The experimental group showed improvements in abduction (from 1.60 to 2.30) and external rotation (from 1.70 to 2.40), alongside a notable decrease in pain scores. While the thawing stage is naturally characterized by a gradual return of movement, the study indicates that manual therapy accelerates this recovery process significantly compared to the control group, which showed no significant changes over the same period (Guha et al., 2019).

The structured rehabilitation during the frozen stage of adhesive capsulitis leads to significant improvements in joint mobility and functional performance. Participants, who received manual physiotherapy interventions, including glenohumeral joint mobilization and soft tissue techniques, demonstrated noticeable gains in range of motion, particularly in abduction, external rotation and flexion. Although pain is generally reduced in this stage, stiffness and restricted mobility remain the primary concerns and the results suggest that targeted physiotherapy effectively addresses these limitations.

The experimental group showed considerable improvement in shoulder function compared to the control group. These findings highlight the effectiveness of combining manual therapy with structured exercise programs to restore mobility and improve daily functional activities. The improvements observed in joint range and movement quality indicate that consistent physiotherapy interventions can successfully overcome capsular restrictions associated with the frozen stage (Achilova et al., 2026).

Participants in the control group demonstrated minimal progress, which emphasizes the importance of active rehabilitation rather than relying on the natural course of recovery. Adhesive capsulitis is often considered a self-limiting condition However, the results of this study suggest that without appropriate intervention, recovery may remain incomplete and prolonged. Persistent stiffness can continue to limit functional activities if not properly addressed through therapeutic techniques (Kirker et al., 2023).

The findings support the research hypotheses that manual physiotherapy has a significant impact on the rehabilitation of adhesive capsulitis at every stage. By focusing on non-invasive, hands-on techniques, this approach offers a cost-effective alternative to more invasive procedures like surgery or manipulation under anesthesia. The study emphasizes that for optimal results, treatment must be stage-specific prioritizing pain control and gentle motion in the early stages and shifting toward aggressive ROM restoration in the later stages. So that manual physiotherapy interventions are highly effective in managing the frozen stage of adhesive capsulitis. These findings support the role of physiotherapy as an essential treatment approach for restoring shoulder mobility and function.

CONCLUSION

This research study concluded that manual physiotherapy interventions were a foundational and highly effective strategy for the rehabilitation of individuals suffering from freezing stages of adhesive capsulitis. The study demonstrated that a structured program focusing on glenohumeral joint mobilizations and soft tissue mobilization leads to a significant restoration of functional mobility and a meaningful reduction in persistent pain.

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