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EFFECTIVENESS OF SPENCER MET AND SCAPULAR PATTERN EXERCISES TO IMPROVE PAIN, RANGE OF MOTION, AND FUNCTIONAL DISABILITY IN ADHESIVE CAPSULITIS

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Keywords
Adhesive capsulitis, Activities of daily living, Frozen shoulder, Functional disability, Pain, Spencer Muscle energy technique, Spencer MET, Scapular Pattern, Range of motion(ROM), Visual analog scale, Shoulder pain and disability index (SPADI)

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Abstract

Background: *Adhesive capsulitis is characterized by a painful condition in which gradual loss of both passive and active range of motion in shoulder joint due to progressive fibrosis and contractures in glenohumeral joint capsule. Patient of adhesive capsulitis have difficulties in performing activities of daily life.*

Objective: *To compare the effects of spencer muscle energy technique and scapular pattern exercises in patients of adhesive capsulitis.*

Method: *Patients were randomly allocated in two groups. Sample size were 24. In group A patients were treated with spencer muscle energy technique and in group B patients were treated with scapular pattern exercise Pre and post intervention assessment was done by using goniometer, SPADI and VAS.Data was analyzed by using SPSS version.*

Results: *the participants N=24 were randomly allocated in two groups, Group A and Group Between group comparison for VAS and goniometer post treatment results showed significant improvement in group A (median score1.5) as compared to group B (median score 29.5) which is highly significant difference. In within group Wilcoxon signed-rank test showed both groups in post treatment scores were significantly higher than pretreatment score, p values .002 across all measures. An independent sample T-test post treatment scores indicated a significant improvement in Spencer Muscle Energy Technique Exercise (mean ± SD: 133.75 ± 22.475, p = .050) as compared to Scapular Pattern (mean ± SD: 133.75 ± 32.342, p = .050). Reject the null hypothesis due to significant post-treatment differences.*

Conclusion: *This concluded that both treatment techniques are effective in improving the condition however Spencer Muscle Energy Technique shows a more significant improvement in ROM and pain control than scapular pattern with adhesive capsulitis*

INTRODUCTION

Typically, adhesive capsulitis goes through three separate stages (that is, the periods of pain, stiffness, and recovery). The whole procedure requires one to three years (Jacob et al., 2023). AC is indicated by the development of contractures and fibrosis inside the Glenohumeral joint capsule. As a result of stiffness, pain, and restrictions in the shoulder's range of motion gradually appear. People who have physical examinations show decreased mobility in multiple planes, which affects their ability to move both actively and passively (Patel et al., 2020).

There are three phases a painful "freezing" period (10–36 weeks), a "frozen" and "thawing" stage (5–26 months), and a stiff stage (4–12 months) with progressive improvement in motion (Sarasua et al., 2021). Although a frozen shoulder can last for some time, it normally improves with time (Barbosa et al., 2019). Duplay first described it as scapulohumeral per arthritis in 1896. Then, in 1934, Codman introduced the term "frozen shoulder" to describe the pain and stiffness it causes to your shoulder, especially if you don't utilize it (Cohen et al., 2020).

In addition to being at higher risk, people with type 1 diabetes also experience greater impairment and less mobility. It's critical to maintain control over blood sugar levels, as shown by glycated hemoglobin A1C (HbA1c). Being out of control increases your risk of developing frozen shoulder. Adhesive capsulitis is known to be associated with risk factors, including high cholesterol, gout, diabetes, thyroid problems, rheumatoid arthritis, and Parkinson's disease (Sarasua et al., 2021) Pain in the shoulders followed by reduction in ROM in AC. The dull, poorly localized pain may also spread into the biceps. The soreness and stiffness may begin when you reach behind or overhead your back. The symptoms include fever, chills, lethargy, and unexpected weight loss (Ramirez, 2019). Anatomical changes include eradication of the sub coracoid fat triangle and stiffness of the axillary pouch, rotator cough joint and coracohumeral ligaments (Fields et al., 2019). The development of adhesions of the thickened glenohumeral capsule and the presence of rotator intervals limit both active and passive ROM. The development of extensive scar tissue and inflammation are associated with the etiology and classification of the disease (Redler & Dennis, 2019).

Conservative management include non-surgical interventions such as oral glucocorticoids, physical therapy, and NSAIDS. If symptoms intensify or recovery doesn't seem to be progressing, intraarticular glucocorticoid injections could be used before the surgery. It has been shown that methylprednisolone injections administered intra-articularly decrease pain and increase ROM faster than physical therapy, ice therapy, and no treatment at all. (Type of Botulinum Toxin) Botulinum toxin is a widely used treatment for a number of diseases characterized by asymmetry in muscle contractions. From a physiological perspective, articular cartilage, tissues, and synovial fluid metabolism may all be impacted by sodium hyaluronate. It is thought that whole body cryotherapy has benefits because it reduces afferent neuronal pathways that affect pain perception, releases β-endorphins, and has anti-inflammatory qualities (Patel et al., 2020).

Intraarticular injections of corticosteroids are the most often utilized treatments for patients with AC. By minimizing capillary vasodilation and vascular permeability, it functions as an anti-inflammatory medication. The use of oral medications In adhesive capsulitis, nonsteroidal anti-inflammatory drugs (NSAIDs), paracetamol, and oral steroids (prednisone) are prescribed. When a patient has no contraindication, oral acetaminophen and NSAIDs are the first therapy because oral steroids remain reserved for more severe situations (Chhatlani et al., 2020).

When used in conjunction with physical therapy, manual mobilization techniques improve disability and ROM for individuals with AC (Ramirez, 2019). While conventional treatment show effects to improve shoulder ROM, Spencer's MET is effective in relieving shoulder discomfort (Rimal, 2021).

The Spencer technique is an articulatory method that offers seven different techniques to treat adhesive capsulitis-related shoulder restriction. Extending the capsules, ligaments, and restricted muscles is accomplished through rhythmic, smooth, passive action. The majority of the force is applied in the final range of motion. A wider range of motion without experiencing pain is a result of stretching the tissues, encouraging lymphatic flow, and improving joint circulation. Spencer met functions better in terms of

reducing disability, relieving pain, and improving range of motion (Jivani & Hingarajia, 2021).
The scapula rotates laterally along an axis perpendicular to its plane during forward flexion and abduction in the frontal and scapular planes, and tilts posteriorly around an axis parallel to the scapular spine (Fayad et al., 2006; McClure et al., 2001). Additionally, during arm elevation in the sagittal plane, the protraction/retraction rotation around a vertical axis takes on the characteristic "M" form, which is primarily dependent on the elevation plane (Fayad et al., 2006).

1.Rationale:
Adhesive capsulitis (AC), characterized by pain and limited range of motion (ROM) in the shoulder joint. MET may help in addressing the joint stiffness and tight tissues, while scapular pattern exercises can retrain movement patterns and improve muscular coordination. Their non-invasive nature makes them safe, cost-effective, and applicable for a wide range of patients, providing a comprehensive treatment option that could yield better long-term outcomes than conventional methods.

1.3. Study Objective:
To compare the effects of scapular pattern exercises and spencer muscle energy techniques to improve pain, ROM and functional disability in patients with adhesive capsulitis of shoulder joint.

1.4. Hypothesis:
Null hypothesis:
• There is no significant difference between the effects of Spencer MET and Scapular pattern exercises on pain, ROM and functional disability in patients with adhesive capsulitis.

Alternative Hypothesis:
• There is significant difference between the effects of Spencer MET and Scapular pattern exercises on pain, ROM and functional disability in patients with adhesive capsulitis.

2. Literature Review:
Tamjeed Ghaffar et al., conducted a study in 2023 to determine the effects of muscle energy method (MET) and proprioceptive neuromuscular facilitation (PNF) stretch on pain and disability in individuals with adhesive capsulitis in order to relieve any discomfort. The information was gathered by using structured data collection forms. Pain intensity was measured using the Numeric Rating Scale (NRS), and pain and functional disability were measured using the Shoulder Pain Assessment Disability Index (SPADI) in this study. According to the study's findings, PNF stretch is less effective than Spencer MET at reducing pain in cases of adhesive capsulitis (Ghaffar et al., 2023).
Bhavika et al was conducted a study to evaluate the effects of scapular mobilization and the scapular proprioceptive neuromuscular inhibition approach on participants' adhesive capsulitis' discomfort, range of motion, and function. Both groups' outcomes—shoulder range of motion, shoulder pain and disability index, and the Numerical Pain Rating Scale—were assessed before and after the intervention. This study found that in patients with adhesive capsulitis, scapular mobilization in addition to traditional physiotherapy was more successful in lowering pain and enhancing function and range of motion. (Bhavika and Vinosh Kumar 2023).
Gohil et al, in 2023 conducted a study to find out how individuals with SIS who suffer from pain and functional disability respond to the Spencer approach when combined with conventional physiotherapy. NPRS and quick DASH were used as pre- and post-intervention outcomes. The results of this study indicate that the Spencer procedure, when combined with conventional physiotherapy, can significantly decrease pain and functional disability in SIS patients. Gohil et al.).
Malpani et al., in 2022 conducted a study to verify that proprioceptive neuromuscular facilitation, combined with scapular stability exercises, effectively reduces discomfort and improves range of motion (ROM) and function in individuals suffering from adhesive capsulitis. Using a goniometer for range of motion measures, a numerical pain rating scale for pain, and the Shoulder Pain and Disability Index (SPADI) for functional disability, the study's results cover pain, shoulder functions, and range of motion. According to this study, proprioceptive neuromuscular facilitation combined with exercises for scapular stability are effective treatments for patients with adhesive capsulitis (Malpani et al., 2022).

Kamerkar Kumar et al conducted a study in 2022 to assess how proprioceptive neuromuscular facilitation method and scapular mobilization affect shoulder discomfort, range of motion, and disability in patients with adhesive capsulitis. A visual analogue scale (VAS), a universal goniometer, and a shoulder pain disability index were used to measure pain, range of motion (ROM), and functional impairment. Between individuals with adhesive capsulitis, both groups showed a significant improvement in ROM, pain relief, and functional impairment. But there was more improvement in the group that had scapular mobilization (Kamerkar, Kumar et al. 2022).

Gasibat et al.,in 2022 conducted a study to assess the differences in outcomes between the SEMT and traditional therapy methods for a frozen shoulder. Shoulder pain was assessed using the Numerical Pain Rating Scale (NPRS) to determine the results. Shoulder ROM was recorded using a standard physical goniometer, which served as a reliable tool for measuring degrees of mobility. Although conventional treatment shown more efficacy in improving shoulder range of motion, this study found that SMET was more beneficial in reducing shoulder pain (Gasibat et al., 2022).

ED Souza, M Shah in 2022 conducted a study to review the effect of muscle energy technique on improving pain and functions in patients with adhesive capsulitis. The study outcomes were measured by using VAS and SPADI. This study concluded that muscle energy technique is more effective treatment intervention for individuals suffering from adhesive capsulitis (Souza & Shah, 2022).

Butt and Tanveer, in 2022 conducted a study to compare the effects of adhesive capsulitis patients' neuromuscular facilitation approach. Pain was evaluated using a visual analogue scale, and functional activity was determined by SPADI at the baseline, second, and fourth week. The study concluded that in individuals with adhesive capsulitis, scapular proprioceptive neuromuscular facilitation approach with routine physical therapy is more beneficial than routine physical therapy alone (Butt & Tanveer, 2022).

Hussain et al conducted a study in 2022 to analyze the effects of muscular energy techniques vs sleeper and cross-body stretches on individuals experiencing shoulder periarthritis. With the Goniometer and VAS, ROM and pain were measured. The findings showed that, when it came to pain reduction and abduction in ROM for patients with periarthritis, sleeper, cross-body shoulder stretches, and Muscle Energy Techniques for Shoulder all significantly performed better than the other in terms of VAS and shoulder abduction ROM. However, Muscle Energy Techniques showed slightly superior results in these areas (Hussain, Premkumar et al. 2022).

Phansopkar et al conducted a study in 2022 to evaluate the effectiveness of Maitland mobilization, Mulligan, Kaltenborn, and Spencer method for frozen shoulder. VAS, ROM, and SPADI were used to measure the results. The study will conclude with the drawing of results. (Phansopkar and Qureshi)

MAGDY ELNAGGAR et al in 2021 conducted a study in order to assess the impact of passive stretching exercises, end range mobilization, and scapular mobilization on shoulder pain severity, functional disability, and passive shoulder flexion, abduction, internal rotation, and external rotation in the treatment of idiopathic adhesive capsulitis. Significant progress was seen in all of the examined variables in this study. It was concluded from this study that when it came to enhancing shoulder pain severity, functional impairment, and range of motion in the shoulder flexion and abduction, end range mobilization and scapular mobilization were much more helpful than passive stretching activities. Despite this, there was no discernible difference in the groups' increased shoulder external and internal rotation range of motion (MAGDY ELNAGGAR et al., 2021).

Jivani & Hingar in 2021 performed an experimental investigation to determine whether Maitland's mobilization and Spencer MET are more beneficial for treating individuals with frozen shoulders. Pain, range of motion (ROM), and disability were the study's outcomes that were measured. Using the Visual Analogue Scale for pain, the Shoulder Pain and Disability Index (SPADI) for disability, and the Goniometer for range of motion, pre- and post-intervention assessments were conducted. The findings of this study indicate that both approaches are useful in reducing pain, easing disability, and improving range of motion. However, in patients with frozen shoulder, Spencer Met is more efficient than Maitland Mobilization in terms of reducing disability,

reducing pain, and improving flexibility and motion (Jivani & Hingarajia, 2021).

Mohamed et al., in 2020 carried out a study to compare the efficacy of a dynamic scapular recognition exercise with a placebo of active range-of-motion (ROM) exercises of the affected upper limb in treating patients with adhesive capsulitis of the shoulder, with the goal of improving scapular upward rotation and reducing shoulder pain and disability. Pain, range of motion, and disability were the study's outcomes that were measured. The Shoulder Pain and Disability Index (SPADI) was used to quantify shoulder pain and disability, and a digital inclinometer was used to measure the scapular upward rotation and range of motion of the shoulder joint. As a result of this study, shoulder flexion and abduction range of motion as well as scapular upward rotation are significantly enhanced by a dynamic scapular recognition exercise (Mohamed et al., 2020).

Mishra et al. in 2019 conducted an experimental study to assess the effects of conventional physiotherapy and scapular proprioceptive neuromuscular facilitation in individuals with stage II adhesive capsulitis. The Gujarati version of the Shoulder Pain and Disability Index (SPADI) was used to measure disability, while the Visual Analogue Scale (VAS) was used to quantify pain. According to the conclusions of this study, individuals with adhesive capsulitis can find relief from pain and incapacity by combining conventional physiotherapy treatments with Scapular Proprioceptive Neuromuscular Facilitation (Mishra et al., 2019).

Haveela et al was compared a study in 2018 of the effectiveness of Spencer's and Mulligan's techniques separately in patients with frozen shoulder in comparison to traditional therapy. Gonioemetry, SPADI, and NPRS were used to measure the results. But compared to the control group and the Spencer group, Mulligan's group's functional improvement was greater. (Haveela, Dowle et al. 2018).

A comparative study was conducted in 2018, to determine how passive stretching and the Spencer Muscle Energy Technique impact adhesive capsulitis. The outcomes of the research included the measurement of shoulder pain using the numeric pain rating scale (NPRS), the measurement of shoulder range of motion (ROM) using a goniometer, the assessment of shoulder functions using the shoulder pain and disability index (SPADI), and the quick version of the disabilities of the arm, shoulder, and hand questionnaire. According to the study's conclusions, passive stretching is less helpful in treating adhesive capsulitis than the Spencer muscle energy technique (SMET) (Iqbal et al., 2020).

Yashadhora S Joshi conducted a comparative study to compare the effectiveness of Maitland glenohumeral mobilization plus scapular Proprioceptive Neuromuscular Facilitation (PNF) versus Maitland glenohumeral mobilization in patients with adhesive capsulitis. Measurements were taken both before and after treatment at the ninth session using the Visual Analog Scale (VAS), Universal goniometer for ROM, Lateral Scapular Slide Test (LSST), and Shoulder Pain and Disability Index (SPADI). In conclusion, Maitland glenohumeral mobilization and scapular PNF were more successful in reducing pain, flexion, abduction, internal and external rotation range of motion, LSST, and SPADI in patients with adhesive capsulitis (Joshi, Shridhar et al. 2020).

Gasibat et al. coducted an observational study in 2019 to evaluate the effectiveness of SMET and conventional treatment methods for frozen shoulder. The Numeric Pain Rating Scale (NPRS) was employed to quantify pain in the shoulders. Shoulder ROM was measured with a conventional physical goniometer. According to the study, conventional treatment was more successful in increasing shoulder range of motion, whereas SMET was more beneficial in relieving shoulder discomfort. Furthermore, it may be said that SMET can be supplemented with other methods for pain management or utilized as a backup plan (Gasibat et al., 2022).

Chavan et al, conducted a study in 2017 to determine the impact of the myofascial arm pull technique and Spencer MET on adhesive capsulitis. The Visual Analogue Scale (VAS) was used to measure pain, the Shoulder Pain and Disability Index (SPADI) was used to measure functional disability, and a half-circle universal goniometer was used to measure shoulder range of motion. The study found that contrasted to the Myofascial arm pull technique, the Spencer MET is more efficient in enhancing shoulder mobility (Chavan et al., 2017).

Balcı et al.in 2016 carried out a study to find out how conventional exercise programs combined with physiotherapy modalities and scapular proprioceptive

neuromuscular facilitation (PNF) approaches affect shoulder discomfort, scapular dyskinesis, shoulder range of motion, and function in adhesive capsulitis. The Visual Analog Scale, Lateral Scapular Slide Test, and Goniometer were used to measure the study's outcomes. The study found that traditional exercise, physiotherapy methods, and proprioceptive neuromuscular facilitation (PNF) showed immediate effects on adhesive capsulitis. According to this study, scapular exercises should be a part of an effective therapy plan for adhesive capsulitis patients' shoulder rehabilitation (Balcı et al., 2016)

Contractor et a l in 2016 conducted a study to assess how well Spencer MET works for pain and functional impairment in shoulder adhesive capsulitis. The study's outcomes were measured using the visual analogue scale for pain and the SPADI for functional impairment. This study found that, when compared to standard treatment, The Spencer MET is more helpful in improving functional abilities in patients with adhesive capsulitis (Contractor et al., 2016).

Contractor et al conducted a study in 2016 to determine whether Spencer MET affects functional disability and pain in patients with adhesive capsulitis. Both the VAS and SPADI retraining outcomes were used. In conclusion, compared to traditional treatment, the Spencer MET is more beneficial in restoring functional capacity in patients with adhesive capsulitis. (Contractor, Agnihotri et al. 2016).

Boruah et al., in 2015 conducted a study to determine whether gleno-humeral range of motion and discomfort are improved in patients with adhesive capsulitis of the shoulder by scapular mobilization or mobilization combined with movement technique. The goniometer and SPADI pain score were used in this study to quantify the pain outcomes prior to and following therapy completion, respectively. In comparison to scapular mobilization, mobilization with movement demonstrated superior results in this three-week study (Boruah et al., 2015).

2.1. Literature gap:

The potential synergy between Spencer MET, which focuses on joint mobilization through active muscle contraction, and scapular pattern exercises, which aim to restore scapular rhythm and shoulder coordination, remains largely unexplored. Current study will not only fill a critical literature gap but also contribute to the development of more effective, evidence-based treatment protocols for patients suffering from adhesive capsulitis.

3. Material and Methods

3.1: Study Design

The study will be conducted as a Randomized clinical trial (RCT).

3.2: Study Setting

- Hussain memorial hospital, Lahore
- Fatima memorial hospital, Lahore

3.3: Study Duration

The duration will be four months after the approval of synopsis.

3.4: Study Group:

All participants were divided into two groups. Both the kind of intervention and the group to which the subjects belonged were hidden from them. One group was provided with Spencer MET and the second group was provided with Scapular pattern exercises only.

Group A: Participants in group A were provided with 7 stages of Spencer MET.

Potential pain reduction mechanisms involve stimulating low-threshold mechanoreceptors and central pain inhibition. Isometric contraction activates mechanoreceptors, leading to localized pain modulation. Muscle Energy Technique (MET) increases range of motion by triggering Golgi tendon organ inhibition (Jivani & Hingarajia, 2021).

The injured shoulder was above the patient while they lay on their side. Using the proximal hand, the therapist stabilized the shoulder girdle while the distal hand made seven distinct movements to apply force to the shoulder's limiting barrier. These motions included glenohumeral pump, abduction, adduction with internal rotation, shoulder flexion (SF), circumduction with distraction, and shoulder extension (SE). Patients were instructed to employ their muscle energy for ten seconds throughout each movement, working against the therapist's mild resistance.(three sets of five repetitions) The exercise was performed five times with rest periods throughout the course of three weekly sessions on alternate days for six weeks (Dudkiewicz et al., 2004; Knebl et al.,

2002).The evaluation took place initially at the baseline, followed by assessments after 4 weeks and post treatment, specifically in the 6th week.(Iqbal, 2020).Total repetitions performed are 105 which are performed with 10 sec holds .so total treatment for this intervention is 18 minutes.

Group B: Participants in group B were administered with Scapular pattern exercises. PNF employs four mechanisms to enhance ROM and muscle activation, proving effective in relieving pain and improving function.

A qualified therapist applied scapular PNF in two diagonals, anterior elevation and posterior depression and posterior elevation and anterior depression, to the PNF group. While the therapists stood in the desired motion, the patients laid on the side that was not impacted. The therapist started by providing preemptive guidance. The therapist pulled the scapula to its extended position at the start of the pattern and then instructed the necessary movement. Techniques for facilitating repeated contractions and rhythmic start were used in every motif. These are the PNF agonistic approaches with the best matched scapular facilitation. The rhythmic start technique normalizes the action, enhances coordination, teaches the patient how to do it, and helps them relax. The method of repeated contractions directs the patient's motion toward the intended motion while also increasing active range of motion and strength. 3 sets of 20 repetitions with 10 seconds hold (total hold time is 600 seconds which is equal to 10 minutes) . The rest interval between repetitions was 5 seconds for each (total rest interval 300 seconds which is 5 minutes) (Balcı, 2016).

Conventional treatment for both groups: According to Shah et al. (2021), both groups received conventional treatment for four weeks, with rest intervals spread over three sessions each week. This treatment consisted of the following. For ten minutes, therapeutic US was administered using a 1 MHz US head, a 5 cm2 effective radiating area (ERA), and a 1.5 W/cm2 dose. (3 sets with 15 repetitions) of wall pushups to strengthen, warm up and stretch shoulder muscles. Total 45 repetitions with 5 seconds hold and 3 seconds rest interval in each (225 seconds total hold and 135 sends rest periods). The total time period required for wall pushups is 6 minutes and of US is 10 minutes.

3.5: Selection Criteria:

Patient will be meet the following selection criteria consider as a potential participant of the study:

Inclusion Criteria:

- Patients clinically diagnosed with adhesive capsulitis, confirmed by clinical examination. (capsular pattern).
- Patients reporting pain levels of at least 4 out of 10 on the Visual Analog Scale (VAS) for pain.
- Adults aged 40 to 60 years old, as adhesive capsulitis is most prevalent in this age group.
- Patients with a Shoulder Pain and Disability Index (SPADI) score of 30 or more, indicating significant functional limitations.

Exclusion Criteria:

- Patients who have had recent shoulder surgery, fractures, or traumatic injuries.
- Patients with neurological conditions affecting the shoulder, such as cervical radiculopathy, stroke, or brachial plexus injury.
- Patients who have received corticosteroid injections in the affected shoulder within the past 3 months
- Presence of systemic diseases that could affect joint mobility, such as rheumatoid arthritis, diabetes mellitus (if poorly controlled), or thyroid disease.

3.6: Sampling Technique:

A simple random sampling technique among the 24 selected participants will be used.

3.7: Outcomes

- Pain
- ROM
- Functional disability

3.8: Data Collection Tools:

1. Visual Analogue Scale (VAS).

An instrument known as a Visual Analogue Scale (VAS) is used to assess traits or attitudes that are thought to span an assortment of values and are difficult to quantify directly. There are several ways that VAS can be displayed.

Including: Gradients, numbers, middle-point scales, and numerical rating scales. Analog scales with curves and meter shapes. Likert scales or graphic rating scales with descriptive phrases spaced along a line. A fixed-length, straight horizontal line, often measuring 100 mm, is the most basic VAS. The most severe boundaries of the parameter to be measured (symptom, pain, health) that are oriented from the left (worst) to the right (best) are known as the endpoints. Vertical VAS is used by many researchers, whereas horizontal scales are oriented from right to left in certain studies.

With 59.3% of the population being female, the average (SD) age was 41.6 (13.0) years. One eigenvalue greater than one (2.39) that explained 79.6% of the variation was found using factor analysis, suggesting the existence of a single factor. Good internal consistency was demonstrated by the Cronbach's alpha **of 0.87.** The QIDS-SR-16 scores and total M3VAS scores showed a substantial correlation (r = 0.72, p<0.001), suggesting good convergence validity\Strawbridge, 2023 #76}. Research shows that 7% to 11% of persons worldwide are unable to use the VAS scale to estimate their level of pain. Due to the fact that certain individuals had trouble assessing the level of their pain, while others experienced cognitive difficulties (Begum, 2019).

2. Shoulder Pain and Disability Index (SPADI):

The construct validity of the SPADI is good, and it interacts well with other shoulder questionnaires that are region-specific. To gauge present shoulder pain and impairment in an outpatient context, the Shoulder Pain and impairment Index (SPADI) was created. The 13 items of the SPADI measure two separate domains: pain, which is measured with five subscales, and disability, which is measured with eight subscales. The SPADI comes in two variants; the first one scores each item on a **Interpretations:** It takes about five to ten minutes to complete the questionnaire that is self-administered termed as the SPADI, which includes a set of written instructions. The patient must mark each item on a 10-crn visual analog scale with spoken anchors at either end for each inquiry. The SPADI comprises two categories of questions. Five questions on the intensity of a person's pain make up the pain dimension. Additionally, eight questions on functional activities are used to gauge how challenging it is for a person to perform certain ADLs that need the use of an upper limb. Patients mark each question on a 10-cm visual analog scale with a mark to indicate their response. “No pain at all" and "worst pain imaginable" are the verbal anchors for the pain dimension. "No difficulty" and "So difficult it required help" are the verbal anchors for the functional activities. To get a total score, the scores from the two dimensions are equalized. (Healed, 1997). Seven of the eight estimated correlations established (≥ 75%) for the subscales were satisfied, indicating a satisfactory construct validity. The CFA revealed that all markers for the Pain and Disability subscales had good values. The pain and disability subscales both had strong internal consistency (α = 0.859 and α = 0.895, respectively). For pain (ICC = 0.989 [95% Confidence Interval (CI) = 0.975–0.995]) and disability (ICC = 0.990 [95% CI = 0.988–0.998]), high test–retest reliability (ICC) was observed. For the pain and disability subscales, respectively, Standard Error of Measurement values of 2.27 and 2.32 and Minimal Detectable Change values of 6.27 and 6.25 were determined (Venturin et al., 2023).

Items on a second version are rated using a numerical rating scale (NRS) instead of the visual analogue scale (VAS). The latter version was created to create the tool. Simpler to score and implement. It takes less than five minutes to finish both variants. (Breckenridge, 2011).

3. Goniometer:

The universal goniometer is commonly used due to its low cost and availability. However, Milanese et al. note that improper use can affect its reliability and validity. Ockendon et al. compared it with an iPhone app, revealing significant differences in reliability. The universal goniometer's precision is questioned due to human error and inconsistency, impacting its validity and reliability as an assessment tool. The Hawk goniometer is a digital instrument that is nearly identical to the analogues of today, measuring joint ranges, velocity, and acceleration variables with a high degree of reliability and affordability. Specifically made to measure angles of movement of the human body with a precision of 1°, the Hawk goniometer is a perfect replacement for conventional goniometers, which are typically based on a scale of 5° increments.{Pérez-De La Cruz, 2021).Based on

Codman's criteria—shoulder pain that develops gradually and is felt at the deltoid insertion; difficulty to sleep on the impacted side; atrophy of the spinate; and minimal local tenderness—the diagnosis of frozen shoulder was confirmed based on the patient records. Furthermore, there are limitations on both active and passive movements.(Hand et al., 2008).A goniometer is a device is used to measure joint's range of motion(ROM). There are six items i.e. Flexion, Extension, Abduction, Adduction, Lateral Rotation, Medial Rotation. e score interpretation of the goniometer range is Flexion (0-180°), Extension (0-50°), Abduction (0-180°), Adduction (0-50°), Lateral Rotation (0-90°), Medial Rotation (0-90°).validity of the tool was checked by eight experts from faculties of Department of Community Health Medicine, Department of Statistics, Department of English & Odia, and various nursing institute, who had revised the tools for clarity, applicability, relevance, comprehensive and understanding for implementation (Kuanar et al., 2022).

3.9: Data collection procedure:

We got permission from the Hospital Ethical Committee to do this study. Everyone who took part in this study agreed to it after learning about the study and what it involved. They were told they could choose to be in the study or not. We kept their information private to protect their identity. All participants in this were split up into two groups that were similar. will undergo screening for frozen shoulder and, following an investigation and physical examination, have the diagnosis confirmed. Those members of the chosen demographic who meet the inclusion and exclusion criteria will be invited to take part in the research. The study used two different treatment plans one group is given with spencer MET and other group is given with Scapular pattern exercises. Both groups were provided with conventional therapy before intervention.

Conventional treatment for both groups:

According to Shah et al. (2021), each group received conventional treatment for four weeks, with periods of rest spread over three sessions each week. This treatment consisted of the following. For ten minutes, therapeutic US was administered using a 1 MHz US head, a 5 cm2 helpful radiating region (ERA), and a 1.5 W/cm2 dose. (3 sets with 15 repetitions) of wall pushups to strengthen, warm up and stretch shoulder muscles. Total 45 repetitions with 5 seconds hold and 3 seconds rest interval in each (225 seconds total hold and 135 sends rest periods). The total time period required for wall pushups is 6 minutes and for the US it is 10 minutes.

Group A: Participants in group A were provided with 7 stages of Spencer MET.

A. To Increase The External Rotation:

1. Compression method combined with circumduction: Rotate the humerus clockwise and counterclockwise by flexing the subject's elbow, abducting the shoulder to 90°, and using the elbow as a pivot. Repeat steps 8–10 in both directions while applying gentle compression to the glenohumeral joint.
2.Using the traction technique for circumduction: As the subject rotates the humerus in circular and counterclockwise circles, flex the elbow, maintain shoulder abduction, and exert traction force on the glenohumeral joint. Perform concentric circles to the subject's maximum tolerance, repeating the procedure 8-10 times in both directions, optionally with the elbow in extension position.

Group B: Group B participants were given workouts involving the scapular pattern. Group B participants were given workouts involving the scapular pattern. In the PNF group, a skilled therapist applied scapular PNF in three sets of 20 repetitions with a 10-second hold in each of the two diagonals (anterior elevation and posterior depression and posterior elevation and anterior depression) (total hold time is 600 seconds which is equal to 10 minutes). (The therapists stood in the appropriate motion as the patients lay on the side that was not injured. The therapist started by providing preemptive guidance. The therapist pulled the scapula to its extended position at the start of the pattern and then instructed the necessary movement. Techniques for facilitating repeated contractions and rhythmic start were used in every pattern. These are the PNF agonistic approaches with the best matched scapular facilitation. The rhythmic start technique normalizes the action, enhances coordination, teaches the patient how to do it, and helps them relax. The

method of repeated contractions directs the patient's motion toward the intended motion while also increasing active range of motion and strength. Every repetition had a 5-second break period, for a total of 5-minute rest periods) (Balcı, 2016).

3.10: Sample size:

Sample Size For Comparing Two Means

Input Data

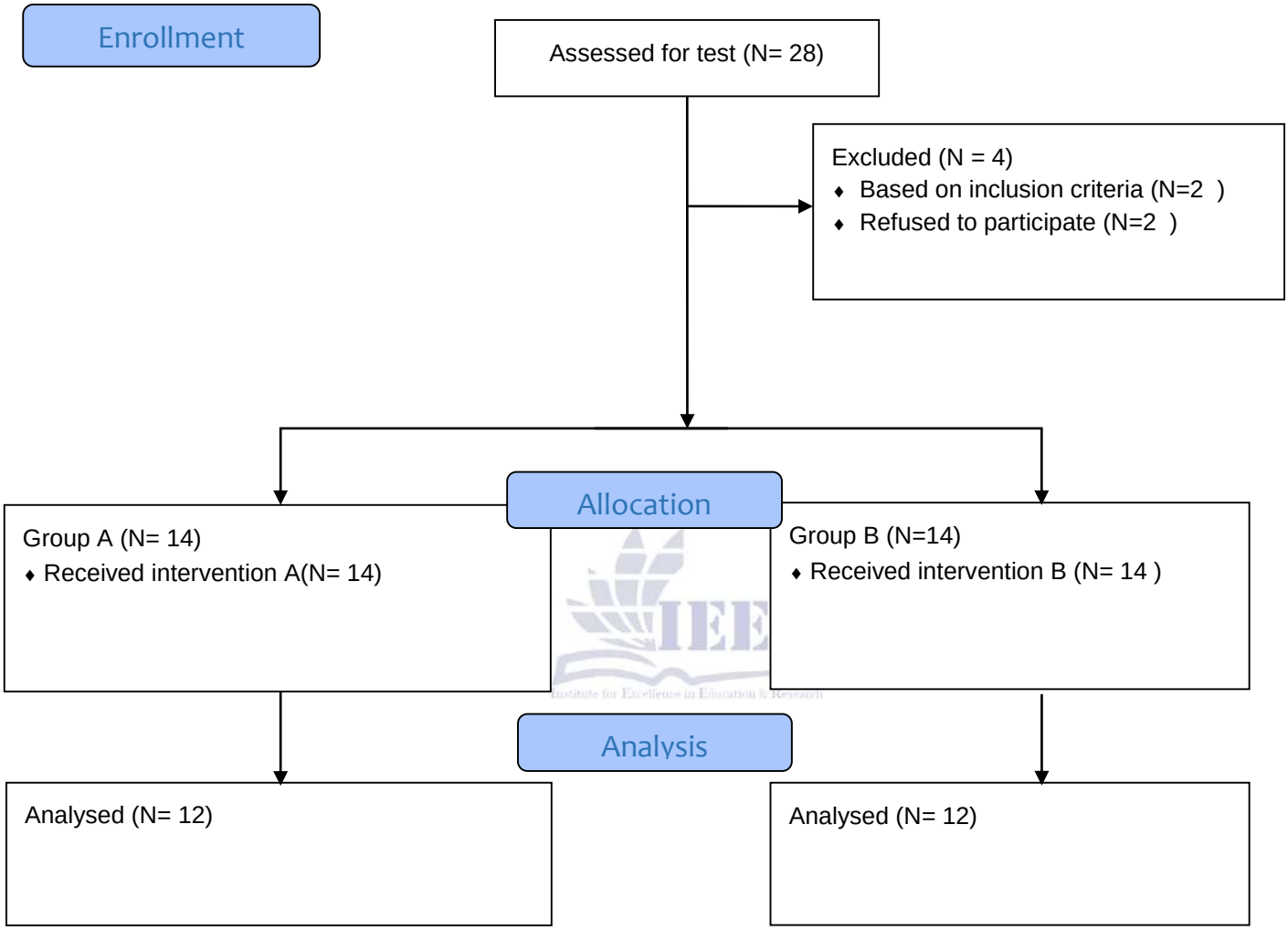
Confidence Interval (2-sided)	95%		
Power	80%		
Ratio of sample size (Group 2/Group 1)	1		
	Group 1	**Group 2**	**Difference***
Mean	0.41	0.21	0.2
Standard deviation	0.014	0.24	
Variance	0.000196	0.0576	
Sample size of Group 1	12		
Sample size of Group 2	12		
Total sample size	24		

*Difference between the means

Results from OpenEpi, Version 3, open source calculator--SSMean
Print from the browser with ctrl-P
or select text to copy and paste to other programs.

Z1-a/2 Level of significance 95%
µl Expected mean difference in Control Group=0.41
µ2 Expected mean difference in Experimental Group=0.21
Expected standard deviation in Control group=0.014
Expected standard deviation in Experimental group=0.24
Z1-ß power of the study= 80% n
Expected sample size in a group= 24
After adding 20% drop out 24+4=28 in each group.
Sample size in group A =14
Sample size in group B =14
In this sample size the Subjects of both groups participated in the study were evaluated for outcome measurements such as pain by using VAS (Visual analogue scale) (Khyathi & Asha, 2015).

3.11: Consort Flow Diagram



4.Results and Interpretation:

Table 1: Age of participants:

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	24	1	4.2	4.2	4.2
	25	1	4.2	4.2	8.3
	29	1	4.2	4.2	12.5
	30	3	12.5	12.5	25.0
	31	1	4.2	4.2	29.2
	32	1	4.2	4.2	33.3
	35	3	12.5	12.5	45.8
	36	1	4.2	4.2	50.0
	37	1	4.2	4.2	54.2
	38	1	4.2	4.2	58.3
	40	2	8.3	8.3	66.7
	46	1	4.2	4.2	70.8
	53	2	8.3	8.3	79.2
	58	2	8.3	8.3	87.5
	59	1	4.2	4.2	91.7
	70	2	8.3	8.3	100.0
	Total	24	100.0	100.0	

The total 26 participants were added with average mean of 52 and standard deviation of 6.555.

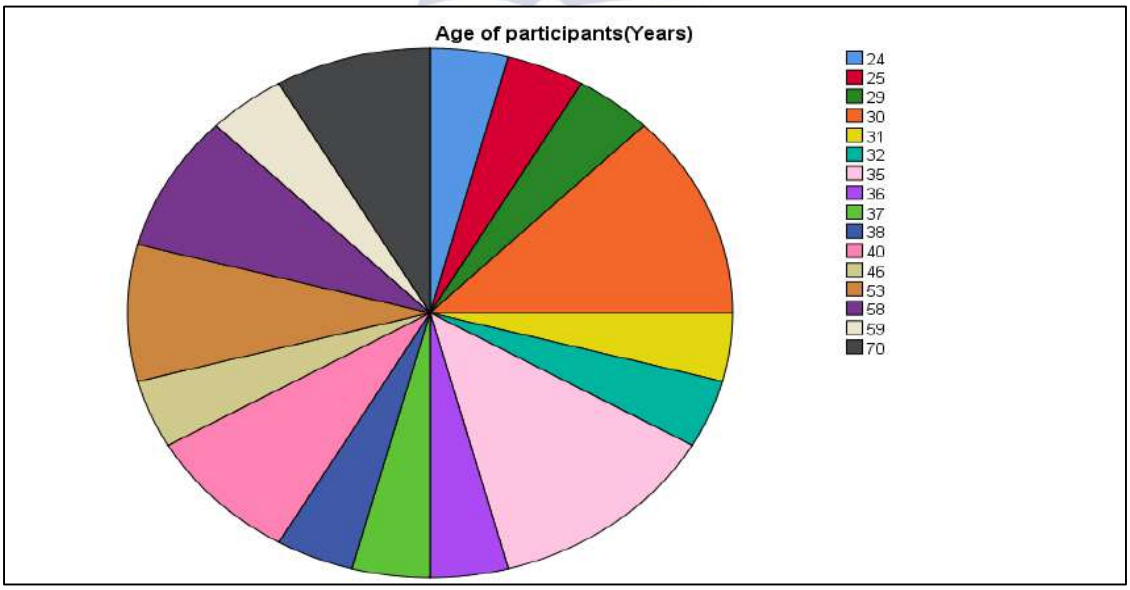


Figure 1: Age of participants.

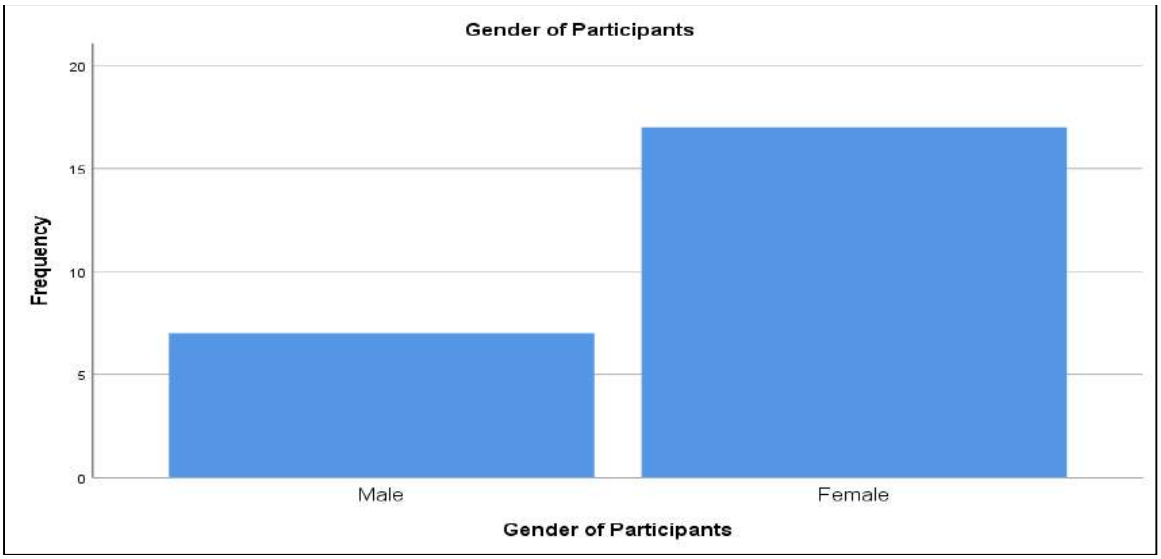


Figure 2: Gender of participants:

Showed that out of 24 patients 29% patients were male, and 71% patients were female and diagnosed with frozen shoulder.

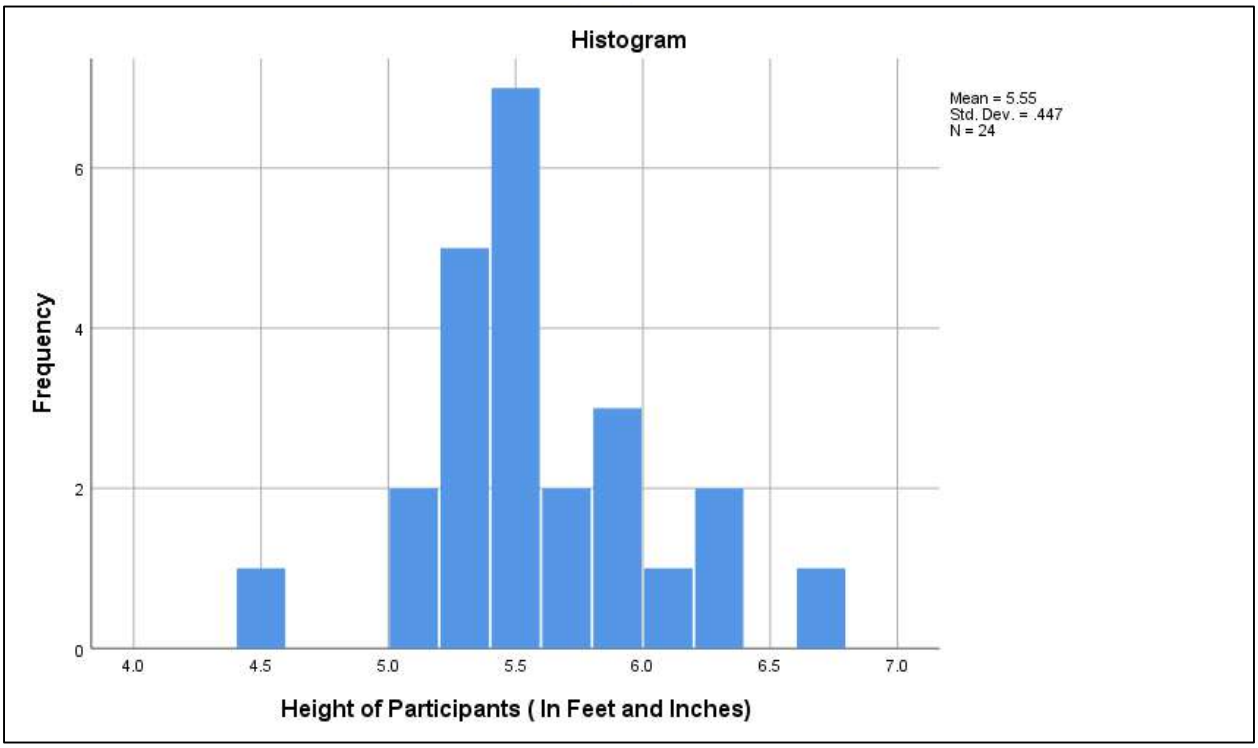


Figure 3: Hight of participants:

Total 24 participants were added in this study which shows the mean difference of Hight is 5.55 feet and Std Dev is .447.

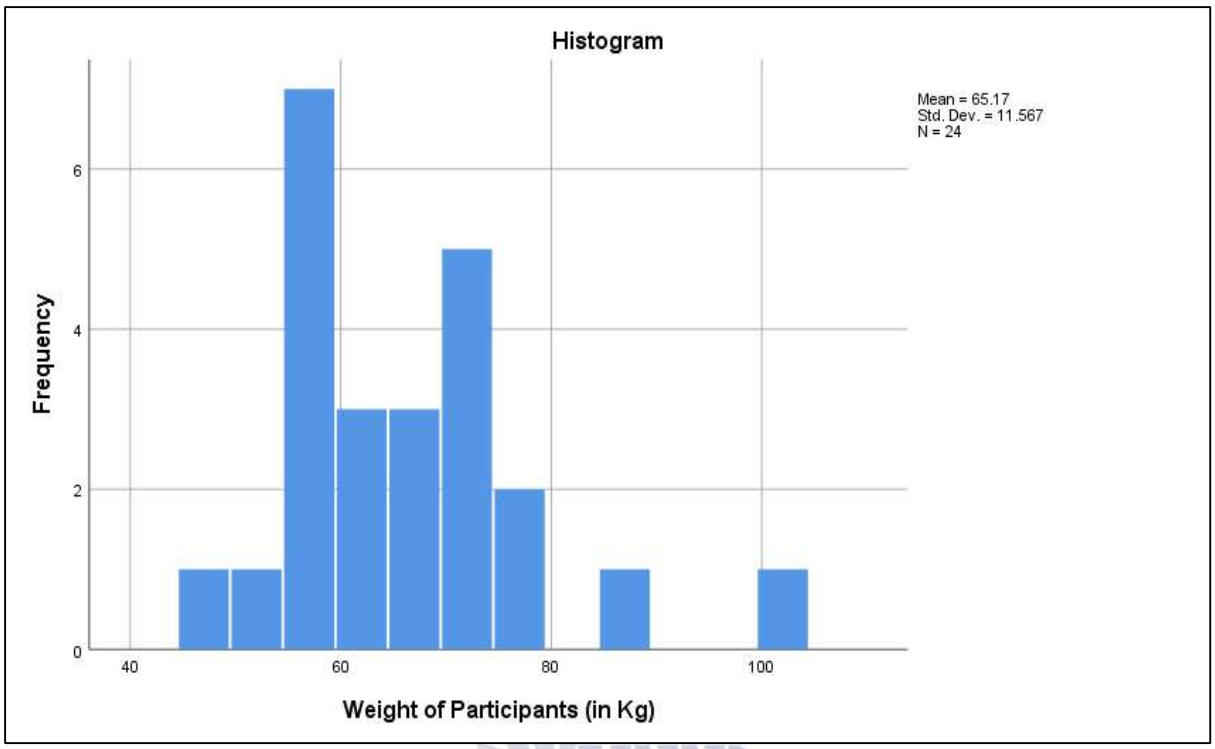


Figure 4:Weight of participants:

The total 24 participants were added in this study, with the mostly participants body mass index mean was 65.17% and standard deviation of 11.567%.

Table 2:Test of Normality:

Test of Normality (Shapiro-Wilk)			
	Statistic	**Df**	**P'**
Visual Analogue scale	.832	24	.110
Shoulder-Flexion	.951	24	.279
Shoulder-Extension	.896	24	.18
Shoulder-Abduction	.938	24	.146
Shoulder-Adduction	.926	24	.123
Shoulder-Internal Rotation	.919	24	.155
Shoulder-External Rotation	.899	24	.120
Shoulder Pain and Disability Index Scale	.940	24	.167

Using the Shapiro-Wilk statistic, the data's normality was examined. The results demonstrated that the data is normally distributed, with the p-value for a number of variables, including the Shoulder Pain and Disability Index Scale, Shoulder-Abduction, Shoulder-Adduction, Shoulder-Internal Rotation, and Shoulder-Flexion, Visual

Analogue scale, Shoulder-Extension, and the Shoulder-External Rotation, is being significant at $p > 0.05$. Parametric tests were used for both within-group and between-group comparisons.

Table 3:Between Groups Comparison (Parametric) of Flexion:

Variable	Group	No	Mean & Std. Deviation	P-Value
Pre_ Shoulder Flexion	Spencer Muscle Energy Technique	14	79.58±19.242	.263
	Scapular Pattern	14	81.67±13.707	
Post_ Shoulder Flexion	Spencer Muscle Energy Technique	14	133.75±22.475	.003
	Scapular Pattern	14	103.75±32.342	

An independent sample t-test showed that there was no significant change in the pre-treatment ratings on the Shoulder flexion between the two groups (mean ± SD: 79.58 ± 19.242, p =.263) for the Spencer Muscle Energy Technique group and (81.67 ± 13.707, p =.263) for the Scapular pattern group. However, compared to post treatment findings of Scapular Pattern (mean ± SD: 103.75 ± 32.342, p =.003) and spencer muscle energy technique group (133.75±22.475) post-treatment scores showed a substantial improvement in Spencer Muscle Energy Technique Exercise (mean ± SD: 54.17 ±3.233, p =.003) because of higher mean difference. According to the findings, both groups shows significant improvement in flexion but the Spencer Muscle Energy approach is superior to the Scapular Pattern in terms of enhancing shoulder flexion in cases of adhesive capsulitis.

Table 4: Between Groups Comparison (Parametric) of Adduction:

Variable	Group	No	Mean & Std. Deviation	P-Value
Pre_ Shoulder Adduction:	Spencer Muscle Energy Technique	14	18.25 ± 292.00	.251
	Scapular Pattern	14	12.75 ± 236.00	
Post_ Shoulder Adduction:	Spencer Muscle Energy Technique	14	36.35± 313.50	.002
	Scapular Pattern	14	15.41 ± 214.50	

An independent sample t-test showed that there was no significant change in the pre-treatment ratings on the Shoulder adduction between the two groups (mean ± SD: 18.25 ± 292.00, p =.251) for the Spencer Muscle Energy Technique group and (12.75 ± 236.00,P=.251) for the Scapular pattern group. However, compared to post treatment findings of Scapular Pattern (mean ± SD: 15.41 ± 214.50, p =.002) and spencer muscle energy technique group (36.35± 313.50,p=.002) post-treatment scores showed a substantial improvement in Spencer Muscle Energy Technique Exercise (mean ± SD: 54.17 ±3.233, p =.003) because of higher mean difference. According to the findings, both groups shows significant improvement in adduction but the Spencer Muscle Energy approach is superior to the Scapular Pattern in terms of enhancing shoulder adduction cases of adhesive capsulitis.

Table 5: Between Groups Comparison (Parametric) of Internal Rotation:

Variable	Group	No	Mean & Std. Deviation	P-Value
Pre_ Shoulder internal rotation:	Spencer Muscle Energy Technique	14	48.93 ± 5.23	.119
	Scapular Pattern	14	38.75 ± 5.91	

Post_ Shoulder internal rotation:	Spencer Muscle Energy Technique	14	67.18 ± 4.81	.002
	Scapular Pattern	14	47.18 ± 9.65	

An independent sample t-test showed that there was no significant change in the pre-treatment ratings on the Shoulder internal rotation between the two groups (mean ± SD: 48.93 ± 5.23 , p =.119) for the Spencer Muscle Energy Technique group and (38.75 ± 5.91,P=.119) for the Scapular pattern group. However, compared to post treatment findings of Scapular Pattern (mean ± SD: 15.41 ± 214.50, p =.002) and spencer muscle energy technique group (47.18 ± 9.65 ,p=.002) post-treatment scores showed a substantial improvement in Spencer Muscle Energy Technique Exercise (mean ± SD: 67.18 ± 4.81, p =.003) because of higher mean difference. According to the findings, both groups shows significant improvement in internal rotation but the Spencer Muscle Energy approach is superior to the Scapular Pattern in terms of enhancing shoulder internal rotation in adhesive capsulitis.

Table 6: Between Groups Comparison (Parametric) of Abduction:

Variable	Group	No	Mean & Std. Deviation	P-Value
Pre_ Shoulder Abduction	Spencer Muscle Energy Technique	14	74.58±23.689	.712
	Scapular Pattern	14	69.58±22.709	
Post_ Shoulder Abduction	Spencer Muscle Energy Technique	14	126.25±23.750	.004
	Scapular Pattern	14	107.92±26.391	

An independent sample t-test showed that there was no significant change in the pre-treatment ratings on the Shoulder abduction between the two groups (mean ± SD: 74.58±23.689 , p =.712) for the Spencer Muscle Energy Technique group and (69.58±22.709 P=.712) for the Scapular pattern group. However, compared to post treatment findings of Scapular Pattern (mean ± SD: 107.92±26.391 , p =.004) and spencer muscle energy technique group (126.25±23.750, ,p=.004) post-treatment scores showed a substantial improvement in Spencer MET because of higher mean difference. According to the findings, both groups shows significant improvement in abduction but the Spencer Muscle Energy approach is superior to the Scapular Pattern in terms of enhancing shoulder abduction in adhesive capsulitis.

Table 7: Between Groups Comparison (Parametric) of SPADI:

Variable	Group	No	Mean & Std. Deviation	P-Value
Pre_ SPADI	Spencer Muscle Energy Technique	14	65.83±12.364	.968
	Scapular Pattern	14	53.67±14.643	
Post_ SPADI	Spencer Muscle Energy Technique	14	30.58±15.246	.004
	Scapular Pattern	14	43.23±23.062	

An independent sample t-test showed that there was no significant change in the pre-treatment ratings on the SPADI between the two groups (mean ± SD: 65.83±12.364 , p =.968) for the Spencer Muscle Energy Technique group and (53.67±14.643 ,P=.968) for the Scapular pattern group. However, compared to post treatment findings of Scapular Pattern (mean ± SD: 43.23±23.062 p =.004) and spencer muscle energy technique group (30.58±15.246 ,p=.004) post-treatment scores showed a substantial improvement in Spencer MET because of higher mean difference. According to the findings, both groups shows significant effect in reducing pain and disability but the Spencer

Muscle Energy approach is more effective as compared to the Scapular Pattern in terms of reducing pain and disability in adhesive capsulitis.

Table 8: Between Groups Comparison (Parametric) of Shoulder Extension:

Variable	Group	No	Mean & Std. Deviation	P-Value
Pre_ Shoulder Extension:	Spencer Muscle Energy Technique	14	20.83±12.34	.968
	Scapular Pattern	14	18.67±14.63	
Post_ Shoulder Extension:	Spencer Muscle Energy Technique	14	40.58±15.46	.004
	Scapular Pattern	14	37.23±23.62	

An independent sample t-test showed that there was no significant change in the pre-treatment ratings on the Shoulder extension between the two groups (mean ± SD: 20.83±12.34 , p =.968) for the Spencer Muscle Energy Technique group and (18.67±14.63 P=.968) for the Scapular pattern group. However, compared to post treatment findings of Scapular Pattern (mean ± SD: 37.23±23.62, p =.004) and spencer muscle energy technique group (40.58±15.46 ,p=.004) post-treatment scores showed a substantial improvement in Spencer Muscle Energy Technique because of higher mean difference. According to the findings, both groups shows significant improvement in extension but the Spencer Muscle Energy approach is more effective as compared to Scapular Pattern in terms of enhancing shoulder extension in adhesive capsulitis.

Table 9: Between Groups Comparison (Parametric) of Shoulder External Rotation:

Variable	Group	No	Mean & Std. Deviation	P-Value
Pre_ External Rotation:	Spencer Muscle Energy Technique	14	55.82±12.64	.968
	Scapular Pattern	14	35.67±14.65	
Post External Rotation:	Spencer Muscle Energy Technique	14	75.98±23.46	.004
	Scapular Pattern	14	50.71±23.62	

An independent sample t-test showed that there was no significant change in the pre-treatment ratings on the Shoulder external rotation between the two groups (mean ± SD: 55.82±12.64 , p =.968) for the Spencer Muscle Energy Technique group and (35.67±14.65 ,P=.968) for the Scapular pattern group. However, compared to post treatment findings of Scapular Pattern (mean ± SD: 50.71±23.62 , p =.004) and spencer muscle energy technique group (75.98±23.46 ,p=.004) post-treatment scores showed a substantial improvement in Spencer MET because of higher mean difference. According to the findings, both groups shows significant improvement in external rotation but the Spencer Muscle Energy approach is more effective as compared to Scapular Pattern in terms of enhancing shoulder external rotation in adhesive capsulitis.

Table 10: Between Groups Comparison (Parametric) of VAS:

Variable	Group	No	Mean & Std. Deviation	P-Value
Pre_ VAS	Spencer Muscle Energy Technique	14	08.83±12.6	.928
	Scapular Pattern	14	07.67±10.6	
Post_ VAS:	Spencer Muscle Energy Technique	14	4.58±15.2	.002
	Scapular Pattern	14	4.23±07.4	

An independent sample t-test showed that there was no significant change in the pre-treatment ratings on the VAS between the two groups (mean ± SD: 08.83±12.6 , p =.928) for the Spencer Muscle Energy Technique group and (07.67±10.6 ,P=.928) for the Scapular pattern group. However, compared to post treatment findings of Scapular Pattern (mean ± SD: 4.23±07.4 p =.002) and spencer muscle energy technique group (4.58±15.2 ,p=.002) post-treatment scores showed a substantial improvement in Spencer Muscle Energy Technique because of higher mean difference. According to the findings, both groups shows significant reduction in pain but the Spencer Muscle Energy approach is more effective as compared Scapular Pattern in terms of reducing pain in adhesive capsulitis.

Table 11: Within Groups Comparison (Parametric) of Group A:

Variable	Tool	Pre_ Mean & Std. Deviation	Post_ Mean & Std. Deviation	Mean Difference	P-value
Spencer Muscle Energy Technique	Flexion	79.58±19.242	133.75±22.475	54.17±3.233	.001
	Extension	20.83±12.34	40.58±15.46	19.75±3.12	.001
	Adduction:	18.25 ± 292.00	36.35± 313.50	18.1±21.5	.001
	Abduction:	74.58±23.689	126.25±23.750	51.67±0.061	.001
	External Rotation	55.82±12.64	75.98±23.46	20.16±10.82	.001
	Internal Rotation	48.93 ± 5.23	67.18 ± 4.81	18.25±0.42	.001
	SPADI	65.83±12.364	30.58±15.246	35.25±2.88	.001
	VAS	08.83±12.6	4.58±15.2	4.25±2.6	.001

He paired t-test compares the mean within each treatment group. The post-treatment means for flexion, extension, adduction, abduction, external rotation, internal rotation, external rotation, SPADI and VAS for the Spencer MET

significantly improves. The significant p-value (0.001) indicates that there is difference within group treatment. However, the mean difference in the Spencer Muscle Energy Technique Group is greater than the mean difference in the Scapular pattern Group.So, Spencer Muscle Energy Technique resulted in a significantly greater improvement as compared to the Scapular pattern regimen in improving ROM, reducing pain and disability in individuals with AC.

Table 12: Within Groups Comparison (Parametric) of Group B:

Variable	Tool	Pre_ Mean & Std. Deviation	Post_ Mean & Std. Deviation	Mean Difference	P-value
Scapular pattern	Flexion	81.67±13.707	103.75±32.342	22.08±18.635	.001
	Extension	18.67±14.63	37.23±23.62	18.56±8.99	.001
	Adduction:	12.75 ± 26.00	15.41± 21.50	2.66±4.5	.001
	Abduction:	69.58±22.709	107.92±26.391	38.34±3.68	.001
	External Rotation	35.67± 14.65	50.71± 23.62	15.04±8.97	.001
	Internal Rotation	38.75±5.91	47.18±9.65	8.43±3.74	
	SPADI	53.67±14.643	43.23±23.062	10.44±8.41	.001
	VAS	07.67±10.6	4.23±07.4	3.44±3.2	.001

The paired t-test compares the mean within each treatment group. The post-treatment mean for flexion, extension, adduction, abduction, external rotation, internal rotation, external rotation, SPADI and VAS for the Scapular Pattern Group significantly improves . The significant p-value (0.001) indicates that there is difference within group treatment. However, the mean difference in the Spencer Muscle Energy Technique Group is greater than the mean difference in the Scapular pattern Group. So, Spencer Muscle Energy Technique resulted in a significantly greater improvement as compared to the Scapular pattern regimen in improving ROM, reducing pain and disability in individuals with AC.

5. Discussion:

A prior study compared how well Maitland mobilization technique and Spencer muscular energy approach improved pain, range of motion, and impairment in individuals with frozen shoulder. For the study, 58 volunteers in total were chosen. split up into two teams. As an outcome tool, goniometer SPADI and VAS were employed. The values before and after the intervention differed statistically. According to the results, SPENCER MET improved the patient's condition more successfully (Jivani & Hingarajia, 2021).

A second study compared the effectiveness of myofascial ARM pull and Spencer muscular energy techniques in the treatment of adhesive capsulitis. Twenty people were chosen, and they were split up into groups A and B. Pain and functional impairment within the groups showed statistically significant improvement (p=0.0020) according to analysis utilizing the Wilcoxon matched pairs test and pairs' test. When compared to the Myofascial arm pull

technique, the Spencer MET group observed a noticeably higher improvement in shoulder mobility (Chavan et al., 2017).

In a prior study, the Spencer Muscle Energy Technique and Conventional Treatment for Frozen Shoulder were compared. Forty of the sixty patients that were assessed were involved—20 (or 50%) in each group. Shoulder ROM was measured using a physical goniometer, which is a typical tool for analyzing degrees of movement. While conventional treatment shown more efficacy in improving shoulder range of motion, SMET was more successful in reducing shoulder pain. We can draw the conclusion that SMET can be applied as a substitute for traditional therapeutic approaches or in conjunction with them to reduce pain (Gasibat et al., 2022).

In order to compare the efficacy of mobilization and muscular energy approach with adhesive capsulitis of the shoulder, another study was carried out. There were 42 ACS patients total who were divided into two groups (n=21). For four weeks, five days a week, the groups received both muscle energy technique and traditional therapy, as well as mobilization with movement. To evaluate differences between baseline and post-intervention, ROM, SPADI, and NPRS were employed. Compared to MET (Group A), MWM (Group B) was linked to a statistically significant higher change in ROM and SPADI score. By using NPRS, a statistically significant difference was seen in both groups. When combined with conventional therapy, MWM helps patients with adhesive capsulitis improve their functional impairment and shoulder range of motion (Patel, 2022).

A study comparing the effects of Spencer Muscle Energy Technique and Proprioceptive Neuromuscular Facilitation Stretch on pain and disability in patients with adhesive capsulitis was carried out. For this study, a total of thirty individuals between the ages of thirty and sixty were recruited. The Numeric Rating Scale (NRS) was used to gauge the degree of pain, and the Shoulder Pain Assessment Disability Index (SPADI) was used to assess both pain and functional disability. According to the study's findings, patients' pain has been reduced by Spencer Mets more successfully than by PNF treatment (Ghaffar et al., 2023).

The effectiveness of Maitland mobilization, Kaltenborn, Mulligan, and Spencer Technique on pain, range of motion, and functional disability in patients with frozen shoulders was compared in another study. There will be 80 samples in all, which will be split up into four groups of 20. For three weeks, they will undergo treatment five times a week. Revaluations of VAS, ROM, and SPADI are planned. According to the study's findings, SPENCER was more successful at improving patients' conditions (Phansopkar & Qureshi).

The purpose of the study was to evaluate and compare Mulligan's and Spencer's techniques separately with traditional therapy in individuals with frozen shoulder. Ninety patients with frozen shoulders were chosen at random. Three groups participated in the study: a control group that received conventional therapy; a group that received conventional therapy and Mulligan's technique MWM; and a group that received conventional therapy and Spencer's technique. The outcome measurements encompassed goniometry, SPADI, and NPRS. At three and six weeks, there was a significant difference (p-value 0.000 <0.05) in shoulder ROM, SPADI, and NPRS for all three groups. Mulligan's group experienced a greater functional improvement than the Spencer and control groups (Ali et al., 2022).

In order to determine how Spencer MET affected patients' pain and functional impairment related to adhesive capsule disease of the shoulder joint, a study was carried out in 2016. The visual analogue scale for pain and the SPADI for functional impairment were used to measure the study's outcomes. The results of this study show that for patients with adhesive capsulitis, The Spencer MET is more effective than traditional treatment at restoring functional skills (Contractor et al., 2016).

A study by Hussain et al. in 2022 evaluated the effects of sleepers and cross-body stretches against muscular energy approach on individuals with shoulder peri arthritis. The Goniometer and VAS were used to measure ROM AND discomfort. Conclusion: Sleepers, shoulder stretches performed cross-body, and Muscle Energy Techniques for Shoulder all considerably better lower pain in the VAS and shoulder abduction range of motion when used in the therapy of peri arthritis. However, Muscle Energy Techniques results in somewhat greater pain reduction and range expansion in peri arthritis

shoulder ROM as compared to sleeper and cross-body shoulder stretches. Hussain & associates, 2022).

This study was designed to evaluate the effect of Spencer MET on Pain and Functional Disability in Adhesive Capsulitis of Shoulder joint. In case and control both pain (VAS), SPADI showed significant improvement (p; 0.05). But there was more significant improvement in case as compared to control group in SPADI but not in VAS. The Spencer MET is more effective increasing functional ability in patients with adhesive capsulitis as compared to conventional treatment (Contractor et al., 2016).

6. Conclusion:

Both treatment techniques are effective in improving the condition. However, Spencer Muscle Energy Technique shows a more significant improvement in ROM and pain control than scapular pattern with adhesive capsulitis.

6.1 Limitations:

- It may be difficult to apply double blinding due to the nature of the interventions (manual therapy and exercises). This could introduce bias, as patients' expectations or therapists' knowledge of treatment could influence outcomes.
- Without a control group it may be difficult to differentiate whether the observed improvements are due to the specific interventions (Spencer MET and scapular exercises) or general placebo effects associated with receiving any form of care.
- current study population may not represent all patients with adhesive capsulitis such as those with secondary adhesive capsulitis (caused by trauma or surgery) or to populations with differing demographic characteristics.

6.2 Recommendations:

- study recommend to add structured patient education program that focuses on understanding adhesive capsulitis, self-management strategies, and the importance of adherence to exercise protocols.
- Investigate the psychological factors such stress and anxiety that may influence treatment outcomes and recovery processes
- Implement qualitative research methods (e.g., interviews or focus groups) to gain deeper insights into patients' lived experiences with adhesive capsulitis, their coping strategies, and perceptions of treatment effectiveness.

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Annexure 1: Study Questionnaire

Questionnaire for Individuals with Adhesive Capsulitis

Serial No. _____
Contact No. ___

Demographic data

Age (in years): __
Gender: _____
Height (in feet): _____
Weight (in kg): _____
Education (in years): _____
Patient occupation: _____

SPADI:

SPADI (SHOULDER)

Name _____ Date_____

PAIN SCALE	
How severe is your pain:	
1. At its worst.	No pain 0 1 2 3 4 5 6 7 8 9 10 Worst Pain Imaginable
2. When lying on involved side.	No pain 0 1 2 3 4 5 6 7 8 9 10 Worst Pain Imaginable
3. Reaching for something on a high shelf.	No pain 0 1 2 3 4 5 6 7 8 9 10 Worst Pain Imaginable
4. Touching the back of your neck.	No pain 0 1 2 3 4 5 6 7 8 9 10 Worst Pain Imaginable
5. Pushing with the involved arm.	No pain 0 1 2 3 4 5 6 7 8 9 10 Worst Pain Imaginable
DISABILITY SCALE	
How much difficulty did you have:	
1. Washing your hair.	No difficulty 0 1 2 3 4 5 6 7 8 9 10 So difficult required help
2. Washing your back.	No difficulty 0 1 2 3 4 5 6 7 8 9 10 So difficult required help
3. Putting on an undershirt or pullover sweater.	No difficulty 0 1 2 3 4 5 6 7 8 9 10 So difficult required help
4. Putting on a shirt that buttons down the front.	No difficulty 0 1 2 3 4 5 6 7 8 9 10 So difficult required help
5. Putting on your pants.	No difficulty 0 1 2 3 4 5 6 7 8 9 10 So difficult required help
6. Placing an object on a high shelf.	No difficulty 0 1 2 3 4 5 6 7 8 9 10 So difficult required help
7. Carrying a heavy object of 10 pounds.	No difficulty 0 1 2 3 4 5 6 7 8 9 10 So difficult required help
8. Removing something from your back pocket.	No difficulty 0 1 2 3 4 5 6 7 8 9 10 So difficult required help

DEVELOPED BY Roach 1991 [1];

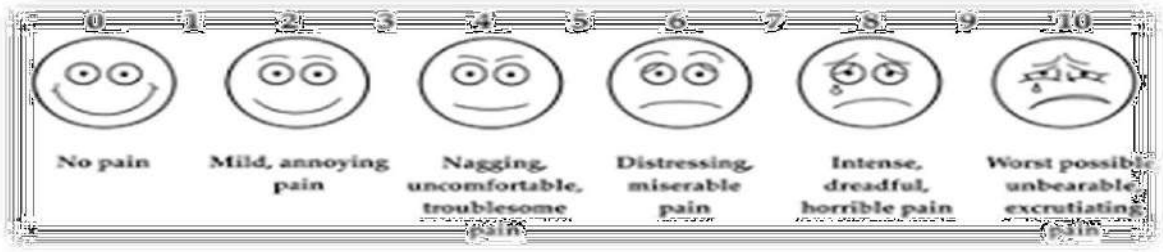
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Tool	Pre-treatment	Post-treatment	Follow-up
SPADI			

Visual Analogue Scale

On a scale of 0 to 10, with 0 being no pain and 10 being the worst pain imaginable, please rate your current level of pain. Tell us how intense your pain has been over the past week on average



Tool	Pre-treatment	Post-treatment	Follow-up
VAS			

Goniometer:

Tool	Pre-treatment	Post-treatment	Follow-up
Goniometer			

Annexure 2: Consent Form (English)

The study you are about to participate in is to determine the comparative effectiveness of Spencer MET and scapular pattern exercises to improve pain, range of motion, and functional disability in adhesive capsulitis.

The study has no potential harm to participants. All data collected from you will be coded in order to protect your identity, and should not be disclosed to anyone. Following the study there will be no way to connect your name with your data. Your answers to the questions will not affect the quality of education given to you. Any additional information about the study results will be provided to you at its conclusion, upon your request.

You are free to withdraw from the study at any time. You agree to participate, indicating that you have read and understood the nature of the study, and that all your inquiries concerning the activities have been answered to your satisfaction.

Name: Date:
Signature:

Consent Form (Urdu)

میں ---------- تصد یق کرتا / کرتی ہوں کہ
جناب ---------- نے
اپنی تحقیق بعنوان :
جس تحقیق میں آپ حصہ لینے جا رہے ہیں اس کا مقصد ایڈہیسیو کیپسولائٹس کے مریضوں میں درد میں کمی، حرکات کی حد (رینج آف موشن) میں بہتری اور فعالیت میں کمی کو کم کرنے کے لیے اسپنسر ایم ای ٹی اور اسکیپولر پیٹرن ورزشوں کے تقابلی اثرات کا جائزہ لینا ہے۔
زیر نگرانی _____کے متعلق بتا دیا ہے ۔ مجھے اس کی نو عیت ، مقا صد، احداف ، تو قعات، فوائد اور خطرات کے متعلق ساری معلومات فراہم کر دی گئ ہیں۔
اس تحقیق کے دوران ساری معلومات صیغہ راز میں رہیں گی اور مریض کا نام اور دیگر معلومات صرف تحقیق کے لیے استعمال ہوں گی۔ مجھے یہ بھی بتا دیا گیاہے کہ یہ تحقیق صرف ایک شخص کے مفاد میں نہیں بلکہ بحثیت مجموعی انسانیت کا مفاد اس سے وابستہ ہے۔ اگر میں تمام تفصیلات جاننے کے بعد اس تحقیق میں شامل ہونے سے معذرت کروں تو مجھ پر کوئی پابندی نہیں ہو گی۔ میں کسی وقت بھی اس تحقیق سے اپنے آپ کو علیحدہ کر سکتا / سکتی ہوں اور مجھ پر کسی قسم کی کوئی بندش نہیں ہو گی ۔ میں بذات خود بقائمی ہوش و حواس اپنی رضا مندی سے اس تحقیقاتی عمل میں شامل ہوتا/ ہوتی ہوں۔

دستخط محقق ---------- دستخط
مریض ----------