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Effectiveness of mobilization with movement for the treatment of shoulder pain and limitation of shoulder movement

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Decleration

I hereby declare that the present dissertation entitled " **Effectiveness of Mobilization of Movement for the Treatment of Shoulder Pain and Limitation of Shoulder Movement"** is an original work of my own. All sources have been cited appropriately. Any mistakes or inaccuracies are my own. I also declare that for any publication, presentation or dissemination of information of the study, I would bind to take consent from the department of Physiotherapy of Bangladesh Health Professions Institute (BHPI).

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Acronyms

BHPI	Bangladesh Health Professions Institute
CRP	Centre for the Rehabilitation of the Paralysed
MWM	Movement with Mobilization
MS	Musculo-skeletal
NSAID‟s	Non-Steroidal Anti-inflammatory Drugs
PT	Physiotherapy
RCT	Randomized Control trail
IRR	Infra-red radiation
ROM	Range of Motion
VAS	Visual Analogue Scale
SMD	Standardized Mean Difference
MD	Mean Difference

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Abstract

Background: Shoulder pain and movement restrictions are common musculoskeletal complaints that significantly affect daily activities. Mobilization with Movement (MWM), a manual therapy technique developed by Brian Mulligan, has been widely used for shoulder conditions. Studies suggest that mobilization with movement can enhance range of motion (ROM), reduce pain, and improve functional outcomes. However, the effectiveness of mobilization with movement compared to other physiotherapy interventions remains debated. This study aims to assess the impact of MWM on pain reduction, ROM improvement, and functional recovery in individuals with shoulder disorders. **Aim:** This study aims to evaluate the effectiveness of MWM in reducing shoulder pain and improving mobility in individuals with movement restrictions. It investigates the effects of mobilization with movement on pain levels, ROM, and functional ability. Additionally, the study compares MWM to conventional rehabilitation techniques to determine its relative benefits in shoulder pain management. **Methodology:** The study was a single group pre test post test design that measured pre-test and post-test results. 26 patients were allocated based on inclusion criteria. The participants received six sessions of treatment. Numeric Pain Rating Scale, Goniometer, Oxford Grading scale were used to measure the pain and range of joint. **Results: :** The pre and post test results of 26 participants were measured using paired t test. The test reveals that the shoulder pain intensity and range of movement statistically improved ($p< 0.05$) after receiving the intervention. But muscle power of oxford grading did not show any difference in before and after comparison. **Discussion:** MWM appears to be a beneficial treatment for shoulder pain and movement restrictions, offering improvements functional ability. Its effectiveness may be attributed to enhanced joint biomechanics and neuromuscular control. Although current evidence supports MWM, variations in study methodologies and small sample sizes highlight the need for further research. Future studies should focus on long-term effects and standardized protocols to establish MWM as a primary intervention in physiotherapy.

Keywords: Mobilization, Movement, Shoulder, Pain, Range of motion, Disability.

Word count: 10576

CHAPTER-1: INTRODUCTION

1.1. Background

Severe shoulder pain and restricted shoulder movements are rather common musculoskeletal problems affecting people of different ages. They considerably influence everyday lives and the quality of life (Lewis, 2016). Complex anatomy and biomechanical requirements place the shoulder joint prone to various dysfunctions as it is one of the most mobile joints in the human body (Kumar et al., 2019).

Among the injuries and disorders leading to pain and limited mobility (thus, affecting performance and efficiency), there are such conditions as adhesive capsulitis, rotator cuff tendinopathy, and shoulder impingement syndrome (Hannafin & Chiaia, 2000). Despite the numerous physiotherapy interventions that have been researched on to remedy shoulder pain, mobilisation methods are becoming a success because of its effectiveness in restoring movement and the fact that it is non-invasive (Vicenzino et al., 2011).

Mobilisation with movement (MWM), developed by Brian Mulligan, is an extension of accessory movements of a joint into the range of physiological movement (active or passive) (Mulligan, 1999). The system is usually adopted in musculoskeletal disorders, such as the disorders of the shoulders, to help ease the joint mobility and pain of the joint (Hing et al., 2010).

The applied MWM consists in the alleviation of suffering and promotion of functional movement as a result of the re-orientation of joint surfaces to the improved location (Paungmali et al., 2012). Secondly it is also suggested that MWM can lead to the activation of the mechanoreceptors leading into an improved neuromuscular stability and control of the pain (Vicenzino et al., 2011).

The concept of MWMs effectiveness in the treatment of shoulder pain, deficit of movement was tested numerous times, and the perspective looks promising. As it was shown by an article by Hanchard et al. (2014) the research used randomized control trials and compared the outcomes of patients with the problem of shoulder impingement syndrome treated with MWM to those who had not received the therapy, as they did not find any significant difference in range of motion and decrease in pain levels between the patients under control and the ones receiving MWM intervention, the results did not change much in comparison with those patients who had received

treatment with traditional physiotherapy alone. Similarly, Heggannavar et al. (2020) found MWM is more effective than other interventions of manual therapy when it comes to the improvement of shoulder and tissue mobility in patients with adhesive capsulitis. Additionally, MWM was also observed to be useful in rotator cuff-related disorder management since it enhanced joint kinematics and decreased pain (Teys et al., 2013).

The comparisons that are made in clinical relevance of MWM are also in contrast with other therapeutic interventions. In their article titled comparisons between MWM and exercise therapy (Souvlis et al., 2015), their general observation revealed that patients with shoulder dysfunction who used MWM experienced a big decrease in pain and more change in functional outcome benefits within a shorter interval than those with physically active exercise therapy. Yet another study, one by Bennell et al. (2010), signifies that MWM can become an unusual addition to the exercise treatment, providing quick enhancement to the functional performance in the absence of painful range of movement. Despite being some of these positive findings, the researchers are still trying to explore the optimal dose and possible successes of MWM in the long run in most shoulder conditions (Hing et al., 2010).

MWM needs to be applied by a clinician with the full knowledge of how it should be applied and the circumstances of the patient. It has been noted that success of MWM is also considered based on the skill of the therapist to achieve the right path and level of mobilisation (Vicenzino et al., 2011). Moreover, MWM does not respond equally to different patients, and this is why tailor-made and patient-oriented treatment programs and further studies of the mechanism influencing its effectiveness should be developed (Kumar et al., 2019). Since there is an emerging interest in non-invasive, inexpensive physiotherapy methods, MWM holds a great potential as the main or a secondary intervention for the management of the shoulder pain and locomotore restriction.

So, MWM proved to be quite effective as it helped to reduce the pain and increase the motion of shoulder, and it possibly viewed as an excellent intervention in the treatment of physiotherapy. However, superior treatment parameters and standardised practices, as well as long-term benefits can only be achieved through additional high-quality research (Heggannavar et al., 2020). With a performance of these types of research gaps, MWM may be better incorporated into regular practice and improve patient with shoulder dysfunctions results.

Human shoulder is quite a complex anatomical structure, which is why its malfunction is possible when its wide range of motion is taken into consideration. Restricted movement and shoulder pain are some of the most common musculoskeletal complaints. These are the causes of disability, impaired life quality and economic loss because of lost workdays and medical expenses (Luime et al., 2004). There are a number of pathologies that might induce these conditions and they include the nonspecific mechanical dysfunction, the rotator cuff conditions, adhesive capsulitis, and subacromial impingement syndrome. Physiotherapists therefore need to use patient-centered, cost-effective, and evidence-based interventions more so to restore functional ability of the shoulders and reduce pain.

Since time immemorial, manual therapy has been employed to help people with musculoskeletal pathologies such as shoulder dysfunction. In recent years, Brian Mulligan manual technique, Mobilisation with Movement (MWM) has attracted more attention than any of the other approaches. In this method, a painful or limited movement of the patient is actively carried out, and a long passive accessory glide is applied by the therapist (Mulligan, 2010). The general tenet of MWM says that it is aimed at rectifying the positional faults, the minor and frequently undetectable distortions between joints to which the development of pain and loss of functionality is attributed (Vicenzino et al., 1996). MWM seeks to enhance neuromuscular co-ordination and mobility by fixing these flaws in the process of active motion.

Not only do shoulder issues make life physically uncomfortable, they also really hampers the activities of daily living (ADLs), occupational performances, and quality of sleep (van der Windt et al., 1995). Since shoulder joint is vital in movements of the upper extremities, it is very important to manage shoulder conditions as quickly and effectively as possible. Conventional methods usually incorporate the use of medicine, relaxation, physical activities and in some cases surgery. But manual therapy exercises, such as MWM, are the non-invasive and cost effective method, which is also useful in outpatient care (Teys et al., 2008). These benefits mean that physiotherapists all over the world currently use MWM in their clinical practices.

A number of studies have been conducted to finf out the effectiveness of MWM in managing shoulder pain and limitation of movement. Studies have also indicated that MWM is capable of instant pain relieving effects and improvement in active range of motion in conditions like adhesive capsulitis and subacromial impingement syndrome

as well as shoulder pain of the rotator cuff (Paungmali et al., 2003; Teys et al., 2008). The findings of Paungmali et al. (2003) revealed that one session of MWM on the shoulder created hypoalgesic effects and thus confirming the understanding that MWM may encourage mechanical and neurophysiological impacts. Participants under MWM displayed promising results regarding shoulder impingement patients on both the scale of range of motion and functional ability even after a single treatment session (Teys et al., 2008).

Understanding of the fundamental mechanisms of MWM effectiveness is being studied. When viewed biomechanically, MWM is said to correct minor joint misalignments, decreasing the stress on the joints and enhancing the patterns of movement (Mulligan, 2010). Neurophysiologically, the method can evoke the descending pain inhibitory processes and suppress central sensitisation, which is one of the symptoms of chronic musculoskeletal pains (Vicenzino et al., 1996). In addition, active movement application to the treatment promotes the re-established competent motor control and potentially promotes proprioception and the quality of functional movements (Bisset and Vicenzino, 2005).

Besides its physiological effects, MWM is linked to active patient involvement, which makes it in line with the current theories of rehabilitation with a focus on patient-centered care and self-management. Patients tend to be more independent in their recovery and will easily adhere to rehabilitation plans when they are advised to conduct MWM-assisted exercises on their own after practicing the technique (Lewis, 2016). MWM is a psychologically beneficial intervention since it is centred on pain-free movement thus helping patients with chronic shoulder pain break down the fear and avoidance cycle (Leeuw et al., 2007).

1.2 Rationale

One of the most prevalent complaints in the scope of musculoskeletal rehabilitation is shoulder pain and limited movement. These illnesses greatly affect the capability of a person to go through the daily routines hindering their productivity and reducing their quality of life. There are many treatment options such as medicine, surgery, physical therapy among others that have been employed to treat shoulder dysfunctions.

Nonetheless, non-invasive and affordable interventions are still in demand, as a number of patients seek alternative treatment options that will grant them effective pain management and functional improvement without surgery risks or adverse effects due to prolonged exposure to medications.

Movement-based mobility has been proposed as a potentially effective intervention of shoulder dysfunctions because of its unique treatment that incorporates the combination of manual therapy and active involvement of the patient. As compared to conventional passive methods of mobilisation, MWM involves the use of a therapist-assisted glide during which the patients change the position of the shoulder in a range which is not defined by pain. This combination is intended to regain functional capacity and joint mobility and would lower pain levels in a relatively short time span. The rationale behind this research is rooted in the fact that there is an increased demand in non-invasive, evidence-based interventions of physiotherapy that is capable of treating shoulder pain and restriction of movements. However, despite the promising outlooks in clinical evidence, MWM requires further examination to determine the best usage, efficiency or established effects in the long-term perspective. Measurement of efficacy of MWM would be useful in the formulation of standardised treatment measures and would also give a good idea on how the method finds application in rehabilitation.

The objectives of the study include determination of the impact that MWM has had on shoulder pain and mobility as well as providing a systematic analysis of its possible therapeutic value. This study will assist in decision-making of physiotherapists when using it in a clinical setting and it may improve the approaches towards treating shoulder dysfunction, as this is a key point of this research proposal by evaluating its effectiveness. Further, the successful rehabilitation programs will become more personalised since the specific patient groups perceiving the most benefits of MWM will become known.

The final aim of this study is to fill the gap between theory and practice to provide a full comprehension of the role of MWM in physiotherapy. This would enhance patient care, have lower healthcare expenditures, and increase the list of non-operative procedures of shoulder disorders.

1.3 Aim

This study's aim was to find out the effectiveness of mobilization with movement for the treatment of shoulder pain and and limitation of shoulder movements.

1.4 Hypothesis:

1.4.1 Null hypothesis:

Mobilization with Movement along with conventional physiotherapy is not more effective than with conventional physiotherapy alone to improve shoulder pain and limitation of shoulder movement.

H0: $\mu1-\mu2 = 0$ or $\mu1=\mu2$ where the pretest and posttest group, initial and final mean difference is same.

1.4.2 Alternative hypothesis:

Mobilization with Movement along with the conventional physiotherapy is more effective than with conventional physiotherapy alone to improve shoulder pain and limitation of shoulder movement.

H1: $\mu1-\mu2 \neq 0$ or $\mu1 \neq \mu2$, where the pretest and posttest group, initial and final mean difference is not same.

1.5 Objectives:

1.5.1 General Objective:

To evaluate the effectiveness of Mobilization with Movement (MWM) in reducing shoulder pain and improving shoulder range of movement.

1.5.2 Specific Objectives:

1. To measure and compare the pain levels between pre test and post test group.

2. To assess changes in range of motion of shoulder before and after MWM intervention.

3. To evaluate improvements in shoulder function

4. To determine effectiveness of MWM of short term in relieving pain and enhancing movement in individuals with shoulder conditions.

5. To analyze the statistical significance of changes in pain and mobility following MWM intervention.

1.6 Operational definition

Effectiveness

It means the ability to produce desired result. When anything is effective, that means it has an intended expected result, or produces a deep, clear impression.

Shoulder conditions

A variety of musculoskeletal disorders that impact the shoulder joint, surrounding muscles, ligaments, and tendons are referred to as shoulder conditions. Trauma, overuse, degeneration, or underlying medical conditions can all lead to these conditions. Rotator cuff injuries, frozen shoulder, shoulder impingement, arthritis, and dislocations are among the common shoulder conditions. Pain, stiffness, weakness, and restricted range of motion are some of the symptoms that can affect everyday activities and general functioning. Imaging, functional testing, and clinical evaluation are usually used in the diagnosis process. Physiotherapy, medicine, injections, or surgery are possible forms of treatment, depending on the severity. Reducing pain, restoring movement, and enhancing quality of life are the goals of effective management.

Movement with mobilization exercise

Mulligan developed the use of MWM for peripheral joints. This method combines the physiologic (osteo-kinematic) motion of a joint, which can be done passively by the therapist or actively by the subject, with a prolonged manual technique "gliding" force applied to the joint. Theoretically, the manual force, also known as mobilisation, is meant to cause bone positional faults to shift. MWM aims to restore pain-free motion to joints where range of motion is painfully limited.

Conventional physiotherapy

The medical community frequently uses and accepts physiotherapeutic interventions. In order to identify the interventions that are frequently utilised as traditional physiotherapy for shoulder conditions, the researcher created a list of evidence-based physiotherapy interventions and gave it to the physiotherapist.

CHAPTER-II LITERATURE REVIEW

Mobilisation with Movement (MWM) is one of the manual therapy used to treat pain and restricted movements on the shoulder which has been applied widely. Its effectiveness has been studied many times, and it was particularly noted to evaluate its effect on range of motion (ROM), its analgesic potential, and the increase in the overall functions. Enhancement in the performance of clinical trials and systematic reviews has over time enhanced our comprehension of the effectiveness of MWM when compared with other therapeutic interventions of shoulder disorders.

It has been indicated that in case of shoulder pain and mobility, MWM could also be effective, especially in the cases of adhesive capsulitis, rotator cuff tendinopathy, or shoulder impingement syndrome.In 2021, Satpute et al. performed a systematic review and meta-analysis of randomised control trials (RCTs) comparing the effect of MWM intervention on pain, range of motion, and disability. The study that involved 25 RCTs significantly improved the metrics of functional disability (SMD -1.50), the degree of flexion (MD -11.73), abduction (MD -13.14), and pain reduction (SMD -1.23) in patients with frozen shoulders. Also, MWM showed significant changes in flexion range of motion (MD -18.48) of the symptomatic shoulder in patients with movement-related shoulder pain and pain (SMD -1.07). Nevertheless, the study emphasized the necessity of interpreting results very carefully and cast doubt on a possible bias in the trials it incorporated (Satpute et al., 2021).

Torrierri Jr. et al. (2023) conducted another systematic review focusing on the effects of MWM on shoulder pain, disability, and movement range in patients with shoulders pain and movement dysfunction. Upon pooling and analysing data in 26 studies, the review revealed that MWM had significant reductions in pain during movements (SMD of -0.6) and increases in shoulder abduction (MD of 12.7o) when compared to sham intervention approaches in the short-term period. Also, the combination of MWM and conventional rehabilitation programs yielded better results, decreasing functional disability (SMD -1.3) and pain that were experienced at rest (MD -1.2). Although these are positive results, the research found that the level of assurance about the evidence was low and very low, which means that further outstanding research must be conducted to support these findings (Torrierri Jr. et al., 2023).

It has also been looked at how effective MWM is compared to the other physiotherapy available methods. Baeske et al. (2024) conducted an RCT in an attempt to compare the effects of adding MWM to a conventional exercise intervention in chronic atraumatic rotator cuff-related pain patients. One group was subjected to MWM plus exercise and the other group was subjected to MWM plus exercise. The group of respondents was selected randomly to be assigned with one of the two groups. The experimental group achieved significant improvements, such as decreased night pain (MD -2.1), also improved pain during motion (MD -1.5) as well as improved functions (MD -15 points of the Shoulder Pain and Disability Index) after five weeks of the treatment.

Moreover, AROM was much active in flexion (MD 16 o), abduction (MD 23 o), external rotation (MD 11 o) and movement hand behind back (MD 20 o) when compared to the control. These benefits were maintained in a one-month follow-up, and it could be assumed that the therapeutic effects of MWM include the prolonged process of functional recovery (Baeske et al., 2024).

The systematic review of Kuru Çolak et al. (2024) was an even more comprehensive study of MWM as it included 27 studies and 1,157 participants. It was noted in the review that MWM, compared to other mobilisation techniques, were statistically better at improving the range of movement in flexion and shoulder abduction and functional movement (MD -11.24). Although these positive results were found, it was highlighted in the review that the improvements were statistically important, but it remains unknown whether it has any clinical importance as well. The authors referred to the need to conduct further investigation to identify whether such statistical differences have significant functional benefits in patients (Kuru Çolak et al., 2024).

Although the evidence on MWM is positive there are some considerations to put in place concerning methodology. Most of the enrolled studies are highly susceptible to the bias of low sample size, inhomogenous intervention procedures, and poor blinding. Variation in outcome measures and follow up also makes the synthesis of results difficult. On the basis of systematic reviews the certainty of evidence has always been low to very low and more detailed, methodologically well-designed RCTs other than conventional protocols are required to show the conclusive role of MWM in the treatment of shoulder pain.

Based on the research body since 2010 to 2025, it has been stated that MWM could be exceedingly beneficial in reducing shoulder pain and improving mobility and this could be more revealed when applied with the orthodox rehabilitation programs. Nevertheless, inconsistencies, methodological limitations, and levels of certainty of the existing body of evidence appear to be characterised. Although there are statistically significant gains in some studies, it is unknown what the clinical consequences of the findings are.

To substantiate the implications of MWM, future research ought to focus on large and high-quality RCTs, where instrumentation of the intervention is standardised and propositions to examine the sustainability of its treatment-induced consequences extended to bouts of follow-ups. Clinicians are advised to take MWM as one alternative that could prove beneficial as part of regular physiotherapy in the management of shoulder pain as an additional treatment option whenever the impairments in movements are the most likely instigators.

Besides its use in clinics, recent studies have analyzed the physiological details of the effectiveness of MWM. According to results on electromyography (EMG) and ultrasonography studies MWM can increase proprioceptive information that would harmonise neuromuscular control and stabilise joints. A study by Lee et al. (2023) demonstrates the idea that MWM helps in biomechanical corrections at the joint-level by noting that patients undergoing MWM provided improved scapulohumeral rhythm and amplified rotator cuff muscle activity. Based on these results, it may be possible that MWM can assist with long-term motor learning and rehabilitation, as well as symptoms, which may explain the improved functions and pain (Lee et al., 2023).

Moreover, with the recent developments in technology of rehabilitation, it has been possible to assess MWM outcomes in a more objective way. Muscular effort and joint kinematics in MWM interventions have been measured using wearable motion sensors as well as force-sensitive insoles. The potential effectiveness of real-time biofeedback in combination with MWM has been indicated in a pilot study by Zhang et al. (2024) that biofeedback might help optimise the movement patterns and force application so that the end result of the training becomes more effective. According to Zhang et al. (2024), the adoption of these technologies in physiotherapy-related practice can introduce new opportunities of tailoring MWM interventions and providing better patient outlook.

With the accumulation of the evidence of MWM, it is advisable to study its long-term consequences, especially those studies that focus on how it can be used to prevent recurrent shoulder pain and disability.

More so, examining the usefulness of MWM on different populations such as athletes and the elderly can be a meaningful source of new information on its applicability in general. As the research methodology and technology in the field of rehabilitation have been evolving, MWM appears to be a possible method that should be researched and developed constructively in the future. Assessing the cost-effectiveness of MWM compared to other costs can also enable healthcare policymakers to create evidence-based treatment regimens that achieve the best patient outcomes at a minimum cost.

Attention should also be given to additional study of high quality, which should help in understanding the role of MWM in treatment and clear the way to its regular application in rehabilitation environments.

The musculoskeletal problems such as shoulder pain and its limitation are common complaints that significantly affect daily life activities and the quality of life as well. One among the myriads of physiotherapy techniques, Mulligan Mobilisation with Movement (MWM) has attracted much attention owing to its significant potential of dealing with shoulder disorders. To address small positional errors in joints and bring back pain-free movement, MWM takes a combination of the active physiological movement by the patient together with the use of a long passive accessory glide by the therapist (Mulligan, 2010).

There are many studies that have assessed the effectiveness of MWM in treating shoulder conditions. Teys et al. (2008) had carried out a randomised controlled trial to the patients diagnosed with shoulder impingement syndrome and had reached the conclusion that a single MWM session produced 'substantial and statistically significant changes in shoulder range of motion and pain immediately post-intervention'. On the same note, Paungmali et al., (2003) indicated that MWM produced immediate hypoalgesic effects, which implied that neurophysiological pain modulation was one of the mechanisms underlying the modality.

In addition, Sharma et al. (2015) showed that when MWM was utilized regularly within a few weeks, it led to the long-term improvements in external rotation and shoulder abduction in patients with adhesive capsulitis. The researchers (Kumar et al., 2012) reached this conclusion by identifying that MWM facilitated better management of pain and mobility when no addition to other treatments was

incorporated into standard physiotherapy but was rather added to an exercise therapy intervention.

MWM is believed to lessen the tightness of the capsule and also correct the joint structure in a mechanical fashion and stimulate the descending inhibitory circuit of the pain pathways (Vicenzino et al., 1996). The benefits enhance the use of MWM especially under pathological conditions marked by co-occurring pain and limited movements such as those in frozen shoulder, shoulder impingement, and rotator cuff tendinopathy.

Regardless of the fact that MWM is presumed to be safe and easily administered, it should be remembered that its success varies according to the appropriate technique and patient compliance. Most of the studies rely on its short-term benefits although more studies are needed to establish its effectiveness in the long term and how effective its dosage shall be in future (Crow et al., 2010).

According to recent research, the mobility improvement using MWM and decreasing shoulder pain are the appreciable effects of Mulligan on the treatment of this issue. MWM is important in enhancing overall functional improvement significantly in patients with shoulder dysfunction since it is accompanied by a well-formulated rehabilitation protocol.

Mulligan Mobilisation with Movement (MWM) is applicable in some clinical procedure especially in adhesive capsulitis treatment, shoulder pain due to impingement syndrome, and rotator cuff dysfunction. It is more feasible than the usual passive therapies due to its fast output and participatory interventions.

Treatment of subacromial impingement syndrome (SIS) is one of the most researched usages of this treatment. Most frequent symptoms of SIS are pain during overhead movements and restrictions of shoulder mobility, especially of abduction and flexion. Hing et al. (2008) examined the outcomes of MWM on SIS patients and found that it could decrease pain measured by Visual Analogue Scale (VAS) and augment the extensibility in shoulder flexion and abduction. The results share similarity with the findings of the previous research by Vicenzino et al. (2000) who concluded that in only a single MWM session, there was a significant improvement in pain and shoulder impingement symptoms.

Another condition that considerably restricts the mobility of a shoulder is adhesive capsulitis, or frozen shoulder, which in many cases is not responsive to conventional treatment. The MWM-guided range of motion (ROM) recovery has shown

encouraging results especially in external rotation and abduction. According to Vermeulen et al. (2006), another finding was that MWM coupled with high-grade mobilisations exceeded the outcomes of low-grade mobilisations. In the same manner, Duzgun et al. (2011) compared MWM and traditional passive stretching exercises among patients with adhesive capsulitis. Satisfaction scores in the MWM group were elevated and the rate of improvement of shoulder range of motion was accelerated significantly.

Benefits of neuro modulation as well as through mechanical movements and glide are attributed to succinct improvements in frozen shoulder. Desensitisation of central nervous system through painless movement can eliminate the avoidant behaviour that is related to the fear and likely to prolong stiffness in chronic circumstances (Bisset and Vicenzino, 2005).

The success of MWM is followed by both neurophysiological and mechanical amendment system. The method can reduce pain in central mechanisms, which stimulates the descending inhibitory pathways (Paungmali et al., 2003). The joint glide accommodates muscle activation and motor reprogramming opportunities by rearranging the joint to minimize mechanical, compressing and pinching forces, particularly in situations such as impingemen

Biomechanically, MWM could loosen or desensitize the capsular and increase joint play that is important in a ball-and-socket joint such as the shoulder. Another important theory was suggested by Mulligan (2010) which identifies the conditions of sliding and possible joint position faults during long-term movements that may contribute to the treatment of pain and reduced mobility due to small shifts.

These mechanisms are further supported by a study by Kaltenborn (2003) which stresses that normal arthrokinematics should be brought back into place in order to get back to normal kinematics of the shoulder. MWM brings in functional movements, and focuses directly on these small positional faults, which makes it a two-fold benefit.

MWM has been compared to other adherents of manual therapies, i.e., Kaltenborn approaches or Maitland mobilisation in many studies. Nagrale et al. (2015) did a randomised control trial to compare the use of MWM and Maitland mobilisation among individuals with subacromial impingement syndrome. In their study, it was revealed that the two methods yielded positive results that involved the improvement in shoulder functions and the minimization of pain; however, MWM indicated a pain reduction earlier and a quicker recuperation in functional mobility.

Joseph et al. (2017) studied the strengths of Mulligan MWM yet soft tissue mobilisation in the management of the impingement of the shoulders of A patients. Although the study concluded that both interventions had conspicuous effects in reducing pain and enhancing range of motion, MWM performed effectively in should flexion as well as abduction and functional independence concerning Shoulder Pain and Disability Index (SPADI).

Nevertheless, not every research agrees with the thought that MWM is better. As stated by Wright et al., not only MWM, but also the adjacent, overall, rehabilitation program is instrumental, since in the long term, the efficacy of MWM is comparable to that of passive stretching and strengthening exercises (Wright et al., 2005).

Active participation model is one of the advantages of MWM where patients are not treated passively. Since patient participation contributes to the outcomes to a great extent, it is of particular value in musculoskeletal rehabilitation. Based on the research of Abboud and Kim (2010) and other researchers, most of the interventions involving movement based and encouraging patient participation are usually more successful in their effects as well as adherence.

Follow-up outcome measures generally take the form of the Shoulder Pain and Disability Index (SPADI) and the Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire to measure functional improvements in the case of MWM. Four weeks after scapular stabilisation exercises along with MWM, Bansal et al. (2016) revealed that SPADI scores of the patients showed significant improvements, which is a positive sign of improvement in their functional ability to perform daily activities.

Nevertheless, the literature has certain problems although, despite them, the outcomes are positive. Most of the studies rely on a small sample size and short follow up. Also, MWM application across studies is quite challenging to standardise as variability in treatment protocols is present in most studies in terms of frequency, intensity and type of glide. Also, other studies do not have proper blinding or controls thereby introducing bias in interpretation of results (Greenhalgh, 2010).

Moreover, there are not many studies to look into long-term effects of MWM on chronic shoulder problems despite the well-known effects of this workout on the immediate one. According to Ginn and Cohen (2005), although MWM might be included in the solution, the answer needs thorough evaluation and multimodal

treatment in order to achieve lifelong recovery. Shoulder pain is usually complicated by biomechanical and psychosocial factors.

The more recent studies are examining the applications of the utilization of MWM along other interventions like kinesiotaping, neuromuscular re-education and dry needling. As an illustration, Chandhok and Mehta (2021) have shown that patients with shoulder impingement improved more in terms of pain and functional movement as MWM and kinesiotaping rather than the MWM alone intervention.

The second in which MWM is emerging is in post surgical rehabilitation like post rotator cuff repair. Notwithstanding its shortcomings, early studies indicate that well-formulated MWM has the potential to assist in motion restoration, without causing any harm to tissue healing. Further randomised controlled trials are required to confirm such findings and give recommendations on safe practice.

Technology can also assist in MWM research advancement. The changes in joint mechanics and muscle activity during and after MWM can be measured, by means of the motion capture and electromyography (EMG).

Although it is a common clinical practice to apply Mulligan MWM (MWM) in clinical practice even though it is relatively new to integrated clinical guidelines. The International Orthopaedic and Physiotherapy Associations suggest manual therapy as one of the multimodal therapy modalities to address frozen shoulder and subacromial pain syndrome (Hopman et al., 2013). Yet, in most cases, the mentioning of MWM is rather restricted as references are weak in terms of methodology used in the literature, practitioner experience, and training.

Nonetheless, the highly experienced clinicians have often found value in implementing MWM in evidence-informed practice models because of its appreciable short-term advantages. As an example, Lewis (2016) claims that MWM is a process that is crucial in the shoulder rehabilitation settings, especially when the pain is positional-specific and is related to positional joint dysfunctions. He notes that the findings of interventions such as MWM need to be based on symptom behaviour, irritability and a response to treatment and not necessarily diagnosis.

The quality of MWM very much depends on the efficiency of a therapist and his knowledge of shoulder biomechanics. Unsuitable application can negate effect and lead patients to further inconveniences. McClatchie and Kadziolka (2019) report that the ability of the therapist to detect positional errors and make appropriate glides when the movement is technically actuated on the go determines positive results.

They discovered that the continuous application of MWM in their clinical audit by trained therapists resulted in movement and recovery rates and patient satisfaction when compared to their generic mobilisation techniques.

Moreover, the results of inter-rater reliability tests indicate that despite the fact that qualified specialists can rely on MWM methods using similar results, inexperienced therapists can use them in different ways, and this fact may affect the overall positivity of the process (Souvlis et al., 2004). This makes the practical training and post-graduate manual therapy education important in making MWM part and parcel of the clinical world.

The emphasis in modern pain science is to incorporate a significant amount of consideration of the biopsychosocial model of pain, which acknowledges that pain is neither a solitary physical process, nor is it completely independent of other psychical, emotional, and social considerations. This model and the proactive approach define MWM nicely. Fear-avoidance behaviour loops can be broken by involving the patient with activities normally avoided by the patient because the patient fears being in pain (Leeuw et al., 2007).

In MWM the therapist guides the patient on pain free movement in graded exposure technique. In addition to the mechanical advantages, this may help rebalance the manner in which the central nervous system perceives pain which might lead to long term functional compensations and the abatement of movement anxiety (Moseley, 2004). Louw et al. (2016) reported that the active treatment modalities such as MWM, which factors in movement and patient empowerment, could be more successful than the passive approaches in the treatment of chronic musculoskeletal pain in the long-term.

According to current research, MWM is becoming more common when it comes to treatment of overuse shoulder injuries affecting athletes including rotator cuff tendinopathy, labral tears, and glenohumeral internal rotation deficit (GIRD). To these populations, the recovery of movement and returning to sports is essential as soon as possible.

Reinold et al. (2008) investigated professional baseball players with GIRD through the application of MWM techniques, posterior capsule stretching. Symmetrical rotational recovery was significantly better and pain reduced in the MWM group. Such results are valuable in the professionally competitive sports environment where

both safe and effective treatment is required and the recovery period needs to be reduced.

Also, MWM has helped to enhance scapulohumeral rhythm of overhead athletes. Scapular mobilisation in combination with shoulder MWM has the potential to improve neuromuscular control and kinetic chain coordination of throwing sports (Cools et al., 2014). Sports rehabilitation is one of the arenas where the potential of applying MWM is not limited to conventional musculoskeletal pain environments.

The advantage of MWM is that it is tolerable and non-invasive in general. MWM uses graded movements with an eye on the patients pain threshold as opposed to the high-velocity techniques or forceful manipulations. Such systematic review by Ho et al. (2009), which reviewed the use of MWM in shoulder conditions, further confirmed the classified safety profile of MWM, that it does not have any significant adverse effects when used in various studies.

In addition, the method provides patient feedback in real time and an immediate adjustment or termination in case of discomfort is possible. According to George et al., (2011), this aspect enhances treatment compliance and the level of patient trust, both of which are critical in successful rehabilitation. It is also consistent with the best practice principles in patient-centered care, which is based on team decision making and treatment plans that are devised individually.

Even though it is increasingly being proven, a lot of one makes a gap in the literature of MWM. Most of the studies looked at the short term outcomes and not many of the high quality data on long term effect is found and particularly in chronic conditions. In addition, the range of treatment protocols differs significantly in terms of glide direction, number of repetitions, and frequency of sessions, and as a result, it is tough to normalise the outcomes or introduce a generalized way of application (Hing et al., 2008).

The strength of the evidence is also influenced by the absence of blinding of randomised controlled trials (RCTs) of an adequate sample size. Hancock et al. in the review conducted in 2007 of manual therapy interventions on shoulder pain proposed more accurate outcome measures, longer follow-up, more accurate diagnostic criteria and better designed RCT trials.

The cost-effectiveness of MWM, most especially in resource-limited settings should also be examined in the future. Societal settings with under access to surgical or medication management should utilize MWM because it is a low-tech intervention that may be used as an effective alternative where therapists have the necessary training.

MWM is not supposed to be considered an independent intervention but just an addition to a more comprehensive rehabilitation plan. Literature such as Bang and Deyle (2000) have indicated that manual therapy and specific shoulder Exercises yields a great success in terms of outcome compared to either technique alone. The same has applied with MWM.

As an example, Vikram et al. (2020) concluded that the condition of postural education and MWM of exercised patients with scapular stabilisation exercises showed a faster recovery in their range of motion and SPADI score compared to exercise-only patients. This is in agreement with the notion that MWM can promote early mobility, lowering threshold of pain and enabling the patient to participate more in strengthening and functional exercises.

CHAPTER-III METHODOLOGY

3.1 Study Design

Quasi experimental design differs from a true experimental design in that, although it contains an independent variable that is manipulated to look for an effect on a dependent variable, either control group or randomization is lacking. These designs are useful to researchers looking for validation of treatment method and techniques, (Bailey, 1997). In experimental design, all three of the components- manipulation, control and randomization-are required. (Bailey, 1997). In this study control group was absent the outcomes were measured by comparing pre-test and post-test results. So, this is called the one-group pretest-posttest design.

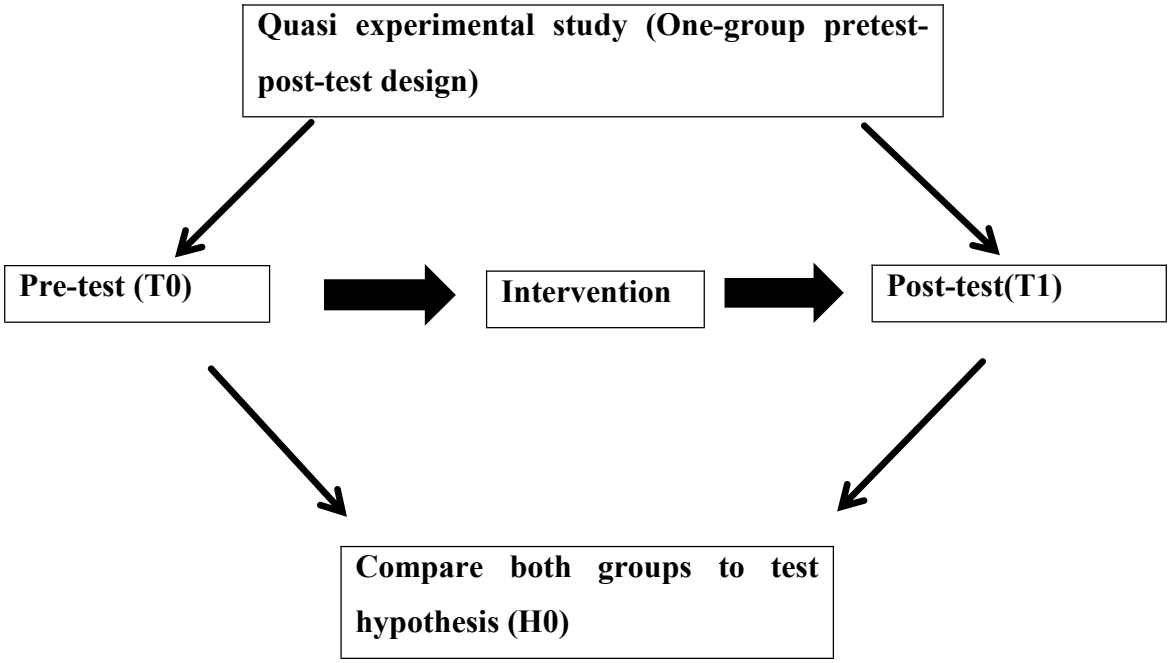

Figure 1: Study Design

3.2 Study Site

Musculoskeletal Unit, Physiotherapy Department, CRP, Savar, Dhaka- 1343.

3.3 Study Population

The study population was the patients with shoulder conditions attended in the MS unit of physiotherapy department at CRP, Savar, Dhaka.

3.4 Study Duration

This study was conducted from 1 June 2024 to 31 May 2025.

3.5 Data collection duration

Data was collected from December 2024 to April 2025.

3.6 Method of sample selection

Inclusion criteria

1. Participants aged 18 years and above. (Vicenzino et al., 2007).
2. Movement Restriction (Satpute et al., 2021).
3. Diagnosed with shoulder pain and restrictrd shoulder range of motion. (Hegedus et al., 2012).
4. Willingness to Participate (Zhang et al., 2024).

Exclusion Criteria

1. Recent Shoulder Surgery (Kuru Çolak et al., 2024).
2. Neurological Disorders (Satpute et al., 2021).
3. Pregnant Women (Lee et al., 2023).
4. Patients with psychiatric disorders or cognitive impairments (Delaney et al., 2002).

3.7 Sample Size

According to the inclusion and exclusion criteria 26 patients were selected for this study.

3.8 Sampling Technique

The sampling procedure was purposive sampling technique. In this sampling procedure, researcher intentionally selects participants who fulfills specific criterias.

3.9 Method of Data collection

- **Data Collection Tools**:

Data collection tools were informed consent form, questionnaire, papers, pen, and pencil.

- **Measurement Tools:**

  A socio-demographic questionnaire was used to know the socioeconomic status of the patient.

  Numeric Pain Rating Scale was used to measure the pain level,

  Goniometer was used to measure joint range of motion.

  Oxford Grading Scale was used for muscle power.

3.10 Data collection procedure

Following the fulfillment of inclusion and exclusion criteria, the data collecting technique was carried out by assessing the patient, beginning collection of data, treatment, and final collection of data. Patients were evaluated by a graduate physiotherapist. Each patient received treatment for six sessions. Data was acquired through a pretest, intervention, and post-test, and it was collected using a written questionnaire developed by the researcher. Before initiating treatment, a pretest was performed, and the level of pain and joint range was measured using numeric pain rating scale, as well as goniometer. The same approach was used to administer the post-test at the end of the six treatment sessions.

3.11 Intervention

Treatment

1. Inferior glide MWM to restore a loss of internal rotation/extension and adduction (Hand behind back.)

-10 to 15 repetitions in 1 set, 3 sets per treatment session.

2. Mid range mobilization in sitting postero lateral glide for flexion, abduction, elevation.

- 10 to 15 repetitions in 1 set, 3 sets per treatment session.

3.12 Data analysis

Statistical analysis was performed using the statistical package for social science (SPSS) version 25. The researcher will use the pie chart, bar chart, linear line diagram, and inferential statistical test.

3.12.1 Statistical test

Statistical analysis refers to the well-defined organization and interpretations of the data by systemic and mathematical procedure and rules.

Hypothesis Test

Paired t test was used to compare difference means of paired samples.

Assumptions

- Paired data
- The data are quantitative
- Distributions are normal

Null hypothesis & Alternative hypothesis

Ho: $\mu1 - \mu2 = 0$ or $\mu1 \geq \mu2$; where the initial and final mean difference was same

. Ha: $\mu1 - \mu2 \neq 0$, $\mu1 < \mu2$; where the initial and final mean difference was not same

Here,

H0 = Null hypothesis

Ha = Alternative hypothesis

μ1 = Mean difference in initial assessment

μ2 = Mean difference in final assessment.

Formula: pair t test defined by-

$$\mathbf{t} = \frac{\boldsymbol{d}}{\boldsymbol{SE(d)}} = \frac{\boldsymbol{d}}{\boldsymbol{SD/\sqrt{n}}}$$

Here,

d = mean of difference (d) between paired values,

SE = Standard Error of the mean difference,

SD = standard deviation of the differences and

n = number of paired observations

Example:

Suppose we have the following data: Before (mmHg): 130, 135, 125, 140, 128, 132, 129, 131, 138, 127 After (mmHg): 125, 130, 120, 135, 125, 128, 124, 128, 136, 123

Step 1: Calculate the differences between the paired observations (After - Before): Differences=After−Before Differences=After−Before Differences = (125-130), (130-135), (120-125), ..., (136-138), (123-127) Differences = -5, -5, -5, -5, -3, -4, -5, -3, -2, -4

Step 2: Calculate the mean and standard deviation of the differences: Mean of differences = (-5 - 5 - 5 - 5 - 3 - 4 - 5 - 3 - 2 - 4) / 10 = -3.6 Standard deviation of differences ≈ 1.35 (rounded for simplicity)

Step 3: Calculate the standard error (SE) of the mean of differences: $SE(\bar{d})$=101.35≈3.161.35≈0.427

Step 4: Calculate the t-statistic using the formula: $t= \bar{d} /SE(\bar{d}) $=-3.6/0.472≈−8.43

In the same way pain variables in different positions:

Variables	df	t value	p value	Comments
Resting pain	9	1.946	0.134	Not significant
Pain during flexion	11	2.45	$p < 0.05$	Significant
Pain during extension	12	2.88	$p < 0.05$	Significant
Pain during abduction	10	2.228	$p < 0.05$	Significant
Pain during adduction	10	2.349	$p < 0.05$	Significant
Pain during internal rotation	11	1.9	$p < 0.05$	Significant
Pain during external rotation	11	1.83	$p < 0.05$	Significant
Pain during sleep	12	1.799	$p < 0.05$	Significant

Table 1- Pain variables in different position and t value

ROM variables in different movement:

Variables	df	t value	p value	Comments
Flexion	11	2.769	$p < 0.05$	Significant
Extension	10	2.865	$p < 0.05$	Significant
Abduction	10	2.142	$p < 0.05$	Significant
Adduction	11	2.75	$p < 0.05$	Significant
Internal rotation	9	1.44	.124	Not significant
External rotation	10	1.546	.101	Not Significant

Table 2- ROM variables in different movement and t value

3.13. Level of Significance

In order to find out the significance of the study, the "p" value was calculated. The p values refer to the probability of the results for experimental study. The word probability refers to the accuracy of the findings. A "p" value is called level of significance for an experiment and a "p" value of < 0.05 was accepted as significant result for health service research. If the "p" value is equal or smaller than the significant level, the results are said to be significant.

3.14 Ethical Consideration

The researcher maintained some ethical considerations: A Research proposal was submitted to the physiotherapy department of BHPI for approval and the proposal was approved by the faculty members and gave permission initially from the supervisor of the research project and from the course coordinator before conducting the study. The proposal of the dissertation including methodology was presented to the Institutional Review Board (IRB) of Bangladesh Health Professions Institute (BHPI) for oral presentation defense was done in front of the IRB. Then the necessary information was approved by the Institutional Review Board and was permitted to do this research. After getting permission to do this study from the academic institute the researcher started to do it. The researcher had been given permission for data collection from the Musculoskeletal unit of Savar, CRP. Researcher followed the Bangladesh Medical Research Council (BMRC) guideline & WHO research guideline. The researcher was eligible to do the study after knowing the academic and clinical rules of doing the study about what should be done and what should 23 not. All rights of the participants were reserved, and the researcher was accountable to the participant to answer any type of study related question.

CHAPTER IV RESULTS

Socio-demographic Information:

4.1 Age of the participants:

The following sociodemographic data descirbe the percentage of age among 26 participants who were diagnosed with shoulder pain. The mean age of the participants is 47 and the standard deviation is 11.81186. There were several age groups among 26 participants. The range was minimum age 27 years and maximum 64 years. But the results say age between 40-50 years had the highest percentage of 43.03% are mostly affected by shoulder pain.

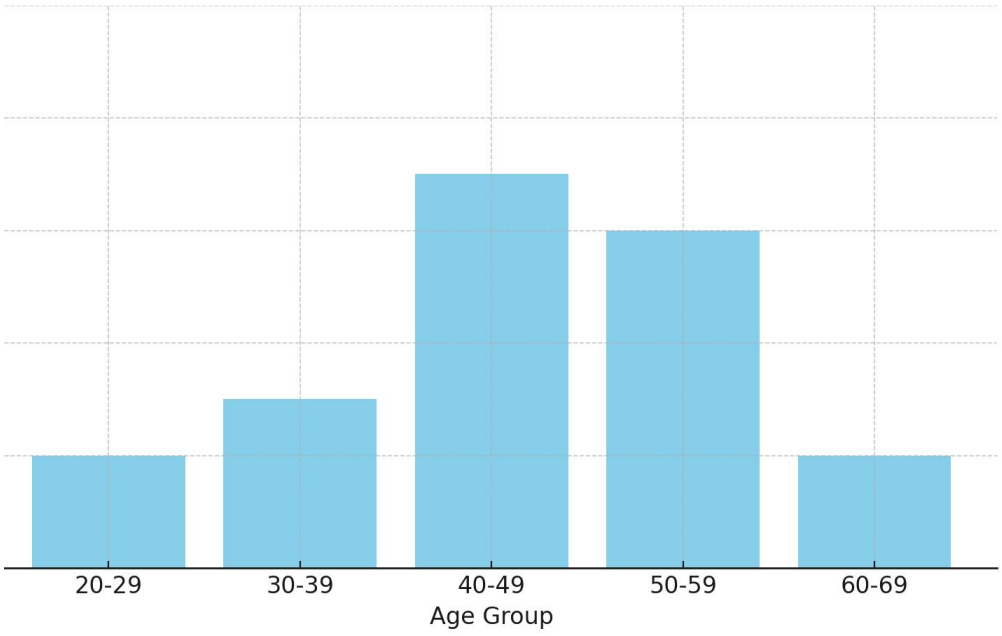

Figure 1: Age of participants

4.2 Gender Ratio:

Among 26 patients in this study with shoulder pain 75% (20) were female and 25% were male (6).

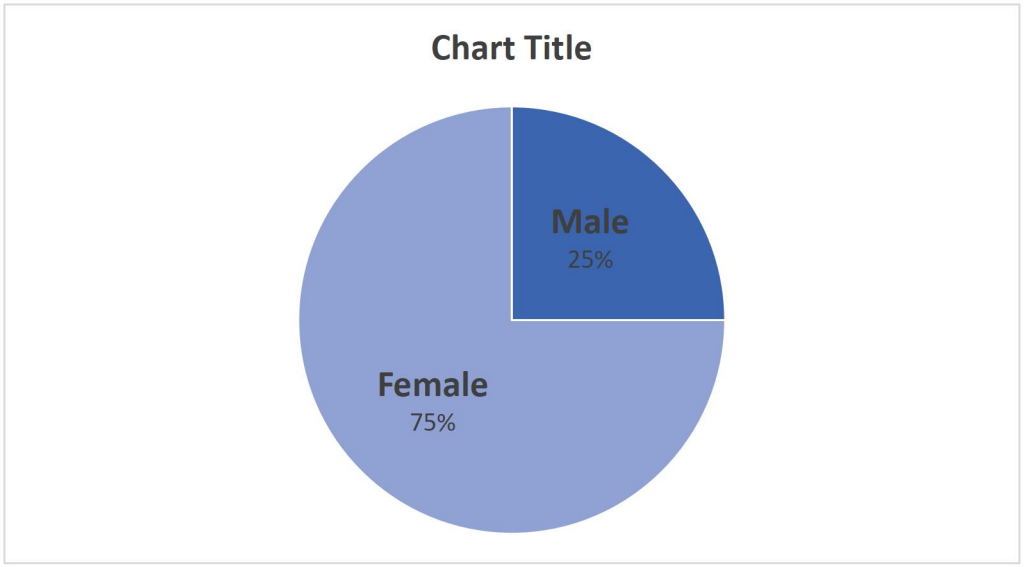

Figure 2: Gender ratio

4.3 Occupation of Participants

The occupational status was measured by analyzing data found from 26 participants. The occupation were housewife (n=12), job holder (n=6), teacher (n=2), business (n=4), others (n=2). So, it is shown that according to individual occupations, housewive were mostly affected part.

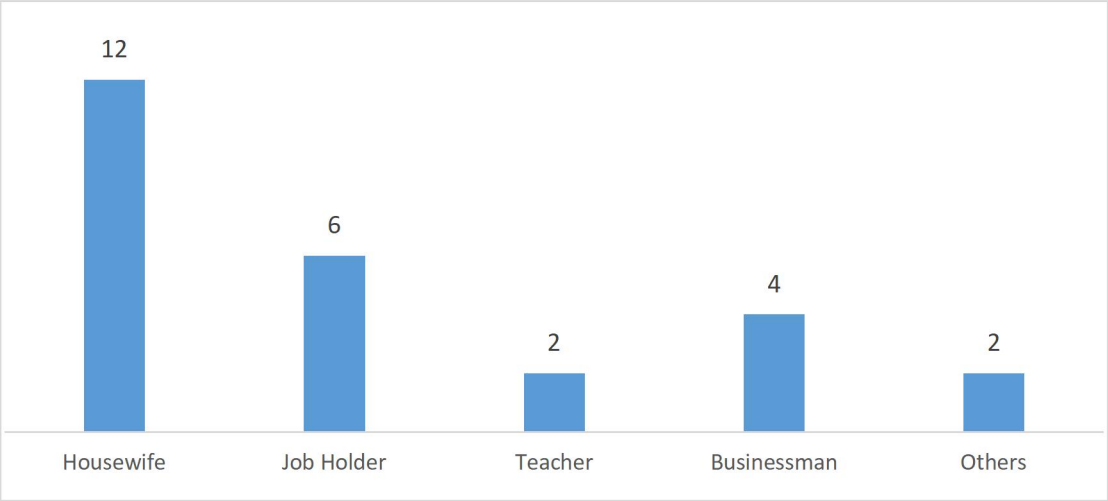

Figure 3: Occupation of participants

4.4 Educational level

The educational level extends from no formal education to post graduation. 26 participants educational level was analysed and most common educational level was both primary and secondary level.

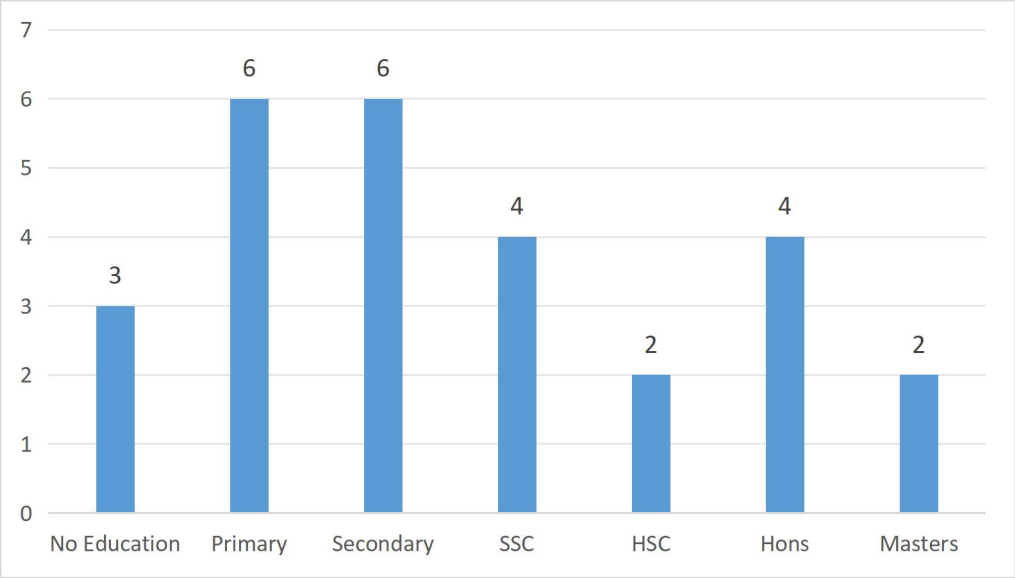

Figure 4: Educational level

4.5 Living area:

Most of the participants lives in village are, and least of them living in semi urban area.

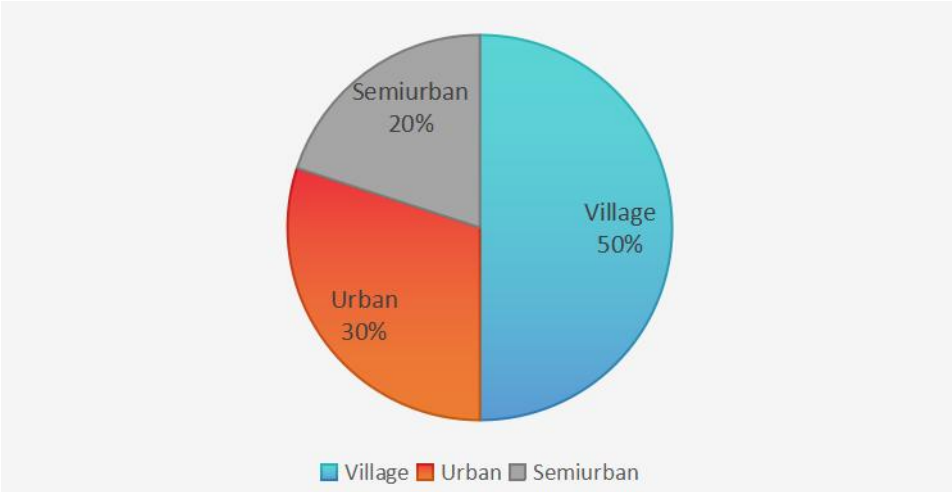

Figure 5: Living area of participants

4.6: Type of family:

About 75% participants lives in nuclear family where about 25% of participants lives in extended family.

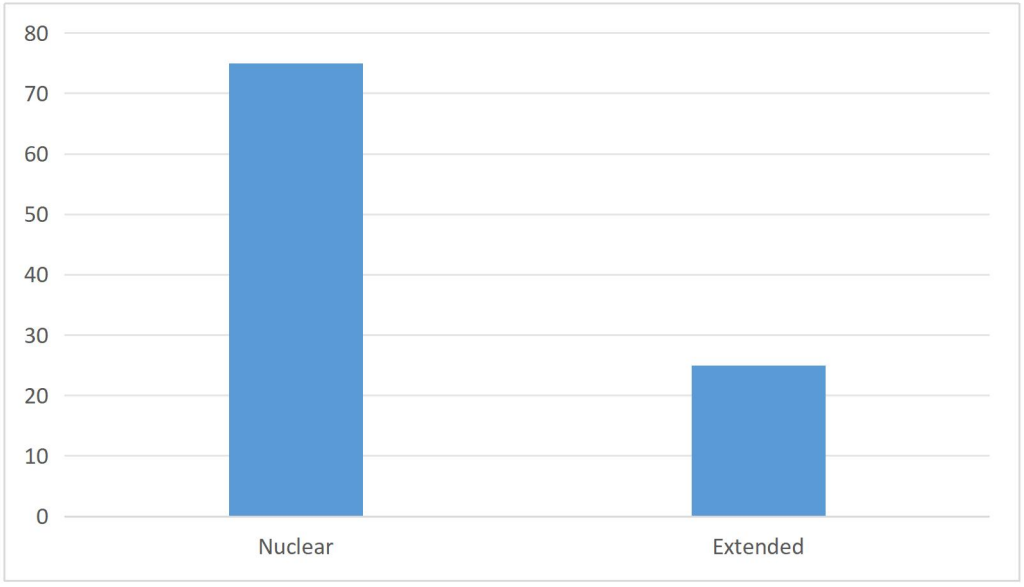

Figure 6: Type of family of participants.

4.7 Reasons of Shoulder Pain:

Among the 26 participant a large number was diagnosed with adhesive capsulitis (n= 15). The others were tendinopathy (n= 5), impingement syndrome (n= 2), and postural shoulder dysfunction (n=4).

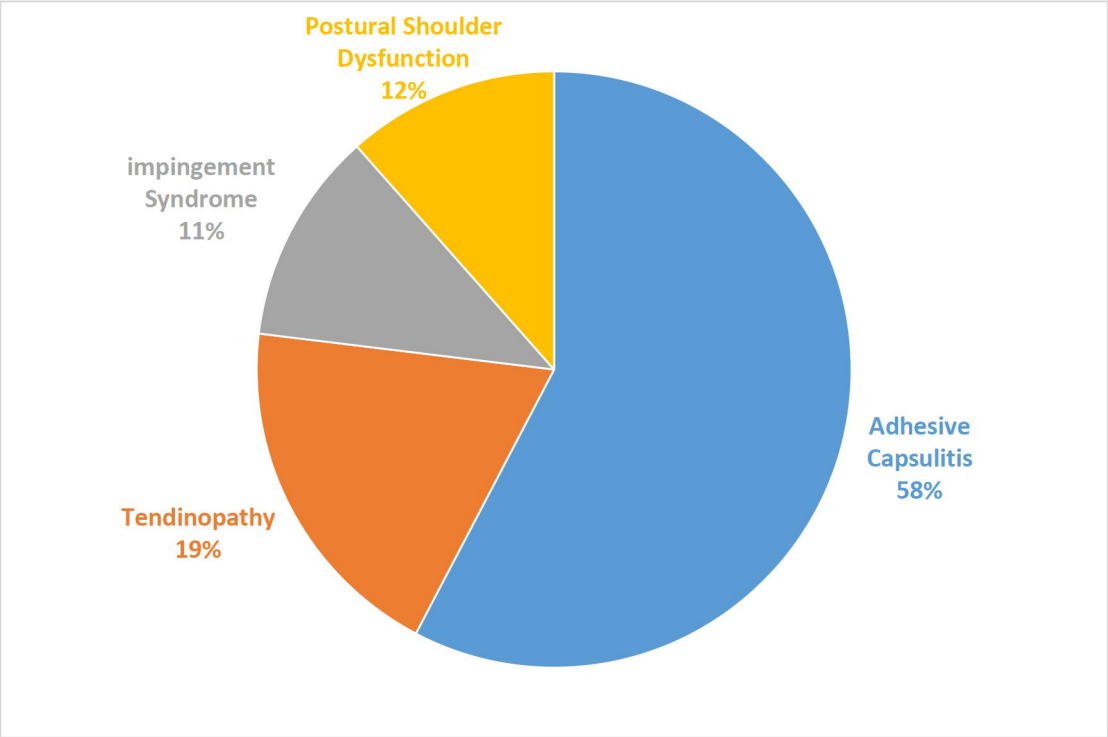

Figure 6: Conditions of participants.

4.8 Result of pain in different position:

Rest pain

The pretest and posttest pain intensity was observed before and after treating with physiotherapy treatment. The degree of freedom (df) was 9 , t value 1.946 and P value was 0.134 which is not significant.Using paired “t” test on the data of resting pain, the result was found to be not significant for alternative hypothesis. So this result suggests that following application of treatment the post test group showed no significant improvement in case of resting pain.

Pain during flexion (Hanging clothes)

The pretest and posttest pain intensity was observed before and after physiotherapy treatment. The mean reduction in pain intensity during flexion between the pretest and posttest group was 1.52. Using a paired t-test on the data for pain during flexion (t = 2.45, df = 11), the P-value was less than 0.05 . Therefore, this result suggests that following the application of physiotherapy treatment, the posttest group showed a statistically significant improvement in pain during flexion

Pain during Extension:

The pretest and posttest pain intensity was measured before and after physiotherapy treatment. The mean reduction in pain intensity during extension between the two groups was 1.15. Using a paired t-test on the data for pain during extension (t = 2.889, df = 12), the P-value was less than 0.05, indicating a statistically significant result.

Therefore, this result suggests that following physiotherapy treatment, the posttest group showed a significant improvement in pain during extension.

Pain during Abduction:

The pretest and posttest pain intensity was observed before and after physiotherapy treatment. The mean reduction in pain intensity during abduction between the pretest and posttest group was 1.35. Using a paired t-test on the data for pain during abduction (t = 2.228, df = 10), the P-value was less than 0.05, indicating that the result was statistically significant

Therefore, this result suggests that following physiotherapy treatment, the posttest group showed a significant improvement in pain during abduction.

Pain during Adduction:

The pretest and posttest pain intensity was measured before and after physiotherapy treatment. The mean reduction in pain intensity during adduction between the two groups was 1.15. Using a paired t-test on the data for pain during adduction (t = 2.349, df = 10), the P-value was less than 0.05, indicating a statistically significant result. For that, this result suggests that following physiotherapy treatment, the posttest group showed a significant improvement in pain during adduction.

Pain during Internal Rotation:

The pretest and posttest pain intensity was measured before and after physiotherapy treatment. The mean reduction in pain intensity during internal rotation between the two groups was 1.08. Using a paired t-test on the data for pain during internal rotation (t = 1.859, df = 11), the P-value was less than 0.05 for a one-tailed hypothesis, indicating statistical significance.

Therefore, this result suggests that following physiotherapy treatment, the posttest group showed a significant improvement in pain during internal rotation.

Pain during External Rotation:

The pretest and posttest pain intensity was measured before and after physiotherapy treatment. The mean reduction in pain intensity during external rotation between the two groups was 1.28. Using a paired t-test on the data for pain during external rotation ($t = 1.83$, $df = 11$), the P-value was less than 0.05 in a one-tailed test, indicating statistical significance.

Therefore, this result suggests that following physiotherapy treatment, the posttest group showed a significant improvement in pain during external rotation.

Pain during Sleeping:

The pretest and posttest pain intensity was observed before and after treating with physiotherapy treatment. Mean difference of reduction of pain intensity during sleeping between the two group was 1.535. Using paired "t" test on the data of pain during sleeping ($t=1.799$, $df=12$) and p value is < 0.05, the result was found to be significant for one tailed hypothesis. So this result suggests that following application of treatment the posttest group showed significant improvement in case of pain during sleeping.

4.9 Results or Range Of Motion:

Range of motion of flexion:

The pretest and posttest pain intensity was observed before and after treating with physiotherapy treatment. Mean difference of range of flexion between the two group was 1.26. Using paired "t" test on the data of range of flexion (t=2.769, df=11) and p value is .005, the result was found to be significant for one tailed hypothesis. So this result suggests that following application of treatment the posttest group showed significant improvement in case of range of flexion.

Range of motion of extension:

The pretest and posttest pain intensity was observed before and after treating with physiotherapy treatment. Mean difference of range of extension between the two group was 2.66. Using paired "t" test on the data of range of extension (t=2.865, df=10) and p value is .0085, the result was found to be significant for one tailed hypothesis. So this result suggests that following application of treatment the posttest group showed significant improvement in case of range of extension.

Range of motion of abduction:

The pretest and posttest pain intensity was observed before and after treating with physiotherapy treatment. Mean difference of range of abduction between the two group was 2.124. Using paired "t" test on the data of range of abduction (t=2.142, df=10) and p value is .0029, the result was found to be significant for one tailed hypothesis. So this result suggests that following application of treatment the posttest group showed significant improvement in case of range of abduction.

Range of motion of adduction:

The pretest and posttest pain intensity was observed before and after treating with physiotherapy treatment. Mean difference of range of adduction between the two group was 3.46. Using paired "t" test on the data of range of adduction (t=2.75,

df=11) and p value is .0029, the result was found to be significant for one tailed hypothesis. So this result suggests that following application of treatment the posttest group showed significant improvement in case of range of adduction.

Range of motion of internal rotation:

The pretest and posttest pain intensity was observed before and after treating with physiotherapy treatment. Mean difference of range of internal rotation between the two group was 3.757. Using paired "t" test on the data of range of internal rotation (t=1.44, df=9) and p value is .124, the result was found to be not significant for one tailed hypothesis. So this result suggests that following application of treatment the posttest group showed no significant improvement in case of range of internal rotation.

Range of motion of external rotation:

The pretest and posttest pain intensity was observed before and after treating with physiotherapy treatment. Mean difference of range of external rotation between the two group was 2.26. Using paired "t" test on the data of range of external rotation (t=1.5465, df=10) and p value is .101, the result was found not to be significant for one tailed hypothesis. So this result suggests that following application of treatment the posttest group showed no significant improvement in case of range of external rotation.

4.10 Results of Muscle Power:

Muscle power:

The pretest and posttest pain intensity was observed before and after treating with physiotherapy treatment. Using paired “t” test on the data of flexor, extensor, abductor, adductor and rotator muscle power, p value is > 0.05 in each of the muscle power. The result was found not to be significant for alternative hypothesis. So this result suggests that following application of treatment the posttest group showed no significant improvement in case of muscle power.

CHAPTER- V DISCUSSION

The purpose of this study was to find out the effectiveness of Mobilization With Movement with conventional physiotherapy treatment for shoulder pain patients. In this experimental study 26 patients with shoulder pain were assigned. Among these 26 patients, there was a single group design. These group attended for 6 sessions (each session for 30 minutes) of treatment in the physiotherapy outdoor department of CRP Savar. The different measurement tools were used to examine the hypothesis and test the hypothesis whether the null hypothesis was accepted or not based on the smaller or larger p. Self-oriented structural questionnaire was used to find out the socio-demographical indicators. Significant improvements occurred in most of the measures that were recorded before and after treatment. And the outcome of pain intensity and range of motion measured by using Numeric Pain Rating Scale (NPRS) and Goniometer among patients with shoulder pain. Mean age of the participants was 47. The range was minimum age 27 years and maximum 64 years. Among them male were 25% (6) and female were 75% (n=20). A large number of them were housewife. The occupation were housewife (n=12), job holder (n=6), teacher (n=2), business (n=4), others (n=2). The educational level extends from no formal education to post graduation. 26 participants educational level was analysed and most common educational level was both primary and secondary level.Most of the participants lives in village are, and least of them living in semi urban area.About 75% participants lives in nuclear family where about 25% of participants lives in extended family.

The mean difference of pain reduction from post test group shows that the study was effective in reducing pain intensity and proves clinically significant. The researcher found significant improvement of pain in shoulder pain.ROM in different functional position result was not statistically significant, but the improvement was better in trial group then in control group. Functional activities score was statistically significant.

By using an paired t test on the data the results were found to be not significant in case of resting pain ($p > 0.05$). But results were found to be significant in case of flexion where ($p < 0.05$) as well as pain in extension, abduction, adduction, medial rotation, lateral rotation and during sleeping the results were significant ($p < 0.05$).

In range of motion analysis the researcher found no significant improvement in internal rotation and external rotation where ($p>0.05$). There were improvement in post test group for the range of motion in flexion, extension, abduction, adduction where ($p<0.05$).

In a meta analysis Daniela et al . (2023) found that Four studies assessed shoulder abduction range of motion as the outcome. The combined mobilization with movement and conventional rehabilitation group comprised 55 patients and the conventional rehabilitation group comprised 56 patients. The meta-analysis showed an improvement in shoulder abduction in the short-term of the combined mobilization with movement and conventional rehabilitation group participants versus the conventional rehabilitation group participants.

Since the majority of participants already had intact muscle power, there was no improvement in muscle power in the post-test group.

In a study by Satpute et al. (2022), eight distinct meta-analyses for pain, range of motion, and disability in the two sub-categories included 21 of the 25 studies. Although the majority of studies were found to have a high risk of bias, the addition of MWM significantly reduced pain for frozen shoulder.

Shrivastava et al. (2011) demonstrated that his research was statistically significant for both the Movement With Mobilisation group and the group receiving traditional physiotherapy. Within two weeks, the MWM group's mean percentage of pain improved from 5.85% to 3.6% with conventional physiotherapy; the p-value was less than 0.05, the lateral rotation was less than 0.05, and the change was not statistically significant. rotation of the medial rotation.

A quasi-experimental study revealed that, out of 100 participants, the experimental group received MWM for two months to increase range of motion, while the control group received conventional physiotherapy. The results showed that the trail group's ROM improved significantly in the areas of abduction ($p<.05$), lateral rotation ($p<.05$), and medial rotation ($p<.05$), but not statistically significantly.

However, the researcher discovered that the post-test group's shoulder pain had significantly improved following six intervention sessions. Shoulder range of motion increased, though not significantly.

It has been demonstrated that mobilisation with movement (MWM) is an effective manual therapy technique for reducing shoulder disorders and improving joint mobility. In conditions like adhesive capsulitis and shoulder impingement, MWM

dramatically improves shoulder range of motion and functional outcome, according to numerous studies.

The present study aimed to determine the efficacy of Mulligan Mobilisation with Movement (MWM) in the treatment of shoulder sufferers that have limited movement. The conclusions were that the shoulder pain and the range of motion were significantly better after intervention. Nonetheless, the change in muscle strength was not significant. These results overall agree with the earlier studies and will provide a significant contribution in terms of understanding limitations and clinical use of MWM in the treatment of shoulder dysfunction.

The decrease in pain was observed and concurred with the results by other previous studies where MWM demonstrated hypoalgesic effects. As an example, one MWM session was enough to make the patients report pain alleviation immediately, which the Paungmali et al. (2003) explained as the neurophysiological action including the descending inhibitory pathway activation. Similarly, Teys et al. (2008) found out that the use of MWM significantly reduced pain in patients with subacromial impingement syndrome. The prolonged glide when active operation is involved can normalise mechanics of joints and provoke the afferent flow thus affecting the perception of pain.

Also, the recovery of the shoulder range of motion proves conclusions of previous research. The mobility improvement of patients with impingement syndromes and adhesive capsulitis was recorded after several MWM sessions (Vermeulen et al., 2006; Sharma et al., 2015). It is believed accessory mobilisation combined with physiological movement can help remedy minor positional fault in the glenohumeral joint which occurs when one moves freely and without pain. It is possible that this mechanical change was itself the cause of the functional gain in range of motion seen in this study.

However, the intervention did not noticeably increase the power of muscles. The present study proposes that whereas MWM is useful in treating joint mobilisation and reducing pain, it need not have any direct impact on muscle strength. This is anticipated since unlike other forms of exercise that are geared at stimulating muscle fibre recruitment and muscle hypertrophy, therefore, requiring progressive resistance training, MWM focuses on joint mechanics and neuromuscular control, which does not lead to comparable implications (Kisner and Colby, 2012).

Neither the change in muscle power nor the absence thereof could be explained by the brief intervention period and no specific strengthening exercises specified in the protocol. Manual therapy has been found, when used in combination with therapeutic exercise, specifically resistance-based training, to strengthen and enhance their subsequent movements (Bang and Deyle, 2000; Vikram et al., 2020). Thus, MWM may not produce enough stimulus to develop significant changes in muscle power without needing to incorporate focused strengthening exercises.

Otherwise it is a result of pain-inhibition effect. The degree of activation of muscles was held back by the lingering muscle inhibition as a result of chronic dysfunction or the fear-avoidance behaviour even though MWM might have facilitated movement and reduced pain. This has been researched along with arthrogenic muscle inhibition which is a condition where ineffective utilization of the nervous system limits muscle recruitment that can be as optimum as possible due to the problem of joint dysfunction which causes pain (Rice and McNair, 2010). Additional management might be required prior to complete neuromuscular recovery, although MWM can start reversing this inhibition through diminishing pain and improving joint mechanics.

These results will have significant clinical importance. They support MWM's function as a useful method for lowering discomfort and enhancing range of motion in cases of shoulder dysfunction. They also draw attention to the necessity of an all-encompassing rehabilitation program that takes into account muscle strength and endurance in addition to joint mechanics. Practically speaking, the findings imply that MWM can be applied as a first line of treatment to lessen discomfort and increase joint mobility, thereby readying the shoulder for more strenuous therapeutic exercises. By enabling pain-free mobility early in the rehabilitation process, it may also boost patient confidence. Patients who have developed movement apprehension as a result of chronic pain may benefit most from this graded exposure (Leeuw et al., 2007).

The current study backs up Mulligan's Mobilisation with Movement's ability to reduce pain and increase shoulder range of motion. It also draws attention to the method's shortcomings in terms of building muscle power. These findings highlight how crucial it is to incorporate MWM into a more comprehensive physiotherapy program that incorporates resistance training in order to guarantee a full functional recovery.

Limitations:

There might be some limitations in every research. Various types of shoulder conditions were not taken. Researcher only explored the effect of MWM after 6 sessions, so the long term effect of MWM was not explored in this study. The study was conducted within short period which is the main limitation of this study. In this study small sample size may constitute a limitation. As the study was conducted at selected area of Center for the Rehabilitation of the Paralyzed (CRP) in musculoskeletal unit which might not represent the whole population with shoulder pain in the context of Bangladesh. As the study period was short so the adequate number of samples could not arrange for the study. There was no system of long-term follow-up after the post-test of the study. There was no available research done in this area in Bangladesh. So, relevant information about mobilization with movement for shoulder pain patient for Bangladesh was very limited in this study.

Additionally, muscle power was assessed using oxford grading scale which may be subject to variability and lacks the precision of dynamometric measurement tools.

CHAPTER - VI CONCLUSION

6.1 Conclusion

The result of this experimental study have find out the effectiveness of conventional physiotherapy with MWM are better treatment than the conventional physiotherapy alone for reducing pain in shoulder pain patients. Participants in the conventional physiotherapy with MWM group showed a greater benefit for improvement of pain and range of movement which indicate that the conventional physiotherapy with MWM can be an effective therapeutic approach for patient with shoulder conditions. From this research the researcher wishes to explore the effectiveness of MWM along with conventional physiotherapy to reduce the features of patient with shoulder conditions which will be helpful to facilitate their pain management and to enhance functional activities. Shoulder conditions are global problem or disease that just not affects a specific joint but the entire complex. The manifestations are not only pain but also limitation in movements and restriction to activities of daily living. From this research, researcher also concluded the specific variables and comparison of their improvement rates. This will aid the professionals to decide the specific evidence based protocol for applying interventions in shoulder conditions.

A useful manual therapy method for the physiotherapeutic treatment of shoulder pain and limited mobility is Mulligan's Mobilisation with Movement (MWM). Modern rehabilitation approaches that prioritise patient-centered care, functional recovery, and long-term self-management are in line with MWM, which has its roots in the correction of minor positional joint faults and is backed by the ideas of active, pain-free movement.

The short-term efficacy of MWM in treating a number of shoulder pathologies, such as adhesive capsulitis, subacromial impingement syndrome, and rotator cuff pain, is well supported by the literature. Comparing MWM to both placebo and traditional treatment modalities, numerous studies have shown that it significantly improves pain, active range of motion, and functional outcomes. The method's clinical appeal, particularly in outpatient and athletic rehabilitation settings, is influenced by its capacity to produce immediate hypoalgesic effects and promote neuromuscular re-education.

MWM's efficacy is further increased by its incorporation into multimodal treatment approaches, such as therapeutic exercise, postural training, and patient education. Its focus on pain-free movement and active engagement aids in overcoming psychological obstacles like fear-avoidance, fostering emotional and physical healing.
However, methodological variability, small sample sizes, and an emphasis on short-term results limit the amount of evidence currently available. Large-scale, carefully planned randomised controlled trials are still required to evaluate MWM's long-term efficacy, cost-effectiveness, and suitability for a range of demographics. Additionally, clinical education must place a strong emphasis on the importance of therapist skill and technique standardisation in determining treatment success.
To sum up, Mulligan's MWM is an effective, safe, and scientifically backed treatment for lowering shoulder pain and increasing range of motion. MWM can greatly improve patient outcomes when properly implemented and incorporated into a comprehensive rehabilitation program. MWM has a lot of potential to influence the direction of conservative shoulder care in the future and expand the use of manual therapy in contemporary physiotherapy as research advances.

6.2 Recommendation

As a consequence of this research it is recommended to do further study including comparison of the conventional physiotherapy and MWM with conventional physiotherapy alone to assess the effectiveness of these interventions withDouble blinding procedure.
It is recommended to do further study with more number of subjects and with a longer time frame.
It is also recommended to include the functional outcome assessment of patient and to identify the average number of sessions that are needed to be discharged from treatment to validate the treatment technique.

REFERENCES

Satpute, K., Reid, S., Mitchell, T., Mackay, G. and Hall, T., 2022. Efficacy of mobilization with movement (MWM) for shoulder conditions: a systematic review and meta-analysis. *Journal of Manual & Manipulative Therapy*, *30*(1), pp.13-32.

Delgado-Gil, J.A., Prado-Robles, E., Rodrigues-de-Souza, D.P., Cleland, J.A., Fernández-de-las-Peñas, C. and Alburquerque-Sendín, F., 2015. Effects of mobilization with movement on pain and range of motion in patients with unilateral shoulder impingement syndrome: a randomized controlled trial. *Journal of manipulative and physiological therapeutics*, *38*(4), pp.245-252.

Dias, D., Neto, M.G., Sales, S.D.S.R., Cavalcante, B.D.S., Torrierri Jr, P., Roever, L. and Araujo, R.P.C.D., 2023. Effect of mobilization with Movement on Pain, disability, and Range of Motion in patients with Shoulder Pain and Movement Impairment: a systematic review and Meta-analysis. *Journal of Clinical Medicine*, *12*(23), p.7416.

Satpute, K.H., Bhandari, P. and Hall, T., 2015. Efficacy of hand behind back mobilization with movement for acute shoulder pain and movement impairment: a randomized controlled trial. *Journal of manipulative and physiological therapeutics*, *38*(5), pp.324-334.

Teys, P., Bisset, L. and Vicenzino, B., 2008. The initial effects of a Mulligan's mobilization with movement technique on range of movement and pressure pain threshold in pain-limited shoulders. *Manual therapy*, *13*(1), pp.37-42.

Djordjevic, O.C., Vukicevic, D., Katunac, L. and Jovic, S., 2012. Mobilization with movement and kinesiotaping compared with a supervised exercise program for painful shoulder: results of a clinical trial. *Journal of manipulative and physiological therapeutics*, *35*(6), pp.454-463.

Abbott, J.H., 2001. Mobilization with movement applied to the elbow affects shoulder range of movement in subjects with lateral epicondylalgia. *Manual therapy*, *6*(3), pp.170-177.

Romero, C.L., Lacomba, M.T., Montoro, Y.C., Merino, D.P., da Costa, S.P., Marchante, M.J.V. and Pardo, G.B., 2015. Mobilization with movement for shoulder dysfunction in older adults: a pilot trial. *Journal of chiropractic medicine*, *14*(4), pp.249-258.

Brudvig, T.J., Kulkarni, H. and Shah, S., 2011. The effect of therapeutic exercise and mobilization on patients with shoulder dysfunction: a systematic review with meta-analysis. *journal of orthopaedic & sports physical therapy*, *41*(10), pp.734-748.

Noten, S., Meeus, M., Stassijns, G., Van Glabbeek, F., Verborgt, O. and Struyf, F., 2016. Efficacy of different types of mobilization techniques in patients with primary adhesive capsulitis of the shoulder: a systematic review. *Archives of physical medicine and rehabilitation*, *97*(5), pp.815-825.

Haik, M.N., Evans, K., Smith, A. and Bisset, L., 2022. Investigating the effects of mobilization with movement and exercise on pain modulation processes in shoulder pain–a single cohort pilot study with short-term follow up. *Journal of Manual & Manipulative Therapy*, *30*(4), pp.239-248.

Yiasemides, R., Halaki, M., Cathers, I. and Ginn, K.A., 2011. Does passive mobilization of shoulder region joints provide additional benefit over advice and exercise alone for people who have shoulder pain and minimal movement restriction? A randomized controlled trial. *Physical therapy*, *91*(2), pp.178-189.

Yeole, U.L., Dighe, P.D., Gharote, G.M., Panse, R.S., Shweta, A. and Pawar, P.A., 2017. Effectiveness of movement with mobilization in adhesive capsulitis of shoulder: Randomized controlled trial. *Indian Journal of Medical Research and Pharmaceutical Sciences*, *4*(2), pp.1-8.

Zavala-González, J., Pavez-Baeza, F., Gutiérrez-Espinoza, H. and Olguín-Huerta, C., 2018. The effectiveness of joint mobilization techniques for range of motion in adult patients with primary adhesive capsulitis of the shoulder: a systematic review and meta-analysis.

Witt, D.W. and Talbott, N.R., 2018. The effect of shoulder position on inferior glenohumeral mobilization. *Journal of Hand Therapy*, *31*(3), pp.381-389.

Nicholson, G.G., 1985. The effects of passive joint mobilization on pain and hypomobility associated with adhesive capsulitis of the shoulder. *Journal of Orthopaedic & Sports Physical Therapy*, *6*(4), pp.238-246.

Yang, J.L., Chang, C.W., Chen, S.Y., Wang, S.F. and Lin, J.J., 2007. Mobilization techniques in subjects with frozen shoulder syndrome: randomized multiple-treatment trial. *Physical therapy*, *87*(10), pp.1307-1315.

DeSantis, L. and Hasson, S.M., 2006. Use of mobilization with movement in the treatment of a patient with subacromial impingement: a case report. *Journal of Manual & Manipulative Therapy*, *14*(2), pp.77-87.

Lenker, C., Larocca, N., Lee, J. and Tucker, P., 2012. The use of thoracic mobilization with movement to treat shoulder impingement in older adults: A case study. *Topics in Geriatric Rehabilitation*, *28*(3), pp.195-200.

Wang, S., Zeng, J., Mani, R., Chapple, C.M. and Ribeiro, D.C., 2024. The immediate effects of mobilization with movement on shoulder range of motion and pain in patients with rotator cuff-related shoulder pain: A randomized controlled trial (Evolution Trial). *Brazilian Journal of Physical Therapy*, *28*(6), p.101145.

Ajit, D. and Shika, S., 2016. Effects of mobilization with movement (MWM) in shoulder impingement syndrome patients on acromiohumeral distance using

ultrasonography. *Journal of Exercise Science & Physiotherapy*, *12*(2), pp.28-35.

Goyal, M., Bhattacharjee, S. and Goyal, K., 2013. Combined effect of end range mobilization (ERM) and mobilization with movement (MWM) techniques on range of motion and disability in frozen shoulder patients: A randomized clinical trial. *Journal of Exercise Science and Physiotherapy*, *9*(2), pp.74-82.

Vermeulen, H.M., Obermann, W.R., Burger, B.J., Kok, G.J., Rozing, P.M. and van den Ende, C.H., 2000. End-range mobilization techniques in adhesive capsulitis of the shoulder joint: a multiple-subject case report. *Physical therapy*, *80*(12), pp.1204-1213.

Harshbarger, N.D., Eppelheimer, B.L., McLeod, T.C.V. and McCarty, C.W., 2013. The effectiveness of shoulder stretching and joint mobilizations on posterior shoulder tightness. *Journal of Sport Rehabilitation*, *22*(4), pp.313-319.

Vicenzino, B., Paungmali, A. and Teys, P., 2007. Mulligan's mobilization-with-movement, positional faults and pain relief: current concepts from a critical review of literature. *Manual therapy*, *12*(2), pp.98-108.

Ho, C.Y.C., Sole, G. and Munn, J., 2009. The effectiveness of manual therapy in the management of musculoskeletal disorders of the shoulder: a systematic review. *Manual therapy*, *14*(5), pp.463-474.

Gutiérrez-Espinoza, H., Cuyul-Vásquez, I., Olguin-Huerta, C., Baldeón-Villavicencio, M. and Araya-Quintanilla, F., 2023. Effectiveness of glenohumeral joint mobilization on range of motion and pain in patients with rotator cuff disorders: a systematic review and meta-analysis. *Journal of Manipulative and Physiological Therapeutics*, *46*(2), pp.109-124.

Surenkok, O., Aytar, A. and Baltaci, G., 2009. Acute effects of scapular mobilization in shoulder dysfunction: a double-blind randomized placebo-controlled trial. *Journal of Sport Rehabilitation*, *18*(4), pp.493-501.

Lluch, E., Pecos-Martín, D., Domenech-García, V., Herrero, P. and Gallego-Izquierdo, T., 2018. Effects of an anteroposterior mobilization of the glenohumeral joint in overhead athletes with chronic shoulder pain: A randomized controlled trial. *Musculoskeletal Science and Practice*, *38*, pp.91-98.

Gong, W., Lee, H. and Lee, Y., 2011. Effects of Gong's Mobilization applied to shoulder joint on shoulder abduction. *Journal of Physical Therapy Science*, *23*(3), pp.391-393.

Çelik, D., Van Der Veer, P. and Tiryaki, P., 2025. The Clinical Significance of Mulligan's Mobilization with Movement in Shoulder Pathologies: A Systematic Review and Meta-Analysis. *Journal of Integrative and Complementary Medicine*, *31*(2), pp.134-142.

Subhash, R. and Makhija, M., 2020. Effectiveness of Mobilization with Movement in weight bearing position on pain, shoulder range of motion and function in patients with shoulder dysfunction. *Indian Journal of Public Health Research & Development*, *11*(6), pp.901-905.

Do Moon, G., Lim, J.Y., Da, Y.K. and Kim, T.H., 2015. Comparison of Maitland and Kaltenborn mobilization techniques for improving shoulder pain and range of motion in frozen shoulders. *Journal of physical therapy science*, *27*(5), pp.1391-1395.

Vermeulen, H.M., Rozing, P.M., Obermann, W.R., Le Cessie, S. and Vliet Vlieland, T.P., 2006. Comparison of high-grade and low-grade mobilization techniques in the management of adhesive capsulitis of the shoulder: randomized controlled trial. *Physical therapy*, *86*(3), pp.355-368.

Kim, Y. and Lee, G., 2017. Immediate effects of angular joint mobilization (a new concept of joint mobilization) on pain, range of motion, and disability in a patient with shoulder adhesive capsulitis: a case report. *The American journal of case reports*, *18*, p.148.

Sreenivasu, K., Paul Daniel, V.K., Subramanian, M.B. and Sajeevan, T., 2016 Effectiveness of end range mobilization with scapular mobilization in frozen shoulder. *Int Arch Integr Med*, *3*(8), pp.53-58.

Wu, C.J., Ting, H., Lin, C.C., Chen, Y.C., Chao, M.C. and Lee, S.D., 2021. Efficacy of joint mobilization apparatus in treating frozen shoulder. *Applied Sciences*, *11*(9), p.4184.

Almureef, S.S., Ali, W.M., Shamsi, S. and Al Zahrani, M.B., 2020. Effectiveness of mobilization with conventional physiotherapy in frozen shoulder: a systematic review. *International journal of recent innovations in medicine and clinical research*, *2*(4), pp.22-29.

Maricar, N., Shacklady, C. and McLoughlin, L., 2009. Effect of Maitland mobilization and exercises for the treatment of shoulder adhesive capsulitis: a single-case design. *Physiotherapy theory and practice*, *25*(3), pp.203-217.

Ribeiro, D.C., Sole, G., Venkat, R. and Shemmell, J., 2017. Differences between clinician-and self-administered shoulder sustained mobilization on scapular and shoulder muscle activity during shoulder abduction: a repeated-measures study on asymptomatic individuals. *Musculoskeletal Science and Practice*, *30*, pp.25-33.

Al Dajah, S.B., 2014. Soft tissue mobilization and PNF improve range of motion and minimize pain level in shoulder impingement. *Journal of physical therapy science*, *26*(11), pp.1803-1805.

Sharad, K.S., 2011. A comparative study on the efficacy of end range mobilization techniques in treatment of adhesive capsulitis of Shoulder. *Indian Journal of Physiotherapy and Occupational Therapy*, pp.28-31.

Camarinos, J. and Marinko, L., 2009. Effectiveness of manual physical therapy for painful shoulder conditions: a systematic review. *Journal of Manual & Manipulative Therapy*, *17*(4), pp.206-215.

Crow, J., Michener, L., & Cleland, J. (2010). *Evaluation of mobilization with movement techniques for the treatment of shoulder conditions: a systematic review*. Journal of Manual & Manipulative Therapy, 18(1), pp.22–28.

Kumar, S., Sharma, V. and Balthillaya, G. (2012). *Effectiveness of Mobilization with Movement on Shoulder Impingement Syndrome: A Randomized Controlled Trial*. International Journal of Therapy and Rehabilitation, 19(6), pp.336–342.

Mulligan, B. (2010). *Manual Therapy: NAGS, SNAGS, MWMS etc.* 6th ed. Wellington, New Zealand: Plane View Services.

Paungmali, A., Joseph, L.H. and Vicenzino, B. (2003). *Hypoalgesic effect of Mobilization With Movement for lateral epicondylalgia: a placebo-controlled study*. Journal of Orthopaedic & Sports Physical Therapy, 33(6), pp.301–307.

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APPENDIX

CONSENT FORM (English)

Assalamualaikum, I am Tamanna Akter Nipa, a student of the B.Sc. in Physiotherapy course, Session 2019-2020, at Bangladesh Health Profession Institute, under the Faculty of Medicine, University of Dhaka. I must complete a thesis to earn my B.Sc. in physiotherapy degree. My thesis title is "Efficacy of Mobilization with Movement for the Treatment of Shoulder Pain and Limitation of Shoulder Movement". The purpose of this study is to evaluate the Efficacy of Mobilization with Movement for the Treatment of Shoulder Pain and Limitation of Shoulder Movement. In order to ask you some questions about this thesis, I will meet you twice: once before the intervention and again after completion. I am assuring you that the treatment provided to you would not cause any damage. Besides, Physiotherapists will provide the treatments. The information you provide will be kept confidential and will only be used for thesis purposes. You have the right to terminate your participation at any time. Moreover, if you feel uncomfortable answering any question you can skip that question. The questionnaire will take 20 to 30 minutes to fill up. Please give me the correct answers to the questions and enable the data collector to evaluate your health. Contact my supervisor if you have any questions. Muhammad Millat Hossain, Associate Professor and Course Co ordinator, MRS, BHPI. If you kindly give your consent, we can start. So, may I have your consent to proceed with the interview?

Yes: No:

Thank you for your participation as well as the information.

Signature of Participant…… Date:……

Signature of Data collector……. Date……..

Signature of Researcher…….. Data……..

অনুমতি ফর্ম

আসসালামুয়ালাইকুম, আমি তামান্না আক্তার নিপা, বি.এসসি. ইন ফিজিওথেরাপি কোর্সের ২০১৯-২০২০ সেশনের একজন শিক্ষার্থী, বাংলাদেশ হেলথ প্রফেশন ইনস্টিটিউট, মেডিসিন অনুষদ, ঢাকা বিশ্ববিদ্যালয়ের অধীনে। বি.এসসি. ইন ফিজিওথেরাপি ডিগ্রি অর্জনের জন্য আমাকে একটি থিসিস সম্পন্ন করতে হবে। আমার থিসিসের শিরোনাম হলো "কাঁধের ব্যথা ও কাঁধের নড়াচড়ার সীমাবদ্ধতার চিকিৎসায় মোবিলাইজেশন উইথ মুভমেন্ট পদ্ধতির কার্যকারিতা"। এই গবেষণার উদ্দেশ্য হলো কাঁধের ব্যথা এবং কাঁধের নড়াচড়ার সীমাবদ্ধতার চিকিৎসায় মোবিলাইজেশন উইথ মুভমেন্ট পদ্ধতির কার্যকারিতা মূল্যায়ন করা।

এই থিসিসের বিষয়ে আপনাকে কিছু প্রশ্ন জিজ্ঞাসা করার জন্য আমি আপনাকে দুবার সাক্ষাৎ করব: একবার ইন্টারভেনশনের আগে এবং আবার ইন্টারভেনশন সম্পন্ন হওয়ার পরে। আমি আপনাকে নিশ্চিত করছি যে, প্রদত্ত চিকিৎসা আপনার কোনো ক্ষতি করবে না। তাছাড়া, ফিজিওথেরাপিস্টরাই এই চিকিৎসা প্রদান করবেন। আপনার প্রদত্ত তথ্য গোপন রাখা হবে এবং শুধুমাত্র থিসিসের উদ্দেশ্যে ব্যবহৃত হবে। আপনি যে কোনো সময় আপনার অংশগ্রহণ বন্ধ করার অধিকার রাখেন। উপরন্তু, যদি আপনি কোনো প্রশ্নের উত্তর দিতে অস্বস্তি বোধ করেন, তাহলে সেই প্রশ্নটি এড়িয়ে যেতে পারেন। প্রশ্নপত্রটি পূরণ করতে ২০ থেকে ৩০ মিনিট সময় লাগবে। দয়া করে প্রশ্নগুলোর সঠিক উত্তর দিন এবং তথ্য সংগ্রাহককে আপনার স্বাস্থ্য মূল্যায়নে সাহায্য করুন।

যদি আপনার কোনো প্রশ্ন থাকে, আমার সুপারভাইজারের সঙ্গে যোগাযোগ করুন।
মুহাম্মদ মিল্লাত হোসেন, সহযোগী অধ্যাপক এবং কোর্স সমন্বয়ক, এমআরএস, বিএইচপিআই।

আপনার সম্মতি প্রদান করলে আমরা শুরু করতে পারি।
তাহলে, সাক্ষাৎকারটি চালিয়ে যাওয়ার জন্য আমি কি আপনার সম্মতি পেতে পারি?

হ্যাঁ: না:

আপনার অংশগ্রহণ এবং তথ্য প্রদানের জন্য ধন্যবাদ।

অংশগ্রহণকারীর স্বাক্ষর: ..... তারিখ: .....
তথ্য সংগ্রাহকের স্বাক্ষর: ..... তারিখ: .....
গবেষকের স্বাক্ষর: ..... তারিখ: .....

Questionnaire (English)

Title: " Efficacy of Mobilization with Movement for the Treatment of Shoulder Pain and Limitation of Shoulder Movement"

Patient's Information

Patient Id:	
Date of Interview:	
Name of Participant:	
Diagnosis:	
Address:	Vill: Post Office: Upazila: District:
Phone number:	

Part-1: Socio-demographic Information

No.	Questions	Response
1	Age	.....…..years
2	Gender	• Male • Female
3	Occupation	o Service holder o Businessman o Housewife o Student o Teachers o Others
4	Marital status	• Married • Unmarried

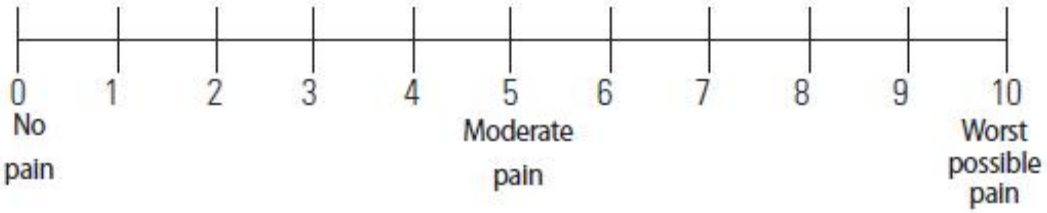
5	Family type	• Nuclear family • Extended family
6	Living area	• Rural • Urban • Semi-urban
7	Education level	• Illiterate • Primary • Secondary • SSC • HSC • Graduate • Masters or above
8	Monthly expenses	……
9	Past medical history	• Hypertension • Diabetes • Heart disease • Arthritis • Bronchial asthma • Others……..

Pre Test Data

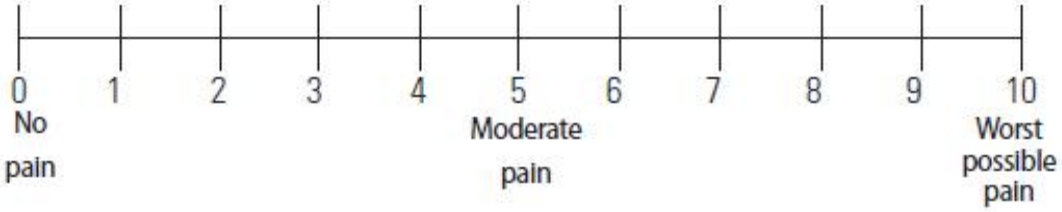
Part-II: Numerical Pain Rating Scale (NPRS)

There are some questions (QN 1- QN 7) and with each question there is a long line. The line represents pain situation. The left hand end indicates no pain at all and right hand end indicates worse pain imaginable. Please a mark on the line where you feel it shows how much pain you have.

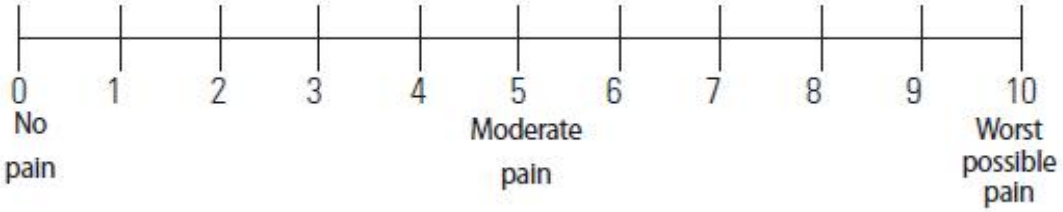
1. How severe your pain is at resting position?



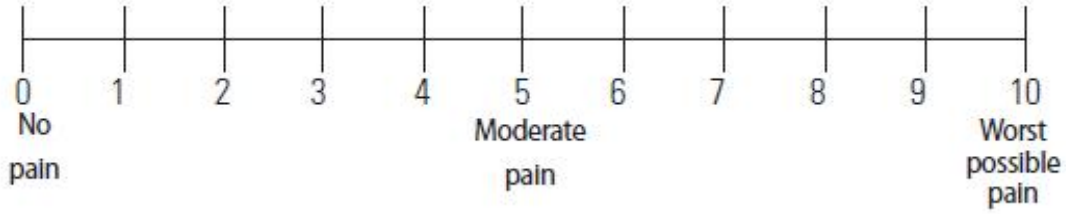
2. How severe is your pain during hanging the clothes? (Flexion)



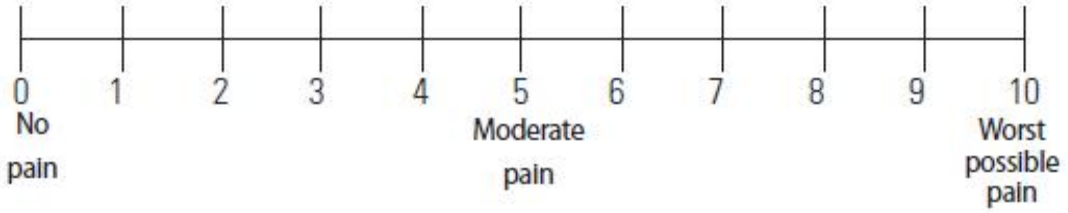
3. How severe is your pain during pushing or pulling? (e.g., opening a door) (Extension) Pre test



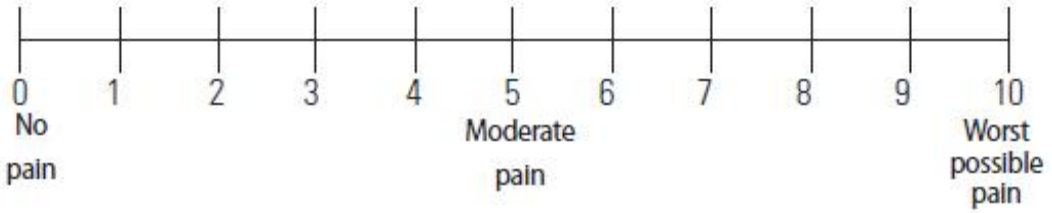
4. How severe is your pain during rising arm sideways? (Abduction)



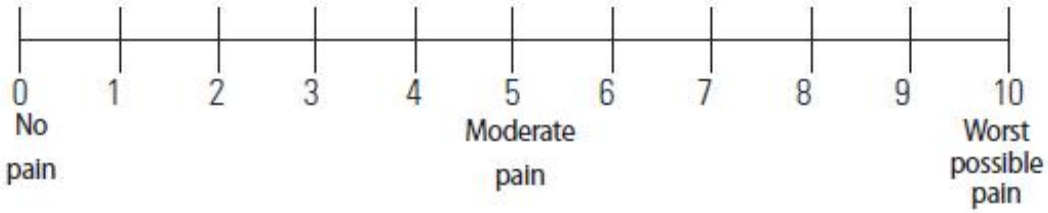
5. How severe is your pain during combing hair ? (Lateral Rotation



6. How severe is your pain during Scratching Lower back ? (Medial rotation)



7. How severe is your pain during lying in affected side? (Adduction)



Part-III: Range of motion of affected limbs measured by Goniometer

Pretest Data

Movement	Active ROM (Affected side)	Passive ROM (Affected side)
Shoulder flexion		
Shoulder extension		
Shoulder abduction		
Shoulder adduction		
Shoulder internal rotation		
Shoulder external rotation		

Part -IV: Oxford Grading

(Muscle Power Test)

Pretest Data

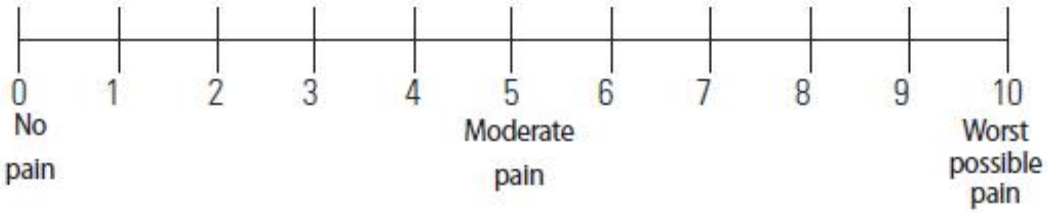
Muscle Group Name	Affected Side
Flexor	
Extensor	
Abductor	
Adductor	
Rotator	

Post-test Data

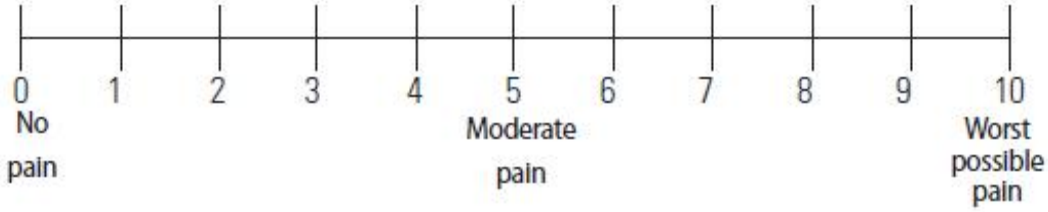
Part-I: Numerical Pain Rating Scale (NPRS)

There are some questions (QN 1- QN 7) and with each question there is a long line. The line represents pain situation. The left hand end indicates no pain at all and right hand end indicates worse pain imaginable. Please a mark on the line where you feel it shows how much pain you have.

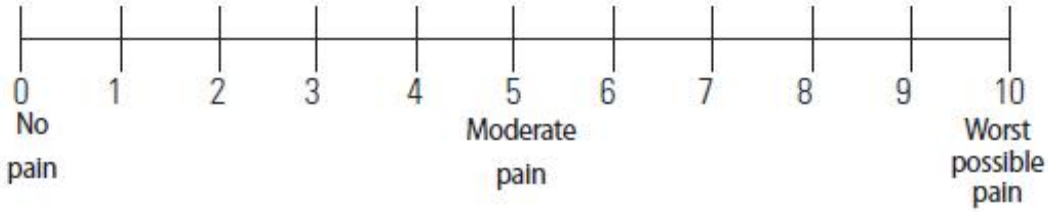
1. How severe your pain is at resting position?



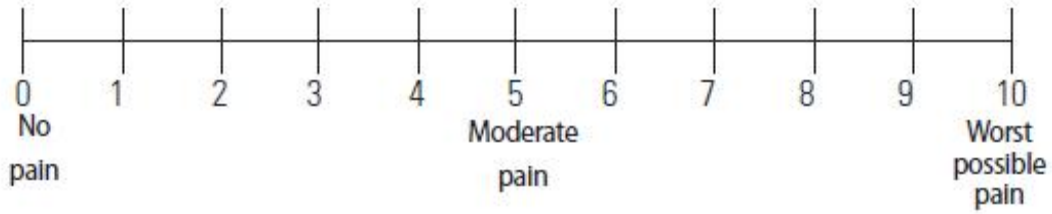
2. How severe is your pain during hanging the clothes? (Flexion)



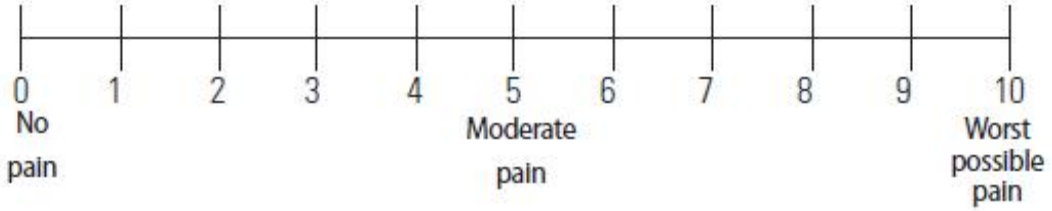
3. How severe is your pain during pushing or pulling? (e.g., opening a door) (Extension)



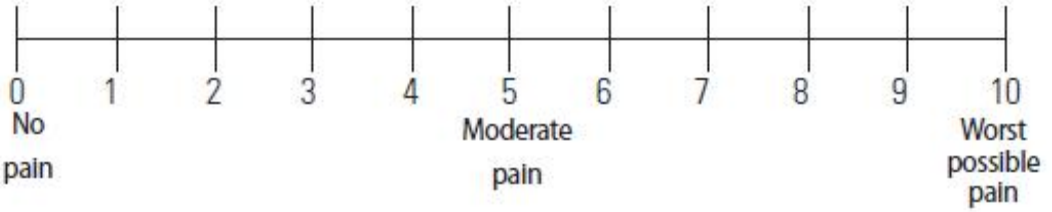
4.How severe is your pain during rising arm sideways? (Abduction)



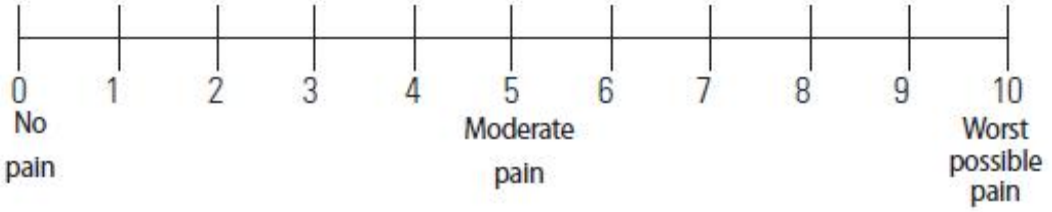
5. How severe is your pain during combing hair ? (Lateral Rotation)



6.How severe is your pain during Scratching Lower back? (Medial rotation)



7. How severe is your pain during lying in affected side? (Adduction)



Part-II: Range of motion of affected limbs measured by Goniometer

Posttest Data

Movement	Active ROM (Affected side)	Passive ROM (Affected side)
Shoulder flexion		
Shoulder extension		
Shoulder abduction		
Shoulder adduction		
Shoulder internal rotation		
Shoulder external rotation		

Part -III: Oxford Grading

(Muscle Power Test)

Posttest Data

Muscle Group Name	Affected Side
Flexor	
Extensor	
Abductor	
Adductor	
Rotator	

প্রশ্নপত্র (বাংলা)

শিরোনাম: "কাঁধের ব্যথা ও কাঁধের নড়াচড়ার সীমাবদ্ধতার চিকিৎসায় মোবিলাইজেশন উইথ মুভমেন্ট পদ্ধতির কার্যকারিতা"

রোগীর তথ্য

রোগীর আইডি	
সাক্ষাৎকারের তারিখ	
অংশগ্রহণকারীর নাম	
কোড	
ঠিকানা	গ্রাম:
	ডাকঘর:
	উপজেলা:
	জেলা:
ফোন নম্বর	

অংশ-১: সামাজিক-জনসংখ্যাগত তথ্য

নং	**প্রশ্ন**	**উত্তর**
১	বয়স	..... বছর
২	লিঙ্গ	- পুরুষ - মহিলা

নং	প্রশ্ন	উত্তর
৩	পেশা	০ চাকরিজীবী ০ ব্যবসায়ী ০ গৃহিণী ০ শিক্ষার্থী ০ শিক্ষক ০ অন্যান্য
৪	বৈবাহিক অবস্থা	- বিবাহিত - অবিবাহিত
৫	পরিবার প্রকার	- একক পরিবার - যৌথ পরিবার
৬	বাসস্থান	- গ্রাম - শহর - আধা-শহর
৭	শিক্ষাগত স্তর	- নিরক্ষর - প্রাথমিক - মাধ্যমিক - এসএসসি - এইচএসসি - স্নাতক - মাস্টার্স বা তার উপরে
৮	মাসিক ব্যয়	

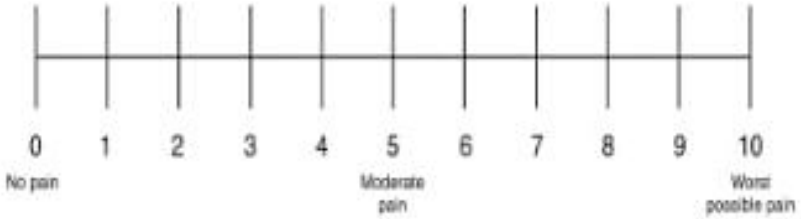
নং	প্রশ্ন	উত্তর
৯	পূর্ব চিকিৎসা ইতিহাস	- উচ্চ রক্তচাপ - ডায়াবেটিস - হৃদরোগ - বাত - ব্রঙ্কিয়াল অ্যাজমা - অন্যান্য.....

পূর্বপরীক্ষার তথ্য

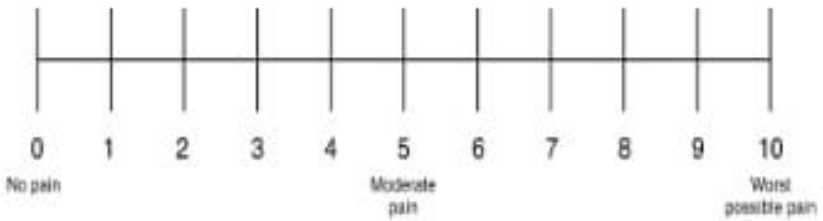
অংশ-II: সংখ্যাসূচক ব্যথা নির্ধারণ স্কেল (NPRS)

কিছু প্রশ্ন আছে (প্রশ্ন ১ - প্রশ্ন ৭), এবং প্রতিটি প্রশ্নের সঙ্গে একটি দীর্ঘ সংখ্যার সারি রয়েছে। সংখ্যাগুলো ব্যথার অবস্থা প্রকাশ করে। **বাম দিকের প্রান্ত** বোঝায় কোনো ব্যথা নেই, এবং **ডান দিকের প্রান্ত** বোঝায় কল্পনাযোগ্য সবচেয়ে তীব্র ব্যথা। যেখানে আপনার মনে হয় এটি আপনার ব্যথার মাত্রা প্রকাশ করে, সেই সংখ্যায় দাগ দিন।

১. বিশ্রাম অবস্থায় আপনার ব্যথার তীব্রতা কতটা?

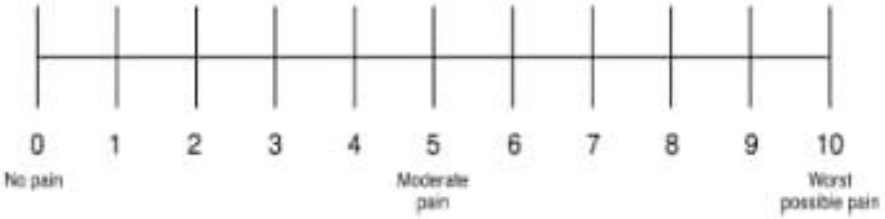


২. জামাকাপড় খোলানোর সময় আপনার ব্যথার তীব্রতা কতটা? (ফ্লেক্সশন)

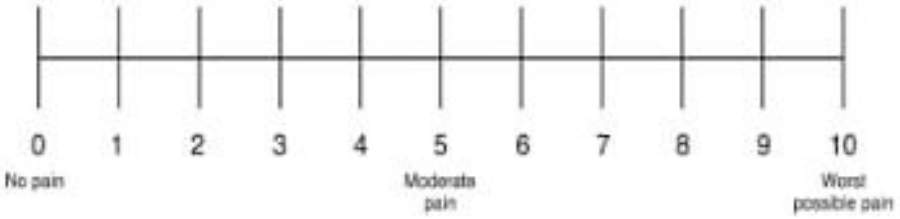


৩. ঠেলা বা টান দেওয়ার সময় আপনার ব্যথার তীব্রতা কতটা? (যেমন, দরজা খোলা) (এক্সটেনশন)

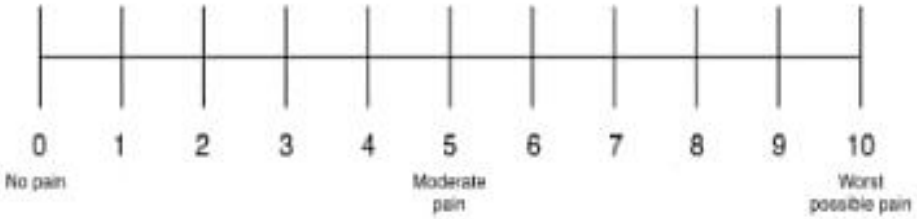
৪. পাশের দিকে হাত তুলতে গেলে আপনার ব্যথার তীব্রতা কতটা? (অ্যাবডাকশন)



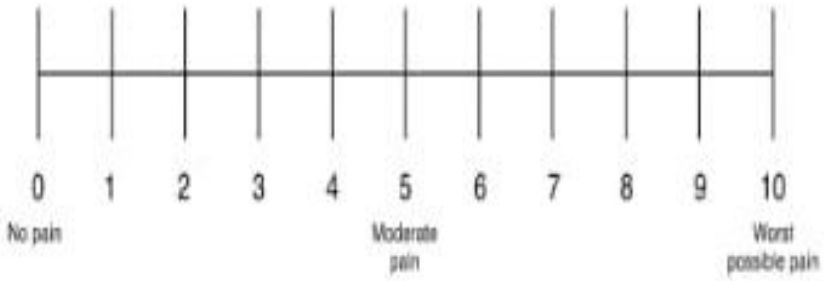
৫. চুল আঁচড়ানোর সময় আপনার ব্যথার তীব্রতা কতটা? (ল্যাটারাল রোটেশন)



৬. আপনার কোমরের পেছনটি ছুঁতে গেলে আপনার ব্যথার তীব্রতা কতটা? (মিডিয়াল রোটেশন)



৭. ক্ষতিগ্রস্ত পাশে শোয়াতে গেলে আপনার ব্যথার তীব্রতা কতটা? (অ্যাডাকশন)



অংশ-III: গনিওমিটার দ্বারা প্রভাবিত অঙ্গের নড়াচড়ার পরিসীমা পরিমাপ

(পরীক্ষা-পূর্ব ফলাফল)

নড়াচড়া	একটিভ ROM (আক্রান্ত পাশ)	প্যাসিভ ROM (আক্রান্ত পাশ)
কাঁধের ফ্লেক্সশন		
কাঁধের এক্সটেনশন		
কাঁধের অ্যাবডাকশন		
কাঁধের অ্যাডাকশন		
কাঁধের অভ্যন্তরীণ রোটেশন		
কাঁধের বাহ্যিক রোটেশন		

অংশ-IV: অক্সফোর্ড গ্রেডিং

(মাংসপেশির শক্তি পরীক্ষা) (পরীক্ষা-পূর্ব ফলাফল)

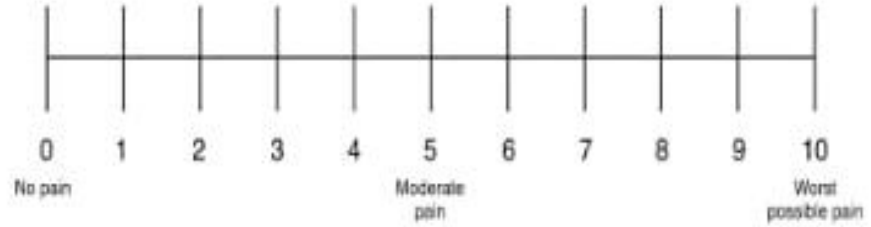
মাংসপেশির গ্রুপের নাম	আক্রান্ত পাশ
ফ্লেক্সর	
এক্সটেনসর	
অ্যাবডাক্টর	
অ্যাডাক্টর	
রোটেটর	

পোস্ট-পরীক্ষার তথ্য

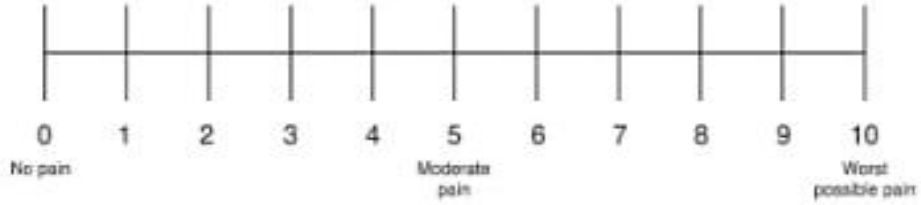
অংশ-I: সংখ্যাসূচক ব্যথা নির্ধারণ স্কেল (NPRS)

কিছু প্রশ্ন আছে (প্রশ্ন ১ - প্রশ্ন ৭), এবং প্রতিটি প্রশ্নের সঙ্গে একটি লম্বা সংখ্যার সারি রয়েছে। সংখ্যাগুলো ব্যথার অবস্থা প্রকাশ করে। **বাম দিকের প্রান্ত** বোঝায় কোনো ব্যথা নেই এবং **ডান দিকের প্রান্ত** বোঝায় কল্পনাযোগ্য সবচেয়ে তীব্র ব্যথা। যেখানে আপনার মনে হয় এটি আপনার ব্যথার মাত্রা প্রকাশ করে, সেই সংখ্যার চারপাশে একটি বৃত্ত আঁকুন।

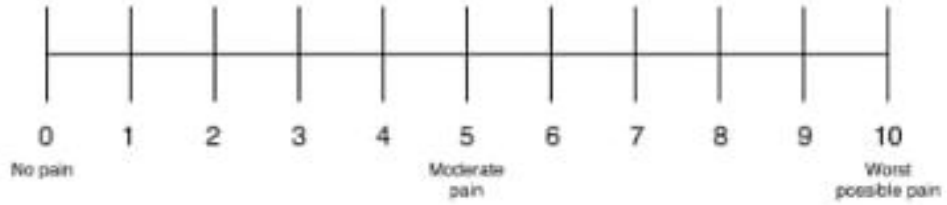
১. বিশ্রাম অবস্থায় আপনার ব্যথার তীব্রতা কতটা?



২. জামাকাপড় ঝোলানোর সময় আপনার ব্যথার তীব্রতা কতটা? (ফ্লেক্সশন)

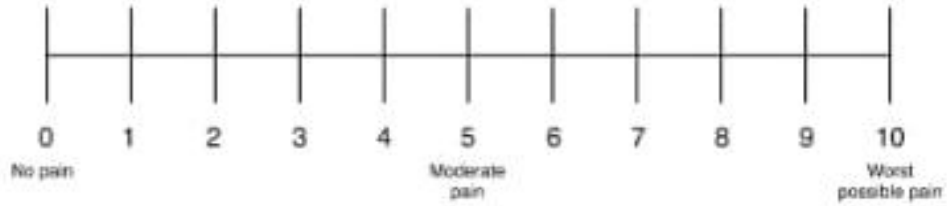


৩. ঠেলা বা টান দেওয়ার সময় আপনার ব্যথার তীব্রতা কতটা? (যেমন, দরজা খোলা) (এক্সটেনশন)



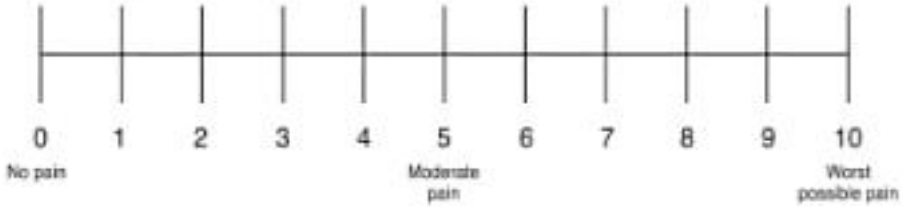
৪. পাশের দিকে হাত তুলতে গেলে আপনার ব্যথার তীব্রতা কতটা? (অ্যাবডাকশন)

৫. চুল আঁচড়ানোর সময় আপনার ব্যথার তীব্রতা কতটা? (ল্যাটারাল রোটেশন)



৬. কোমরের পেছনটি ছুঁতে গেলে আপনার ব্যথার তীব্রতা কতটা? (মিডিয়াল রোটেশন)

৭. ক্ষতিগ্রস্ত পাশে শোয়াতে গেলে আপনার ব্যথার তীব্রতা কতটা? (অ্যাডাকশন)



অংশ-II: গনিওমিটার দ্বারা প্রভাবিত অঙ্গের নড়াচড়ার পরিসীমা পরিমাপ

(পরীক্ষা-পরবর্তী ফলাফল)

নড়াচড়া	একটিভ ROM (আক্রান্ত পাশ)	প্যাসিভ ROM (আক্রান্ত পাশ)
কাঁধের ফ্লেক্সশন		
কাঁধের এক্সটেনশন		
কাঁধের অ্যাবডাকশন		
কাঁধের অ্যাডাকশন		
কাঁধের অভ্যন্তরীণ রোটেশন		
কাঁধের বাহ্যিক রোটেশন		

অংশ-III: অক্সফোর্ড গ্রেডিং

(মাংসপেশির শক্তি পরীক্ষা) (পরীক্ষা-পরবর্তী ফলাফল)

মাংসপেশির গ্রুপের নাম	আক্রান্ত পাশ
ফ্লেক্সর	
এক্সটেনসর	
অ্যাবডাক্টর	
অ্যাডাক্টর	
রোটেটর	

BANGLADESH HEALTH PROFESSIONS INSTITUTE

বাংলাদেশ হেলথ্ প্রফেশন্স ইনস্টিটিউট (বিএইচপিআই)
Bangladesh Health Professions Institute (BHPI)
(The Academic Institute of CRP)

Ref: CRP-BHPI/IRB/12/2024/1028 *Date:* 15/12/2024

To
Tamanna Akter Nipa
4th Year B.Sc. in Physiotherapy
Session: 2019-2020, Student ID: 112190527
BHPI, CRP, Savar, Dhaka-1343, Bangladesh.

Subject: Approval of the thesis proposal "Efficacy of Mobilization with Movement for the Treatment of Shoulder pain and Limitation of Shoulder Movement"

Dear Tamanna Akter Nipa,
Congratulations.
The Institutional Review Board (IRB) of BHPI has reviewed and discussed your application to conduct the above-mentioned dissertation, with you, as the principal investigator and Md. Ershad Ali, Lecturer, Department of Physiotherapy, BHPI as thesis supervisor. The following documents have been reviewed and approved:

Sl. No.	Name of the Documents
1	Research Proposal
2	Questionnaire (English version)
3	Information sheet & consent form.

The purpose of the study is to find out the outcomes of efficacy of mobilization with movement for the treatment of shoulder pain and limitation of shoulder movement. The study involves use of a questionnaire that may take 20 to 30 minutes to answer. Any instruction or precaution for collection of specimens and there is no likelihood of any harm to the participants and participation in the study may benefit the participants. The members of the Ethics committee have approved the study to be conducted in the presented form at the meeting held at **9 AM on July 16, 2024 at BHPI (44th IRB Meeting).**

The institutional Ethics committee expects to be informed about the progress of the study, any changes occurring in the course of the study, any revision in the protocol, and patient information or informed consent and ask to be provided a copy of the final report. This Ethics committee is working in accordance with the Nuremberg Code 1947, the World Medical Association Declaration of Helsinki, 1964 - 2013, and other applicable regulations.

Best regards,

Muhammad Millat Hossain,
Associate Professor & Course Coordinator, MRS
Member Secretary, Institutional Review Board (IRB)
BHPI, CRP, Savar, Dhaka-1343, Bangladesh

সিআরপি-চাপাইন, সাভার, ঢাকা-১৩৪৩, বাংলাদেশ। ফোন: +৮৮ ০২ ২২৪৪৪৫৪৬৪-৫, +৮৮ ০২ ২২৪৪৪১৪০৪, মোবাইল: +৮৮ ০১৭৩০ ০৫৯৬৪৭
CRP-Chapain, Savar, Dhaka-1343, Bangladesh. Tel: +88 02 224445464-5, +88 02 224441404, Mobile: +88 01730059647
E-mail : principal-bhpi@crp-bangladesh.org, Web: bhpi.edu.bd

11th January, 2025

Head

Department of Physiotherapy

Centre for the Rehabilitation of the Paralysed (CRP)

Chapain, Savar, Dhaka-1343

Through: Head, Department of Physiotherapy, BHPI.

Subject: Prayer for seeking permission to collect data for conducting research project.

Sir,

With due to respect and humble submission to state that I am Tamanna Akter Nipa, a student of 4th year B.Sc. in physiotherapy at Bangladesh Health Professions Institute (BHPI). The Ethical committee has approved my research project entitled: "Efficacy of Mobilization with Movement for the Treatment of Shoulder Pain and Limitation of Shoulder Movements" under the supervision of Muhmmad Millat Hossain, Associate Professor and Course Co-ordinator, MRS, BHPI. I want to collect data for my research project from the Department of Physiotherapy at CRP. So, I need permission for data collection from the Musculoskeletal Unit of Physiotherapy Department at CRP-Savar, Dhaka-1343. I would like to assure that anything of the study will not be harmful for the participants and the Department itself.

I, therefore pray and hope that you would be kind enough to grant my application and give me permission for data collection and oblige thereby.

Yours faithfully,

Nipa

Tamanna Akter Nipa

4th Year B.Sc. in Physiotherapy

Class Roll: 21; Session: 2019-20

Bangladesh Health Professions Institute (BHPI)

(An academic Institution of CRP)

CRP-Chapain, Savar, Dhaka-1343.

Forwarded
Sirdh
23.01.2025
Dr. Shazal Kumar Das, PhD
Assistant Professor and Head
Department of Physiotherapy
BHPI, CRP, Savar, Dhaka-1343.

Approved
23/1/25
Prof. Dr. Mohammad Anwar Hossain, PhD
Professor Physiotherapy Department BHPI
Senior Consultant & Head
Physiotherapy Department
CRP, Savar, Dhaka-1343

Recommended & Forwarded
Millat Hossain
136 19/01/2025
Muhammad Millat Hossain
Associate Professor
Project & Course Coordinator
Dept. of Rehabilitation Science
BHPI, CRP, Savar, Dhaka-1343, Bangladesh