Chettinad Health City Medical Journal
Volume 13, Issue 3 - 2024, Pg. No. 47-54
Peer Reviewed & Open Access Journal

Research Article

# Efficacy of Muscle Energy Technique Versus Movement with Mobilisation in Recreational Swimmers with Scapular Dyskinesis: A Comparative Study

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**DOI:** https://doi.org/10.24321/2278.2044.202444

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**How to cite this article:**
Sangma K, Das L. Efficacy of Muscle Energy Technique Versus Movement with Mobilisation in Recreational Swimmers with Scapular Dyskinesis: A Comparative Study. Chettinad Health City Med J. 2024;13(3):47-54.

Date of Submission: 2024-02-19
Date of Acceptance: 2024-07-20

## A B S T R A C T

*Introduction:* Recreational swimming is a popular all-around exercise that is particularly helpful in therapy and as an exercise for people. In recreational swimming, repetitive arm revolutions put a significant amount of musculoskeletal strain on the shoulder complex, which might affect the shoulder's kinematics. Loss of control over the typical scapular mechanics, physiology, and motion is known as dyskinesis. This can cause pain while resting, as well as during activities, and is the most commonly noted location of orthopaedic injury in swimmers.

*Objective of the study:* The objective of the current research was to assess the efficiency of MET vs MWM in recreational swimmers with SD.

*Method:* It was a randomised comparative trial. When the subjects were split into 2 groups, Group MET (n = 16) received MET and scapular kinematic exercise and Group MWM (n = 19) received MWM and scapular kinematic exercise. Both groups received therapy for four weeks. The outcome measures were evaluated through LSST and DASH score Dash Sports Module.

*Result:* Pre and post values of LSST, DASH score, and DASH sports module decreased in both groups (p value < 0.05).

*Conclusion:* The research concluded that both MWM and MET showed efficiency in correcting SD. However, MET with exercise was found to be more effective in improving SD in swimmers.

**Keywords:** Recreational Swimmers, Scapular Dyskinesis, Muscle Energy Technique, Movement with Mobilisation, Lateral Scapular Slide Test, DASH, Scapular Exercises

## Introduction

Swimming at a competitive level necessitates a training volume ranging from 9 km per week for club-level swimmers to 110 km per week or more for swimmers competing at the international level. The appropriate number of arm revolutions is predicted to range from 3,000 to 44,000 every week, which accumulates throughout a 40-week career season for each swimmer.[1] Both arms must move in an identical manner and alternately during a freestyle stroke due to the kinematics movement. As per Emily Nicole et al. (2019)[2], every arm revolution would be split

into 3 successive stages based on the studies. The catch phase begins as soon as the hand enters the water, and during this time the shoulder is raised to reach forward as far as possible. Powerful humeral adduction, extension, and internal rotation are then required during the pull phase. An external rotation and humeral abduction are used to position the hand forward for the subsequent arm entry to complete the recovery phase.

Swimming needs repeated arm rotations, and as a result, an acute reaction to excessive repetition involves a shift in scapular kinematics inside swimmers. Madsen et al.[3] found that for 25 mins of swimming training. 82% of their teenage swimmers showed SD as a result of arm elevation in the scapular plane. A training session led to an increase in the incidence of such scapular dyskinesia. Young adults have similarly shown alterations in scapular kinematics after a six-week swimming training session including more internal rotation, protraction, and elevation,[4] as repeated arm rotation places substantial musculoskeletal stress on the shoulder complex, which is recognised to produce a change in shoulder kinematics.[5]

Swimmers, gymnasts, tennis players, manual labourers like painters, and hairdressers who operate with their upper extremities intensely and repeatedly frequently have impingement syndrome, shoulder pain, or rotator cuff tears. 68% of patients with rotator cuff disorders had scapular dyskinesis.[6]

SD is the medical term for the condition when the scapula moves or functions abnormally, SD also recognised as SICK scapula syndrome, is a change or departure from the scapula's typical resting or active posture in shoulder movement.[7] The scapular orientation is changed in patients with symptomatic SD, who also have raised activity in the middle, lower trapezius muscles, and serratus anterior during arm elevation, abduction, as well as side-lying ER (External Rotation). Patients with SD can ultimately have shoulder discomfort, even if they are asymptomatic. Patients experiencing shoulder discomfort have SD at a similar rate as patients who don't experience any pain.[5] Despite these findings, there is currently a lack of clinical data to establish whether shoulder discomfort leads to the development of SD or whether SD contributes to shoulder pain.[8]

The LSST (Lateral Scapular Slide Test) and DASH (Disability of the Arm, Shoulder, and Hand) and DASH sports module will be employed as outcome measures in this case. The mediolateral inferior angle displacement and scapular asymmetry are measured using the static LSST in clinical settings at three distinct levels of shoulder abduction.[9] The 30-item DASH questionnaire, which also includes an optional sports module, was employed as an end measure. It examines a patient's capacity for carrying out certain upper extremity activities.[10]

Professionals from a range of disciplines employ the muscle energy technique (MET), which has been pushed for the treatment of shortened muscles, weaker muscles, constrained joints, and lymphatic drainage. Evidence shows that isometric stretching, such as MET (or the same isometric stretching methods), is superior to passive stretching for enhancing muscular extensibility. The usage of isometric changes involving activation of the agonist muscle is advised to achieve a maximal range of motion and flexibility of the muscle.[11]

Mulligan's movement with mobilisation (MWM) strategies have been proven to improve joint function, and there are several theories as to why this happens. This idea relates to tiny positional errors that develop after an injury and cause the joint to misalign, causing symptoms like pain, stiffness, or paralysis. MWMs fix this by moving the joint, which makes it track normally.[12]

In swimmers, scapular dyskinesis is a highly prevalent occurrence. Several different manual treatment approaches have been partially successful in fixing the issue: however, they are not as effective as other techniques when compared to one another. One technique MET has not been used in correcting scapular dyskinesis.

The objective of this study is to examine whether MET is as effective as other approaches to correcting scapular dyskinesis.

## Objective of the Study

To check whether MET or Mulligan's MWM show any effectiveness with therapeutic exercises in correcting scapular dyskinesis in recreational swimmers

## Hypothesis

**Null hypothesis:** There will not be a significant improvement in both MET and Mulligan's MWM group with scapular dyskinesis in recreational swimmers.

**Alternate hypothesis:** There will be a significant improvement in either MET or Mulligan's MWM group with scapular dyskinesis in recreational swimmers.

**ISSN: 2278-2044**
**DOI: https://doi.org/10.24321/2278.2044.202444**

## Materials and Method

This was a comparative analysis that was carried out to determine the efficiency of MET and MWM in recreational swimmers in Kamrup District. The procedure of research was approved by the Research Ethics Committee of The Royal Global University. The duration of the study was set for 6 months. The sample size was calculated, and 60 subjects were to be included in the present study population. Informed consent was obtained from the participants. Out of 60, 16 were excluded due to exclusion criteria. They were allocated into 2 groups conveniently (MET = 22 and MWM = 22 Groups).

The participants were explained about the study and the treatment procedure. Inclusion criteria were as follows: (1) recreational swimmers age group 12–30 years, (2) training sessions of a minimum of 3 times per week and 6 his weekly,[13] (3) both genders, (4) asymmetry while performing Lateral Scapular Slide test (1 cm above).

Exclusion criteria were as follows: 1) not willing to participate, 2) prior shoulder surgery or pain that has prevented the subject from practising swimming for the last three months, 3) presence of shoulder instability, 4) clavicular pathology, 5) cervical or thoracic pathology, such as lordosis of severe kyphosis.

Material used: Measuring tape, marker pen, goniometer, clipboard, thera-band, towel, portable bed.

Instrument/ tools: Informed consent, data collection sheet, lateral scapular slide test, dash questionnaire

The subjects were assessed and their data was collected for scapular dyskinesis using LSST and DASH and DASH sports module.

**Figure 1.Thera Band**

**Figure 2.Measuring Tape**

## Protocol

44 subjects of the age group of 12–30 years were selected and assessed according to inclusion and exclusion criteria.

⇩

Informed consent of the subjects was obtained.

⇩

A thorough explanation of the whole procedure was given to all the participants.

⇩

Subjects were divided into two groups and pre-intervention data was collected from both groups.

⇩ Group MET (16)

⇩ Group MWM (19) Drop out: 6 (not willing to continue, injured) Drop out: 3 (not willing to continue)

⇩ ⇩

Exercise session was for 40–45 min for both of the groups, 4 times a week followed by a rest period of each alternate day for about 4 weeks of intervention.

⇩

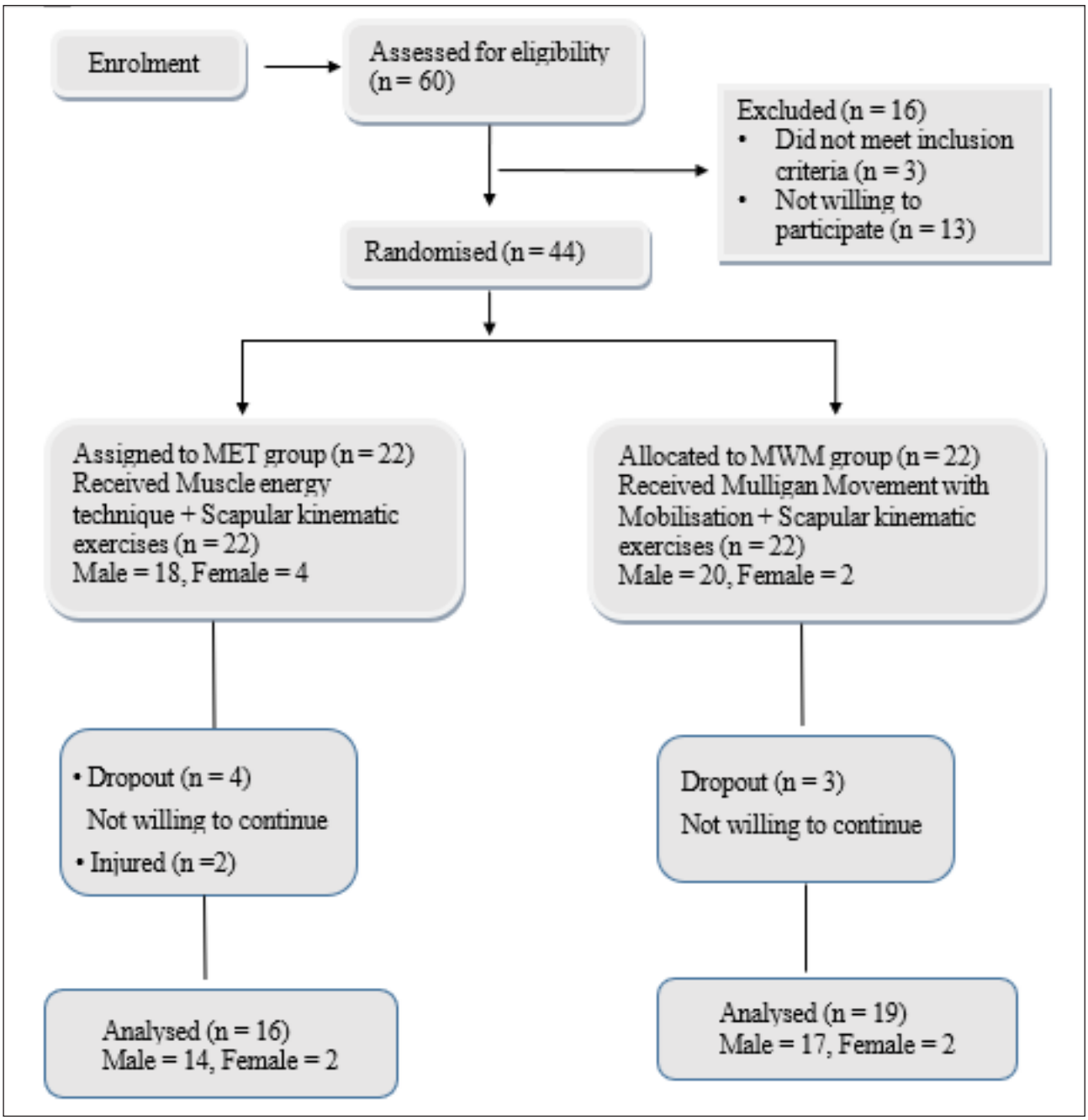
Final data was collected on the final day after the final session of intervention.

⇩

Data was collected and analysed accordingly and results were obtained.

**ISSN: 2278-2044**
**DOI: https://doi.org/10.24321/2278.2044.202444**

## Flowchart




## Procedure

Ethical clearance was taken from the institutional ethical committee. The subjects, recreational swimmers fulfilling the inclusion criteria, were selected for the study. All subjects were explained about the purpose of the study and were educated about the test procedure and treatment that was to be conducted. The subjects were asked to sign informed consent documents. Then subjects were allocated to the groups using the envelop method. Subjects were then screened using the LSST test and were asked to fill out the DASH questionnaire, these were done on pre-treatment (1st session of intervention) and post-treatment (3rd week 9th session of the intervention).

- MET group: Muscle energy treatment and scapular kinematics exercise
- MWM group: Movement with mobilisation and scapular kinematics exercise

## Group MET (Muscle Energy Technique)

*Upper trapezius* left side was done where the subject position was in sitting, with the starting position being in the neck opposite side rotation with flexion. The therapist

**ISSN: 2278-2044**
**DOI: https://doi.org/10.24321/2278.2044.202444**

adds a slight stretch to that motion and asks the subject to go back to the neutral position. The therapist stands behind the subject with one hand stabilising the shoulder to avoid elevation and the other hand resisting the head movement going to the neutral position.[14]

For the *Middle trapezius* muscle on the left side, the subject was sitting initially in a neutral neck position and then the subject was asked to do side flexion on the right side. The therapist stood behind the subject with one hand stabilising the shoulder to avoid shoulder elevation and the other hand resisting the head movement going back to the neutral position. The subject was asked to go back to the neutral position while the therapist resisted the movement.

For the *Lower trapezius* muscle left side, the subject was in a sitting position. The subject's head was put in forward flexion with the same side rotation. The therapist gave a slight stretch and asked the subject to go back to a normal neutral position while the therapist resisted the motion.

For *Latissimus dorsi* for both muscles, the subject was again in a sitting position with arms resting on the therapist's shoulder, slightly in forward flexion of the trunk, where the LD muscle was in a slight stretch position. The therapist held the back of the subject wrapping it. The subject was asked to go back to the neutral position while the therapist resisted the movement.

For *the Rhomboid left muscle*, the subject was in a prone position with the target muscle. The left side shoulder was put in 90° of flexion hanging. The therapist stood beside the subject and held the arm. The subject was asked to do shoulder retraction while the therapist resisted that movement.

For *the Serratus anterior left muscle*, the patient was lying down in a supine position, and the therapist was standing on the other side of the ribs. To abduct the patient's ipsilateral shoulder and elbow to 90° with their hand looking upwards, the provider grabs the afflicted rib angle below the subject. Apply inferolateral tension to the rib angle while the individual inhales. Ask the patient to maintain their breath for three to five seconds while moving their arm forward while receiving equal resistance from the clinician.[15]

The same procedure was repeated for the right-side muscle of the trapezius all bands, lattisimus dorsi, rhomboids, and serratus anterior with a 7-second hold and a 7-second repetition.

## Group MWM (Movement With Mobilisation)

For the scapulothoracic joint, MWM on the left side, the subjects sat in a good relaxed posture. The subject's arms rested by his/ her side with the forearm supinated, fingers and thumb extended and the thumb pointing laterally in the direction of the movement. The therapist stood facing the subject, on the opposite side of the shoulder. The therapist reached across the subject's trunk. To affect the right shoulder the therapist places the palm of the left hand over the clavicle with the right hand on the medial aspect of the scapula with the fingers spread across the dorsal aspect of the scapula controlling the scapula position. While keeping optimal scapula position the patient is asked to actively elevate their arm through abduction to the pain point onset and return to the starting point. While the subject performs abduction, the therapist allows upward rotation of the scapula and encourages posterior rotation and external rotation (aiming to replicate/ facilitate normal scapulohumeral rhythm). Repeat for 6–10 times. The same was repeated for the left side.[16]

The scapular kinematics exercise was done by both groups after each session as part of the treatment, keeping in mind the players. The program included two stretching exercises, sleeper, and corner stretch, as well as strengthening exercises performed with resistance tubing. Including an external rotation at 90° abduction, shoulder internal rotation at 90° abduction, scapular punches, throwing acceleration, as well as deceleration, Low rows, shoulder flexion, scapular retraction with upward rotation (Ys), scapular retraction with downward rotation (Ws), scapular retraction (Ts). This was done for 2 sets with 10 repetitions.

## Statistical Analysis

Statistical analysis for the present study was done with the help of Statistical Package for the Social Sciences (SPSS) version 27. All the quantitative variables were tallied between two groups using a paired sample t test after checking for normal distribution within each group.

To assess the change in outcome measure scores of both groups, an independent sample t test was conducted.

## Results

**Table 1.Age and Gender Difference**

| Variable | Mean | | SD | N | t Value |
|---|---|---|---|---|---|
| Age (years) | 18.542 | | 3.174 | 35 | 0.577752 |
| Gender | Male | Female | 7.889 | | 0.5 |
| | 31 | 4 | | | |

ISSN: 2278-2044
DOI: https://doi.org/10.24321/2278.2044.202444

**Table 2.Lateral scapular Slide Test Score in Movement with Mobilisation Group and Muscle Energy Technique Group**

| MWM | 0° | | 45° | | 90° | | MET | 0° | | 45° | | 90° | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LSST | Pre | Post | Pre | Post | Pre | Post | LSST | Pre | Post | Pre | Post | Pre | Post |
| Mean | 0.805 | 0.284 | 1.084 | 0.378 | 1.068 | 0.443 | Mean | 0.975 | 0.225 | 1.225 | 0.386 | 1.237 | 0.537 |
| SD | 0.624 | 0.195 | 0.453 | 0.988 | 0.465 | 0.189 | SD | 0.629 | 0.148 | 0.988 | 0.231 | 0.485 | 0.305 |
| t test | 0.0013 93993 | | 0.00000 596632 | | 0.0000 14729 | | t test | 0.00010 2642 | | 0.0005 28357 | | 0.00013 702 | |

**Table 3. Disability of Arm Shoulder and Hand Score and Disability of Arm Shoulder and Hand Sport Score**

| MWM | | Mean | SD | t Test | MET | Mean | SD | t Test |
|---|---|---|---|---|---|---|---|---|
| DASH | Pre | 11.22 | 6.864 | 0.003863199 | Pre | 9.77 | 7.304 | 0.000782467 |
| | Post | 6.92 | 4.038 | | Post | 3.22 | 5.081 | |
| DASH sports | Pre | 17.76 | 14.32 | 0.004284661 | Pre | 16.82 | 14.553 | 0.000271738 |
| | Post | 10.62 | 7.73 | | Post | 4.16 | 10.287 | |

The present study included 35 participants; 16 participants were included in the MET group (Group MET) who received Muscle Energy Technique with scapular kinematics exercise, and 19 subjects were allocated to the MWM group (Group MWM) who received Mulligan Movement with Mobilisation. The two groups were compared based on 3 outcome measures namely LSST, Dash and Dash sports module.

Baseline demographic data such as age and gender were taken. All the baseline variables were compared between the two groups and there is no statistical significance observed in the demographic characteristics. Hence the study population was homogenous.

The mean age of the MWM group was 18.875 ± 2.758 years, and that of the MET group was 18.263 ± 3.477 years. Overall, the mean age of the subjects in the study was 18.542 ± 3.174 years.

In the MWM group, 89.47% of people were male and 10.52% were female. In group MET, 87.5% were male and 12.5% were female.

## Lateral Scapular Slide Test

Changes were seen in both the groups in pre- and post-intervention at all levels. At 0°, the MET group showed more significance compare to MWM (p value = 0.000102642), while at 45° and 90°, MWM showed more significance compare to MET in correcting SD (p values = 0.00000596632 and 0.000014729, respectively).

## DASH Score

MWM pre-intervention score was 11.22 ± 6.846 and post-intervention score was 6.92 ± 4.038. In the MET group, the pre-intervention score was 9.77 ± 7.304 and the post-intervention score was 3.22 ± 5.081. The analysis of pre- and post-intervention DASH scores within the group showed a significant association (p value < 0.005).

## DASH Sports Module

The pre-intervention score of group MWM was 17.763 ± 14.322 and the post-intervention score was 10.624 ± 7.730. In group MET, the pre-intervention score was 16.828 ± 14.553 and the post- intervention score was 4.160 ± 10.287. The analysis of pre and post data of the DASH Sports Module within the group showed a significant association (p value < 0.005).

## Discussion

Shoulder injury among swimmers is a common condition found in both recreational and pro leagues. The SD is commonly seen among these athletes who have shoulder pathology. In previous studies, various techniques and exercises have been used to treat and correct the condition but none are as effective when compared to one another. One technique MET and Mulligan MWM has not been compared to correct SD.

The outcome measurements of this study indicated considerable gains in both groups, however, the MET group outperformed Mulligan's mobilisation with movement group on the DASH score and Dash Optional Sports Module, except for the Post Lateral Scapular Slide test in 45° and 90°. Based on the DASH and DASH Optional Sports module Scale and Lateral Scapular Slide test 0°, we observed the efficiency of each treatment method individually. Except on the Lateral scapular slide test 45 and 90°, it showed

**ISSN: 2278-2044**
**DOI: https://doi.org/10.24321/2278.2044.202444**

marginal results between the two groups. Findings of the present research indicated that in the MET group treated there has been a significant drop in DASH. DASH Sports, and LSST when comparing the pre and post-intervention. This is consistent with a prior analysis conducted by Selkow et al.[17] MET could be applied to correct an asymmetry in SD inducing innominate rotations using targeting contractions of muscle of scapula movements and moving the innominate in a corrected direction.[18]

The group treated with Mulligan MWM also showed significant results in improving the SD in all aspects but was not as significant when compared with MET. One of the Main reasons why the MET showed more effectiveness than MWM is that Muscle Energy techniques involve isometric stretching while correcting the movement, although the MWM involves mainly correcting the movement pattern as demonstrated in the earlier work by Miller. The joint memory to stay on course seems to recover when the correct MWM is performed numerous times,[19] proposing that the therapy of scapular dyskinesis is best handled with METs.

## Limitations of the Study

In this study, strength exercises were used for the interventions, but due to the unavailability of a handheld electro-dynamometer, we were not able to keep strength as an outcome for the study. The fact that the participants persisted in their swimming regimen throughout the treatment may be the cause of the lacklustre outcomes.

## Future Scope of the Study

Strength can be included as an outcome metric to give a more thorough evaluation of the interventions. To prevent confounding variables during the treatment, think about keeping an eye on and maybe regulating the participants' usual swimming schedule. Employ sophisticated biomechanical analysis instruments such as electro-goniometers to obtain more precise result measurements. To gain more insight into the efficacy of interventions for scapular dyskinesis, extend the trial to a group with certain shoulder diseases with scapular dyskinesis.

## Conclusion

The present study concluded that both interventions showed effectiveness in correcting scapular dyskinesis. While comparing both groups, it was found that the MET group showed better results in all aspects, except in LSST 45° and LSST 90° the Mulligan's MWM group showed marginal results. Additionally, none of the participants in either group reported about the intervention's negative effects or discomfort. Therefore, it is suggested that MET should also be incorporated in correcting scapular dyskinesis.

**Source of Funding:** None

**Conflict of Interest:** None

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**ISSN: 2278-2044**
**DOI: https://doi.org/10.24321/2278.2044.202444**