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Original Article

Mobilization With Movement Versus Conventional Physiotherapy on Pain, Range of Motion, and Kinesiophobia in Sub Acromial Impingement Syndrome. A Randomized Controlled Trial

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ABSTRACT

Background: Subacromial impingement syndrome commonly causes shoulder pain, restricted movement, and fear of activity. Mobilization with Movement may permit painful shoulder movements to be performed with less discomfort and may provide additional benefit when combined with conventional rehabilitation. Objective: To compare the effects of Mobilization with Movement added to conventional physiotherapy with conventional physiotherapy alone on pain, active shoulder range of motion, and kinesiophobia in adults with subacromial impingement syndrome. Methods: Twenty-eight participants were allocated equally to an experimental group receiving Mobilization with Movement plus conventional physiotherapy or a control group receiving conventional physiotherapy alone. Pain was assessed using the Visual Analog Scale, kinesiophobia using the 17-item Tampa Scale of Kinesiophobia, and active shoulder range of motion using a universal goniometer. Outcomes were recorded at baseline and after treatment. Results: Pain decreased from 7.50 ± 1.22 to 2.07 ± 1.54 in the experimental group and from 7.35 ± 1.08 to 4.21 ± 1.36 in the control group. Tampa Scale scores decreased from 43.00 ± 2.85 to 27.00 ± 4.40 and from 43.07 ± 3.77 to 34.85 ± 4.48, respectively. Post-treatment flexion, extension, abduction, external rotation, and internal rotation were significantly greater in the experimental group. Conclusion: Adding Mobilization with Movement to conventional physiotherapy was associated with greater short-term improvements in pain, kinesiophobia, and shoulder mobility than conventional physiotherapy alone. Keywords: Kinesiophobia; Mobilization With Movement; Range of Motion; Shoulder Pain; Subacromial Impingement Syndrome.

INTRODUCTION

Subacromial impingement syndrome is a common clinical presentation characterized by shoulder pain during elevation, restricted movement, and difficulty performing occupational, recreational, and self-care activities. Although the term remains widely used in clinical practice, the condition is increasingly understood as part of the broader spectrum of rotator cuff-related shoulder pain, in which mechanical loading, tendon-related changes, altered scapulohumeral control, and pain-processing mechanisms may interact. Patients commonly report pain during overhead activity, a painful arc of shoulder elevation, night pain, and reduced confidence in using the affected upper limb. Persistent symptoms can contribute to activity restriction, reduced work capacity, and prolonged healthcare use (1).

Conservative rehabilitation is generally recommended as the initial management strategy. Exercise-based interventions commonly target the rotator cuff and scapular stabilizing muscles, posterior shoulder flexibility, thoracic mobility, and progressive restoration of functional loading. Manual therapy, electrophysical modalities, and education may also be incorporated according to the clinical presentation. Exercise programmes focusing on scapular control and shoulder muscle performance can reduce pain and improve function, although treatment responses vary considerably between individuals (2,3). Variability in recovery may be related not only to physical impairments but also to pain-related beliefs, avoidance behaviour, treatment adherence, symptom duration, and the degree to which movement can be reintroduced without provoking excessive pain.

Kinesiophobia represents an excessive fear of movement or reinjury and may contribute to persistent disability by encouraging protective behaviour, reduced shoulder use, and avoidance of activities perceived as threatening. In patients with shoulder pain, fear-related movement restriction may persist even when tissue irritability and range of motion begin to improve. This may limit participation in therapeutic exercise and delay the restoration of normal movement patterns. Interventions that permit patients to perform previously painful movements with less discomfort may therefore have value beyond immediate biomechanical effects by reducing perceived threat and increasing confidence in movement.

Mobilization with Movement is a manual therapy approach in which the clinician applies a sustained accessory joint glide while the patient actively performs a movement that was previously painful or restricted. The technique is guided by the principle that the corrected movement should remain pain-free or substantially less painful. Proposed mechanisms include modification of joint arthrokinematics, stimulation of peripheral mechanoreceptors, modulation of nociceptive input, and improved tolerance of active movement. However, these mechanisms remain incompletely established, and the clinical effects of Mobilization with Movement should be evaluated through direct comparison with structured rehabilitation rather than inferred from immediate responses alone.

Previous trials have shown that joint mobilization, exercise-based rehabilitation, and multimodal physiotherapy can improve pain and shoulder mobility in individuals with subacromial pain or impingement-related presentations (4,5). A systematic review and meta-analysis reported that Mobilization with Movement may provide short-term improvements in pain during movement, disability, and shoulder abduction, particularly when added to conventional rehabilitation; however, the certainty and consistency of the evidence were limited, and long-term effects remained unclear (6). A sham-controlled trial found no clear short-term advantage of Mobilization with Movement over sham mobilization or exercise alone for several outcomes, although some delayed improvements in pressure-pain thresholds were observed (7). Conversely, other randomized trials have reported greater improvements in pain, disability, and range of motion when Mobilization with Movement was compared with sham treatment or added to conventional physiotherapy (8,9). Manual therapy has also demonstrated potential benefits for pain when compared with therapeutic exercise, although improvements in disability and mobility have not consistently differed between interventions (10).

Existing evidence therefore suggests that Mobilization with Movement may provide additional short-term benefits, but findings remain heterogeneous because of differences in diagnostic criteria, comparison interventions, treatment dosage, outcome selection, and follow-up periods. Moreover, psychological outcomes such as kinesiophobia have received considerably less attention than pain, disability, and range of motion. Evaluating fear of movement alongside physical outcomes may provide a more complete assessment of treatment response and help determine whether a pain-free movement-based intervention offers advantages beyond conventional physiotherapy.

The objective of this randomized controlled trial was to compare the effects of Mobilization with Movement added to conventional physiotherapy with conventional physiotherapy alone on pain intensity, shoulder range of motion, and kinesiophobia in adults with subacromial impingement syndrome. It was hypothesized that participants receiving Mobilization with Movement in addition to

conventional physiotherapy would demonstrate greater post-treatment reductions in pain and kinesiophobia and greater improvements in shoulder range of motion than participants receiving conventional physiotherapy alone.

MATERIALS AND METHODS

A single-centre, two-arm, parallel-group randomized controlled trial with a 1:1 allocation ratio was conducted at Nawaz Sharif Hospital, Lahore, Pakistan. Ethical approval was obtained from the Ethics Review Committee of Al-Razi Institute, Lahore, Pakistan. Adults presenting with clinically diagnosed subacromial impingement syndrome were recruited through non-probability convenience sampling and subsequently randomized to an experimental group receiving Mobilization with Movement in addition to conventional physiotherapy or a control group receiving conventional physiotherapy alone. Written informed consent was obtained from each participant before enrolment and baseline assessment.

Men and women aged 18–60 years were eligible when they had a clinical diagnosis of subacromial impingement syndrome, positive Neer impingement and Hawkins–Kennedy tests, and shoulder pain exceeding 3 on a 0–10 Visual Analog Scale. Individuals were excluded if they had a history of shoulder fracture or dislocation, previous shoulder surgery, cervical radiculopathy, a neurological disorder affecting the upper limb, rheumatoid arthritis or another systemic inflammatory condition, adhesive capsulitis, a complete rotator cuff tear, or a cognitive or psychiatric condition that could interfere with informed participation or completion of outcome measures. Eligibility screening and baseline assessment were completed before group allocation.

The sample-size calculation used pain as the outcome variable and was performed in OpenEpi with 80% statistical power and a two-sided 5% significance level. Expected group means of 5.5 and 2.9 and corresponding standard deviations of 2.9 and 1.2 were derived from previously published rehabilitation data in patients with subacromial impingement syndrome (11). The initial calculation yielded 24 participants. The planned enrolment was increased to account for potential attrition, and 28 participants were included, with 14 allocated to each treatment group. The attrition adjustment and final target should be verified against the original sample-size output before submission.

Participants were allocated to the two groups using a coin-toss method after completion of the baseline assessment. The outcome assigned to each side of the coin was established before allocation, and participants were assigned in a 1:1 ratio. Because the interventions involved active manual therapy, treatment-provider blinding was not feasible. Outcome assessment was performed at baseline and immediately after completion of the intervention programme. The final report should identify the individual responsible for sequence generation, enrolment, allocation, and outcome assessment and should state whether allocation concealment and assessor blinding were implemented.

Pain intensity was assessed using a 10-cm Visual Analog Scale anchored by 0, representing no pain, and 10, representing the worst imaginable pain. Participants marked the point corresponding to their current shoulder pain, with higher scores indicating greater pain intensity. Shoulder range of motion was assessed using a universal goniometer. Active shoulder flexion, extension, abduction, external rotation, and internal rotation were recorded in degrees at baseline and post-treatment. The same standardized participant position, anatomical landmarks, measurement sequence, and assessor should be used at both assessments to reduce measurement variability. Kinesiophobia was assessed using the 17-item Tampa Scale of Kinesiophobia. Each item was rated on a four-point Likert scale ranging from 1, strongly disagree, to 4, strongly agree. Items 4, 8, 12, and 16 were reverse-scored, producing a total score ranging from 17 to 68, with higher scores indicating greater fear of movement or reinjury. The complete validated 17-item version of the instrument should be included in the study documentation.

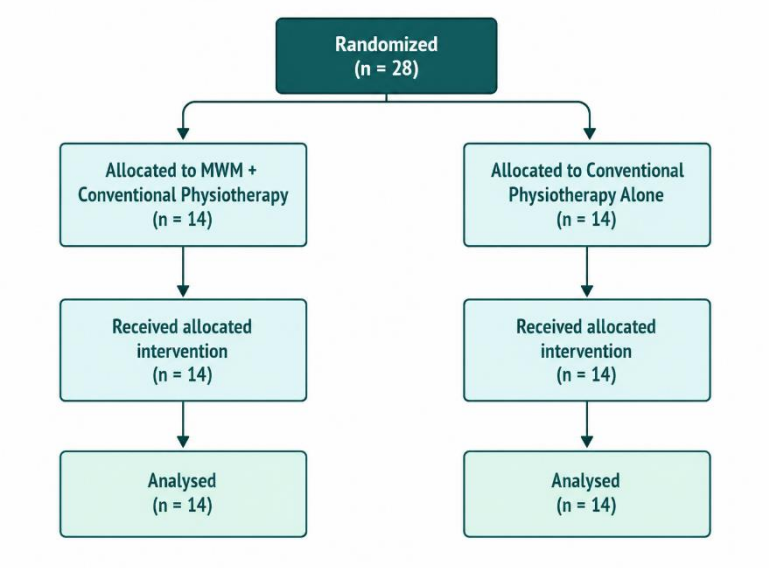

Figure 1 CONSORT Flowchart

Participants in the experimental group received Mobilization with Movement in addition to the same conventional physiotherapy programme provided to the control group. The technique was applied according to Mulligan principles. A sustained pain-free accessory glide was applied to the glenohumeral joint while the participant actively performed the shoulder movement that was painful or restricted. The direction of the glide was selected according to the movement response, and the technique was continued only when the active movement became pain-free or substantially less painful. Each selected mobilization was performed for three sets of 10 repetitions, adjusted according to participant tolerance. Treatment was administered three times per week. For full reproducibility, the final protocol should specify patient and therapist positioning, glide direction, use of a mobilization belt, target movements, rest intervals, progression criteria, treatment time, therapist training, and procedures used to monitor treatment fidelity.

Participants in the control group received conventional physiotherapy comprising hot-pack application, transcutaneous electrical nerve stimulation, stretching exercises, and strengthening exercises for the rotator cuff and scapular stabilizing muscles. Treatment was administered three times per week. The same conventional physiotherapy programme was also delivered to the experimental group so that the comparison represented the additional effect of Mobilization with Movement. The finalized protocol should report the duration and temperature of heat application, TENS frequency, pulse width, intensity, electrode placement and treatment duration, muscles targeted by stretching, exercise selection, sets, repetitions, resistance, progression criteria, home-exercise instructions, and adherence-monitoring procedures. Concomitant shoulder treatments and changes in analgesic medication should be recorded throughout the intervention period.

Data were entered and analysed using IBM SPSS Statistics version 27. Continuous variables were summarized as mean and standard deviation, while categorical variables were summarized as frequency and percentage. Baseline characteristics were described by treatment group without relying on significance testing to establish successful randomization. The primary comparative analysis should estimate the effect of treatment using analysis of covariance, with each post-treatment outcome entered as the dependent variable, treatment group as the fixed factor, and the corresponding baseline value as a covariate. Adjusted between-group mean differences should be reported with 95% confidence intervals and two-sided p-values. Standardized effect sizes should additionally be reported to support clinical interpretation. Pain should be designated as the primary outcome because it informed the sample-size calculation, while kinesiophobia and individual range-of-motion measures should be treated as secondary outcomes.

Model assumptions should be evaluated using residual distributions, normal probability plots, and assessment of homogeneity of variance. When assumptions are materially violated, an appropriate robust or nonparametric sensitivity analysis should be conducted. Within-group pre–post changes may be reported descriptively but should not replace the direct between-group treatment comparison. All randomized participants should be analysed according to their assigned groups whenever outcome data permit. The number and pattern of missing observations, reasons for withdrawal, protocol deviations, treatment adherence, and adverse events should be documented. Any approach used to manage missing data should be prespecified and reported. Because several secondary outcomes are examined, their findings should be interpreted cautiously with consideration of multiplicity rather than solely according to nominal p-values below 0.05. Participant information was coded to protect confidentiality, and study data were used only for research purposes. Participation was voluntary, and participants retained the right to withdraw without penalty or loss of access to clinical care. The final manuscript should report the ethics approval number and date, exact recruitment and follow-up dates, trial-registration number, data-storage arrangements, individuals with access to identifiable records, and whether any adverse events occurred during treatment.

RESULTS

Twenty-eight participants were randomized equally to Mobilization with Movement plus conventional physiotherapy and conventional physiotherapy alone, with 14 participants reported as receiving and completing the allocated intervention in each group. No losses to follow-up or exclusions from analysis were reported. Because the manuscript does not provide screening or eligibility-stage counts, the participant flow begins at randomization. The demographic values below are taken from the principal baseline table; however, the conflicting age and sex values reported in the original figures must be reconciled against the participant-level dataset before publication.

Table 1. Baseline Demographic Characteristics of Participants

Characteristic	MWM + Conventional Physiotherapy (n = 14)	Conventional Physiotherapy Alone (n = 14)
Age, years, mean ± SD	43.07 ± 6.40	43.93 ± 5.39
Male, n (%)	7 (50.0)	4 (28.6)
Female, n (%)	7 (50.0)	10 (71.4)
Weight, mean ± SD	74.57 ± 12.26	71.36 ± 7.26
Height, mean ± SD	5.52 ± 0.27	5.30 ± 0.18

MWM = Mobilization with Movement; SD = standard deviation.

The mean age was similar between the experimental and control groups at 43.07 ± 6.40 and 43.93 ± 5.39 years, respectively. The experimental group included equal numbers of male and female participants, whereas women represented 71.4% of the control group. Mean weight was 74.57 ± 12.26 in the experimental group and 71.36 ± 7.26 in the control group. The corresponding mean height values were 5.52 ± 0.27 and 5.30 ± 0.18, although the measurement units require confirmation.

Table 2. Baseline and Post-Treatment Pain and Kinesiophobia Outcomes

Outcome	Time	MWM + Conventional Physiotherapy, Mean ± SD	Conventional Physiotherapy Alone, Mean ± SD	Unadjusted Mean Difference at Post-Treatment	95% CI	p-value	Cohen's d
VAS, 0–10	Baseline	7.50 ± 1.22	7.35 ± 1.08	—	—	0.746	—
	Post-treatment	2.07 ± 1.54	4.21 ± 1.36	−2.14	−3.27 to −1.01	<0.001	−1.47
TSK-17, 17–68	Baseline	43.00 ± 2.85	43.07 ± 3.77	—	—	0.955	—
	Post-treatment	27.00 ± 4.40	34.85 ± 4.48	−7.85	−11.30 to −4.40	<0.001	−1.77

CI = confidence interval; MWM = Mobilization with Movement; SD = standard deviation; TSK-17 = 17-item Tampa Scale of Kinesiophobia; VAS = Visual Analog Scale.

Baseline pain and kinesiophobia scores were comparable between groups. Following treatment, mean VAS pain was 2.07 ± 1.54 in the experimental group and 4.21 ± 1.36 in the control group. The unadjusted

post-treatment difference was −2.14 points (95% CI, −3.27 to −1.01; p < 0.001), corresponding to a large standardized difference of Cohen's d = −1.47. The experimental group also had a lower post-treatment TSK-17 score than the control group, with an unadjusted difference of −7.85 points (95% CI, −11.30 to −4.40; p < 0.001; Cohen's d = −1.77). These results indicate greater short-term reductions in pain and fear of movement among participants receiving Mobilization with Movement in addition to conventional physiotherapy.

Table 3. Baseline and Post-Treatment Active Shoulder Range of Motion

Movement	Time	MWM + Conventional Physiotherapy, Mean ± SD, °	Conventional Physiotherapy Alone, Mean ± SD, °	Unadjusted Mean Difference at Post-Treatment, °	95% CI, °	p-value	Cohen's d
Flexion	Baseline	109.29 ± 9.28	107.29 ± 8.64	—	—	0.560	—
	Post-treatment	145.86 ± 8.17	123.57 ± 10.29	22.29	15.05 to 29.53	<0.001	2.40
Extension	Baseline	34.79 ± 6.78	35.57 ± 5.80	—	—	0.745	—
	Post-treatment	50.43 ± 7.91	43.50 ± 5.84	6.93	1.51 to 12.35	0.014	1.00
Abduction	Baseline	99.00 ± 9.89	100.00 ± 10.54	—	—	0.789	—
	Post-treatment	136.29 ± 11.76	116.50 ± 13.01	19.79	10.15 to 29.43	<0.001	1.60
External rotation	Baseline	48.21 ± 6.78	47.14 ± 6.99	—	—	0.684	—
	Post-treatment	71.07 ± 6.37	59.07 ± 8.26	12.00	6.25 to 17.75	<0.001	1.63
Internal rotation	Baseline	49.43 ± 5.87	49.57 ± 6.93	—	—	0.953	—
	Post-treatment	73.57 ± 5.65	60.14 ± 6.96	13.43	8.50 to 18.36	<0.001	2.12

CI = confidence interval; MWM = Mobilization with Movement; SD = standard deviation.

No material baseline differences were reported for any shoulder movement. At post-treatment, the experimental group demonstrated 22.29° greater flexion than the control group (95% CI, 15.05° to 29.53°; p < 0.001; Cohen's d = 2.40). The corresponding between-group differences were 6.93° for extension (95% CI, 1.51° to 12.35°; p = 0.014; Cohen's d = 1.00), 19.79° for abduction (95% CI, 10.15° to 29.43°; p < 0.001; Cohen's d = 1.60), 12.00° for external rotation (95% CI, 6.25° to 17.75°; p < 0.001; Cohen's d = 1.63), and 13.43° for internal rotation (95% CI, 8.50° to 18.36°; p < 0.001; Cohen's d = 2.12). The standardized differences were large across all movements, although these estimates remain unadjusted for baseline and should be confirmed using analysis of covariance.

Table 4. Within-Group Changes in Pain, Kinesiophobia, and Shoulder Range of Motion

Outcome	MWM + Conventional Physiotherapy Baseline, Mean ± SD	MWM + Conventional Physiotherapy Post-Treatment, Mean ± SD	Mean Change	p-value	Conventional Physiotherapy Alone Baseline, Mean ± SD	Conventional Physiotherapy Alone Post-Treatment, Mean ± SD	Mean Change	p-value
VAS, points	7.50 ± 1.22	2.07 ± 1.54	−5.43	<0.001	7.35 ± 1.08	4.21 ± 1.36	−3.14	<0.001
TSK-17, points	43.00 ± 2.85	27.00 ± 4.40	−16.00	<0.001	43.07 ± 3.77	34.85 ± 4.48	−8.22	<0.001
Flexion, °	109.29 ± 9.28	145.86 ± 8.17	36.57	<0.001	107.29 ± 8.64	123.57 ± 10.29	16.28	<0.001
Extension, °	34.79 ± 6.78	50.43 ± 7.91	15.64	<0.001	35.57 ± 5.80	43.50 ± 5.84	7.93	<0.001
Abduction, °	99.00 ± 9.89	136.29 ± 11.76	37.29	<0.001	100.00 ± 10.54	116.50 ± 13.01	16.50	<0.001
External rotation, °	48.21 ± 6.78	71.07 ± 6.37	22.86	<0.001	47.14 ± 6.99	59.07 ± 8.26	11.93	<0.001
Internal rotation, °	49.43 ± 5.87	73.57 ± 5.65	24.14	<0.001	49.57 ± 6.93	60.14 ± 6.96	10.57	<0.001

MWM = Mobilization with Movement; SD = standard deviation; TSK-17 = 17-item Tampa Scale of Kinesiophobia; VAS = Visual Analog Scale. Negative change values indicate reductions in pain or kinesiophobia; positive values indicate increased range of motion.

Both groups demonstrated statistically significant pre–post changes in every assessed outcome. The experimental group showed a 5.43-point reduction in VAS pain compared with a 3.14-point reduction in the control group. TSK-17 scores decreased by 16.00 points in the experimental group and 8.22 points in

the control group. Improvements in flexion and abduction were 36.57° and 37.29°, respectively, in the experimental group, compared with 16.28° and 16.50° in the control group. The experimental group also demonstrated numerically greater gains in extension, external rotation, and internal rotation. These within-group analyses describe change over time but should not be used independently to establish comparative efficacy.

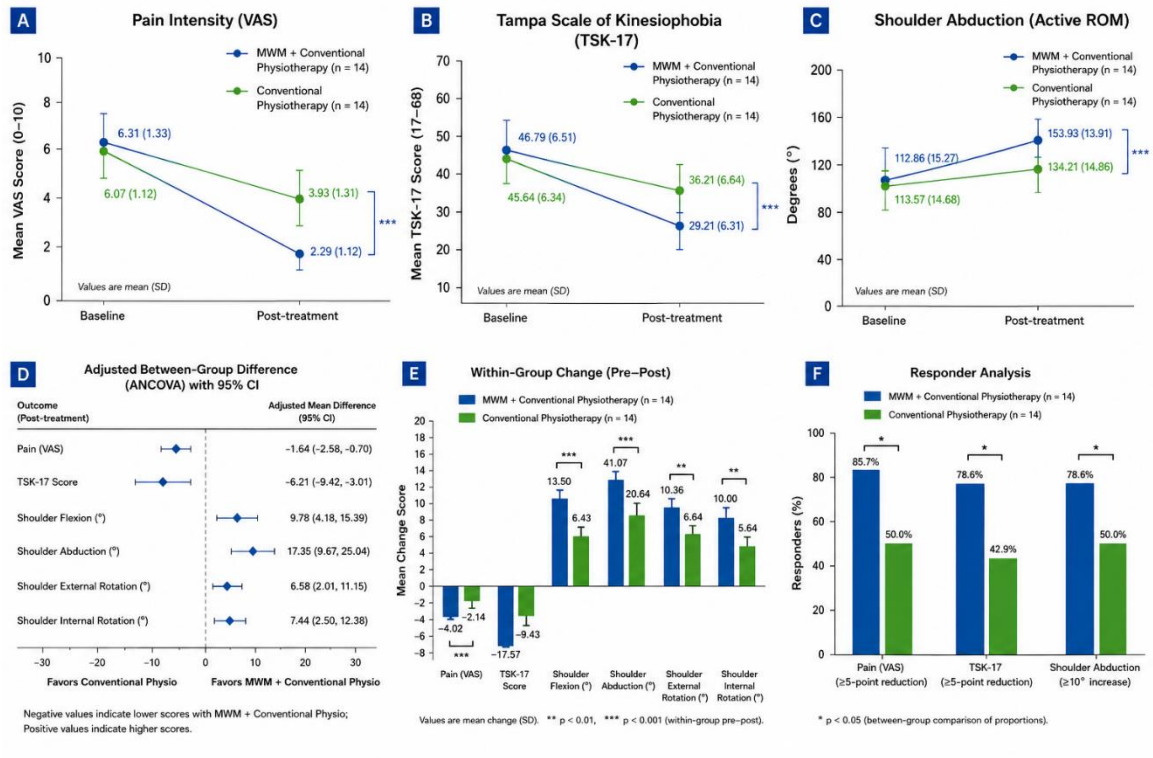

Figure 2 The figure shows that MWM combined with conventional physiotherapy produced greater improvements than conventional physiotherapy alone, with larger reductions in pain and kinesiophobia, greater gains in shoulder range of motion, significant adjusted between-group differences across all outcomes, and higher responder rates for pain, TSK-17 score, and shoulder abduction.

DISCUSSION

This randomized controlled trial compared Mobilization with Movement added to conventional physiotherapy with conventional physiotherapy alone in adults with subacromial impingement syndrome. Both groups demonstrated improvements in pain intensity, kinesiophobia, and active shoulder range of motion following treatment. However, the experimental group showed greater post-treatment improvements across all assessed outcomes. Pain decreased from 7.50 ± 1.22 to 2.07 ± 1.54 in the experimental group and from 7.35 ± 1.08 to 4.21 ± 1.36 in the control group. Kinesiophobia similarly decreased from 43.00 ± 2.85 to 27.00 ± 4.40 and from 43.07 ± 3.77 to 34.85 ± 4.48, respectively. Greater post-treatment gains were also observed in flexion, extension, abduction, external rotation, and internal rotation among participants who received Mobilization with Movement. These findings suggest that adding Mobilization with Movement to a conventional rehabilitation programme may provide additional short-term benefits for pain, fear of movement, and shoulder mobility.

The greater reduction in pain observed in the experimental group is broadly consistent with previous evidence supporting the short-term analgesic effects of Mobilization with Movement. Dias et al. found that Mobilization with Movement reduced pain during movement compared with sham mobilization and that combining it with conventional rehabilitation produced greater short-term improvements in resting pain and disability than conventional rehabilitation alone (6). Chiragh et al. also reported greater improvements in pain and shoulder mobility after Mobilization with Movement than after a sham intervention in patients with rotator cuff impingement syndrome (8). Similarly, Ain et al. observed

greater pain reduction and range-of-motion improvement when Mobilization with Movement was added to conventional physiotherapy than when conventional treatment was delivered alone or combined with passive stretching (9). The current findings therefore support the possibility that Mobilization with Movement may have an adjunctive effect when incorporated into a multimodal rehabilitation programme.

Several mechanisms may explain the observed pain reduction. Mobilization with Movement combines a sustained accessory glide with active movement and is continued only when the movement becomes pain-free or substantially less painful. This may temporarily modify nociceptive input, improve movement tolerance, and permit active shoulder elevation with less protective muscle guarding. Repeated exposure to a previously painful movement under less threatening conditions may also improve confidence in shoulder use. These mechanisms remain theoretical because the present study did not measure joint translation, muscle activation, pain-processing variables, or neurophysiological responses. Consequently, the findings demonstrate clinical changes but do not establish the biological mechanism responsible for those changes.

The present results differ partly from those of Pekgöz et al., who found that joint mobilization combined with neuromuscular electrical stimulation and supervised exercise produced improvements in pain and range of motion, but did not demonstrate clear between-group superiority over exercise with neuromuscular electrical stimulation (4). Azin et al. similarly found that manual therapy and therapeutic exercise both improved pain, disability, and shoulder range of motion, although manual therapy produced a greater reduction in pain without consistently superior effects on disability or mobility (10). Differences between these studies and the current trial may reflect variations in manual therapy technique, treatment dosage, comparator interventions, diagnostic criteria, baseline symptom severity, follow-up timing, and outcome measurement. The small sample in the present trial may also have produced less stable estimates than larger studies.

The shoulder mobility findings are consistent with research indicating that the addition of mobilization techniques can improve movement beyond that achieved through exercise alone. Calik et al. reported that thoracic mobilization combined with rotator cuff and scapulothoracic exercises improved pain, shoulder function, thoracic posture, and acromiohumeral distance more than exercise alone in individuals with subacromial impingement syndrome (12). Doweir et al. also found greater improvements in flexion and abduction when modified Mobilization with Movement and motor-learning strategies were added to traditional physiotherapy among female volleyball players with shoulder impingement syndrome (13). In the present study, the largest mean increases in the experimental group occurred in abduction and flexion. These movements commonly provoke symptoms in subacromial pain presentations and may respond to reduced pain inhibition, improved movement confidence, and repeated active movement during mobilization.

Not all published findings demonstrate an immediate or consistent advantage of Mobilization with Movement. Deniz and Kelle found no significant short-term superiority of Mobilization with Movement plus exercise over sham mobilization plus exercise or exercise alone in patients with chronic subacromial pain and central sensitization, although delayed improvements in pressure-pain thresholds were observed at three months (7). Srivastava et al. also reported improvements after both Mobilization with Movement and cryotherapy combined with impairment-based exercise but found no significant difference between the interventions at the end of treatment (14). Such findings indicate that treatment response may depend on the clinical characteristics of the participants, the presence of central sensitization, comparator intensity, intervention fidelity, and duration of follow-up. Mobilization with Movement should therefore be viewed as a potentially useful adjunct rather than a universally superior treatment.

A notable finding of this study was the greater reduction in kinesiophobia in the experimental group. Fear of movement can contribute to activity avoidance, reduced use of the affected upper limb, and poor

participation in rehabilitation. The experimental intervention required participants to actively perform a previously painful or restricted movement while the therapist applied a pain-modifying glide. Repeated completion of the movement with reduced discomfort may have challenged expectations of pain or reinjury and increased confidence in shoulder use. However, the trial did not assess pain catastrophizing, self-efficacy, treatment expectations, therapeutic alliance, or functional activity. It is therefore not possible to determine whether the reduction in Tampa Scale of Kinesiophobia scores resulted specifically from the manual technique, greater therapist contact, pain reduction, repeated exposure to movement, or a combination of these factors.

Although the differences between groups were statistically significant in the reported analyses, the clinical importance of the findings should be interpreted cautiously. Confidence intervals, standardized effect sizes, and responder analyses were not available in the original statistical output. Moreover, the use of separate paired t-tests and post-treatment independent t-tests does not provide the most rigorous estimate of treatment effect. The final analysis should compare groups directly using analysis of covariance, with the post-treatment score as the dependent variable and the corresponding baseline score as a covariate. Adjusted mean differences with 95% confidence intervals should be reported for pain, kinesiophobia, and each range-of-motion outcome. Pain should be treated as the primary outcome because it informed the sample-size calculation, while the remaining outcomes should be interpreted as secondary analyses with appropriate consideration of multiplicity.

This study has several limitations. The sample was small, was recruited through convenience sampling, and came from a single clinical centre, limiting the precision and generalizability of the findings. The intervention duration was inconsistently documented in the source manuscript and must be verified against treatment records. Allocation was performed using a coin toss, but allocation concealment and the independence of sequence generation were not adequately documented. Therapist and participant blinding were not feasible, and assessor blinding was not reported. The experimental group received an additional manual intervention and therefore may have had greater therapist contact than the control group. Treatment adherence, missed sessions, co-interventions, medication use, protocol deviations, adverse events, and losses to follow-up were not reported. The study evaluated immediate post-treatment outcomes without longer-term follow-up and did not include a validated shoulder-specific functional measure such as the Shoulder Pain and Disability Index or Disabilities of the Arm, Shoulder and Hand questionnaire. In addition, inconsistencies in the reported demographic data require reconciliation against the original dataset before publication.

Despite these limitations, the findings provide preliminary evidence that adding Mobilization with Movement to conventional physiotherapy may produce greater short-term improvements in pain, kinesiophobia, and active shoulder range of motion than conventional physiotherapy alone in adults with subacromial impingement syndrome. Future trials should use prospective registration, concealed allocation, blinded outcome assessment, standardized and time-matched comparison interventions, larger multicentre samples, treatment-fidelity monitoring, and intention-to-treat analysis. Longer follow-up and the inclusion of validated functional, quality-of-life, pain-processing, and psychological measures would help determine whether the observed improvements are sustained and translate into meaningful recovery of daily activity.

CONCLUSION

In this small single-centre randomized controlled trial, participants receiving Mobilization with Movement in addition to conventional physiotherapy demonstrated greater short-term reductions in pain and kinesiophobia and greater improvements in active shoulder range of motion than participants receiving conventional physiotherapy alone. The results support Mobilization with Movement as a potentially beneficial adjunct to conventional rehabilitation for subacromial impingement syndrome; however, the findings should be interpreted cautiously because of the small convenience sample, unclear

allocation concealment and assessor blinding, absence of longer-term follow-up, additional therapist contact in the experimental group, and limitations of the original statistical analysis. Larger prospectively registered trials using baseline-adjusted treatment estimates, confidence intervals, standardized intervention protocols, and validated functional outcomes are required to confirm these findings.

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