

Effect of Instrument-Assisted Soft Tissue Mobilization Alone Versus IASTM Combined With Structured Exercise in Gym Practitioners with Levator Scapulae Syndrome

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Abstract

Background: Gym practitioners may develop cervical and shoulder-region symptoms in association with repetitive loading, sustained postures and exercise technique. Instrument-assisted soft tissue mobilization (IASTM) is commonly used as a manual treatment, whereas therapeutic exercise can address flexibility, movement control and loading behaviour. This study compared IASTM alone with IASTM combined with structured exercise in gym practitioners with levator scapulae syndrome.

Methods: Thirty participants were allocated by envelope method to Group A (IASTM alone; n=15) or Group B (IASTM plus structured exercise; n=15). Both groups received three sessions per week for four weeks. Group B additionally received levator scapulae stretching, scapular retraction/depression, deep neck flexor activation, postural correction and gym-technique education. Outcomes were Numerical Pain Rating Scale (NPRS), Shoulder Pain and Disability Index (SPADI), Patient-Specific Functional Scale (PSFS), and cervical rotation, lateral flexion, flexion and extension. Pre- and post-intervention data were analyzed using paired comparisons and between-group comparisons of change scores.

Results: Both groups improved across all seven outcomes. NPRS decreased from 7.60 to 5.07 in Group A and from 7.73 to 2.27 in Group B. SPADI decreased from 52.78% to 32.93% and from 54.67% to 14.75%, respectively. PSFS increased from 3.27 to 7.04 and from 3.31 to 8.92. Cervical rotation increased by 14.0° in Group A and 24.0° in Group B; lateral flexion by 8.0° and 12.8°; flexion by 8.0° and 9.4°; and extension by 8.0° and 12.0°. The supplied statistical report identified significant between-group differences in change for all outcomes ($p < 0.001$).

Conclusion: In this sample, IASTM combined with structured exercise was associated with larger improvements than IASTM alone across pain, disability, patient-specific function and cervical range of motion after four weeks. The findings support further evaluation of multimodal rehabilitation; however, the small sample and limitations in reporting and follow-up warrant cautious interpretation.

Keywords: instrument-assisted soft tissue mobilization; IASTM; levator scapulae syndrome; neck pain; gym practitioners; therapeutic exercise; cervical range of motion; SPADI; PSFS.

1. Introduction

Musculoskeletal symptoms involving the cervical and shoulder regions are common among physically

active individuals. Gym practitioners are repeatedly exposed to resistance training, sustained positions, repetitive upper-limb movements and relatively high training loads. These factors may contribute to local muscular overload, altered movement strategies, tenderness and restrictions in cervical or shoulder movement. The levator scapulae connects the cervical spine to the scapula and contributes to scapular elevation and downward rotation as well as ipsilateral cervical movement [1,2].

Levator scapulae syndrome may present with localized pain and tenderness around the posterolateral neck and superior medial border of the scapula, together with muscle tightness and restricted cervical movement. In gym practitioners, repeated loading, exercise technique, inadequate recovery and sustained postures may aggravate symptoms.

IASTM is a manual therapy technique in which a rigid instrument is used to assess and treat soft tissues. Studies have reported short-term changes in range of motion and selected pain or function outcomes after IASTM, but systematic reviews have also highlighted heterogeneity and low certainty in parts of the evidence base [3–6]. Proposed physiological mechanisms remain incompletely established and were not directly tested in the present study.

Active exercise may complement manual therapy by addressing movement control, flexibility, muscle performance and posture. Scapular stabilization and postural-correction programmes have been associated with improvements in pain, disability, posture and selected cervical movement outcomes in people with neck-related disorders [7–9]. A combined programme may therefore address both symptomatic soft tissue and modifiable movement or loading factors.

The present study was undertaken to compare IASTM alone with IASTM combined with structured exercise in gym practitioners with levator scapulae syndrome, with particular attention to pain, disability, patient-specific function and cervical range of motion.

2. Aim and Objectives

The aim was to evaluate the effect of IASTM with exercises on pain, functional disability and cervical range of motion in gym practitioners with levator scapulae syndrome.

- To assess pain intensity before and after intervention using the Numeric Pain Rating Scale.
- To evaluate shoulder-related pain and disability using the Shoulder Pain and Disability Index.
- To evaluate patient-specific functional performance using the Patient-Specific Functional Scale.
- To assess changes in cervical rotation, lateral flexion, flexion and extension.
- To compare the magnitude of change between IASTM alone and IASTM combined with structured exercise.

3. Methods

3.1 Study Design and Participants

The project was described as a randomized controlled trial using non-probability convenience sampling. Thirty gym practitioners were recruited from gymnasiums and physiotherapy outpatient departments and allocated by envelope method to two groups of 15 participants each. The study included participants aged 18–35 years of either sex with a clinical diagnosis of levator scapulae syndrome, pain of at least 3/10 on NPRS for at least two weeks, and the specified restriction in cervical lateral flexion and/or rotation.

Participants were excluded if they had cervical spine surgery or fracture, neurological deficit such as radiculopathy or myelopathy, skin lesions/infection/open wounds at the treatment site, systemic or

inflammatory conditions contraindicating treatment, recent steroid injection or ongoing physiotherapy to the same region within three months, cardiac or vascular contraindications to manual therapy, or inability/unwillingness to complete the intervention schedule.

3.2 Intervention

Group	Treatment	Schedule
A (n=15)	IASTM alone; posture advice and avoidance of aggravating gym movements	3 sessions/week × 4 weeks
B (n=15)	IASTM followed by levator scapulae stretching, scapular retraction/depression, deep neck flexor activation, postural correction and gym-technique education	3 sessions/week × 4 weeks

For IASTM, the participant was positioned comfortably in sitting or prone with the cervical spine in slight flexion and contralateral rotation. Lubricant was applied and controlled unidirectional and multidirectional strokes were performed over the levator scapulae region for approximately 5–8 minutes, with tissue response and participant tolerance monitored. Group B then received approximately 15–20 minutes of structured exercise. Levator scapulae stretching was performed as a 30-second hold for three repetitions.

3.3 Outcome Measures

- NPRS: 0–10 numerical pain scale, with higher scores indicating greater pain [16].
- SPADI: region-specific measure of shoulder pain and disability, expressed as a percentage [18,19].
- PSFS: patient-specific rating of selected activities, with higher scores representing better perceived function [20,21].
- Cervical ROM: rotation, lateral flexion, flexion and extension measured in degrees using the study's goniometric assessment procedure.

3.4 Statistical Analysis

The final analysis included 30 participant records. Descriptive statistics were summarized using means and standard deviations. Paired t-tests were used for within-group pre–post comparisons. The supplied statistical report also compared change scores between the two groups. A two-sided p-value below 0.05 was considered statistically significant. The source report identified between-group change-score comparisons at $p < 0.001$ for all seven outcomes.

The source statistical output returned infinite t statistics for some cervical range-of-motion comparisons because of zero variance in the corresponding difference scores. These outputs are acknowledged but are not presented as conventional finite test statistics in this manuscript.

4. Results

Thirty participants were analyzed, with 15 participants in each group. The participant-level master chart supplied in the blackbook contained pre- and post-intervention observations for the seven outcomes.

Both groups demonstrated improvement across pain, disability, patient-specific function and cervical range of motion.

4.1 Overall Change

Outcome	Pre-intervention mean	Post-intervention mean	Mean change
NPRS	7.67	3.67	-4.00
SPADI (%)	53.73	23.84	-29.88
PSFS	3.29	7.98	+4.69
Cervical rotation (°)	55.50	74.50	+19.00
Cervical lateral flexion (°)	30.50	40.90	+10.40
Cervical flexion (°)	40.07	48.77	+8.70
Cervical extension (°)	44.07	54.07	+10.00

4.2 Group-wise Change

Outcome	Group A: IASTM alone	Group B: IASTM + exercise	A change	B change
NPRS	7.60 → 5.07	7.73 → 2.27	-2.53	-5.47
SPADI (%)	52.78 → 32.93	54.67 → 14.75	-19.85	-39.92
PSFS	3.27 → 7.04	3.31 → 8.92	+3.77	+5.61
Cervical rotation (°)	54.80 → 68.80	56.20 → 80.20	+14.00	+24.00
Cervical lateral flexion (°)	30.00 → 38.00	31.00 → 43.80	+8.00	+12.80
Cervical flexion (°)	39.53 → 47.53	40.60 → 50.00	+8.00	+9.40
Cervical extension (°)	43.53 → 51.53	44.60 → 56.60	+8.00	+12.00

4.3 Statistical Findings

Outcome	A t	A p	B t	B p	Change-score t	Change-score p
NPRS	-19.00	2.153 × 10 ⁻¹¹	-33.08	1.079 × 10 ⁻¹⁴	13.82	5.008 × 10 ⁻¹⁴
SPADI	-52.15	1.941 × 10 ⁻¹⁷	-42.70	3.132 × 10 ⁻¹⁶	19.89	4.703 × 10 ⁻¹⁸
PSFS	18.88	2.347 × 10 ⁻¹¹	48.29	5.659 × 10 ⁻¹⁷	-7.96	1.147 × 10 ⁻⁸
Cervical rotation	∞	0	∞	0	-∞	0
Cervical	∞	0	119.73	1.763 × 10 ⁻¹⁶	-44.90	1.232 × 10 ⁻⁸

lateral flexion				10^{-22}		10^{-27}
Cervical flexion	∞	0	32.47	1.399×10^{-14}	-4.84	4.343×10^{-5}
Cervical extension	∞	0	∞	0	$-\infty$	0

5. Discussion

This study compared IASTM alone with IASTM combined with a structured exercise programme in 30 gym practitioners with levator scapulae syndrome. Both groups improved after four weeks, while the combined-treatment group demonstrated larger mean changes across all seven outcomes. The pattern was consistent for pain, disability, patient-specific function and each of the four cervical ROM measures.

5.1 Pain

NPRS decreased by 2.53 points in Group A and by 5.47 points in Group B. The larger reduction in Group B may reflect the additional contribution of repeated active movement, stretching, scapular control and cervical motor-control exercises. However, because the design compared two active interventions and the study did not include an untreated control group, the findings do not establish that the additional benefit was caused by one specific physiological mechanism.

The finding is directionally consistent with literature suggesting that IASTM may influence pain and movement-related outcomes in selected populations, although systematic reviews have reported heterogeneous and sometimes very-low-certainty evidence [3–6].

5.2 Disability and Patient-specific Function

SPADI decreased by 19.85 percentage points in Group A and 39.92 percentage points in Group B. PSFS increased by 3.77 points and 5.61 points, respectively. These changes indicate greater improvement in reported shoulder-related disability and patient-selected activities in the combined group. The exercise component may have contributed through repeated practice, graded loading, postural correction and gym-technique education.

5.3 Cervical Range of Motion

Cervical rotation increased by 14.0° in Group A and 24.0° in Group B. Lateral flexion increased by 8.0° and 12.8° , flexion by 8.0° and 9.4° , and extension by 8.0° and 12.0° , respectively. The consistent direction of change suggests improved measured mobility over the intervention period. The larger changes in the combined group are compatible with the rationale for pairing manual treatment with stretching and active movement control.

5.4 Relationship to Existing Evidence

The present findings broadly align with reports that scapular stabilization and postural exercises can improve neck-related pain, disability and movement outcomes [7–9]. They are also compatible with studies reporting short-term ROM changes following IASTM [4,10]. At the same time, systematic reviews have emphasized methodological heterogeneity and uncertainty around the magnitude and clinical importance of IASTM effects [3,5]. The current findings should therefore be interpreted as results from this specific sample and protocol rather than as evidence of universal superiority.

5.5 Clinical Interpretation

From a clinical perspective, the findings support consideration of IASTM as one component of a broader

rehabilitation programme for active individuals with soft-tissue symptoms. Exercise directed toward flexibility, scapular control, cervical motor control, posture and gym technique may provide a practical active component alongside manual therapy. Clinical decisions should remain individualized and should account for symptom behaviour, tolerance, contraindications and the broader evidence base.

6. Limitations

- The sample was small (n=30; 15 participants per group), which limits precision and generalizability.
- The study did not include a clearly documented untreated control group.
- Only pre- and post-intervention measurements were available; long-term maintenance of treatment effects could not be assessed.
- NPRS, SPADI and PSFS are partly self-reported and may be influenced by subjective reporting.
- Adherence, co-interventions, symptom duration and other potential confounders were not fully documented.
- Physiological mechanisms such as electromyographic activity, tissue stiffness and local circulation were not directly measured.
- The blackbook does not provide a trial registration number, detailed allocation concealment procedure, or an ethics approval number.

7. Clinical Implications

- IASTM may be considered as part of a multimodal physiotherapy programme rather than as an isolated treatment strategy.
- Active rehabilitation should address flexibility, scapular control, cervical motor control, posture and movement habits.
- NPRS, SPADI, PSFS and cervical ROM can be used together to capture complementary aspects of patient response.
- Gym-specific education may help patients modify aggravating loading and exercise technique during recovery.
- Treatment should be individualized according to presentation, tolerance and contraindications.

8. Future Research

- Larger and more diverse samples should be studied.
- Baseline demographic and clinical characteristics should be reported and compared between groups.
- Follow-up should include immediate, 1-, 3- and 6-month assessments where feasible.
- Effect sizes and 95% confidence intervals should be reported alongside p-values.
- Future trials should use clearly documented allocation concealment, preregistration and standardized intervention fidelity procedures.
- The protocol should be replicated in different gyms, clinics and physically active populations.

9. Conclusion

In the 30 participants analyzed, both IASTM alone and IASTM combined with structured exercise were associated with improvements in pain, disability, patient-specific function and cervical range of motion after four weeks. The combined-treatment group demonstrated larger mean improvements across all

seven outcomes. These findings support further investigation of IASTM as part of a multimodal rehabilitation programme incorporating active exercise, scapular control, cervical stabilization, flexibility and gym-technique education. Given the small sample and methodological limitations, the results should be interpreted cautiously and should not be taken as definitive evidence of universal superiority of the combined intervention.

STATISTICAL DATA CHARTS

Figures 1–7 present the reported group-wise pre- and post-intervention means for the seven study outcomes.

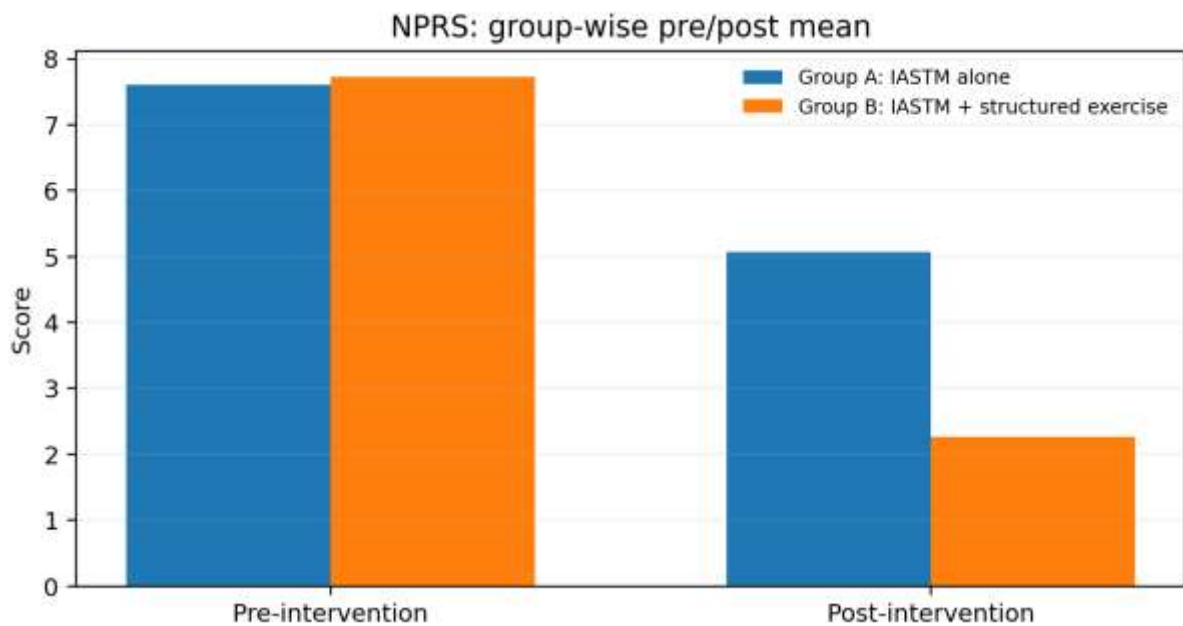


Figure 1. NPRS – pre- and post-intervention group means.

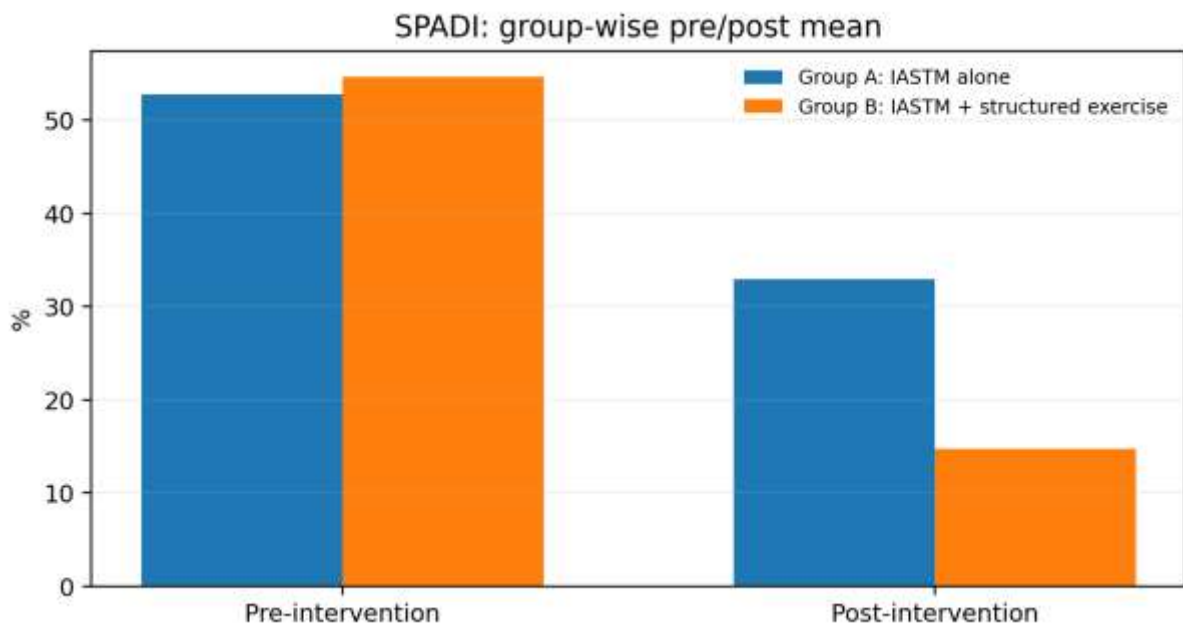


Figure 2. SPADI – pre- and post-intervention group means.

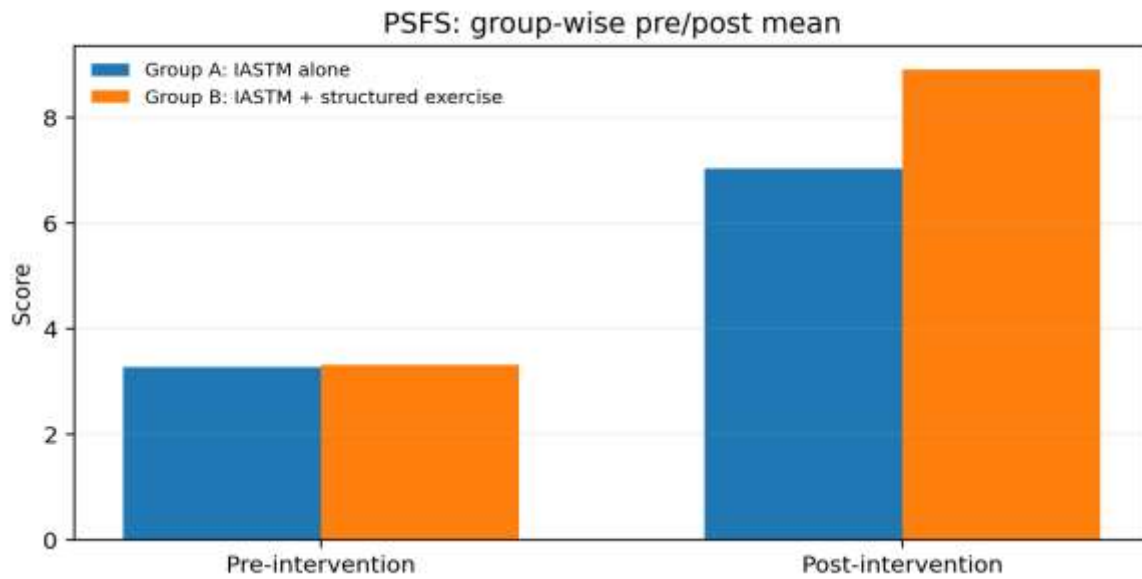


Figure 3. PSFS – pre- and post-intervention group means.

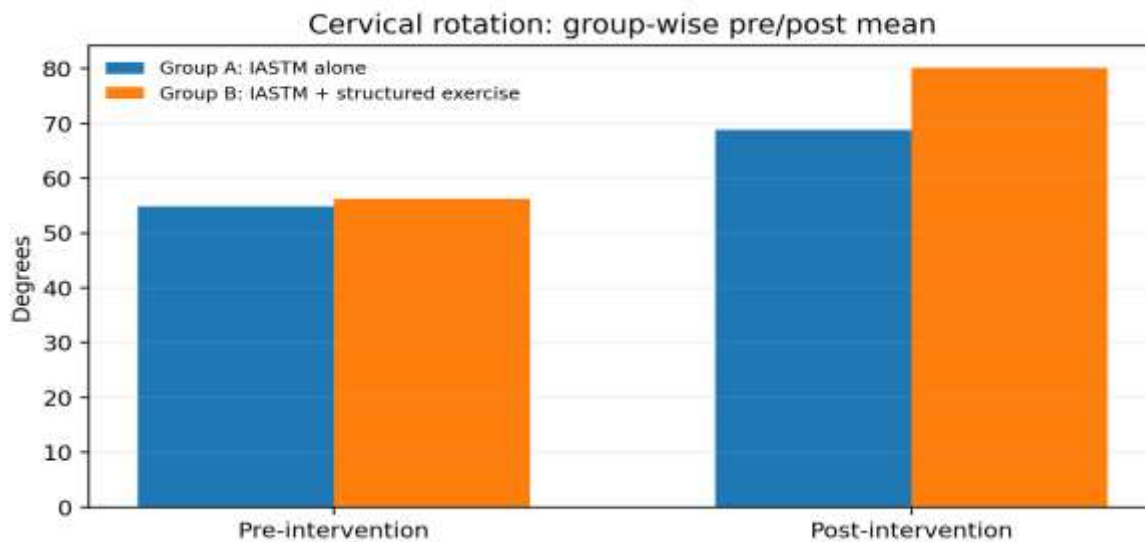


Figure 4. Cervical rotation – pre- and post-intervention group means.

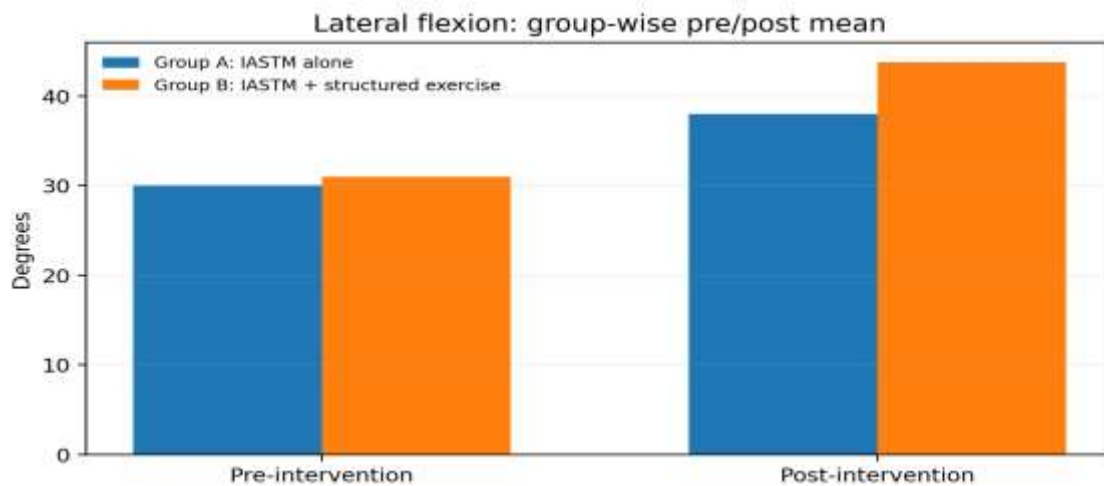


Figure 5. Lateral flexion – pre- and post-intervention group means.

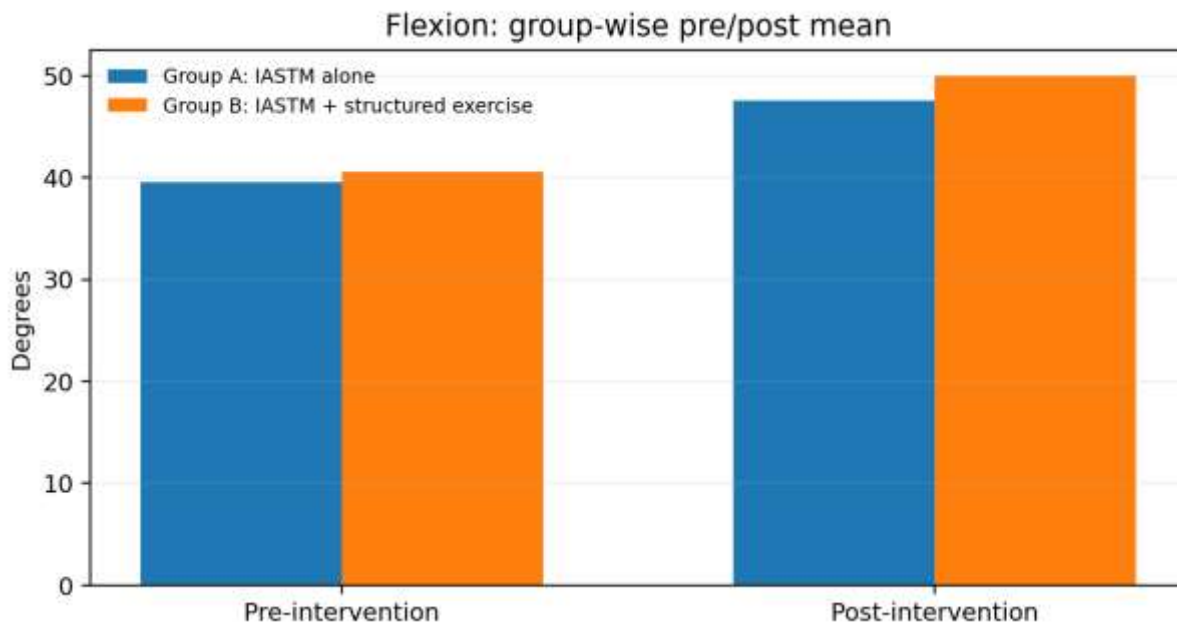


Figure 6. Flexion – pre- and post-intervention group means.

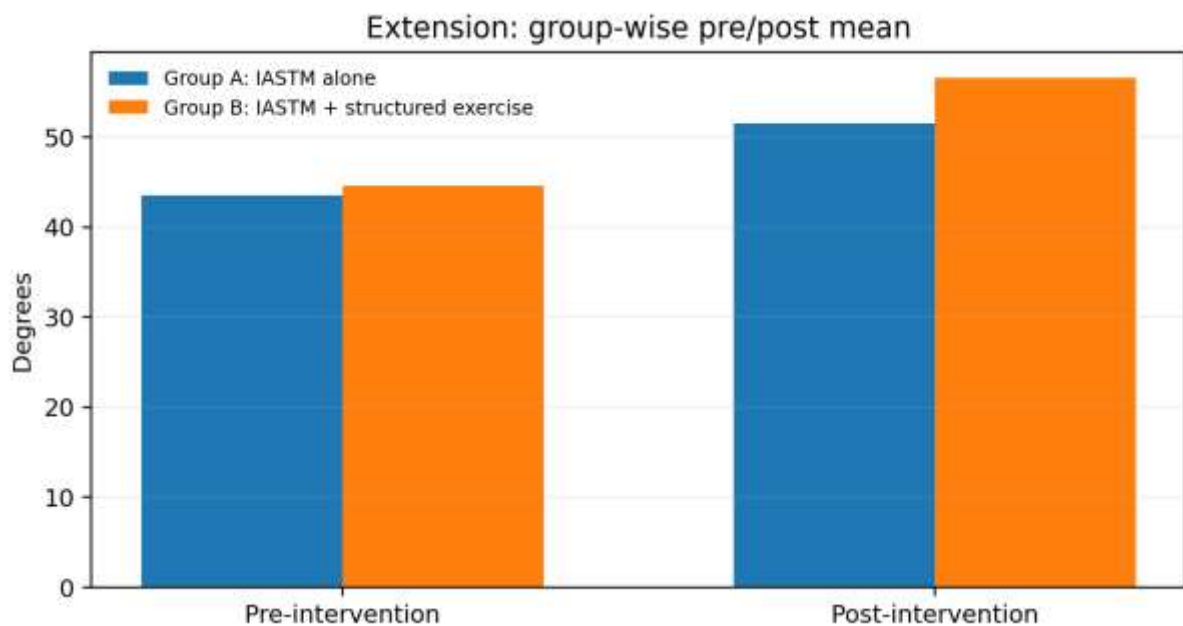


Figure 7. Extension – pre- and post-intervention group means.

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