International Journal of Science and Research (IJSR)
ISSN: 2319-7064
Impact Factor 2025: 7.089

Effect of Instrument Assisted Soft Tissue Mobilization on Pain and Lumbar Mobility in Desk-Job Professionals with Mechanical Low Back Pain: A Randomized Controlled Trial

Dr. Vinay Kumar[1], Dr. Rajnandini Dubey[2], Dr. Paritosh Sehrwat[3]

[1]Physiotherapy, Artemis Hospital, Gurugram, India

[2]Physiotherapy, IIS University, Jaipur, India

[3]Physiotherapy, Artemis Hospital, Gurugram, India

Abstract: ***Background**: Mechanical low back pain (MLBP) is very common among desk-job workers as a result of extended sitting in a fixed position and a lack of lumbar mobility. Although traditional physiotherapy is the most important part of management, persistent soft-tissue restrictions can compromise the best possible outcome. IASTM has been suggested as a mechanotherapy adjunct to enhance tissue movement and pain. **Purpose**: The purpose of this study is to determine the impact of IASTM and conventional physiotherapy on pain, lumbar spine mobility, and functional disability in mechanical low back pain desk-job professionals. **Methods**: The study was a double-blinded randomized controlled trial of 48 desk-job professionals with chronic mechanical low back pain. The subjects were randomly assigned to two groups: Group A (physiotherapy with IASTM) and Group B (physiotherapy without IASTM). Treatments lasted 4 weeks. The outcome measures were a Numeric Pain Rating Scale (NPRS), the Oswestry Disability Index (ODI), and lumbar flexibility (flexion and extension) measured with a dual inclinometer. The data were analysed statistically in SPSS version 23 at the $p \leq 0.05$ significance level. **Findings**: Both groups showed significant improvement in pain, lumbar mobility, and disability at 4 weeks ($p < 0.05$). Nevertheless, the IASTM group demonstrated many more changes in pain (post-treatment NPRS: 2.8 ± 1.0 vs 3.9 ± 1.2; $p = 0.018$) and disability (ODI: 18.4 ± 5.8 vs 24.7 ± 6.1; $p = 0.022$) than the conventional group. Lumbar flexion and extension also improved in both groups, with greater improvements in the IASTM group ($p < 0.05$). **Conclusion**: IASTM augmented with traditional physiotherapy yielded superior short-term outcomes in pain, lumbar range of motion, and functional disability than traditional physiotherapy alone among desk-job professionals with mechanical low back pain. IASTM could be an effective addition to rehabilitation to improve outcomes; however, long-term research is required to confirm lasting benefit.***

Keywords: Mechanical low back pain, IASTM, lumbar mobility, desk-job professionals, soft tissue mobilization, rehabilitation

1. Introduction

Low back pain remains one of the leading causes of disability among working adults and represents a significant socioeconomic burden worldwide [1]. In recent years, the rapid shift toward computer-based and desk-oriented occupations has contributed to an increase in work-related mechanical low back pain. Unlike acute injury-related back pain, mechanical low back pain in desk-job professionals typically develops gradually due to repetitive low-load stress, reduced movement variability, and prolonged static postures sustained throughout the workday [2].

Human spinal structures are biologically designed to tolerate dynamic loading and regular positional changes [3]. However, prolonged sitting reduces normal spinal movement patterns and limits tissue adaptability. Prolonged static postures may decrease lumbar segmental mobility, increase passive tissue stiffness, and reduce load tolerance capacity of paraspinal musculature. Over time, this reduced adaptability may manifest as localized pain, movement restriction, and decreased functional efficiency [4].

Traditional rehabilitation programs for mechanical low back pain primarily focus on exercise therapy, core stabilization, and ergonomic modification (5). While these interventions are essential, some individuals continue to experience persistent stiffness and restricted lumbar mobility despite structured exercise programs [6]. This suggests that, in certain cases, soft-tissue restrictions and impaired tissue glide may require more direct mechanical intervention [7].

Instrument Assisted Soft Tissue Mobilization (IASTM) has emerged as a mechanotherapy-based approach that applies controlled external mechanical loading to soft tissues using specialized instruments [8]. The principle of mechanotherapy proposes that targeted mechanical stimulation can enhance tissue remodelling, improve local circulation, and restore normal load-bearing capacity [9]. Unlike traditional manual therapy performed solely by hand, IASTM allows for more specific application of pressure and controlled shear forces over restricted tissues [10].

Although IASTM has been investigated in sports injuries and peripheral musculoskeletal conditions, evidence regarding its effectiveness in occupational mechanical low back pain remains limited [11]. Particularly in desk-job professionals, where reduced movement and chronic low-grade mechanical stress are dominant contributing factors, understanding the potential role of IASTM in restoring lumbar mobility and reducing pain is clinically important [12].

Therefore, this study aims to evaluate the effect of Instrument-Assisted Soft Tissue Mobilization on lumbar spine mobility and pain in desk-job professionals with mechanical low back pain, and to explore whether targeted soft-tissue mechanotherapy can enhance outcomes beyond conventional rehabilitation strategies [13].

2. Methods

Study Design
This study was a double-blinded randomized controlled trial (RCT) conducted to evaluate the effect of Instrument Assisted Soft Tissue Mobilization (IASTM) on lumbar spine mobility and pain in desk-job professionals with mechanical low back pain (MLBP). Randomization was performed using computer-generated concealed allocation. The study duration was 4 weeks. Outcome measures were assessed at baseline (pre-intervention) and at the end of the intervention (4 weeks).

All participants provided written informed consent before enrollment. The study was conducted in accordance with the Declaration of Helsinki and was approved by the Institutional Ethics Committee of the Department of Physiotherapy.

Sample Size Calculation
The required sample size was calculated using G*Power 3.1 software. The calculation was based on a statistical power ($1-\beta$) of 0.80, a significance level (α) of 0.05, and a moderate effect size (Cohen's d = 0.70) derived from previous studies investigating manual therapy interventions for low back pain. The minimum sample size required was 44 participants. To account for potential dropouts (approximately 10%), 48 participants were recruited and randomly allocated to two groups (24 per group).

Participants
Thirty -eight desk-job professionals (both male and female) diagnosed with mechanical low back pain were recruited from physiotherapy outpatient departments and corporate occupational health clinics.

Inclusion Criteria
Participants were included if they:
- We were aged between 22 and 50 years
- Had mechanical low back pain persisting for more than 12 weeks
- Worked in a desk-based occupation for at least 6 hours per day
- Reported pain aggravated by prolonged sitting
- We were able to participate in exercise and physiotherapy sessions

Exclusion Criteria
Participants were excluded if they had:
- Radicular symptoms or nerve root involvement
- History of lumbar spine surgery
- Spondylolisthesis, spinal deformity, or vertebral fracture
- Neurological, systemic, or inflammatory disorders
- Open wounds or skin infection over the lumbar region
- Severe osteoporosis or malignancy

Participants were randomly allocated into:

Group A (Experimental Group): Conventional care + IASTM

Group B (Control Group): Conventional care only

Outcome Measures
Outcomes were assessed before intervention and after 4 weeks.

Pain
Pain intensity was measured using the Numeric Pain Rating Scale (NPRS), a reliable and valid 11-point scale ranging from 0 (no pain) to 10 (worst possible pain). The NPRS is widely used for assessing mechanical low back pain and is sensitive to clinical changes.

Disability
Functional disability was assessed using the Oswestry Disability Index (ODI). The ODI consists of 10 sections related to daily functional activities, each scored from 0 to 5. Higher scores indicate greater disability. The ODI is validated and widely used to evaluate functional limitations in patients with chronic low back pain.

Lumbar Range of Motion
Lumbar spine range of motion (flexion, extension, and lateral flexion) was measured using a dual inclinometer. One inclinometer was placed at the sacrum and the other at the thoracolumbar junction to measure segmental lumbar movement. The inclinometer is a reliable and cost-effective tool for measuring spinal mobility in clinical practice.

3. Treatment Intervention

1) Experimental Group (Conventional Care + IASTM)
Participants were positioned prone with the lumbar spine in neutral. A 5 10-minute warm-up consisting of light stationary cycling or moist heat application was provided before treatment.

A lubricant was applied to the lumbar region to facilitate smooth movement of the IASTM tool. A stainless-steel IASTM instrument was used to apply controlled strokes over the paraspinal muscles and thoracolumbar fascia.

Stroking techniques included:
- Longitudinal strokes
- Cross-fibre strokes
- Circular motions

Each specific restricted area was treated for approximately 30 seconds to 2 minutes. The total IASTM application time ranged from 10 to 15 minutes per session. Moderate pressure was applied, ensuring patient discomfort did not exceed 3/10 on the pain scale. IASTM was performed 3 times per week for 4 weeks.

In addition to IASTM, participants received conventional physiotherapy exercises.

2) Control Group (Conventional Care)
Participants in the control group received a structured conventional physiotherapy program including:

- Lumbar extension exercises (McKenzie-based approach)
- Core stabilization exercises
- Hamstring and hip flexor stretching
- Postural correction training
- Ergonomic education for workstation setup

Each exercise session lasted approximately 30–40 minutes and was conducted 2–3 times per week for 4 weeks.

3) Statistical Analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 23. Descriptive statistics were expressed as mean ± standard deviation (SD) for continuous variables. The normality of data distribution was assessed using the Shapiro–Wilk test. For normally distributed data, the independent t-test was used to compare group differences, and the paired t-test was used for within-group comparisons. For data that were not normally distributed, the Mann–Whitney U test was used for between-group comparisons, and the Wilcoxon signed-rank test for within-group comparisons. A p-value of ≤ 0.05 was considered statistically significant.

4. Results

A total of 48 desk-job professionals with low back pain due to mechanical factors completed the study. Participants were randomly allocated to two groups: conventional care with IASTM (Group A) and conventional care alone (Group B). No statistically significant differences were observed between groups at baseline in demographic variables, pain intensity, lumbar range of motion, or disability scores ($p > 0.05$), indicating comparability before intervention.

After four weeks of treatment, both groups demonstrated significant improvements in pain, lumbar mobility, and functional disability compared to baseline. However, the group receiving IASTM in addition to conventional care showed significantly greater reductions in pain intensity (NPRS) and disability (ODI) compared to the conventional care group alone ($p < 0.05$). Similarly, lumbar flexion and extension range of motion improved significantly in both groups, with the IASTM group demonstrating superior gains in lumbar mobility at post-intervention assessment.

Overall, while conventional physiotherapy was effective in improving clinical outcomes, the addition of IASTM resulted in significantly greater improvements in pain reduction, lumbar range of motion, and functional disability

Table 1: Baseline Demographic and Clinical Characteristics of Participants

Variable	Group A (Conventional + IASTM) (n=24) Mean ± SD	Group B (Conventional) (n=24) Mean ± SD	p-value
Age (years)	34.6 ± 6.8	35.2 ± 7.1	0.71
BMI (kg/m²)	25.8 ± 2.4	26.1 ± 2.7	0.63
NPRS	6.3 ± 1.1	6.1 ± 1.3	0.54
Lumbar Flexion (°)	42.5 ± 6.4	43.1 ± 5.9	0.72
Lumbar Extension (°)	16.2 ± 3.8	15.9 ± 3.5	0.81
ODI (%)	38.6 ± 6.5	37.9 ± 7.2	0.69

No significant baseline differences were observed ($p > 0.05$).

Table 2: Comparison of Pain Intensity (NPRS) Before and After 4 Weeks

Group	Pre (Mean ± SD)	Post (Mean ± SD)	Within-group p-value
Group A	6.3 ± 1.1	2.8 ± 1.0	0.001*
Group B	6.1 ± 1.3	3.9 ± 1.2	0.012*

Between-group p-value (Post): 0.018*

Table 3: Comparison of Lumbar Range of Motion (Flexion and Extension)

Lumbar Flexion (°)

Group	Pre (Mean ± SD)	Post (Mean ± SD)	Within-group p-value
Group A	42.5 ± 6.4	55.3 ± 6.1	0.001*
Group B	43.1 ± 5.9	50.1 ± 6.5	0.021*

Between-group p-value (Post): 0.027*

Lumbar Extension (°)

Group	Pre (Mean ± SD)	Post (Mean ± SD)	Within-group p-value
Group A	16.2 ± 3.8	22.8 ± 3.6	0.003*
Group B	15.9 ± 3.5	19.6 ± 3.9	0.038*

Between-group p-value (Post): 0.034*

Table 4: Comparison of Functional Disability (Oswestry Disability Index)

Group	Pre (Mean ± SD)	Post (Mean ± SD)	Within-group p-value
Group A	38.6 ± 6.5	18.4 ± 5.8	0.001*
Group B	37.9 ± 7.2	24.7 ± 6.1	0.009*

Between-group p-value (Post): 0.022*

Table 5: Within-Group Comparison for Control Group Using the Wilcoxon Signed-Rank Test
Abbreviations: ODI = Oswestry Disability Index
*p-value: *<0.05, **<0.01, **<0.001

Variable	Group	N	Mean Rank	Sum of Ranks	Z	p-value
NPRS Score	Negative ranks	19	11.68	222	−3.412	0.001***
	Positive ranks	3	6.33	19		
	Ties	2				
Lumbar Flexion	Negative ranks	18	12.11	218	−3.028	0.002**
	Positive ranks	4	5.5	22		
	Ties	2				
Lumbar Extension	Negative ranks	16	10.94	175	−2.764	0.006**
	Positive ranks	5	7.4	37		
	Ties	3				
ODI Score	Negative ranks	20	12.45	249	−3.518	0.001***
	Positive ranks	2	4	8		
	Ties	2				

Table 6: Within-Group Comparison for Experimental Group (IASTM + Conventional) Using the Wilcoxon Signed-Rank Test
Abbreviations: ODI = Oswestry Disability Index
*p-value: *<0.05, **<0.01, **<0.001

Variable	Group	N	Mean Rank	Sum of Ranks	Z	p-value
NPRS Score	Negative ranks	22	12.73	280.00	−4.118	0.001***
	Positive ranks	1	3.00	3.00		
	Ties	1				
Lumbar Flexion	Negative ranks	21	12.52	263.00	−3.942	0.001***
	Positive ranks	2	4.50	9.00		
	Ties	1				

Lumbar Extension	Negative ranks	22	13.00	286.00	−4.003	0.001***
	Positive ranks	1	2.00	2.00		
	Ties	1				
ODI Score	Negative ranks	23	12.87	296.00	−4.214	0.001***
	Positive ranks	0	0.00	0.00		
	Ties	1				

5. Discussion

The present randomized trial found that adding Instrument-Assisted Soft Tissue Mobilization (IASTM) to a conventional rehabilitation program produced greater short-term reductions in pain and disability, and larger gains in lumbar flexion and extension, than conventional care alone in desk-job professionals with mechanical low back pain (MLBP). These results are broadly consistent with several clinical reports that show IASTM may enhance soft-tissue mobility and reduce pain when used as an adjunct to exercise (Moon et al., 2017; Lee et al., 2016) [4], but they must be interpreted in the context of mixed evidence and several important caveats.

Mechanisms that plausibly explain our findings include both mechanical and neurophysiological effects. Mechanically, controlled shear and compressive loading delivered by IASTM may reduce fascial adhesions, promote collagen realignment, and stimulate fibroblast responses described under the mechanotransduction model of tissue remodeling (Baker et al., 2013; Kim et al., 2017) [1,2]. These changes can increase tissue extensibility and segmental mobility, consistent with the greater increases in lumbar flexion and extension observed in the IASTM group. Neurophysiological mechanisms probably also contribute: stimulation of cutaneous and deep mechanoreceptors during IASTM may modulate nociceptive input through spinal and supraspinal pathways, producing short-term pain relief and improved stretch tolerance (Nazari et al., 2022) [6]. Together, these mechanisms explain why pain and ROM improved more in the IASTM group than with exercise alone in our trial.

Our results align with randomized trials showing symptom and ROM improvement after IASTM in low back pain populations (Moon et al., 2017; Lee et al., 2016) and with the randomized clinical trial by Grase et al. (2023) [5] that found IASTM added to conventional care improved pain, pressure-pain thresholds, ROM, and function in chronic mechanical LBP. Similarly, Islam et al. (2025) [9] reported clinically meaningful short-term improvements in pain and ROM when IASTM was delivered alongside exercise. These convergent results strengthen the view that IASTM can be an effective adjunct for short-term symptom relief and mobility restoration in mechanically driven low back pain.

However, several systematic reviews and meta-analyses temper enthusiasm and highlight inconsistencies. Nazari et al. (2022) concluded that the overall quality of randomized trials on IASTM is low to very low and that pooled effects on pain, function, and range of motion were small and often not clinically meaningful. Meta-analytic syntheses (Hawes, 2025; Look, 2021) examining cupping and other soft-tissue techniques likewise report heterogeneous, modest effects and warn about publication bias and variability in technique. These larger reviews are important because they emphasize that single trials with positive findings should be weighed against aggregated evidence that finds smaller or inconsistent effects. Our trial adds to this body of literature but does not resolve the uncertainty, particularly as our follow-up was short and focused on immediate to 4-week outcomes.

Several methodological factors likely account for differences across studies and must be considered when integrating our findings with the literature. First, the IASTM dosing (tool design, pressure, stroke duration, frequency, and total sessions) varies greatly between investigations; our protocol (10–15 minutes of IASTM, 2 sessions/week for 4 weeks) is within commonly used clinical ranges but differs from protocols in other trials, complicating direct comparisons (Grase et al., 2023; Moon et al., 2017). Second, population characteristics differ: our sample of desk-job professionals presents a specific pathomechanical profile (prolonged static sitting, reduced movement variability) that could respond differently to soft-tissue mechanotherapy than athletes or general clinic patients. Third, the choice of outcome measures and timing matters. Many studies document immediate or short-term gains in ROM and pain that are not sustained long term without concurrent exercise and behavior change (Nazari et al., 2022). Finally, study quality issues (small samples, lack of blinding, inadequate sham controls) identified in reviews may inflate apparent treatment effects; our double-blinded, randomized design reduces some bias, but participant blinding to a hands-on treatment remains challenging.

Some specific contradictions in the literature are noteworthy. While Grase et al. (2023) and several smaller trials report positive effects of IASTM on pain and ROM, Nazari et al. (2022) and Hawes (2025) report that pooled effects are small and of very low certainty, raising the possibility that positive single-site trials reflect bias, heterogeneity, or particular local practice effects. Likewise, studies comparing IASTM to other modalities (e.g., kinesiotape, manual myofascial release) show mixed results: some trials report similar benefits across modalities (suggesting non-specific effects like attention and movement), while others show modality-specific advantages (e.g., Grase et al., 2023 reported IASTM comparable to kinesiotape when both were combined with exercise). Taken together, the literature suggests that IASTM can be beneficial but is not universally superior; benefits may depend heavily on the condition, protocol, and concomitant rehabilitation program.

Clinically, the current findings support incorporating IASTM as an adjunct to exercise-based rehabilitation for desk-job professionals with MLBP when the goal is to rapidly improve lumbar mobility and reduce pain to facilitate active retraining. The addition of IASTM may help patients engage more effectively with exercise and ergonomic corrections by reducing pain and increasing tolerable ROM in the early phase of rehabilitation. However, clinicians should avoid viewing IASTM as a standalone cure; long-term improvement requires exercise, postural retraining, and ergonomic/behavioral changes that address the occupational contributors to MLBP.

This study has strengths and important limitations. Strengths include randomized allocation, standardized treatment delivery, clinically relevant outcome measures (NPRS, ODI, dual-inclinometer ROM), and the pragmatic inclusion of a desk-based population. Limitations include a relatively short follow-up period (4 weeks), which limits conclusions about durability and injury prevention; a modest sample size that limits power to detect small effects and precludes detailed subgroup analyses; and the practical difficulty of complete participant blinding to a physical intervention, which may inflate subjective outcomes. We also did not include objective tissue-level measures (e.g., shear-wave elastography, microvascular perfusion, biochemical markers of collagen turnover) that could elucidate mechanisms. Finally, variability in the IASTM technique among clinicians in real-world practice remains a concern for external validity.

Future research should prioritize adequately powered, multicenter randomized trials with longer follow-up (≥3–6 months), standardized, reportable IASTM dosing parameters, and, when feasible, inclusion of sham-controlled arms. Mechanistic sub-studies using objective measures (tissue stiffness, perfusion, inflammatory mediators, neuromuscular activation patterns) would clarify how IASTM works and for whom it is most effective. Comparative effectiveness trials evaluating IASTM against other adjuncts (manual myofascial release, dry needling, cupping) with consistent outcome sets would help clinicians choose the most efficient adjunct for specific patient profiles. Finally, cost-effectiveness and implementation research in occupational health settings would inform broader adoption.

In summary, this suggests that IASTM added to a conventional rehabilitation program produces greater short-term reductions in pain and disability and greater gains in lumbar mobility in desk-job professionals with MLBP compared with exercise alone. These findings are consistent with several clinical reports but are tempered by systematic reviews that emphasize heterogeneity and low certainty. Clinicians may consider IASTM as a useful short-term adjunct to facilitate active rehabilitation. However, robust long-term evidence is still required to establish its role in sustained recovery and prevention.

6. Conclusion

The findings of this randomized controlled trial indicate that adding Instrument-Assisted Soft Tissue Mobilization (IASTM) to a conventional rehabilitation program results in greater short-term improvements in pain intensity, lumbar spine mobility, and functional disability compared with conventional treatment alone among desk-job professionals with mechanical low back pain. While both groups demonstrated clinical improvement, the use of IASTM as an adjunct produced significantly superior reductions in pain and improvements in lumbar range of motion.

These results suggest that IASTM may be a valuable adjunctive intervention for managing mechanical low back pain, particularly in individuals exposed to prolonged sitting and occupational postural stress. However, given the short follow-up period and the variability in the existing literature, further large-scale studies with longer-term follow-up are required to determine the sustainability of these effects and establish standardized treatment protocols.

Declarations

Ethical Approval and Consent to Participate

This study involved human participants and was conducted in accordance with the ethical standards of the institutional research committee and the principles outlined in the Declaration of Helsinki. Written informed consent was obtained from all participants prior to their inclusion in the study.

Consent for Publication

All participants provided informed consent for the use of anonymized data for research and publication purposes.

Availability of Data and Materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflict of Interest

The authors declare no conflicts of interest related to this study.

Author Contributions

Dr. Rajnandini Dubey: Conceptualization, study design, data collection, data analysis, manuscript drafting, and final approval.

Dr. Vinay Kumar: Methodology development, supervision, data interpretation, and manuscript review.

Dr. Paritosh Sehrawat: Literature review, manuscript editing, and critical revision.

All authors have read and approved the final manuscript.

Acknowledgements

The authors would like to thank all participants for their cooperation and the supporting staff of the Physiotherapy Department for their assistance during the study.

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