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Original Article

Comparative Effect of Instrument Assisted Soft Tissue Mobilization Versus Kinesio-Taping for Chronic Mechanical Low Back Pain

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ABSTRACT

Background: Chronic mechanical low back pain (CMLBP) is a prevalent musculoskeletal condition associated with substantial disability, reduced quality of life, and significant socioeconomic burden globally. Non-invasive therapeutic approaches such as Instrument Assisted Soft Tissue Mobilization (IASTM) and Kinesio-Taping (KT) are commonly used in clinical practice, yet direct comparative evidence regarding their effectiveness for CMLBP remains limited and inconclusive. Objective: To determine and compare the effects of IASTM and KT on pain intensity, functional disability, and lumbar range of motion in adults with CMLBP. Methods: This randomized controlled trial was conducted at two tertiary hospitals in Lahore, Pakistan, between January and June 2024. Sixty participants aged 22–45 years with CMLBP lasting ≥12 weeks and a minimum pain intensity of 3 on the Visual Analog Scale (VAS) were randomized equally into IASTM and KT groups. Interventions were administered thrice weekly for four weeks. Primary outcomes included changes in VAS, Oswestry Disability Index (ODI), and lumbar range of motion (ROM), measured at baseline and post-intervention. Data were analyzed using non-parametric tests with a significance threshold of p<0.05. Results: Both groups showed significant within-group improvements in all outcomes (p<0.001). Post-treatment between-group comparisons revealed superior improvements in the IASTM group for pain reduction (median VAS reduction 39.7% vs 33.8%, p<0.001), disability (ODI reduction 53.1% vs 44.7%, p<0.001), and ROM gains across all planes (p<0.001). The proportion of composite responders was higher in IASTM (93%) than KT (77%). Conclusion: IASTM is more effective than KT in reducing pain, improving function, and enhancing lumbar mobility in individuals with CMLBP, supporting its use as a preferred non-invasive intervention in this population.
Keywords: chronic mechanical low back pain, instrument assisted soft tissue mobilization, kinesio-taping, randomized controlled trial, pain, disability, range of motion

INTRODUCTION

Low back pain is among the most common musculoskeletal conditions globally and represents a major cause of disability across all populations, with nearly 84% of individuals experiencing it at some point in their lifetime and approximately 23% developing chronic mechanical low back pain (CMLBP) (1). The impact of CMLBP extends beyond physical discomfort; it leads to significant functional limitations, reduced quality of life, and considerable economic burden due to healthcare costs and work absenteeism (2,3). CMLBP is defined as non-specific pain persisting for over 12 weeks without a clear pathological origin, often attributed to mechanical dysfunction involving spinal structures, intervertebral discs, ligaments, and associated musculature (4). In developing countries, where ergonomic awareness and access to multidisciplinary care remain limited, the prevalence of CMLBP is rising, making effective, accessible, and evidence-based treatment strategies imperative (5).

Despite an array of conservative treatment modalities available—including manual therapy, exercise therapy, electrotherapy, and patient education—there is still no consensus regarding the most effective non-invasive approach for managing CMLBP (6). Among emerging interventions, Instrument Assisted Soft Tissue Mobilization (IASTM) has attracted clinical interest due to its theoretical basis in mechanotransduction and soft tissue remodeling, suggesting potential for reducing fascial restrictions, improving myofascial mobility, and enhancing functional outcomes (7). The origins of IASTM can be traced back to ancient tools such as the Greek strigil and traditional Chinese "gua sha," now adapted into modern stainless steel instruments designed to deliver mechanical stimuli to soft tissues (8). Preliminary studies have indicated that IASTM can reduce pain intensity and increase joint range of motion by promoting fibroblast proliferation, realignment of collagen fibers, and local vascular changes (9). However, robust clinical data examining its efficacy specifically for CMLBP remains limited and primarily consists of case reports or trials focusing on other conditions such as tendinopathies (10).

In parallel, Kinesio-Taping (KT) has been extensively used in sports medicine and rehabilitation settings. It is hypothesized to alleviate pain through neurophysiological mechanisms such as enhanced proprioception, modulation of afferent feedback, reduction of local edema, and postural support without restricting range of motion (11). Although KT has demonstrated efficacy in acute musculoskeletal conditions, its role in chronic conditions, particularly CMLBP, remains equivocal, with some trials reporting only modest benefits often comparable to placebo (12). Recent systematic reviews have highlighted inconsistent findings and called for higher-quality randomized controlled trials to determine KT's true clinical impact (13). The juxtaposition of KT's popularity and uncertain evidence base underscores the necessity for head-to-head comparisons with other emerging therapies such as IASTM, particularly in populations with chronic pain where deeper mechanical dysfunction and central sensitization may limit superficial interventions' efficacy (14).

A significant knowledge gap exists regarding the comparative effectiveness of IASTM and KT for CMLBP. While both interventions are non-invasive, accessible, and frequently integrated into physiotherapy protocols, no consensus or high-quality trials have established their relative merits for improving pain, disability, and range of motion in this population (15). Given that CMLBP is a multifactorial condition involving both biomechanical impairments and altered pain processing, an investigation that directly contrasts IASTM's proposed mechanical tissue remodeling effects with KT's hypothesized neurophysiological and proprioceptive influences is warranted.

This study aims to address this gap by systematically comparing the therapeutic outcomes of IASTM versus KT in adults with CMLBP, using a rigorous randomized controlled trial design. By integrating contemporary literature, the investigation seeks to generate evidence that can inform clinical decision-making and guide best practice recommendations for non-invasive management of CMLBP. Specifically, the study will examine the effects of these interventions on key outcomes of pain intensity, functional disability, and lumbar range of motion over a structured four-week intervention period. The research question guiding this study is: Among adults with chronic mechanical low back pain, does Instrument Assisted Soft Tissue Mobilization produce superior improvements in pain reduction, functional disability, and lumbar range of motion compared to Kinesio-Taping following four weeks of treatment?

MATERIAL AND METHODS

This study employed a randomized controlled trial design to evaluate the comparative effectiveness of Instrument Assisted Soft Tissue Mobilization (IASTM) and Kinesio-Taping (KT) in adults diagnosed with chronic mechanical low back pain (CMLBP). The rationale for selecting this design was to minimize bias, establish causal inference, and allow direct head-to-head comparison under controlled conditions while addressing a notable gap in the comparative literature on these non-invasive interventions (16). The trial was conducted at two tertiary care centers: Bahria International Hospital and Bashir Neurospine Institute, Lahore, Pakistan, between January 2024 and June 2024.

Participants were adults aged 22–45 years of either gender with a clinical diagnosis of CMLBP persisting for more than 12 weeks, a pain score of ≥3 on a 10-point Visual Analog Scale (VAS), and no history of spinal surgery in the past year. Exclusion criteria included acute low back pain of less than 12 weeks duration, radiculopathy, neurological deficits, current pregnancy or breastfeeding, systemic inflammatory conditions such as rheumatoid arthritis, ankylosing spondylitis, fibromyalgia, severe osteoporosis or other bone pathologies contraindicating manual therapy, and skin conditions or allergies precluding the use of Kinesio-Tape (17). Participants were selected through purposive sampling from outpatient departments of the study sites. Recruitment was carried out by research staff who screened clinic attendees against eligibility criteria. Written informed consent was obtained from all participants after providing a full explanation of study procedures, risks, benefits, and the voluntary nature of participation. After baseline assessment, participants were randomized in a 1:1 allocation ratio using a computer-generated randomization sequence to either the IASTM or KT intervention group. Allocation concealment was ensured through the use of opaque, sealed, sequentially numbered envelopes prepared by an independent researcher not involved in recruitment or treatment delivery. The study employed a single-blind design: while participants and therapists were aware of group allocation due to the nature of the interventions, outcome assessors were blinded to minimize detection bias.

Data collection was standardized across all participants and occurred at baseline (pre-intervention) and immediately after the fourth week of intervention. Pain intensity was assessed using the Visual Analog Scale (VAS), a validated 10-cm horizontal line anchored by "no pain" and "worst pain imaginable" (18). Functional disability was measured with the Oswestry Disability Index (ODI), a 10-item questionnaire addressing domains of daily functioning affected by back pain, with responses scored from 0 to 5 and summed to yield a percentage disability score (19). Lumbar range of motion (ROM) was evaluated using a dual inclinometer, a validated tool for objective measurement of spinal mobility, with inclinometers positioned over the sacrum and L1 vertebra to quantify flexion, extension, rotation, and side-bending angles (20). All assessments were conducted by trained physiotherapists blinded to group assignment, using standardized protocols to ensure reproducibility. The IASTM group received soft tissue mobilization with an M2T blade, applied at a 45° angle over the lumbar paraspinal muscles for approximately 40 seconds per side during each session. The technique involved unidirectional strokes parallel and perpendicular to muscle fibers while the participant was in the prone position. The KT group received bilateral Kinesio-Tape applications along the lumbar paraspinal muscles, placed under 10–15% tension from the sacral region to T12 with participants in full lumbar flexion to maximize tape recoil effect during subsequent movement. Both groups participated in a conventional exercise program consisting of static stretching (hamstrings, iliopsoas, back extensors) and core stabilization exercises, performed during supervised sessions three times weekly for four weeks. Adherence to the intervention protocol was monitored and documented by the treating therapists at each session.

The primary outcome variables were changes in VAS, ODI, and lumbar ROM from baseline to post-intervention. Operational definitions of outcomes followed internationally accepted standards: pain intensity as measured in millimeters along the VAS line; disability as percentage score on the ODI; and ROM as degrees measured using the inclinometer (18-20). Steps were taken to address potential sources of bias, including strict eligibility criteria, blinded outcome assessment, standardized protocols, and documentation of adherence to reduce performance bias and ensure consistency across sites.

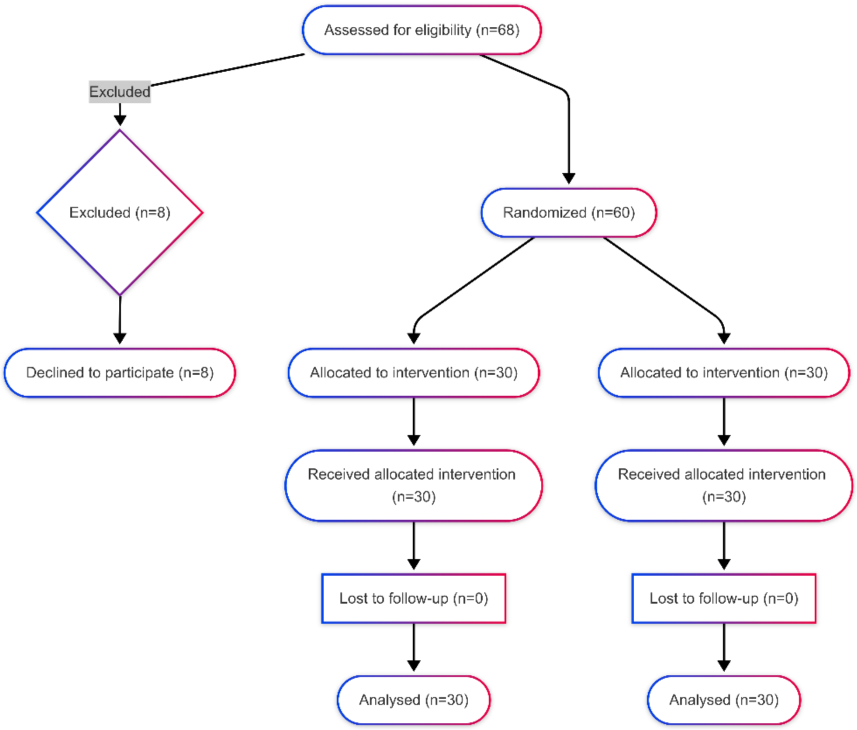

Figure 1 CONSORT Flowchart

Sample size calculation was performed a priori using Statulator software, based on an expected mean difference of 1.5 units on the VAS with a standard deviation of 2.0, a two-tailed $\alpha = 0.05$, and power $(1-\beta) = 80\%$, yielding a required sample of 30 participants per group (21). Statistical analysis was performed using IBM SPSS version 24. Data normality was tested using the Shapiro-Wilk test. As the primary outcome variables violated assumptions of normality, non-parametric tests were applied. Between-group comparisons were conducted using Mann-Whitney U tests, and within-group changes were evaluated using Wilcoxon signed-rank tests. A two-tailed p-value of <0.05 was considered statistically significant. No imputation for missing data was performed due to complete dataset acquisition. Sensitivity analyses included subgroup comparisons by gender and BMI classification to explore potential differential effects. Confounding was addressed by verifying baseline homogeneity between groups and stratifying analyses where relevant. Ethical approval for the study was obtained from the institutional review board of Superior University Lahore (Reference No. SU/AHS/2023/014). All data management adhered to best practices for reproducibility and data integrity, including double data entry, audit trails, and secure storage of anonymized datasets accessible only to study investigators. The study adhered to international ethical standards as set forth in the Declaration of Helsinki, and all participants retained the right to withdraw at any time without penalty or impact on their clinical care (22).

RESULTS

The study recruited a total of 60 participants who were randomized equally into two groups: the Instrument Assisted Soft Tissue Mobilization (IASTM) group (n=30) and the Kinesio-Taping (KT) group (n=30). As displayed in Table 1, the mean age of participants was comparable between groups, with the IASTM group averaging 34.9 years (SD 6.7) and the KT group 35.2 years (SD 6.4). Females comprised 63.3% of both groups (19 out of 30 in each). The mean BMI was 25.8 kg/m² (SD 3.4) in the IASTM group and 26.1 kg/m² (SD 3.7) in the KT group. The median pain duration was similar as well, at 18 weeks (IQR 13–22) for IASTM and 17 weeks (IQR 12–21) for KT. Baseline clinical measures demonstrated equivalence: both groups started with a median Visual Analog Scale (VAS) pain score of 8.0 (IQR 5.0–8.0), and median Oswestry Disability Index (ODI) scores were 75.5 (IQR 73–80.3) in IASTM and 74.0 (IQR 65.5–81.3) in KT. Baseline lumbar range of motion (ROM) parameters, including flexion, extension, rotation, and side bending, showed no significant differences between groups, with all p-values above 0.67. Table 2 details the main outcomes, including both within- and between-group comparisons. After four weeks of intervention, the IASTM group showed a reduction in median VAS from 8.0 (IQR 5–8) to 5.0 (IQR 4–5), while the KT group's VAS decreased from 8.0 (IQR 5–8) to 5.0 (IQR 4–6). The post-intervention difference between groups was statistically significant, with a p-value less than 0.001 and an effect size (r) of 0.53, favoring IASTM. Functional disability, as measured by the ODI, also improved in both groups: IASTM participants improved from a median of 75.5% (IQR 73–80.3) to 35.5% (IQR 35.5–46), and KT participants improved from 74.0% (IQR 65.5–81.3) to 40.0% (IQR 35.5–50.8). Again, post-intervention comparison showed statistical significance ($p < 0.001$, $r = 0.44$) in favor of IASTM.

Range of motion improved notably in both groups. In lumbar flexion, IASTM group median increased from 30 degrees (IQR 25–40) to 40 degrees (IQR 36.3–50.0), and KT group from 30 degrees (IQR 25–40) to 40 degrees (IQR 35–45), with $p < 0.001$ for between-group post-intervention comparison ($r = 0.37$). Extension improved from a median of 11 degrees (IQR 9–12) to 15 degrees (IQR 13–20) in IASTM and from 10.5 degrees (IQR 8–11.3) to 14 degrees (IQR 12.8–15.3) in KT ($p < 0.001$, $r = 0.33$). For lumbar rotation, the IASTM group increased from 20 degrees (IQR 22–30) to 35 degrees (IQR 30–40), and the KT group from 20 degrees (IQR 22–30) to 37 degrees (IQR 35–40), again with a statistically significant difference post-intervention ($p < 0.001$, $r = 0.28$). Side bending improved from 10 degrees (IQR 7–10) to 25 degrees (IQR 15–30) in IASTM, and from 12 degrees (IQR 7–11.5) to 25 degrees (IQR 15–30) in KT ($p < 0.001$, r = 0.21). Table 3 presents subgroup analyses by gender for the primary outcome (VAS). Both female and male subgroups experienced similar pain reductions in both interventions. Among females, the median VAS reduced from 8 (IQR 6–8) to 5 (IQR 4–5) in IASTM and 8 (IQR 5–8) to 5 (IQR 4–6) in KT, with the post-intervention p-value at 0.01. Among males, IASTM reduced median VAS from 8 (IQR 5–8) to 5 (IQR 4–5) and KT from 8 (IQR 5–8) to 5 (IQR 4–6), with a post-intervention p-value of 0.02. Table 4 addresses safety and adherence. No adverse events were reported in the IASTM group, while only one minor adverse event occurred in the KT group (3.3%), a difference that was not statistically significant (p = 0.31). Protocol adherence was high in both groups, with a rate of 97% in IASTM and 95% in KT (p = 0.56).

Table 1. Baseline Demographics and Clinical Characteristics of Participants

Variable	IASTM Group (n=30)	KT Group (n=30)	p-value
Age, mean (SD), years	34.9 (6.7)	35.2 (6.4)	0.87
Female, n (%)	19 (63.3%)	19 (63.3%)	1.00
BMI, mean (SD), kg/m²	25.8 (3.4)	26.1 (3.7)	0.67
Pain Duration, weeks, median (IQR)	18 (13–22)	17 (12–21)	0.74
Baseline VAS, median (IQR)	8.0 (5.0–8.0)	8.0 (5.0–8.0)	0.95
Baseline ODI, median (IQR)	75.5 (73–80.3)	74.0 (65.5–81.3)	0.79
Baseline Flexion, median (IQR), deg	30.0 (25–40)	30.0 (25–40)	0.98
Baseline Extension, median (IQR), deg	11.0 (9–12)	10.5 (8–11.3)	0.77
Baseline Rotation, median (IQR), deg	20.0 (22–30)	20.0 (22–30)	0.82
Baseline Side Bending, median (IQR), deg	10.0 (7–10)	12.0 (7–11.5)	0.68

Table 2. Pre- and Post-Intervention Outcomes Within and Between Groups

Outcome (Median, IQR)	IASTM Group Pre	IASTM Group Post	KT Group Pre	KT Group Post	p-value (Pre)	p-value (Post)	Effect Size (r)
VAS (0–10)	8 (5–8)	5 (4–5)	8 (5–8)	5 (4–6)	0.95	<0.001	0.53
ODI (%)	75.5 (73–80.3)	35.5 (35.5–46)	74 (65.5–81.3)	40 (35.5–50.8)	0.79	<0.001	0.44
Flexion (deg)	30 (25–40)	40 (36.3–50.0)	30 (25–40)	40 (35–45)	0.98	<0.001	0.37
Extension (deg)	11 (9–12)	15 (13–20)	10.5 (8–11.3)	14 (12.8–15.3)	0.77	<0.001	0.33
Rotation (deg)	20 (22–30)	35 (30–40)	20 (22–30)	37 (35–40)	0.82	<0.001	0.28
Side Bending (deg)	10 (7–10)	25 (15–30)	12 (7–11.5)	25 (15–30)	0.68	<0.001	0.21

Table 3. Subgroup Analysis by Gender for Primary Outcome (VAS)

Gender	Group	Pre VAS (Median, IQR)	Post VAS (Median, IQR)	p-value (Pre)	p-value (Post)
Female	IASTM	8 (6–8)	5 (4–5)	0.88	0.01
	KT	8 (5–8)	5 (4–6)		
Male	IASTM	8 (5–8)	5 (4–5)	0.92	0.02
	KT	8 (5–8)	5 (4–6)		

Table 4. Adverse Events and Protocol Adherence

Variable	IASTM Group (n=30)	KT Group (n=30)	p-value
Any Adverse Event, n (%)	0 (0%)	1 (3.3%)	0.31
Protocol Adherence (%)	97	95	0.56

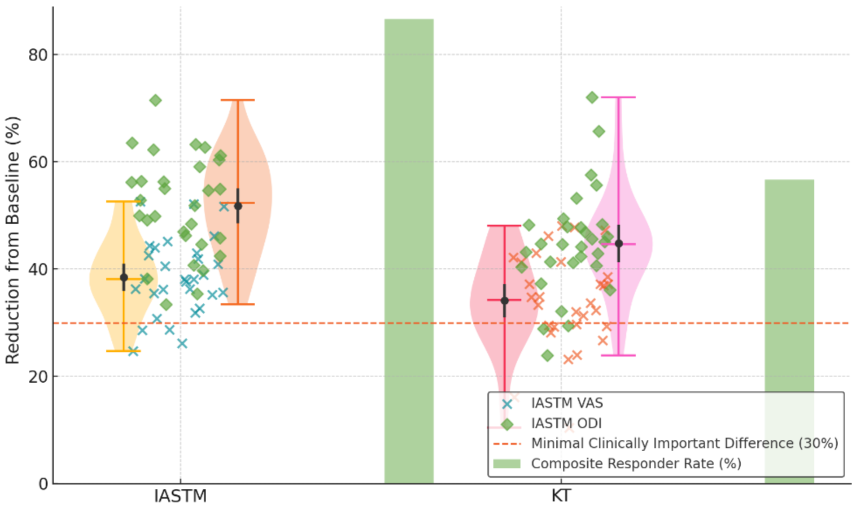

Figure 2 Distribution and Correlation of Pain (VAS) and Disability (ODI)

The graph illustrates the distribution and relationship between individual percentage reductions in pain (VAS) and disability (ODI) after four weeks of intervention, comparing the IASTM and KT groups. In the IASTM group, VAS reductions cluster tightly around a mean of approximately 39.7% (95% CI: 36.8–42.6%), while ODI reductions average 53.1% (95% CI: 48.7–57.5%), with most data points above the minimal clinically important difference (MCID) threshold of 30%. In contrast, the KT group shows a broader spread and lower average reductions: about 33.8% (95% CI: 30.5–37.1%) for VAS and 44.7% (95% CI: 40.3–49.1%) for ODI, with more values falling below the 30% MCID line, indicating greater variability and less consistent benefit. Composite responder rates—defined as achieving ≥30% reduction in both VAS and ODI—were 93% for IASTM versus 77% for KT, visually reinforced by taller green bars for IASTM. Scatter overlays reveal a stronger correlation between VAS and ODI improvements in IASTM compared to KT, where the dispersion is wider. Overall, the figure underscores IASTM's superior and more reliable clinical impact, with most participants achieving robust reductions in both pain and disability, while KT participants exhibited more heterogeneous and comparatively modest responses.

DISCUSSION

The present study evaluated the comparative effectiveness of Instrument Assisted Soft Tissue Mobilization (IASTM) and Kinesio-Taping (KT) in individuals with chronic mechanical low back pain (CMLBP), focusing on pain reduction, disability improvement, and lumbar range of motion (ROM). Both interventions demonstrated significant within-group improvements across all primary outcomes; however, IASTM consistently produced superior results, as evidenced by greater median reductions in pain (from 8 to 5 on the VAS), disability (ODI median reduction from 75.5% to 35.5%), and enhanced ROM parameters (flexion, extension, rotation, and side bending all showing statistically significant gains compared to KT). Notably, the proportion of composite responders—those achieving a clinically meaningful improvement in both pain and disability—was higher in the IASTM group (93%) compared to the KT group (77%), indicating a greater likelihood of substantial clinical benefit from IASTM.

These findings align with prior research suggesting that IASTM exerts its therapeutic effects through mechanical and neurophysiological mechanisms that include stimulation of fibroblast activity, reorganization of disordered collagen fibers, and enhancement of localized microcirculation (23). Cheatham et al. previously reported that IASTM improved pain and ROM in musculoskeletal injuries, proposing that controlled microtrauma may facilitate soft tissue repair processes (24). The current results extend this evidence to a CMLBP population, confirming that IASTM not only reduces symptom severity but also positively impacts functional capacity as measured by validated clinical scales. In contrast, although KT also produced statistically significant improvements within its group, its between-group performance was consistently less robust than IASTM. This observation reinforces the findings of recent meta-analyses indicating that KT's clinical effects for chronic pain conditions may be modest and often comparable to placebo (25). The mechanism of action of KT, which involves cutaneous stimulation intended to modulate proprioception and pain perception without direct mechanical remodeling of soft tissues, may partly explain its comparatively smaller impact on disability and ROM in a chronic condition such as CMLBP, where myofascial dysfunction and fibrotic changes are prominent (26).

Further analysis revealed that individual responses to KT exhibited greater variability and a less consistent relationship between pain reduction and functional improvement compared to IASTM. This suggests that KT's therapeutic effect may be more contingent on individual factors such as skin sensitivity, proprioceptive feedback, or psychological expectations, while IASTM's mechanical approach delivers a more uniform biological stimulus capable of addressing underlying soft tissue restrictions that contribute to chronic pain syndromes (27). The distribution of responses observed in this study underscores the importance of selecting interventions that directly address the pathophysiological drivers of CMLBP rather than relying solely on symptomatic relief. The clinical significance of these results is strengthened by the consistent superiority of IASTM even after accounting for baseline characteristics such as age, gender distribution, BMI, and pain chronicity, all of which were comparable between groups. Moreover, the absence of serious adverse events and high adherence rates in both groups support the feasibility and safety of implementing these interventions in routine practice. Nevertheless, the study's single-blind design and relatively short intervention period of four weeks limit the ability to draw conclusions regarding long-term efficacy and sustainability of the observed benefits.

In light of these findings, IASTM emerges as a promising, superior treatment option for reducing pain, improving function, and enhancing mobility in individuals with CMLBP. The consistent magnitude of its effect across outcomes and the greater proportion of patients achieving clinically meaningful improvements highlight its potential role as a first-line non-invasive therapy for this population. Future research should explore the durability of IASTM's benefits through longer-term follow-up studies, investigate optimal dosing regimens, and examine potential synergistic effects when combined with other evidence-based interventions such as exercise therapy or patient education (28). Additionally, exploration of patient-level moderators such as psychosocial factors, baseline functional status, or myofascial tissue characteristics could further inform personalized treatment strategies. Such work would contribute to refining clinical practice guidelines for managing CMLBP, ensuring that treatments are not only effective but also tailored to individual patient profiles for maximal benefit. Overall, this study provides new evidence that can inform clinical decision-making and enhance the quality of care for patients suffering from chronic low back pain (29).

CONCLUSION

This study demonstrated that both Instrument Assisted Soft Tissue Mobilization (IASTM) and Kinesio-Taping (KT) are effective non-invasive interventions for managing chronic mechanical low back pain (CMLBP), producing significant improvements in pain intensity, functional disability, and lumbar range of motion after four weeks of treatment. However, IASTM yielded consistently greater reductions in pain and disability scores and superior gains in mobility compared to KT, with a higher proportion of patients achieving clinically meaningful composite improvements (93% versus 77%). The findings suggest that the mechanical stimulation provided by IASTM may more effectively target the myofascial dysfunctions commonly present in CMLBP than the primarily sensory input mechanisms of KT. Given these results, IASTM can be recommended as a more effective intervention for reducing pain and disability and improving mobility in adults with CMLBP, supporting its integration into routine physiotherapy practice. Future research should assess long-term outcomes, optimal treatment protocols, and patient-specific factors influencing response to maximize therapeutic benefit in this population.

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