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Review Article

Impact of Instrument-Assisted Soft-Tissue Mobilization (IASTM) on the Functional Status of Myofascial Structures: Scoping Literature Review

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Abstract

Background: Instrument-Assisted Soft-Tissue Mobilization (IASTM) is a non-invasive technique using specialized tools to treat soft tissue dysfunctions and enhance myofascial function. It improves joint range of motion through mechanical stimulation. Comparable to manual therapies like deep friction massage, IASTM may offer advantages by applying greater force, reducing both treatment time and physical strain on the practitioner.

Methods: In this scoping literature review, a thorough search was performed across PubMed, Cochrane, and Google Scholar. The articles were screened according to specific inclusion criteria, ultimately identifying 14 studies: 12 randomized controlled trials and 2 quasi-experimental studies. These studies were selected for their relevance to myofascial conditions and IASTM interventions, while excluding those that were irrelevant or did not focus on IASTM.

Results: The findings reveal that both IASTM and stretching effectively improved ankle dorsiflexion ROM. However, neither intervention significantly altered pain sensitivity or muscle stiffness.

Conclusion: IASTM was safe and effective in reducing joint stiffness, but its impact on muscle properties was limited. The study highlights the need for further research to explore additional outcome measures, refine intervention protocols, and investigate tool designs to optimize therapeutic effectiveness. Limitations include variability in methodologies and small sample sizes, which may affect the result' consistency and generalizability.

Keywords: Ankle, Articular, Friction, Goals, Massage, Myofascial release therapy, Pain, Range of motion, Sample size, Search engine

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Introduction

Instrument-Assisted Soft-Tissue Mobilization (IASTM) is a non-invasive therapeutic technique that uses specialized tools to enhance the function of myofascial tissues. These tools, designed in various shapes and materials, help diagnose and treat soft tissue conditions more efficiently by allowing greater force application, reducing treatment time, and minimizing practitioner fatigue. IASTM is believed to produce clinical outcomes similar to manual therapies like deep friction massage and myofascial release (1-6). IASTM is a method that involves the use of tools like bars or spurtles to apply mechanical stimulation to soft tissues including muscles, deep fascia, and tendons. This technique involves varying the intensity of stimulation by stroking the skin, which is thought to improve joint range of motion. The proposed mechanisms for this effect include reducing muscle activity or altering central nervous system responses, potentially by influencing mechanoreceptors within the targeted tissues (7,8). IASTM employs specialized tools with angled edges to aid clinicians in assessing and mobilizing soft tissue (9). Over time, various case reports have highlighted the success of IASTM in treating a range of conditions. This technique, whether used on its own or in conjunction with other treatments, has proven effective for addressing issues such as tendinopathies, myofascial pain and restrictions like chronic calf pain and hamstring tightness. Additionally, it is used to address soft tissue injuries, muscle strain. Furthermore, it aids in reducing scar tissue and adhesions that result from surgeries or injuries, Lastly, it helps manage the degeneration of soft tissues due to overuse or aging, often improving mobility and reducing pain in muscles, tendons, and fascia (10). Clinicians have employed a diverse array of tools with various specifications, including differences in manufacturer, materials (such as steel, bone, or stone), shapes, sizes, and weights, reflecting their individual training backgrounds and levels of clinical expertise. Examples of such instruments include RockBlades Mullet (RB), EDGE Mobility System (EM), TécnicaGavilán Ala (TG), Graston Technique (GT), and Fascial Abrasion Technique (FAT) Stick (10-13).

Animal studies investigating the impact of IASTM (Instrument-Assisted Soft Tissue Mobilization) on tissue healing provide the primary evidence for determining the appropriate force application in this technique (14-16). Research consistently shows that applying greater force enhances fibroblastic healing processes, including recruitment and maturation. This suggests a potential correlation between the intensity of force applied during IASTM and the level of fibroblastic activity stimulated (17,18).

Professionals increasingly utilize IASTM to address myofascial restrictions. This technique involves using a specialized tool to deliver a mobilizing force that aims to improve the condition of scar tissue and release myofascial adhesions (19,20). Utilizing instruments rather than relying solely on a clinician's hands is believed to offer a mechanical advantage. This approach may enable deeper penetration and potentially enhance the precision of treatment delivery (21), eliminate any instances of plagiarism and minimize the physical strain experienced by clinicians during treatment procedures (22,23). The use of IASTM is believed to promote the remodeling of connective tissue by facilitating the breakdown of excessive fibrous tissue and encouraging the repair and regeneration of collagen through the activation of fibroblasts (19,24). This can lead to the disintegration of scar tissue, the elimination of adhesions, and enhanced flexibility in fascial tissues (17-20,22,25).

While numerous studies have been conducted, some researchers have chosen IASTM, but results regarding the efficacy of this technique have been inconclusive. Therefore, a thorough review of the current literature is necessary to provide clarity on whether IASTM is superior to traditional treatment methods or if it demonstrates significant improvements in outcome measures. The aim of this study is to evaluate recent research and provide insights into the effectiveness of physiotherapy interventions involving IASTM.

Materials and Methods

A scoping review is a literature review designed to investigate and outline the current research on a specific topic. Its primary objective is to uncover key concepts, identify gaps in existing knowledge, and assess the types of evidence available. This approach is particularly beneficial for complex topics or those that have not been extensively reviewed. In contrast to systematic reviews, which focus on answering specific research questions through a detailed evaluation of high-quality studies, scoping reviews adopt a wider perspective. They encompass various study designs and methodologies, aiming to provide a general overview rather than an exhaustive quality assessment. While systematic reviews seek to draw precise conclusions and recommendations, scoping reviews allow researchers to better understand the broader context of a topic and highlight areas that require further exploration (26). In this scoping literature review, comprehensive literature search was performed during the academic year 2022-23, focusing on research from the past 10 years. PubMed Cochrane library, Google scholar databases the keyword that used "Instrument-assisted soft tissue mobilization", Myofascial syndrome and Myofascial Structures bullion concept such as "And" and "OR" were used to search the articles in all the databases. The inclusion criteria were as follows: studies were required to evaluate the effects of IASTM on the functional status of myofascial structures, including any outcomes related to pain, range of motion, or overall functional improvement. Eligible studies included Randomized Controlled Trials (RCTs) written in English, and conducted with human participants. Additionally, studies had to provide clear data on the intervention specifics, such as the duration and frequency of IASTM application, as well as the characteristics of the study population, including age, gender, and baseline condition. It is important to note that the protocol for this scoping review was not prospectively registered. To address potential bias, particularly from studies conducted by manufacturing companies, the methodology and sources of funding were carefully evaluated in each study. Preference was given to independent research, and studies were critically analyzed from manufacturers for any signs of bias, such as lack of proper controls or overemphasis on positive outcomes (Table 1). The exclusion criteria encompassed studies that focused solely on non-myofascial conditions or interventions other than IASTM, such as pharmacological treatments or non-invasive modalities without specific mention of IASTM. Articles not meeting methodological quality standards or those lacking detailed outcome measures pertinent to the functional status of myofascial structures were also excluded. Additionally, reviews, editorials, opinion pieces, and studies with insufficient data on the intervention or participant characteristics were excluded to ensure a comprehensive and relevant selection of studies for

Table 1. Cochrane risk of bias table of included studies

Author, year	Eligibility criteria	Random allocation	Concealed allocation	Similar baseline	Subject blinding	Therapist blinding	Assessors blinding	Adequate follow-up	Intention to treat analysis	Between group comparison	Point estimates & variability	Score
Kevin Laudner *et al* 2014	+	+	?	+	-	?	?	?	+	+	+	6
JP Vardiman J. *et al* 2015	+	+	-	+	?	?	?	-	-	-	+	4
Nicole MacDoanld, 2016	+	+	+	+	-	-	+	-	+	+	+	8
Konstanti-s Fousekis *et al* 2016	+	+	-	+	?	?	?	-	+	+	+	6
Dawn T. *et al* 2017	+	+	+	+	?	?	?	-	+	-	+	8
Weiqing Ge *et al* 2017	+	+	?	+	?	?	?	-	+	-	+	5

Contd. table 1.

Corrie Myburgh *et al* 2018	+	+	+	+	+	+	+	-	+	+	+	10
Carrie A. *et al* 2018	+	+	-	+	?	?	?	-	+	+	-	5
Naoki Ikeda *et al* 2019	+	+	-	+	?	?	?	-	+	+	+	6
Leanna J. Gunn *et al* 2019	+	+	-	+	?	?	?	+	+	+	-	6
Haytham M. *et al* 2020	+	+	-	+	?	?	?	-	+	+	+	6
Nickolai JP Martonick *et al* 2023	-	+	-	+	-	-	-	+	+	+	+	6
Ujjwal Gupta *et al* 2023	+	+	+	+	+	?	?	?	+	+	+	8
Andreas Brandl *et al* 2023	+	-	-	+	?	?	?	+	+	-	+	5

the review.

Results

The selection process of articles summarized using PRISMA flow diagram (Figure 1) and the study details (sample size, interventions, outcomes, results and conclusion) were furnished in table 2.

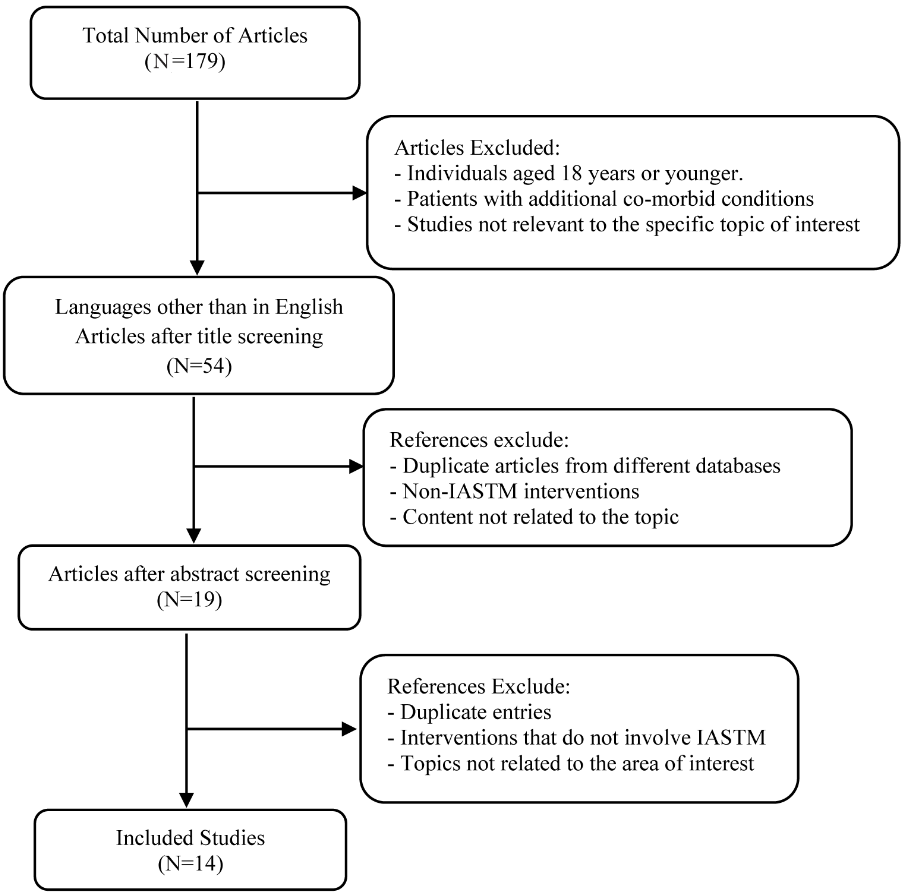

Figure 1. PRISMA flow diagram for selection of articles.

Table 2. Characteristics of the included studies

Author & year	Study design	Control group (Group-I)	Experimental group (Group II)	(Group) III	(Group IV)	Outcome variables (assessment tools)	Result
Kevin Laudner *et al* 2014	Blinded randomized design	No treatment (n=18)	One application of IASTM to posterior shoulder (n=17)	-	-	Passive GH horizontal adduction ROM (digital inclinometer); passive GH internal rotation ROM (digital inclinometer)	IASTM treatment increased GH horizontal adduction and internal rotation ROM acutely. Study shows IASTM effective for improving GH ROM in baseball players
J.P. Vardiman, J. *et al* 2015	Randomized controlled study	11 healthy men were measured for MTS, PROM, PRT and MVCPT after 24h, 48h and 72h after IASTM	IASTM on plantar flexors (n=11)	-	-	Passive Range of Motion (PROM): Measured using an isokinetic dynamometer. Maximal Voluntary Contraction Peak Torque (MVPT): Indicates the maximum strength exerted voluntarily. Surface EMG: Records electrical activity of muscles. Perception of Functional Ability Questionnaire: Assesses individuals' views on their functional capabilities	IASTM may reduce inflammation and improve muscle recovery post-exercise. IASTM can positively impact intramuscular inflammation, pain, ROM, and strength
Nicole MacDoanld, 2016	A pretest-posttest radnomized control design.	Control group (n=16)	IASTM quadriceps treatment group (n=16)	IASTM triceps surae treatment group (n=16)	-	Patient's standing height was first measured by using the Vertec. Then maximum jump height was recorded on Vertec, Peak power (PP) and peak velocity (PV) were measured using Tendo power analyzer	IASTM does not detrimentally affect lower extremity muscle performance. Future research should focus on muscle performance effects in myofascial pathology
Konstantinos Fousekis *et al* 2016	Randomized controlled study	No treatment (n=10)	Ergon-IASTM Technique (n=20), 3 treatment sessions over a 3 week period	Static application of cupping therapy (n=20), 3 treatment sessions over a 3 week period	Ischemic pressure (n=20), 3 treatment sessions over a 3 week period	PPT measurements (mechanical algometer) and pain sensitivity (visual analogue scale)	Ergon IASTM technique is more effective in reducing MTrPs tenderness. Future trials needed for definitive conclusions on therapeutic interventions

Contd. table 2.

Dawn T. *et al* 2017	Randomized controlled study	No treatment was rendered to people and assessed on the initial day and then 3 weeks later (post-test) (n=14)	6 IASTM sessions over a 3 week period (at least 2 days between sessions)	-	-	PPT measurements using dolorimeter	IASTM reduces MTrP pain threshold effectively over three weeks. Study protocol development and assessment are crucial for intervention research. Future studies should include additional outcome measures for comprehensive analysis
Weiqing Ge *et al* 2017	This study was a quasi-experimental study using single group pretest-posttest design	23 subjects, 14 males & 9 females were recruited	IASTM application at anterior thigh regions	-	-	Two-point discrimination was measured 3 times using an electrical digital caliper & pain threshold measurements using a hand-held dynamometer	IASTM affects 2-point discrimination but not pain threshold. No significant soft tissue deformation occurred after IASTM application. Study provides insight into IASTM's neurophysiological effects on mechanosensitive neurons
Corrie Myburgh *et al* 2018	A randomized intervention study with a blinded design was implemented, where each participant acted as their own control	20 healthy males were randomly allocated to active self-stretch of triceps surae muscles	IASTM was given to 20 healthy males	-	-	Range of motion (Digital inclinometer); Pressure pain sensitivity (digital algometer) and petechiae occurrence	No significant differences in ankle range of motion between groups. Pressure-pain sensitivity remained unchanged post-intervention. No petechiae observed after high-pressure IASTM
Carrie A. *et al* 2018	Randomized controlled study	60 healthy participants were randomly allocated, control group (n=20)	IASTM (n=20)	Stretching exercises (n=20)	-	Dorsiflexion range of motion and lunge test (WBLT)	Both IASTM and stretching improved ankle dorsiflexion ROM in weight-bearing conditions. Sample size of 57 was deemed sufficient for primary analyses. Baseline characteristics of study participants were assessed

Contd. table 2.

Naoki Ikeda *et al* 2019	Randomized controlled crossover study	A crossover study included 14 healthy volunteers (11 men & 3 women)	IASTM was performed on the skin over the posterior part of lower leg for 5 *min* and targeted soft tissues	-	-	Dorsiflexion range of motion and ankle joint stiffness (isokinetic dynamometer); Muscle stiffness (shear wave elastography)	IASTM improves ankle dorsiflexion range of motion and stiffness. No effect on stretch tolerance or muscle stiffness of MG and SOL. Joint stiffness reduction contributes to improved joint range of motion
Leanna J. Gunn *et al* 2019	Randomized controlled study	PNF study (active straight leg raise) (n=23)	IASTM study (passive straight leg raise) (n=17)	-	-	Hamstring flexibility (PSLR & ASLR)	PNF and IASTM techniques improve hip ROM significantly over static stretching. Both interventions are reliable and effective alternatives to static stretching
Haytham M. *et al* 2020	Randomized controlled study	IASTM using an M2T blade twice a week for 4 weeks in addition to stretching exercise (n=20)	SM twice a week for 4 weeks in addition to stretching exercises (n=20	-	-	Pain intensity (visual analogue scale); pressure pain threshold (algometer); neck function (NPDI)	Both IASTM and SM improved pain and function in patients No significant differences between the two treatment groups in outcome measures
Andreas Brandl *et al* 2023	Quasi-experimental study with one intervention group	21 healthy volunteers were selected	IASTM (n=21)	-	-	Lumbar bioimpedance (bioimpedance analysis) TLF stiffness on MP1 (indentometry); skin temperature (infrared thermometer)	Bioimpedance increased significantly from 58.3 to 60.4 ohm after treatment Temperature increased significantly from 36.3 to 36.6 degrees Celsius post-treatment No significant change in lumbar myofascial stiffness was observed
Ujjwal Gupta *et al* 2023	Pretest and posttest experimental comparative design	Foot exercises for four weeks (n=20)	Soft tissue mobilization (IASTM) for four weeks (n=20)	Static stretching of gastro-cnemius soleus complex, tibialis anterior and achilles tendon in addition to foot exercises (n=20)	-	Foot posture index (morphologic foot assessment); Pain, disability and activity limitation (foot function index); Dynamic balance and postural control (balance assessment); Range of motion (goniometer)	IASTM group showed significant improvement in flexibility, foot function, and balance FFI increased remarkably in the stretching group compared to the control IASTM with foot exercises is preferred for patients with pronated foot

Contd. table 2.

Nickolai JP Martonick *et al* 2023	Randomized crossover study	9 athletic trainers were selected who have previously completed IASTM training	Passive Range of Motion (PROM): Measured using an isokinetic dynamometer Maximal Voluntary Contraction Peak Torque (MVPT): indicates the maximum strength exerted voluntarily. Surface EMG: Records electrical activity of muscles. Perception of functional ability questionnaire: assesses individuals' views on their functional capabilities	-	-	Peak (Fpeak) and mean (Fmean) forces were recorded using 2 (grip type)×5 (IASTM instrument)	Two-handed grip produces greater force than one-handed grip. Instrument shape influences force production more than instrument weight Instrument length affects force production with one or two-handed grips

GH: Glenoheumral, ROM: Range of Motion, PROM: Passive Range of Motion, MVPT: Maximal Voluntary Contraction Peak Torque, EMG: Elctromyography, PP: Peak power, PV: Peak Velocity, PPT: Presure pain threshold, MTrPs: Myofascial trigger point, NPDI: Neck pain disability index, TLF: Thoracolumbar fascia.

Discussion

This study offers valuable insights into the effects of Instrument-Assisted Soft Tissue Mobilization (IASTM) and stretching on ankle Range of Motion (ROM), pain sensitivity, muscle stiffness, and function. While no significant differences in ankle ROM were found between the groups, several key observations merit discussion to fully elucidate these findings.

Both IASTM and stretching were effective in improving ankle dorsiflexion ROM under weight-bearing conditions, indicating that these interventions can positively impact joint flexibility. However, post-intervention pressure-pain sensitivity remained unchanged, suggesting that while these treatments improve ROM, they do not significantly alter pain sensitivity. This finding is important as it underscores the specificity of these interventions in enhancing joint function without affecting pain perception, which can be crucial for ensuring treatment compliance and patient satisfaction.

Previous research by Cheatham *et al* similarly demonstrated that IASTM can enhance joint ROM and muscle flexibility without significantly impacting pain sensitivity, consistent with the present findings (27). On the other hand, research by Markovic *et al* suggested that IASTM may increase pain tolerance alongside ROM improvements, implying potential variability in treatment effects based on application techniques or patient demographics (28).

IASTM applied with high pressure did not result in adverse skin effects, such as petechiae, indicating its safety. However, it did not significantly affect stretch tolerance or the stiffness of the gastrocnemius (MG) and Soleus (SOL) muscles, suggesting that while IASTM enhances joint ROM, its impact on muscle properties may be limited. Nevertheless, the reduction in joint stiffness highlights IASTM's potential to improve functional outcomes, particularly in patients with restricted joint mobility. Research by Behm *et* *al* supports these findings, indicating that IASTM can reduce joint stiffness and improve ROM without significantly altering muscle stiffness. In contrast to Behm *et al* (29), Miners and Bougie reported that IASTM improved both muscle stiffness and elasticity, suggesting that variability in outcomes may depend on the type of muscle treated or the duration of the intervention (30). Both IASTM and stretching demonstrated effectiveness in improving pain and function, with no significant differences observed between the two groups. This finding suggests that both interventions may be viable options for achieving similar therapeutic outcomes, providing flexibility for clinicians to tailor treatments based on patient preferences or specific clinical goals.

Sullivan *et al* similarly found comparable improvements in pain and function between IASTM and stretching in patients with chronic ankle instability (31). However, Hopper *et al* demonstrated that IASTM may outperform stretching in improving functional outcomes among athletes, underscoring the importance of contextual factors such as patient population or performance goals in determining treatment effectiveness (32).

The study suggests that IASTM might reduce inflammation and enhance muscle recovery after exercise, influencing factors such as intramuscular inflammation, pain, ROM, and strength. The observed decrease in Muscle Trigger Point (MTrP) pain threshold over the course of three weeks supports the efficacy of IASTM in managing localized muscle pain. Additionally, IASTM's impact on two-point discrimination and its influence on pain threshold suggest potential neurophysiological modulation, possibly through the activation of mechanosensitive neurons.

Research by Loghmani and Warden aligns with these findings, demonstrating IASTM's ability to modulate neurophysiological responses, reduce inflammation, and promote muscle recovery (33). On the other hand, Miller and Rockey observed no significant neurophysiological changes following IASTM treatment, suggesting that the primary benefits of the intervention may be biomechanical rather than neurophysiological (34).

The efficacy of IASTM in enhancing Glenohumeral (GH) joint ROM in baseball players highlights its potential use in sports medicine. The physiological changes observed post-treatment suggest that further exploration is required to optimize therapeutic outcomes for specific populations, such as athletes or individuals with musculoskeletal disorders.

Implications for research

This study underscores the effectiveness of both IASTM and stretching in improving ankle dorsiflexion range of motion and functional outcomes. The findings suggest that future research should focus on exploring additional outcome measures, such as muscle performance and neurophysiological effects, to gain a more comprehensive understanding of these interventions. Additionally, refining intervention protocols and investigating the long-term effects of IASTM and stretching will be crucial for optimizing therapeutic practices and patient outcomes.

Conclusion

This study demonstrated that both IASTM and stretching are effective in improving ankle dorsiflexion range of motion and functional outcomes. Despite no significant differences between the two interventions in pain sensitivity or muscle stiffness, both techniques enhanced joint flexibility and function. IASTM showed promise in reducing inflammation and improving muscle recovery, while the impact on specific neurophysiological parameters warrants further investigation. These findings offer flexibility in clinical practice, supporting the use of both IASTM and stretching as viable options for managing ankle mobility issues. Future research should explore additional outcomes and refine protocols to optimize therapeutic effectiveness.

Limitations

This review has several limitations. Firstly, the variability in study methodologies and outcome measures across the reviewed literature may affect the consistency and comparability of results. Secondly, the limited number of studies on certain aspects, such as the neurophysiological effects of IASTM, restricts the depth of analysis. Additionally, the short duration of some studies and small sample sizes may impact the generalizability of the findings. Future reviews should address these limitations by including more standardized methods and larger, more diverse study populations.

Conflict of Interest

Authors declare no conflict of interest.

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