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The effects of instrument-assisted soft tissue mobilization compared to other interventions on pain and function: a systematic review

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Background: Instrument-assisted soft tissue mobilization (IASTM) is an emerging intervention in physical therapy. With the increasing prevalence of pain and disability associated with musculoskeletal impairments, it is essential to identify the most effective treatment strategies.

Objective: To systematically examine evidence on the effectiveness of IASTM, compared to other interventions on patients with pain and disability resulting from musculoskeletal impairments.

Methods: Numerous databases were searched using the terms Instrument Assisted Soft Tissue, Pain, Function, Graston, and soft tissue mobilization (STM). Inclusion criteria included: randomized clinical trials on patients with musculoskeletal impairments, STM had to be a treatment intervention, performed on human subjects, and had to capture a measure of pain or function. Articles were excluded if they were not published in English or if the subjects were of the pediatric or geriatric populations. Included articles were appraised using the Physiotherapy Evidence Database (PEDro) scale.

Results: Seven studies met the inclusion criteria. All seven articles scored a minimum 4/10 on the PEDro scale. The studies involved treatment of numerous anatomical locations and the majority of the studies demonstrated significant improvements in pain and/or range of motion when compared to control or other conservative treatment groups.

Conclusions: These outcomes support the idea that IASTM may have an impact on physiological changes by providing an increase in blood flow, reduction in tissue viscosity, myofascial release, interruption of pain receptors, and improvement of flexibility of underlying tissue. It is suggested that IASTM is an effective treatment intervention for reducing pain and improving function in less than a three-month period.

Keywords: Instrument assisted, Soft tissue, Mobilization, Pain, Function, Musculoskeletal

Introduction

Musculoskeletal conditions affect more than 1.7 billion people worldwide,¹ are the second largest cause of disability, and fourth largest impact on overall health when considering disability worldwide.¹ By the year 2040, it is predicted that musculoskeletal impairments will impact 21% of adults older than the age of 65, and 4% of adults older than the age of 85 in the United States.¹

Conservative therapeutic interventions for musculoskeletal conditions leading to pain and disability include soft tissue mobilization (STM),² myofascial release,³ foam rolling,⁴ strengthening,⁵ and various stretching techniques.⁶ With the increasing prevalence of pain and disability associated with musculoskeletal impairments, it is essential to identify the most efficacious interventions to maximize patient outcomes and decrease the societal burden.

Instrument-assisted soft tissue mobilization (IASTM) is an emerging intervention commonly used in physical therapy practice based on principles introduced by James Cyriax.⁷ IASTM can be completed with a variety of different tools, but the most common method of IASTM used in practice is with stainless steel instruments. The instruments are designed with beveled edges,⁸ and often have a variety of different contours allowing the edges to conform to different anatomical locations on the body.⁹ When using the instrument, the clinician typically will stroke the skin in a multidirectional fashion while holding the instrument at a 30°–60° angle.^{10,11} It has been reported that by using the instrument in this fashion, the clinician is able to detect soft tissue irregularities^{10,11} through vibratory feedback.⁷ When comparing traditional STM to IASTM, it is suggested that STM with the unaided hand is less accurate in detecting restrictions and/or adhesions than when using IASTM.⁹ Furthermore, the instrument reportedly allows for greater depth of penetration, while minimizing

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compressive forces to the interphalangeal joints of the clinician's hands.⁷ The physiological mechanism associated with IASTM is proposed to be through introduction of microtrauma to the affected tissue and facilitating the inflammatory response phase of the healing cascade.¹² IASTM studies on rat models regarding the mechanism of healing demonstrated increased fibroblast proliferation, collagen synthesis, maturation, and optimal alignment.^{13,14}

There are multiple studies that suggest that treating acute and chronic musculoskeletal injuries with IASTM can decrease pain and improve function.^{15–18} Hammer¹⁶ reported data on three patients with musculoskeletal injuries who were treated with IASTM; one patient with supraspinatus tendinosis, one with achilles tendinosis, and one with plantar fasciosis.^{16,18} All patients reported a decrease in pain and an improvement in function post-IASTM treatment.^{16,18} Hammer and Pfefer¹⁷ used an IASTM technique on a patient diagnosed with low back pain and prolonged flexion posture and found an increase in lumbar range of motion (ROM) in all directions post-intervention.^{17,18} While many clinicians are using IASTM for the management of patients with musculoskeletal restrictions, controversy exists in the literature. Gulick¹⁰ conducted a study comparing IASTM to no intervention on the treatment of pain caused by myofascial trigger points (MTrPs).¹⁰ The study was conducted on individuals with MTrPs in both the right and left upper trapezius; one side was treated with IASTM, and the other went untreated. There were no significant differences found in pain change in the short-term when treating MTrPs with IASTM or leaving them untreated.¹⁰ The purpose of the current systematic review is to examine the current literature on IASTM, and review the evidence on the effects of using IASTM as a treatment intervention compared to other interventions on patients with musculoskeletal impairments with pain and disability.

Methods

Literature search

An extensive search was conducted in the following databases: CINAHL, PubMed, Academic Search Complete and through independent research. Databases were searched from 1 January 2000 through 17 December 2015. Search

terms used to identify relevant articles including Instrument Assisted Soft Tissue, Pain, Function, Graston, and STM in conjunction with Boolean Operators. Furthermore, a hand search of the reference lists of selected studies was completed in order to identify additional relevant studies to complete an all-inclusive literature search. Table 1 displays a full search of PubMed describing the combination of search terms.

Study selection

Following the initial search of the databases using the previously listed search terms, seven independent examiners reviewed the titles. If the titles were determined to be potentially eligible (Table 1), the abstracts were then reviewed. If the abstracts appeared relevant, the full-texts were obtained. All duplicates were eliminated.

Next, studies were screened to determine eligibility criteria. Inclusion criteria included: studies had to include patients with musculoskeletal impairments, STM had to be a treatment intervention, the study had to be a randomized clinical trial, and had to capture a measure of pain or function. Articles were excluded if they were not published in English, if there was no reported outcome data, or if patients were under the age of 16 or over the age of 65. All remaining articles were included in the systematic review. The study selection process is illustrated in Figure 1.

Data analysis

The Physiotherapy Evidence Database (PEDro) scoring criteria¹⁹ was used to calculate a methodological score for each study. The PEDro score was selected as the form of methodological assessment based on the scales reliability of scoring randomized control trials (RCTs).¹⁹ The PEDro score assesses the quality of RCTs using an 11-item scale scored on a range of 0–10, with each satisfied item contributing one point (item 1 is excluded in the total). Using the scale, the resulting articles were scored separately by two of the seven researchers to determine the quality of the selected RCTs in this study. If any differences in scoring were noted between the two researchers the article was scored by a third researcher. All PEDro scores were

Table 1 Results of PubMed database search

Search term(s)	Article results	Articles deemed not applicable	Number to be further screened
Augmented Soft Tissue Mobilization and Pain	4	4	0
Instrument Assisted Soft Tissue and Pain	18	7	11
Soft Tissue Mobilization and Pain and Function	485	476	9
Instrument Assisted Soft Tissue and Function	23	15	8
Graston and Function	8	0	8
Instrument Assisted Soft Tissue Mobilization and Benefits	0	0	0
Graston and Benefits	0	0	0
Instrument Assisted Soft Tissue Mobilization	20	12	8

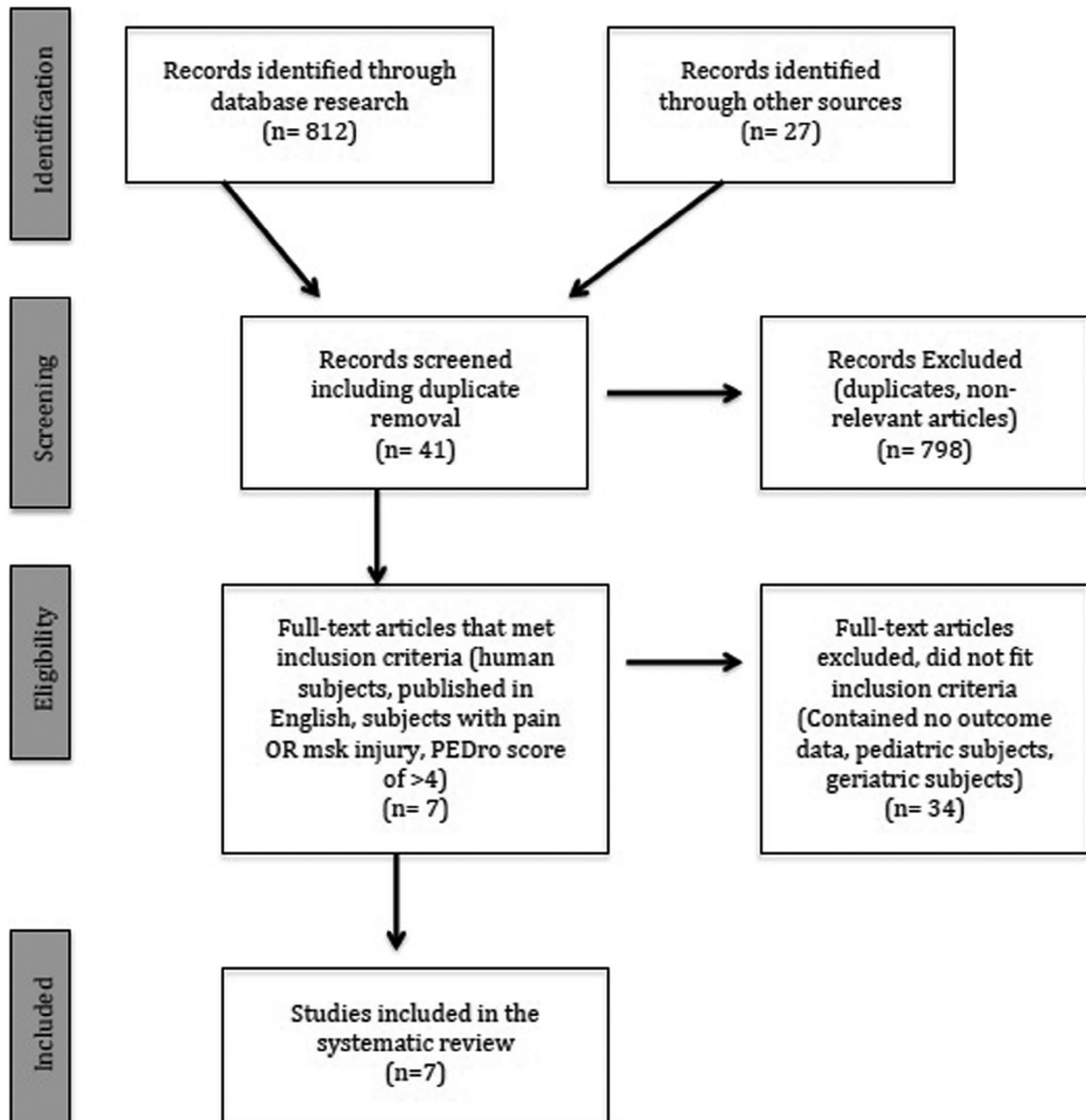


Figure 1 Article Selection Process

cross-examined by a separate researcher to eliminate the risk of bias in our review. PEDro scores. For this study, a PEDro score of $\geq 4/10$ was indicated as good methodological quality.²⁰

Data extraction

Using a standardized form, seven independent investigators extracted the data from the seven articles that were selected for this study. The standardized form included: participant characteristics, diagnostic criteria, interventions, follow-up procedures, outcome measures, and results. The information included in the standardized form was compared by separate authors to verify the accuracy and eliminate the risk of bias. The outcomes of interest were the effects of IASTM on musculoskeletal

impairments in relation to pain and ROM, as well as the article's PEDro score.

Results

Article selection

The extensive database search produced 812 potential articles for inclusion. After the removal of duplicate and/or non-relevant studies, 41 references were further analyzed. Seven^{4,10,18,21–24} of the 41 studies were deemed eligible for inclusion (Figure 1).

Methodological quality

Certain inclusion criteria were included in more than one study, such as not having any injury or surgery within last six months to two years and not having received any

Table 2 Participant characteristics by study

Study	Sample size	Gender	Age	Pathology
Blanchette et al. ²³	30, 3 dropped out (27)	Male (<i>n</i> = 12) Female (<i>n</i> = 15) (male/female) Control: (6/6) Experimental: (9/6)	Experimental (<i>n</i> = 15): 47 ± 10 years Control (<i>n</i> = 12): 46 ± 10 years	Lateral epicondylitis
Gulick ¹⁰	Phase 1: 27 Phase 2: 22	Phase 1: Male (<i>n</i> = 13) Female (<i>n</i> = 14) Phase 2: Male (<i>n</i> = 5) Female (<i>n</i> = 17)	Phase 1: 23.88 ± 1.13 years Phase 2: 24.82 ± 3.19 years	Phase 1: 2 MTrPs in upper back (1 L side, 1 R side) Phase 2: 1 MTrP
Lauche et al. ²¹	40, 1 dropped out (39)	Male (<i>n</i> = 9) Female (<i>n</i> = 30) (male/female) Control: (5/14) Experimental: (4/16)	49.23 ± 10.96 years	Non-specific low back or chronic neck pain
Laudner et al. ¹⁸	35	Male (<i>n</i> = 35)	IASTM (<i>n</i> = 17): 20.1 ± 1.2 years Control (<i>n</i> = 18): 20.3 ± 1.1 years	Posterior shoulder tightness in collegiate baseball players
Markovic ⁴ Sandrey et al. ²⁴	20 45, 9 subjects dropped out (36)	Male (<i>n</i> = 20) Male (<i>n</i> = 31) Female (<i>n</i> = 5) (male/female) DBT/GiSTM: (13/0) DBT/GiSTM-S: (10/2) DBT/C: (8/3)	19 ± 2 years DBT/GiSTM (<i>n</i> = 13): 18.4 ± 5.9 years DBT/GiSTM-S (<i>n</i> = 12): 17.7 ± 5.6 years DBT/C (<i>n</i> = 11): 17.1 ± .3 years	Healthy soccer players Ankle instability
Senbursa et al. ²²	30	Not specified	Self-training strength exercise (<i>n</i> = 15): 49.5 ± 7.9 years STM (<i>n</i> = 15): 48.1 ± 7.5 years	Shoulder impingement

treatment within the last year. Exclusion criteria were very similar among studies. Most studies excluded subjects if they had any of the following: cardiopulmonary issues, diabetes mellitus, coagulation disorders, traumatic onset of injury, or history of surgery.^{10,18,21–24}

The traits of participants for each study can be seen in Table 2. The number of subjects in the studies ranged from 20 to 45 (prior to dropouts). The average age of the participants was between 16 and 30 years. Gender distribution varied among studies. Four of the studies had a mixture of male and female subjects,^{10,21,23,24} two had only males,^{4,18} and one failed to specify.²² Pathologies of participants differed based on type of injury and anatomical location. However, outcomes pertained to either ROM and/or pain.

Table 3 details the PEDro scores for all articles. Three of the articles scored a 4/10,^{4,10,22} one article scored a 5/10,²³ two of the articles scored a 6/10,^{21,24} and one article received a 7/10.¹⁸ All of the articles reviewed scored at least a 4/10, which indicates that they are of good methodological quality.²⁰ Only two of the articles had blinding of the subjects^{22,24} and none of the articles had blinding of therapists who performed the intervention.

Table 4 describes the characteristics of each study that pertain to the methodology and results. This table also contains the overall PEDro score, and a breakdown of the primary strengths and weaknesses of each study. Common strengths were the random allocation of subjects (100%) and the use of a control group (71%); while common weaknesses were a lack of blinding of therapists (100%),

assessors (83%), subjects (71%), and small sample sizes (100%).

Neck

One study²¹ looked at the effectiveness of Gua Sha therapy in both chronic neck pain (CNP) patients and chronic low back pain (CLBP) patients. The results of CLBP patients will be discussed in the next paragraph. In regards to CNP, Lauche et al.²¹ found that the treatment group compared to the control group (who received no intervention), had significant decrease in pain reported via the visual analog scale (VAS), increased pain pressure threshold (PPT), and improvements in subjective reports of overall general health.

Back

Two studies^{10,21} investigated the effects of IASTM on back pain. Gulick¹⁰ measured the effects of Graston technique on MTrP located in the upper back. While there were no significant differences between the treatment and control, the study¹⁰ did find that there was a significant increase in pressure tolerance from pre-treatment to post-treatment. Lauche and colleagues,²¹ as previously mentioned, studied the effects of Gua Sha therapy on CLBP. The study²¹ concluded that while there were no changes in PPT in CLBP patients, there were significant decreases in pain reported by the VAS and improvements in overall health reported by the subjects, compared to the group who received no treatment.

Table 3 PEDro scale results

Author	Eligibility criteria specified	Subjects randomly allocated	Concealed allocation	Similar at baseline	Blinding of subjects	Blinding of therapists	Blinding of assessors	Measures obtained by at least 85%	All received treatment	Between group results	Point measures and measures of variability	Total PEDro Score
Blanchette et al. ²³	Yes	Yes	Yes	No	No	No	No	No	Yes	Yes	Yes	5
Gulick ¹⁰	Yes	Yes	No	Yes	No	No	No	Yes	No	Yes	No	4
Lauche et al. ²¹	Yes	Yes	Yes	Yes	No	No	No	Yes	No	Yes	Yes	6
Laudner et al. ¹⁸	Yes	Yes	No	Yes	No	No	Yes	Yes	Yes	Yes	Yes	7
Markovic ⁴	Yes	Yes	No	Yes	No	No	No	No	No	Yes	Yes	4
Sandrey et al. ²⁴	Yes	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Yes	6
Senbursa et al. ²²	Yes	Yes	No	No	Yes	No	No	No	No	Yes	Yes	4

Shoulder

There were two studies^{18,22} that looked at the effects of either manual therapy or IASTM on the shoulder. Senbursa and colleagues²² investigated whether an exercise program with or without manual therapy was more beneficial in decreasing pain and increasing shoulder ROM, and function in subjects with shoulder impingement. Both groups saw significant decreases in pain and increases in function; the manual group had significantly greater improvements than the exercise group alone²². Significant ROM improvements were only found in the manual group.²² Laudner et al.¹⁸ looked at the effectiveness of Graston technique on acute passive glenohumeral abduction and internal ROM in collegiate baseball players compared to a control group that received no treatment. The study¹⁸ found that the treatment group had greater acute ROM improvements compared to the control group.

Elbow

One study²³ looked at the effectiveness of Graston technique on lateral epicondylitis. At six weeks, subjects treated with Graston technique had significant decrease in the Patient Rated Tennis Elbow Evaluation (PRTEE) and pain, which was recorded using the VAS.²³ These results remained consistent at three months.²³ Subjects in the control group did not see significant changes until three months.²³ Increases in pain-free grip strength (PFG) were seen in both groups starting at the six-week mark.²³

Hip and knee

One study⁴ evaluated the acute effects of Foam Rolling (FR) vs. Fascial Abrasion Technique (FAT), a form of IASTM, on hip and knee PROM in healthy male soccer players. Both groups saw significant increase in hip and knee ROM immediately following treatments, but the IASTM group had greater gains in ROM than the FR group.⁴ Twenty-four hours after treatment, the IASTM group maintained significantly higher hip and knee ROM, while the FR group regressed to pre-treatment values.⁴

Ankle

One study²⁴ compared the effects of a Dynamic Balance Training (DBT) program with and without Graston technique on chronic ankle instability. After four weeks, all groups improved on the Foot and Ankle Measurement (FAAM), the FAAM Sport, ankle ROM, and the Star Excursion Balance Test (SEBT).²⁴ There were no significant differences between groups, but the largest effect size was seen with the group including Graston technique.²⁴

Discussion

The purpose of the current systematic review was to examine the available evidence for the use of IASTM as a treatment intervention compared to other interventions

Table 4 Characteristics of the studies reviewed

Study	Condition	Intervention	Groups	Outcomes	Time to follow up	Results
Blanchette et al. ²³	Lateral Epicondylitis	15 pts in IASTM group received Graston 2x/week for 6 weeks 15 pts in control group received education on natural progression of LE, proper work ergonomics at computer, stretches, and benefits of first level analgesics	1. IASTM: Graston technique 2. Control: Pt education	Patient Reported Tennis Elbow Evaluation (PRTEE), Pain via VAS, and Pain free grip strength (PFG)	6 weeks after initial treatment and 3 months after initial treatment	Significant changes in PRTEE and VAS for IASTM group at 6 weeks and at 3 months. Control group only had significant changes at 3 months. Both groups had significant increases in PFG at 6 weeks and 3 months
Gulick ¹⁰	Myofascial Trigger Points (MTiP) in upper back	Phase 1: Participants had 2 MTiP (1 right and 1 left). One treated with Graston (5 min 2x/week for 3 weeks) while the other was the control (no treatment) Phase 2: Participants randomly divided into treatment group where they received Graston (5 min 2x/week for 3 weeks) or into a control group (no intervention)	Phase 1: Treated MTiP vs. Non-treated MTiP Phase 2: 1. Treatment Group: IASTM (Graston) 2. Control: No treatment	Pressure Tolerance using Dolorimeter	Phase 1: After 6th treatment and 3-4 days after completion of 3 week treatment. Phase 2: Assessed after every treatment and the every other day for 10 days after completion of final treatment	No significant differences in either phase between groups but did show a difference over time
Lauche et al. ²¹	Neck pain and LBP	IASTM group received Graston therapy to C7-T1 for neck pain and with LBP from C7-L5; sessions lasted 10–15 min Control group received no treatment	1. IASTM: Graston therapy 2. Control: waitlist group, received no intervention	Pain, pressure pain threshold, subjective measures of overall health	Prior to intervention, 7 days post treatment	IASTM group had decreased pain at rest, subjective reports of feeling better after treatment, decreased pain using VAS, increased pain threshold
Laudner et al. ¹⁸	Posterior shoulder tightness in collegiate baseball players	IASTM group received Graston technique performed parallel (20 s) and perpendicular (20 s) to the muscle fibers of the posterior axillary border for a total of 40 s. Control group remained in a prone position for the same duration as the IASTM treatment session	1. IASTM: one bout of Graston technique to the posterior shoulder 2. Control: no treatment between pretest and posttest	Acute passive GH horizontal adduction and internal rotation ROM	Prior to intervention, immediately post	IASTM group had significantly ($p < 0.001$) greater acute GH horizontal abduction and IR ROM improvements compared to the control group (11.1° to -0.12° and 4.8° to -0.14°, respectively)

Markovic ⁴	Healthy, male soccer players (regional-level)	Foam rolling (FR) group implemented 2-min of quadriceps and hamstrings rolling	1. Foam rolling (FR) group (FR) 2. Fascial Abrasion Technique (FAT) group received 2-min of FAT applied to the quadriceps and hamstrings	PROM measured in supine passive knee flexion test and passive straight leg raise test. The Pt's dominant leg was used, and a digital inclinometer was utilized to measure ROM.	2 testing sessions separated by 24 h Session 1: pre-intervention measures after 5 min warm up and immediately post-intervention Session 2: after 5 min warm up	Both groups had significant ($p < 0.05$) increases in knee and hip PROM following the treatment sessions, with the FAT group exhibiting greater gains (pre to post-test gains in knee and hip PROM: 13.1° and 15.2°, or 10 and 19%, respectively) compared to the FR group (pre to post-test gains in knee and hip PROM: 6.6° and 7.0°, or 5 and 9%, respectively) 24 h post-intervention the FAT group maintained significantly ($p < 0.05$) higher PROM in both tests (pre- to 24 h post-test gains in knee and hip PROM: 9.0° and 10.1°, or 7 and 13%, respectively), whereas the FR group returned to pre-test PROM.
Sandrey et al. ²⁴	Chronic Ankle Instability (CAI)	Dynamic Balance Training and Graston (DBT-GISTM) consisted of 2x/week for 4 weeks low impact dynamic activities with Graston (8 min prior) DBT-GISTM-S consisted of the same # of visits and DBT activities with a sham Graston (8 min prior to activity) DBT-C was the control group that consisted of the activity program 2x/week for 4 week	1. DBT-GIST 2. DBT-GISTM-S 3. DBT-C	Foot And Ankle Measure (FAAM), FAAM Sport, VAS for pain, ROM (PF, DF, Inv, Ev), Star Excursion Balance Test (SEBT) in 3 directions (Ant, Post-Med, Post-Lat)	After completion of final treatment	All groups exceeded MCID for FAAM and FAAM Sport. All groups decreased in pain. All groups improved ROM in DF and EV but only DBT-GISTM improved PF and Inv. All groups improved SEBT scores but DBT-GISTM had largest effect size in Ant and Post-Med
Senbursa et al. ²²	Shoulder Impingement	Exercise group instructed with AROM, stretching/strengthening program including rotator cuff muscles, rhomboids, levator scapulae, and serratus anterior with an elastic band at home (at least 7x/week for 10–15 min) Manual group received 12 sessions of joint and soft tissue mobilization techniques, ice application, stretching/strengthening programs, and pt ed. in the clinic 3x/week	1. Exercise Group (Control) 2. Manual Therapy Group	Pain using VAS, Shoulder ROM using goniometer, function using Neer functional assessment questionnaire	All outcome measures used at end of treatment. Measured using VAS and functional questionnaire again 3 months after initiation of treatment.	Both groups experienced significant improvements in pain and function; Manual group had significantly more improvements. ROM in manual therapy group significantly improved while in the exercise group it did not.

for the management of individuals with musculoskeletal impairments.

Summary of evidence

The literature review identified seven RCTs^{4,10,18,21–24} that satisfied the eligibility criteria and examined the effectiveness of manual therapy, and specifically IASTM, for musculoskeletal impairments on pain and disability. IASTM can be implemented in a variety of different ways using various instruments. Four studies^{10,18,23,24} included in this review used a form of IASTM called the Graston technique, which involves using Graston® instruments on the skin in a variety of strokes at a 30°–60° angle to assess and treat soft tissue involvement, such as scar tissue and myofascial restrictions.^{10,11} The other soft tissue techniques included in this study were Gua Sha therapy,²¹ FAT,⁴ and joint, and STM.^{18,21,22} Gua Sha therapy²¹ involves a smooth-edged instrument that is pressed along the skin in a variety of horizontal and vertical strokes until petechiae are visible on the surface of the skin. The FAT⁴ includes the use of a single tool (FAT tool) for the treatment of scar tissue and myofascial restrictions utilizing the various edges.

Pain

Three of the seven^{21,23,24} selected articles examined the effects of IASTM on pain intensity using VAS as the primary method of measurement. Blanchette et al.²³ also examined pain-free grip strength using a dynamometer and Lauche et al.²¹ subjectively measured pressure pain threshold via a body diagram. All three articles^{21,23,24} reported a decrease in pain in both a short-term and/or long-term follow-up which surpassed the reported VAS minimal clinically important difference (MCID).²⁵ Additionally, Blanchette et al.²³ found a decrease in pain with grip strength at a six-week and a three-month follow-up. Only one study did not measure pain intensity using the VAS¹⁰. Gulick¹⁰ measured the effects of IASTM on pain pressure tolerance using a Dolorimeter pre-intervention, post-intervention, and at follow-up and reported no significant difference in pressure tolerance compared to the control group.

Additionally, Senbursa et al.²² found that manual therapy can significantly decrease pain scores compared to conservative interventions in the short-term, but pain relief was not significantly different compared to the conservative group at a three-month follow-up. These results²² in comparison to the work conducted by Blanchette et al.²³ show that IASTM, in comparison to manual therapy, results in long-term benefits for pain relief.

Function/disability

In addition to pain, four of the seven articles^{4,18,23,24} measured the effects of IASTM on function^{4,18,24} or disability.²³ Functional improvements were defined as an increase in ROM measured via a goniometer or an inclinometer, which were found to be statistically significant in three of

the four studies.^{4,18,24} Pre-existing standardized outcome measures were used to quantify the levels of disability. Subjects in the study by Blanchette et al.²³ reported a decrease in disability according to the PRTEE. The average change in score went from 37+/-19 points initially, and decreased to 15+/-19 points at six week follow-up,²³ suggesting a clinically important change by surpassing the PRTEE MCID of 11 points.²⁶ Sandrey et al.²⁴ found both functional improvements in ROM as well as a decrease in disability as measured by the FAAM, which has an MCID of nine points.²⁷ These outcomes support the idea that IASTM can have an impact on physiological changes by providing an increase in blood flow,^{4,21} reduction in tissue viscosity,⁴ myofascial release,^{4,24} interruption of pain receptors,^{4,21} and improvement of flexibility of underlying tissue.²¹

According to the PEDro scale (Table 3), four of the seven articles^{18,21,23,24} are of high quality indicating greater internal validity, while the remaining three studies^{4,10,22} received good scores. The main threats to internal validity were non-blinding of therapists (100%)^{4,10,18,21–24}, assessors (86%),^{4,10,21–24} and subjects (71%),^{4,10,18,21,23} which ultimately creates a limitation to the current systematic review by creating the potential for internal bias. The PEDro scale¹⁹ was the sole method for determining the level of internal validity in all included studies. All of the studies included are RCTs,^{4,10,18,21–24} which is considered level 1b quality of evidence.²⁸ Considering the strength of the PEDro scores and level of evidence, the results of this systematic review suggest that IASTM as a manual therapy technique may result in decreased pain and disability or improvement of function in individuals with musculoskeletal impairments.

Limitations

The primary limitation of this review is the lack of available, quality research based on the eligibility criteria. RCTs were selected as the highest level of available evidence to include in this systematic review based on Center of Evidence-Based Management description of research quality.²⁸ The search of the previously stated databases returned a minimal amount of quality randomized controlled trials investigating the effects of IASTM on musculoskeletal impairments. As evidenced by Figure 1, of the 812 potential studies screened for eligibility, only seven were identified as meeting the eligibility criteria. By using the PEDro scale as the only method of measuring internal validity,¹⁹ lower evidence studies were not included, but they may have had the potential to contribute supporting evidence to the topic at hand.

Another limitation was subject sample size and population. All included studies had a relatively small sample size ranging from 20 to 45 subjects. Four articles displayed gender discrepancies,^{4,18,21,24} making generalization of treatment response difficult. The study by Lauche et al.²¹ included 30 female and 9 male subjects, Sandrey et al.²⁴

included 31 males and 5 females, and Laudner et al.¹⁸ and Markovic⁴ had study populations represented by healthy male athletes (Table 2).

All studies included in this review^{4,10,18,21–24} consisted of varying length of follow-up, with a range of immediate post-intervention^{10,18,21,22,24} to three months²³ (Table 3). No single study investigated the long-term effects of IASTM and manual therapy on pain and/or function. Additionally, the Launder et al.¹⁸ and Markovic's⁴ studies included participants without functional or pain limitations, therefore a ceiling or floor effect may have impacted individual study results. It is also possible that only including articles in English and the fact that seven different researchers screened and scored articles could have resulted in selection bias.

Conclusion

The purpose of this systematic review was to provide a summary of the current available literature for the use of IASTM on treating individuals with musculoskeletal impairments. The results of the studies^{4,10,18,21–24} included in this review suggest that IASTM is an effective treatment intervention for reducing pain and improving function in less than a three-month period. Further research is required to strengthen available evidence to further examine the effects of IASTM in relation to other manual therapy techniques. Future research should include larger sample sizes, greater long-term follow-up and varying populations. Further research is required to determine if IASTM is the preferred method for treating individuals with musculoskeletal impairments compared to a conservative treatment approach.

Disclosure statement

No potential conflict of interest was reported by the authors.

Notes on contributors

Matthew Lambert, Rebecca Hitchcock, Kelly Lavalley, Eric Hayford, Russ Morazzini, Amber Wallace, and Dakota Conroy are Doctor of Physical Therapy students and members of the 2017 graduating class of Franklin Pierce University in Manchester, New Hampshire. This research was conducted as part of a two-term course through the didactic portion of the authors' education. Josh Cleland, lead professor at Franklin Pierce University, acted as a mentor throughout the research process.

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