



COMPARISON OF VARIOUS OUTCOMES FOLLOWING INSTRUMENT-ASSISTED SOFT TISSUE MOBILIZATION TREATMENT: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Cristina Seffrin, ATC, LAT

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Thesis Committee Members: Dr. Alison Gardiner-Shires, Dr. Nicole Cattano, Dr. Melissa Reed

Introduction¹⁻⁶

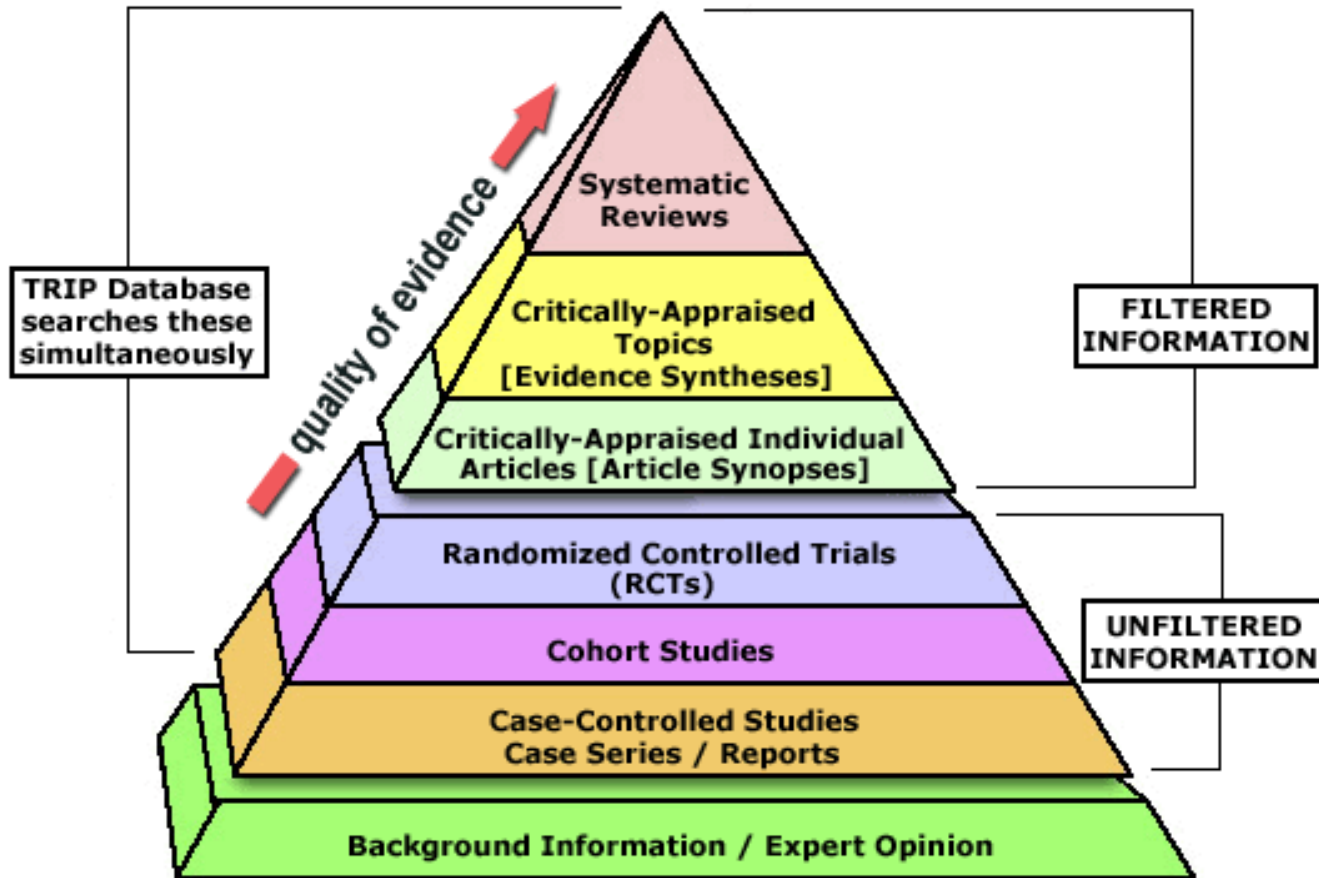
- Instrument-assisted soft tissue mobilization (IASTM)
- Form of manual therapy
- Used to address pain, ROM, strength and functional deficits



Study Objectives

1. Determine IASTMs overall effectiveness for improving pain, ROM, strength, and/or functionality
2. Provide clinicians recommendations for use
3. Guide future research

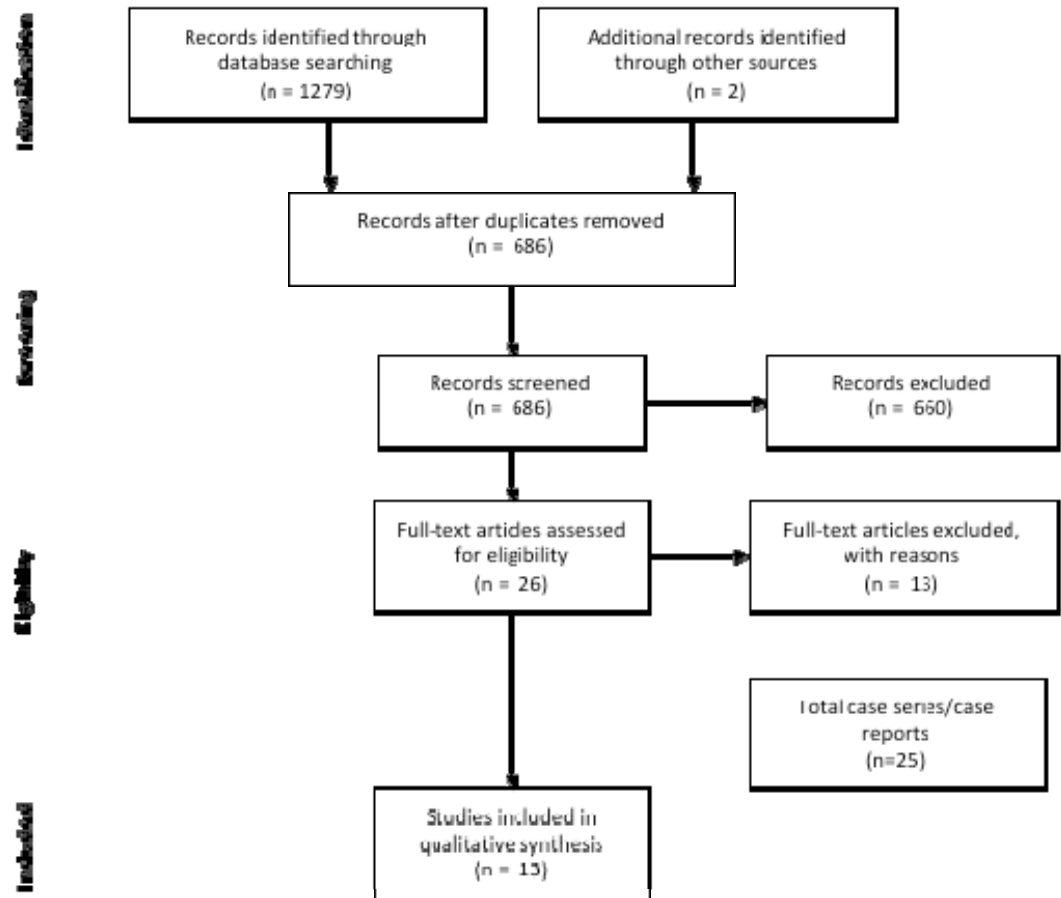
Introduction: Evidence Hierarchy



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What is a systematic review?

- In-depth review of current literature
- Five major elements
 1. Systematic Search
 2. Systematic Selection
 3. Quality assessment
 4. Data extraction
 5. Data synthesis



What is a meta-analysis?

- Systematic review with a mathematical component
 - New statistics are calculated
- Cohen's d formula
 - Cohen's $d = \Delta \text{ mean} / \text{pre-test standard deviation}$
- Rhea's categories
 - $< 0.35 = \text{trivial}$
 - $0.35 - 0.80 = \text{small}$
 - $0.80 \text{ to } 1.50 = \text{moderate}$
 - $> 1.50 = \text{large}$

Results: Quality Assessment

Table 3. Quality Assessment of 13 studies using the PEDro Scale and criteria met, CEBM levels, and SORT scale.

Author (year)	PEDro Criteria											PEDro Score	SORT Scale	CEBM Level
	1	2	3	4	5	6	7	8	9	10	11			
Bailey et al (2015) ¹⁶	Y	Y	N	Y	N	N	Y	Y	Y	Y	Y	7	2	2
Blanchette & Normand (2011) ²¹	Y	Y	Y	Y	N	N	N	Y	Y	Y	Y	7	2	2
Burke et al (2007) ²³	Y	Y	N	N	N	N	Y	N	Y	Y	Y	5	2	2
Crothers et al (2016) ²⁴	Y	Y	Y	Y	N	N	Y	N	Y	Y	Y	7	2	2
Heinecke et al (2014) ¹⁷	Y	Y	N	N	N	N	N	Y	Y	Y	Y	5	2	2
Kivlan (2014) ²⁵	Y	Y	N	Y	Y	N	Y	N	N	Y	Y	6	2	2
Lauder et al (2014) ¹⁶	Y	Y	N	N	N	N	Y	Y	Y	Y	Y	6	2	2
Markovic (2015) ¹⁹	Y	Y	N	Y	N	N	N	N	Y	Y	Y	5	2	2
McCormack et al (2016) ²⁷	Y	Y	Y	Y	N	N	N	Y	Y	Y	Y	7	2	2
Schaefer & Sandrey (2012) ²⁸	Y	Y	Y	Y	N	N	N	Y	N	Y	Y	6	2	2
Sevier & Stegink-Jansen (2015) ²²	Y	Y	N	Y	N	N	Y	N	Y	Y	Y	6	2	2
Vardiman et al (2015) ²⁰	Y	Y	N	Y	N	N	N	Y	Y	Y	Y	6	2	2
Wilson et al (2000) ²⁰	N	Y	N	N	N	N	Y	Y	N	N	N	3	2	2

Abbreviations: PEDro, Physiotherapy Evidence Database; SORT, Strength of Recommendation Taxonomy; CEBM, Centre for Evidence-Based Medicine

Results: Study characteristics of non-injury-based studies

Table 1. Characteristics of non-pathological-based and pathological-based studies.

Author (year)	Area Treated/ Pathology	Outcome Scales				Groups	Results	Product Used
		Pain	ROM	Function	Strength			
Non-pathological based studies								
Bailey et al (2015) ¹⁶	Shoulder	X				• IASTM & self-stretching • Control (self-stretching)	• ↑ in glenohumeral HA, IR compared to control (p < 0.001)	SASTM
Heinecke et al (2014) ¹⁷	Shoulder	X				• IASTM & strength/stretch • Control (strength/stretch)	• ↑ left arm Apley's Scratch compared to control (p = 0.045)	GT
Laudner et al (2014) ¹⁸	Shoulder	X				• IASTM • Rest	• ↑ in glenohumeral HA and IR following treatment compared to control (p < 0.001)	GT
Markovic (2015) ¹⁹	Lower extremity	X				• IASTM • Foam rolling	• ↑ pre-post hip and knee flexion at both follow up points in IASTM group; ↑ hip flexion compared to foam rolling (p = 0.039) • ↑ pre-post immediate measurement only foam rolling group	FAT
Vardiman et al (2014) ²⁰	Lower leg	X	X	X		• IASTM • Control	• ↓ in PFAQ in IASTM for daily living (p = 0.02) and pain (p = 0.006)	GT

Abbreviations: X, outcome assessed; ↑, significant improvement; ROM, range of motion; IASTM, instrument-assisted soft tissue mobilization; HA, horizontal adduction; ER, external rotation; IR, internal rotation; SASTM, sound assisted soft tissue mobilization; GT, Graston Technique; FAT, Fascial Abrasion Technique; PFAQ, perception of functional ability questionnaire; ↓, significant decrease

Results: Study characteristics of injury-based studies

Table 2. Characteristics of non-pathological-based and pathological-based studies (continued).

Author (year)	Area Treated/ Pathology	Outcome Scales				Groups	Results	Product Used
		Pain	ROM	Function	Strength			
Pathological-based Studies								
Blanchette & Normand (2011) ²¹	Lateral elbow epicondylopathy	X	X	X	• IASTM • Control	• ↑ in IASTM for VAS & PRTEE at 6 weeks & 3 months; ↑ strength at 6 weeks • ↑ in Control for VAS & PRTEE at 3 months; ↑ strength at 6 weeks	GT	
Sevier & Stegink-Jansen (2015) ²²	Lateral elbow epicondylopathy	X	X	X	• IASTM & eccentric exercise/stretching • Control (eccentric exercise/stretching) • Delayed IASTM (after control)	• ↑ DASH at 4 weeks compared to control (p = 0.047); 78.8% treated with IASTM resolved, 40.9% treated with only eccentric exercise resolved • No significant differences between delayed group or initial IASTM group (p > .05)	Astym	
Burke et al (2007) ²³	Carpal tunnel syndrome	X	X	X	• IASTM • SMT	• IASTM maintained ↑ in VAS & symptoms severity at 3 month (p < 0.05) while SMT group increased in symptoms	GT	
Crothers et al (2016) ²⁴	Non-specific thoracic pain	X	X		• IASTM • SMT (HVLA to the thoracic spine) • Placebo (de-tuned ultrasound)	• No significant differences between groups in VAS or ODI	GT	
Kivlan et al (2015) ²⁵	Lower extremity injury			X	• Astym • Placebo • Control	• ↑ % change in IASTM group compared to control and sham (p = 0.001) • No significant difference between sham and control (p = .68)	Astym	
Wilson et al (2000) ²⁶	Patellar tendinopathy	X	X		• IASTM & stretching/strengthening • Control (stretching/strengthening)	• ↑ in PFJES in IASTM compared w/ control (p < 0.05) • 86% IASTM treated resolved, 60% of traditional resolved	ASTM Advant EDGE	
McCormack et al (2016) ²⁷	Achilles tendinopathy	X	X		• IASTM plus eccentric exercise • Control (eccentric exercise)	• ↑ VISA-A in IASTM group compared w/ control at 12, 26, 52 weeks (p = .03)	Astym	
Schaefer & Sandrey (2012) ²⁸	Chronic ankle instability	X	X	X	• IASTM w/ DBT • Placebo w/ DBT • Control (DBT)	• No significant difference in any outcome between groups	GT	

Abbreviations: X, outcome assessed; ↑, significant improvement; ROM, range of motion; IASTM, instrument-assisted soft tissue mobilization; GT, Graston Technique; VAS, visual analog scale; PRTEE, Patient Rated Tennis Elbow Evaluation; DASH, Disability of the Arm, Shoulder and Hand scale; SMT, soft tissue mobilization; HVLA, high velocity, low amplitude; ODI, Oswestry Disability Index; PFJES, patellofemoral joint evaluation scale; ASTM, augmented soft tissue mobilization; VISA-A, Victorian Institute of Sport Assessment Achilles-Specific Questionnaire; GROC, Global Rating of Change; CAI, chronic ankle instability; DBT, Dynamic Balance Training; FAAM, Foot and Ankle Ability Measure

Results: Effect Size Pain

Table 3. Effect sizes of pain outcomes in IASTM groups: baseline to time point.

Author (Product)	Pathology	T _x time X # of T _x	Scale Used	Time Elapse Effect Size ^{a,b}										
				Short-term				Long-term						
				0w	24h	48h	72h	1w	4w	6w	8w	12w	26w	52w
Blanchette & Normand (GT) ²¹	Lateral elbow epicondylopathy	unspecified X 10	VAS mm							1.30		1.26		
Sevier & Stegink-Jansen (Astym) ²²	Lateral elbow epicondylopathy	unspecified X 8	VAS mm							0.92		0.67	N/R	1.96 2.08
Burke et al (GT) ²³	Carpal tunnel syndrome	unspecified X 10	VAS mm	1.95										1.97
Crothers et al (GT) ²⁴	Non-specific thoracic pain	10-15 min X max of 10	VAS cm					0.48	1.10				1.19	1.05 1.19
McCormack et al (Astym) ²⁷	Achilles tendinopathy	20-30 min X 12	NPRS							0.95		0.78	1.19	1.56 1.62
Schaefer & Sandrey (GT) ²⁸	Chronic ankle instability	8 min X 8	VAS cm							1.08				
Vardiman et al (GT) ²⁰	Non-pathological lower leg	7-8 min X 1	PFAQ pain ^c		-2.21	-2.07	-2.21							

Abbreviations: T_x, treatment; #, number; 0w, immediately following treatment; 24h, 24 hours; 48h, 48 hours; 72h, 72 hours; 1w, 1 week; 4w, 4 weeks; 6w, 6 weeks; 8w, 8 weeks; 12w, 12 weeks; 26w, 26 weeks; 52w, 52 weeks; GT, Graston Technique®; VAS, visual analog scale; mm, millimeters; min, minutes; cm, centimeters; NPRS, numeric pain rating scale; PFAQ, perceived functional ability questionnaire

^a Effect size of <0.35 is considered trivial, 0.35-0.80 is considered small, 0.80-1.50 is considered moderate, >1.50 is considered large.

^b Positive effect size indicates improvement.

^c Effect size was calculated based on data reported from a PFAQ subscale.

Results: Effect Size Range of Motion

Table 4. Effect sizes of ROM outcomes in IASTM groups: baseline to time point.

Author (Product)	Pathology/Body Part	T _x time X # of T _x	ROM	Time Elapse Effect Size ^{a,b}							
				Short-term				Long-term			
				0w	24h	48h	72h	2w	4w	12w	
Bailey et al (SASTM) ¹⁰	Shoulder	2 min X 1	GH ER	0.19							
			GH IR	1.11							
			GH HA	1.45							
Heinecke et al (GT) ¹⁷	Shoulder	3-5 min X 8	GH IR right					0.43	0.46		
			GH IR left					0.51	0.58		
			GH ER right					0.35	0.80		
			GH ER left					0.33	0.80		
			GH HA right					0.98	1.23		
			GH HA left					0.89	1.24		
Laudner et al (GT) ¹⁸	Shoulder	40 sec X 1	GH IR	0.44							
			GH HA	1.91							
Burke et al (GT) ²⁵	Carpal tunnel syndrome	unspecified X 10	Wrist flex	0.81							0.57
			Wrist ext	0.73							0.58
Markovic (FAT) ¹⁹	Hip and knee	2 min X 1	Hip flex	2.46	1.64						
			Knee flex	2.48	1.52						
Schaefer & Sandrey (GT) ²⁸	Chronic ankle instability	8 min X 8	Ankle DF							1.62	
			Ankle PF							0.92	
			Ankle Inv							0.75	
			Ankle Ev							1.00	
Vardiman et al (GT) ²⁰	Non-pathological lower leg	7-8 min X 1	Ankle DF	0.04	0.05	0.05	-0.28				

Abbreviations: ROM, range of motion; T_x, treatment; #, number; 0w, immediately following treatment; 24h, 24 hours; 48h, 48 hours; 72h, 72 hours; 2w, 2 weeks; 4w, 4 weeks; 12w, 12 weeks; SASTM, Sound-assisted Soft Tissue Mobilization; min, minutes; GH, glenohumeral; ER, external rotation; IR, internal rotation; HA, horizontal adduction; GT, Graston Technique®; sec, seconds; flex, flexion; ext, extension; FAT, Fascial Abrasion Technique™; DF, dorsiflexion; PF, plantarflexion; Inv, inversion; Ev, eversion

^a Effect size of <0.35 is considered trivial, 0.35-0.80 is considered small, 0.80-1.50 is considered moderate, >1.50 is considered large.

^b A positive effect size indicates an improvement in ROM.

Results: Effect Size Strength

Table 5. Effect sizes of strength outcomes in IASTM groups: baseline to time point.

Author (Product)	Pathology/Body region	T _x time X # of T _x	Scale Used	Time Elapse Effect Size ^{a,b}														
				Short-term						Long-term								
				0w	24h	48h	72h	4w	6w	8w	12w							
Blanchette & Normand (GT) ²¹	Lateral elbow epicondylopathy	unspecified X 10	Grip in kg															0.14
Sevier & Stegink-Jansen (Astym) ²²	Lateral elbow epicondylopathy	unspecified X 8	Grip in lbs							0.28								-0.06
Burke et al (GT) ²³	Carpal tunnel syndrome	unspecified X 10	Grip in kg	0.63														0.59
			Pinch in kg	0.81														
Kivlan (Astym) ²⁵	Lower extremity	about 12 min X 1	Newtons	0.30														
Vardiman et al (GT) ²⁰	Non-pathological lower leg	7-8 min X 1	PF peak torque	-0.29	-0.08	-0.20	-0.24											

Abbreviations: T_x, treatment; #, number; 0w, immediately following treatment; 4w, 4 weeks; 6w, 6 weeks; 8w, 8 weeks; 12w, 12 weeks; GT, Graston Technique®; kg, kilograms; lbs, pounds; min, minutes; PF, plantarflexion

^a Effect size of <0.35 is considered trivial, 0.35-0.80 is considered small, 0.80-1.50 is considered moderate, >1.50 is considered large.

^b A positive effect size indicates a gain in strength.

Results: Effect Size Functionality

Table 6. Effect sizes of functional outcomes in IASTM groups, baseline to time point.

Author (Product)	Pathology/Body Part	T _x , time X # of T _x	Scale Used	Time Elapse Effect Size ^{a,b}							
				Short-term				Long-term			
				0w	1w	4w	6w	8w	12w	26w	52w
Blanchette & Normand (GT) ²¹	Lateral elbow epicondylopathy	unspecified X 10	PRTEE				1.16		1.11		
Sevier & Stegink-Jansen (Astym) ²²	Lateral elbow epicondylopathy	unspecified X 8	DASH			0.97		0.84	N/R	1.57	1.78
			VAS function			0.68		0.76	N/R	1.36	1.44
Burke et al (GT) ²³	Carpal tunnel syndrome	unspecified X 10	Function scale	0.54					0.54		
Crothers et al (GT) ²⁴	Non-specific thoracic pain	10-15 min X max of 10	ODI		0.63	1.05			1.22	1.22	1.21
McCormack et al (Astym) ²⁷	Achilles tendinopathy	20-30 min X 12	VISA-A			1.08		1.60	1.88	2.05	2.24
Schaefer & Sandrey (GT) ²⁸	Chronic ankle instability	8 min X 8	FAAM			1.22					
			FAAM-Sport			1.43					
			SEBT anterior			2.21					
			SEBT posteriomedial			0.90					
			SEBT posteriorlateral			0.74					

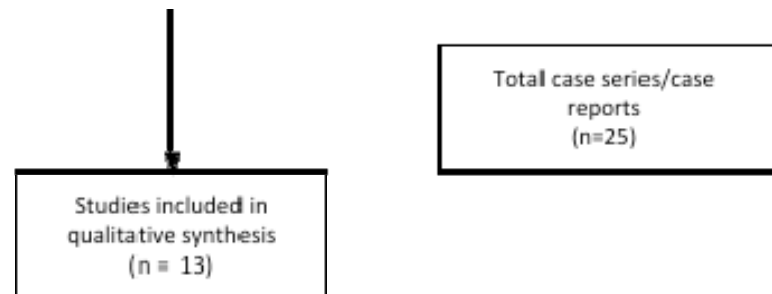
Abbreviations: T_x, treatment; #, number; 0w, immediately following treatment; 24h, 24 hours; 48h, 48 hours; 72h, 72 hours; 1w, 1 week; 4w, 4 weeks; 6w, 6 weeks; 8w, 8 weeks; 12w, 12 weeks; 26w, 26 weeks; 52w, 52 weeks; GT, Graston Technique®; PRTEE, Patient-rated Tennis Elbow Evaluation; DASH, Disability of the Arm, Shoulder and Hand scale; VAS, visual analog scale; N/R, time point measurement but no data reported; min, minutes; ODI, Oswestry Disability Index; VISA-A, Victorian Institute of Sport Assessment Achilles-Specific Questionnaire; FAAM, Foot and Ankle Mobility Measure; FAAM-Sport, Foot and Ankle Mobility Measure Sport; SEBT, star excursion balance test; PFAQ, perception of functional ability questionnaire; ROM, range of motion; ADL, activities of daily living

^a Effect size of <0.35 is considered trivial, 0.35-0.80 is considered small, 0.80-1.50 is considered moderate, >1.50 is considered large.

^b A positive effect size in measurements indicates an improvement in function.

Discussion: Study Characteristics

- 13 RCTs
 - 25 case reports/series
- Moderate PEDro scores, level 2 evidence
- Overall SORT grade “B”



Discussion: Effectiveness of IASTM

- 8 studies showed significant significance compared to control
- 10 studies showed moderate to large effect sizes pre- to post-IASTM treatment
- Large effect sizes in ROM, pain and functionality
 - Most indicated for IASTM treatments
- ROM deficits linked to injury incidence²⁹⁻³¹

Future Research

- Human-based physiology
- More consistent methodologies
- Higher-quality methodologies
- Better data reporting
 - Effect sizes
 - Resolution rates
- Post-operative subjects and other body regions
- Performance outcomes



Limitations

- BOOLEAN string
- Accessibility of articles
- Variety in studies
- Effect size calculation

Conclusions

1. Determine IASTMs overall effectiveness in improving pain, ROM, strength, and/or functionality
 - **Great potential for improving pain, ROM, functionality**
 - **May translate to healthier, less-injured, and more compliant athletes**
2. Provide clinicians recommendations for use
 - **Most indicated for ROM, pain, and functionality**
3. Guide future research
 - **High-quality research needed to further substantiate current research**

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QUESTIONS?

Email: cs853923@wcupa.edu