Journal of Sport Rehabilitation, (Ahead of Print)
https://doi.org/10.1123/jsr.2021-0216
First Published Online: Feb. 2, 2022

Human Kinetics
TECHNICAL REPORT

Clinician Reliability of One-Handed Instrument-Assisted Soft Tissue Mobilization Forces During a Simulated Treatment

Shaun Duffy, Nickolai Martonick, Ashley Reeves, Scott W. Cheatham, Craig McGowan, and Russell T. Baker

Clinicians utilize instrument-assisted soft tissue mobilization (IASTM) to identify and treat myofascial dysfunction or pathology. Currently, little is known regarding the ability of clinicians to provide similar IASTM forces across treatment sessions. The authors' purpose was to quantify clinician reliability of force application during a simulated IASTM treatment scenario. Five licensed athletic trainers with previous IASTM training (mean credential experience = 5.2 [4.3] y; median = 5 y) performed 15 one-handed unidirectional sweeping strokes with each of the 3 instruments on 2 consecutive days for a total of 90 data points each. The IASTM stroke application was analyzed for peak normal forces (F_{peak}) and mean normal forces (F_{mean}) by stroke across 2 sessions. The authors' findings indicate IASTM trained clinicians demonstrated sufficient F_{peak} and F_{mean} reliability across a treatment range during a one-handed IASTM treatment. Future research should examine if IASTM applied at different force ranges influences patient outcomes.

***Keywords*:** manual therapy, massage, IASTM

Instrument-assisted soft tissue mobilization (IASTM) is an intervention used to provide localized treatment with hand-held instruments.[1,2] Clinicians apply longitudinal or perpendicular forces along myofascial lines or to specific soft tissue structures to manipulate soft tissue.[1–4] The use of IASTM has been reported to promote healing,[4,5] improve patient outcomes,[1,5] and increase range of motion.[3] Clinicians have also indicated a preference for utilizing instruments rather than their hands when applying soft tissue mobilization.[5,6] This preference may be related to perceptions that instruments enhance soft tissue anomaly detection[5,6] or allow application of more targeted forces[5–8] to increase fibroblast recruitment, stimulate collagen repair, and promote connective tissue remodeling.[9–11]

Numerous companies, such as Técnica Gávilan®, Graston Technique®, Edge Mobility System™, and Fascial Abrasion Technique™, market instruments, or IASTM training programs for clinicians. While some similarities exist across instruments and IASTM training across the companies, variations also exist across instruments (eg, weight, beveling, surface, number of treatment edges, etc), training options (eg, training required for instrument purchase, instruments marketed to health care professionals or patients, etc), and the approach to instrument application (eg, instrument motion, speed of stroke, stroke force, patient positioning, etc). For example, the Graston Technique® offers multiple training programs, has specific protocols (eg, examination, warm-up, IASTM treatment, stretching, strengthening, ice) guiding IASTM application, and is designed to be applied by trained medical professionals.[11,12] Other IASTM companies, however, may not promote specific IASTM protocols or require any training prior to instrument purchase or utilization. Potential differences in IASTM training, instrument application or treatment protocols, and clinician preferences or treatment goals in IASTM application may result in inconsistent IASTM application in clinical practice and research.[5,6,11]

Potential variations (eg, the amount of force used during IASTM application, etc) may also exist within and between clinicians irrespective of training and little is known regarding the optimal IASTM treatment application (eg, stroke type, stroke force utilized, stroke speed, treatment length, patient positioning, etc) to maximize treatment effectiveness.[5,6,13] Some researchers have described the directionality of the IASTM treatment but not the actual force application.[1,14,15] Others have reported an estimated force (~208 g or 2.04 N) based on the weight of the tool used.[13] Research with instrumented tools is limited; however, available data provide a wide range of treatment forces for peak force (495.58–924.88 g and 4.68–9.07 N) and mean force (268.19–455.81 g and 2.63–4.47 N) during IASTM application by a single clinician.[16] Forces may also vary across target tissue, treatment sessions, or instruments. Researchers[17] recently reported that trained IASTM clinicians produced an average peak force of 6.7 N (683.21 g) and average mean force of 4.5 N (458.87 g) during a simulated treatment of calf tightness using a force plate. However, wide ranges in average peak force (265.13–1427.60 g and 2.6–14.0 N) and average mean force (163.15–1019.73 and 1.6–10.0 N) were also found across clinicians, and the reliability of these forces was not established across instruments or treatment

Duffy, Martonick, and Baker are with the WWAMI Medical Education Program, University of Idaho, Moscow, ID, USA. Martonick, Reeves, and Baker are with the Department of Movement Sciences, University of Idaho, Moscow, ID, USA. Cheatham is with the Division of Kinesiology, California State University Dominguez Hills, Carson, CA, USA. McGowan is with the Department of Integrative Anatomical Sciences and Keck School of Medicine, University of Southern California, Los Angeles, CA, USA. Baker (russellb@uidaho.edu) is corresponding author.

sessions.[17] Variations in the amount, duration, or reliability of the applied forces within or between clinicians or across instruments might help explain inconsistent outcomes in the IASTM literature.[11]

Failure to establish clinician ability to replicate similar forces across treatment sessions limits our ability to examine IASTM effectiveness in clinical and laboratory settings. In addition, providing insight into the ability of trained IASTM clinicians to produce similar forces across treatment sessions can help inform future research studies. Therefore, the purpose of this study was to investigate the reliability of the average forces and the average peak forces applied by clinicians during a simulated IASTM treatment.

Methods

Study Design

The University of Idaho Institutional Review Board approved the study. The investigation was conducted as a randomized crossover study in a university biomechanics laboratory and utilized 3 different IASTM instruments: (1) Técnica Gavilán® (Técnica Gavilán, Tracy, CA) *Ala*, mass: 196 g; (2) Fascial Abrasion Technique™ (Fit Institute, Niagara Falls, ON) *FAT Stick*, mass: 293 g; and (3) RockBlades® (RockTape, Durham, NC) *Mullet*, mass: 178 g. The average force (ie, the average force perpendicular to the treatment plane from the beginning to end of a single stroke; F_{mean}) and the average peak force (ie, the peak force plate reading during a single stroke; F_{peak}) were recorded (in Newtons) for each IASTM stroke applied during the treatment scenario. Informed consent was provided by participants prior to study participation.

Participants

A convenience sample of 5 licensed athletic trainers who were a subset of a previous study[17] was utilized for this study. Participants were included if they had previously completed at least one professional IASTM training course (Técnica Gávilan® = 5 and RockBlades® = 1). Credentialed experience among participants ranged from 1 to 12 years (mean = 5.2 [4.3] y; median = 5 y), while current use of IASTM in clinical practice also varied (never = 1, rarely = 2, and frequently = 2).

Instrumentation

Forces were applied to a skin simulant (Complex Tissue Model; Simulab Corporation©, Seattle, WA) of a 1-in thickness designed to replicate skin, subcutaneous fat, fascia, and preperitoneal fat. The skin simulant was attached to a force plate (HE6×6; AMTI©, Watertown, MA). Raw data were obtained with the force plate set to record at 500 Hz and recorded with NetForce software (version 3.5.3; AMTI, Watertown, MA); the force plate was zeroed between each instrument and participant. Force plate data were exported into MATLAB (version 2019b; MathWorks, Natick, MS) and were filtered with a 10-Hz low-pass Butterworth filter. The plotted data were used to visually determine the start and finish of each instrument stroke.

Procedures

Data were collected at 2 time points on 2 consecutive days in a university biomechanics lab; participants reported for the second session approximately 24 hours after the first session. Participants completed a familiarization protocol (ie, practiced 5 one-handed strokes with each instrument on the skin simulant) before beginning the testing protocol on each day. Following the familiarization periods, the same standardized treatment scenario was provided to participants before each treatment session. Participants were asked to reproduce their clinical practice for the standardized treatment scenario with each instrument using one-handed unidirectional sweeping strokes.

Participants were instructed to lift the instrument off the simulant between strokes to allow researchers to identify individual strokes during the testing protocol. Clinicians performed 5 one-handed, sweeping strokes on the skin simulant with each instrument in a randomized order. The testing protocol was repeated 3 times for a total of 15 strokes per instrument on each testing day; a total of 45 treatment strokes were completed each day. Across the 2 sessions, a total of 90 treatment strokes were recorded (30 treatment strokes per instrument).

Data Analysis

Descriptive statistics and coefficients of variation (CVs) were calculated in Excel 16.3 (Microsoft®, 2019, Redmond, WA) for F_{peak} and F_{mean} (Table 1). Average peak forces (F_{peak}) were calculated as the sum of maximum vertical forces for each stroke divided by the number of trials. Average mean forces (F_{mean}) were defined as the average of the vertical forces produced across the entire length of a single stroke and divided by the number of trials. Coefficients of variation (CV = [SD/mean] × 100) were calculated across both days for individual instruments and for the total strokes across all instruments for F_{peak} and F_{mean}; CVs ≤ 30% were considered low and indicative of data homogeneity.[18] Box and whisker plots were created to compare F_{mean} and F_{peak} between days.

Bland–Altman (BA) plots (Figure 1) were created for each clinician to determine agreement between the peak and mean forces applied on days 1 and 2. The BA plots were created with R (version 3.6.2; The R Foundation for Statistical Computing Platform, 2019, https://www.r-project.org/about.html) and the BlandAltmanLeh (version 0.3.1) package. The BA plots were created with data points from all instruments and are presented with mean differences, 95% limits of agreement, and the precision of those limits (eg, 95% confidence intervals). We also calculated these values using the BA analysis for each instrument (Table 1).

Results

Participants produced average F_{peak} ranging from 2.9 to 7.9 N (~296–806 g) and average F_{mean} from 1.9 to 5.6 N (~194–571 g; Table 1; Figures 2 and 3). The highest F_{mean} (6.9 N) occurred with the RB instrument (clinician E), while the lowest F_{mean} (1.7 N) occurred with the TG instrument (clinician B).The highest F_{peak} (8.8 N) occurred with the RB instrument (clinician E), while the lowest F_{peak} (2.6 N) occurred with the FAT and TG instruments (clinician A and clinician B, respectively). The SDs were all <2 N for average F_{peak} and 1.2 N for average F_{mean}. The CVs for F_{peak} and F_{mean} were lowest for all participants when the TG instrument was utilized; average CVs across all instruments and participants ranged from 17 to 37 for average F_{peak} and 16 to 32 for average F_{mean} (Table 1). Box plots indicated the F_{peak} and F_{mean} values tended to overlap from days 1 to 2 suggesting similar force application across days (Figures 2 and 3). The BA analyses suggest participants demonstrated agreement for force application across days. When examining forces across all clinicians and instruments, 97% of the data points were within the limits of agreement (Figure 1). The limits of agreement were widest for F_{peak} of clinician D and narrowest for F_{mean} of clinician B. The highest

Table 1 Peak Force Equals the Peak Force From Each Stroke From All Instruments Across Both Days and Mean Force Equals the Average Force From Each Stroke From All Instruments Across Both Days

		Peak forces, N					Mean forces, N				
Clinician	Instrument	Mean force (SD)	CV %	Mean diff.	Lower limit ± CI	Upper limit ± CI	Mean force (SD)	CV %	Mean diff.	Lower limit ± CI	Upper limit ± CI
A	RockBlade	5.4 (1.0)	19	−1.2	−3.4 ± 1.0	0.9 ± 1.0	3.9 (0.8)	20	−0.9	−2.8 ± 0.9	0.8 ± 0.9
	FAT	2.6 (0.9)	33	−0.2	−1.7 ± 0.8	1.4 ± 0.8	2.4 (0.8)	34	−0.2	−2.1 ± 0.9	1.6 ± 0.9
	Gavilan	4.3 (0.7)	17	−1.2	−2.2 ± 0.5	−0.2 ± 0.5	3.2 (0.6)	19	−1.01	−1.7 ± 0.4	−0.3 ± 0.4
	Total	4.1 (1.5)	37	−0.4	−3.3 ± 0.7	2.4 ± 0.7	3.0 (0.9)	31	−1	−2.5 ± 0.4	0.4 ± 0.4
B	RockBlade	2.9 (0.6)	19	−0.7	−1.7 ± 0.5	0.3 ± 0.5	1.9 (0.4)	21	−0.5	−1.1 ± 0.3	0.2 ± 0.3
	FAT	3.1 (0.6)	18	−0.8	−1.6 ± 0.4	0.1 ± 0.4	1.9 (0.3)	18	−0.4	−1.1 ± 0.3	0.2 ± 0.3
	Gavilan	2.6 (0.3)	11	−0.2	−0.8 ± 0.2	0.4 ± 0.2	1.7 (0.2)	11	−0.2	−0.8 ± 0.2	0.3 ± 0.2
	Total	2.9 (0.5)	19	−0.6	−1.5 ± 0.2	0.3 ± 0.2	1.9 (0.3)	18	−0.4	−1.0 ± 0.2	0.3 ± 0.2
C	RockBlade	8.1 (1.4)	17	0.2	−2.3 ± 1.2	2.5 ± 1.2	5.0 (1.0)	19	0.1	−1.8 ± 0.9	1.9 ± 0.9
	FAT	7.0 (1.4)	20	1	−2.8 ± 1.3	3.7 ± 1.3	4.1 (0.8)	19	0.5	−1.0 ± 0.8	2.0 ± 0.8
	Gavilan	5.7 (0.8)	15	0.8	−0.7 ± 0.8	2.4 ± 0.8	3.3 (0.4)	13	0.1	−0.7 ± 0.5	1.0 ± 0.5
	Total	7.0 (1.6)	23	0.7	−1.6 ± 0.6	3.0 ± 0.6	4.2 (1.0)	24	0.2	−1.2 ± 0.4	1.7 ± 0.4
D	RockBlade	4.2 (1.1)	27	−1.6	−3.6 ± 0.9	0.4 ± 0.9	4.0 (0.8)	31	−1.1	−2.4 ± 0.6	0.1 ± 0.6
	FAT	7.2 (1.6)	22	2.1	0.8 ± 0.7	3.5 ± 0.7	4.2 (1.0)	24	1.3	0.2 ± 0.6	2.5 ± 0.6
	Gavilan	6.6 (1.0)	15	−0.7	−2.1 ± 0.6	0.7 ± 0.6	3.8 (0.7)	19	−0.5	−1.5 ± 0.5	0.5 ± 0.5
	Total	5.9 (1.8)	30	−0.1	−3.6 ± 0.9	3.5 ± 0.9	3.5 (1.1)	32	−0.1	−2.5 ± 0.5	2.3 ± 0.6
E	RockBlade	8.8 (1.5)	17	0.9	−1.0 ± 1.0	3.0 ± 1.0	6.9 (0.9)	17	0.4	−0.9 ± 0.7	1.7 ± 0.7
	FAT	8.1 (0.8)	10	−0.4	−1.8 ± 0.7	1.0 ± 0.7	5.9 (0.7)	12	−0.2	−1.2 ± 0.5	0.8 ± 0.5
	Gavilan	6.9 (0.7)	10	0.1	−1.6 ± 0.8	1.8 ± 0.8	5.0 (0.6)	12	0.1	−1.5 ± 0.8	1.7 ± 0.8
	Total	7.9 (1.3)	17	0.2	−2.3 ± 0.6	2.3 ± 0.6	5.6 (0.9)	16	0.1	−1.3 ± 0.4	1.5 ± 0.4

Abbreviations: CI, confidence interval; CV, coefficient of variation; FAT, Fascial Abrasion Technique™. Note: The CVs were calculated as (SD/avg.) × 100. Values from the Bland–Altman analysis (mean differences, limits of agreement, and 95% CIs for the limits) are also presented.

value for mean differences was displayed by clinician D (2.1 N) for F_{peak} with the FAT instrument; however, mean differences of 1 N or less for the total strokes from all instruments were found for all participants.

Discussion

We investigated the reliability of the F_{mean} and F_{peak} applied by clinicians during a simulated IASTM treatment. The CVs, box and whisker plots, and BA plots provide insight into the consistency of force application during IASTM. The summary of evidence indicates clinicians who have at least completed some formal IASTM training (ie, Técnica Gávilan®) are likely providing consistent forces within a therapeutic range from treatment session to treatment session (eg, F_{mean} SD was ~1 N or less across all instruments and clinicians) whether they do (ie, Técnica Gávilan® *Ala*) or do not (Fascial Abrasion Technique™ *FAT Stick* or RockBlades® *Mullet*) have training using that specific instrument. Our participants had the lowest SD and CVs when using the TG instrument, and typically produced lower F_{peak} and F_{mean} values when utilizing the TG instrument compared with the RB and FAT instruments (Table 1).

Researchers[5,6] have recently tried to gain insight into IASTM utilization by surveying clinicians. The majority (~80%) of respondents in one survey[5] indicated they either do not know how to or do not try to quantify force during IASTM; it has also been reported that clinicians may willfully deviate from recommendations taught in IASTM training courses.[5,6] Our results provide some insight into these phenomena. The TG training program includes recommendations that lower force loads are needed and that instruments can be applied during exercise. Our findings are interesting because all participants in this study completed TG training and produced lower force levels and less variation with the TG instrument. However, it is also possible that this is the result of other factors, such as the type of instrument utilized, instrument weight, instrument beveling, and feedback, different levels of experience with different instruments, or different levels of resistance (eg, different instrument surfaces) between instruments and the skin simulant. The lack of formal training in another IASTM technique (eg, Fascial Abrasion Technique™, etc) or the type of stroke being utilized may also influence these results.

Prior reports have indicated that clinicians may not consider or be able to calculate the amount of force being applied during IASTM.[5,6] Clinicians may also not accurately predict the amount of force being produced during IASTM,[17] and optimal force application for IASTM has not been established across pathologies or treatment locations.[11] Our results, however, inform the efforts in this area by providing evidence that IASTM trained clinicians still provide consistent F_{peak} and F_{mean} within a therapeutic range across treatment sessions despite these limitations. Our F_{peak} (2.9–7.9 N; ~296–806 g) and F_{mean} (1.9–5.6 N; ~194–571 g) across all participants were also similar to reports by Vardiman et al[16] (4.68–9.07 N, 495.58–924.88 g and 2.63–4.47 N, 268.19–455.81 g for F_{peak} and F_{mean}, respectively). Thus, it is likely that IASTM trained clinicians are treating within these ranges when applying IASTM to the posterior leg, and future research should examine difference in outcomes when IASTM is applied at the lower or higher ends of these ranges to determine differences in therapeutic effects.

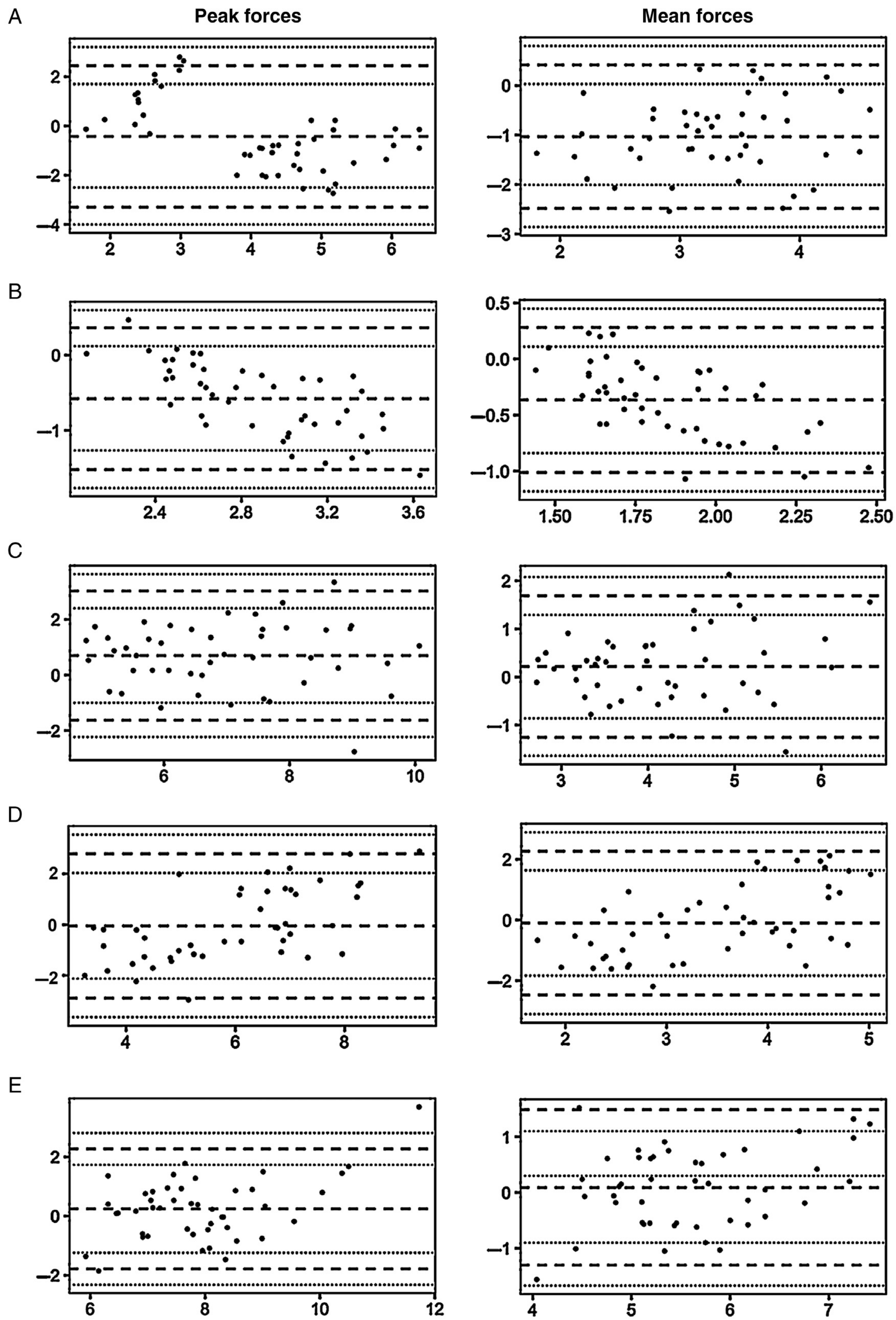

Figure 1 — Bland–Altman plots for peak forces (in Newtons) and mean forces (in Newtons). Peak force equals the peak force from each stroke. Mean force equals the average force from each stroke. Each data point indicates the proximity to zero of a given difference (calculated as the first measurement minus the second) plotted against the average value of the 2 measurements. Rows are labeled by clinician.

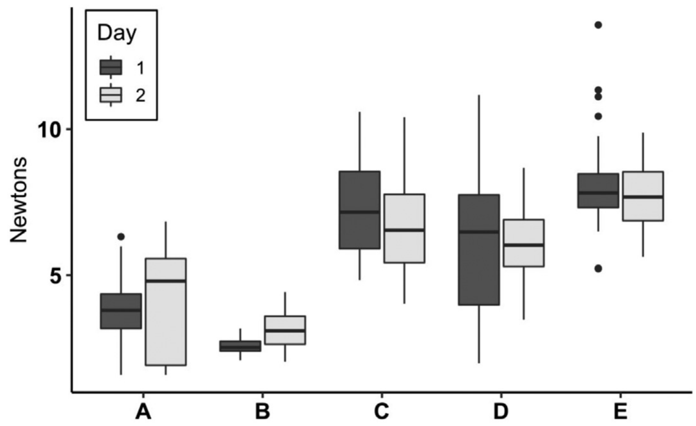

Figure 2 — Box and whisker plots for F_{peak} across all instruments for each clinician.

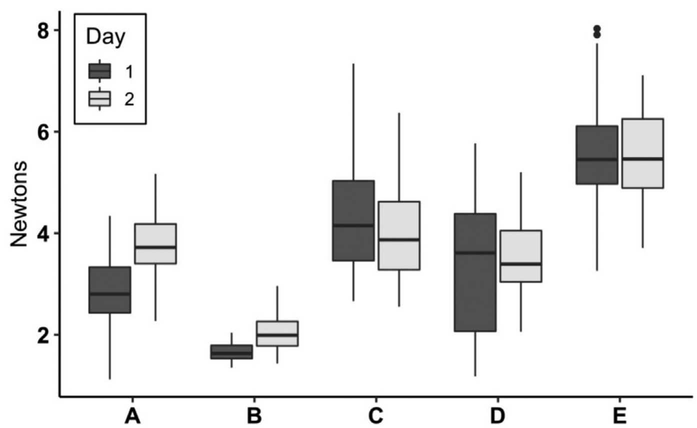

Figure 3 — Box and whisker plots for F_{mean} across all instruments for each clinician.

Our study is not without limitations. Our sample was relatively small and only included clinicians with similar professional IASTM training course backgrounds, and only a limited number of instruments and treatment strokes were utilized. For example, utilization of a different instrument (eg, FAT-Tool *Pro Large*, Técnica Gavilán® *Garra*, RockBlades® *Mallet*, etc) or a different treatment stroke taught in an IASTM course could influence force production and reliability. The results may also be influenced by having the clinicians treat a simulated tissue that lacked myofascial adhesions. Furthermore, our study protocol (eg, standardized treatment table height, skin simulant, unidirectional stroke, patient positioning) may not fully replicate patient care, the forces utilized across a complete IASTM intervention session, or the reliability of those forces across a more diverse clinician group who have completed other forms of IASTM training. Future research is needed to elucidate how different IASTM instruments, trainings, or clinical experience may affect force reliability. Future research is needed to determine if and how clinician-applied forces change based on treatment goals, the instrument being used, and the tissue being treated.

Conclusion

Our findings indicate IASTM trained clinicians demonstrated sufficient F_{peak} and F_{mean} reliability with applied forces within a narrow treatment range during a one-handed IASTM treatment. Our participants produced forces that were similar to but not quite as high as prior reported forces in human trials; however, the forces utilized were substantially higher than those used in animal models. Further research is needed to determine if the variation in forces within clinical sessions affects clinical outcomes, as well as how variations in force ranges (eg, 2–4 N vs 6–8 N) between clinicians influence patient outcomes.

References

1. Baker RT, Nasypany A, Seegmiller JG, Baker JG. Instrument-assisted soft tissue mobilization treatment for tissue extensibility dysfunction. *Int J Athl Ther Train*. 2013;18(5):16–21. doi:10.1123/ijatt.18.5.16
2. Fousekis K, Eid K, Tafa E, et al. Can the application of the Ergon® IASTM treatment on remote parts of the superficial back myofascial line be equally effective with the local application for the improvement of the hamstrings' flexibility? A randomized control study. *J Phys Ther Sci*. 2019;31(7):508–511. PubMed ID: 31417211 doi:10.1589/jpts.31.508
3. Gunn LJ, Stewart JC, Morgan B, et al. Instrument-assisted soft tissue mobilization and proprioceptive neuromuscular facilitation techniques improve hamstring flexibility better than static stretching alone: a randomized clinical trial. *J Man Manip Ther*. 2018;27(1):15–23. PubMed ID: 30692839 doi:10.1080/10669817.2018.1475693
4. Loghmani MT, Warden SJ. Instrument-assisted cross fiber massage increases tissue perfusion and alters microvascular morphology in the vicinity of healing knee ligaments. *BMC Complement Altern Med*. 2013;13(1):240. doi:10.1186/1472-6882-13-240
5. Cheatham SW, Baker RT, Larkins LW, Baker JG, Casanova M. Instrument assisted soft-tissue mobilization: a survey of practice patterns among allied health professionals. *J Athl Train*. 2021;56(10):1100–1111. doi:10.4085/1062-6050-0047.20
6. Baker R, Start A, Larkins L, Burton D, May J. Exploring the preparation, perceptions, and clinical profile of athletic trainers who use instrument-assisted soft tissue mobilization. *Athl Train Sports Health Care*. 2018;10(4):169–180. doi:10.3928/19425864-20180201-02
7. Hammer W. The effect of mechanical load on degenerated soft tissue. *J Bodyw Mov Ther*. 2008;12(3):246–256. PubMed ID: 19083680 doi:10.1016/j.jbmt.2008.03.007
8. McMurray J, Landis S, Lininger K, Baker R, Nasypany A, Seegmiller J. A comparison and review of indirect myofascial release therapy, instrument-assisted soft tissue mobilization, and active release techniques to inform clinical decision making. *Int J Athl Ther Train*. 2015;20(5):29–34. doi:10.1123/ijatt.2015-0009
9. Melham TJ, Sevier TL, Malnofski MJ, Wilson JK, Helfst RH. Chronic ankle pain and fibrosis successfully treated with a new noninvasive augmented soft tissue mobilization technique (ASTM): a case report. *Med Sci Sports Exerc*. 1998;30(6):801–804. doi:10.1097/00005768-199806000-00004
10. Davidson CJ, Ganion LR, Gehlsen GM, Verhoestra B, Roepke JE, Sevier TL. Rat tendon morphologic and functional changes resulting from soft tissue mobilization. *Med Sci Sports Exerc*. 1997;29(3):313–319. PubMed ID: 9139169 doi:10.1097/00005768-199703000-00005

11. Cheatham SW, Lee M, Cain M, Baker R. The efficacy of instrument assisted soft tissue mobilization: a systematic review. *J Can Chiropr Assoc*. 2016;60(3):200–211. PubMed ID: 27713575
12. Graston Resources: Frequently Asked Questions. Graston Technique Website. 2016. https://grastontechnique.com/Clinicians/Resources/. Accessed April 1, 2021.
13. Cheatham S, Kreiswirth E, Baker R. Does a light pressure instrument assisted soft tissue mobilization technique modulate tactile discrimination and perceived pain in healthy individuals with DOMS? *J Can Chiropr Assoc*. 2019;63(19):18–25.
14. Markovic G. Acute effects of instrument assisted soft tissue mobilization vs. foam rolling on knee and hip range of motion in soccer players. *J Bodyw Mov Ther*. 2015;19(4):690–696. PubMed ID: 26592226 doi:10.1016/j.jbmt.2015.04.010
15. Laudner K, Compton BD, McLoda TA, Walters CM. Acute effects of instrument assisted soft tissue mobilization for improving posterior shoulder range of motion in collegiate baseball players. *Int J Sports Phys Ther*. 2014;9(1):1–7. PubMed ID: 24567849 doi:10.1016/j.jbmt.2015.04.010
16. Vardiman J, Siedlik J, Herda T, et al. Instrument-assisted soft tissue mobilization: effects on the properties of human plantar flexors. *Int J Sports Med*. 2015;36(3):197–203. PubMed ID: 25347141 doi:10.1055/s-0034-1384543
17. Martonick NJP, Reeves AJ, Whitlock JA, et al. Instrument-assisted soft tissue mobilization forces applied by trained clinicians during a simulated treatment. *J Sport Rehabil*. 2022;31(1):120–124. doi:10.1123/jsr.2020-0247
18. Favero LP, Belfiore P. *Data Science for Business and Decision Making*. San Diego, CA: Academic Press; 2018:60–61.