International Journal of Physical Education, Exercise and Sports
www.physicaleducationjournal.com
Online ISSN: 2664-9896
Received: 03-07-2026, Accepted: 03-08-2026, Published: 18-08-2026
Volume 8, Issue 3, 2026, Page No. 1-5

Effects of soft tissue mobilization technique on rhomboids muscle trigger points on its pain pressure threshold in tennis players

Dr. Nishat Kazim Ali Sayyed, Dr. Akhilesh Biwalkar
SVSS Latur College of Physiotherapy, Latur, Maharashtra, India
DOI: https://doi.org/10.66856/ijpees.2026.8.3.8059

Abstract
Background: Tennis is a high-intensity global sport that demands strong upper limb coordination, postural control, and dynamic scapular stability. Among the key stabilizing muscles, the rhomboids play a vital role in scapular retraction and shoulder alignment during repetitive movements such as the serve, forehand, and backhand strokes. Continuous loading and overuse of these muscles predispose tennis players to myofascial trigger points (MTrPs), resulting in pain, tightness. Instrument-Assisted Soft Tissue Mobilization (IASTM) is a noninvasive physiotherapy technique that employs specialized stainless-steel tools to mobilize soft tissue, break fibrotic adhesions, enhance collagen remodeling, and stimulate fibroblast proliferation. This approach may effectively relieve trigger points, increase circulation, and restore optimal muscle function.
Aim: To evaluate the effects of the IASTM technique on rhomboid muscle trigger points and its impact on pain pressure threshold (PPT) in tennis players.
Methodology: An experimental study was conducted on 111 amateur tennis players aged 15–25 years diagnosed with rhomboid muscle trigger points. Pain intensity was measured using the Numerical Pain Rating Scale (NPRS), and PPT was assessed using an algometer. Participants received IASTM treatment for 5 minutes, followed by cryotherapy to minimize post-treatment inflammation. Pre- and post-intervention data were statistically analyzed using paired *t*-test and Wilcoxon signed-rank test to determine significance.
Results: Post-intervention analysis demonstrated a significant reduction in pain and increase in pain pressure threshold. The mean NPRS decreased from 6.07 ± 1.39 to 5.03 ± 1.98 ($p < 0.001$), while the mean PPT increased from 1.23 ± 0.42 to 1.41 ± 0.50 ($p < 0.001$). Out of 111 participants, 59.5 % showed positive improvement, 18 % had no change, and 22.5 % experienced transient soreness or no improvement.
Conclusion: The study concludes that Instrument-Assisted Soft Tissue Mobilization (IASTM) is an effective intervention for managing rhomboid muscle trigger points in tennis players. The technique enhances collagen synthesis, improves microvascular circulation, and promotes connective-tissue healing, leading to pain reduction and improved tolerance to pressure. Incorporating IASTM into sports physiotherapy protocols can aid in the prevention and rehabilitation of overuse injuries and enhance athletic performance.

Keywords: Instrument-assisted soft tissue mobilization (IASTM), rhomboid muscle, myofascial trigger points, pain pressure threshold, tennis players, physiotherapy, sports rehabilitation

Introduction

Tennis is a global sport played by many players at multiple skill levels [1]. Tennis is a popular global sport that attracts individuals from different age groups and with participation in more than 200 countries affiliated with the International Tennis Federation (Pluim *et al*. 2006) [2].

The muscles action in the tennis sport acts isotonically and isometrically[3].The isometric contraction is performed at the racket handle movement, it has been essential for the muscles to act isometrically, because a strong and good stroke depends on a firm grip and strong legs (quadriceps, thighs) (Zhang *et al*., 2016; Colomar, Baiget, & Corbi, 2020) [3].

During the grip movement the muscle in action are flexor digitorum superficialis, palmaris longus flexor muscles are involved [3]. For the forehead drive In the Preparation Phase the muscles that are involved are as lateral deltoid, posterior deltoid, teres minor and teres major, biceps brachii [3] For the Hitting Phase pectoralis major, anterior deltoid, triceps, elbow, core muscles, quadriceps, plantar flexion, gastrocnemius, tibialis posterior, soleus [3] In the Final Phase deltoid, pectoralis major, rhomboid, serratus anterior, gastrocnemius, tibialis posterior muscle [3] For the backhead drive In the Preparation Phase the muscles that are in action are flexor digitorum superficialis, deltoid, pectoralis major muscle, biceps brachii, flexors muscles of the fingers, teres major, the infraspinatus and the posterior deltoid [3] Hitting Phase posterior deltoid, the supraspinatus, teres major, triceps, elbow, the rhomboid [3] Final Phase deltoid, supraspinatus, upper trapezius, gastrocnemius, tibialis posterior, peroneus longus, brevis, tibialis posterior, obliquus internus and another core muscles [3] The biomechanics in the tennis sport [4] Service: The eccentric stretch and pre-tensing of the anterior shoulder muscles is maximised by a vigorous leg drive which positions the racquet with “down behind and away from the lower back” in preparation for the drive to the ball [4].

Groundstrokes: Volley/service return: Placing the quadriceps muscle (extensor at the knee joint) on the stretch, subsequent release of the energy to enhance the quick movement in the preparation for the stroke [4].

Coordination strategies in tennis are as follows [4]. In the power strokes (the service) includes the Leg drive and the trunk rotations requires the shoulder speed [4]. Upper arm elevation and the flexion requires the elbow speed [4] Forearm extension and pronation and upper arm internal rotation requires the wrist speed and the orientation of the racquet [4] Hand flexion requires the racquet speed [4] For the precision stroke requires the shoulder rotation forward step of the front leg and the forward movement of the racquet arm all work together as a whole unit [4].

The muscles majorly involed in the action are the deltoid, triceps brachii, arm flexors and forearm superficial flexor muscles of the dominant were hypertrophied (MRI) compared with the non-dominant by 11-15%. [5]. These muscles represented a similar fraction of the whole muscle volume in both upper extremities [5].

The serratus anterior and trapezius muscle act together to stabilise the scapula against the thoracic wall, elevation of the scapula is regulated by coupling of the upper and lower trapezius muscle, as well as the serratus anterior and the rhomboids [6].

Rhomboids plays an important role in stabilization of both the scapula and shoulder girdle [7]. Rhomboids are innervated from the dorsal scapular nerves of the scapula and its vascular source is dorsal scapular artery [7]. Rhomboid compromises of two distinct muscles rhomboids minor and major that lie deep in the trapezius (Martin and Fish, 2018) [7].

The common condition affected is the Myofascial trigger points (MTrPs) are a common problem can affect any muscle in body they are the foci of tenderness that is been caused by excessively contracted muscle tissue that is further formed as the taut bands or the small knots that has been seen in the pathological microscopic part of the image, that causes the pain and also the spasm (Marecki and Wosicki, 1987) [7]. Whenever it occurs in a localized group of muscles or single group of muscle producing sensory motor autonomic symptoms it is known as myofascial pain syndrome [7].

The prevalence for the trigger points in the rhomboids major muscle is 14.3% and rhomboids minor is 10.2% trigger points [8]. It is most neglected muscle. The Refore the need arises for the study.

The Tennis player are more susceptible to a variety of range of injuries including the chronic overuse condition and also acute traumatic injuries [9]. Though the variety of the hundreds of strokes per matches the kinetic chains enables the player to generate the high racquet and ball velocities while also minimizing the joint loads, especially when the player is playing with the power shots that includes the overhead serves, overhead smashes, and also the groundstrokes [9]. The kinetic chain particularly begins at the feet and knees, progress to core, and trunk, to SHOULDER, and elbow, to wrist, and racquet [9].

The OTHER common injuries in the SHOULDER- are superior labrum anterior to posterior (SLAP) tears, Internal or subacromial impingement, rotator cuff tendinopathy/tear; ELBOW- Medial and Lateral tendinopathy; WRIST- Extensor carpi ulnaris tendinitis/subluxation, carpal ligament sprain; HIP Groin muscle strain; KNEE- Thigh muscle strain, Knee ligament sprain/rupture, Meniscus tear, Extensor tendinopathy/rupture; ANKLE – Sprain, Fracture; TRUNK- Paraspinal muscle strain, Rib strain [10].

Pressure pain threshold (PPT) is defined as the minimum force applied which induces pain. This measure has proven to be commonly useful in evaluating tenderness symptom [11]. Pressure pain threshold (PPT), measured by algometer is defined as the point at which painless stimulation such as pressure turns into a painful sensation [12].

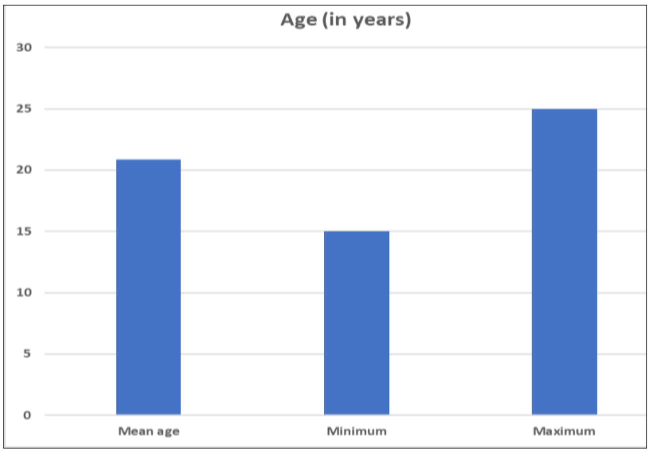
To release the trigger points effectively the instrument such as the Instrument-assisted soft tissue mobilization techniques (IASTM) is noninvasive technique procedure rapidly growing in popularity amongst ATHELETS SPORT PLAYERS due to their effectiveness and efficiency in treating soft tissue restrictions [13].

The IASTM techniques use the special stainless-steel instruments that enable the therapist to locate efficiently and also to treat the soft tissue dysfunctions, such as the fibrosis, adhesions, chronic inflammation, or degeneration [13].

Benefits from the IASTM use that include the increased fibroblast proliferation, and reduction in the adhesions, increases in the vascular response, and remodeling of disorganized collagen fiber matrix [12]. IASTM technique also has been found beneficial in improvements in range of motion [13].

The forces applied by the therapist is minimized forces are maximized that are delivered to the tissues, stimulates the deeper situated point of adhesions, it also stimulates the connective tissues remodeling [14].

The Iastm showed the improvement in the athlete
Results



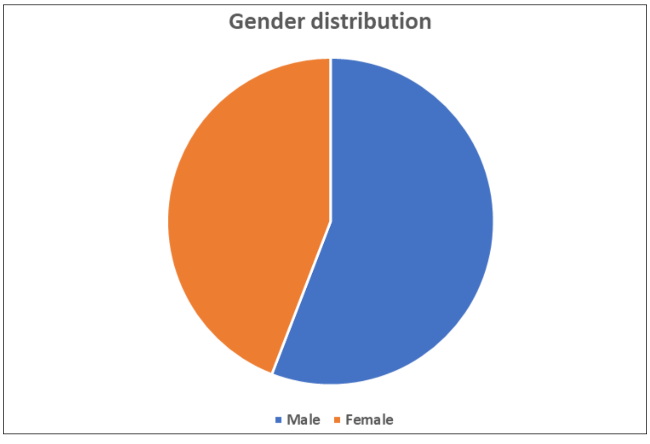
Graph 1: Age distribution

Youngest being 15 years and the oldest 25 years. This reflects that the study population was primarily composed of young adults.

Gender Distribution

Table 1:

GENDER	N	%
Male	62	55.9%
Female	49	44.1%



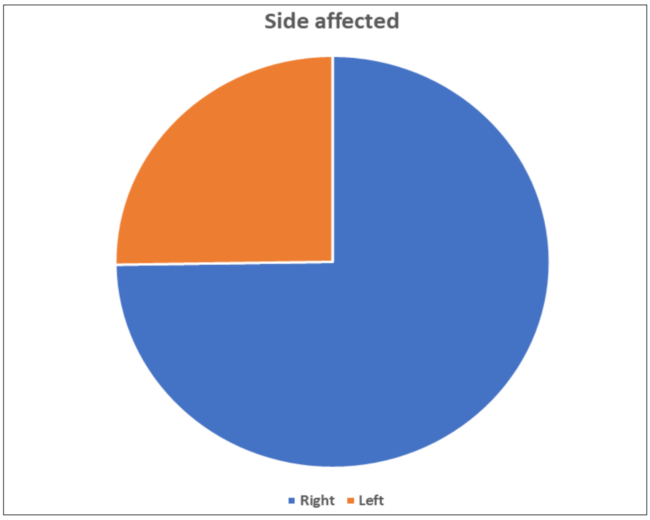
Graph 2:

With respect to gender distribution, there were 62 males (55.9%) and 49 females (44.1%), showing a relatively balanced sample with a slight predominance of males over females.

Side Affected

Table 2:

Side Affected	N	%
Right	83	74.8
Left	28	25.2



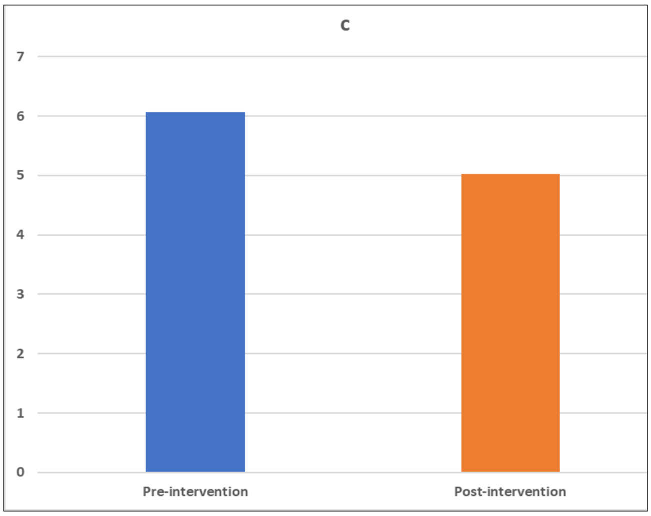
Graph 3:

Regarding the side affected, the right side was more frequently involved in 83 participants (74.8%), whereas the left side was affected in 28 participants (25.2%), indicating that the right side was nearly three times more commonly affected than the left.

Comparison of pre-intervention and post-intervention NPRS score

Table 3:

Interval	Mean ± SD	Difference	z-value	p-value
Pre-intervention	6.07 ± 1.39	1.05	-5.046	<0.001*
Post-intervention	5.03 ± 1.98			



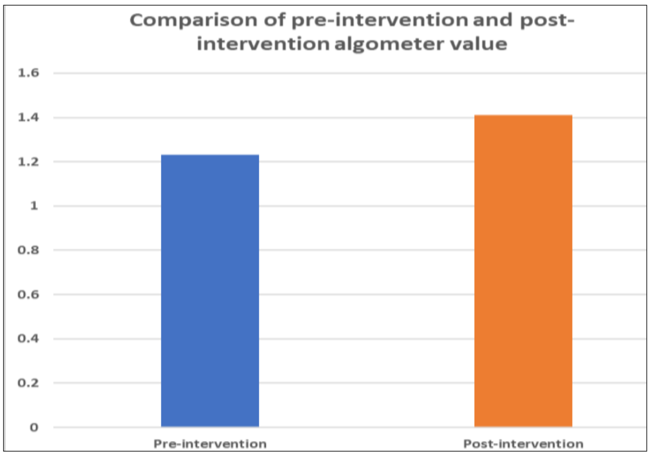
Graph 4:

Wilcoxon signed rank test; * indicates a significant difference at $p \leq 0.05$ On comparison of pain scores, the mean NPRS score showed a significant reduction following the intervention, decreasing from 6.07 ± 1.39 at baseline to 5.03 ± 1.98 post-intervention, with a mean difference of 1.05. The Wilcoxon signed rank test confirmed this reduction to be statistically significant ($z = -5.046$, $p < 0.001$).

Comparison of pre-intervention and post-intervention algometer value

Table 4:

Interval	Mean ± SD	Difference	t-value	p-value
Pre-intervention	1.23 ± 0.42	-0.18	-4.223	<0.001*
Post-intervention	1.41 ± 0.50			



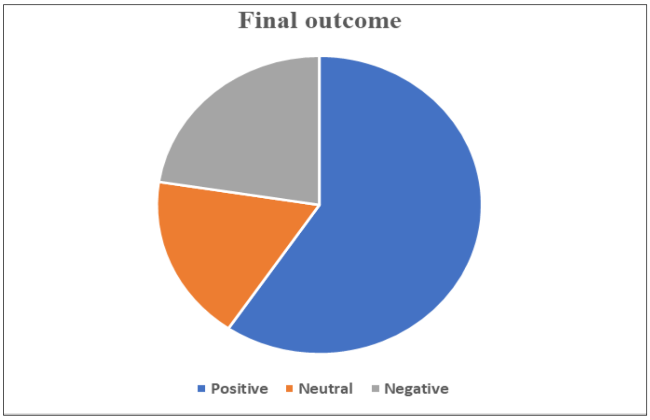
Graph 5:

Wilcoxon signed rank test; * indicates a significant difference at $p \leq 0.05$ Pressure pain threshold values assessed using an algometer demonstrated significant improvement after intervention. The mean algometer value increased from 1.23 ± 0.42 at baseline to 1.41 ± 0.50 post-intervention, with a mean difference of -0.18. This change was also statistically significant ($t = -4.223$, $p < 0.001$.

Result details

Table 5:

Result	N	%
Positive	66	59.5
Neutral	20	18.0
Negative	25	22.5



Graph 6:

When evaluating the overall result distribution, 66 participants (59.5%) showed a positive outcome, there was reduction in the pain more pain presuure threshold, while 20 (18.0%) demonstrated a no change in response, and 25 (22.5%) had increased pain outcome, there was increased in the pain.

Conclusion

This study provides strong, sport-specific, muscle-specific, and condition-specific evidence supporting the use of IASTM for rhomboid trigger points in tennis players. With 59.5% of participants showing positive outcomes, IASTM proves effective in reducing pain, improving ROM, enhancing functional performance, and potentially preventing compensatory injuries. Compared to previous research, the targeted application in a well-defined athletic population demonstrates superior practical relevance, positioning IASTM as a valuable intervention in sports physiotherapy and rehabilitation programs. The study reinforces that focused, evidence-informed application of IASTM can deliver meaningful clinical and performance benefits in sport-specific settings

References

1. Myers NL, Sciascia AD, Kibler W, Uhl T. Volume-based interval training program for elite tennis players. Sports Health,2016:8(6):536–540.
2. Kachanathu SJK, Kumar P, Malhotra M. Relevance and incidence of musculoskeletal injuries in Indian tennis players, an epidemiological study. American Journal of Sports Science and Medicine,2014:2(5):1–5. doi:10.12691/ajssm-2-5A-1.
3. Koronas V, Koutlianos N. Muscle activation during forehand and backhand drives in the sports discipline of tennis. Physical Education and Sport,2020:18(3).
4. Elliott B. Biomechanics and tennis. British Journal of Sports Medicine,2006:40(5):392–396. doi:10.1136/bjsm.2005.023150.
5. Sanchís-Moysi J, Idoate F, Olmedillas H, Guadalupe-Grau A, Alayón S, Carreras A, *et al*. The upper extremity of the professional tennis player, muscle volumes, fiber-type distribution and muscle strength. Scandinavian Journal of Medicine & Science in Sports,2010:20(3):524–534. doi:10.1111/j.1600-0838.2009.00969. x.
6. Van der Hoeven H, Kibler WB. Shoulder injuries in tennis players. British Journal of Sports Medicine,2006:40(5):435–440. doi:10.1136/bjsm.2005.023218.
7. Albaker A, Alharbi D, Ghufaily A, Almisfer S, Alobaysi Y, Alghuyaythat W, *et al*. Rhomboid muscle spasms among the population of Saudi Arabia. Medical Science,2023:27.
8. Ribeiro DC, Belgrave A, Naden A, Fang H, Mattews P, Parshottam S. The prevalence of myofascial trigger points in neck and shoulder-related disorders, a systematic review of the literature. BMC Musculoskeletal Disorders,2018:19(1):252. doi:10.1186/s12891-018-2157-9.
9. Fu MC, Ellenbecker TS, *et al*. Epidemiology of injuries in tennis players. Current Reviews in Musculoskeletal Medicine,2018:11(1):1–5. doi:10.1007/s12178-018-9452-9.
10. Arora A, Doshi S. Injury profile of professional Indian tennis players. International Journal of Health Sciences & Research,2017:7(3).
11. Maniatakis A, Mavraganis N, Kallistratos E, Mandalidis D, Mylonas K, Angelopoulos P, *et al*. The effectiveness of instrument-assisted soft tissue mobilization technique (Ergon© technique), cupping and ischemic pressure techniques in the treatment of amateur athletes' myofascial trigger points. Journal of Novel Physiotherapy,2016: S3(009). doi:10.4172/2165-7025.S3-009.
12. Maquet D, Croisier JL, Demoulin C, Crielaard JM. Pressure pain thresholds of tender point sites in patients with fibromyalgia and in healthy controls. European Journal of Pain,2004:8(2):111–117. doi:10.1016/S1090-3801(03)00082-X.
13. Cygańska AK, Tomaszewski P, Cabak A. Pain threshold in selected trigger points of superficial muscles of the back in young adults. PeerJ,2022:10:e12780. doi:10.7717/peerj.12780.
14. Agarwal S, Bedekar N, Shyam A, Sancheti P. Comparison between effects of instrument-assisted soft tissue mobilization and manual myofascial release on pain, range of motion and function in myofascial pain syndrome of upper trapezius, a randomized controlled trial. Hong Kong Physiotherapy Journal,2024:44(1):57–67.
15. Kim J, Sung DJ, Lee J. Therapeutic effectiveness of instrument-assisted soft tissue mobilization for soft tissue injury, mechanisms and practical application. Journal of Exercise Rehabilitation,2017:13(1):12–22. doi:10.12965/jer.1732824.412.
16. Gill JY. The prevalence of myofascial trigger points in asymptomatic overhead athletes. 2015.
17. Bennette S. Common injuries in sub-elite tennis players. 2015.
18. Alghadir AH, Anwer S. Test–retest reliability, validity, and minimum detectable change of visual analog, numerical rating, and verbal rating scales for measurement of osteoarthritic knee pain. Journal of Pain Research,2018:11:851–856. doi:10.2147/JPR.S158847.
19. Segeel M. The effect of chiropractic adjustive therapy and dry needle therapy in the treatment of inter-scapular pain due to active rhomboid minor and major trigger points. 2010.
20. Kinser AM, Sands WA, Stone MH. Reliability and validity of a pressure algometer. Journal of Strength and Conditioning Research,2009:23(1):312–314. doi:10.1519/JSC.0b013e31818f051c.
21. Gulick DT. Instrument-assisted soft tissue mobilization increases myofascial trigger point pain threshold. Journal of Bodywork and Movement Therapies,2018:22(2):341–345. doi: 10.1016/j.jbmt.2017.10.012.
22. Lambert M, Hitchcock R, Lavallee K, Hayford E, Morazzini R, Wallace A. The effect of instrument assisted soft tissue mobilization compared to other intervention on pain and function, a systematic review. 2017.
23. Cheatham SW. Instrument assisted soft tissue mobilization, a commentary on clinical practice guidelines for rehabilitation professionals. International Journal of Sports Physical Therapy,2019:14(4).

24. Arce Gálvez L, Cuervo Pulgarín JL, Castellanos Ramelli D, Guauque Marcelo CV, Valencia Gómez RE. Trapezius-rhomboid plane block for myofascial pain syndrome, description of a new intervention. Interventional Pain Medicine,2024:3(2).
25. Mahmood A, Saleem S, Khan MU. Comparison of trigger points pressure release with ultrasound therapy to decrease rhomboid trigger points. Pakistan Journal of Rehabilitation,2016:5(2).
26. Abrams GD, Renstrom PA, Safran MR. Epidemiology of musculoskeletal injury in tennis players. British Journal of Sports Medicine,2012:46:492–498.
27. Ikeda N, Hiratsuka K, Isaka T. Effect of 6-week instrument-assisted soft tissue mobilization on joint flexibility and musculotendinous properties. Sports,2024:12(6):150. doi:10.3390/sports12060150.
28. Mondal ES, Zutshi K, Dhingra M. Immediate and acute effect of self myofascial release vs instrument assisted soft tissue mobilization on flexibility, strength and sport-specific performance in young male soccer players. Indian Journal of Youth and Adolescent,2022:9.
29. 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. International Journal of Sports Physical Therapy,2014:9(1).
30. Beaupre M, Tassoul T, LeMire P, Elsing M, Braun SI, Stow RC. Effects of the Graston Technique on overhead throwing velocity in collegiate baseball players. International Journal of Research in Exercise,2015:11.
31. Ali M, Ansari B, Rafique N, Mahmood A. Effects of instrumented assisted soft tissue mobilization IASTM on trigger points of the cervical and lumbar region among sedentary individual. Journal of Population Therapeutics and Clinical Pharmacology,2008:31(8):385–394.
32. Rhyua HS, Han HG, Rhi SY. The effects of instrument-assisted soft tissue mobilization on active range of motion, functional fitness, flexibility, and isokinetic strength in high school basketball players. Technology and Health Care,2018:26(5):833–842. doi:10.3233/THC-181384.