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Comparative Study Between Instrumental Assisted Soft Tissue Mobilization and Static Stretching on Delayed Onset of Muscle Soreness in Young Adult Female

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ABSTRACT

Aim: To compare the effect of IASTM and static stretching on delayed onset muscle soreness in young females.
Objectives: To find out the effectiveness of instrumental assisted soft tissue mobilization on reducing delayed onset of muscle soreness (DOMS). To find out the effectiveness of static stretching on reducing delayed onset of muscle soreness (DOMS). To compare the effectiveness of instrumental assisted soft tissue mobilization and static stretching on reducing delayed onset of muscle soreness (DOMS).
Methodology: In this comparative study, 40 young adult females who fulfilled the inclusion criteria were recruited from MVP'S college and research center. Subjects were then divided into 2 groups: GROUP A: IASTM and GROUP B: Static stretching.
First of all, DOMS was induced in each subject using exercise protocol. Then the treatment was given for the next 3 days. Outcome measures of NPRS, ROM of ankle dorsiflexion and Y balance scale were evaluated before and after each treatment session.
Results: ANOVA was found significant when the data was compared within the groups as well as Unpaired t test was found significant when data was compared between the groups.
Conclusion: This study concluded that IASTM and static stretching both are effective for delayed onset of muscle soreness. It was found that both IASTM and static stretching decreases pain, increase range of motion and balance. Clinicallyand statistically IASTM was found more effective than static stretching.

Keywords: DOMS, IASTM, Static stretching, gastrocnemius, NPRS

INTRODUCTION

Aim of the study: To compare the effect of IASTM and stretching on delayed onset musclesoreness in young females.
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Introduction: Delayed onset of muscle soreness (DOMS) is a sensation of pain, stiffness, loss of proprioception and muscle soreness, commonly experienced after unaccustomed strenuous exercises, particularly those involving eccentric contractions. [(1)] Delayed onset of muscle soreness reaches its peak intensity of symptoms at 24 to 72 hours after cessation of exercise. [(2)]

Typical symptoms of DOMS are muscular pain and tenderness, others include muscle swelling, soreness.

Functional impairments including decline in the range of motion, deterioration of proprioception. [(2)] A review of the literature suggests that more than one theory namely: lactic acid, muscle damage, inflammation, connective tissue damage, muscle damage and enzyme efflux, can be used to explain the onset of DOMS. [(2)]

The process begins with application of high tensile muscle forces associated with eccentric exercise, which leads to damage to z -line in the muscle and increases levels of blood enzyme creatine kinase. Which is followed by swelling and inflammatory cell infiltration within first few hours, which peak at 48 hours post exercise. [(2)]

There are certain physiological changes that have been observed in the muscle following eccentric activity. These are- miniscule tear to muscle tissue which is accountable for the discharge of chemical substances that stimulate free ending like Histamines, anaerobic metabolites and chemical action enzyme; Development of osmotic pressure inflicting swelling of encompassing tissue (fluid retention); cramps or muscle spasm leading to decreased activity; Alteration in cell calcium regulation mechanism; Inflammatory response that results in enhanced white corpuscle count, interleukin-1 beta, white blood corpuscle and accumulation of leucocytes[(3)]

DOMS can impair individuals' motivation and enthusiasm for activities engagement or sports participation and may increase further injury, thus undermining their quality of life. [(3)]

The process begins with application of high tensile muscle forces associated with eccentric exercise, which leads to damage to z -line in themuscle and increases levels of blood enzyme creatine kinase. [(2)]Instrument-assisted soft tissue mobilization (IASTM) is a clinical intervention applied with handheld tools to address myofascial dysfunctionor pathology. [(3)]

There are scientific theories regarding effect of IASTM such as mechanical and neurophysiological. The mechanical theory suggests that pressure andshearing from the instrument may release and breakdown scar tissue, adhesions and facial restriction and aid tissue healing. The neurophysiology theory suggests that pressure from the tool may stimulate local mechanoreceptors, nociceptors e.g. C-tactile fibers. [(3)]

IASTM treatment, the Nord blade is used to administer the treatment. The Nord blade is a stainless-steel shape metal instrument with bevelled edge and contours that can conform to different body anatomical location and allow for a deeper penetration. [(6)]

IASTM is a simple and practical technique, Because the surface of the instrument minimizes the force used by the practitioner, but maximizes the force delivered to the tissues, it is possible to stimulate points of adhesion located in deep areas. [(6)]

It was found that the levels of discomfort and fatigue experienced by therapists who treated patients with IASTM were significantly lower than the levels in therapists treating their patients using the metal end of a reflex hammer. Moreover, IASTM has another advantage of being able to produce positive effects in a much shorter period than friction massage, another mode of soft tissue therapy, which requires 15–20 min. (6)

Static stretching is also found as a remedy to reduce or prevent DOMS after a strenuous sport activity. In this sense, stretching can be performed as a part of warm-up before exercise or immediately after exercise aiming to prevent development of DOMS.

Static stretching elongates muscle just past the point of tissue resistance and then held in a lengthened position with a sustained stretch force over a period of time. (4)

Static stretching is also found as a remedy to reduce or prevent DOMS after a strenuous sport activity. In this sense, stretching can be performed as a part of warm-up before exercise or immediately

after exercise aiming to prevent development of DOMS, or in the days after exercise to reduce pain and stiffness associated with existing DOMS. (4)

MATERIALS & METHODS

40 participants were selected on the basis of inclusion and exclusion criteria.

They were explained about the procedure and a consent form was signed from all the participants.

Participants were allotted into 2 groups using simple random sampling method.

Group A-Instrumental assisted soft tissue mobilisation (IASTM).

Group B-Static stretching.

The muscles selected for study was Gastrocnemius.

PROCEDURE TO INDUCE DOMS

Each participant warmed up using 2 sets of heel raises of 15 repetitions with 20 seconds break between each set.

The eccentric exercise was performed on specifically manufactured stair stepper. The participants raised their heels maximally contracting the calf muscles for 1 second then putting the heels down slowly within 3 seconds until soles touched a-35 degree slant plate. All participants performed 5 sets of 30 repetition with rest of 10 seconds between each set, the last set was performed until muscle fatigue, when repetition of eccentric exercise would not be possible.

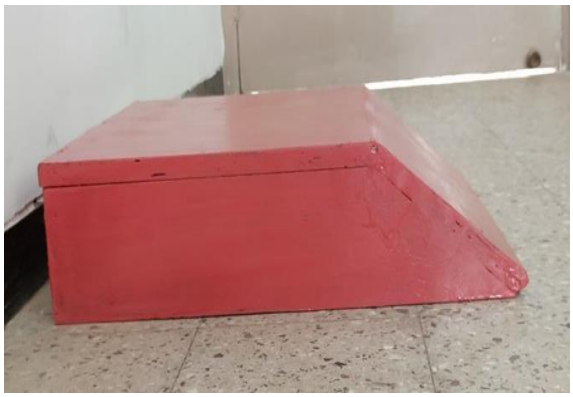

Figure 1: Modified stepper

Figure 2: calf raise

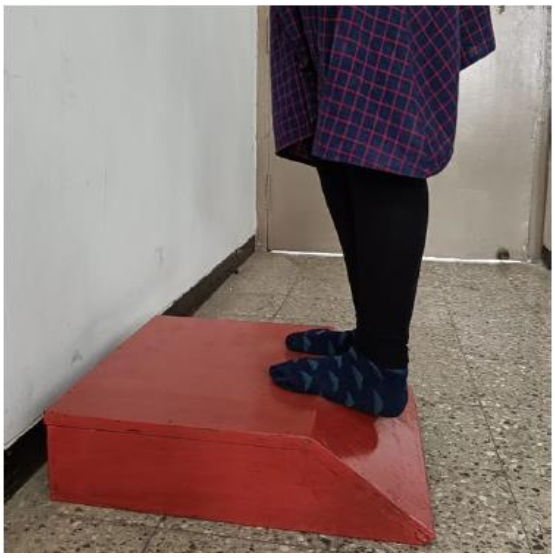

Figure 3: Eccentric contraction of calf

Group A: IASTM

The therapist administered 90 seconds IASTM treatment on calf muscle with Nord blade angled at 30 degrees from proximal to distal direction. This technique was performed at 24,48 hours and 72 hours. NPRS, ROM of ankle dorsi flexion and Y- balance scale was measured after each treatment session

Figure 4: Application of IASTM

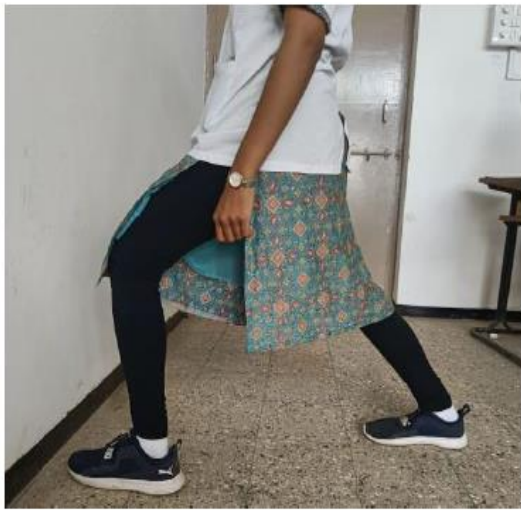

Figure 5: Static stretching

Group B: Static stretching: Stretching was administrated in such a way that the participants were asked to placed non stretched leg forward and stretched leg backward. The participants shifted the body weight forward on the non- stretched leg until she felt the stretch leg will be at a point of mild discomfort. The stretch was maintained for 30 seconds with 10 seconds interval and repeated for 10 times. Static stretching was performed at 24 hours,48 hours and 72 hours. NPRS, ROM of ankle dorsi flexion and was measured after each treatment session.

Materials used in the Study

Specifically manufactured stair stepper (stepper with inclination at the heel side), Goniometer, IASTM tool (Nord blade), Watch, Pen, Paper, Consent form, Moisturizer

Statistical Analysis

Data Analysis

Comparison within the groups is done using ANOVA and comparison between the groups is done using unpaired t test.

GROUP A: IASTM

Table NO. 1 Comparison of NPRS between day 1, day 2 and day 3 of right lowerlimb.

	Mean±SD	P value	F value	Significance
Day 1	5.6 ±0.94032	<0.0001	252.4	Extremely Significant
Day 2	3.1 ±0.640723			
Day 3	0.35 ±0.587143			

Table NO. 2 Comparison of NPRS following day 1, day 2 and day 3 of LEFT lowerlimb.

	Mean ± SD	P value	F value	Significance
Day 1	5.9 ± 1.020836	<0.0001	132.9	Extremely Significant
Day 2	3.7 ± 1.341641			
Day 3	0.6 ± 0.598243			

Table NO. 3: Comparison of ROM between day 1, day 2 and day 3 of rightlower limb.

	Mean ± SD	P value	F value	Significance
Day 1	16.45 ± 1.877148	<0.0001	111.9	Extremely Significant
Day 2	21.9 ±2.552604			
Day 3	26.5 ±1.877849			

Table NO. 4: Comparison of ROM between day 1, day 2 and day 3 of left lowerlimb.

	Mean ± SD	P value	F value	Significance
DAY 1	16.25 ±2.221308	<0.0001	71.75	Extremely Significant
DAY 2	21.05 ±3.203206			
DAY 3	25.55 ±1.700619			

Table NO. 5: Comparison of Y Balance scale between day 1, day 2 and day 3 ofright lower limb.

	Mean ± SD	P value	F value	Significance
DAY 1	83.9 ±5.571544	<0.0001	5.128	Extremely Significant
DAY 2	85.8 ±16.51347			
DAY 3	93.75 ±3.971941			

Table NO. 6: Comparison of Y Balance scale between day 1, day 2 and day 3 ofleft lower limb.

	Mean ± SD	P value	F value	Significance
DAY 1	81.45 ±5.500957	<0.0001	18.18	Extremely Significant
DAY 2	86.15 ±5.274317			
DAY 3	91.2 ±4.514305			

GROUP B: STATIC STRETCHING

Table NO. 7: Comparison of NPRS scale between day 1, day 2 and day 3 ofRight lower limb.

	Mean±SD	P value	F value	Significance
Day 1	7.95±0.944513	<0.0001	93.17	Extremely Significant
Day 2	6.25±0.850696			
Day 3	3.5±1.277333			

Table NO. 8: Comparison of NPRS scale between day 1, day 2 and day 3 of leftlower limb.

	Mean±SD	P value	F value	Significance
Day 1	7.2±1.105013	<0.0001	81.34	Extremely Significant
Day 2	5.95±0.759155			
Day 3	3.45±0.944513			

Table NO. 9: Comparison of ROM scale between day 1, day 2 and day 3 of Rightlower limb.

	Mean±SD	P value	F value	Significance
Day 1	12.8±0.894427	<0.0001	165.5	Extremely Significant
Day 2	15.95±1.932411			
Day 3	22.4±2.036509			

Table NO. 10: Comparison of ROM between day 1, day 2 and day 3 of Leftlower limb.

	Mean±SD	P value	F value	Significance
Day 1	13.3±1.031095	<0.0001	71.75	Extremely Significant
Day 2	16.4±1.391705			
Day 3	20.9±1.916686			

Table NO. 11: Comparison of Y Balance scale between day 1, day 2 and day 3 of Right lower limb.

	Mean±SD	P value	F value	Significance
Day 1	76.9±3.683534	<0.0001	17.37	Extremely Significant
Day 2	80.65±3.731445			
Day 3	84.05±4.084309			

Table NO. 12: Comparison of Y Balance scale between day 1, day 2 and day 3 ofLeft lower limb.

	Mean±SD	P value	F value	Significance
Day 1	75.05±4.122786	<0.0001	20.55	Extremely Significant
Day 2	79.45±3.872644			
Day 3	83.2±4.073018			

Data analysis between the Groups by using UN PAIREDT TEST

Table 13: Comparison between pre and post intervention NPRS score of Rightlower limb between group A and B.

	DAY 1		DAY 2		DAY 3	
	PRE	POST	PRE	POST	PRE	POST
GroupA	8.65 ±1.0399	5.6±0.94033	5.5 ± 0.88852	3.1 ± 0.64072	2.75 ±0.7163	0.35 ±0.58714
GroupB	9.2 ± 0.41039	7.95 ±0.9445	8.1 ± 0.64072	6.25 ±0.85069	5.6 ± 0.99472	3.5 ± 1.27733
T value	2.200	7.885	10.61	13.23	10.40	10.02
P value	0.0340	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Results	Statisticallynot significant	Statistically significant.	Statistically significant.	Statistically significant.	Statistically significant.	Statistically significant.

Table 14: Comparison between pre and post intervention NPRS score of Leftlower limb between group A and B.

	DAY 1		DAY 2		DAY 3	
	PRE	POST	PRE	POST	PRE	POST
GroupA	8.75 ±1.0195	5.6±1.02083	5.65±0.8127	3.7±1.341641	3.2±0.69585	0.6±0.59824
GroupB	9.15±0.48936	7.95±0.94451	8.05±0.604805	5.95±0.75915	5.45±0.998683	3.45±0.94451
T value	1.58	6.259	10.59	6.252	8.267	11.40
P value	0.1220	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Results	Statisticallynot significant.	Statistically significant.	Statistically significant.	Statistically significant.	Statistically significant.	Statistically significant.

Table 15: Comparison between pre and post intervention ROM score of Rightlower limb between group A and B.

	DAY 1		DAY 2		DAY 3	
	PRE	**POST**	**PRE**	**POST**	**PRE**	**POST**
GroupA	12.5±1.96012	16.45±1.87714	18.1±2.84512	21.9±2.552604	22.8±2.483631	26.5±1.877849
GroupB	11.6±1.95744	12.8±0.89442	13.45±1.5381	15.95±1.932411	18.05±1.468081	22.4±2.036509
T value	1.435	7.850	6.430	8.311	7.363	6.619
P Value	0.1544	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Results	Statisticallynot significant.	Statistically significant.	Statistically significant.	Statistically significant.	Statistically significant.	Statistically significant.

Table 16: Comparison between pre and post intervention ROM score of Leftlower limb between group A and B.

	DAY 1		DAY 2		DAY 3	
	PRE	**POST**	**PRE**	**POST**	**PRE**	**POST**
GroupA	12.1±2.38195	16.25±2.22130	17.75±2.69258	21.05±3.2032	22.35±2.77725	25.55±1.700619
Group B	11.35 ±1.49648	13.3±1.03109	13.45±1.5381	16.4±1.3917	18.45±1.5035	20.9±1.9166
T value	1.192	5.387	6.201	5.954	5.532	8.116
P value	0.2405	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Results	Statistically not significant.	Statistically significant.	Statistically significant.	Statistically significant.	Statistically significant.	Statistically significant.

Table 17: Comparison between pre and post intervention Y Balance score ofRight lower limb between group A and B.

	DAY 1		DAY 2		DAY 3	
	PRE	**POST**	**PRE**	**POST**	**PRE**	**POST**
GroupA	78.51±5.060	83.9±5.571544	85.8±5.699492	85.8±16.51347	90.9±4.789242	93.75±3.971941
GroupB	75±3.71341	76.9±3.683534	78.2±3.562967	80.65±3.73144	82.1±4.166281	85.55±4.382681
T value	2.244	4.687	5.057	6.169	6.200	6.202
P value	0.0370	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Results	Statisticallynot significant.	Statistically significant.	Statistically significant.	Statistically significant.	Statistically significant.	Statistically significant.

Table 18: Comparison between pre and post intervention Y Balance score ofLeft lower limb between group A and B.

	DAY 1		DAY 2		DAY 3	
	PRE	**POST**	**PRE**	**POST**	**PRE**	**POST**
GroupA	76.6±5.69764	81.45±5.50095	83.3±5.554515	86.15±5.27431	87.8±4.840618	91.2±4.514305
Group B	74.5±2.41704	75.05±4.12278	76.35±4.14570	79.45±3.87264	80.85±3.89703	83.2±4.073018
T value	1.517	4.163	4.484	4.579	5.002	5.884
P value	0.1374	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Results	Statistically not significant.	Statistically significant.	Statistically significant.	Statistically significant.	Statistically significant.	Statistically significant.

RESULT

The result of the study showed that both the groups (i.e. IASTM and Static stretching) significantly improves all the outcome measures.

The mean values of all outcome measures of day 1, day 2 and day 3 werecompared using ANOVA within the groups.

Group A: at P value <0.0001 for NPRS of both right and left lower limbs, the result was found to be extremely statistically significant.

At P value of <0.0001, ROM of ankle dorsiflexion for both right and left lower limb was found extremely statistically significant.

P value of Y-balance scale was found to be <0.0001 for both right and leftlower limb the result was found to be extremely statistically significant.

For group B: at P value <0.0001 for NPRS of both right and left lower limb,the result was found to be extremely statistically significant.

At P value of <0.0001, the ROM of ankle dorsiflexion was found extremelystatistically significant for both right and left lower limb.

P value obtained for Y-balance scale of both right and left lower limb was

<0.0001 which was extremely statistically significant.

Results between two groups were compared using unpaired t test.

The P value obtained was found to be statistically significant for NPRS of right and left lower limb, ankle dorsiflexion ROM of right and left lower limb and Y-balance scale of right and left lower limb.

DISCUSSION

The purpose of this study was to compare the effectiveness of Instrumental assisted soft tissue mobilization (IASTM) and Static stretching on delayed onset of muscle soreness in young adult females. In this study, 40 subjects were assigned, 20 subjects were in group A who received IASTM after induction of DOMS for 3 days. Group B consisted of 20 subjects who received Static stretching after induction of DOMS for 3 days.

In group A, the P value for NPRS, dorsiflexion ROM of ankle and Y- Balance scale was <0.0001 (extremely significant). Thus, the study showed that IASTM was effective in decreasing pain, improving range of motion and balance.

To observe the long-term effect of IASTM on ankle dorsiflexion ROM Holly M. Bush *et al (*2020*)* performed 6 treatment session in a period of 3 weeks which showed significant improvement in ROM in treating patients with dorsiflexion defects[(12)]. Jong- Hoon Park (2020) investigated effects of IASTM on chronic ankle instability taekwondo players which revealed improvement in ROM, isokinetic muscle strength and balance. It was believed that there was indirect improvement of balance through the improvement in the ROM and proprioceptive senses of the ankle [(17)].

In study conducted by Scott w. Cheatham *et al* (2019) where 23 subjects underwent three different testing sessions of IASTM for 3 consecutive days after strenuous exercise revealed a decrease in perceived pain (higher tolerance to pressure) which suggests that the light IASTM treatment modulated nociceptive activity (C-tactile fibers). C-tactile fibers are low threshold afferent mechanoreceptors that innervate the human skin and contribute to pain perception. These receptors respond to light tissue compressive forces and have been reported to modulate pain and mediate allodynia in DOMS. [(3)]

are several scientific theories regarding the effects of IASTM, most notable, mechanical and neurophysiological. The theory suggests that pressure and shearing from the instrument may release and breakdown scar tissue, adhesions and fascial restriction and aid in tissue healing (loghmani MT and Warden SJ 2019). [(20)]

Dr. M. Vijayakumar *et al* (2019*)* stated that IASTM was useful intervention for reducing pain as well as improving ankle dorsiflexion ROM and also had a good 24hr carry-over effect. It was also concluded that IASTM had upper hand over CMR (Compressive myofascial release) in terms of patient comfort and better tolerance to treatment. [(18)]

Bayliss AJ *et al* (2019) Stated that nine sessions of IASTM approach, soft tissue mobility, pain, calf strength and lower functional scale scores were improved and pain symptoms were reduced [(15)]. Stanek J *et al* (2018) found improvement in ROM after administration of IASTM in subjects with ankle dorsiflexion defect. [(13)] Grieve R. *et al* (2011) identified an immediate significant improvement in ankle ROM after a single intervention of trigger point pressure release on latent soleus. [(29)] Microvascular and capillary haemorrhage, along with localized inflammation can occur as a result of using IASTM to apply appropriate pressure and shear force to soft tissue. Such inflammation restarts healing process by removing scar tissue and releasing adhesions, while also increasing blood and nutrient supply to the injured area and migration of fibroblast (Baker *et al*, 2013; Hammer, 2008).[(21)]

In group B, the P value for NPRS, dorsiflexion ROM of ankle and Y- Balance scale was <0.0001 (extremely significant). Thus, the study showed that Static stretching was effective in decreasing pain, improving range of motion and balance.

Static stretching is commonly used method of stretching in which the soft tissues are elongated just past the point of tissue resistance and then held in lengthened position with a sustained stretch force over a period of time.

Ramesh .C *et al (*2021*)* performed a study in which it was observed that the mean dorsiflexion range of motion during post-test is higher than pre-test after the application of static stretching. [(4)] Lactic acid production is very dependent on the intensity of physical activity. Production of lactic acid in untrained people is the same as in the trained people, the difference is process of elimination from lactic acid. A study done by Zulaini *et al* (2021) concluded that the formation of lactic acid levels due to exercise often called DOMS can decrease if given active recovery and stretching.

The tension in the muscles can also limit and inhibit the range of motion in joints, stretching can prevent tension in muscle groups, maintain joint flexibility, and help warm up before doing core exercise. [(5)]

Ameer A.M *et al* (2018) suggested that active static stretching of lower limb muscles tends to decrease the lower limb reaction time and improve movement performance.[(23)]

Ried *et al* (2018) examined the effects of different static stretching durations (i.e 30, 60, 90 or 120s) of knee flexors and extensors as a part of full warm-up practice on muscle strength and power. The authors revealed that while all stretch duration improved ROM, clear reductions in strength and power were found with 120s of static stretching per muscle group, however, less than or equal to 60s of static stretching per muscle group resulted in increase in ROM and either no change or beneficial effects on strength and power performances.[(22)] The same authors suggested to include static stretching in a pre-exercise warmup program because it has the potential to lower the risk of sustaining musculotendinous injuries (Wood *et al* 2007*;* Behm *et al* 2016*).* [(24)]

Haddad M. *et al* 2014 found that static stretching of lower limbs and hip muscles had a negative effect on explosive performances up to 24 hours post stretchingwith no major effects on repeated sprint ability. [(25)]

Calf muscle stretching provides a small and statistically significant increase in ankle dorsiflexion Radford J.A *et al (*2006*).* Static stretching appears to have a greater effect on soleus muscle flexibility as evidence by gain in the ROM of ankle. [(26)]

An investigation performed by Cheung K *et al* (2003) on DOMS, treatment strategies and performance factors found consistent results as the present study. The results demonstrated that stretching exercises were amongst the most effective option for reducing the symptoms of DOMS. [(27)]

When the 2 groups were compared by using Un paired T-test we found that IASTM showed relatively more effectiveness on reducing DOMS clinically and statistically than static stretching p value <0.0001. Although both the groups showed significant effectiveness on reducing the DOMS.

The mechanism of static stretching works on lengthening of the shortened muscle fiber while IASTM works on break down of scar tissue of the muscle fibers.

With the help of IASTM fibroblasts proliferation and collagen repair takes place. this plays a major role in reducing the effect of DOMS. Static stretching when given prior to a strenuous exercise in the form of warm up helps to heat up the muscle and make flexible enough to prevent any exercise inducedsoreness.

IASTM works on the pain-gait mechanism where the c-fibers which carry nociceptive stimulus are blocked when the mechano-receptors are activated while using the IASTM tool on the skin surface which is the main reason why there is immediate reduction in the pain perceived by the subjects while static stretching activates the stretch reflex in which muscle spindle are activated which resist the change in muscle length by causing the stretched muscle to contract, when the muscle is stretched for a prolonged period of time the muscle spindle habituates and reduces its signaling which later helps to improve the flexibility of the muscles.

IASTM also releases the trigger points [18] which cannot be released during static stretching as a muscle harboring a trigger point will be too painful to stretch fully and subsequent inhibitory reflex will prevent sufficiently lengthening of the muscle band and forcing a stretch will often result in injury that is a muscle strain and thus not resolve the trigger point. [28]

There is also increase in the blood flow to the treatment area while using IASTMwhich helps to drain the exudates in the form of lactic acid which is produced during strenuous exercise and deposited in the muscle fibers. IASTM not only reduces pain but also helps healing of the fibers which are damaged during an eccentric contraction as there is proliferation of fibroblast and collagen repair takes place. [6] Certainly, there are no evidences which suggest static stretching may help the muscle fibers in the healing process.

The study suggests that both IASTM and static stretching are effective in reducing DOMS. Static stretching when included in the warm-up and cool down routine helps to reduce any muscle injury where else IASTM when applied after, eccentric exercise routine may not only reduce the chances of a muscle injury but also facilitate healing, and reduce the recovery time taken due to its effect on mechanoreceptors and nociceptors in recreational gym users and athletes after exercise induced soreness.

Clinical Implication

The result of this investigation suggests to clinicians that there may be merit in using a light IASTM stroke to stimulate local mechanoreceptors and nociceptors when treating patients in pain or following injury.

Both the treatments give effective results while dealing with DOMS thus can be used in recreational gym trainers and athletes to improve their performances, reduce the chances of injury and recovery time.

The results of this study are preliminary evidence, clinicians should consider this before integrating these treatments and assessment techniques into their clinical practice

CONCLUSION

This study concluded that IASTM and static stretching both are effective for delayed onset of muscle soreness. It was found that both IASTM and static stretching decreases pain, increase range of motion and balance scale. Clinically and statistically IASTM was found more effective than static stretching.

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Ethical Approval: Approved

REFERENCES

1. Blanca Romero-Moraleda, Roy La Touche, Sergio Lerma-Lara, Raul Ferrer Pena, Victor Paredes, Ana Belen Peinado and Daniel Munoz-Garcia. Neurodynamic mobilization and foam rolling improved delayed onset muscle soreness in an healthy adult population: a randomized controlled clinical trial(2017).PeerJ 5:e3908;DOI 10.7717/peerj.3908. page number 14.
2. Yanfei Xie, Beibei Feng, Mphil, Kedi Chen, Lars L. Andersen, Phil Page and Yuling Wang. (2017) "The efficacy of dynamic contract relax stretching on DOMS among healthy individuals a randomised clinical trial."Clin j sport med. 2018 jan: 28 (1):28-36. Doi: 10.1097/JSM.0000000000000442.
3. Scott W. Cheatham, Ethan Kreiswirth, Russell Baker (2019). "Does light pressure Instrumental assisted soft tissue mobilisation technique modulate tactile discrimination and perceived pain in healthy individual with DOMS?" J Can Chiropr Assoc 2019:63(1)
4. Dr.C.Ramesh, Alagappan Thiyagarajan, VinothaDurai (2021) "Effectiveness of static stretching and active muscle relaxation techniques on calf muscle tightness in normal

subjects". IJAMSCR/VOLUME 9 issue 2:2021 (91-97).
5. Zulaini, N S Harahap, N S Siregar and Zulfahri (2020). "Effect of stretching and recovery on DOMS after exercise". Journal of physics conference series 1811(1): 012113 DOI: 10.1088/1742-6596/1811/ 1/0121
6. Mallika Bitra, SG Sudhan (2019). "IASTM in management of musculoskeletal pain: A literature review with implications for clinical practice guidelines." journal of clinical and diagnostic research. 2019 dec, Vol 13 (12):YE01-YE05. doi 10.7860/ JCDR/2019.
7. Carrie A.Rowlett William J.Hanney, Patrick S.Pabian, Jordon H.McArthur, Carey E.Rothschild Morey J.Kolber (2018).(6) "Efficacy of Instrumental assisted soft tissue mobilisation in
8. comparison to gastrocnemius-soleus stretching for dorsiflexion range of motion: A randomised controlled trial" doi.org/10.10/j.jbmt.2018.02.008.
9. B D Chaurasia's Human Anatomy, seventh edition, volume 2.page number: 58
10. Scott W. Shaffer, SP USA, Deydre S. Teyhen, SP USA, Chelsea L. Lorenson, SPUSA, Rick L. Warren, SP USA, Christina M. Koreerat, SP USA, Crystal A. Straseske, SP USA, John D. Childs, USAF BSC Military Medicine, Volume 178, Issue 11, November 2013, Pages 1264–1270, "Y-Balance Test: A Reliability Study Involving Multiple Raters "
11. Carrie A Rowlett, William J Hanney, Patrick S Pabian, Jordon H McArthur, Carey E Rothschild, Morey J. Efficacy of instrument-assisted soft tissue mobilization in comparison to gastrocnemius-soleus stretching for dorsiflexion range of motion: A randomized controlled trial. KolberJournal of bodywork and movement therapies 23 (2), 233-240, 2019.
12. Holly M Bush, JustinM Stanek, Joshua D Wooldridge, Stephanie L Stephens, Jessica S Barrack. Comparison of the Graston Technique® With Instrument-Assisted Soft Tissue Mobilization for Increasing Dorsiflexion Range of Motion. J sport rehabilitation. doi: 10.1123/jsr.2019-3097
13. Justin Stanek, Taylor Sullivan, Samantha Davis. J Athl Train. Comparison of compressive myofascial release and the Graston Technique for improving ankle-dorsiflexion range of motion. 2018 Feb;53(2):160-167. Doi:10.4085/1062-6050-386-16.
14. Hyun-Seung Rhyu, Hyun-Gu Han, Soung-Yob Rhi. The effects of instrument-assisted soft tissue mobilization on active range of motion, functional fitness, flexibility, and isokinetic strength in high school basketball players. Technol Health Care. 2018;26 (5):833-842. Doi:10.3233/THC-181384.
15. Amy J Bayliss, T Crandall, Danielle L Farmer, Stuart J Warden. Instrument-assisted soft tissue mobilization alters material and mechanical properties in healthy, shortened Achilles tendons. https://s3.us-east-2.amazonaws.com/docs.graston.com/research/iastm_alters_properties_in_achilles_csm_2015_abstract_.pdf
16. Zubia Veqar. Causes and management of Delayed Onset Muscle Soreness: A review (2012).Zubia Veqar/Elixir Human Physio.55(2013) 13205-13211.
17. Jong-Hoon Park,[1] Hyun-Seung Rhyu,[2] and Soung- Yob Rhi[1] The effects of instrument-assisted soft tissue mobilization rehabilitation exercise on range of motion, isokinetic strength, and balance in chronic ankle instability taekwondo players, JExerc Rehabil. 2020 December: 16(6):516-521. Doi:10.12965/jer.2040752.376.
18. Dr. M. Vijayakumar[1], Aishwarya Jaideep[2], Rashi Khankal[2], Dr. Preeti Gazbare[3], Blessy Abraham[2.] Effectiveness of Compressive Myofascial Release Vs Instrument Assisted Soft Tissue Mobilization in Subjects with Active Trigger Points of the Calf Muscle Limiting Ankle Dorsiflexion International Journal of Health sciences and research vol.9 issue 4: April 2019.
19. 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; 13:240. J nov Physiother S3:012. Doi: 10.4172/2165-7025.S3-012.
20. Warren I Hammer .The effect of mechanical load on degenerated soft tissue, J Bodyw Mov Ther.2008 Jul:12(3)2:246-56. Doi: 10.1016/j.jbmt.2008.03.007. Epub 2008 june03
21. Jonathan Reid. The effects of different durations of static stretching within a comprehensive warm-up on voluntary and evoked contractile properties July 2018 European Journal of Applied Physiology 118(6). Eur J Appl Physiol.2018 Jul: 118(7):1427-1445. Doi:10.1007/s00421-018-3874-3.
22. Mariam A Ameer, Qassim I Muaidi. Effect of Acute Static Stretching on Lower Limb Movement Performance Using STABL

Virtual Reality System. J Sport Rehabilitation ,2018 Nov 1;27(6):520-525. doi: 10.1123/jsr.2017- 0017. Epub 2018 Jul 19.
23. Helmi Chaabene, David G. Behm .Front. Acute Effects of Static Stretching on Muscle Strength and Power: An Attempt to Clarify Previous Caveats Physiol.,29 November 2019 | https://doi.org/10.3389/fphys.2019.01468
24. Haddad JSCR 2013 Static Stretching Can Impair Explosive Performance For At Least 24 Hours. January 2014. Journal of strength and conditioning research vol 28 (1) page no. 141-145.
25. JA Radford. Does stretching increase ankle dorsiflexion range of motion? A systematic review. October 2006 British Journal of Sports Medicine 40(10):870-5; discussion 875.DOI:10.1136/bjsm.2006.029348.
26. Karoline Cheung [1], Patria Hume, Linda Maxwell. Delayed onset muscle soreness: treatment strategies and performance factors. 2003;33(2):145-64. doi: 10.2165/00007256-200333020-00005.
27. Author: Ginna. Trigger points: why stretching is not the answer. 3400 Table Mesa dr. Ste 201.boulder,80305.
28. ROB GRIEVE. The immediate effect of soleus trigger point pressure release on restricted ankle joint dorsiflexion., J BODYW. Mov Ther.2011 Jan:15(1):42-9. Doi: 10.1016/j.jbmt.2010.02

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