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## COMPARE THE EFFECTS OF MUSCLE ENERGY TECHNIQUE VS MYOFASCIAL RELEASE TECHNIQUE ON HAMSTRING FLEXIBILITY IN AMATEUR JUDO PLAYERS- A PROSPECTIVE EXPERIMENTAL RESEARCH STUDY

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### ABSTRACT

**Introduction:** The growing popularity of sports and exercise is focusing attention on the injuries that may occur in addition to the health benefits. Treating sports injuries may be expensive, so preventive strategies and measures are required on economic as well as medical grounds. **Objective:** To compare the effect with Muscle Energy Technique (MET) vs Myofascial Release Technique (MFR) on hamstring flexibility in amateur judo players. **Method:** In the present study, the total of 30 subjects were divided equally in 2 groups where group A underwent muscle energy technique and group B underwent Myofascial release techniques. Outcome measures were assessed before and after intervention by using active knee extension test and sit and reach test. **Result:** When comparing between groups; the mean AKE (RT) post score in Group A was 139.50 and the mean AKE (RT) post score in Group B was 135.50 which was statistically significant ( $p$ -value  $<0.0001$ ). The mean AKE (LT) post score in Group A was 138.07 and the mean AKE (LT) post score in Group B was 133.93 which was statistically significant ( $p$ -value  $<0.0001$ ). The mean SIT & REACH TEST post score in Group A was 17.36 and the mean SIT & REACH TEST post score in Group B was 15.64 which was statistically significant ( $p$  value  $<0.0001$ ). **Conclusion:** Muscle energy technique has been shown to be an effective technique in increasing the flexibility of hamstring muscle in amateur judo players.

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## INTRODUCTION

The growing popularity of sports and exercise is focusing attention on the injuries that may occur in addition to the health benefits. Treating sports injuries may be expensive, so preventive strategies and measures are required on economic as well as medical grounds. Several epidemiological surveys have outlined the frequency and types of injuries in various sports, but study comparisons are complicated by the different injury criteria used as well as by inconsistency in data collection and recording.<sup>1</sup> Martial arts such as judo and karate are also becoming popular, and the associated risks may be Greater than in most team games.<sup>1</sup> Muscle surrounding the knee joint further contributes to knee stabilization during lower extremity movement. Primary muscles include the quadriceps anteriorly, hamstrings posteriorly, gluteus medius and tensor fascia lata /IT band laterally and the hip adductors medially. The repetitive, eccentric nature of muscular activity about the knee during sports may lead to fatigue related injuries.<sup>2</sup> Judo one of the Japanese traditional martial arts in now the most widely practiced martial arts in the world. Judo includes at least four technical aspects throw, hold down, choke and arm lock. Each of which could impose large stress on various anatomical structures. For a successful throws a judoka needs to manipulate the Centre of mass of the opponent relative to the

base of support and make their opponent land on their back with speed gathered in the fall as a consequence.<sup>3</sup> Over the last several years, the study of Judo in the Asian countries has steadily gained in popularity. In 1964 Judo became an Olympic sport (Shinohara, 2006). Judo originates from Japan. In Japanese Judo means "gentle way" (Borkowski& Manzo, 1999). Jigoro Kano is known as the founder of Judo in 1882 (Ohlenkamp, 2006). Modern Judo is a marital art based on the traditional Jiu-Jitsu fighting and self-defense techniques. This martial art consists of throwing and grappling on the ground utilizing specialized pins, control holds, arm locks, and choking techniques. Judo uses off balance and leverage techniques in order to effectively throw opponents. Judo teaches self-defense techniques which build self-confidence, mental concentration, as well as physical coordination, power, and flexibility. Studies suggested that the risk of knee injury is greater than that of any other anatomical structures based on fouryear epidemiological research in Finland reported that the knee injury accounted for approximately 20% of all injuries in judo. Literature showed that fresh men judokas had experienced a history of knee injury and also reported multiple episodes of knee injury in the pre seasoned physical examination. In many cases surgical interventions will allow judokas to return to their previous activity level, this usually require intensive and long rehabilitation which may have last negative impact on their athletic careers and risk of osteoarthritis.<sup>4</sup> Prevention of injury is important to Judo students

because if participants are injured it may be costly, painful, possibilities in having negative impacts to career and livelihood, and recovery may be time consuming and have negative impacts on quality of life. The cost of medical treatment for injuries may not be affordable. Pain prevention is important because it affects quality of life and may include addictive medicine. Injuries have different levels of severity so that means that certain injuries may take longer to heal than others.<sup>5</sup> Hamstring strain injury is one of the most common injuries in sports, and causes significant loss of training and competition time and significantly affects the quality of life of injured athletes. This indicates a need to prevent this injury. Hamstring muscle injury also has a high re-injury rate, which frustrates the injured athletes as well as the clinicians and increases cost of the treatment. This indicates a need to improve current prevention and treatment strategies for hamstring strains.<sup>6</sup> To prevent hamstring strain injury and improve the treatment for this injury, understanding the injury rate, mechanisms, and risk factors is essential. Significant research efforts have been made to understand hamstring muscle strain injury and re-injury over the last several decades. These research efforts provided further insight into prevention, treatment and clinical practice. The purpose of this literature review is to summarize studies on hamstring strain injury rate, mechanism, and risk factors with a focus on the prevention and rehabilitation of this injury. Rupture of the hamstring tendon is a rare injury in sporting activities.<sup>7</sup> Many studies have also reported that hamstring muscle strain injury frequently occurs in many popular individual sports, such as track and field, waterskiing, cross-country skiing, downhill skiing, judo, cricket, and bull riding.<sup>8</sup> Besides sports, dancing is another physical activity that has a high risk for hamstring muscle strain injury. Asklung et al. reported that 34% of dancers have experienced acute hamstring strain injuries and 17% had overuse injuries of hamstring muscles.<sup>9</sup>

Rupture of the hamstring tendon is reported to occur when abduction of the hip joint is forced with the hip joint flexed and the knee joint extended also active hamstring muscle forces can also rupture the tendon, as is usually the case with Achilles tendon rupture.<sup>10</sup> Muscle energy technique (MET) is a procedure that involves voluntary contraction of a patient's muscle in a precisely controlled direction, at varying levels of intensity. It is unique in its application as the client provides the initial effort while the practitioner facilitates the process. The benefits of MET include: Restoring normal tone in hypertonic muscles, strengthening weak muscles, preparing the muscle for subsequent stretching, improved joint mobility. It includes two techniques post isometric relaxation technique and reciprocal inhibition. Hamstring tightness is a common problem faced by the general population as well as sports players. The MET is a widely accepted method for treating hamstring tightness and sit and reach test is a procedure used to measure hamstring flexibility. The sit and reach test are the most common flexibility test used in health-related fitness test batteries. It is also suggested to use this test to evaluate hamstring flexibility because the test have acceptable reproducibility, have moderate validity, simple procedure that is easy to administer, require minimal skills training and particularly useful in large scale flexibility evaluation. Thus, in this study, the post isometric relaxation technique is used to study the effectiveness of MET in improving hamstring flexibility.<sup>11,12</sup> Muscle energy technique (MET) is a manual technique developed by osteopaths that is now used in many different manual therapy professions. It is claimed to be effective for a variety of purposes, including lengthening a shortened or contracture muscle, strengthening muscles, as a lymphatic or venous pump to aid the drainage of fluid or blood, and increasing the range of motion (ROM) of a restricted joint.<sup>12,13</sup> Myofascial Release techniques are utilized in a wide range of settings and diagnoses; pain, movement restriction, spasm, spasticity, neurological dysfunction, i.e., cerebral palsy, head and birth injury, CVA's, scoliosis, menstrual and pelvic pain and dysfunction, headaches, temporomandibular pain and dysfunction, geriatrics, sports injuries, pediatrics, chronic fatigue syndrome, fibromyalgia, traumatic and surgical scarring, acute and chronic pain. The health professions had ignored the importance of an entire physiological system, the fascial system that profoundly influences all other structures and systems of the body.<sup>14</sup>

This glaring omission had severely affected our effectiveness and the lasting quality of our efforts. Including Myofascial Release into our current evaluator and treatment regimens allows us to provide a more comprehensive approach to our patients that is safe, cost efficient and consistently effective.<sup>15</sup> Myofascial Restrictions can produce enormous pressures on pain sensitive structures. Fascia is a tough connective tissue which spreads throughout the body in a three-dimensional web from head to foot without interruption. The fascia surrounds every muscle, bone, nerve, blood vessel and organ of the body, all the way down to the cellular level. Therefore, malfunction of the fascial system due to trauma, posture, or inflammation can create a binding down of the fascia, resulting in abnormal pressure on nerves, muscles, bones, or organs. This can create pain or malfunction throughout the body, sometimes with bizarre side effects and seemingly unrelated symptoms, not always following dermatomal zones. It is thought that an extremely high percentage of people suffering with pain and/or lack of motion may be having fascial problems; but most go undiagnosed, as the importance of fascia is just now being recognized. The goal of Myofascial Release is to help return the individual's physiological adaptive capacity by increasing space and mobility and restoring three-dimensional balance and returning the structure to as close as potentially possible to its vertical orientation with gravity. This equilibrium allows the individual's self-correcting mechanisms to come into play and alleviate symptoms and restore proper function.<sup>16</sup> According to previous studies, physical performance is mainly gait speed, chair rise capacity, and balance skills which are evaluated on the lower limbs, and which are greatly affected by the strength of the quadriceps and hamstrings. Furthermore, the flexibility of the hamstrings is important because knee extensor torque is affected by the flexion angle of the hip joint. As such, the flexibility of hamstrings is indispensable for improving physical performance.<sup>18</sup> Majority of the judo players are forced to leave the sport due to knee injury with amateurs giving up more readily. This study conducted in amateur judo players who are more prone to injuries like pulling muscle, strain, ligament tears etc. thus aiming to prevent the futuristic injuries in young players. There is a scarcity of literature concerning whether muscle energy technique or myofascial release technique on improving hamstring flexibility in amateur judo players. This study emphasis on filling up the desolate in literature and it could set a good foundation for these amateur judo players that will allow them to succeed further down the road.<sup>19</sup> Purpose of this study was to determine the effectiveness of muscle energy technique (MET) on hamstring flexibility in amateur Judo players. To determine the effectiveness of myofascial release technique (MFR) on hamstring flexibility in amateur Judo players. To compare the effect of muscle energy technique (MET) vs Myofascial release technique (MFR) on hamstring flexibility in amateur Judo players

## METHODS

The research used a pre-post-test experimental group design. 30 subjects with Tight hamstring muscle (inability to achieve greater than 160 degree of knee extension with hip at 90 degree of flexion) aged between 16-20 years who fulfilled the inclusion criteria were recruited randomly into two groups of 15 each by convenience sampling. Consent was obtained from them prior to the study. Assessment was taken for all 30 subjects using Active knee extension, sit and reach test on the first and the last day of treatment. The subjects were divided into two groups, Group A subjects (experimental) were given muscle energy technique and group B (experimental) were treated with Myofascial release technique. Inclusion criteria's comprised of only males, Age – 16 to 20 years, Tight hamstring muscle (inability to achieve greater than 160 degree of knee extension with hip at 90 degree of flexion), BMI – less than or equal to 25. The subjects with acute or chronic low back pain, Acute or chronic hamstring injury, Inability to actively extend knee fully in sitting position were excluded from the study. The outcome was based on measurement of active knee extension test and sit and reach test, both are reliable and valid tool for the purpose. Pre-test value of active knee extension test and sit and reach test were

assessed before the intervention and the post-test values of the same was collected after 8 weeks intervention.

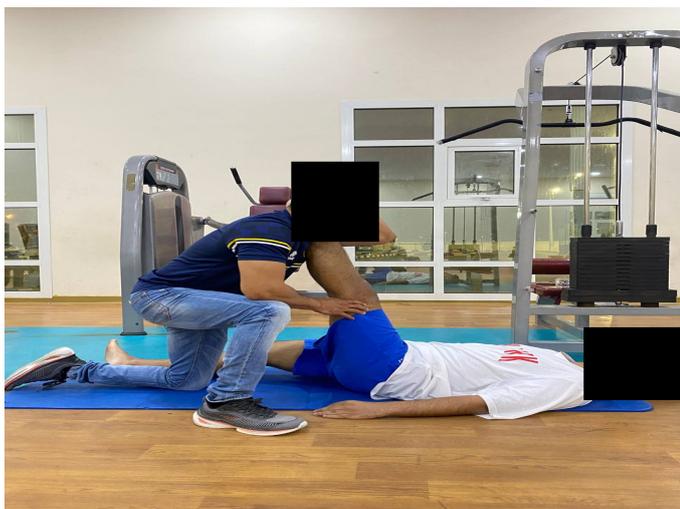
## Procedure

### Group a Experimental group 1

**Muscle Energy Technique:** Muscle energy technique was applied using post isometric relaxation technique. While the subject was lying in the supine position, the subject's hip was passively flexed by the therapist until the bind was felt. From this position, the subject's lower leg was placed onto the therapist's right shoulder. Then the subject was asked to apply pressure over the shoulder of the therapist for 7–10 s. After the contraction of the hamstrings and during the relaxation phase, the therapist passively took the leg into further flexion with 30 s hold. Then the subject's leg was lowered on the treatment table for a short resting period with duration of approximately 10 s. This procedure was repeated again with the frequency of 2 reps.<sup>20</sup>

### Group B Experimental group 2

**Myofascial Release Technique:** Patient position was prone lying and Therapist position was beside patient, Myofascial Release technique was given using ulnar border of hand. MFR was given from proximal to distal direction using a light amount of pressure over hamstring muscle. The pressure was being scaled following contact until the slack in the skin was taken up and that position was held until the tissues begins to soften the position of hand will be crossed in order to work as energy efficiently as possible. The stretch was maintained for 60 seconds. Treatment time was 5-10 minutes per session with total of 6 sessions per week.<sup>16</sup>



Picture 1. Met Procedure



Picture 2. MFR Procedure

**Popliteal Angle/ Active Knee Extension Test:** Pre-post and follow up measurement data on Popliteal angle were collected from both groups. Subjects were assessed for hamstring tightness using the Active Knee Extension test (Popliteal angle). The subject was in supine position with hips flexed 90° and knee flexed. A cross bar was used to maintain the proper position of hip and thigh. The testing was done on the right lower extremity and subsequently the left lower extremity and the pelvis were strapped down to the table for stabilization and control on accessory movements. Landmarks used to measure hip and knee range of motion were greater trochanter, lateral condyle of femur and the lateral malleolus which were marked by a skin permanent marker. The fulcrum of the goniometer was centered over the lateral condyle of the femur with the proximal arm secured along the femur using greater trochanter as a reference. The distal arm was aligned with the lower leg using the lateral malleolus as a reference. The hip and knee of the extremity being tested were placed into 90° flexion with the anterior aspect of thigh in contact with the horizontal cross bar frame at all times to maintain hip in 90° flexion. The subject was then asked to extend the right lower extremity as far as possible until a mild stretch sensation was felt. A full circle goniometer was then used to measure the angle of knee flexion. Three repetitions were performed and an average of the three was taken as the final reading for Popliteal Angle.<sup>20</sup>



Picture 3. Active Knee Extension Test

**Sit and reach test:** There are various techniques and variations of the Sit and Reach test. The one which is explained below is based upon the Young Men's Christian Association (YCMA) from the American College of Sports Medicine (ACSM) guideline, 2014.

- Pretest: Clients/Patients should perform a short warm-up prior to this test with some gentle stretches. During the test, participants are suggested not to do fast, jerky movements, which may increase the possibility of an injury. The participant's shoes should be removed.
- A yardstick is placed on the floor and tape is placed across it at a right angle to the 15 inches mark. The client/patient sits with the yardstick between the legs, with the legs extended at right angles to the taped line on the floor. Heels of the feet should touch the edge of the taped line and be about 10 to 12 inches apart.
- The client/patient should slowly reach forward with extended arms, placing one hand on top of the other facing palms down, as far as possible, holding this position for approximately 2 seconds. Be sure that the participant keeps the hands parallel and does not lead with one hand. Fingertips can be overlapped and should be in contact with the measuring portion or yardstick of the sit-and-reach box.
- The score is the most distant point (cm or in) reached with the fingertips. The best of three trials should be recorded. To assist with the best attempt, the client/patient should exhale

and drop the head between the arms when reaching. Testers should ensure that the knees of the participant stay extended; however, the participant's knees should not be pressed down. The client/patient should breathe normally during the test and should not hold her/his breath at any time.

- Note the zero point at the foot/box interface to use the appropriate norms. So, for YCMA the "zero" point is set at the 15 inches mark.30



Picture 4. Sit and reach test

## RESULTS

Table 1 Data are mean  $\pm$  standard deviation (sd). In the Group A, the mean age is 18.93 and sd is 0.92 and in the Group B, the mean age is 19.21 and sd is 0.80 which was not statistically significant ( $p$ -value  $>0.388$ ). In the Group A, the mean BMI is 22.24 and sd is 0.74 and in the Group B, the mean BMI is 22.68 and sd is 0.62 which was not statistically significant ( $p$ -value  $>0.103$ ).

Table 1. D Baseline data for demographic variable

Sl. No:	Variable	Group A	Group B	t-value	p- Value
1	Age	18.93 $\pm$ 0.92	19.21 $\pm$ 0.80	-0.87771	$>0.388$
2	BMI	22.24 $\pm$ 0.74	22.68 $\pm$ 0.62	-1.68999	$>0.103$

Table 2. Baseline data for outcome variables

Sl. No	Variable	Group A	Group B	t-value	p- Value
1	AKE (Rt)	129.14 $\pm$ 3.08	128.57 $\pm$ 2.74	0.5184	$>0.609$
2	AKE (Lt)	129.43 $\pm$ 3.27	128.00 $\pm$ 3.11	1.18294	$>0.248$
3	Sit & Reach	14.36 $\pm$ 0.63	14.14 $\pm$ 0.66	0.87448	$>0.390$

Table 3. Pre post difference within group A

Sl.No:	Variable	Pre	Post	t-value	p- Value
1	AKE (Rt)	129.14 $\pm$ 3.08	139.50 $\pm$ 1.79	10.157778	$<0.0001$
2	AKE (Lt)	129.43 $\pm$ 3.27	138.07 $\pm$ 1.44	9.675833	$<0.0001$
3	Sit & Reach	14.36 $\pm$ 0.63	17.36 $\pm$ 0.63	14.309088	$<0.0001$

Table 4. Pre post difference within group B

Sl.No:	Variable	Pre	Post	t-value	p- Value
1	AKE (Rt)	128.57 $\pm$ 2.74	135.50 $\pm$ 1.95	6.764628	$<0.0001$
2	AKE (Lt)	128.00 $\pm$ 3.11	133.93 $\pm$ 2.43	4.913844	$<0.0003$
3	Sit & Reach	14.14 $\pm$ 0.66	15.64 $\pm$ 0.93	7.389181	$<0.0001$

Table 5. Difference between groups

Sl.No:	Variable	Group A	Group B	t-value	p- Value
1	AKE (Rt)	139.50 $\pm$ 1.79	135.50 $\pm$ 1.95	5.65685	$<0.0001$
2	AKE (Lt)	138.07 $\pm$ 1.44	133.93 $\pm$ 2.43	5.48425	$<0.0001$
3	Sit & Reach	17.36 $\pm$ 0.63	15.64 $\pm$ 0.93	5.70583	$<0.0001$

In summary data was homogenous among both groups. Table 2 In the Group A, the mean AKE (RT) was 129.14 with standard deviation of 3.08 and in the Group B, the mean AKE (RT) is 128.57 with standard deviation of 2.74 which was not statistically significant ( $p$ -value  $>0.609$ ). In the Group A, the mean AKE (LT) was 129.43 with standard deviation of 3.27 and in the Group B, the mean AKE (LT) is 128.00 with standard deviation of 3.11 which was not statistically significant ( $p$ -value  $>0.248$ ). In the Group A, the mean SIT & REACH TEST was 14.36 with standard deviation of 0.63 and in the Group B, the mean SIT & REACH TEST is 14.14 with standard deviation of 0.66 which was not statistically significant ( $p$ -value  $>0.390$ ). In summary data were homogenous among both groups for baseline data. In the study, the pre mean AKE (RT) score was 129.14 with standard deviation of 3.08 was improved to post mean AKE (RT) score was 139.50 with standard deviation of 1.79 which was statistically significant ( $p$ -value  $<0.0001$ ). In the study, the pre mean AKE (LT) score was 129.43 with standard deviation of 3.27 was improved to post mean AKE (LT) score was 138.07 with standard deviation of 1.44 which was statistically significant ( $p$ -value  $<0.0001$ ). In the study, the pre mean SIT & REACH TEST score was 14.36 with standard deviation of 0.63 was improved to post mean SIT & REACH TEST score was 17.36 with standard deviation of 0.63 which was statistically significant ( $p$ -value  $<0.0001$ ). In the study, the pre mean AKE (RT) score was 128.57 with standard deviation of 2.74 was improved to post mean AKE (RT) score was 135.50 with standard deviation of 1.95 which was statistically significant ( $p$ -value  $<0.0001$ ). In the study, the pre mean AKE (LT) score was 128.00 with standard deviation of 3.11 was improved to post mean AKE (LT) score was 133.93 with standard deviation of 2.43 which was statistically significant ( $p$ -value  $<0.0003$ ). In the study, the pre mean SIT & REACH TEST score was 14.14 with standard deviation of 0.66 was improved to post mean SIT & REACH TEST score was 15.64 with standard deviation of 0.93 which was statistically significant ( $p$ -value  $<0.0001$ ). Table 5 However when comparing between group the mean AKE (RT) post score in Group A was 139.50 with a standard deviation 1.79 and the mean AKE (RT) post score in Group B was 135.50 with a standard deviation 1.95 which was statistically significant ( $p$ -value  $<0.0001$ ). The mean AKE (LT) post score in Group A was 138.07 with a standard deviation 1.44 and the mean AKE (LT) post score in Group B was 133.93 with a

standard deviation 2.43 which was statistically significant ( $p$ -value  $<0.0001$ ). The mean SIT & REACH TEST post score in Group A was 17.36 with a standard deviation 0.63 and the mean SIT & REACH TEST post score in Group B was 15.64 with a standard deviation 0.93 which was statistically significant ( $p$  value  $<0.0001$ ).

## DISCUSSION

This study was conducted to find the effectiveness muscle energy technique (MET) and myofascial release techniques (MFR) on hamstring flexibility in amateur judo players. In the present study total of 30 subjects were divided equally in 2 groups; group A underwent muscle energy technique and group B underwent myofascial release techniques. Outcome measures used were active knee extension test and sit and reach test. All the included subjects received the allocated treatment for the complete study duration with no drop out. In the study, Group A, Received muscle energy technique, the pre mean AKE (RT) score was 129.14 was improved to post mean AKE (RT) score was 139.50 which was statistically significant ( $p$ -value  $<0.0001$ ). In the study, the pre mean AKE (LT) score was 129.43 was improved to post mean AKE (LT) score was 138.07 which was statistically significant ( $p$ -value  $<0.0001$ ). In the study, the pre mean SIT & REACH TEST score was 14.36 was improved to post mean SIT & REACH TEST score was 17.36 which was statistically significant ( $p$ -value  $<0.0001$ ). The results of the study revealed that following a 6-day treatment program of MET, subjects have shown significant improvement ( $P < 0.001$ ) in the flexibility of hamstring muscle, Ivan discussed that MET is an effective, nontraumatic manipulative technique The use of MET is said to inhibit motor activity via the Golgi tendon organs or the muscle spindles. Post isometric relaxation technique to a reduction of the tone of the muscles. The latency period of approximately 10 s that is present after the isometric phase. During this period, the movement toward the new position of a joint or muscle can be easier (due to the reduction in tone). According to Zuzana, the changes within the connective tissues display mechanical properties relating to both fluid (viscous) and elastic components. "Creep" represents the temporary elongation of connective tissue during stretch as a result of its viscoelastic properties.<sup>8</sup> Permanent "plastic" changes occur as a result of micro-tearing and remodeling of connective tissue fibers. MET may produce increased muscle length by a combination of creep and plastic changes in the connective tissues. If the relaxation phase in MET would be performed for 30 s, it could be lead to a prolongation of the muscle due to creep and also due to plastic changes in the connective tissue. . Gibbson, sports osteopath discussed earlier that MET as opposed to indirect because the muscular effort is from a controlled position, in a specific direction against a distant counterforce. Dynamic stretching as well as MET proved to be effective in improving the hamstring flexibility.<sup>22</sup>

The amateurs in this judo field need more wariness so that their professional footing can be set strong. Though judo is a contact game, injuries are common. The knee joint is the most injury prone area. If the muscles around knee joint are strong enough to withstand stress, the incidence rate of injuries can be reduced. The Muscle Energy Technique can be used for improving muscles flexibility.<sup>23</sup> In this study both outcomes showed improvement after giving MET, this could be due to the isometric contraction causes lengthening of viscoelastic and plastic changes in myofascial connective tissue. The post-isometric relaxation can principally be a biomechanical event; i.e.; combination of plastic change and viscoelastic creep in series and parallel connective tissue elements of the muscle. MET has been explored as a treatment focusing on increasing extensibility of soft tissues. Certain series of studies are validating the use of MET by observing the effects on different segments and directions of trunk motion and hamstring extensibility.<sup>24</sup> In the study, Group B, received myofascial release technique the pre mean AKE (RT) score was 128.57 was improved to post mean AKE (RT) score was 135.50 which was statistically significant ( $p$ -value  $<0.0001$ ). In the study, the pre mean AKE (LT) score was 128.00 was improved to post mean AKE (LT) score was 133.93 which was statistically significant

( $p$ -value  $<0.0001$ ). In the study, the pre mean SIT & REACH TEST score was 14.14 was improved to post mean SIT & REACH TEST score was 15.64 which was statistically significant ( $p$ -value  $<0.0001$ ). Keisuke Itotani et al conducted the study on Myofascial Release of the Hamstrings Improves Physical Performance found that MFR for hamstrings affects not only the improvement in flexibility but also the improvement in physical performance. Therefore, it is important to perform MFR to maintain physical function and performance until the restriction of activity is lifted and people are able to actively increase the amount of physical activity. According to our study result we hypothesized that Myofascial Release apparently may affects the elastocollagenous complex (integrated collagen and elastin fibers), as well as the consistency of the ground substance. Increased soft-tissue flexibility relieves tissue tension within the elastocollagenous complex. While the density and viscosity of the matrix (ground substance) decreases, the metabolic rate increases, resulting in improved metabolism and health. If the fascia has shortened and tightened and twisted, it can contribute to and perpetuate musculoskeletal dysfunction.<sup>25,26</sup> However, when comparing between group the mean AKE (RT) post score in Group A was 139.50 and the mean AKE (RT) post score in Group B was 135.50 which was statistically significant ( $p$ -value  $<0.0001$ ). The mean AKE (LT) post score in Group A was 138.07 and the mean AKE (LT) post score in Group B was 133.93 which was statistically significant ( $p$ -value  $<0.0001$ ). The mean SIT & REACH TEST post score in Group A was 17.36 and the mean SIT & REACH TEST post score in Group B was 15.64 which was statistically significant ( $p$  value  $<0.0001$ ). Ahmed have discussed that the application of post isometric relaxation technique produces greater changes in muscle extensibility. It has been shown by Abreham that MET is a better technique in improving hamstring flexibility when compared with ballistic stretching. Ramesh and Sivasankar discussed in their study that in MET an increase in muscle length may be due to the biomechanical event, neurophysiological changes, and increase in tolerance to stretching. MET is more effective than ultrasound therapy with active static stretching and passive static stretching in improving hamstring flexibility in individuals with hamstring tightness. The present study goes with the same technique revealed an increase in hamstring flexibility which in turn reduces the risk of hamstring injury.<sup>27</sup>

## CONCLUSION

Based the study's findings and review of supporting evidence, this study accepts the experimental hypothesis while rejecting the null hypothesis. Thus, the current study concluded that both muscle energy techniques and myofascial releasing technique are effective treatment plan for hamstring flexibility in amateur judo players but when comparing the difference between MET and MFR; Muscle energy technique has been shown to be more effective technique in increasing the flexibility of hamstring muscle in amateur judo players.

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