



ORIGINAL ARTICLE

EFFECT OF MUSCLE ENERGY TECHNIQUE VERSUS POSITIONAL RELEASE TECHNIQUE ON RECREATIONAL FOOTBALL PLAYERS WITH CHRONIC ANKLE INSTABILITY- A COMPARATIVE STUDY

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ABSTRACT

Background of the study: Ankle sprain is a prevalent sports injury, predisposing to a high risk of suffering a sequel, hence leading to chronic ankle instability which showcases pain, reduced flexibility, strength, and neuromuscular function as main hindrances. The objective of this study was to compare the effectiveness of Muscle Energy Technique (MET) to Positional Release Technique (PRT) in patients with chronic ankle instability and evaluate which gives a faster result in terms of measuring dynamic balance, functional limitation and EMG activity. **Methodology:** Based on the inclusion criteria, 30 subjects with CAI were divided into two groups of 15. Pre and post test conducted on modified Star Excursion Balance Test for dynamic balance, Foot Ankle Disability Index for functional limitation and Electromyography-Interference pattern for Gastrocnemius. One group was treated with MET (7–10s contraction at 20% max force – new restriction barrier –30s stretch-3 contractions) and cryotherapy and other with PRT (sensitivity reduced to 70% and hold for 90 sec)² and cryotherapy. Implemented in 3 sessions per week for 4 weeks, lasting for 1 hour. **Results & Conclusion:** Statistically there was a significant difference in values of pre and post-test in both groups. However MET group showed a greater improvement and had a better impact in subjects with chronic ankle instability.

Keywords: Chronic Ankle instability, Muscle energy technique, position release technique, Modified star excursion balance test, Electromyography, foot ankle disability index.

Received on 15th October 2024; Revised on 10th November 2024; Accepted on 20th November 2024
DOI:10.36678/IJMAES.2024.V10I04.003

INTRODUCTION

Studies have shown that approximately 85% of ankle injuries include degree of sprain to the ligaments of the ankle and of these 85% are inversion sprains. Out of these more than 40% of ankle sprains have the possibility to cause chronic problem and lead to recurrence¹. Lateral ankle sprains (LASs) is a consistent injury incurred during participation in sport and physical activity, sequentially individuals who experience a first-time LAS will most likely develop chronic ankle instability (CAI)⁴

Chronic ankle instability is characterized by an individual exhibiting a tendency for recurrent ankle sprains within one year after the initial ankle sprain, frequent perceptions of the ankle giving way, and persistent symptoms such as pain, swelling, limited motion, weakness, and diminished self-reported function¹ are trademark sign it has been accredited to 2 potential causes : mechanical instability and functional instability⁶.

The incidence of ankle sprain is paramount in football players A systematic review published in 2014 explored the presence of athletes with recurrent sprains, perceived ankle instability, and mechanical ankle instability, which are all aspects of CAI³. Their view showed that while many papers have investigated the prevalence of recurrent sprains in a wide array of sports football, basketball and netball had the highest percentage of athletes with recurrent sprains (approximately 60%)⁷.

Positional Release Therapy is an indirect manual therapy technique in which a position of comfort (POC) is attained, this facilitates the release of fascial contraction i.e., somatic

dysfunction it certifies that after the tissue is placed into a POC, there will be a low grade spasm encompassed in the tissue referred to as a fasciculation. The fasciculatory response method can be utilized in determining the length of time a POC is sustained hence forth the POC may need to be held from 20 seconds to several minutes.⁸

Since Muscle energy technique is a manual treatment procedure that involves the voluntary contraction of one's muscle in a precisely controlled direction, done at varying levels of intensity against a distinctly endured counter-force. This lead to the hypothesis that MET can be used to lengthen and strengthen muscles, to increase fluid mechanics, to decrease local edema and to mobilize a restricted articulation. Further studies evaluating both these treatment protocols are essential to identify effective approaches to reduce the long-term functional limitations of ankle sprains and to the ultimate resolution to the difficulties faced by chronic ankle instability in the general population.

METHODOLOGY

Comparative study on Recreational players from different football turfs in Trivandrum. 30 samples of the population who satisfied the inclusion and exclusion criteria were selected by Simple random sampling and study conducted in duration of 6 months.

Inclusion criteria: Male recreational football players having had ankle sprain recurrently. Age group of 20 to 25years, Stiffness of ankle, Episodes of giving way, Reduced foot ankle disability score.

Exclusion criteria: Congenital deformity of foot and ankle, History of fractures of lower limb, any other neurological disorders, any surgeries related to ankle, plantar fasciitis. Deep vein thrombosis.

Procedure: Based on the inclusion criteria, 30 subjects were selected randomly after proper screening. Subjective assessment of the patient was done which includes name, age, gender, chief complaints, duration of the condition and history of the patient. The subjects were then randomly divided into two groups by the fish and bowl method i.e., group A and group B with 15 subjects in each group. Informed consent was collected from them after explaining all the necessary details, Pre and post test was conducted on both group A and B that is mSEBT for dynamic balance, FADI for functional limitation and EMG-Interference pattern for Gastrocnemius muscle activity.

Group A was then treated with muscle energy technique along with cryotherapy for 3 days per week for a period of 4 weeks with one session per day. Group B was treated with positional release therapy and cryotherapy for 3 days per week for a period of 4 weeks with one session per day. The results were decoded and analyzed statistically using SPSS-29 software.

Muscle energy technique

Procedure

Position of patient: The above-mentioned technique was given to the patients as in the following protocol in supine lying position: Each technique for 5 repetitions. Duration of contractions for 7-10 seconds and repetitions were 3-5 times per day, 3-4 days a week, 4 weeks program⁴.

Technique

Since CAI is a chronic problem (longer Duration than 3 weeks) the barrier is assessed treated in a position of ease, slightly towards the mid-range, away from the restriction barrier. Starting from the opportune position (the barrier that is restricted or just prior fit), a small effort is exerted by the patient (no more than 20% of available strength) towards plantar flexion, against unwavering resistance, while breathing appropriately.

This leads to an isometric contraction of Gastrocnemius, while the knee is maintained in extension. The subject has to hold the contraction for 5 to 7 seconds. Released slowly on an exhalation, the foot/ankle is dorsiflexed (the whole foot is flexed and not just the toes) to its new restriction barrier slightly and painlessly beyond the new barrier, with the patient's assistance.

The tissues should be held in slight stretch for between 5 and 30 seconds, to allow a slow lengthening of tissues. This pattern is repeated until no further gain is achieved (backing off towards mid-range for the next contraction). This is an effective method to increase strength of the muscles. (7-10s contraction at 20% max force progress to new restriction barrier a 30s stretch is given and 3 contractions were performed)⁴.

Cryotherapy is followed after the exercise protocol for 10-15 mins.

Positional release technique:

Position of Patient: Subject was in prone lying position with the knee flexed to 90 deg the

ankle plantar flexed. One hand of the therapist monitored the dysfunction (sensory hand) and the other hand (motor hand) will keep positioning the subject. As the sensory hand senses the tissues initiate to loosen, the motor hand propels the body in that direction and hinders the affected area from returning to the previous position.

This procedure was repeated 3 times. Sensitivity reduced to 70% and hold for 90sec². This was followed by cryotherapy for 10-15 mins Treatment was done in 3 sessions per week for 4 weeks and each session lasting for 1 hour.

Modified star excursion balance test,

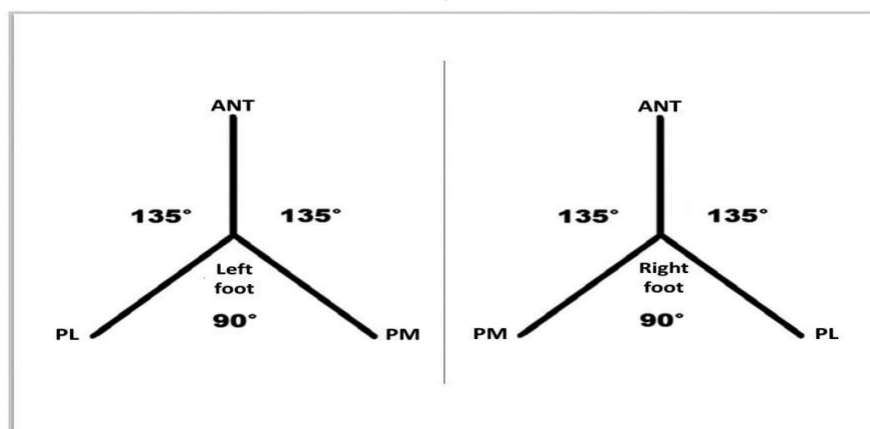


Figure 1: Modified star excursion balance test angles.

Test performance description:

For each limb (barefoot): - the most distal aspect of great toe was placed in the center of "Y" - While maintaining single leg stance, patient is asked to reach with their free limb in the anterior, postero medial, and poster lateral directions - In each test direction, and recorded the reaches Trial was discarded or repeated if: -

- ☐ Stance foot was lifted or moved,
- ☐ Weight was transferred to the other foot,
- ☐ Balance was lost, or
- ☐ Hands were removed from hips

Outcomes: Reach distances of the limb Anterior, Postero-lateral, Postero-medial directions were measured.

The obtained result was expressed as a percentage of lower limb length for each direction. The measuring of limb length was implemented in supine position, from the anterior and superior iliac spine to the medial malleolus.

ANT normalized score (%) = Mean of the three trials in ANT direction (cm) x100/ Tested limb length (cm)

Followed by calculation of a composite score for the affected limb¹², norm COMP score (%) = norm ANT(%) + norm PM(%) + norm PL(%)

Electromyography

placement	
Start position	Lying on belly, knee extended, foot projecting over end of table(FIG11.6)
Location active electrode	At most prominent bulge of muscle ¹³
Reference electrode	At muscle tendon above heel.
Ground electrode	At popliteal fossa
Test: ask subject to plantar flex foot with emphasis on pulling heel up ward more than pushing forefoot down.(FIG7)	

The FADI Index questionnaire was rated according to the response by the subject before and after the Intervention. Comprising of 34-items, the questionnaire is divided into two subscales: ☐ the Foot and Ankle Disability Index ☐ Foot and Ankle Disability Index Sport. FADI consists of 26 items, and the FADI Sport has 8. FADI contains 4 pain related items and 22 items related to activity. FADI Sport contains 8 activity related items. It promotes the assessment of more difficult tasks that are

essential to sport. FADI Sport is unique in that it is a population-specific subscale designed for athletes. It is designed to detect deficits in higher functioning subjects. Each of the 34 items is scored on a 5-point scale from 0 (unable to do) to 4 (no difficulty at all). The scoring of the 4 pain related items in FADI are scored 0 (none) to 4 (unbearable). The FADI has a total point value of 104 points, whereas the FADI Sport has a total point value of 32 points. Having a total of 136 points

EMG(μ V)		No. of Samples	Median(Inter Quartile Range)	Mean Rank	Sum of Ranks	U value	Z value	P value *
Time Point	Group							
Pre	A	15	80 (69-94)	12.9	193.50	73.500	-1.621	.106
	B	15	90 (82-96)	18.10	271.50			
Post	A	15	127 (119-136)	22.97	344.50	0.500	-4.648	<.001
	B	15	94 (85-101)	8.03	120.50			

Table 1: Comparison of EMG between group A and group B

The post test values of group A were, median (inter quartile range) 127(119-136).The post test values of group B were, median (inter quartile range),94(85-101),The post test Mann-Whitney U value was 0.500, Z value was -4.648; P value was $< .001$ which shows that there is a

statistically significant difference in post-test values of EMG between group A and B. Also the result shows that post test value of EMG in group A (MET) is higher than the post test value of EMG in group B (PRT).

FADI(foot ankle disability index)		No. of Samples	Median (Inter Quartile Range)	Mean Rank	Sum of Ranks	U value	Z value	P Value *
Time Point	Group							
Pre	A	15	84 (62-88)	16.47	247.00	98.000	-0.602	0.567
	B	15	75 (70-82)	14.53	218.00			
Post	A	15	95 (88-100)	20.20	303.00	42.00	-2.921	0.003
	B	15	77 (74-88)	10.80	162.00			

Table 2: Comparison of FADI between group A and group B

The post test values of group A were, median (inter quartile range) 95(88-100), .The post test values of group B were, median (inter quartile range), 77(74-88), .The post test Mann-Whitney U value was 42.00, Z value was -2.921; P value was 0.003 which shows that there is a

statistically significant difference in post-test values of FADI between group A and B. Also the result shows that post test value of FADI in group A (MET) is higher than the post test value of FADI in group B (PRT).

mSEBT(%)		No.of Samples	Median (Inter Quartile Range)	Mean Rank	Sum of Ranks	U value	Z value	P value *
Time Point	Group							
Pre	A	15	76 (70-81)	15.37	230.50	110.500	-0.083	0.935
	B	15	77 (73-79)	15.63	234.50			
Post	A	15	90 (82-93)	20.60	309.50	36.000	-3.176	$<.001$
	B	15	81 (77-84)	10.40	156.50			

Table 3: Comparison of mSEBT between group A and group B

The post test values of group A were, median (inter quartile range) 90(82-93).The post test values of group B were, median (inter quartile range) 81 (77-84). The post test Mann-Whitney U value was 36.000, Z value was-3.176; P value was<.001which shows that there is a statistically Significant difference in post-test values of MSEBT between group A and B. Also the result shows that post test value of mSEBT in group A (MET) is higher than the post test value of mSEBT in group B (PRT). Fig: 3 Modified star excursion balance test



Fig: 3 Modified star excursion balance test

Illustrations:



Fig: 1 Muscle Energy Technique (Group A)



FIG: 2 Positional Release Techniques (PRT)



Fig: 4 Electro Myography (EMG)

DISCUSSION

All subjects well tolerated and no one dropped out of the study. Wilcoxon signed-rank test and a Mann Whitney U test were used as statistical tools to reach a conclusion, All out come measure were collected before and after the intervention protocol. Statistical analysis was done using software SPSS29 version. In both groups Wilcoxon test was used to compare pre-test and post-test values. The post-test scores of both groups were analyzed using Mann Whitney U Test. The results showed that after 4weeks of treatment protocol both groups showed improvement

According to Jay Hertel et al Chronic ankle instability can be summarized as an even to occurring after an initial LAS leading to a propensity for recurrent ankle sprains, subsequent episodes or feeling of the ankle giving way, and often accompanied by recurrent symptoms such as pain, limited motion, swelling, diminished self-reported function due to weakness

The knowledge of factors contributing to CAI has taken leaps and evolved over the past many decades. Freeman et al presented the first comprehensive theory of ankle instability in 1965. The term functional instability was hence coined, which was operationally defined as “the disability to which patients refer when they say that their foot tends to ‘give way’ in the months and years after initial ankle sprain.” the other term he proposed was mechanical instability this is due to pathological laxity of the ankle which was only rarely the root cause of the foot’s functional instability. Mechanical instability was specifically defined as increased varus tilt of the talus under inversion stress.

Tropp et al conducted a number of studies in the 1980s that aimed to progress the understanding of the causes of CAI. Using the mechanical instability–functional instability dichotomy as the initial point, A conclusion that functional instability could not be singularly due to proprioceptive like sensory deficits, as originally hypothesized by Freeman et al, but also as a result of changes in the motor component of sensory-motor control, which particularly impaired postural control, diminished ankle-eversion strength, and alterations in motor control of the muscles proximal to the injured ankle.

Hence any treatment protocol which aimed at improving the motor component of sensory

motor control was detrimental in being included in the plan of care ,a wide variety of manual techniques have been seen to be applied out of which this study aimed at concentrating on muscle energy technique and positional release technique.

Lynette collin et al conducted a comparative study of MET versus manipulation and the conclusion leaned towards MET yielding more significant results¹. Nevertheless Nirali Jain et al had a study done on Comparison of Active Release Technique and Positional Release Therapy for Gastrocnemius in Recreational Runners, results of the statistical analysis showed that there was a significant improvement in the PRT group².

Cathleen brown et al. in their study where they assessed functional ankle instability using EMG in recreational athletes in order to determine the changes EMG amplitude during landing activities. Recreational athletes were randomly selected and EMG reading obtained on different phases of landing. A conclusion that changes in muscle activity was seen during the landings.

Sheri a hale et al oversaw a study in the reliability and sensitivity of the foot ankle disability index in subjects with chronic ankle instability a conclusion that Fadi and Fadi sport is reliable in detecting functional limitation in subjects with CAI thus the current study utilized the Fadi sports module as its focus is on football players.

Jayhert el et al implemented a study on simplifying the star excursion balance test and performed an analyses of subjects with and without chronic ankle instability, 48 young adults with or without CAI were randomly allocated and performed 3 trails of 8 tasks each

, a conclusion that the anterior, postero-medial and postero-lateral reach tasks maybe used to test functional deficits related to CAI in lieu of testing all 8 tasks The result of the study concluded that m SEBT is a reliable tool for capturing dynamic balance in individuals with CAI. In accordance with this the current study has proposed the use of mSEBT for dynamic balance.

CAI shows a propensity to loss of protective reflex muscle stabilization and neuromuscular deficits may be manifested as impaired balance reduced joint position sense, slower firing of the muscles to inversion perturbation of the ankle, slowed nerve conduction velocity, impaired cutaneous sensation, strength deficits and decreased range of motion.

Reciprocal inhibition (The form of Muscle Energy Technique used in this study), involves the physiological response of the antagonists of a muscle that has been isometrically contracted. When a muscle is isometrically contracted, its antagonist will be inhibited and will relax immediately following this.

According to Ewan Thomas et al attributed this increase in stretch tolerance could mean that a high intensity contraction could produce postsynaptic inhibitory mechanisms, resulting in lower excitation of the cortical and α - motor neurons, thereby modulating stretch perception and hence improving in muscle strength by recruitment of more motor units and stimulating proprioceptors.

The other group was subjected to positional release which according to Joshua under wood et al., suggested that PRT is an indirect manual therapy technique in which the therapist identifies a position of comfort (POC) by decreasing tension of affected tissue obtained by palpation of tender point (TP) which

facilitates the release of fascial contraction hence somatic dysfunction. Once the tissue is placed into a POC, presence of low grade spasm contained in the tissue referred to as fasciculation. The Fasciculatory response method can be utilized in determining the length of time a POC is sustained, possibly, the POC may need to be held from 20 seconds to several minutes⁸. Once the fasciculation has ceased in the form of sub grade spasms, heat, pins and needle. The therapist gently brings the limb back to initial position. viswanathan et al explained that holding the position of comfort (ease) for 5 to 20 minutes evokes therapeutically significant physiological response in tissue i.e., neurological and circulatory which alleviate pain, enhanced mobility and resolution of actual dysfunction PRT places the soft tissues or joints into the position of ease to encourage self-regulating in fluencies and promote it to function more efficiently.

Thus, it increases the ROM and reduces the pain. It helps in placing restricted or dysfunctional tissues in a position of comfort which helps to disengage from restriction barrier and hence improving the functional capacity.

The fact that Met yielded a much more significant result could be examined further by the following points. The mechanism behind gains in strength, dynamic balance and function associated with MET can be due to:

Lynette colleen et al suggested that lengthening and strengthening muscles will increase fluid mechanics and decrease local edema and hence mobilize a restricted articulation.

Hertling and Kessler (1996) et al explain that any stress to ligaments around a joint results in firing of specific receptors in the joint and through the reflex arc, producing contracture of muscles overlying the joint and relaxing antagonistic muscles.

Ewan thomas et al postulates an increased stretch tolerance. This could indicate that a high-intensity contraction could induce postsynaptic inhibition, resulting in decreased stimulation of the cortical and alpha-motor neurons that modulate stretch perception⁴.

Ovijitbaidya et al suggest it could also be due to the functional recovery and correction of positional fault.

MET frequently utilizes isometric contraction of muscle for a minimal period, an increased tension sustained for a few seconds is sensed within the Golgi tendon organs, which impart impulses to the posterior horn cell and has an inhibitory effect on the increased motor stimulus at the anterior horn cell. This inhibitory effect causes a reduction in motor impulses and consequent relaxation¹

MET can release articular restrictions, lengthen muscle fibers and increase the range of motion through a combination of creep and plastic change in the connective tissue as postulated by Bibhuti Sarkaret al²

Conflict of interest: There was no personal or institutional conflict of interest for this study.

Fund of the Study: This was a self funded study.

Ethical Approval: Institutional ethics committee of Bethany Navajeevan College, Ref no: BNCP/MSK/2021/03

Acknowledgement: First and foremost, I am grateful to GOD ALMIGHTY without whose blessings this would have been impossible, my family particularly my spouse whose constant encouragement and support gave me courage and confidence throughout the study.

I would like to express my heartfelt gratitude to my guide Prof. J. Andrews Milton, MPT (ORTHO) Principal, Bethany Navajeevan College of Physiotherapy, for his encouragement, patience, motivation, enthusiasm, immense knowledge and for the continuous support to my dissertation work. I could not have imagined having a better advisor and mentor for my study.

I wish to thank all my Lecturers for their support and kind cooperation. I also wish to thank all my friends and non teaching staff of BNCP for their support.

Last but not least I would like to thank all the subjects of my study for their whole hearted cooperation which has helped me to complete this study. I thank all who have helped me all the while.

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Fidha Sidheek, J. Andrews Milton, Amina Shajahan, Jabir.S, Arya P.V, Parvathy G.M (2024).
Effect of Muscle Energy Technique Versus positional Release Technique On Recreational football Players With Chronic Ankle Instability-A comparative Study, *ijmaes*; 10(4); 1951-1961.