

Effect of Muscle Energy Technique Vs Retro-Walking on Hamstring Flexibility and Dynamic Balance in Young College Going Students - A Comparative Study

Maria Chawdi¹, Drashti Niket Shah²

¹Intern, College of Physiotherapy, MMC, WH, Miraj, Maharashtra, India

²Assistant Professor, College of Physiotherapy, MMC, WH, Miraj, Maharashtra, India.

Corresponding Author: Maria Chawdi

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ABSTRACT

Background: Hamstring muscle tightness can be defined as “inability to extend the knee completely when the hip is flexed.” Prevalence of hamstring muscle tightness in young college going students is 40.17%. MET is a technique that uses muscle’s own energy in the form of gentle isometric contractions to relax the muscles via autogenic or reciprocal inhibition and lengthen the muscle. Retro – walking is a transitory and dynamic activity which can be used to treat the flexibility as well as dynamic balance.

Aim: To study the effect of Muscle energy technique VS Retro-walking on hamstring flexibility and dynamic balance in young college going students.

Methodology: 74 participants were selected based on the selection criteria. Prior and after the treatment both the outcome measures, Passive Knee Extension Test and Y-Balance Test were measured. Participants were randomly divided into two groups with n=37 in each group. Group A received MET while group B received Retro-walking. The treatment was given for 5 consecutive days.

Results: Results showed us that both the groups were clinically significant, but the statistical analysis was not analytically significant.

Conclusion: MET and Retro-walking were significant in terms of clinical outcome, but the data was not proven to have a significant p value. Hence the study concluded that the MET as well as Retro – walking is effective, simple and easy to apply in Hamstring tightness subjects. So, it can be implemented clinically as well.

Keywords: Muscle energy technique, Retro-walking, Hamstring tightness, Passive knee extension test, Y balance test.

INTRODUCTION

The most essential element for a normal biomechanical function is flexibility.^[1] The back of thigh muscles is called as a hamstring muscle. This includes semitendinosus, semi -membranous, long head biceps femoris and adductor magnus. The biomechanically hamstring muscle is proved as knee flexors. “Inability to extend

the knee completely when the hip is flexed which is accompanied by discomfort or pain along the posterior thigh and/or knee” is defined as hamstring tightness. Hamstring tightness often leads to post- exercise soreness and decreases coordination among athletes. Some studies show, that decreased hamstring flexibility is a risk factor for the development of patellar tendinopathy and

patellofemoral pain, hamstring strain injury and symptoms of muscle damage following eccentric exercise.^[2]

The hamstring muscles are mostly linked to movement dysfunction at the lumbar spine, pelvis and lower limbs, and it is also associated with low back pain and gait abnormality. Hamstring tightness may also cause neuro-musculoskeletal symptoms. These musculoskeletal symptoms will lead to decrease in strength, stability, endurance, etc. Tightness in hamstring muscle might cause posterior pelvic tilt which lead to decrease in lumbar lordosis result in low back pain.^[3]

Prevalence of hamstring muscle tightness among undergraduate students shows 40.17% in which tightness has found more in male than female participants.^[2]

The ability to maintain a base of support with minimal movement is defined as static balance, and the ability to perform a task while maintaining a stable position is known as dynamic balance. In static balance, gravity moves while the base of support remains fixed. Here, the sense of balance maintains the centre of gravity within the base of support. Whereas, in dynamic balance, both the centre of gravity and the base of support are in constant motion, and during the stance phase of the movement, the centre of gravity never aligns itself to the base of support.^[2]

Various techniques for increasing hamstring flexibility:

1. Muscle energy technique
2. Retro-walking
3. Dynamic soft tissue mobilization
4. Manual or mechanical stretching
5. Self-stretching
6. Neuromuscular facilitation and inhibition techniques
7. Joint mobilization/manipulation
8. Neural tissue mobilization.

Various techniques for improving dynamic balance:

1. Retro-walking
2. Muscle energy technique

3. Proprioceptive neuromuscular facilitation
4. Visual feedback technique
5. Foam rolling techniques
6. Trampoline training
7. Aquatic training
8. Tai chi.

Muscle Energy Technique

MET is a form of manual therapy. MET via autogenic or reciprocal inhibition uses muscles own energy in the form of gentle isometric contractions to relax and lengthen the muscles. MET is an active technique in which the patient is also an active participant, whereas when compared to static stretching which is a passive technique the therapist does all the work. The muscle which has been shortened is placed in a mid-range position about halfway between relaxed and fully stretched state. The subject then contracts the muscle isometrically, using maximum degree of effort, for about 20 seconds while the effort is resisted by the therapist. After contraction, for relaxation the subject's leg should be taken into further flexion with 30 second hold. Then the subject's leg is lowered for a short resting period with duration of 10 seconds. Studies show the effectiveness of muscle energy technique in increasing hamstring flexibility as well as balance.^[4]

Retro Walking

For normal daily activities the ability to move backwards is necessary. It allows the body to be positioned to perform various tasks. During forward walking the action of quadriceps is mainly eccentric while backward walking causes both isometric and concentric activity of the quadriceps femoris muscle. The mechanism of backward walking is quite different from forward walking. Stance phase during gait begins with heel strike and ends with toe off in forward walking, whereas, in backward walking toes contact the ground first and the heel is lifted off the ground in early stance is sustained by co-activation of several limb

muscles flexors and extensors at the hip knee and ankle joint in forward walking whereas in backward walking it is accompanied by activity in knee extensors and ankle plantar flexors. in backward walking. Studies show that backward walking was associated with increased cadence and decreased stride length when compared with forward walking. Studies also show effectiveness of retro-walking in improving hamstring flexibility and dynamic balance.^[3]

Hamstring muscle tightness results in limitation of knee extension ROM when hip is flexed. Studies show increase in hamstring flexibility and dynamic balance using MET as well as Retro-walking. These techniques are improving flexibility as well as dynamic balance individually.

So, the purpose of this study is to find out the comparison between the effect of MET vs retro-walking on hamstring flexibility and dynamic balance in young college going students.

METHODOLOGY

1. Type of study: Comparative study
2. Type of sampling: Simple random sampling
3. Study design: Randomized clinical trial
4. Sample size: 36 for each group
5. Study duration: 6 months
6. Study setting: College of physiotherapy, Miraj

MATERIALS

1. Data collection form/ assessment form
2. Pen
3. Paper
4. Universal goniometer
5. Treadmill
6. White tape for Y-TEST
7. Measuring tape

Procedure

- Ethical clearance was granted from the Institutional Ethical Committee.
- All the subjects were selected based on the inclusion and exclusion criteria.

- Prior to the study the whole procedure was explained to the subjects.
- A written informed consent was taken from the subjects prior to study.
- The subjects were tested for hamstring tightness using popliteal angle test and for dynamic balance using Y-balance test both prior and after the study.
- The subjects were randomly be divided into two groups- Group A: MET, Group B: Retro-walking.
- The intervention was be given for 5 consecutive days, 1 session/day.

Pre-Intervention Test

Popliteal Angle Test:

- This test is done in supine position.
- The opposite limb is extended, and the limb which is to be tested is flexed at 90 degree both at hip and knee.
- The therapist then passively extends the knee till the maximum tolerable stretch of hamstring muscle. The angle is then measured.^[4]

Y-Test:

- With hands placed on hips the patient stands on one leg while reaching out in 3 different directions with the other lower extremity.
- They are : Anterior (A), Posterolateral (B), Posteromedial (C)
- Each test is repeated 3 times and the maximum reach in each direction is recorded.^[5]

Group A: Muscle Energy Technique

MET will be applied using post isometric relaxation technique. Subject lies in supine position. His hip would be passively flexed by the therapist till limitation. Now the subject's leg will be placed on therapist shoulder and is instructed to press downward, while the therapist resists it for 20 seconds. After contracting hamstring, for relaxation the subject's leg should be taken further into flexion with 30 secs hold. Then the subject's leg is lowered for a short resting period with

duration of 10 secs. 5 repetitions will be done.

Group B: Retro-Walking

Initially start with 10 min practice session at 0- degree inclination. The treadmill will adjust to produce a speed of 4 km/h and 0-degree inclination, during intervention period. For 6 min period.

Post Intervention Test

After the intervention of muscle energy technique and retro-walking, the pre-intervention procedure was repeated. Both the pre and post data was compared. Also, the data between the two groups was compared and the effect was evaluated.

Statistical Analysis

Statistical Package for the Social Sciences [SPSS] software version 23 has been used for statistical analysis. The level of significance for PRE and POST test for

passive knee extension test and y balance test for between group was calculated using Mann Whitney test.

The level of significance for within group was done using Wilcoxon test.

RESULTS

Statistical Package for the Social Sciences [SPSS] software version 23 has been used for statistical analysis. The level of significance for PRE and POST test for passive knee extension test and y balance test for between group was calculated using Mann Whitney test.

The level of significance for within group was done using Wilcoxon test.

For this study, 74 participants with hamstring tightness were included. To check the flexibility and balance, Passive knee extension test and Y Balance test were used respectively for both the groups, pre and post the intervention.

Table no.1 Between group independent Mann Whitney test

Variable	Time frame	Group	Mean	SD	z-value	P-value
PKE RT	Pre	Group A	134.31	6.11	3.849	0.001*
		Group B	140.00	6.44		
	Post	Group A	152.64	6.38	1.058	0.293
		Group B	154.14	5.62		
PKE LT	Pre	Group A	135.58	5.91	3.834	0.001*
		Group B	141.42	6.96		
	Post	Group A	153.97	6.30	0.158	0.875
		Group B	153.75	5.62		
YBT-ANT RT	Pre	Group A	69.86	4.85	1.013	0.315
		Group B	71.11	5.59		
	Post	Group A	81.22	7.14	0.799	0.427
		Group B	79.06	14.62		
YBT-ANT LT	Pre	Group A	69.75	4.96	0.767	0.446
		Group B	70.69	5.48		
	Post	Group A	81.83	5.69	0.092	0.927
		Group B	81.69	7.09		
YBT-PM RT	Pre	Group A	69.97	5.53	1.501	0.138
		Group B	72.03	6.08		
	Post	Group A	83.25	7.29	0.217	0.829
		Group B	83.61	6.84		
YBT-PM LT	Pre	Group A	69.75	6.36	2.390	0.020*
		Group B	73.47	6.85		
	Post	Group A	83.17	7.42	0.715	0.477
		Group B	84.44	7.75		
YBT-PL RT	Pre	Group A	74.58	6.17	1.468	0.147
		Group B	76.72	6.19		
	Post	Group A	87.89	6.71	0.495	0.622
		Group B	88.78	8.43		
YBT-PL LT	Pre	Group A	71.89	13.10	2.076	0.042*
		Group B	77.06	7.16		
	Post	Group A	87.08	4.65	1.309	0.195
		Group B	89.14	8.19		

Table no.1.: Shows the mean, standard deviations, z-value and p-value of both the outcome measures between both the groups, pre and post-test respectively. The results of the study revealed that muscle energy technique as well as retro-walking has extremely significant effect on popliteal angle test and Y-balance test.

RESULT FROM ANALYSIS

The final analysis proves that both the groups were clinically significant but the statistical analysis was not analytically significant.

The mean value of PKE and YBT indicated changes post treatment and higher values are recorded for post treatment outcome and the standard deviation shows the limited consistency with post treatment value which is more than the pre value.

Based on the results of the test analysis at 5% significance level, there is a significant statistical reliable difference between the pre & post treatment values with p-value is less than the 5% significance level (i.e., $0.001 < 0.05$) in the study and therefore it justifies the improvements in health outcome post intervention.

This states that both the techniques, that is MET as well as Retro-walking have good reliability in terms of rehabilitation.

DISCUSSION

The focus of this study was to compare the effect of muscle energy technique versus retro walking on hamstring flexibility and dynamic balance in young college going students. The result of the present study demonstrated that hamstring flexibility and dynamic balance improved in both the groups after intervention.

MET is a form of manual therapy. MET via autogenic or reciprocal inhibition uses muscles own energy in the form of gentle isometric contractions to relax and lengthen the muscles. MET is an active technique in which the patient is also an active participant, whereas when compared to static stretching which is a

passive technique the therapist does all the work.

The temporary elongation of connective tissue during stretch is because of its viscoelastic properties is known as creep. As a result of remodelling and micro-tearing of connective tissue fibres, permanent plastic changes may occur. MET may produce increased muscle length by a combination of plastic and creep changes in connective tissues. If the relaxation phase, in MET would be performed for 30s, it may lead to prolongation of the muscle due to plastic changes and creep in the connective tissue.

In many studies it is stated that backward walking exercise can minimize the burden on joints and increase muscle strength in the lower limbs. Also, retro-walking does not cause adverse effects on the body through the stimulation of the major muscle in a rhythmic and dynamic fashion. It does not require any equipment or special tools which makes it effective and easy to use. The stance begins with toe contact during backward walking and ends with heel being lifted off the ground, the normal eccentric contractions of the rectus femoris is replaced by propulsive concentric contraction, during initial contact the activity at 0 degrees of inclination the knee is flexed approximately 31 degrees. The knee had extended position of approximately 14 degrees of knee flexion by mid-stance. The rectus femoris is also contracting concentrically at the same time to assist with knee extension during backward walking. At the ankle, greater demands were produced on dorsiflexion range of motion during backward walking.

H. FREDRIKSEN, et.al. (1997) found passive knee extension test as the gold standard for measuring hamstring tightness with an ICC=0.94 and the concurrent validity with universal goniometer 0.85. The Y Balance Test is a dynamic stability test with an ICC=0.80-0.85. Y-balance test is applicable clinically to provide an accurate assessment of the lower limb neuromuscular control. Hence,

passive knee extension test and Y-balance test is used in this study to measure hamstring tightness and dynamic balance respectively.^[6]

There was a study done to find out the prevalence and severity of hamstring tightness among college going students by BHAGYASHREE K. KOLI, et.al. (2018). Tightness was measured by AKE test. Results showed higher prevalence of hamstring tightness in college students. Hence it is concluded that prevalence of hamstring tightness is very high in college going students of age group 18-25years.^[1] Hence awareness of hamstring flexibility through appropriate treatment is important to prevent various musculoskeletal problems.^[1]

A study done by JAYDEV PANDYA, et.al. (2020) found out the effect of dynamic soft tissue mobilization with retro-walking on hamstring flexibility and dynamic balance in young college students. Prior and after the treatment both the outcome measures, Active knee extension test and Y-Balance test was measured. Intervention in the form of dynamic soft tissue mobilization with retro-walking were given alternate 3 sessions per week for 4 weeks. Results showed significant improvement by improving flexibility and dynamic balance. Hence it was concluded that dynamic soft tissue mobilization with retro-walking increases hamstring flexibility and dynamic balance in young college students. Therefore, this study shows that retro-walking is clinically applicable to treat hamstring tightness.^[2]

The efficacy of MET on hamstring flexibility in normal Indian college males was studied by MOHD WASEEM, et.al. (2009). G-A (10): Subjects were treated with MET. G-B (10): Subjects were kept as control [no intervention]. Treatment was given for 5 consecutive days. Prior and after the treatment the outcome measure that is popliteal angle was measured. Results showed significant improvement in popliteal angle (<.001). Hence it is concluded that MET significantly improves hamstring

flexibility. Therefore, this study indicates that MET is a very efficient technique to improving muscle flexibility.^[7]

ADILAH LOGDE, et.al. (2018)

found out the effects of retro walking on hamstring flexibility in normal healthy individual. 50 subjects participated. Training was for 4 weeks period and hamstring tightness pre and post implementations were assessed by sit and reach test. After 4 weeks increase in hamstring flexibility was seen. Hence it was concluded that retro-walking training showed significant improvement in hamstring flexibility and therefore it can be implemented clinically as well.^[3]

CONCLUSION AND LIMITATIONS

MET and Retro-walking were significant in terms of clinical outcome, but the data was not proven to have a significant p value. This states that MET and Retro-walking are equally effective on hamstring flexibility and dynamic balance in both the groups.

In college going students, the prevalence of hamstring tightness is very high. Hence awareness of hamstring stretching is important to prevent musculoskeletal problems.

Hence the study concluded that the MET as well as Retro-walking is effective, simple and easy to apply in Hamstring tightness subjects. Therefore, it can be implemented clinically as well.

The limitations of this study were that proper distribution of males and females can be done and sports players can be excluded from the study. Further recommendation includes the study being done in other population, study done to compare males and females, can be done on larger population and for a longer period of duration.

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