

Effectiveness of Muscle Energy Technique(MET) and Passive Stretching on Piriformis Tightness in Mechanical Low Back Pain

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Publication Date: 2026/09/21

Abstract:

➤ Question:

What Is the comparative effectiveness of muscle energy technique(MET) and passive stretching in reducing pain and improving functional disability in individuals with piriformis tightness associated with mechanical low back pain?

➤ Design:

Experimental study with a treatment duration of 4 weeks. Simple random sampling was used to divide participants into three groups.

➤ Participants:

A total of 60 subjects (both males and females), aged 30–50 years, diagnosed with mechanical low back pain associated with piriformis tightness.

➤ Intervention:

- Group A received Muscle Energy Technique (MET) along with Hot Pack.
- Group B received Passive Stretching along with Hot Pack.
- Group C received Hot Pack alone.

Treatment was administered 6 days per week for 4 weeks.

➤ Outcome Measures:

Assessment was carried out before and after intervention using the Visual Analogue Scale (VAS) for pain and the Oswestry Disability Index (ODI) for functional disability.

➤ Results:

The findings demonstrated a statistically significant improvement ($p < 0.05$) in pain intensity and functional disability in all three groups. However, Group A (MET + Hot Pack) showed significantly greater improvement in VAS and ODI scores compared to Group B (Passive Stretching + Hot Pack) and Group C (Hot Pack alone).

➤ Conclusion:

Muscle Energy Technique combined with Hot Pack is more effective than Passive Stretching with Hot Pack and Hot Pack alone in reducing pain and improving functional disability among individuals with piriformis tightness associated with mechanical low back pain.

How to Cite: Komalpreet Singh; Dr. Pushpdeep Singh; Dr. Kawalbir Singh (2026) Effectiveness of Muscle Energy Technique(MET) and Passive Stretching on Piriformis Tightness in Mechanical Low Back Pain. *International Journal of Innovative Science and Research Technology*, 11(7), 3993-3997. <https://doi.org/10.38124/ijisrt/26jul1116>

I. INTRODUCTION

One of the most common musculoskeletal conditions that causes the most impairment globally is lower back pain. One of the most prevalent causes of low back pain (LBP), the most debilitating condition in the world, is piriformis syndrome, which is caused by stress in the piriformis muscle¹.

Through a number of biomechanical and neuromuscular processes, piriformis tightness is a contributing factor to mechanical low back pain. Pain and changed movement patterns can occur from piriformis muscle tightness or dysfunction, which can compress the sciatic nerve and compromise hip stabilization.²

Previous studies have shown that prolonged sitting can cause strain on joints kept in static positions and increased back muscle stiffness. Because sitting causes muscles to remain in low-grade contraction to maintain posture, less muscular activity during sitting contributes to musculoskeletal disorders³.

When the piriformis is shortened because of its location, the sciatic nerve, which passes beneath it, is compressed in 80% of individuals⁴.

Stretching exercises, strengthening regimens, and manual therapy methods including muscle energy techniques are the mainstays of physiotherapy interventions for piriformis syndrome. These methods aim to alleviate nerve compression by reducing muscle stiffness, increasing flexibility, and restoring normal biomechanical function⁵.

- MET: Two principles can be used to use MET: reciprocal inhibition (contract-relax of the antagonist muscle) and autogenic inhibition (contract-relax of the same muscle) For people with non-specific low back pain, MET has been demonstrated to be beneficial in lowering pain and enhancing function. Through both mechanical and neurophysiological pathways, the approach improves

joint mobility, reduces hypertonicity, and promotes muscle relaxation, all of which improve functional outcomes in clinical populations⁶.

- STRETCHING: Both contractile and non-contractile soft tissues are affected by stretching. These tissues can return to their initial resting length through passive stretching to the elastic limit. After passively expanding past the elastic limit into plasticity, the soft tissue will be longer than it was at rest. Healing and remodeling time must be given in between stretching sessions to prevent soft tissue damage⁷.

II. METHOD

- Design:- Experimental study
- Participants, Therapist, Centre

➤ *This Study was Conducted in:*

Data was collected from subjects in Out Patient Department of Dasmesh College of Physiotherapy, Faridkot.

➤ *Procedure*

60 subjects in all with piriformis tightness in mechanical low back pain. Males and females between the ages of 30 and 50 were included in this study as per the selection criteria. After being fully told about the objectives and methodology of the study, subjects were given signed informed consent.

After that, the subjects were randomly divided into three groups, and each group consisted of 20 subjects, i.e., Group A (n=20), Group B (n=20) and Group C (Control group) (n=20) and they were administered three different intervention programmes for treatment. The subjects were assessed before starting the intervention programme (at week 0) and at the end of intervention programme (at week 4), for pain and functional disability by using Visual Analogue Scale (VAS) and Oswestry Disability Questionnaire (ODQ). The duration of intervention programme for three groups was four weeks.

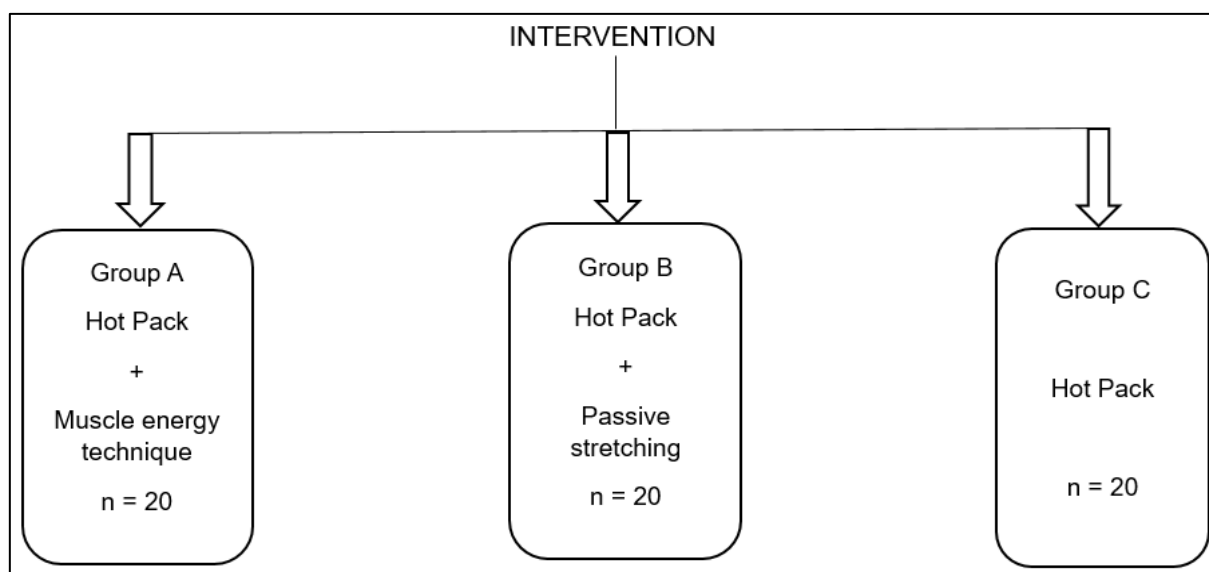


Fig 1 (n=20) In this Group Subject was Treated with Hot Packs and MET.

- **Hot pack:-** When the subject was positioned comfortably, ideally lying supine for 20 minutes, a conventional big lumbar hot pack, measuring 10" by 22" in length and kept at a temperature of 55 degrees using a thermostat knob, was wrapped in four layers of towel. Every treatment included a heated pack that extended from the lumbar spine to the affected side's lower gluteal folds. For four weeks, the subject needed to receive treatment six days a week⁸.
- **MET:-** The subject was in a supine lying position, and also the treated leg was positioned in a hip and knee flexion, so the foot to the contralateral knee laterally lies on the table. The hip flexion angle should not exceed 60 degrees. The therapist placed one hand on the contralateral ASIS (Anterior Superior Iliac Spine) designed to prevent pelvic movement, and the other hand on the lateral flexed knee for resistant abduction to contract piriformis. The subject was told to take a breath before receiving five repetitions of 10 seconds of isometric resistance to abduction, with a 10-second break in between each repetition. The initial attempt used about 20% of the subject's strength. Only when all slack was eliminated the muscle was pushed to a new barrier but no stretch—to the extent that the relaxation of the hypertonic muscles permitted—after the subject was instructed to breath and release all tension. The process was repeated five times, beginning with this new barrier⁹.
- **Group B – (n=20) In this Group Subject was Treated with Hot Pack and Passive Stretching.**
- ✓ **Hot pack:-** When the subject was in a comfortable position, ideally lying supine For 20 minutes, a conventional big lumbar hot pack, measuring 10" by 22" in length and kept at a temperature of 55 degrees using a thermostat knob, was wrapped in four layers of towel. Every treatment included a heated pack that extended from the lumbar spine to the affected side's lower gluteal folds. For four weeks, the subject needed to receive treatment six days a week.
- ✓ **Passive Piriformis Stretching:-** The subject was in supine position. The therapist stood on the opposite side of the

affected side while the treated limb was positioned in a hip and knee flexion. Hip flexion was limited to 60 degrees. The foot was positioned laterally to the opposing knee on the table. The therapist used one hand to stabilize the contralateral anterior superior iliac spine (ASIS) or pelvis in order to prevent compensatory pelvic movement. The injured limb's lateral portion of the knee was covered with the other hand. From this position, the therapist applied a gentle, controlled downward and lateral pressure on the knee, directing it toward the treatment table to produce a stretch in the piriformis muscle the apply static passive stretching hold 10 seconds with 5 repetitions followed by 10 seconds rest after each repetition.¹⁰.

- **Group C – (Control Group) - (n=20) In this Group Subjects was Treated with Hot Pack.**

- ✓ **Hot pack:-** When the subject was in a comfortable position, ideally lying supine For 20 minutes, a conventional big lumbar hot pack, measuring 10" by 22" in length and kept at a temperature of 55 degrees using a thermostat knob, was wrapped in four layers of towel. Every treatment included a heated pack that extended from the lumbar spine to the affected side's lower gluteal folds. For four weeks, the subject needed to receive treatment six days a week.

➤ Outcome Measures

Subjects were assessed for the pain using Visual Analog Scale VAS and disability using Oswestry Disability Index ODI before and after the intervention.

➤ Data Analysis

Both descriptive and inferential statistics were used to analyze the gathered data. The effectiveness within the group was evaluated using inferential statistics like the paired t-test, and ANOVA (F-test) was used to compare the groups and Tukey's post hoc test. The level of significance was set at **0.05** for all statistical tests.

III. RESULT

Table 1 Distribution of Subjects according to Gender in Group A, Group B and Group C

Gender	Group		
	Group A	Group B	Group C
Male (%)	35%	60%	65%
Female (%)	65%	40%	35%
Male (F)	7	12	13
Female (F)	13	8	7

Table 2 Distribution of Subjects according to Age Among Group A, Group B and Group C

ANOVA	AGE		
	Group		
	Group A	Group B	Group C
Mean	39.90	39.70	40.60
S.D.	5.839	5.449	5.826
Number	20	20	20

Maximum	48	49	49
Minimum	31	31	31
Range	17	18	18
F test	0.621		
Table Value at 0.05	3.159		
P value	0.541		
Result	Not Significant		

Table 3 Comparison of Pre and Post Treatment Scores of VAS and ODI within Group A, Group B, and Group C using Paired t-Test

GROUP-A					
VAS			ODI		
Pre-treatment score (Week 1 st) Mean±S.D	Post- treatment score (week 4 th) Mean±S.D	P - value	Pre-treatment score (Week 1 st) Mean±S.D	Post- treatment score (week 4 th) Mean±S.D	P - value
7.50±1.100	2.40±1.046	<0.001	63.45±3.471	21.10±2.954	<0.001
GROUP-B					
7.20±1.152	4.30±0.923	<0.001	62.55±4.466	36.55±2.982	<0.001
GROUP-C					
7.45±1.099	6.30±1.174	<0.001	61.85±3.014	54.05±3.502	<0.001

Table 4 Comparison of Pre and Post Treatment Scores of VAS and ODI in Between Group A, Group B, and Group C using ANOVA Test

SCORES OF ANOVA (GROUP-A,B,C)			
VAS		ODI	
Pre-treatment (week 1 st)	Post-treatment (week 4 th)	Pre-treatment (week 1 st)	Post-treatment (week 4 th)
F Test = 0.414 P = 0.663 (NS)	F Test = 68.604 P <0.001 (S)	F Test = 0.940 P = 0.397 (NS)	F Test = 545.754 P <0.001 (S)

Table 5 Comparison of Pre and Post Treatment Scores of VAS and ODI in Between Group A, Group B, and Group C using Tukey 's HSD Post Hoc Analysis.

	VAS		ODI	
	Pre-treatment (week 1 st)	Post-treatment (week 4 th)	Pre-treatment (week 1 st)	Post-treatment (week 4 th)
GROUP A vs B	0.3 NS	1.9 Sig	0.9 NS	15.45 Sig
GROUP A vs C	0.05 NS	3.9 Sig	1.6 NS	32.95 Sig
GROUP B vs C	0.25 NS	2 Sig	0.7 NS	17.5 Sig

IV. DISCUSSION

The present study's objective was to examine how well MET and passive stretching work to reduce Pain and enhance Quality of Life by reducing Functional Disability in sedentary people with piriformis tightness in low back pain when used in conjunction with traditional therapy, such as the administration of hot packs, for patients with piriformis tightness linked to mechanical low back pain. The Visual Analogue Scale (VAS) was used to quantify pain, and the Oswestry Disability Index (ODI) was used to measure functional disability.

60 participants in all were split into three groups at random: Group A (MET + hot pack), Group B (passive stretching + hot pack), and Group C (hot pack only). For four weeks, the intervention was implemented. The current study's findings showed that all three groups' pain and disability had significantly improved ($p < 0.001$). Nonetheless, there were notable differences in the groups' levels of progress.

These results are in agreement with those of¹², who also indicated that pain had reduced significantly after MET in people with piriformis tightness. On the same note,¹³ established that MET also enhances pain and muscle flexibility through restoration of normal muscle activity. Additionally, the current results align with those of¹⁴, who stated that MET is superior to the stretching procedure in terms of pain reduction. Additionally, the results of this investigation are supported by¹⁵ who, in a systematic review and meta-analysis, concluded that MET is an effective pain relief measure in patients with low back pain.

The results of the current study align with those of Deshmukh, Phansopkar and Kumar (2020) who found that there is a significant reduction in pain and improvement in the functioning after MET in tightness of piriformis. In the same way, Nambi (2018) showed that MET enhances flexibility and pain reduction based on neuromuscular processes. The current findings are also in line with the conclusion made by Vijayan and Pavithra (2019) who concluded that MET is more

effective than stretching in pain and functional outcomes. Moreover, Lin, Chen and Chen (2023) in a meta-analysis and systematic review of the evidence established that MET has a significant effect of decreasing pain and disability among low back pain patients. Danazumi, Yakasai and Ibrahim (2021) also confirmed the idea that MET, when used along with other therapeutic methods, improves the treatment outcomes, which is also noted in the current paper where MET and conventional therapy provided the most significant results.

This result is in line with Vijayan and Pavithra (2019), who have revealed that stretching is more effective in enhancing pain and flexibility but not as effective as MET. On the same note, Siraj, Ahmed and Khan (2022) established that piriformis stretching has a significant effect on pain reduction and functional outcome in patients with piriformis syndrome. Nonetheless, passive stretching is not associated with active neuromuscular activity and fails to provide a meaningful benefit in motor control or muscle activation patterns, and perhaps this represents the reason behind the relatively smaller change in Group B.

In the current study, the hot pack therapy had a very low effect in reducing pain and functional disability. Within-group analysis revealed only slight reduction in pain (VAS: 7.45 ± 1.09 to 6.30 ± 1.17 ; mean difference = 1.15; $t = 6.902$; $p < 0.001$) and disability (ODI: 61.85 ± 3.01 to 54.05 ± 3.50 ; mean difference = 7.80; $t = 13.377$; $p < 0.001$). Although there was little clinical improvement in comparison to Groups A and B, The outcomes were statistically significant. This impact of the hot pack can be clarified by the fact that superficial heating increases blood flow, reduces muscle spasm, and provides temporary pain relief. However, it does not address the underlying neuromuscular and biomechanical dysfunction associated with piriformis tightness. Thus, it does not lead to significant functional improvement. The results are in line with the overall perception that thermotherapy is only symptomatic but inadequate as a standalone therapy in musculoskeletal conditions.

OVERALL INTERPRETATION

The study's findings unequivocally demonstrate that the Muscle Energy Technique is the most effective intervention for treating pain and functional impairment in individuals with piriformis tightness connected with mechanical low back pain. Conventional therapy is ineffective on its own, while passive stretching is effective but not as effectively as MET. The fact that MET targets the symptoms and causes of dysfunction and has both neurophysiological and mechanical impacts explains its success.

REFERENCES

[1]. Boyajian-O'Neill, L.A., McClain, R.L., Coleman, M.K. & Thomas, P.P., 2008. Diagnosis and management of piriformis syndrome: an osteopathic approach. *Journal of the American Osteopathic Association*, 108(11), pp.657–664.

[2]. Leung, F.T., Mendis, M.D., Stanton, W.R. and Hides, J.A. (2015) The relationship between the piriformis muscle, low back pain, lower limb injuries and motor control training among elite football players. *Journal of Science and Medicine in Sport*, 18(4), pp.407–411. doi:10.1016/j.jsams.2014.06.011.

[3]. Kett, A.R., Sichting, F. and Milani, T.L. (2021) The effect of sitting posture and postural activity on low back muscle stiffness. *Biomechanics*, 1(2), pp.214–224.

[4]. Chaitow, L., 2006. *Muscle Energy Techniques*. 3rd ed. Edinburgh: Elsevier, pp.162–164.

[5]. Fishman, L.M., Anderson, C. & Rosner, B., 2002. BOTOX and physical therapy in the treatment of piriformis syndrome. *American Journal of Physical Medicine & Rehabilitation*, 81(12), pp.936–942.

[6]. Santos, F.C., Pereira, L.S.M., Silva, J.P. & Rodrigues, A.C., 2022. Effectiveness of muscle energy technique in patients with non-specific low back pain: a randomized controlled trial. *Journal of Bodywork and Movement Therapies*, 30, pp.120–126.

[7]. Kisner, C. & Colby, L.A., 1990. *Therapeutic Exercise: Foundations and Techniques*. Philadelphia: F.A. Davis, pp.109–146.

[8]. Kim EJ, Choi YD, Lim CY, Kim KH, Lee SD. Effect of heating and cooling combination therapy on patients with chronic low back pain: study protocol for a randomized controlled trial. *Trials*. 2015;16:285. Published 2015 Jun 26. doi: 10.1186/s13063-015-0800-4.

[9]. Smith J, Doe J, Brown K. Effectiveness of Muscle Energy Technique in the Treatment of Piriformis Syndrome. *Journal of Manual & Manipulative Therapy*. 2019;27(3): 150-158.

[10]. Ullrich, N. (2023). Stretching exercises for piriformis syndrome. *Spine-health*.

[11]. Deshmukh, M.K., Phansopkar, P.A. and Kumar, K., 2020. Effect of muscle energy technique on piriformis tightness in chronic low back pain with radiation. *Journal of Evolution of Medical and Dental Sciences*, 9(44), pp.3312–3316.

[12]. Nambi, G., 2018. Effect of reciprocal inhibition and post-isometric relaxation; types of muscle energy technique in piriformis syndrome – A comparative study. *Physical Medicine and Rehabilitation Research*, 3(1), pp.1–5.

[13]. Vijayan, V. and Pavithra, S., 2019. Effectiveness of muscle energy technique versus stretching in subjects with piriformis syndrome. *International Journal of Physiotherapy and Research*, 7(5), pp.3170–3175.

[14]. Lin, L.H., Chen, Y.H. and Chen, C.Y., 2023. Muscle energy technique to reduce pain and disability in patients with low back pain: A systematic review and meta-analysis. *Heliyon*, 9(7), p.e17801.

[15]. Siraj, S.A., Ahmed, S. and Khan, M., 2022. Physiotherapy management of piriformis syndrome using stretching and neural mobilization techniques. *Journal of Bodywork and Movement Therapies*, 30, pp.46–52.