To Compare the outcome of neuromuscular therapy, active release technique and stretching among subjects with piriformis tightness

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ABSTRACT

Background: This study is Aim to find out the Effectiveness of Neuromuscular Therapy and Active Release Technique in females with Piriformis Tightness of Age Group 20-30 Study states that incidence of Piriformis Tightness 79.5% in health individual of India piriformis tightness has been of 6 times more in women's than in men's Because of Wider quadriceps Femoris muscle angle (Q-angle) which leads to Buttock and leg pain. Neuromuscular Therapy and Active Release technique both Treatment found Effective in Treating Piriformis Tightness, but the Comparision in Females has not done yet so to find out better choice of Treatment we conduct this study. **Methods:** This experimental study was Conducted in D.Y.Patil college of Physiotherapy, Kolhapur 116 subjects were Selected based on their Inclusion and exclusion Criteria. they were Divided into 3 groups based on chit method Group A Receiving Neuromuscular Therapy (Myofascial Release Muscle Energy Technique). Group B receiving Active Release Technique and Group C receiving Stretching for 3 weeks with 2 sessions each week. Pre- test and Post-test were Examined using VAS scale on Rest and Activity and Hip IR ROM using Goniometer. DATA was Analyzed using MS Excel Software.

Result: The results of the study indicate that all three techniques demonstrated comparable effectiveness, with no statistically significant differences observed between them. Specifically, the p-value for the VAS score at rest was 0.96, and the p-value for the VAS score during activity was 0.65, both of which were not statistically significant.

However, when compared to the stretching technique, both of the other techniques were found to be statistically significant and more effective. The mean differences in VAS scores between these techniques and stretching were 19 and 21, respectively, highlighting their superior efficacy in pain reduction.

Conclusion while the three techniques were equally effective, both were significantly more effective than stretching, as evidenced by the observed mean differences.

but the Neuromuscular Technique is more Superior Treatment followed by Active Release Technique.

INTRODUCTION

The piriformis muscle Originates from pelvic surface of middle three pieces, by three digitation and upper margin of greater sciatic notch and inserts on inner surface of greater trochanter. [1] Spinal nerve S1 & S2 and sometimes L5 innervate the piriformis

muscle. Sciatic nerve comes out of the greater sciatic foramen deep inside the inferior surface of the piriformis muscle. [2] The action of the piriformis muscle rotates the hip externally when the hip is externally rotated and abducted when the hip is flexed. The superior gluteal artery and gluteal nerve appears above the muscle and inferior gluteal artery and inferior gluteal nerve appears below the muscle. [3] Study saw that prevalence of piriformis tightness was 79.5% incident in healthy individuals of India by (JC Mujawar 2019). [4] Three joint muscles lie below the gluteal muscle which is one of the most important and powerful muscles. It was reported that the increased pain and piriformis tightness is due to prolonged sitting. [5] **Pre-Disposing Factors for Piriformis tightness:** Overactivity of piriformis muscle- as piriformis is a postural type of muscle and always overactive in nature. Piriformis muscle is made up of type-1 fiber and when muscle becomes abnormally stressed it has characteristic of shortness or tightness. [4] When agonist muscle which performs specific movement related to joint become weak, piriformis synergistic muscle overcome and work as agonist muscle. **Signs & symptoms:** Sensitivity around the piriformis muscle, a discernible lump in the ipsilateral buttock, an uneven weakening in the impacted limb, soreness after more than fifteen minutes of sitting or standing, positive symptoms of Piriformis, limited internal rotation of affected limb [2] Incidence of piriformis tightness has been of 6 times more in women's than in men's. Which leads to pain in the buttock and legs. [6] Piriformis muscle tension can result in several musculoskeletal disorders, including piriformis syndrome, low back pain, and sciatic nerve discomfort. Overuse and pressure on muscles cause muscular imbalance, which leads to chronic lower back discomfort. [7] With 90% of the population experiencing low back discomfort, this is the most frequent worry. According to (Kjaer et al., 2005), the incidence of low back pain cases is estimated to be between 6% and 8%. [6] Nonetheless, piriformis muscle tension is linked to symptoms in 6–7% of patients with low back pain. [3] Women are more likely than males to develop piriformis syndrome (3:1), which is related to the broader quadriceps femoris muscle angle (Q-angle) in women's biomechanics.in women's os coxae, or pelvis. [3] The most frequent cause of piriformis syndrome is tightness in the piriformis muscles, which puts more pressure on the sciatic nerve. [6] The possible range of motion for the hip internal rotation is normally 30°–35°. [8] According to the study, the patient's complaints of hip internal rotation range of motion pain and issues walking were related. Recognition of piriformis muscle can be challenging due to the differential

diagnosis of leg and buttock discomfort. Palpation is very crucial in this situation. According to research, the most typical symptom is tenderness when the larger sciatic notch is felt. Over the piriformis muscle, it feels like sausage-like bulk. [9]

Stretching the piriformis muscle together with heat therapy and ultrasound therapy are two aspects of conventional physiotherapy management for piriformis pathology that have positive results. Deep friction massage and deep tissue mobilization are additional therapies that provide adjuvant therapy. [10] People with musculoskeletal disorders also benefit from the various therapy modalities. These consist of myofascial release, active release technique (ART), and muscle energy therapy (MET). [4] Therefore, the aim of this study is to determine prevalence in females and evaluate treatment efficiency. The use of various treatment methods, such as muscle energy therapy and myofascial release, can help people with musculoskeletal disorders. The technique involves the utilization of short load –long term stretches to hyperirritable spots to accomplish optimal length, decrease and improve its functions. MET (muscle energy technique) soft tissue manipulation that unified exactly directed and controlled, patient set to isometric and isotonic contraction that compressed to facilitate, musculoskeletal function and reduce pain. [11] Although it has been suggested that MET acts on joint proprioceptors and mechanoreceptors, which will have an impact on descending pathways and alter the motor programming of the target joint, the precise mechanism by which MET induces pain relief remains unclear Additionally, it has been suggested that the application of the technique causes changes in the soft tissue's viscoelastic properties, which in turn leads to pain relief and increased mobility; an increase in stretch tolerance is thought to be the mechanism causing enhanced flexibility. [12] Myofascial release therapy may be beneficial in treating musculoskeletal pain, according to certain ideas. These hypotheses include the release of serotonin, the parasympathetic response of the autonomic nervous system, the gate control theory, and interpersonal attention. [13] It was mentioned that massage treatment aids in the healing of people with low back pain and sciatica symptoms in addition to lowering discomfort and increasing range of motion. Myofascial release also lessens sciatic nerve discomfort and the tightness in the impacted muscles. During myofascial release, the overactivity of malfunctioning muscle, fascia, and connective tissue is overridden by the process of autogenic inhibition, which is triggered by mechanical pressure on Golgi receptors to provide proprioceptive information to the central nervous system. [5] Active

release technique (ART) is a manual therapy used to recover function of soft tissue .in many ways it is like “pin and stretch" technique. [4] In this technique tender point in shortened muscle position act by high intense pressure, and then patient is asked to move leg from shortened to lengthened position used to establish optimal texture, resilience and function of soft tissues.

METHODOLOGY:

Materials: Pen, Plinth, universal Goniometer, consent Form.

This is Randomized clinical trial after getting ethical approval from Institutional ethics committee study started. Patients who meet the study's inclusion criteria and are willing to provide consent will be chosen as subjects with piriformis tightness. After a brief introduction and educational session, a preliminary examination will be conducted, including gathering demographic information like name, age, height, and weight. **Inclusion criteria:** Age group 20-30, female participants, subjects who are sitting more than 4-5 hours, pain over buttock and hip, restriction in hip internal rotation and external rotation ROM less than 35°, positive FAIR test (flexion, adduction, and internal rotation). **Exclusion criteria:** Any inflammatory condition at hip joint, pregnant women**,** Recent fractures and surgery of spine and hip, Any congenital deformity of lower limb, Joint instability or any soft tissue injuries past 6 months. After completing the FAIR test, the subjects will be split into three groups using the chit method. The VAS scale will be used to measure pain. and the universal goniometer will be used to measure the range of motion of the hip internal rotation. There were 3 groups, Group A receiving –neuromuscular technique, Group B receiving –active release technique, Group C receiving_ Stretching, the traditional physiotherapy management strategy will involve stretching.

Study type: Randomized clinical trial, **Study design:** Experimental study, **Study** duration**:** 6 months, **Sampling design:** Consecutive sampling method, **Sample size:** sample size- 116 **Sample size calculation:** Sample size is calculated for confidence interval 95%, 80% power and effect size 0.4666378 by using software G*Power version 3.1.9.4. Total Sample size calculated is 116, for first group it is 58 and for second group it is 58 **Outcome measures: Visual Analogue Scale (VAS)** Visual analogue scale is unidimensional measure of pain intensity, used to record patient pain progression.it is

a 10cm scale in length it will be taken by asking patient to mark their pain level on 10cm line. which shows starting point as a no pain and ending point as a worst pain.

Hip internal rotation range of motion: Hip range of motion will be measured in prone lying with knee in 90 of flexion. The central axis will be placed on center of knee while movable arm will be parallel to long axis of tibia and stationary bar will also be parallel to long axis of tibia. patient then asked to move their leg outwardly without moving their hip this ROM will be taken for hip internal rotation ROM.

FAIR Test: The test is sensitive and specific test to detect irritation and tightness of piriformis muscle. The technique involves a patient in side lying position with tested hip on top therapist will passively move patients' lower extremity into flexion (90 degree), adduction, and internal rotation. The therapist stabilizes the hip and applies downward pressure to the knee to internally rotate and adduct the hip. The test will be positive when a patient complains of pain in gluteal area.

Group A-Neuromuscular therapy, to improve hip internal rotation range of motion, Group A will get neuromuscular therapy (soft tissue manipulation) for the piriformis muscle. Reciprocal inhibition, a muscular energy technique, will be used in conjunction with myofascial release. Internal rotation is achieved by the therapist gripping the ankle and hip joints while the patient is lying prone at the edge of the bed with their knee bent to a 90° angle. The elbow tip will be positioned on the central region of the muscular belly's trigger points. The triangular-shaped muscle triangle known as the piriformis is created by uniting three spots. Spinous process S2 the S4 procedure The location of the greater trochanter of the femur is in the center of the trigger point. Elbow will be used to apply force for five to seven seconds. Reasonable muscle will be used, but no undue stretching will be done. Patients will be urged to perform an isometric contraction of the piriformis muscle by moving their leg against resistance and toward external rotation while maintaining contact. Following the appropriate contraction.

Group B - will be given Active release technique, to achieve muscle lengthening, the patient will be asked to twist their leg internally while lying on the edge of the bed, prone, with their knee flexed to a 90° angle. Direct force is applied by placing the elbow tip on trigger points. Then the lower limb will be taken to new position and resistance barrier same procedure will be repeated. Up till more improvements are obtained, the therapy is repeated five to seven times. **Group C**- will be given stretching for piriformis muscle, the patient will be asked to lie in a supine position to accomplish muscular

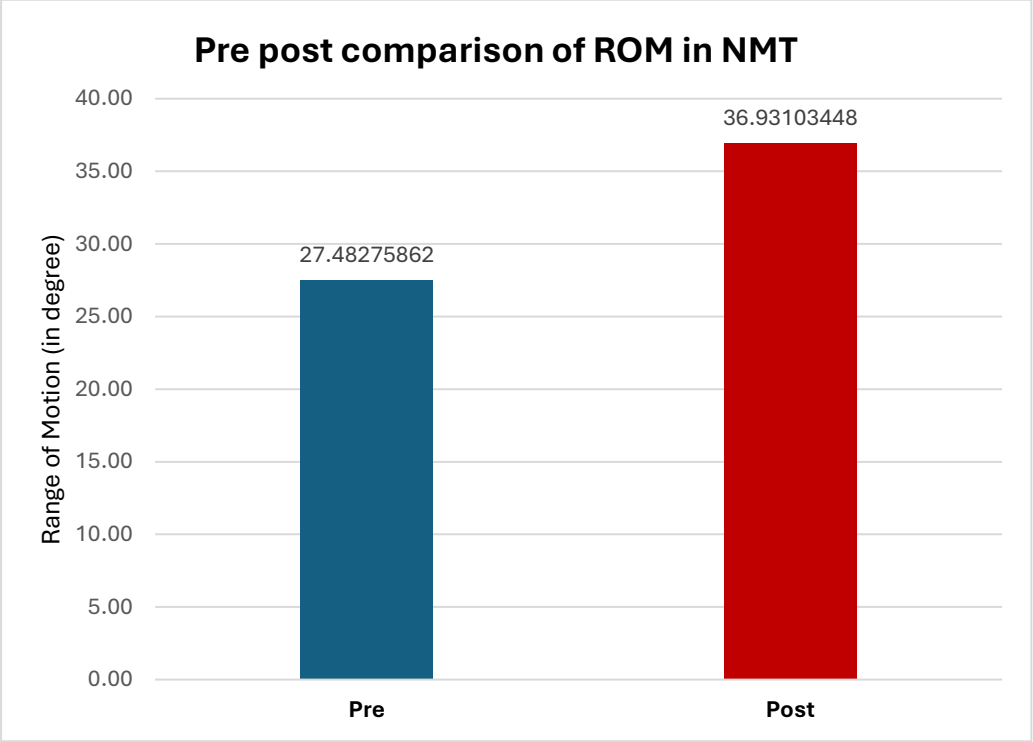
lengthening. The patient's ankle should be rested over the other leg's knee by the therapist. Therapist Hold the patient's thigh and press the knee inward toward the chest. The patient will experience a stretch down their buttocks and possibly on the other side of their hip. The stretch was maintained for 30 seconds. Total treatment time for all 3 groups -3 weeks with 2 sessions each week. In home exercise protocol Active stretching for piriformis muscle will be taught to all groups of patients.

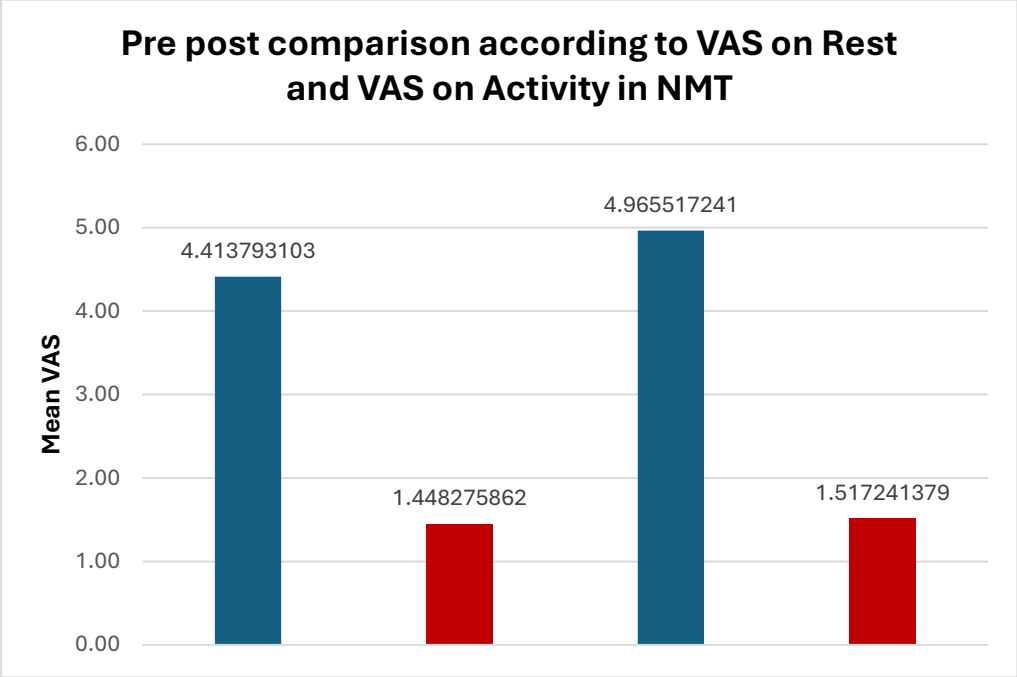
RESULTS

Table-1

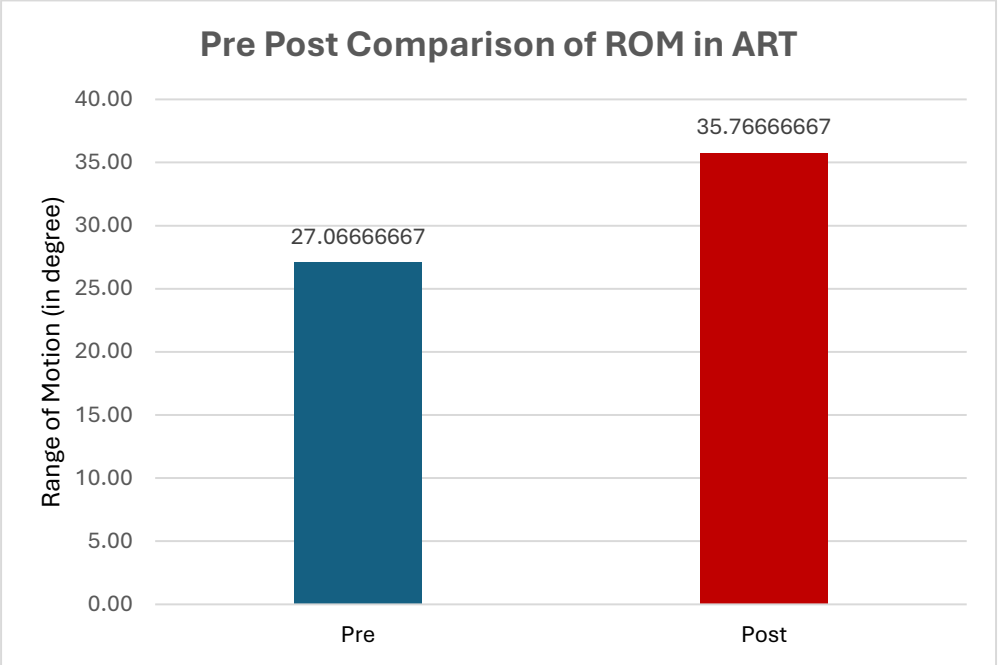
Pre post comparison

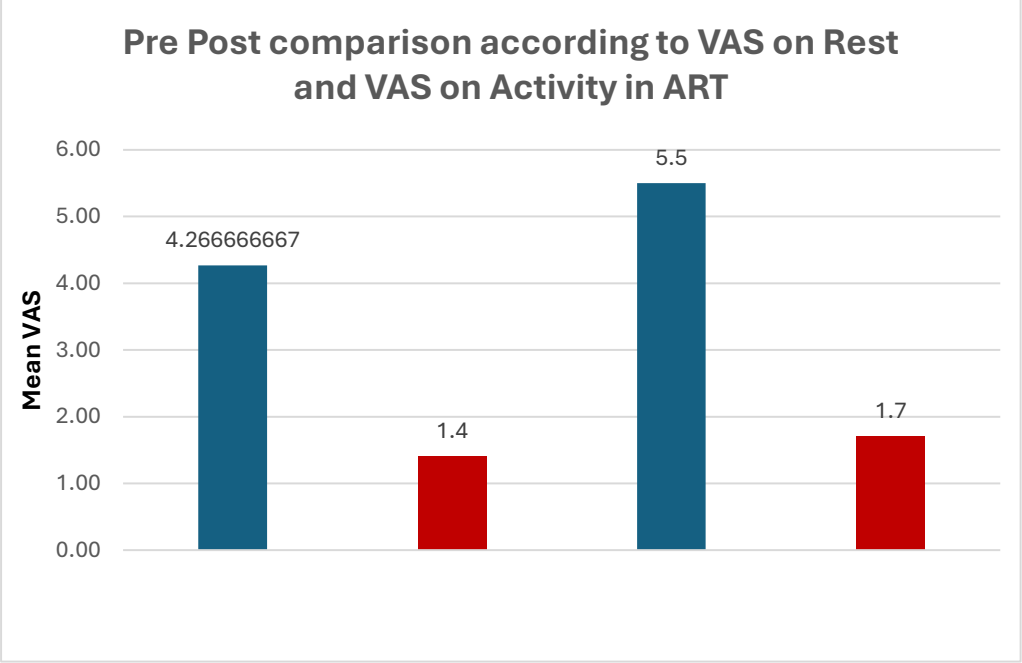
NMT Intra group pre-post statistical analysis of group A revealed statistically significant values of VAS, and Hip IR ROM. The mean VAS on Rest pre intervention was 4.41± 1.15 which decreased to 1.45± 0.83 (p 3.12E-21) which was significant. The mean VAS on Activity pre intervention was 4.97±1.18 which decreased to 1.52± 0.87 (p 4.25E-21) which was significant. The mean Hip IR ROM pre intervention was 27.48± 2.94 which increased to 36.93± 1.83 (p 4.08-18) which was extremely significant.



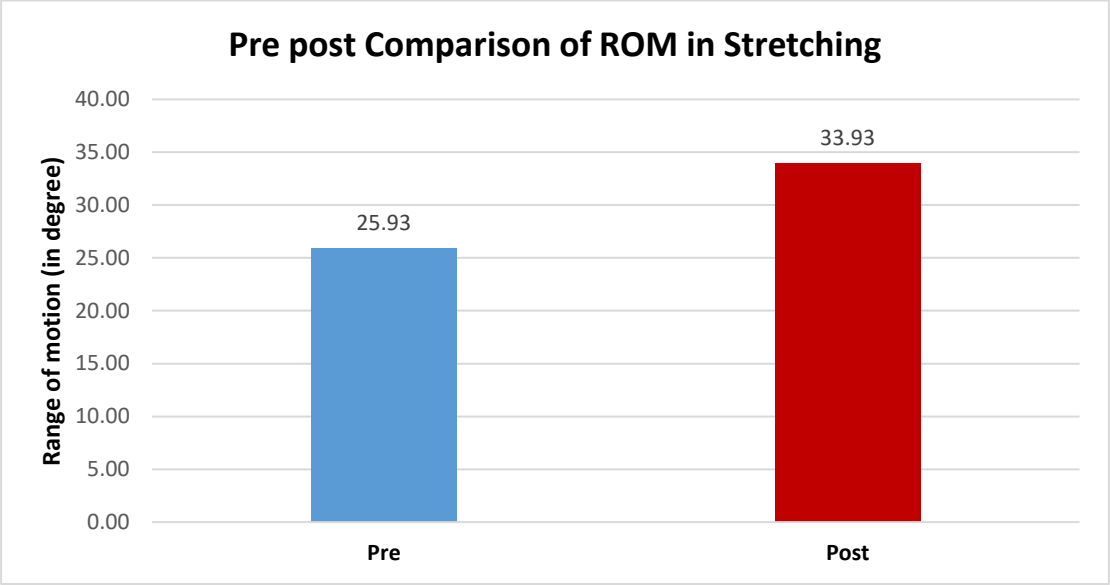


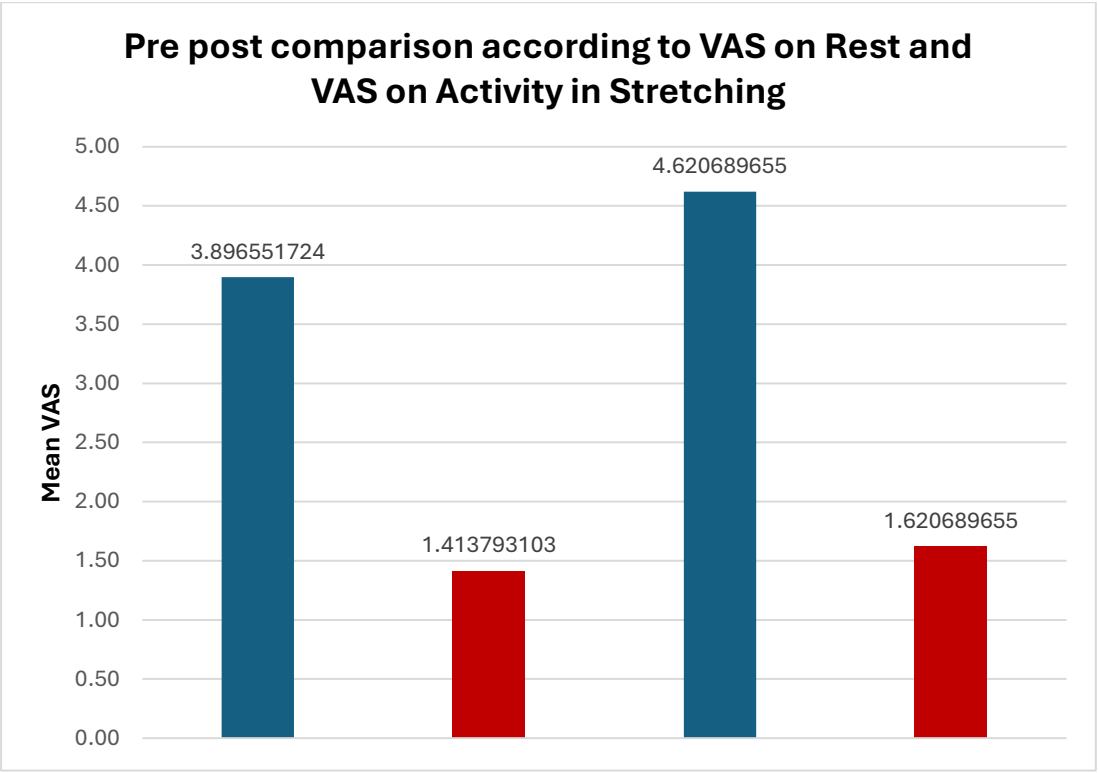
Intra group pre-post statistical analysis of group B revealed statistically significant values of VAS, and Hip IR ROM. The mean VAS on Rest pre intervention was 4.27± 1.01 which decreased to 1.40± 0.67 (p 2.53E-16) which was significant. The mean VAS on Activity pre intervention was 5.50±1.17 which decreased to 1.70± 0.65(p3.28E-18) which was significant. The mean Hip IR ROM pre intervention was 27.07± 2.24 which increased to 35.77± 2.03 (p 4.16E-20) which was extremely significant.





Intra group pre-post statistical analysis of group C revealed statistically significant values of VAS, and Hip IR ROM. The mean VAS on Rest pre intervention was 3.90± 0.90 which decreased to 1.41± 0.57 (p 5.63E-15) which was significant. The mean VAS on Activity pre intervention was 4.62±0.98 which decreased to 1.62± 0.73(p3.54E-19) which was significant. The mean Hip IR ROM pre intervention was 25.93± 1.77 which increased to 33.93± 1.79 (p 2.29E-21) which was extremely significant.





Comparison of NMT, ART & Stretching (using Anova)

Outcome Measure	Technique	Mean	SD	P value
ROM	NMT	36.93	1.83	1.979E-07
	ART	35.77	2.03	
	Stretching	33.93	1.79	

VAS on Rest	NMT	1.45	0.83	0.96
	ART	1.40	0.67	
	Stretching	1.41	0.57	
VAS on Activity	NMT	1.52	0.87	0.65
	ART	1.70	0.65	
	Stretching	1.62	0.73	

The Intergroup analysis of Comparision of all 3 groups mean intervention group A For VAS on Rest was 1.45±0.83 and for VAS on Activity was to 1.52±0.87 For Hip IR ROM 36.93±1.83, (p1.979E-07) Mean intervention group B VAS on Rest was 1.40±0.67 and VAS on Activity1.70±0.67, Hip IRR OM 35.77±2.03 and mean intervention group C was 1.41.±0.57 ,VAS on activity 1.62±0.73 in and Hip IR ROM 33.93±1.79. The p value of VAS on Rest was found to be 0.96 which was not significant and p value of VAS on Activity was found to be 0.65 which was also not significant.

DISCUSSION-

Basically, piriformis tightness and muscular pain are caused by a shortening of the muscle, which most frequently affects inactive individuals. Hiya.A.Kukadia et al. state that piriformis muscle tension can cause a variety of disorders, including piriformis syndrome, sciatic nerve pain, and low back pain (LBP).[5] The purpose of this study was to ascertain the benefits of neuromuscular treatment and active release technique on female patients with tight piriformis.to lessen discomfort and enhance females' range of motion. Subjects that meet the inclusion and exclusion criteria as well as those who test positive on the FAIR test have been included in this study. The goniometer was used to assess the range of motion in the hip internal rotation, and the VAS was utilized to measure the intensity of the pain. A total of 116 participants were enrolled in this study. The study involved the recruitment of subjects. After evaluation, the subjects were split into three groups using the lottery method; each group consisted of 38 individuals. Group A received neuromuscular treatment, Group B was given active release technique, and Group C had piriformis muscle stretching. There are two sessions every week for three weeks of treatment. Every measurement was taken on the first (pre-test) and last days of the treatment sessions (post-test). According to statistical

data, Group A (NMT) and Group B (ART) significantly differed on the pre & posttest on the VAS and internal rotation ROM.

GROUP A (NMT): Group A consisted of 38 participants in total. In subjects who received NMT procedure, group analysis utilizing paired t-test revealed that few patients stopped their treatment. The mean VAS on activity pre-intervention was 4.97±1.18, which was significant, and on rest score pre-intervention was 4.41±1.15, which was lowered to 1.45±0.83 (p 3.12 E-21). On the other hand, there was a highly significant difference in the mean difference of IR ROM on the pre-intervention (27.48±2.94) and posttest (36.93±1.83; p = 4.08 E-18). Similarly, study by Ekta Chaudhary et.al. demonstrate greater significant effect among groups ($p<0.05$). The MFR group shows greater significant improvement in VAS with mean difference 0.86 (p=0.000), PPT mean difference 0.41 (p0.000) and with mean difference 35.33 ROM(p=0.000) when myofascial release was given to the patients with upper trapezius spasm. This study involves 45 subjects which are divided into 3 groups. Group A received MFR+ Exercises, Group B received cold pack=Exercises Group C received only Exercises. [13] Another study by Richa Mahajan et.al showed extremely significant improvement of MET on subacute mechanical neck pain in which 45 patients were included which showed greater improvement in decreasing pain intensity & improving cervical ROM. the reason Behind improvement of joint ROM is the mechanical pressure on Golgi receptor & autogenic inhibition. [14]

GROUP B (ART): There were 38 participants in all in group B. A few patients stopped receiving treatment during the session. The Hip IR ROM score pre-intervention was 27.07±2.24 & posttest intervention 35.77±2.03(p4.16E-20) which was very significant. Within group analysis, the subjects underwent ART technique and were assessed using a paired t-test. The mean VAS on rest score pre-intervention was 4.27±1.01 which was reduced to 1.40±0.67p (2.53E-16) & was on activity pre-intervention was reduced to post intervention 1.70±0.65(p3.28 E-18) which was significant. Similarly, study by Daxa Mishra et.al shows significant improvement in neck ROM(p=0.0001) and VAS mean difference 1.86 (p=0.0001), and Neck disability index NDI with mean difference 7.47 P (0.0001) when ART given to the patients with Upper Trapezius Spasm.in this study 60 Patients with both the gender male & female of age group between 20 to 55 years received ART and MFR technique to the patients with Upper trapezius spasm. They were divided into two groups by computerized

randomization's Group A (ART) and Group B(MFR) for seven days. [15] Similarly, in a study by Vijay Kage et.al ART in subjects with hamstring tightness in 40 normal healthy subjects showed significant improvement in popliteal angle ($p<0.001$) &sit and reach flexibility test ($p<0.001$) as compared to mulligan bent leg raise technique. [16] While our focus areas may be different from those of these studies, our current study's application of ART to treat the piriformis muscle resulted in a significant improvement in both the VAS score and range of motion (ROM). This improvement is likely due to the removal of scar tissue that was adhered to the soft tissue and caused movement limitation. [17]

Group C (Stretching): Within group analysis in the subjects underwent stretching done by paired t-test which involves the mean VAS on rest. pre-intervention 3.90±0.90 which was reduced to 1.41±0.57(p 5.63 E-15) whereas VAS on Activity Pre-intervention 4.62±0.98 which reduced to 1.62 ±0.73(p3.54 E-19) which was reduced to 1.62±0.73(p3.54 E-19) which was significant mean Hip IR ROM is 33.93±1.79 (p2.29 E-21) which was significant. Similarly, study by Saeed et.al performed specific piriformis stretching in females with piriformis syndrome. Studies showed a high improvement in outcomes in terms of decrease pain score on NPRS, FPLES (functional performance of lower Extremity scale) and measured referral length at all three positions (p0.05). [18] Inhibition of Golgi tendon Organ leads to Decrease stretch of muscle occurs due to slow static stretch which increases the joint ROM & decreases the Pain. [19] Intergroup analysis in all 3 groups was done by using ANOVA test & it shows that statistical value for VAS on rest and VAS on Activity was not significant. with p value on rest (p0.96) & p value for VAS on Activity was (0.65) but inter group analysis for Hip IR ROM showed significant effect with p value p (1.979 E-07) which was extremely significant.

CONCLUSION

Based on the study's findings, it was determined that while stretching and neuromuscular therapy were both more effective than stretching, neuromuscular therapy had a greater mean difference in treating piriformis tightness than either active release technique or stretching. Thus, the alternative hypothesis is accepted by the present study.

REFERENCES

1. Boyajian-O'Neill LA, McClain RL, Coleman MK, Thomas PP. Diagnosis and management of piriformis syndrome: an osteopathic approach. J Am Osteopath Assoc. 2008 Nov;108(11):657-64. doi: 10.7556/jaoa.2008.108.11.657. PMID: 19011229.
2. Probst D, Stout A, Hunt D. Piriformis syndrome: a narrative review of the anatomy, diagnosis, and treatment. PM&R. 2019 Aug;11:S54-63.
3. Mujawar JC, Chotai K, Kanase S, Jadhav A. Effectiveness of neuromuscular therapy and active release technique in young adults with piriformis tightness. Indian J Physiother Occup Ther. 2019;13:212-7.
4. Rajendran S, Sundaram SS. The effectiveness of myofascial release over stretching on pain and range of motion among female college students with piriformis syndrome. Malaysian Journal of Movement, Health & Exercise. 2020 Jul 1;9(2):45.
5. Kukadia HA, Malshikare A, Palekar TJ. Effect of passive stretching v/s myofascial release in improving piriformis flexibility in females–a comparative study. Indian J. Physiother. Occup. Ther. 2019 Oct;13:457.
6. Mughal S, Ahmad M, bin Malik K. Prevalence of Piriformis Tightness Due to Long Hours Sitting Among Bankers of Faisalabad City. Independent Journal of Allied Health Sciences. 2020;3(01):55-9.
7. Siraj SA, Dadgal R. Physiotherapy for Piriformis Syndrome Using Sciatic Nerve Mobilization and Piriformis Release. Cureus. 2022 Dec 26;14(12).
8. Roy S, Solanki N, Phd AC. EFFECTIVENESS OF MUSCLE ENERGY TECHNIQUE VERSUS STATIC STRETCHING IN SUBJECT WITH TIGHT PIRIFORMIS IN MALE OFFICE GOING SUBJECTS: A RANDOMIZED CLINICAL TRIAL. IJRAR-International Journal of Research and Analytical Reviews (IJRAR). 2022 Aug;9(3):295-321.
9. Rehman AU, Khan LG, Khalid M, Mumtaz U, Akhtar H, Gondal A, Waris S. Comparison of Active Release Technique and Post Isometric Relaxation in Patients

with Piriformis Syndrome. Pakistan Journal of Medical & Health Sciences. 2022 Jun 18;16(05):683-.

10. Norbury JW, Morris J, Warren KM, Schreiber AL, Faulk C, Moore DP, Mandel S, Mohnot D, Kalueff AV, DuRapau Jr VJ, Mohnot S. Diagnosis and management of piriformis syndrome. Pract Neurol. 2012 May;8(3):24-7.
11. Thomas E, Cavallaro AR, Mani D, Bianco A, Palma A. The efficacy of muscle energy techniques in symptomatic and asymptomatic subjects: a systematic review. Chiropr Man Therap. 2019 Aug 27;27:35. doi: 10.1186/s12998-019-0258-7. PMID: 31462989; PMCID: PMC6710873.
12. Werenski J. The effectiveness of Myofascial release technique in the treatment of Myofascial pain. Lit. Rev. 2011 Jun 17;32: 440-50.
13. Chaudhary ES, Shah N, Vyas N, Khuman R, Chavda D, Nambi G. Comparative study of myofascial release and cold pack in upper trapezius spasm. International Journal of Health Sciences & Research. 2013 Dec;3(12):20-7.
14. Mahajan R, Kataria C, Bansal K. Comparative effectiveness of muscle energy technique and static stretching for treatment of subacute mechanical neck pain. Int J Health Rehabil Sci. 2012 Jul;1(1):16-21.
15. Mishra D, Prakash RH, Mehta J, Dhaduk A. Comparative study of active release technique and myofascial release technique in treatment of patients with upper trapezius spasm. J Clin Diagn Res. 2018 Nov 1;12(11): YC01-4. 15
16. Kage V, Ratnam R. Immediate effect of active release technique versus mulligan bent leg raise in subjects with hamstring tightness: a randomized clinical trial. Int J Physiother Res. 2014;2(1):301-4. 16
17. Brian A, Kamali A, Michael Leahy P. Release Your pain: Resolving Repetitive Strain Injuries with Active Release Techniques. Pub Group West, 2005, 15-29.
18. Saeed Q, Malik AN, Ghulam S. Outcome of Specific Piriformis Stretching Technique in Females with Piriformis Syndrome. Journal of Pioneering Medical Sciences. 2017 Oct 1;7(4).
19. VK MK, Kumar RS. Effectiveness of Active Release Technique Versus Myofascial Release Technique on Patients with Plantar Fasciitis: A Comparative Study. Indian Journal of Public Health Research & Development. 2019 Oct 1;10(10).