

THE EFFECTIVENESS OF MYOFASCIAL RELEASE OVER STRETCHING ON PAIN AND RANGE OF MOTION AMONG FEMALE COLLEGE STUDENTS WITH PIRIFORMIS SYNDROME

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Abstract

Piriformis syndrome is a painful neuromuscular disorder that occurs when the piriformis muscle irritates and/or compresses the proximal sciatic nerve. Prolonged sitting position is the foremost cause of piriformis tightness in sedentary population that may eventually leads to piriformis syndrome. The incidence of piriformis has been reported to be six times more prevalent among females than males. Piriformis tightness will cause reduction in the range of motion, as well as limitations in walking, sitting and even running. Moreover, individuals will also feel pain in their butt muscles, which could be frustrating. Thus, the aim of this study is to determine the effectiveness of myofascial release over stretching on pain and range of motion among female college students with piriformis syndrome. Twenty participants aged between 19 to 25 years old with tight piriformis muscle for four weeks participated in the study based on the inclusion and exclusion criteria. Subjects were randomised and underwent myofascial release and stretching treatment twice in a week for four weeks. Before each session, the pain score and goniometer measurements were recorded. The experimental group and control group benefited through reduced pain and range of motion. Therefore, there are no significant effects of myofascial release found over stretching between the two groups.

Keywords: Myofascial release, college students, piriformis syndrome, stretching, goniometer, pain score

Introduction

Piriformis syndrome (PS) is a painful neuromuscular disorder that takes place when the piriformis muscle irritates and compresses the proximal sciatic nerve. It is caused by tightness and dysfunction in the piriformis muscles, which compress and hinder the sciatic nerve. Pain may occur due to inflammatory and oedematous changes in the muscle and surrounding fascia, which in turn causes compressive neuropathy. Sciatica is caused by compression of the sciatic nerve by the piriformis muscle, and has been described for over 70 years. The existence of PS remains controversial. Only 21 out of 29 physical medicine and rehabilitation specialists surveyed in the USA believed that the condition exists. It has been argued both that the syndrome is over-diagnosed and underdiagnosed (Hopayian, 2010).

If the syndrome is left untreated, imbalances may lead to a gait with hip in external rotation, shortened stride length, and functional length discrepancy (Frontera, Silver & Rizzo (2014). Piriformis syndrome also may lead to pathologic conditions on the sciatic nerve, chronic somatic dysfunction and compensatory changes that may result in pain, numbness, hyperaesthesia and muscle weakness if it is diagnosed late (Boyajian-O'Neill et al., 2008). In addition, overtraining the muscle may overwhelm the body's ability to adapt and cause further injury (Cosca & Navazio 2007).

Piriformis syndrome occurs most frequently from the ages of 30 to 49 and affects individuals of all physical activity levels and occupations. The contemporary use of piriformis syndrome began with Robinson (1947), who delineated five salient features: history of local trauma, pain localized to Sacro iliac (SI) joint, greater sciatic notch and piriformis muscle which extends along the sciatic nerve and presents difficulty in walking, stooping or lifting (Fishman et al., 2002).

Kjaer et al., (2005) states that the incidence is thought to be 6% to 8% of all low back pain cases, and that it is most often noted in 30 to 40-year age group. Mitra et al., (2014) also stated that at least 6% of patients who have been diagnosed with low back pain actually have piriformis syndrome. In a study by Mondal et al., (2017) on prevalence of piriformis syndrome among 200 sedentary healthy individuals, 159 (79.5%) were identified as having piriformis syndrome.

Bell (2008) stated that massage therapy helps reduce pain and elevate range of motion, in addition to assisting in healing patients with low back pain and sciatica symptoms. Myofascial release also helps in decreasing the tightness of the muscles affected and reduces the irritation of the sciatic nerve (Pal et al., 2014). The results of this study suggest that massage therapy had improvement on reducing low back pain intensity and increased range of Motion (ROM) for patients. Moreover, deep myofascial massage decreased pain (48.4% DOMS reversal) during muscle stretch and mechanical hyperalgesia was reduced (27.5% reversal) after both the deep massage and superficial touch groups relative to control (increased hyperalgesia by 38.4%).

Moreover, during myofascial release, the mechanical pressure on Golgi receptors triggers proprioceptive input into the central nervous system, through the process of

autogenic inhibition, which overrides the dysfunctional over activity muscle, fascia and connective tissue. This creates an inhibitory response in the muscle spindle itself and has been shown to decrease gamma motor unit activity (Schleip 2003). Myers (2013) stated that myofascial release is concerned with releasing and restructuring the body's fascial limitations mechanically and reorganizing the neuromuscular system. An article on massage states that massage transversely across the fibers passively broadens the muscle and prevents scar tissue and the tangling of muscle fibres together (Chamberlain 1982).

Myofascial release uses physical manipulation in fascial tissue. According to Keys (2014), facial tension places pressure on nerves and muscles causing chronic pain. This technique helped correct muscle imbalances, relieve muscle soreness, and improve joint range of motion and help maintain normal muscular strength. Myofascial release occurs through the two neural receptors which are located in the muscle spindle and Golgi tendon organ and the skeletal tissue. The muscle spindle senses change in the fiber length to the central nervous system. When the central nervous system receives the change in fiber length, this triggers the stretch reflex. In a simple note, myofascial release allows the lengthening of the contracted sarcomeres by passively stretching while working directly on the trigger points (Pawaria & Kalra 2015).

Law et al., (2008) performed a double-blinded, randomized controlled trial of the effects of massage on mechanical hyperalgesia (pressure pain thresholds, PPT) and perceived pain using delayed onset muscle soreness (DOMS) as an endogenous model of myalgia. Participants were randomly assigned to a no-treatment control, superficial touch, or deep-tissue massage group. Eccentric wrist extension exercises were performed at visit 1 to induce DOMS 48 hours later at visit 2. Pain, assessed using visual analog scales (VAS), and PPTs were measured at baseline, after exercise, before treatment, and after treatment. Deep massage decreased pain (48.4% DOMS reversal) during muscle stretch. Mechanical hyperalgesia was reduced (27.5% reversal) after both the deep massage and superficial touch groups relative to control (increased hyperalgesia by 38.4%). Resting pain did not vary between the treatment groups. Static stretching combines low force with longer duration. The mechanism of this type of stretching is autogenic inhibition. By holding the muscle in a prolong period of time, the Golgi tendon organ is stimulated and produces an inhibitory effect on the muscle spindle. This will allow the muscle to relax and provide for a better elongation of the muscle (Clark, Lucett & Corn 2008).

While stretching the muscle could be initially painful, continuous stretching usually eases the pain (Marcus, 2007). Keys (2014) compared the effects of myofascial release versus static stretching on hamstring range of motion and found that compared to the myofascial release group (28.9%), acute stretching programs increased hamstring range of motion (33.2%) relatively. Slow stretching, relaxation and breathing in will prevent the gamma spindle response that causes the muscle to compress when rapidly stretched (Pawaria & Kalra 2015).

The Flexion, Adduction and Internal rotation (FAIR) test is more likely to be positive in individuals who have local tenderness in piriformis region. Moreover, in a study on

reliability of FAIR TEST by Norbury et al., (2012), the FAIR test was found to help strengthen the hypothesis at a sensitivity of 0.88 and specificity of 0.83. According to study done by Cooper in 2007, the number of people with piriformis syndrome and the rate of recovery rate of patients identified by FAIR test were greater than what had been seen in patients selected by any other known means.

The aim in this study is to find out the effect of myofascial release over stretching standard physiotherapy regime in piriformis syndrome. In a study, 0.33% of 1293 patients with low back pain cited an incident of Piriformis Syndrome. A separate study showed 6% of 750 patients with the same incidence (Papadopoulos & Khan 2004). About 6% - 8% of low back pain occurrences were attributed to Piriformis Syndrome (Fishman et al., 2002), though other reports concluded about 5% - 36%. In a survey conducted among the general population, 12.2% - 27% included a lifetime occurrence of PS, while 2.2% - 19.5% showed an annual occurrence. Due to high incidence of low back pain in our society, piriformis syndrome frequently goes unrecognized or misdiagnosed in clinical settings. This study will emphasize the recognition of the sign and symptoms that are unique to piriformis syndrome and then identify the effectiveness of myofascial release over stretching treatment in those with piriformis syndrome. According to most articles mentioned above, females are more likely to develop piriformis syndrome than males.

Female college students spend most of their time sitting for a longer period of time in classes or when they are in front of their computer (Owen et al., 2010). In addition, stretching is a far more conservative approach in which helps in reducing the pain and spasm (Papadopoulos & Khan 2004). Therefore, through this study, we would like to determine the effect of myofascial release over stretching technique, since one is a manual therapy and the other is a conventional therapy.

Methods

Research Design: Quasi-experimental study

Sampling design: convenient sampling

Inclusion criteria

Participants were included if they satisfied all three criteria: females between ages 19 to 25; willing to be monitored twice in a week, for 4 weeks; with a positive FAIRS TEST

Exclusion criteria

Participants were excluded if: they were less than 19 years or more than 25 years old; or had any pathology around the hip or any recent injuries around the hip or knee.

Procedures

The piriformis syndrome participants were selected by the proper screening and fulfilling the inclusive and exclusive criteria and were divided into two groups - Group 1 (Myofascial release) and Group 2 (stretching). Informed consent was obtained from each subject prior to participation. Instructions were given to the subjects about techniques performed. A total of 20 subjects was divided equally into two groups by a random lottery method [Group 1 (n=10) and Group 2 (n=10)]. Group 1 received myofascial release massage and Group 2 received slow sustained piriformis muscle stretching, for a treatment duration of about 10-15 min in each session for regular period two times per week.

- Pre-Testing – Check for the intensity pain using the Numerical Rating Scale (NRS) for each subjects and measure the range of motion of each subjects using a goniometer followed by performing FAIRS TEST – Patient is in a side lying position. Passively move the affected lower limb in a flexion position (90 degree), adduction and internal rotation. The therapist then stabilizes the hip and applies a downward pressure to the knee to internally rotate and adduct the hip. A positive test occurs when pain is produced in the gluteal region.
- Implementation phase:
- Group 1 – The therapist instructs the patient to be in a prone lying position. The therapist stands at the affected side of the pain. Adjust the height of the bed according to the preference of the therapist. Perform myofascial release, using the therapist's palm directly on the piriformis muscle, press on the trigger point directly and hold for a while (10 to 100 seconds). Apply small kneading strokes back and forth following the direction of the muscle fibers. Stroke parallel to the fiber to elongate them, because that might be more effective. Perform this for five minutes at least and continue for 3 sets of five minutes each.
- Group 2 – The therapist instructs the patient to lay in a supine lying position, then stands at the affected side of the patient and guides them to perform prolonged passive stretching of piriformis muscle. This starts with flexion, adduction and internal rotation of ipsilateral hip with patient in supine lying position. The foot should rest on the lateral side of her opposite knee. Continue stretching by gently increasing adduction, internal rotation and hip flexion by leading his knee toward opposite shoulder. Piriformis stretch will be given for 20 – 30 seconds and repeated five times.
- Post-Testing – Check if the pain intensity has reduced by using the NRS scale and measure the range of motion of hip internal, external and abduction using the goniometer at the end of the 4th week.

Results

The collected data were finalized and summarized into an appendix for accurate statistical analyses. 20 subjects participated in this study and all of them were female. This is the ratio data and measured by standard deviation. The mean age \pm standard deviations (SD) of the subjects were 22.30 ± 1.42 . IBM SPSS Statistics Version 25 was

used to statistical performance and to calculate the significant difference between pre and post-test of the first and final session of the study. Mean and Standard Deviation (SD) of both pre-test and post-test of the numeric pain scale of both groups, 11 –point NRS, range of motion of hip internal, external and abduction were calculated using IBM SPSS Statistics version 25. The confidence interval was set as 95%. The calculation of differences between the pre and post- test of both groups used paired-t-test and Independent t-test to calculate the difference between both groups, with the level of significance set at $p < 0.05$.

SPSS statistics 25 software was used to carry out the statistics mentioned below:

- Paired t-test was used for parametric test to test intra-group significance.
- Independent t- test were used to analyse inter-group significance.

Age distribution

The mean standard deviation of age was between 22.3 ± 1.42 .

Table 1: Age distribution.

Age(years) (Mean \pm SD)	Ratio	22.30 ± 1.42
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Table 2: Paired t-test for NRS within group.

	Pre-NRS (score) Mean \pm SD	Post-NRS (score) Mean \pm SD	Paired t-test		
			Mean \pm SD	P-value	T-value
G1	4.60 ± 0.699	2.40 ± 0.699	2.200 ± 0.632	0.000*	11.0
G2	4.30 ± 0.823	2.90 ± 0.738	1.400 ± 1.174	0.004*	3.77

The results show that there is a significant difference $*(p < 0.05)$ between pre-test and post-test for NRS in both groups within group analysis using the paired t-test.

Table 3: Paired t-test for internal rotation within groups.

	Pre-IR (degree) Mean \pm SD	Post-IR (degree) Mean \pm SD	Paired T-test		
			Mean \pm SD	P-value	T-value
G1	$26.0^{\circ} \pm 4.595^{\circ}$	$36.5^{\circ} \pm 5.3^{\circ}$	-10.5 ± 5.50	0.00*	6.03
G2	$26.00^{\circ} \pm 4.595^{\circ}$	$33.0 \pm 4.830^{\circ}$	-7.0 ± 7.149	0.13	3.09

The results show that there is no significant difference ($p > 0.05$) between pre-test and post-test for IR in group 2, while there is a significant difference $*(p < 0.05)$ in group 1 within group analysis using paired t-test.

Table 4: Paired t-test for external rotation within group.

	Pre-ER (degree) Mean \pm SD	Post-ER (degree) Mean \pm SD	Paired T-test		
			Mean \pm SD	P-value	T-value
G1	$26.5^{\circ} \pm 4.473$	$37.0^{\circ} \pm 5.375$	-10.5 ± 5.503	0.03*	6.03
G2	$25.5^{\circ} \pm 4.378$	$34.0^{\circ} \pm 5.164$	-8.5 ± 6.68	0.00*	4.02

The results show that there is a significant difference $*(p<0.05)$ between pre-test and post-test for ER in both groups within group analysis between paired t-test.

Table 5: paired t-test for abduction within group.

	Pre-ABD (degree)	Post-ABD (degree)	Paired T-test		
	Mean \pm SD	Mean \pm SD	Mean \pm SD	P-value	T-value
G1	30.0 \pm 6.236	41.0 \pm 3.94°	-11.00 \pm 6.15	0.00*	5.66
G2	30.0 \pm 5.77	38.0 \pm 6.33°	-8.000 \pm 3.5	0.00*	3.09

The results show that there is a significant difference $*(p<0.05)$ between pre-test and post-test for ABD in both group within group analysis between paired t-test.

Table 6: Independent t-test between group 1 and group 2.

	EG1	EG2	Independent T –Test		
			Mean \pm SD	P-value	T-value
NRS (Score)	2.20 \pm 0.632	2.4 \pm 0.699	0.200	0.511	0.67
IR (Degree)	2.2 \pm 0.63°	7.00 \pm 7.15°	-3.500	0.236	1.23
ER (Degree)	7.0 \pm 3.5°	5.0 \pm 4.71°	-2.000	0.297	1.08
ABD (Degree)	10.5 \pm 5.50°	7.50 \pm 3.54°	-3.000	0.164	1.45

- The p-value for NRS and Range of Motion are 0.511, 0.236, 0.297 and 0.164 respectively, where $p > 0.05$
- There were no significant differences in NRS and range of motion scores between group analysis, using independent t-test

Group 1 (Myofascial Release)

1) Evaluation for IR ROM

By comparing the mean value of pre and post-test values of IR ROM. the mean post-test value of IR ROM is 36°, which is greater than the pre-test value of 26°. Also by analysing the pre –test and post-test values by paired T-test, the calculated t-value is 6.03, which is greater than the table value of $t=3.20$ ($d f=9, p = 0.00$), indicating that there is a significant difference between pre and post-test values of IR ROM.

2) Evaluation for NRS

By comparing the mean value of pre and post-test values of NRS score. the mean post-test value of NRS is 2.60, which is greater than the pre-test value of 4.60. Also, by analysing the pre –test and post-test values by paired T-test, the calculated t-value is 11.0, which is greater than the table value of $t=3.20$ ($d f=9, p = 0.00$), indicating that there is a significant difference between pre- and post-test values of NRS score.

3) Evaluation for Abduction

By comparing the pre- and post-test of values of abduction in degrees, the mean post-test values of abduction is 41° , which is greater than the pre-test value of 30° . Also, by analysing the pre-test and post-test values by paired t-test, the calculated t-value is 5.66, which is greater than the table value of $t=3.20$ ($df=9, p=0.00$), which indicates that there is a significant difference between the pre and post-test values of abduction.

4) Evaluation for External Rotation

By comparing the pre- and post-test of external rotation in degrees, the mean post-test values of external rotation is 37° , which is greater than the pre-test value 26.5° . Also, by analysing the pre-test and post-test values via paired t-test, the calculated t-value is 6.03, which is greater than the table value of $t=3.20$ ($df=9, p=0.00$), which indicates that there is a significant difference between the pre- and post-test values of external rotation.

Group 2 (stretching)

1) Evaluation for IR ROM

By comparing the mean value of pre and post-test values of IR ROM, the mean post-test values of IR ROM is 33° , which is greater than the pre-test value 26° . Also, by analysing the pre –test and post-test values by paired T-test, the calculated t-value is 3.09, which is lesser than the table value of $t=3.20$ ($df=9, p = 0.13$), which indicates there is no significant difference between pre and post-test values of IR ROM.

2) Evaluation for NRS

By comparing the values of pre and post-test of NRS score, the mean post-test values of NRS is 2.30 which is greater than the pre –test value 4.30, which indicates that there is a significant difference in NRS pain score. Also by analysing the pre – test and post-test values using paired T-test, the calculated t-value is 3.77 which is greater than the table value of $t=3.20$ ($df= 9, p =0.04$), which indicates there is a significant difference between the pre and post-test values of NRS scale.

3) Evaluation for Abduction

By comparing the pre and post-test values of abduction in degrees, the mean post-test value is 38° which is greater than the pre-test value 30° . Also, by analysing the pre-test and post-test values by paired t-test, the calculated t-value is 7.24 which is greater than the table value of $t=3.20$ ($df=9, p=0.00$), which indicates that there is a significant difference between the pre and post-test values of Abduction.

4) Evaluation of external rotation

By comparing the mean values of pre and post –test values of external rotation of hip ROM, the post value is 34° , which is higher than the pre-test value of 25.5° . Also by analysing the pre and post by paired t-test the calculated t-value =4.02 which is greater than the table value of $t=3.20$ ($df=9 p=0.03$), which indicates that there is a significant difference between pre- and post-test values for external rotation.

Results for independent T-Test

By comparing Both experimental group 1 and group 2 IR ROM shows sig. Value of 0.24 (table value=1.23, d f=18 at p= >0.05), NRS shows sig value of 0.51 (table value =0.67, d f=18 at p >0.05), ABD ROM shows sig. value of 0.164 (table value =1.45, d f=18 at >0.05), ER ROM shows sig value of 0.3 (t value=1.08, df=18 at p>0.05) in independent t –test. This shows that both the experimental group shows no significant difference between myofascial release and hypothesis. Hence, we can accept the null hypothesis & reject the alternate hypothesis.

Discussion and conclusion

This study aimed to determine the effects of myofascial release as compared to stretching technique on pain and range of motion among female college students with piriformis syndrome. In this study, subjects who are tested positive FAIRS TEST have been taken into the study and subjects who fulfil the inclusion and exclusion criteria. The outcome measures used in this study included the numerical pain scale to measure the pain intensity and goniometer to measure the hip internal, external and abduction. Each measurement was performed on the first day of the treatment session (pre-test) and last day of treatment session (post-test). The data was analysed statistically.

Statistical data reveals that there is a significant difference on pre and post-test of group 1 (myofascial release) and group 2 (stretching) on NRS score, abduction and external rotation within the groups.

Myofascial release therapy was effective at reducing LBP intensity and increasing ROM for patients. Moreover, myofascial release has also reduced pain. According to Bell (2008) deep myofascial release decreased pain by (48.4% DOMS reversal) during muscle stretching.

In this study, there has been an increase in IR ROM of hip joint and reduction of pain. This study has hypothesis that the effects are resulted from the physiological effects of myofascial release. On statistical analysis, the mean pre-test IR ROM values of group 1 and group 2 were 26° and 26°, and the mean post treatment IR ROM values were 36.5° and 33°. This result shows that there was no significant difference between groups when analysed statistically. The mean treatment NRS values of group 1 and group 2 were 4.6 and 4.3. The mean of post treatment NRS is 2.40 and 2.90. This results show there was a decrease of 2.2 in group 1 and 1.4 in group 2, indicating that there was a considerable decrease of pain by the application of myofascial release compared to stretching.

The mean pretest ER ROM values of group 1 and group 2 were 26.5° and 25.5°, and the mean post treatment ER ROM values were 37° and 34°. This result shows that there is an increase of 10.5° in group 1 and 8.5° in group 2, which indicates that by the application of myofascial release, there was a considerable increase in ER ROM compared to stretching in female college students with piriformis syndrome.

The mean pretest ABD ROM values of group 1 and group 2 are 30 ° and 30°, and the mean post treatment ABD ROM are 41° and 38°. This result shows that there is an increase of 11° in group 1 and 8° in group 2, which indicates that by the application of myofascial release, there is a considerable increase in ER ROM compared to stretching in female college students with piriformis syndrome.

When the analysis of paired t-test was done between group 1 and group 2, there were significant differences between the pretest and posttest values of IR ROM, ER, ABD ROM and NRS scale except for group 2 that underwent stretching showed >0.13. Myofascial showed greater improvement when compared to stretching. However, when analysis between both the groups using independent t- test was done, there were no significant differences between the pretest and posttest values of IR ROM and NRS scale of groups 1 and 2. It is evident that both treatments are beneficial in terms of reducing pain and increasing ROM of hip joint among patients with piriformis syndrome.

Hence, the study reveals that myofascial release and stretching shows greater improvements in pain and ROM among female college students with piriformis syndrome.

Myofascial release is a manual treatment approach done by physical therapists. Stretching, on the other hand, is a conventional treatment approach that is simple and easy to be carried out without the need for supervision. In this study, both groups were treated with standard physical therapy approach e.g.: group 1 with myofascial release and group 2 with stretching. Both these treatments have reached the conclusion of being beneficial in reducing pain and improving range of motion. There were no significant improvements for myofascial release over stretching between the two groups.

Recommendations

A recommendation for further study would be a larger sample size. A larger sample group with a different background would provide accurate mean values and detect differences more effectively. This would help physical therapists to implement this process in a clinical setting. Therefore, this study should also be conducted among individuals of all age groups, not only among women but men as well, to compare the effects of myofascial release over stretching. Future studies can also be carried out for a longer duration of time for better reliability and validity results. In future, this study can be continued by combining myofascial release and stretching versus another manual therapy for a longer period of time to determine whether it can reduce pain and increase range of motion.

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