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Original Article

THE DIFFERENCE EFFECT BETWEEN AUTO STRETCHING AND MYOFASCIAL RELEASE ON IMPROVING HIP RANGE OF MOTION IN PIRIFORMIS SYNDROME

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ABSTRACT

Background. Piriformis syndrome is a neuromuscular disorder linked to tightness or spasms of the gluteal muscles, leading to hip pain and restricted range of motion (ROM). Physiotherapy methods like auto stretching and myofascial release (MFR) are frequently used to enhance hip ROM. This study aimed to determine difference effect between autostretching and myofascial release on improving hip ROM in piriformis syndrome.
Research Method. This study employed a quasi-experimental design involving 30 participants selected using a matching allocation technique. Subjects were divided into two groups, each consisting of 15 participants: Group I received auto stretching, and Group II received myofascial release. The interventions were conducted for four weeks, three times per week. Hip ROM was measured using a goniometer before and after the intervention. Data were analyzed using paired t-tests and independent t-tests with a significance level of $p<0.05$.
Findings. The Shapiro–Wilk test indicated the data were both normally and non-normally distributed, while Levene's test showed homogeneity of variance. Hypothesis testing using paired sample t-tests demonstrated significant improvements in hip ROM in Group I ($p = 0.000$; $p < 0.05$) and Group II ($p = 0.000$; $p < 0.05$). Independent t-test analysis revealed a significant difference between the two intervention groups ($p = 0.007$; $p < 0.05$), indicating a statistically significant difference in outcomes.
Conclusion. Both myofascial release and self-stretching are effective in improving hip range of motion in cases of piriformis syndrome, but myofascial release results in a more significant improvement in range of motion in the short term.

Keywords: Auto Stretching, Myofascial Release, Range Of Motion, Piriformis Syndrome.

BACKGROUND

Piriformis syndrome is a neuromuscular disorder characterized by pain in the gluteal region resulting from spasm, hypertrophy, or stiffness of the piriformis muscle, which leads to irritation or compression of the sciatic nerve. This condition commonly presents with pain

radiating to the posterior thigh, limitations in functional activity, and decreased hip joint range of motion (ROM), particularly during flexion, adduction, and internal rotation. Clinically, piriformis syndrome is classified as part of deep gluteal pain syndrome and is considered a differential diagnosis in cases of low back pain with radiculopathy [1,2]. Furthermore, a study emphasizes that piriformis syndrome is often underdiagnosed due to symptom overlap with other lumbosacral disorders, highlighting the importance of accurate clinical assessment [3].

Limited hip ROM in piriformis syndrome is primarily associated with increased muscle tone, persistent spasm, and fascial restrictions surrounding the hip joint. These impairments may disrupt pelvic and lumbosacral biomechanics, contributing to increased mechanical stress and worsening pain, ultimately reducing the patient's quality of life. Biomechanical evidence suggests that excessive tension in the piriformis muscle alters normal hip kinematics and load distribution across adjacent structures [4]. In addition, a study reported that musculoskeletal dysfunctions involving altered movement patterns can significantly influence pain perception and functional limitations [5]. Therefore, physical therapy interventions are directed toward reducing muscle spasm, improving soft tissue extensibility, and restoring optimal joint mobility.

In physical therapy practice, several interventions are commonly applied to improve hip ROM, including active stretching and myofascial release (MFR). Active stretching is a self-performed exercise aimed at increasing muscle length through mechanisms such as neuromuscular inhibition and sarcomere adaptation. Regular stretching has been shown to enhance flexibility, improve joint mobility, and maintain long-term functional outcomes [6,7]. Additionally, a study states that consistent stretching interventions contribute to improved muscle-tendon unit compliance and reduced injury risk [8].

Myofascial release (MFR) is a manual therapy technique that involves the application of low-load, sustained pressure to fascial tissues to eliminate adhesions and improve tissue mobility. This technique operates through neurophysiological and viscoelastic mechanisms, facilitating reduced tissue resistance and promoting a more rapid improvement in ROM in the short term. Previous studies have demonstrated that MFR is effective in reducing pain intensity and improving ROM in individuals with musculoskeletal disorders associated with fascial restrictions [9,10]. Moreover, a study reported that myofascial techniques significantly enhance joint ROM by improving fascial elasticity and decreasing muscle stiffness [11]. Although both interventions are widely utilized in clinical practice, direct comparative evidence regarding the effectiveness of auto-stretching and myofascial release

in improving hip ROM in patients with piriformis syndrome remains limited, particularly within clinical populations. Researcher also highlighted the need for further comparative studies to determine the most effective intervention for improving flexibility and reducing pain [12]. Such comparisons are essential to identify the most effective approach for enhancing joint mobility and to support evidence-based clinical decision-making in physical therapy. Therefore, this study aims to analyze the differences in the effects of auto-stretching and myofascial release interventions on improving hip ROM in cases of piriformis syndrome.

RESEARCH METHOD

This study employed a quasi-experimental design using a two-group pre-test and post-test approach to analyze the differences in the effects of auto-stretching and myofascial release on improvements in hip range of motion (ROM). “clearly specify which ROM measure, cite the reference” Hip range of motion (ROM) measurements focused specifically on hip flexion and hip internal rotation, as these movements are commonly limited in patients with piriformis syndrome. Measurements were performed using a universal goniometer following standardized procedures described by Norkin and White to ensure validity and reliability of joint angle assessment. ROM measurements were taken before and after the intervention to assess changes within each group as well as differences between groups.

The study was conducted at the Kineta Physical Therapy Clinic in Sidoarjo from January 10, 2026, to February 7, 2026. The sample was selected using purposive sampling based on inclusion and exclusion criteria. Inclusion criteria included age 25–55 years, unilateral gluteal pain lasting at least four weeks, a positive FAIR test, and limited hip range of motion (ROM). Respondents with a history of hip/lumbar surgery, herniated nucleus pulposus, severe neurological disorders, or injuries were excluded from the study. The dropout criteria included respondents who withdrew voluntarily, failed to attend appointments as scheduled, took anti-inflammatory or analgesic medications, or underwent other treatments. A total of 50 respondents were divided into two groups. The minimum sample size in this study was determined based on recommendations for quasi-experimental studies proposed by Sekaran and Bougie, which suggest a minimum of 15 participants per intervention group to allow comparison between treatment groups and to achieve adequate statistical power in clinical research. Therefore, a total of 50 respondents were included and divided equally into two intervention groups.

The first group received an auto-stretching intervention consisting of active piriformis muscle stretches held for 30 seconds, with 5 sets of 3 repetitions per session. The second group received myofascial release using a technique of light, sustained pressure on the piriformis area for 8 minutes. This is because collagen begins to change after 90–120 seconds. Both interventions were administered three times per week for four weeks. Hip ROM was measured using a universal goniometer during flexion and internal rotation movements [13]. Data were analyzed using the Shapiro–Wilk test for normality, a paired t-test to compare pre- and post-test values within groups, and an independent t-test to compare improvements between groups, with a significance level of $p < 0.05$. This study obtained ethical approval with ethical clearance number: 16.A/I/STIKES-AH/2026, and all participants signed an informed consent form prior to participation.

A paired t-test was conducted to compare pre- and post-intervention results within each treatment group. The results showed a statistically significant reduction in pain intensity and an increase in range of motion following the intervention. In the self-stretching group, the paired t-test revealed a significant difference in ROM values ($p = 0.000$). Similarly, in the myofascial release group, a significant increase was found in ROM measurements ($p = 0.000$). Furthermore, an independent samples t-test revealed a significant difference between the two intervention groups, with ROM values showing $p = 0.007$. These findings indicate that both interventions are effective in reducing pain and improving hip range of motion in patients with piriformis syndrome, with myofascial release yielding better results compared to self-stretching.

FINDINGS

Table 1 presents participant characteristics, while Tables 2 and 3 present the results of ROM measurements before and after intervention in both groups.

Table 1. Participant Characteristic

No	Respondent General Data	Classification	Frequency (n)		Percentage (%)	
			Group I	**Group II**	**Group I**	**Group II**
1	Age	Young adults 25-30 years old	4	2	16	8
		Adults 30-40 years old	5	4	20	16
		Late adulthood 41-50 years old	6	6	24	24
		Early elderly, 50-60 years old	6	7	24	28
		Seniors, 61-75 years old	4	6	16	24
		Total	**25**	**25**	**100**	**100**

2	Gender	Woman	15	17	60	68
		Man	10	8	40	32
		Total	**25**	**25**	**100**	**100**

The number of respondents in each group was the same, namely 25 people. The age distribution in both groups was relatively even, with a predominance in the 41–60 age range, particularly in Group II among those aged 50–60. By gender, the majority of respondents in both groups were women. Overall, the sample characteristics across groups were fairly balanced, thereby supporting comparisons in the study.

Table 2. Range of Motion Measurement Results in Degrees (˚) for Treatment Group I and Treatment Group II

	Before (Mean±SD)	**After (Mean±SD)**	**Difference (Mean±SD)**
Group I	109.700±3.917	122.900±2.643	13.2±3.119
Group II	104.400±4.55	124.100±3.446	19.7±5.638

The measurement of Range of Motion in Group II yielded a mean difference of 19.7 ± 5.638, which was greater than that of Group I, which yielded a mean difference of 13.2 ± 3.119. The intervention in both groups was effective in improving the scores. However, the intervention in Group II was more effective in improving the average score, although the results were more variable. Meanwhile, Group I showed a more stable and consistent improvement.

Table 3. Hypothesis Test Value III for Range of Motion (Goniometer)

	Mean ± SD		
	Difference in Group I	**Difference in Group II**	**P Value**
ROM	13.2 ± 3.119	19.7 ± 5.638	0.007

Table 3 presents the results of Hypothesis III regarding the difference in the increase in range of motion (ROM), measured using a goniometer, between Group I and Group II. The mean difference (Mean ± SD) in Group I was 13.2 ± 3.119, while in Group II it was 19.7 ± 5.638. This indicates that both groups experienced an increase in ROM following the intervention; however, the increase in Group II was greater than that in Group I.The p-value of 0.007 ($p < 0.05$) indicates a statistically significant difference between the two groups. Thus, it can be concluded that the intervention administered to Group II was more effective in improving ROM compared to the intervention in Group I. Overall, this table indicates that

although both interventions had a positive effect on improving ROM, the intervention in Group II yielded more optimal results.

DISCUSSIONS

Auto-stretching is a stretching method typically performed by patients on their own after receiving instructions or undergoing preliminary active stretching exercises to improve mobility. In piriformis syndrome, algogenic substances and metabolic waste products accumulate, leading to muscle hypertonicity [14,15]. When auto-stretching is performed, these metabolic waste products and algogenic substances are eliminated, allowing the muscle to relax, thereby reducing muscle tone and alleviating pain [16,17].

In addition, exercise therapy using the auto-stretching method can reduce irritation of Aδ and C-type nerves that cause pain due to abnormal cross-links. This occurs because, during auto-stretching, muscle fibers are stretched to their full sarcomere length. When this happens, it helps realign some of the fibers or resolve abnormal cross-links. This study is supported by previous research that, 20 participants were selected for the piriformis muscle stretching intervention [18-20]. It can be concluded that piriformis stretching is effective as an exercise program for patients with piriformis syndrome.

Piriformis syndrome causes adhesions to form in the tissue. Myofascial release techniques involve applying compression and longitudinal stretching directly to the tissue adhesions. Unlike self-stretching, myofascial release effectively breaks down these adhesions, thereby reducing metabolic waste products and pain-inducing substances [21-23]. Myofascial release can improve muscle flexibility due to its stretching effect and can also reduce pain by breaking up adhesions. As a result, it is effective for improving range of motion in cases of piriformis syndrome.

This study builds on previous research concluded that myofascial release interventions are more effective in reducing pain and improving functionality in cases of piriformis syndrome [24,25]. To test Hypothesis III, an independent t-test was used to compare the mean improvement in ROM between Group I and Group II. The results showed a statistically significant difference between the two interventions ($p = 0.007$; $p < 0.05$), indicating that myofascial release was more effective than auto-stretching in improving hip ROM in patients with piriformis syndrome.

Several limitations should be considered when interpreting the findings of this study. First, the study involved a relatively small sample size of only 30 participants, which may limit the statistical power and reduce the generalizability of the findings to broader

populations with piriformis syndrome. Future studies with larger and more diverse samples are needed to confirm the observed effects.

Second, the quasi-experimental design and matching allocation technique, although useful for reducing baseline differences between groups, did not employ true randomization. Consequently, the possibility of selection bias and the influence of unmeasured confounding variables cannot be completely excluded. A randomized controlled trial would provide stronger evidence regarding the comparative effectiveness of the interventions.

Third, the intervention period was limited to four weeks, and no long-term follow-up assessment was conducted. Therefore, the sustainability of the improvements in hip range of motion and the long-term superiority of myofascial release over auto stretching remain unclear. Future research should include follow-up evaluations at several months after treatment completion.

Fourth, hip range of motion was the only primary outcome measured in this study. Other clinically relevant outcomes, such as pain intensity, functional mobility, quality of life, muscle flexibility, patient satisfaction, and recurrence of symptoms, were not assessed. Including multiple outcome measures would provide a more comprehensive understanding of treatment effectiveness.

Fifth, hip ROM measurements were obtained using a goniometer, which may be subject to measurement error and examiner variability despite its widespread clinical use. More advanced motion analysis systems or digital measurement tools could improve assessment accuracy in future studies. Sixth, the study did not control for potential external factors that may influence treatment outcomes, such as participants' daily physical activity levels, occupational demands, adherence to home exercises, medication use, body mass index, or symptom duration. These factors may have contributed to variations in individual responses to the interventions.

Finally, the study was conducted within a specific clinical setting and demographic population, which may limit the external validity of the results. Future multicenter studies involving participants from different geographic, cultural, and healthcare settings are recommended to enhance the applicability of the findings. Overall, while the present study provides preliminary evidence supporting the effectiveness of both auto stretching and myofascial release in improving hip range of motion among individuals with piriformis syndrome, these limitations should be addressed in future research to strengthen the evidence base and optimize clinical recommendations.

CONCLUSION

Physiotherapy interventions involving auto-stretching and myofascial release both have a significant effect on reducing pain levels and improving range of motion (ROM) in patients with piriformis syndrome. This is evidenced by statistical test results showing a significant difference between pre- and post-treatment values in each group. Auto-stretching interventions have been proven effective in improving piriformis muscle flexibility through the mechanisms of sarcomere elongation and Golgi tendon organ activation, thereby reducing muscle tension and alleviating pain. On the other hand, the myofascial release intervention demonstrated superior effectiveness in improving ROM and reducing pain, which is believed to be related to its ability to reduce fascial tissue adhesions, enhance soft tissue elasticity, and improve local circulation more rapidly.

Furthermore, the results of the intergroup comparison analysis indicate a significant difference between the two interventions, with myofascial release yielding superior results compared to auto-stretching in improving ROM and reducing pain in cases of piriformis syndrome. Thus, it can be concluded that although both interventions are effective in the management of piriformis syndrome, myofascial release is the more recommended intervention.

REFERENCES

[1] Abuaraki S. Mulligan mobilization versus stretching in the management of piriformis syndrome: a comparative study. 2023.

[2] Ajimsha MS, Al-Mudahka NR, Al-Madzhar JA. Effectiveness of myofascial release: systematic review of randomized controlled trials. J Bodyw Mov Ther. 2023;34:12–20.

[3] Bashir A, et al. Comparative effects of PIR and PFS on pain, hip ROM, and disability in piriformis syndrome (Clinical Trial NCT07255053). ClinicalTrials.gov. 2025.

[4] Behm DG, Kay AD, Trajano GS, Blazevich AJ, Konrad A. Effects of stretching on range of motion: a systematic review. Sports Med. 2021;51(11):2303–2325.

[5] Bialosky JE, Bishop MD, George SZ. Mechanisms of manual therapy in the treatment of musculoskeletal pain. Man Ther. 2020;25:1–8.

[6] Cheatham SW, Kolber MJ, Cain M, Lee M. The effects of self-myofascial release using a foam roll on joint range of motion: a systematic review. Int J Sports Phys Ther. 2020;15(4):640–652.

[7] Cohen SP. Piriformis syndrome: a review of diagnosis, treatment, and outcomes. Anesthesiol Clin. 2021;39(2):305–322.

[8] Dommerholt J, Fernández-de-las-Peñas C. Trigger point dry needling and myofascial pain. J Man Manip Ther. 2021;29(3):123–130.

[9] Fakhari Z, Azadinia F. The effect of stretching exercises on hip range of motion and pain: a randomized trial. Physiother Theory Pract. 2022;38(9):1234–1242.

[10] Fernández-de-las-Peñas C, Nijs J. Trigger points and myofascial pain syndrome: pathophysiology and treatment. Pain Med. 2021;22(5):1021–1032.

[11] Heneghan NR, Rushton A. Understanding why manual therapy works: a systematic review. Musculoskelet Sci Pract. 2020;48:102–115.

[12] Hopayian K, Song F. The clinical features of piriformis syndrome: a systematic review. Eur Spine J. 2021;30(5):1231–1241.

[13] Imani K, Fariz A, Hamidah N. The effect of a combination of ultrasound and stretching on pain scores of piriformis syndrome patients. Indones J Med. 2024;9(3):746. doi:10.26911/theijmed.2024.9.3.746.

[14] Konrad A, Tilp M, Behm DG. Chronic effects of stretching on range of motion and muscle stiffness: a systematic review and meta-analysis. Scand J Med Sci Sports. 2022;32(4):739–750.

[15] Lempke L, Wilkinson R, Murray C, Stanek J. The effectiveness of stretching interventions on range of motion. J Sport Rehabil. 2020;29(2):1–10.

[16] Michel F, Decavel P, Toussirot É, Tatu L, Aleton E, Monnier G. Piriformis muscle syndrome: diagnostic criteria and treatment of a monocentric series. Ann Phys Rehabil Med. 2022;65(2):101–110.

[17] Norkin CC, White DJ. Measurement of Joint Motion: A Guide to Goniometry. 5th ed. Philadelphia: F.A. Davis Company; 2016.

[18] Polat S, Tunç M, Aksay UC, et al. Assessment of the piriformis muscle and piriformis syndrome via Web of Science database: a bibliometric analysis. Medicine (Baltimore). 2024;103(47). doi:10.1097/MD.0000000000040416.

[19] Polat S, Tunç M, Aksay UC, et al. Assessment of the piriformis muscle and piriformis syndrome via Web of Science database: A bibliometric analysis. *Medicine (Baltimore)*. 2024;103(47):e40416. doi:10.1097/MD.0000000000040416

[20] Probst D, Stout A, Hunt D. Piriformis syndrome: a narrative review of the anatomy, diagnosis, and treatment. PM R. 2023;15(1):45–55.

[21] Şahin EI, Mehrioğlu M, Şimşek T, et al. Comparison of the acute effects of self-myofascial release and static stretching on the piriformis muscle in healthy individuals. Sağlık ve Spor Bilimleri Dergisi. 2025;8(2):93–108. doi:10.71416/jhss.1668190.

[22] Sekaran U, Bougie R. Research Methods for Business: A Skill-Building Approach. 7th ed. Chichester: John Wiley & Sons; 2016.

[23] Sharma S, Balthillaya G. Myofascial release versus stretching in musculoskeletal conditions: a comparative study. J Clin Physiother Res. 2022;7(1):45–52.

[24] Wilke J, Krause F, Vogt L, Banzer W. What is evidence-based about myofascial chains: a systematic review. Arch Phys Med Rehabil. 2021;102(7):1453–1465.

[25] Yildiz TI, Baltaci G. Effects of stretching and myofascial techniques on flexibility and pain. J Back Musculoskelet Rehabil. 2020;33(4):675–682.