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Effect of Active Release Technique Versus Positional Release Therapy in Individuals with Piriformis Syndrome: A Quasi-Experimental Study

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Abstract

Background and Purpose: Piriformis Syndrome (PS) is a neuromuscular disorder resulting from sciatic nerve compression by the piriformis muscle, contributing to 6%–8% of sciatica cases. Anatomical variations, trauma, muscle overuse, and other factors play a role in its development. Common symptoms include deep buttock pain and discomfort aggravated by sitting or specific hip movements. Diagnosis often utilizes the modified FAIR test. Treatment approaches like Positional Release Technique (PRT) and Active Release Technique (ART) aim to reduce muscle tension and release adhesions, while therapeutic ultrasound and moist heat may support soft tissue healing through thermal and non-thermal effects. **Methods:** This study used a two-group pre- and post-test design. It included individuals aged 30-50 diagnosed with Piriformis Syndrome. A total of 75 participants were screened and 60 were included based on inclusion and exclusion criteria using the FAIR Test. Numerical Pain Rating Scale (NPRS) was measured pre intervention and post intervention for measuring pain. Subjects were divided randomly into 2 groups that is Group A and Group B using coin toss method. The intervention comprised active release technique or positional release technique along with ultrasound and moist heat for four days per week, for 2 weeks. **Result:** Sixty patients diagnosed with Piriformis Syndrome were included in the study. Following the intervention, both groups demonstrated a significant reduction in pain, with improvements observed in both ART and PRT Groups. The PRT Group showed a 65.9% reduction in pain intensity compared to a 37.2% reduction in the ART Group, indicating greater clinical improvement with PRT. **Conclusion:** The study concluded that Positional Release Therapy demonstrated better outcomes than Active Release Technique in the management of Piriformis Syndrome.

Major Findings: Both Positional Release Therapy (PRT) and Active Release Technique (ART) effectually reduced pain in individuals with Piriformis Syndrome. PRT demonstrated significantly greater improvement in pain scores compared to ART. These findings support the clinical efficacy of PRT as a preferable conservative treatment approach for Piriformis Syndrome.

Keywords: ART, FAIR, Piriformis Syndrome, PRT, Test

1. Introduction

Piriformis Syndrome (PS) is a neuromuscular condition characterized by sciatic nerve compression or irritation as it traverses near or through the piriformis muscle, contributing to non-discogenic sciatica, lower back pain, and buttock discomfort[1,2]. Despite its prevalence, PS lacks a universally accepted definition and remains controversial among clinicians[1]. The syndrome was first termed by Robinson, although the concept of sciatic nerve compression by the piriformis was earlier described by Freiberg and Vinke[1,3,4]. PS is estimated to account for 6-8 % of sciatica cases, with the general prevalence of sciatica ranging from 12% to 27%[5].

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Anatomical variations in the piriformis-sciatic nerve relationship, such as those classified by Beaton and Anson, may predispose individuals to PS[5-7]. Normally, the sciatic nerve runs beneath the piriformis in 90% of cases; however, variations include it passing through or above the muscle[7]. The piriformis originates from the sacrum and inserts onto the greater trochanter, functioning as an external rotator and abductor of the hip, with innervation from L5 to S2, predominantly S1 and S2[2,5,6]. In some individuals, fusion with the obturator internus tendon may also contribute to sciatic nerve compression[5].

Multiple etiologies are implicated in PS, including congenital anomalies, trauma, overuse, hypertrophy, infection, and leg length discrepancy[8]. Clinically, it presents with deep buttock pain, worsened by sitting or piriformis engagement. Diagnostic confirmation may involve the modified FAIR test, which combines hip positioning with digital pressure to reproduce sciatic symptoms[1,9].

Positional Release Technique (PRT) and Active Release Technique (ART) are commonly used for PS treatment. PRT, introduced by Dr. Lawrence Jones, involves placing the muscle in a relaxed, shortened position with sustained pressure to alleviate pain and restore mobility[10,11]. ART, developed by Dr. P. Michael Leahy, involves deep manual pressure combined with active muscle movement to break down adhesions and restore soft tissue function[10,12,13]. ART aims to restore tissue texture, flexibility, nerve mobility, and vascular integrity through over 500 condition-specific protocols[10,11].

Ultrasound therapy, initially developed as a diathermy alternative, remains widely used for soft tissue healing. It's benefits stem from both thermal and non-thermal mechanisms, although the precise biological actions are often difficult to isolate[14].

2. Materials and Methods

It was a quasi-experimental study which comprised of individuals with PS, both male and female, aged 30-50 years. The study included people who had pain rate more than or equal to 4 and positive FAIR test. The study included 60 participants selected by using convenient sampling technique. The subjects who were pregnant or had any disc bulge, recent abdominal surgery, recent hip trauma or injury, recent fracture of hip/lumbar/pelvis and burns and wounds were excluded from the study.

2.1 Sample Size Calculation

The required sample size was estimated using the formula for comparing two independent means: $N = [2(S_1 + S_2)^2 (Z_1-\alpha/2 + Z_1-\beta)^2] / d^2$ where S_1 and S_2 are standard deviations of Groups A and B, $Z_1-\alpha/2 = 1.96$ for a 5% significance level, $Z_1-\beta = 1.682$ for 95% power, and d is the expected mean difference.

Using pilot data (SD = 0.94 for PRT, 0.77 for ART) and an expected difference of 1 VAS point, the calculated sample size was approximately 78 participants (39 per group). Considering feasibility, 60 participants (30 per group) were included, providing 95% power at a 5% significance level.

2.2 Study Procedure

The FAIR test was performed with the patient in a supine position, the affected hip flexed to 60 degrees and the knee flexed to 90 degrees. While stabilizing the hip, a single examiner internally rotated and adducted the hip by applying downward pressure on the knee.

The FAIR maneuver has a sensitivity of 85% for identifying Piriformis Syndrome (PS) and 82% specificity for identifying normal legs when using a cutoff of two Standard Deviations (SDs) above the normal H-reflex latency (1.36 ms). The FAIR test has been widely used as an inclusion criterion in therapeutic trials for the treatment of PS[9].

2.3 Intervention

2.3.1 Participant Allocation and Grouping

Participants diagnosed with Piriformis Syndrome were selected through appropriate screening procedures, based on the inclusion and exclusion criteria. As shown in Figure 1, a total of 60 eligible subjects were then randomly assigned into two equal groups: Group 1 (Positional Release Technique) and Group 2 (Active Release Technique).

Informed consent was obtained from all participants prior to enrollment. Subjects were given clear instructions regarding the procedures involved in the intervention. Randomization was carried out using a coin toss method, resulting in 30 participants per group.

Group 1 received Positional Release Technique (PRT) and Group 2 received Active Release Technique (ART). Each intervention was administered for approximately 5 minutes per session, conducted twice per week over a period of 2 weeks.

Group 1- Positional Release Technique

Piriformis - medial

The patient is prone and the therapist is seated on the tender side. The ipsilateral leg is suspended off the table with the bent knee resting on the therapist thigh. The hip is flexed to approximately 60-90 and abducted Internal/ External rotation is used to fine tune the position.

Piriformis - lateral.

The patient is prone, and the therapist stands on the tender point side. The ipsilateral thigh of the patient is extended, abducted and supported on the therapist's thigh, which is resting on the table. The therapist brings the patients thigh as close as possible to the therapist's hip and then rolls the patients thigh down toward the table to produce marked internal rotation.

Then they apply gentle pressure to the tender point or the area surrounding it. The pressure should be firm enough to engage the tissues but not so intense as to cause pain or discomfort. Hold and wait: Maintain the pressure on the tender point for a period of time, typically around 90 seconds to 2 minutes. During this time, encourage the patient to relax and breathe deeply.

GROUP 2- Active Release Technique

At each scheduled session, the physiotherapist evaluated the subjects for piriformis muscle. The ART includes techniques for the piriformis muscle. Active release technique was applied once to the affected muscle during a therapy session and continued for 5 minutes.

Before stretching the piriformis muscle, treat the same location with hot packs for 10 minutes. The use of hot pack before stretching is very useful to decrease pain.

2.3.2 *Ultrasound Therapy*

Ultrasound therapy was administered at an intensity of 0.5 to 1.5 W/cm² for a duration of 5 minutes. The ultrasound gel was applied in longitudinal strokes along the piriformis muscle, extending from the conjoint tendon to the lateral margin of the greater sciatic foramen.

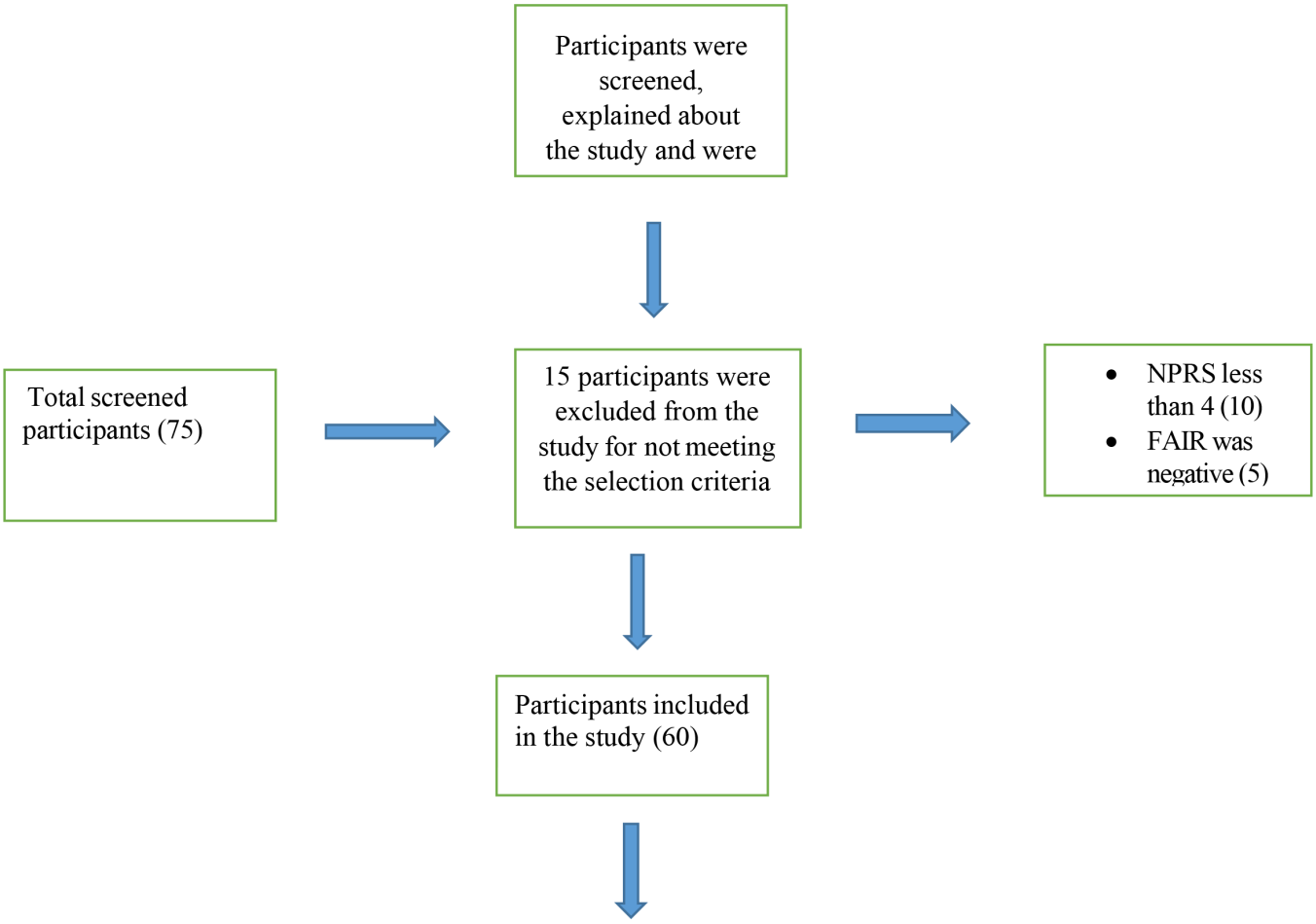


Figure 1. Continued...

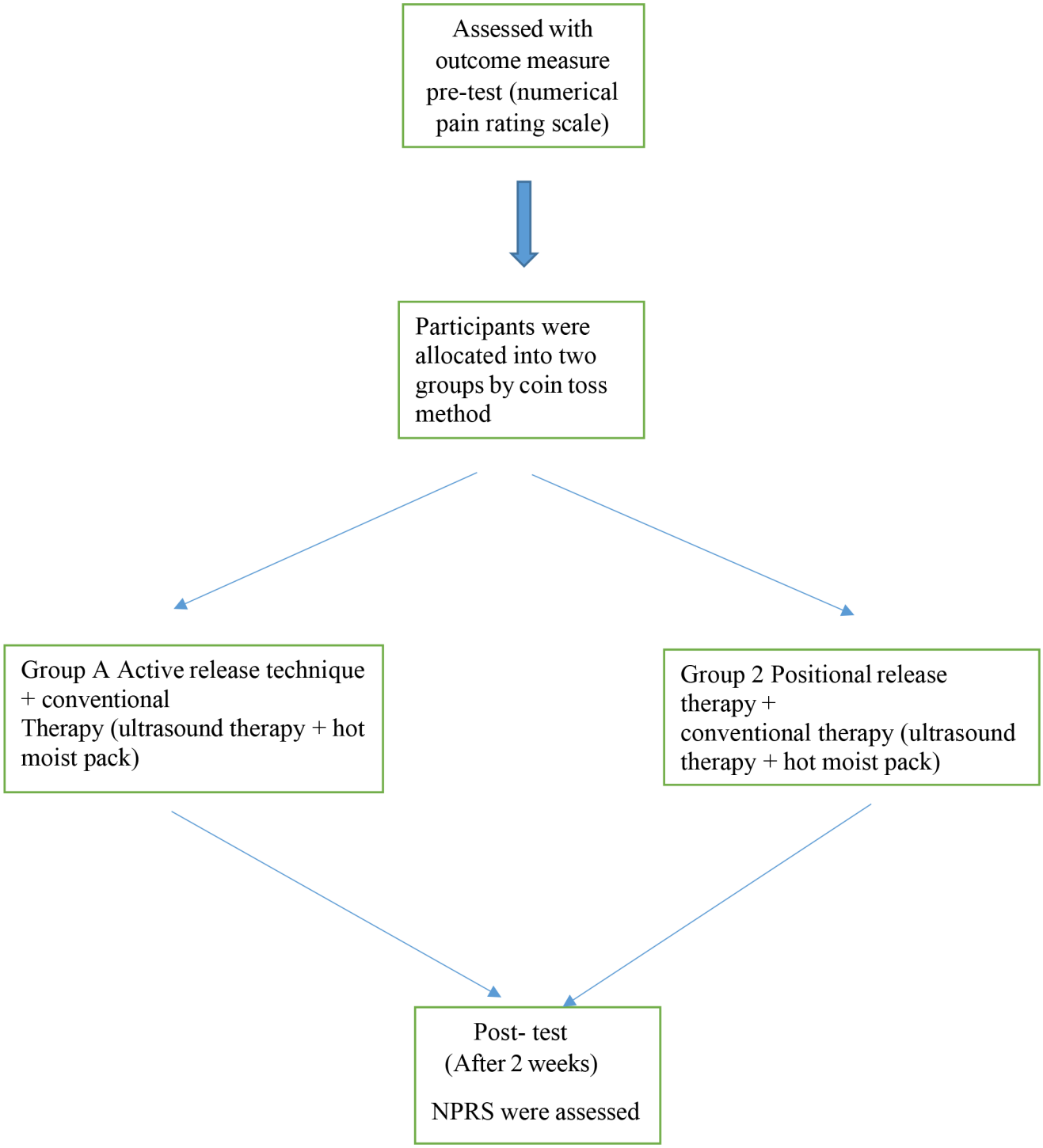


Figure 1. Methodology flow chart.

2.3.3 Outcome Measure

Numerical pain rating scale was used at the start (pre intervention) and completion of 2 weeks of treatment (post intervention)

2.4 Statistical Analysis

The collected data were summarized by using the Descriptive Statistics: frequency, percentage; mean and S.D. The Paired "t" test was used for the pre to post-test

comparison of NPRS irrespective of groups as well as within the groups. The Independent sample "t" test was used to compare NPRS between the groups: Positional release technique and active release technique. The p value < 0.05 was considered as significant. Data were analyzed by using the SPSS software (SPSS Inc.; Chicago, IL) version 29.0.10.

3. Results

The Independent sample *t*-test was used to compare NPRS between the groups. As shown in Table 1, during pre-test, there was no clinically meaningful difference ($p < 0.05$) in baseline NPRS scores between the Positional Release Technique (PRT) and Active Release Technique (ART) groups. Following the intervention, both groups showed a significant reduction in pain ($p < 0.001$). However, the mean post-test NPRS score was lower in the PRT group (2.17 ± 0.83) compared to the ART group (3.50 ± 0.86), indicating greater pain relief in the PRT group.

Table 1. Comparison of NPRS between groups

NPRS		Mean	S.D.	"t"	p value
Pre-test	Positional release technique	6.37	0.85	3.72	< 0.001*
	Active release technique	5.57	0.82		
Post-test	Positional release technique	2.17	0.83	-6.09	< 0.001*
	Active release technique	3.50	0.86		

("t" = Independent sample "t" test; * Significant)

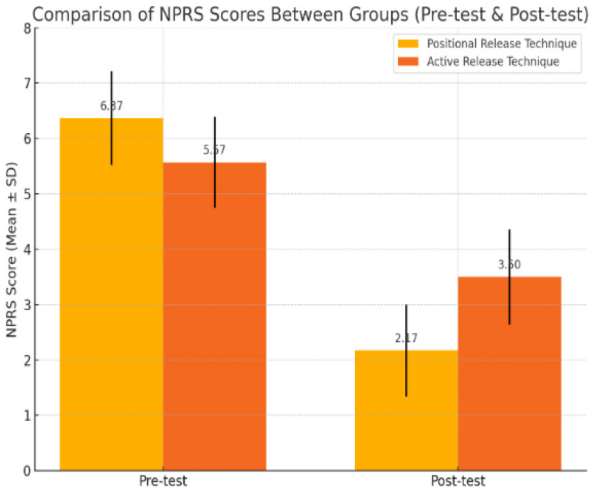


Figure 2. Comparison of NPRS Scores between groups.

The percentage reduction in pain intensity was 65.9% for the PRT group and 37.2% for the ART group, demonstrating superior clinical improvement with PRT. This suggests that positional release therapy produced greater modulation of muscle tension and neural irritation, leading to enhanced pain reduction and patient comfort compared to active release therapy.

4. Discussion

The present study compared the effectiveness of Positional Release Therapy (PRT) and Active Release Technique (ART) in reducing pain in individuals with Piriformis Syndrome, assessed using the Numerical Pain Rating Scale (NPRS). Both groups showed statistically significant pain reduction post-intervention ($p < 0.001$), with the PRT group demonstrating a greater decrease in pain scores (from 6.37 ± 0.85 to 2.17 ± 0.83) than the ART group (from 5.57 ± 0.82 to 3.50 ± 0.86).

These findings align with prior studies. Jain *et al.* found PRT more effective than ART in gastro-soleus trigger point treatment[11], and Kothawale and Rao also reported superior results of PRT in reducing hamstring tightness[10]. The enhanced analgesic effects of PRT may be attributed to its neurophysiological mechanism, which involves positioning the muscle in a shortened state, reducing muscle spindle and nociceptor activity, and possibly inducing parasympathetic activation[5].

In contrast, ART developed by Leahy uses deep manual tension combined with active patient movement to release adhesions and restore soft tissue mobility[13]. Though effective, ART can cause mild discomfort and may be better suited for chronic or dense soft tissue conditions. Positive outcomes have been observed with ART in conditions like chronic neck pain[12], hamstring tightness[10], and Piriformis Syndrome, where it outperformed Post-Isometric Relaxation (PIR) in reducing functional disability[15]. Harlapur *et al.* demonstrated both ART and PRT as effective adjuncts to ultrasound therapy in plantar fasciitis[16].

Amini *et al.* supported the use of PRT for immediate pain relief in myofascial trigger points[14], whereas Trivedi *et al.* found Myofascial Release (MFR) more effective than ART for lateral epicondylitis[17], highlighting the importance of tailoring treatment to tissue pathology. Shetty *et al.* endorsed the versatility and safety of PRT across various musculoskeletal conditions[18], and Ahmed Awan *et al.* emphasized the superiority of manual therapy-including

both ART and PRT-over electrotherapy in treating Piriformis Syndrome[19]. Danazumi *et al.* emphasized that PRT facilitates relaxation of the piriformis muscle and decreases nociceptive input by positioning the muscle in a shortened, pain-free state, making it a safe and effective conservative approach for managing neuromuscular pain conditions such as Piriformis Syndrome. These findings further support the clinical relevance of PRT in physiotherapy practice for reducing pain and restoring soft-tissue mobility[20].

While the results are promising, limitations include a lack of high-quality RCTs, inconsistent protocols, and variability in study populations. No single technique is universally superior; instead, therapy selection should be individualized based on factors such as patient tolerance, therapist expertise and condition severity.

In conclusion, both ART and PRT are effective for managing Piriformis syndrome, but PRT demonstrated superior pain reduction in this study, likely due to its gentle and neuro physiologically mediated approach. Future research should aim to develop standardized protocols and conduct large-scale comparisons to guide clinical decision-making.

5. Limitations

The study's target population was limited to individuals aged 30–50 years, which may narrow the scope of the study's applicability to broader populations. Including a larger and more diverse sample would enhance the external validity and representativeness of the results.

Additionally, the study did not include follow-up assessments; therefore, the long-term effects of the interventions could not be evaluated. Long-term follow-ups are essential to determine the sustainability and lasting impact of treatment outcomes. The study was also conducted in a single clinical setting, which may limit the applicability of the results to different populations, environments, or healthcare systems.

6. Conclusion

This quasi-experimental study demonstrated that both Positional Release Therapy and Active Release Technique are effective in reducing pain among individuals with Piriformis Syndrome. However, PRT yielded significantly greater improvement in pain scores, likely due to its neuro physiologically mediated, passive approach. These findings support the clinical utility of PRT as a preferable treatment modality, especially for patients with acute symptoms or low pain tolerance. Combining PRT or ART with conventional physiotherapy may enhance outcomes beyond what conventional therapy alone can achieve.

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Author Contribution

Akshata B. Basti contributed to the conception and design of the study, conducted the literature review and was involved in data collection and drafting the manuscript. Dr. P. Sathya contributed to finalizing the study title, methodology, and discussion section. Vimarsha Nayak contributed to the discussion and performed critical revision and correction of the manuscript.

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