

EFFECTS OF POST-FACILITATED STRETCHING VERSUS CONTRACT-RELAX STRETCHING IN THE MANAGEMENT OF SCIATICA ASSOCIATED WITH PIRIFORMIS SYNDROME: A RANDOMIZED CLINICAL TRIAL

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Keywords

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Abstract

Background: Piriformis syndrome is a neuromuscular disorder characterized by compression or irritation of the sciatic nerve by the piriformis muscle within the deep gluteal region. It is increasingly recognized as a significant cause of extra-spinal sciatica and a source of chronic buttock pain. Despite its clinical importance, piriformis syndrome remains underdiagnosed and frequently misinterpreted as lumbar spine pathology due to overlapping symptoms, resulting in delayed or inappropriate management.

Objective: The aim of this study was to compare the effects of post-facilitated stretching and contract-relax stretching in the management of sciatica associated with piriformis syndrome.

Methodology: Participants were enrolled into two groups: one receiving post facilitated stretching exercise and the other one receiving contract relax stretching exercise. Outcomes were assessed over a 6-week period, focusing on pain levels and functional ability by goniometer, Numeric pain rating scale (NPRS), Functional disability by Oswestry Disability Index (ODI) and measurement tools and musculoskeletal special test to check p and conformation for piriformis tightness are Slump test, SLR(strait leg raise) test, FAIR TEST (flexion, adduction, internal rotation), Piriformis stretch test. Data was analyzed using SPSS-27.

Results: Overall, all of the examined outcomes showed statistically significant pre-to-post improvement. Hip Rom and SLR rose while NPRS and ODI fell. There was a significant baseline difference for Hip Rom ($p = .006$) but not for NPRS ($p = .372$), ODI ($p = .819$), or SLR ($p = .374$), according to the between-group analysis. Following the intervention, NPRS, ODI, Hip

ROM and SLR showed significant between-group differences (all p -values $<.001$). **Conclusion:** Stretching (PFS) out performed Conventional Rehabilitation Stretching (CRS) in terms of post-intervention results, indicating that PFS was more useful for managing sciatica associated with piriformis syndrome in the short term.

INTRODUCTION

In piriformis syndrome, a neuromuscular disorder, the piriformis muscle in the deep gluteal region pinches or irritates the sciatic nerve. It is becoming recognized as a significant cause of both extra-spinal sciatica and chronic buttock pain. (1) Deep within the gluteal region is a small, flat, triangular muscle called the piriformis. It leaves the pelvis through the greater sciatic foramen and inserts onto the superior portion of the greater trochanter of the femur after starting from the anterior surface of the sacrum, more precisely between the second and fourth sacral segments.(2) About 15–20% of people have structural differences, though, where the sciatic nerve may split into branches that travel in different directions around the piriformis muscle or pass through or above it. These structural differences are thought to be a key risk factor for the development of piriformis syndrome and greatly enhance the chance of nerve compression.(3) Consequently, the sciatic nerve is compressed, causing pain and neurological problems.(4) Piriformis syndrome is regarded as a relatively rare but clinically relevant illness from an epidemiological perspective. Piriformis syndrome is thought to be responsible for between 0.3% and 6% of instances of sciatica and associated musculoskeletal diseases worldwide.(5) Due to the lack of established diagnostic criteria and the frequent misdiagnosis of symptoms as lumbar radiculopathy, these numbers are probably underestimated. The frequency may be much greater in specialized clinical settings, ranging from 17% to 36%, especially among patients who report with non-disco genic sciatica.(6) In the United States, piriformis syndrome affects approximately 2.4 million individuals annually, indicating a substantial burden on the healthcare system.(7) The illness is more common in women and is

more frequently seen in people between the ages of 30 and 60. Anatomical and biomechanical variations, such as a broader pelvis, a higher Q-angle, and hormonal impacts that alter muscle flexibility and joint stability, may be responsible for the female preponderance, with a reported ratio of around 6:1.(8) According to a research done in Lahore, 23.7% of patients had chronic pain issues, demonstrating the increasing prevalence of this ailment in the community.(9) Furthermore, research among university students has demonstrated a high prevalence of piriformis-related symptoms associated with prolonged sitting and inadequate physical activity.(10) Similarly, prolonged constriction of the gluteal area and decreased muscular flexibility put those with sedentary jobs at danger.(11) Furthermore, inflammation may exacerbate sciatic nerve compression by causing edema inside the muscle.(12) The piriformis muscle may become overused, fatigued, and eventually malfunction as a result of this increased demand.(13)

Similar to this, stiffness in nearby muscles like the adductors, hamstrings, and hip flexors can change pelvic position and put more strain on the piriformis. For example, anterior pelvic tilt may result from tight hip flexors, whereas posterior pelvic tilt may be caused by tight hamstrings. These changes in pelvic alignment can interfere with normal biomechanics and put more stress on the piriformis muscle, making it more vulnerable to injury.(14) This may eventually result in nerve compression, muscular spasms, and stiffness.(15) Particularly at risk are athletes who use subpar training methods or lack proper conditioning.(16) In terms of genesis, pathophysiology, and clinical presentation, piriformis syndrome-related sciatica is very different from disco genic sciatica. In piriformis syndrome, the sciatic nerve is compressed at the level of the piriformis muscle rather than at the

nerve root in the lumbar spine, making it a form of non-discogenic or extra-spinal sciatica.(17) The global prevalence of sciatica ranges between 13% and 40%, with an annual incidence of approximately 1% to 5% in the general population.(18) According to studies, up to 6% of sciatica cases may be caused by piriformis syndrome, with greater percentages seen in individuals who do not improve with standard lumbar spine therapies.(19) One clinical sign that helps distinguish piriformis syndrome from spinal causes of sciatica is this localized gluteal discomfort.(20) To rule out other causes of sciatica, including lumbar spine disease, diagnostic imaging may be utilized.(21) As a result, their main application is as supplements to clinical evaluation.(22) The diagnosis of piriformis syndrome can be supported by ultrasound-guided injections of corticosteroids or local anesthetics into the piriformis muscle, which can offer both therapeutic relief and diagnostic confirmation.(23) Furthermore, early detection and treatment of this ailment depend on greater knowledge among medical experts.(24) For better patient outcomes and efficient care, it is essential to comprehend these factors.(25) By treating contributing variables such as bad posture, muscular imbalance, and improper movement patterns, these therapies aim to prevent recurrence in addition to relieving existing symptoms.(26) Because contract-relax stretching effectively increases range of motion and reduces muscle stiffness, it is frequently utilized in rehabilitation settings.(29) By strengthening these muscles, the piriformis muscle is less stressed, normal biomechanics are restored, and the hip joint is more stable overall.(30) Specifically, trigger point release that targets the piriformis muscle might lessen referred pain along the sciatic nerve as well as regional muscular tension. (31) For long-term symptom treatment and prevention, lifestyle changes and ergonomic workplace improvements are crucial.(32)

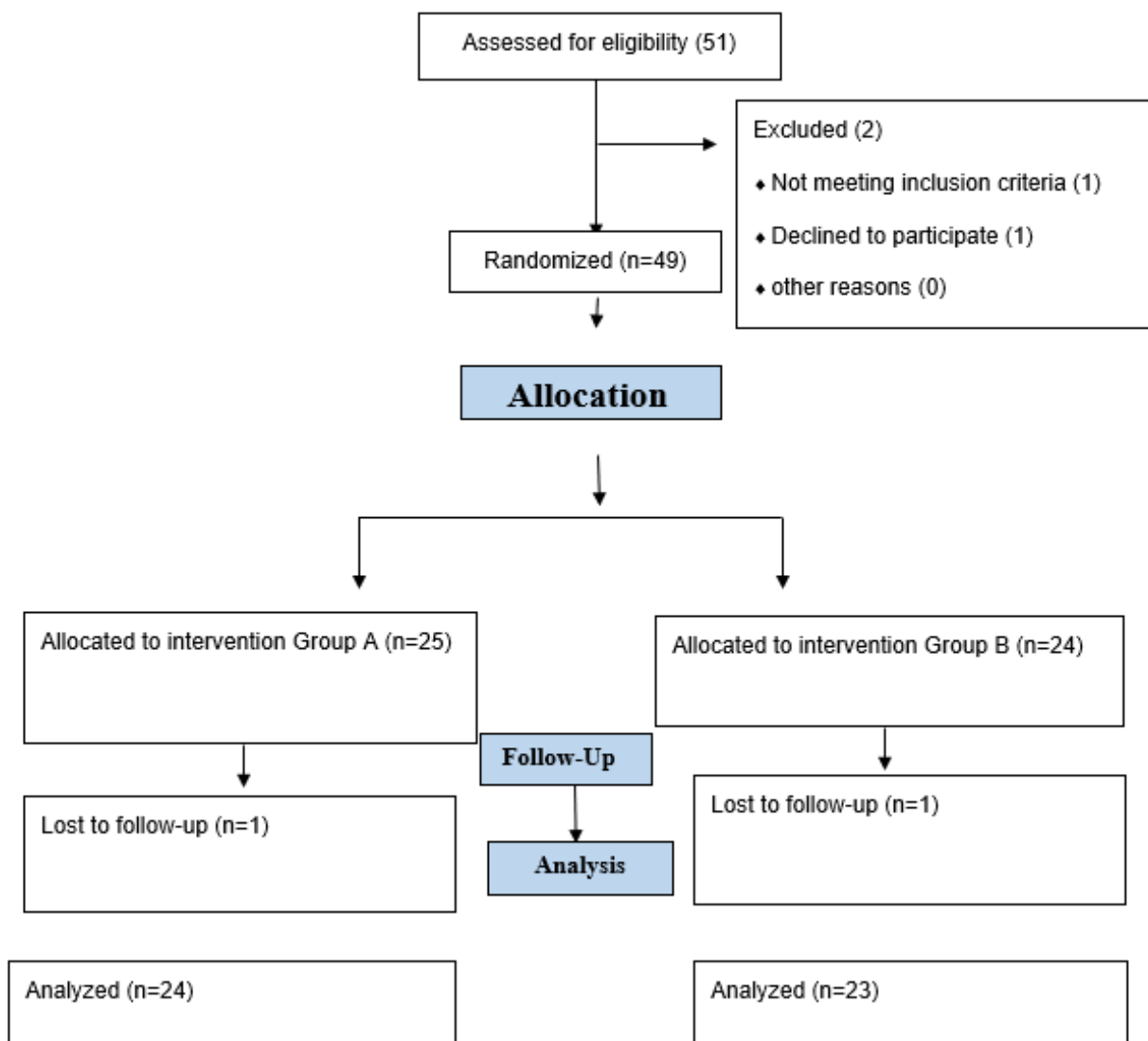
METHODOLOGY

The design of this study was Randomized clinical Trial (RCT). Data was collected from Ashraf medical center and maternity home. The study's sample size was determined using a paired t-test with a 95% confidence level, 0.95 power, a 5% margin of error, and 95% power, as calculated by G-Power version 3.1.9.7.(37). Sampling technique used was non-probability purposive Sampling technique. The duration of this study was 10 months. The criteria for inclusion involved participants between the ages of 30 and 60 who had a clinical diagnosis of tightness in the piriformis muscle and were experiencing pain along the sciatic nerve pathway.(38) Individuals with spinal stenosis, lumbar muscle spasms, facet joint pathology, a history of trauma, disc herniation, or back pain were excluded from the study. Participants who meet inclusion criteria were chosen via lottery method and assigned into one of two groups A or B. The participants and the researcher were kept safe about the allocation method. It was carried by a research assistant who was not involved in any further steps of study. This was a Single blinded RCT. For taking pre and post treatment levels, Outcome assessors were recruited and also blinded to the treatment group allocation. Patients can contact their therapist in case of any problem during trial participation. The data was collected using a single-blinded technique from different hospitals. A total of 51 patients were screened according to the predefined inclusion criteria, and after completion of data collection, the data will be analyzed using SPSS version 27. Participants were randomly allocated into either Group A or Group B. One mediator was administer the interventions, while one assessor, who was blinded to the participants' group allocation, was evaluate pain and range of motion (ROM) before and after the treatment. Both groups were received the same baseline treatment, including a hot pack applied to the gluteal region for 10-15 minutes to relax the muscles and improve circulation, conventional TENS for 15-20 minutes, gentle static piriformis muscle stretching with a hold of 20-30 seconds

for 3–5 repetitions to reduce muscle tightness, active or active-assisted hip internal rotation and adduction exercises to improve joint mobility, and sciatic nerve gliding to reduce tension and compression of the sciatic nerve and alleviate symptoms of sciatica. Group A was received post-facilitated stretching (PFS) for 4–6 weeks, with three sessions per week, each lasting 30–40 minutes. The PFS protocol was consist of 2–3 sets per session, with 10–15 repetitions in each

set, involving muscle contraction for 5–7 seconds followed by stretching for 20–30 seconds. Group B was received PNF using the contract-relax technique combined with nerve gliding for 4–6 weeks, with three sessions per week, each lasting 30–40 minutes. Each session was include 2–3 sets, with 10–15 stretching repetitions per set, involving a 5–7-second contraction followed by a 10–15-second stretch.

CONSORT DIAGRAM



RESULTS

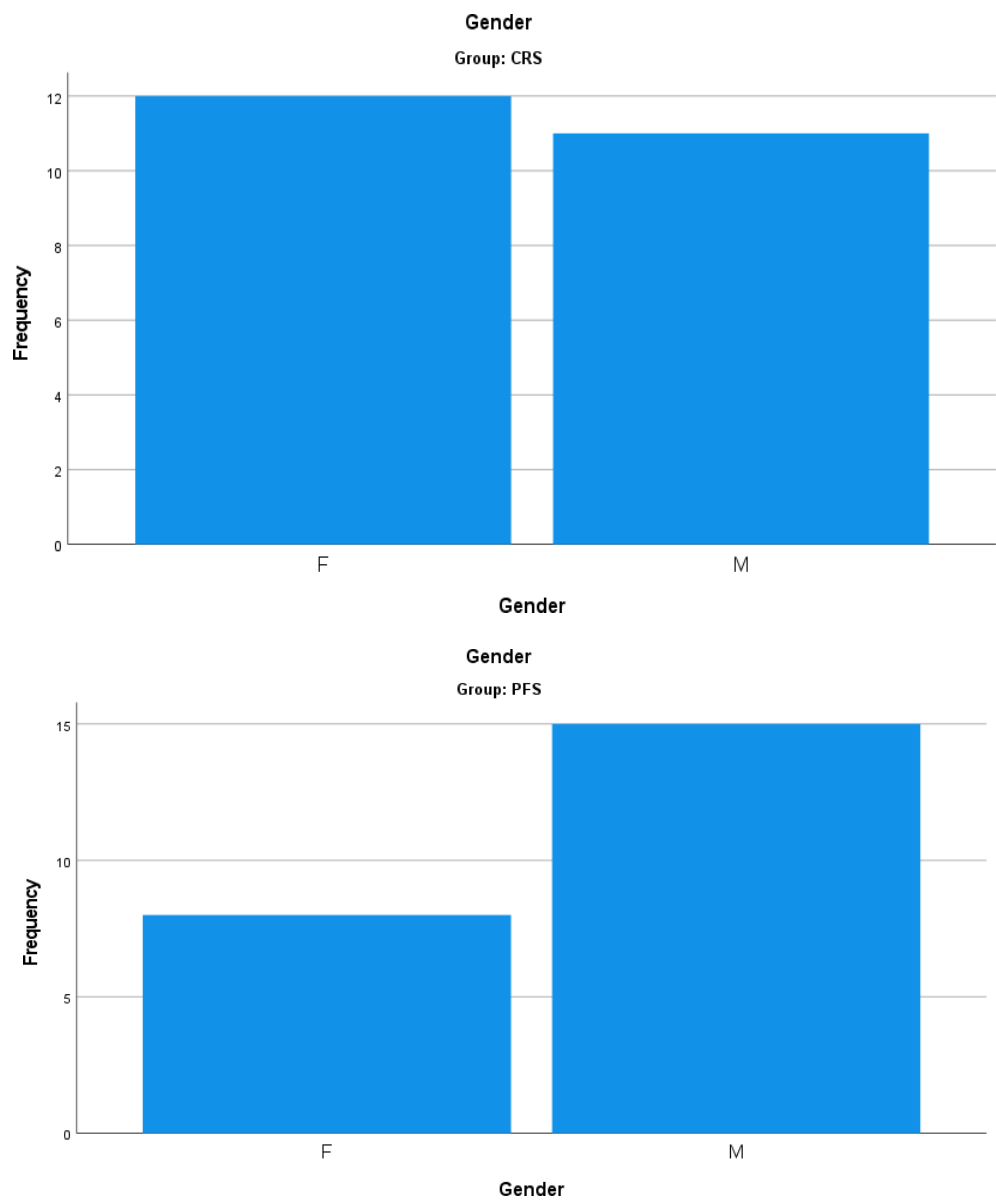
4.1 Demographic Characteristics

The demographic characteristics of the participants were summarized according to

gender and age for the two study groups, CRS and PFS.

Table 4.1. Demographic characteristics of participants

Characteristic	CRS	PFS	Total
Females	12 (52.2)	8 (34.8)	20 (43.5)
Males	11 (47.8)	15 (65.2)	26 (56.5)
Age, Mean $\pm$ SD	45.96 $\pm$ 8.798	43.52 $\pm$ 9.045	44.74 $\pm$ 8.921



There were 12 females (52.2%) and 11 men (47.8%) in the CRS group and 8 females (34.8%) and 15 males (65.2%) in the PFS group. In total, there were 26 men (56.5%) and 20 girls (43.5%). In CRS and PFS, the mean age was 45.96 ± 8.798 and 43.52 ± 9.045 years, respectively. The two group-level summaries yielded a combined overall mean age of 44.74 ± 8.921 years. Of the 23 participants in the CRS group, 11 (47.8% valid percent) were men and 12 (52.2% valid percent) were women. There were eight female participants (34.8% valid percent) and fifteen male participants (65.2% valid percent) in the

PFS group (n = 23). Following the male category in both groups, the cumulative percentage reached 100.0%. As a result, the PFS group had a higher percentage of male participants than the CRS group, which had a nearly equal gender distribution. With a mean age of 45.96 years and a standard deviation of 8.798, the 23 individuals in the CRS group ranged in age from 30 to 60. With a mean age of 43.52 years and a standard deviation of 9.045, the 23 individuals in the PFS group ranged in age from 31 to 60. The mean age of the CRS group was greater than that of the PFS group, with a difference of 2.44 years.

4.2 Test of Normality

Variable	Shapiro–Wilk Statistic	dV	Sig. (p)
NPRS_Pre	0.962	46	0.135
ODI_Pre	0.958	46	0.097
Hip ROM_Pre	0.955	46	0.073
SLR_Pre	0.963	46	0.154

NPRS_Pre (W = .962, df = 46, p = .135), ODI_Pre (W = .958, df = 46, p = .097), Hip ROM_Pre (W = .955, df = 46, p = .073), and SLR_Pre (W = .963, df = 46, p = .154) did not pass the Shapiro-Wilk test. The examined pre-intervention variables did

not exhibit a statistically significant deviation from normalcy since all p-values were higher than .05. For the ensuing parametric analyzes, the normalcy assumption was therefore maintained.

4.3 Paired-Samples t-Test

Outcome	Pre Mean	Pre SD	Post Mean	Post SD	Mean Difference	p
NPRS	6.63	1.793	3.13	1.166	3.5	< .001
ODI	42.43	2.536	19.96	4.521	22.478	< .001
HiP ROM	21.61	3.98	37.61	4.112	-16.0	< .001
SLR	53.78	7.533	73.46	5.402	-19.674	< .001

NPRS decreased from 6.63 (SD = 1.793) to 3.13 (SD = 1.166), mean difference = 3.500, SE = .321, $t(45) = 10.898$, $p < .001$; ODI decreased from 42.43 (SD = 2.536) to 19.96 (SD = 4.521), mean difference = 22.478, SE = .751, $t(45) = 29.931$, $p < .001$. SLR increased from 53.78 (SD = 7.533) to

73.46 (SD = 5.402), with a pre-minus-post mean difference of -19.674, SE = 1.219, $t(45) = -16.144$, $p < .001$. Hip ROM increased from 21.61 (SD = 3.980) to 37.61 (SD = 4.112). Thus, there were statistically significant pre-to-post changes in all four outcomes.

4.4 Independent-Samples t-Test

Outcome	PFS Pre Mean $\pm$ SD	CRS Pre Mean $\pm$ SD	PFS Post Mean $\pm$ SD	CRS Post Mean $\pm$ SD	Pre p	Post p	Cohen's d (Post)
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NPRS	6.87 ± 1.890	6.39 ± 1.699	2.17 ± 0.576	4.09 ± 0.733	.372	< .001	-2.901
ODI	42.35 ± 2.773	42.52 ± 2.333	16.04 ± 2.142	23.87 ± 2.282	.819	< .001	-3.536
HipIR	20.04 ± 4.117	23.17 ± 3.214	41.13 ± 2.007	34.09 ± 2.151	.006	< .001	3.386
SLR	54.78 ± 8.345	52.78 ± 6.660	78.09 ± 2.875	68.83 ± 2.570	.374	< .001	3.396

NPRS was 6.87 ± 1.890 in PFS and 6.39 ± 1.699 in CRS at baseline ($p = .372$), ODI was 42.35 ± 2.773 in PFS and 42.52 ± 2.333 in CRS ($p = .819$), and SLR was 54.78 ± 8.345 in PFS and 52.78 ± 6.660 in CRS ($p = .374$). There was no statistically significant difference between these baselines. The baseline difference was statistically significant ($p = .006$), with Hip ROM being 20.04 ± 4.117 in PFS and 23.17 ± 3.214 in CRS. Following the intervention, NPRS was 2.17 ± 0.576 in PFS and 4.09 ± 0.733 in CRS ($p < .001$), ODI was 16.04 ± 2.142 in PFS and 23.87 ± 2.282 in CRS ($p < .001$), Hip ROM was 41.13 ± 2.007 in PFS and 34.09 ± 2.151 in CRS ($p < .001$), and SLR was 78.09 ± 2.875 in PFS. Significant between-group effects were indicated by the post-intervention Cohen's d values of -2.901 for NPRS, -3.536 for ODI, 3.386 for Hip ROM, and 3.396 for SLR. After the intervention, the PFS group performed better overall because it had higher Hip ROM and SLR values, which indicate greater physical performance, and lower NPRS and ODI scores, which indicate less pain and impairment.

Discussion

The goal of the current study was to assess the benefits of contract-relax stretching (CRS) and post-facilitated stretching (PFS) for the treatment of sciatica linked to piriformis syndrome. After the intervention period, the results showed a considerable improvement in hip internal rotation, straight leg raise, discomfort, and impairment. Overall, all treatment modalities resulted in positive modifications; however, the PFS group showed superior results in the post-intervention comparison. Pain, disability, and functional mobility improved more in the PFS

group than in the CRS group, as shown by lower NPRS and ODI ratings and higher Hip ROM and SLR values. According to the current study, NPRS dropped from 6.39 ± 1.699 to 4.09 ± 0.733 in the CRS group and from 6.87 ± 1.890 to 2.17 ± 0.576 in the PFS group. As a result, the PFS group saw a significantly reduced post-intervention pain level despite having a somewhat higher baseline pain score. There was a statistically significant difference between the groups ($p < .001$). This suggests that PFS could have been more successful than CRS in easing sciatic discomfort and pain related to piriformis syndrome. The results are especially similar to those of Shahzad et al. (2020) who similarly found that SLR significantly improved in piriformis syndrome patients after PFS.(28) The effect-size results offer more proof of how much the two treatment modalities differ from one another. For the post-intervention results, the Cohen's d values were -2.901 for NPRS, -3.536 for ODI, 3.386 for Hip ROM, and 3.396 for SLR. These are extremely significant standardized effects. As a result, the observed differences between PFS and CRS were both statistically significant and very large. The benefit of PFS may have practical therapeutic value, especially for pain reduction, disability, hip mobility, and SLR performance, according to the substantial effect sizes. For individuals with sciatica linked to piriformis syndrome, the current study generally supports the application of stretching-based physical therapy approaches. The results are in line with earlier studies showing that piriformis-focused therapies increase pain, muscular flexibility, SLR, and functional performance. However, prior research has not consistently shown that one stretching approach is better than

another, suggesting that treatment response may vary depending on the particular stretching technique, length of treatment, patient characteristics, and related physiotherapy therapies. PFS outperformed CRS in the current study's post-intervention results, indicating that PFS would be a more useful stretching method for the temporary treatment of sciatica linked to piriformis syndrome.(28)

Conclusion:

Both PFS) and CRS in terms of post-intervention results, indicating that PFS was more useful for managing sciatica associated with piriformis syndrome.

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