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COMPARATIVE EFFECTS OF POSITION RELEASE THERAPY AND RECIPROCAL INHIBITION ON PIRIFORMIS SYNDROME IN SOCCER PLAYERS

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ABSTRACT

The flat piriformis muscle is located parallel to and below the gluteus medius posterior border. Piriformis muscular tension is frequently mistaken with Piriformis Syndrome, which is characterized as sciatic neuritis never brought on by an irritated or injured piriformis muscle. Muscular imbalance brought on by overuse and pressure on the muscles eventually results in the development of chronic lower back pain. The objective of the study was to compare the effects of Positional Release Therapy and Reciprocal Inhibition to manage pain, to improve range of motion and to improve activity of daily livings. 20 subjects were recruited (10 each group) with piriformis syndrome and randomly allocated in two groups: Positional release therapy and reciprocal inhibition technique. Pain [Numeric Pain Rating Scale NPRS)], Range of Motion (Goniometer), and Function [Lower extremity functional scale (LEFS)] were assessed at baseline and post-intervention.

Pain was assessed pretreatment of first session and after every treatment session. Range of motion was assessed at pretreatment of first session and post treatment of every week. Participants were obtained via clinical setup after complete physical examination, history and determining the inclusion and exclusion criteria. Results were analyzed through statistical package for the social sciences (SPSS) version 20. The result of study showed that Position Release Therapy and Reciprocal Inhibition exercises were very effective in alleviating pain, and increasing manual muscle testing, range of motion and lower extremity functional scale scores in soccer players with piriformis syndrome with p-value less than 0.05(add outcomes) .

Conclusion: This study concluded that both Positional release therapy and Reciprocal inhibition were significantly effective techniques to decrease pain, improving ROM, muscle strength and in piriformis syndrome in Soccer but Reciprocal inhibition was better and effective technique as compared to Positional release therapy.

Keywords: Position Release Therapy, Reciprocal Inhibition, METS, Piriformis Syndrome, Soccer players.

INTRODUCTION:

Approximately 4% of people worldwide play football, making it one of the most popular sports in the world. According to a 2007 report by the Federation International de Football Association (FIFA), there were 265 million football players globally, with over 25 million of them being female. There are 25 million registered players with the US Soccer Federation in the US alone (1). Soccer players, both male and female, frequently get injuries to their hips and groin. This might be related to the inherently fast acceleration, sudden cutting and twisting, and high muscle loads during kicking that occur during gameplay (2). A neuromuscular disorder called piriformis syndrome (PS) is defined by hip and buttock pain, with the potential to cause referred pain in the thigh and lower back. Any condition that causes compression of the sciatic nerve, which includes shortening, spasm, hypertrophy, inflammation, or anatomic variation of the piriformis muscle, can cause PS. Individuals with low back pain had a 5%–36% incidence rate for PS. With a 6:1 ratio, PS seems to be more prevalent in women than in men (3). It results from variations in the pelvic anatomy caused by the Q-angle femoris muscle or from hormonal changes that occur during pregnancy.

Buttock discomfort or sciatica are also synonymous with piriformis syndrome (4). PS is frequently overlooked or challenging to diagnose because of its comparable appearance to herniation of the lumbar disc accompanying radiculopathy, narrowing with radiculopathy, as well as neurogenic pain. 183 (6.25%) of 2,910 individuals who suffered from sciatica-related low back and buttock pain in a study conducted in 2013 also had PS. Postponing the diagnosis of PS can result in persistent somatic dysfunction, pathologic disorders affecting the sciatic nerve, compensatory alterations that cause pain, the sensation of paresthesia, hyperesthesia, and weakening in the muscles (5). Piriformis syndrome is often known as "Deep Buttock Syndrome" because patients frequently report experiencing pain in their buttocks and hips (6).

"Wallet neuropathy" or "fat wallet syndrome" is another term for this illness. The piriformis muscle and the sciatic nerve are both affected because it is a neuromuscular issue. PS results from short-term correction for congenital leg length disparity. During standing, walking, or running, the individual with a leg length difference adjusts their posture. The location of a muscle's insert in the bone is influenced by compensatory posture. Acute radiation therapy might result in muscular injury. Radiation therapy for cervical cancer leads to muscle atrophy from fat, which produces PS. Rather of focusing on the patient with or without lower leg pain, percutaneous endoscopic lumbar discectomy alongside a high level of stress in local anesthesia enhances PS after walking (7). Factors that predispose athletes to injury include improper use of practice technique, age, overtraining, number of repetitive stresses, and use of protective equipment. Posture, positioning, training factors, sport, and player position can be contributing factors to the gradual onset of symptoms. Most sport-related peripheral nerve injuries are not severe enough to lead to nerve transection. Nerve injuries are most commonly seen in baseball, football, volleyball, and snow-related sports. The mechanisms of nerve injury vary, and include direct trauma, acute stretch, repetitive stretch traction, local tissue swelling and injury, or (rarely) a postsurgical nerve injury. Accurate diagnosis depends on knowledge of anatomy and a complete physical and neurologic examination (8).

The impacted limb will have an asymmetrical weakness. Positive Piriformis test result, Pace and Nagel sign, Freiberg sign, Beatty test result, Increased discomfort while in the "FAIR" posture restricted ipsilateral lower extremity medial rotation, Gluteal atrophy and ipsilateral short leg may occur in persistent situations of tonic outward rotation of the hip. The causes of sciatica and low back pain are included in the differential diagnosis of PS (9). For the care of patients with PS, the Positional Release Technique (PRT) is being studied as an indirect osteopathic manipulative

treatment that works well. Using this method, active trigger points are located and then ischemia compression is applied to mimic the nociceptive response. After the limb is positioned to release tension in the injured muscle, the excruciating trigger points are released. Hou et al. explained one theory regarding the advantages of ischemia compression, speculating that the relief of pain and muscular spasms by direct digital pressure could be due to either the spinal reflex process or the reactive hyperemia generated in the region (10).

The terms Reciprocal Inhibition (RI) and post-isometric relaxation (PIR) are referred to as MET. The reciprocal inhibition mechanism one of the MET mechanisms postulates that an antagonist muscle action would be inhibited and undergoes relaxation when a muscle contracts isometrically. The Golgi organ tendons allow for post-isometric relaxation (PIR) complying with agonist contractions, and the muscle spindle allows for the inhibition of reciprocal inhibition (RI), that hits the antagonist, in the second method of isometric contractions involving two neurological components using MET (11).

Many conventional interventions, including non-steroidal anti-inflammatory medications have been used to treat this disorder, corticosteroid injections, and cryotherapy in the acute stage and heating therapy in the chronic stage, deep friction massage, rest, ultrasonic, acupuncture, electrical stimulation, laser and progressive strengthening and stretching exercises therapy etc. to deal a patient of piriformis syndrome. But this study will be investigating the effects of Position release therapy (PRT) and Reciprocal Inhibition of METS in soccer players experiencing pain and discomfort condition. The reason for choosing this theme was basically to find out the appropriate therapeutic techniques by comparing therapy results with other techniques.

METHODS:

This study is a Randomized Clinical Trial. The study was conducted in the United Hospital Faisalabad, Physio Treats Physical Therapy and rehabilitation center, Motion Physical therapy and Rehab Centre and Pro Health and Rehab. The study was completed within the time duration of 4 months after the approval of institutional review board (IRB) of The University of Faisalabad (Ref. No TUF/DR/SA/MSPP/2024/413). Purposive sampling technique was used to collect sample. Soccer Players were the target population. 37 participants were accessed for eligibility. 20 patients meeting the inclusion criteria were divided to both groups. Randomization was done by lottery method. Data collection tools were Numeric Pain Rating Scale, Lower Extremity Functional Scale, Goniometer and Manual Muscle Testing. A signed informed consent was obtained from the participants before recruitment into the study. Measurements were taken at the baseline (0 week) and at the end of the 8^{th} week.

INCLUSION CRITERIA:

- Participants of age 18-40 was included
- Male athletes were included
- Pain in the buttock
- Pain up to rank 3 on NPRS
- Positive FABER and FAIR test (12).
- Positive Sciatic nerve tension test
- Onset of pain 24-72 hours after provocative activity
- Tenderness over the piriformis muscle
- Patients who are willing to sign the consent form
- Patient must be soccer player at least from 1 year

EXCLUSION CRITERIA

- Any known vascular condition
- Diagnosed / known psychiatric illness

- Positive SIJ dysfunction criteria (13)
- Positive tests for LBP (14)
- Deformity of the hip joint
- Lumbar Disc Herniation
- Spinal stenosis
- Peripheral neuropathy
- Systemic diseases e.g, hyper/hypotension, diabetes and hypo/hyperthyroidism
- Individual consuming recreational drugs
- Chain kinematic disturbance of whole limb
- Degenerative condition
- Any history of hip trauma or accident (6 months)
- Burn/scar
- Steroidal injection to hip joint
- Diagnosed tumor
- Myofascial pain syndrome

OUTCOMES:

PRIMARY OUTCOME MEASURE

- Pain
- Hip ROM
- Strength

SECONDARY OUTCOME MEASURE

- Lower Extremity Functional Scale

GROUP A

Intervention: Reciprocal Inhibition

Treatment: External rotation, hip flexion, and adduction were the standard stretching suggestions for those with piriformis syndrome. The tested leg of the supine patient was bent at the hip and knee so that the foot rested on the table lateral to the contralateral knee (the tested leg is crossed over the straight non-tested leg). To stretch the piriformis, the tested side's knee was forced into adduction while the non-tested side's pelvis was kept stable during the test. 20 seconds was the holding time, followed by a 5-second rest interval, and this was done five times (15).

GROUP B

Intervention: Position Release Therapy

Treatment: The treated leg bent at the hip and knee, the patient lied supine with their foot resting on the table to the side of their contralateral knee (the leg on the side to be treated is crossed over the other). The therapist applied pressure with one hand to the contralateral ASIS to restrict pelvic motion and with the other to the lateral flexed knee, which was being forced into resisted adduction to inhibit the piriformis muscle or contract antagonists. Placed the treated leg in flexion at the hip and knee so that the foot rested on the table, lateral to the contralateral knee while the patient was in the supine position (the leg on the side to be treated is crossed over the other). When the knee was brought into resisted adduction to contract antagonists or block the piriformis muscle, the therapist placed one hand on the contralateral ASIS to restrict pelvic motion and the other against the lateral flexed knee (16).

CONVENTIONAL TREAMENT

Treatment: Ultrasound Therapy (Continuous mode, 220 Wnm2, 130 Hz frequency, 3-5 min).

For piriformis syndrome, stretching of hip flexors, hip assuctors and external rotator for both

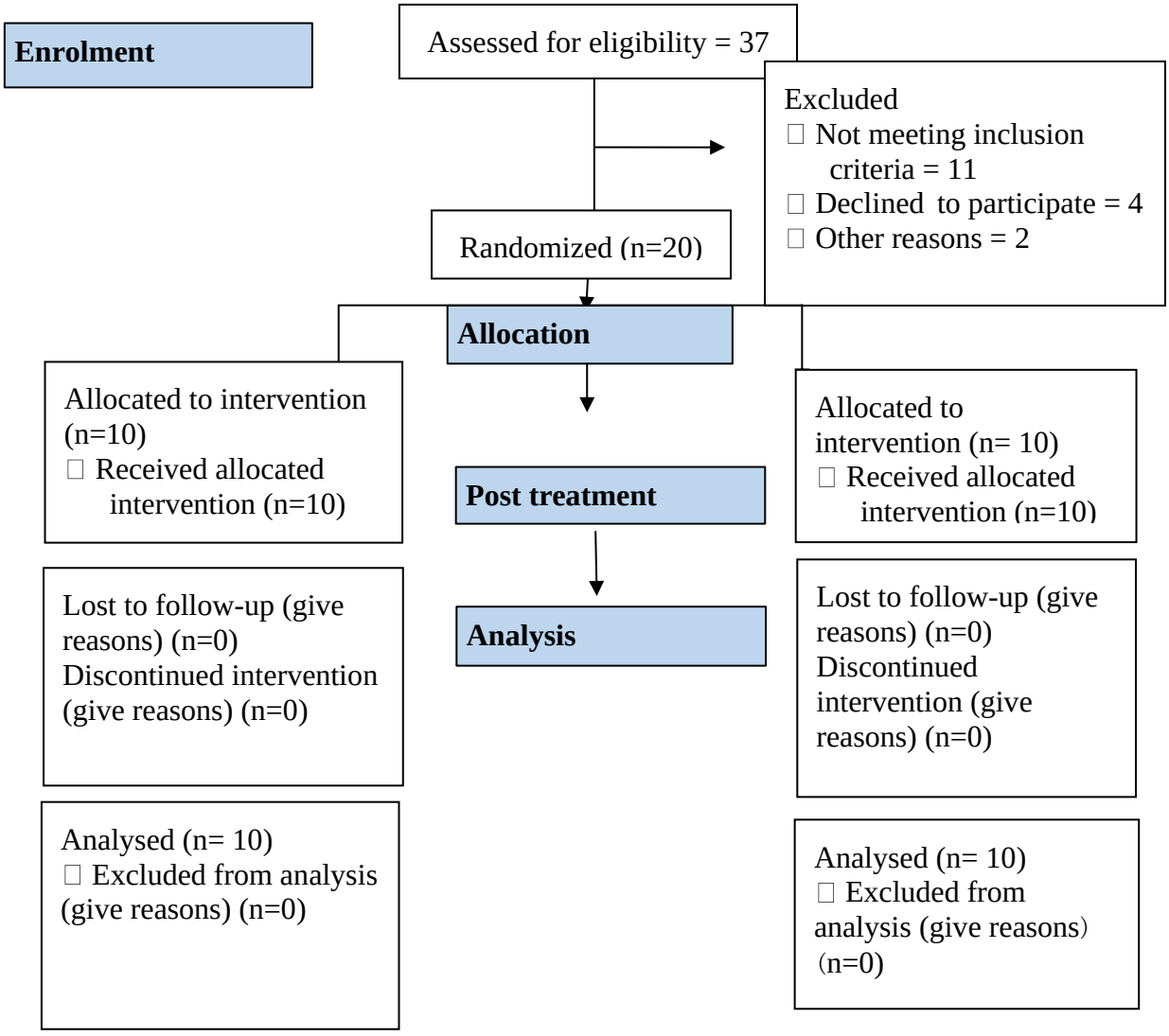
groups

FOLLOW UP MEASUREMENT

Total 8 treatment sessions per month (3 sessions per week)

- **Pre-treatment:** (Using NPRS for pain, PSFS for Function, Goniometer for ROM, MMT for strengthening)
- **After every session:** Using NPRS for pain
- **After every week:** Goniometer for range of motion
- **After 8 weeks:** (Using NPRS for pain, PSFS for Function, Goniometer for ROM, MMT for strengthening)

CONSORT DIAGRAM



Statistical Analysis:

The total sizes of 20 individuals were included in current study in the basis of inclusion and exclusion criteria from piriformis syndrome in Soccer population. Subjects were equally divided into 2 comparison groups each group comprised of 10 participants by the means of purposive sampling technique and lottery method to randomized the subjects into groups. Statistical analysis was performed by using SPSS version 20. Normality of the study variables as assessed by Shapiro wilk sign test, the data showed that all the variables NPRS, Hip abduction, adduction, internal rotation, external rotation and manual muscle testing had the significance value greater than 0.05

which means they followed the normal distribution so, parametric tests were used. But lower extremity functional scale did not follow normal distribution so non parametric tests were used for analysis.

Ethics:
Ethics approvals were obtained from The University of Faisalabad under the Ref. No TUF/DR/SA/MSPP/2024/413

RESULTS:
Twenty participants were included in the study according to the descriptive statistics age ranging from 20-35 years. The mean age of the participants was 25.8± 3.7 years in Positional Release Therapy and 27.6± 4.1years in Reciprocal Inhibition. The data showed that, the mean body mass index of positional release therapy participants was 24.6±4.1 and Reciprocal Inhibition was 22.6±3.3. The BMI distribution of the study participants showed that the mean body mass index of Positional Release Therapy participants was 24.6±4.1 and Reciprocal Inhibition was 22.6±3.3.
The test of normality of the study variables as assessed by Shapiro wilk sign test, the data showed that all the variables Pain, Hip abduction, Adduction, Internal rotation, External rotation ROM, and LEFS had the significance value greater than 0.05 which means they followed the normal distribution so, parametric tests were used. MMT did not follow the normal distribution, so non parametric test was used for analysis. For the analysis of this variable for within group analysis paired t-test, Repeated Measure ANOVA and Wilcoxon and for between group analysis independent sample T-test and Man Whitney U were used.

Age Distribution

	Years	**Frequency**	**Percentage**	**Mean± SD**
Positional release therapy	20-25	5	50.0%	25.8± 3.7
	26-30	4	40.0%	
	30-35	1	10.0%	
Reciprocal inhibition	20-25	3	30.0%	
	26-30	5	50.0%	
	30-35	2	20.0%	
	Total	20	100%	

The above table showed the age distribution among the groups.

BMI Distribution

Weight Categories in kg			**Frequency**	**Percentage**	**Mean± SD**
Positional release therapy	**Underweight**	<18.5	0	0	24.6±4.1
	Normal	18.5 - 24.9	5	50%	
	Over-weight	25-29.9	4	40%	
	Obese	>30	1	10%	
Reciprocal inhibition	**Underweight**	<18.5	0	0	22.6±3.3
	Normal	18.5 - 24.9	8	80%	
	Over-weight	25-29.9	1	10%	
	Obese	>30	1	10%	
	Total		20	100%	

The above table showed the BMI distribution of both group participants.

Within group results of the outcomes

Outcomes	Group		Pre or post treatment	Mean±SD	P-Value
NPRS	**Group A**		Pre	7.9±1.1	<0.05
			Post	4.4±1.2	
	Group B		Pre	7.1±1.1	<0.05
			Post	1.0±0.00	
ROM	**Group A**	**ABD**	Pre	20.9±3.3	<0.05
			Post	32.0±2.1	
		ADD	Pre	35.4±4.5	<0.05
			Post	20.2±2.8	
		IR	Pre	24.0±2.4	<0.05
			Post	38.8±0.91	
		ER	Pre	24.0±2.4	<0.05
			Post	38.8±0.91	
	Group B	**ABD**	Pre	21.2±2.3	<0.05
			Post	43.1±1.7	
		ADD	Pre	35.7±3.8	<0.05
			Post	11.7±4.4	
		IR	Pre	23.6±2.0	<0.05
			Post	44.3±0.94	
		ER	Pre	23.6±2.0	<0.05
			Post	44.4±0.96	
MMT	**Group A**		Pre	2.7±.6	0.01
			Post	3.3±.4	
	Group B		Pre	2.9±.7	0.006
			Post	4.2±.6	
LEFS	**Group A**		Pre	41.4±5.6	<0.05
			Post	46.8±4.7	
	Group B		Pre	43.3±4.6	<0.05
			Post	61.6±5.6	

The above table displays the pre-and post-treatment values of the outcomes for both groups. Both groups for these outcomes showed significant results post treatment as showcased by the mean±SD and p-values.

Between-group results of all the outcomes

	Groups		Mean±SD	P-Value
Post NPRS	**Group A**		4.4±1.2	0.00
	Group B		1.0±.00	
Post ROM	**ABD**	Group A	32.0±2.1	<0.05
		Group B	43.1±1.7	
	ADD	Group A	20.2±2.8	<0.05
		Group B	11.7±4.4	
	IR	Group A	38.8±0.91	<0.05
		Group B	44.3±0.94	
	ER	Group A	38.8±0.91	<0.05
		Group B	44.4±0.96	
Post MMT	**Group A**		7.05±2.83	0.007
	Group B		13.95±2.83	

Post LEFS	**Group A**	46.8±4.7	<0.05
	Group B	61.6±5.6	

The above table showed the results of between group comparison of both groups with the post-intervention values of all outcomes.

DISCUSSION:

Current study entitled "Comparative effects of position release therapy and reciprocal inhibition on piriformis syndrome in soccer players was carried out at the OPD of physiotherapy United Hospital Faisalabad, Physio, Treats Physical Therapy and rehabilitation center, In Motion Physical therapy and Rehab Centre and Pro health and Rehab clinic. Twenty (20) subjects participated in this study, who received the selected interventions for eight weeks with 3 session per week. There was total 24 treatment sessions, three sessions per week for eight weeks. Pre readings and post reading after every session was observed for all the variables. In this study, there were two groups i-e Group A (Position release therapy) PRT group and Group B (Reciprocal Inhibition) RI group. Group A received Position release therapy. Group B received Reciprocal Inhibition exercises. Both groups also received ultrasonic as baseline treatment (Continuous mode, 220 Wnm2, 130 Hz frequency, 3-5 min).

The results of current study have shown that Position release therapy and reciprocal inhibition exercises are very effective in reducing pain, and improving MMT, Abd, Add, IR, ER ROM and LEFS scores in soccer players having piriformis syndrome with p-value less than 0.05.

A systemic review was done in 2022 by having a review of different literatures by Disha Shetty and her colleagues to analyze the effects of positional release therapy and its applications in a variety of musculoskeletal conditions. Findings concluded that PRT have significantly beneficial effects to reduce symptoms in a variety of musculoskeletal conditions (17).The results are in agreement with the findings of the current study which concluded that PRT technique and RI exercises both are very effective in reducing pain, and improving MMT, Abd, Add, IR, ER ROM and LEFS scores in soccer players having piriformis syndrome with p-value less than 0.05.

A research study was done in 2022 by Kristina Fritz et al. to evaluate the effects of Strain counter strain aka PRT and facilitated positional release. The study suggested that it is still unclear how well SCS and FPR work to treat psoas dysfunction, iliacus, and piriformis syndrome. However, osteopathic practitioners' training and practice include treating these illnesses with two indirect manipulations (18). This doesn't really support the findings of the current study which suggested that both PRT technique and RI exercises both are very effective in reducing pain, and improving MMT, Abd, Add, IR, ER ROM and LEFS scores in soccer players having piriformis syndrome with p-value less than 0.05.

A review of different literatures was done by A. A. Khakneshin et al. in 2021 to investigate the beneficial effects of different physiotherapy procedures to manage the patients suffering from PS. On the basis of available evidence, findings suggested that the implementation of muscle energy techniques (RI and PIR) along with the stretching exercises of piriformis and other hip muscles can significantly reduce pain (19).These results highly supported the findings of the current study which suggested that both PRT technique and RI exercises both are very effective in reducing pain in soccer players having piriformis syndrome with p-value less than 0.05.

The current study has shown that PRT technique and RI exercises both are very effective in improving MMT scores in soccer players having piriformis syndrome with p-value less than 0.05. These results are inconsistent with the results of the previous research done in 2021 by Musa S. Danazumi et al. that investigated the beneficial effects of neuromuscular inhibition therapy in comparison with PRT to manage the patients having piriformis syndrome. There were no statistically significant differences ($p>0.05$) found in the subjects' baseline clinical and demographic data. Every outcome had a significant time effect, according to a repeated-measures ANOVA, and there was a significant interaction across time and intervention ($p<0.001$). Following treatment and during the 4-month follow-up, the INIT group outperformed the PRT group in every

outcome ($p<0.05$), according to the Bonferroni post hoc analysis of time and intervention effects**.** The findings of the previous randomized controlled study concluded that INIT have shown more effective results than PRT in reducing symptoms of patients suffering from PS (20). In 2020**,** Mitushi Kishor Deshmukh and colleagues performed a RCT to evaluate the efficacy of METs in piriformis tights in chronic low back pain. The findings of this study concluded that the muscle energy technique has longer-lasting benefits and provides instant pain relief while increasing the range of motion, reducing piriformis tightness, and reducing disabilities (21). These findings highly supported the conclusions of the current research which suggested that both PRT technique and RI exercises both are very effective in reducing pain, and improving Abd, Add, IR, ER ROM in soccer players having piriformis syndrome with p-value less than 0.05.

In 2019, Vani vijayan and Pavithra. S conducted a RCT to evaluate the effects of METs in comparison with stretching exercises in reducing pain and improving LEFS scores in patients suffering from PS. When Group A and Group B's mean VAS scores and LEFS scores were compared, Group A's mean values differed significantly ($P < 0.001$).The findings concluded that METs along with SWD have shown very effective results than stretching exercises to reduce symptoms in patients with PS (22). These findings are in agreement with the results of the current study which concluded that PRT technique and RI exercises both are very effective in reducing pain, and improving MMT, Abd, Add, IR, ER ROM and LEFS scores in soccer players having piriformis syndrome with p-value less than 0.05.

The current study has shown that PRT technique and RI exercises both are very effective in reducing pain, and improving MMT, Abd, Add, IR, ER ROM and LEFS scores in soccer players having piriformis syndrome with p-value less than 0.05. These results have not been supported by the previous research done in 2018 by Gopal Nambi Subash Chandra Bose and Gopal Dusad that investigated the kinds of METs (RI and PIR) to improve the symptoms in patients having PS. The findings concluded that PIR technique have shown more efficacious results to reduce pain, and to improve ROM values and functional scores in subjects having PS than RI technique (23). A RCT was performed by Emad Eldin Mohamed Abd Elatief Ibraheem in 2017. The findings of this study concluded that PRT and conventional therapy both have shown significant results to treat chronic low back problem but conventional therapy effects were more obvious than PRT. Study suggested that PRT can show better results when combine with other therapies (24). The results are inconsistent with the findings of the current study which concluded that PRT technique is very effective in reducing pain, and improving MMT, Abd, Add, IR, ER ROM and LEFS scores in soccer players having piriformis syndrome with p-value less than 0.05.

The current study has shown that PRT technique and RI exercises both are very effective in reducing pain, and improving LEFS scores in soccer players having piriformis syndrome with p-value less than 0.05. These results are consistent with the results of the previous research done in 2014 by Mohamed MN and El Shiwi AM that suggested the significant effectiveness of PRT in reducing pain and improving LEFS scores as compared to therapeutic exercises (25).

CONCLUSION:

This study concluded that both Positional release therapy and Reciprocal inhibition were significantly effective techniques to decrease pain, improving ROM, muscle strength and in piriformis syndrome in Soccer players but Reciprocal inhibition was better and effective technique as compared to Positional release therapy.

LIMITATIONS:

- True control group was not present.
- The sample size was small (n=20) so study results cannot be generalized onto a broader population
- Additionally, no psychological recovery barriers that might be connected to chronic pain were evaluated in this study.

RECOMMENDATIONS:

- More researches should be conducted comparing the effects of PRT and RI with other exercises regimes to get the best possible treatment for soccer athletes suffering from piriformis syndrome.
- Further studies should be conducted for the effects of these interventions by taking the sample from different populations.
- The study evaluated the effects of PRT and RI in soccer players having piriformis syndrome. Effect of these therapies can also be observed in other athletic sports having other musculoskeletal condition.

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