PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION VERSUS MYOFASCIAL RELEASE IN TREATING OF SACROILIAC JOINT DYSFUNCTION

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Abstract

Background: Sacroiliac joint dysfunction (SIJD) is a common condition that is defined by pain in the back that is the result of musculoskeletal impairments. The efficacy of Proprioceptive Neuromuscular Facilitation (PNF) as well as Myofascial Release (MR) in the management of this condition has been investigated, with variable results in terms of functional disability, ROM, along with pain intensity.

Purpose: The current study was carried out to investigate the efficacy of PNF versus MR for treating of SIJD.

Subjects and Methods: Fifty male patients who had SIJD referred by Physician were enrolled in this study, the participants' ages varied between 35 and 45, and they were divided evenly into two groups, A and B, using a random assignment method. Twenty-five subjects in Group (A) were given PNF with bilateral symmetrical and lower extremities pattern of exercise trunk muscles while twenty-five subject in group (B) were given MR on the SIJ area. Patients participated in this study were assessed for pain and function by using pressure algometer, The FABER test, Visual analog scale (VAS) as well as Oswestry disability index (ODI) (%). The participants underwent pre- and post-treatment evaluations, with three sessions each week for a duration of 12 weeks.

Results: The data obtained indicated substantial changes in all assessed variables between the two groups prior to and following treatment. There was a statistically significant difference in the average values of all measured variables among groups A and B. This difference favored group A, showing a substantial improvement.

Conclusion: PNF as well as MR can be incorporated into the physical treatment regimen. PNF was found to be more efficacious than MR in reducing pain and improving functionality for patients having SIJD.

Keywords: Myofascial release; Proprioceptive neuromuscular facilitation; Sacroiliac joint dysfunction

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Introduction

Low back pain (LBP) is a prevalent musculoskeletal problem among modern culture, with a reported lifetime Prevalence of up to 90% in the working age group. The cause of LBP is usually found in lesion of the discs or the facet joints at the L4-L5 and L5-S1 levels but almost 50% of the LBP patients are without discogenic pain into the lower limbs. Clearly, the cause is neither the disc nor the facet joints (Laslett, 2008). Notably, certain study publications have proposed that the Sacroiliac joint (SIJ) is a significant major cause of LBP. SIJ pain can be classified into two distinct types: true SIJ pain as well as SIJD (Kenkampha et al., 2013).

SIJ is a common source of pain within the pelvic girdle as well as lower back, which can also cause referred pain in the lower extremity (Cusi, 2010). It impacts a range of 10% to 25% of the population. SIJD is a condition characterised by altered mechanics, which can involve an increase or decrease from the usual normal, or the existence of an atypical movement (Marcucci, 2014). It has been acknowledged as a condition that causes pain originating from the SIJ. This pain is generated by the excessive or abnormal movement of the ilium bone around the sacrum, leading to irritation of the tissues within the SIJ, such as the capsule, ligaments, or even pain receptors (Alkady et al., 2017).

Physical therapy techniques focus on manually correcting malalignment of the SIJ by prioritizing the restoration of the proper balance of muscles in the lower back along with the pelvis. Although the outcomes of managing SIJD are limited, further research is necessary to compare different treatment strategies (Bindra, 2013). Various manual therapies, including passive Maitland mobilisation, Mulligan's mobilisation with movement, and muscular energy treatments, are commonly employed in physical therapy practice (Bautmans et al., 2010).

Pain trigger point injections have been found to be useful in managing acute myofascial pain syndrome (MPS) throughout invasive approaches. Non-invasive therapies such as PNF, stretching therapy, massage therapy, MR, as well as tape therapy have been found to effectively alleviate pain as well as enhancing functional capacities (Lee et al., 2014).

The PNF incorporates both of these sensory responses in its methodology to enhance flexibility, ROM, as well as strength. PNF employs a variety of exercises. Multiple research projects have reached the conclusion that PNF are advantageous for patients suffering from LBP. It is necessary to develop a comparison of their impact in order to provide early as well as more efficient treatment from the disability (Dhaliwal et al., 2014).

Treatment for a blocked SIJ may involve manipulation or mobilization. Additional therapeutic options to consider include manual or semiactive techniques such as MR of the lumbodorsal fascia as well as postisometric relaxation of various muscles including the adductors, piriformis, hamstrings, quadratus lumborum, iliopsoas, latissimus doris, erector spinae, or tensor fascia lata (Liebenson, 2014).

While exercising, it is important to activate the deep intrinsic stabilizers, which include the multifidus, internal oblique abdominals, along with transverse abdominus. Strength training for the quadratus lumborum, gluteus medius, gluteus maximus, along with latissimus dorsi may also be necessary. Most notably, functional core exercises that promote stability patterns in movements as well as postures that are typical of everyday living, athletics, and work (Alkady et al., 2017).

The number of studies on the clinical effectiveness of manual therapy techniques, such as MR therapy has seen a marked increase (Rodriguez-Fuentes et al., 2016).

The primary objectives of the current research were to detect the efficacy of PNF and MR in treating of SIJD and to compare the efficacy of PNF versus MR on decreasing pain and enhancing functional activity among patients suffering from SIJD.

Materials and Methods

Study design

It was a randomized controlled trial. Cairo University, Egypt's Faculty of Physical Therapy's Research Ethical Committee gave approval to this investigation (P.T.REC/012/005187).

Participants

Fifty male patients who had SIJD referred by physician were enrolled in this study and were gathered from Cairo University's faculty of physical therapy's out-patient clinic as well as from the physical therapy out-patient clinics of El-Helal hospital, Cairo, Egypt. The patients were allocated randomly into 2 groups, with 25 patients in each group, as determined using G*POWER statistical software (version 3.1.9.2; Franz Faul, Universitat Kiel, Germany). The software indicated that a sample size of 25 patients per group was necessary for this investigation. The calculations were performed with the following values: $\alpha=0.05$, $\beta=0.2$, effect size=0.4, as well as allocation ratio N2/N1=1.

The study includes patients based on the subsequent criteria: Their ages ranged from 35 to 45 years, unilateral side, being diagnosed as non-specific LBP with SIJD more than 3 months, patients were recorded their initial pain on the pain intensity with VAS in excess of 30 mm (moderate baseline pain), had a positive more than three tests of the following six testing: thigh thrust test, anterior distraction test, side lying iliac compression test, prone sacral thrust test, Gaenslen's test, and the drop (Active hip flexion) test (Aekplakorn and Mo-suwan, 2009; Karolina et al., 2009). Patients with medical instability, insufficient cognition, impairment of sensation or other neurological or psychological problems, significant tightness and/or fixed deformity, skeletal abnormalities of the lower limbs, whether acquired or congenital, as well as cardiovascular dysfunction were not included.

Patients have the right to voluntarily withdraw from the trial at any time. Following the completion of the consent form, patients were allocated into two groups, namely groups A and B, by a random assignment process. Group (A) was treated by PNF with bilateral asymmetrical and lower extremities pattern of exercise trunk muscles while group (B) was treated by MR on the SIJ area.

Based on the flowchart depicted in figure 1, a total of 60 patients were deemed eligible to take part in this study. However, 10 patients dropped out of participation due to their far geographical location. The Block Stratified Randomized Software program (version 6.0 of the Rand.exe randomization tool for Windows) was used to randomly assign fifty individuals into two groups. The block sizes used were 4, 2, and 6 (Figure 1).

Outcome measures

All participants provided informed consent. The enrolled patients were provided with a comprehensive consent form that outlined the methods and objectives of the study. The researcher conducted a concise interview to assess the ages as well as body mass index (BMI) of the patients in addition verify if they fit the research criteria.

Pressure algometer (Baseline Dolorimeters, USA)

It serves as an instrument that can be employed to determine the pressure and/or force that triggers a pressure-pain threshold. Pressure-pain threshold studies have observed that the most reliable results are achieved when the rate of manual force application is consistent. The force plate was used to compare the maximal force reading and the 1 cm2 round rubber application surface of the handheld algometer (Figure 2) (Knapstad et al., 2018).

Visual analog scale (VAS)

It is utilized extensively as a global indicator of pain intensity. VAS has been demonstrated to be a valid, reliable, as well as interval scale. VAS exhibits a high degree of repeatability and reliability when tested repeatedly. This VAS is characterized by a continuous scale that is composed of a horizontal and vertical line, which is referred to as the vertical VAS and the horizontal visual analog scale. Vertical and horizontal VAS exhibit a strong correlation. However,

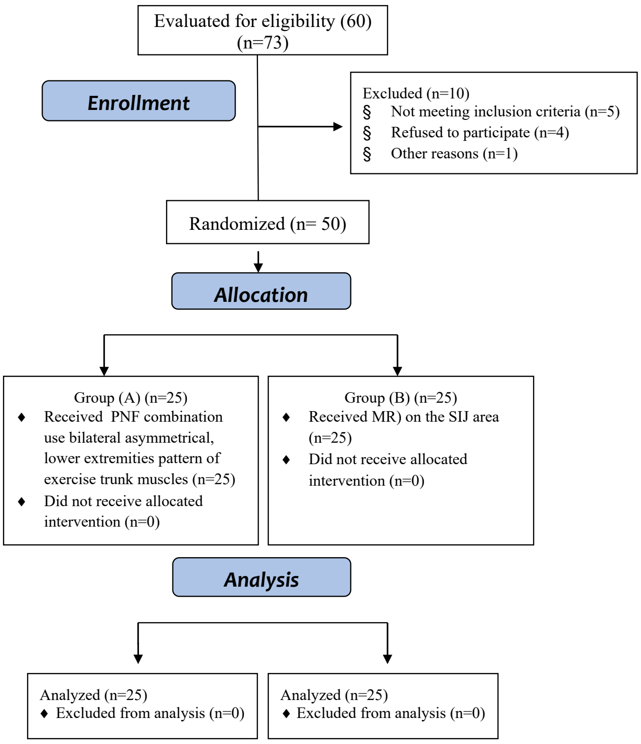

Figure 1. The flow chart of the study.

Figure 2. Pressure algometer.

Figure 3. The FABER test (right and left side) .

the horizontal VAS score is marginally lower than the vertical VAS score (Begum and Hossain, 2019).

Oswestry disability index (ODI) (%)

The ODI is widely regarded as a reliable, valid, and frequently employed tool for the assessment of pain as well as disability. The ODI is widely regarded as the most reliable self-reported outcome measure for assessing the severity of disability as well as QOL. In the 1980s, Fairbank designed it, and it underwent numerous modifications over the years before the final iteration, 2.1, was developed (Amjad et al., 2021).

The FABER test

Purpose

The FABER (Patrick's) Test stands for: flexion, abduction as well as external rotation. The combination of these 3 movements creates a clinical pain provocation test that helps diagnose diseases in the hip, lumbar, in addition sacroiliac area. (Martin and Sekiya, 2008) (Figure 3).

Treatment Program

Proprioceptive neuromuscular facilitation (PNF)

The PNF techniques were applied (Adler et al., 2014) as the following

1) PNF bilateral lower trunk flexion with lower extremity flexion of hip and knee flexion 90 degrees (right and left side):

The patient was positioned in supine and the therapist asked patient to flex lower trunk and flex both lower extremities (knees and hips) on right and left side for 30 sec with giving resistance to the opposite side. on each side followed by 1 min. Relaxation. This exercise was applied for 30 times each session (Figure 4).

2) PNF bilateral lower trunk extension with lower extremity extension of hip and knee extension (right and left side):

The patient was positioned in supine and the therapist asked patient to extend lower trunk and extend both lower extremities (knees and hips) on right and left side for 30 sec with giving resistance to the opposite side. on each side followed by 1 min. Relaxation. This exercise was applied for 30 times each session (Figure 5).

3) PNF trunk lateral flexion (right and left side):

The patient was positioned in supine and the therapist asked patient to flex trunk laterally on right and left side for 30 sec with giving resistance to the

Figure 4. PNF bilateral lower trunk flexion with lower extremity flexion (right and left side).

Figure 5. PNF bilateral lower trunk extension with lower extremity extension with knee extension (right and left side).

Figure 6. PNF trunk lateral flexion (right and left side).

opposite side. On each side followed by 1 min. Relaxation. This exercise was applied for 30 times each session (Figure 6).

4) Combined pattern for the trunk (right and left side):

The patient was positioned in supine and the therapist asked patient to flex trunk laterally and flex both lower extremities (knees and hips) on right and left side for 30 sec with giving resistance to the opposite side. on each side followed by 1 min. Relaxation. This exercise was applied for 30 times each session (Figure 7).

Myofascial release (MR)

The patient was lying face down with their head turned towards the therapist, while the therapist positioned himself at the side of the table, level with the patient's pelvis. The palm of the therapists cephalic hand was placed on the patient's sacrum, finger pointed toward the coccyx. The therapists caudal hand was positioned over the lumbar spinous processes with the fingertips pointing cephalic, thereby contacting the paravertebral soft tissues via the thenar as well as hypothenar eminences. The therapist applied a moderate pressure using both hands towards the front of the body to activate the soft tissues and induce a separation along with distracting effect in the direction of each hand's fingers. This process was then repeated on the opposite side (Figure 8) (Awad and Atta Allah, 2019). The participants had assessment both prior to and following the treatment program, including 3 sessions weekly over a duration of 12 weeks.

Statistical analysis

The acquired data was subjected to statistical analysis using the Statistical Package for the Social Sciences (SPSS), which encompasses:

1. Descriptive statistics: The mean as well as the standard deviation of each variable were determined for the control as well as study groups prior to and 3 months after the implementation of the treatment program.

Figure 7. PNF combined pattern for the trunk (right and left side).

Figure 8. MR on the SIJ area.

2. Inferential statistics: The effect of each treatment was determined by comparing the prior to as well as following treatment findings for each group using a paired t-test. The findings of both groups were compared using an independent t-test conducted prior to as well as following treatment. 0.05 was established as the statistical significance level.

Results

A) Patients demographic data

There was no statistically substantial difference among groups A as well as B in their respective mean ages ($p > 0.05$) (Table 1).

B) Measured variables

1) Before treatment comparison among the two groups (A as well as B):

When contrasting before treatment ± SD of Pressure algometer (kPa/s), VAS and ODI (%) values among groups (A as well as B), non-significant differences were showed ($p > 0.05$) among the two groups (Table 2).

2) Before as well as after- treatment comparison regarding group (A):

When contrasting before as well as after treatment ± SD of Pressure algometer (kPa/s), VAS and ODI (%) values regarding group (A), substantial differences were found ($p < 0.05$) (Table 2).

3) Before as well as after- treatment comparison regarding group (B):

When contrasting before as well as after treatment ± SD of Pressure algometer (kPa/s), VAS and ODI (%) values regarding group (B), substantial differences were found ($p < 0.05$) (Table 2).

4) After treatment comparison among the two groups (A as well as B):

When contrasting after treatment ± SD of Pressure algometer (kPa/s), VAS and ODI (%) values among groups (A and B), substantial differences were found ($p < 0.05$) respectively among the two groups (Table 2).

Discussion

The current study was conducted to investigate the efficacy of PNF versus MR in treating of SIJD.

Table 1 Mean values of age of groups (A and B).

Variable	**Groups**	$\bar{X}$ **± SD**	**t-value**	**p-value**
Age (years)	**Group (A)**	38.92 ± 2.66	0.76	0.454 NS
	Group (B)	39.48 ± 2.58		

Mean SD: Standard Deviation.t-value: Paired and Un-paired t- test value.p-value: Probability value. S: Significant $\bar{X}$.

Table 2. Comparison of Pressure algometer (kPa/s), VAS and ODI (%) for the two groups (A and B). $\bar{X}$**:** Mean. SD: Standard Deviation. P-value: Probability value.

		Group (A) $\bar{X}$ **± SD**	**Group (B)** $\bar{X}$ **± SD**	**p-value**
Pressure algometer (kPa/s)	Before treatment	2.74 ± 0.59	2.64 ± 0.58	0.563^{NS}
	After treatment	3.74 ± 0.61	3.15 ± 0.59	0.001^{S}
	P-value	0.0001^{S}	0.0001^{S}	
VAS	Before treatment	6.76 ± 1.05	6.48 ± 1.09	0.359^{NS}
	After treatment	3.28 ± 0.79	3.88 ± 0.73	0.008^{S}
	P-value	0.0001^{S}	0.0001^{S}	
ODI (%)	Before- treatment	67.37 ± 8.68	67.67 ± 7.69	0.898^{NS}
	After- treatment	37.3 ± 6.5	42.09 ± 6.1	0.01^{S}
	P-value	0.0001^{S}	0.0001^{S}	

NS: Non-Significant. S: Significant

Comparing the prior to and following treatment findings from the group (A) showed a substantial difference that aligns with Areeudomwong and Buttagat, (2019) who proposed that PNF training stimulates the engagement of the core muscles by following the diagonal in addition spiral directions, which align with the topographic arrangement of the muscles involved in everyday activities.

The findings of this study align with those of Paolucci et al., (2018), indicating that PNF is an advantageous non-pharmacological intervention for chronic LBP. PNF has a distinct impact on pain management and waist function among subjects suffering from chronic LBP. Furthermore, PNF can boost the pulmonary function among subjects suffering from chronic LBP. PNF also has the potential to improve the waist function among these patients by enhancing trunk muscle strength as well as coordination, hence increasing trunk stability.

The findings of the current study in group (A) are consistent with the findings of Areeudomwong et al., (2017), who found that PNF training can boost the activity of the paraspinal muscles, leading to increased stability of the lumbar spine in static as well as dynamic situations. It was hypothesized that improved lumbar spine stability might be a factor in the decrease of back pain intensity among subjects suffering from LBP.

A study conducted by Sawant and Ghodey, (2017) examined the effects of PNF on trunk muscle endurance as well as functional capacity with ODI among patients suffering from chronic mechanical LBP. The results demonstrated that PNF significantly improved both measures. In a study conducted by Franklin et al., (2013), the efficiency of PNF for LBP was found to be substantially greater when compared to core stability exercise in terms of improving the ODI score.

Young et al., (2015) stated that a six-week PNF training program resulted in an improvement in pain intensity, as measured by VAS, in older individuals suffering from chronic LBP. (Mok et al., (2014) suggested that patients with chronic LBP exhibit a compromised hip approach when faced with balancing challenges. This could be due to reduced proprioception of the lumbar region and incorrect activation of the muscles in the lower back and pelvis.

The findings of group (A) are supported by George et al., (2013) study, which compared PNF with traditional strengthening exercises targeting the transversus abdominis muscle as well as multifidus. The study demonstrated that PNF resulted in greater improvement in ODI score compared with traditional exercises. Additionally, the study revealed that a three-week PNF training program for trunk muscles, in combination with general trunk exercises, had additional positive effects on pain intensity (measured by VAS) as well as function (measured by ODI) among patients suffering from chronic LBP, when compared to general trunk exercises alone.

The present study's findings were corroborated by Kumar et al., (2011), who reported that PNF resulted in a substantial improvement in ODI score compared to traditional exercise for LBP. The traditional exercise regimen included knee to chest, pelvic bridging, pelvic rolling, as well as alternate arm leg extension. The improvement was observed after a duration of 4 weeks.

Franklin et al., (2013) demonstrated that PNF training resulted in a substantial enhancement in the ROM in lumbar flexion as well as extension among those suffering from LBP in the findings that were obtained within the group. Despite the contradiction with the present investigation, the results also confirmed the findings that PNF training enhanced lumbar ROM in the within-group analysis.

Jeon and Lee, (2009) conducted a study involving 30 patients having chronic LBP. The patients were assigned to the PNF exercise group and completed the PNF chopping along with lifting pattern three times a week for six weeks. The results revealed a substantial improvement in the VAS compared to the pre-intervention period as well the control group. Kim et al., (2011) 30 patients having chronic LBP were randomly assigned to three groups: the control group (I), the core exercise group (II), plus the PNF core exercise group (III). Following a 4-week intervention consisting of 5 sessions per week, the VAS showed a substantial improvement in groups II and III compared to the pre-intervention period. A substantial difference was seen between group I and groups II as well as III during a post hoc comparison.

However, the available trials provide limited evidence that PNF training effectively reduces the intensity of back pain among patients having LBP. The overall summary measure strongly supports the use of PNF training to reduce the intensity of back pain among patients suffering from LBP. Furthermore, the effect size calculated for each trial provides additional evidence of the beneficial effects of PNF training. Clinical trials utilising PNF training consistently outperformed control therapies, regardless of whether the interventions were administered alone or in conjunction with other physical therapy methods (such as electrotherapy as well as exercise). (Pourahmadi et al., 2020).

Comparing the pre as well as post-treatment findings from group (B) showed a substantial difference that aligns with the findings of Degenhard et al., (2017). They observed changes in the levels of various pain biomarkers in the blood, such as endocannabinoids as well as endorphins, after osteopathic manipulative treatment that involved muscle energy techniques. Furthermore, the deactivation of myofascial trigger points (MTrPs) was found to be improved by utilizing various forms of MR.

Group B's findings corroborate those of LeBauer et al., (2018), who claimed that MR's primary purpose was to alleviate pain by relaxing the fascia in the involved area. When it comes to myofascial pain, MR has been shown in multiple trials to alleviate joint stiffness and pain. Patients find MR techniques to be gentle and easy to tolerate.

Altindag and Ozaslan, (2018) confirmed that massage, stretching, as well as pressure can alleviate pain and soreness, but it is unclear whether these effects will endure. Patients who had MR reported much less pain after treatment compared to those who did not.

The objective of the MR technique is to decrease pain, regain lost motion, along with restore the body's aberrant alignment. It removes tissue trauma, breaks down tissue resistance, as well as retrains the body to function in the desired positions.

(Stuart, 2013). Applying direct tissue stretch during the MR to the muscles, fascia, capsule, as well as ligaments can alleviate long-standing hypomobility characterized by significant fibrosis and stiffness (Langevin and Sherman, 2017).

Limitations

This study has a few limitations. It had a small sample size, which might limit the generalization of the results.

Conclusion

PNF was more effective than MR in which aiming to decrease pain and enhance function in patients with SIJD.

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Conflicts of interest

No conflict of interest has been declared by the authors of this academic work.

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