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Original Research Article

Study the Immediate Effects of "Primal Reflex Release Technique™" Versus "Neural Tissue Mobilization" on Hip Flexor Tightness in Individuals with a Sedentary Lifestyle

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ABSTRACT

Background: An inactive life can lead to various problems, such as tightness of muscles, decreased joint mobility, and decreased pliability, which can hinder daily activities. Prolonged sitting puts a lot of force on the muscles, increasing the risk of injury. Studies have shown that many people with desk jobs have tight iliopsoas muscles, resulting in lower strength, restricted hip movement, increased pelvic tilt, and excessive lower back curvature.

Objective: This study investigates the immediate effectiveness of PRRT™ and NTM on hip flexor tightness in individuals with a sedentary lifestyle. The goal is to determine the most effective treatment approach to alleviate hip flexor tightness, thereby reducing associated risks and improving the quality of life for sedentary individuals.

Study Design: Double-blinded Comparative Study

Study Settings: In and around the Himalayan Institute of Medical Sciences, Dehradun

Participants: 60 individuals with a sedentary lifestyle having tight hip flexors in the age group 18-45.

Outcome measures: Hip Flexion Angle measured while performing Modified Thomas Test, Hip Extension Range.

Result: A significant improvement is seen in hip flexion angle (p-value <0.001) and prone hip extension range (p-value <0.001) in both Groups A and B. However, on analysing and comparing the post-intervention results of both groups, no major difference was found in the outcome variables (p-value>0.05).

Conclusion: This study concluded that both techniques are equally effective in reducing hip flexor tightness with a sedentary lifestyle and can mitigate associated risks and enhance the quality of life for sedentary individuals.

KEYWORDS: Hip Flexors, Iliopsoas, PRRT, Neural Tissue Mobilization, Sedentary Lifestyle, Tightness.

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INTRODUCTION

According to one of the WHO's reports Global Action Plan on Physical Activity 2018-2030 (GAPPA), people of the age group of 18-64 years must include moderate and vigorous exercise of 150 minutes and 75 minutes respectively

per week and reduce sitting time. However, studies revealed that 70% of adolescents and 27% of adults are unable to match these recommendations. This physical inactivity, poor physical condition, and sedentary behaviour among the young population are major health concerns worldwide [1].

Since the beginning of the COVID-19 pandemic, research has shown that sedentary behaviour has increased even further, particularly among those working from home [2] This can have a negative impact on various body systems. The nature of sedentary work has been identified as the root cause of different musculoskeletal disorders, such as increased muscle stiffness, fatigue, discomfort, and, in severe cases, low back pain and discomforts, broadly classified under the umbrella of Work-Related Musculoskeletal Disorders (WRMSD) [2,3].

Inactive lifestyles are closely linked to hip flexor tightness. A sedentary lifestyle, characterized by prolonged periods of sitting, keeps the hip flexors in a shortened position. This constant flexed posture causes the hip flexors to adapt and shorten or tighten, leading to reduced mobility and range of motion [4].

As per the definition provided by Kendall et al., hip flexors are said to be tight when an individual cannot achieve full extension of the hip when in the modified Thomas test position. The iliopsoas muscle plays a crucial role in maintaining posture and has been observed to exhibit a significant tendency to shorten (Janda 1978 and 1983). There has been a limited number of studies that determine the iliopsoas length but the research conducted so far shows that almost 20-35% of people with normal physiology exhibit 5 or more degrees of deficit in hip extension due to iliopsoas muscle[5].

In routine activities, hip flexors are not stretched therefore, individuals with sedentary work or lifestyles are more prone to exhibit adaptive alterations which results in shortness of the muscle. This phenomenon warrants attention and intervention to counteract the negative effects of prolonged sitting on posture and musculoskeletal health [6]. Tight Iliopsoas muscle is linked to back pain, causing excessive arching of the spine and forward pelvic tilt, stressing spinal muscles, and possibly leading to disc herniation. Symptoms include lower back and SI joint pain [7].

There are several methods for releasing iliopsoas tension, including PNF, MET, stretching, soft tissue mobilization, and myofascial release [7] but a different intervention like Primal Reflex Release Technique™ (PRRT™) and Neural Tissue Mobilization has not been used. So, this study aims to assess the immediate effect of PRRT™ and NTM on hip flexor tightness in individuals with a sedentary lifestyle. Researching this would contribute to the growing body of evidence-based practices in manual therapy.

METHODOLOGY

Study design: Double-blinded Comparative Study

Sample size: 60 (30 in each method)

Target population: Individuals with Hip Flexor tightness

Sampling Approach: Simple Random Sampling

Study set up: In and around the Himalayan Institute of Medical Sciences, Dehradun

Inclusion Criteria:

· Both male and female

· Age – 18-45

· Sedentary job/lifestyle (minimum 5-7 hours of sitting per day)

· Positive modified Thomas test indicating 10 or more degrees of iliopsoas tightness in either leg

Exclusion Criteria:

· History of the trauma of lumbar spine, Spinal deformity

· Low back pain

· Any pathology around the hip, or knee

· Undergoing any rehabilitation or intervention of lower limb

· Individuals going to the gym

· Pregnancy

Outcome Variables:

· Hip Flexion Angle

· Prone Hip Extension Range

Procedure: The study received ethical clearance from the institutional ethics committee, confirming adherence to ethical principles and guidelines. Subjects were selected based on the inclusion and exclusion criteria and were randomly assigned to one of the two groups after providing informed consent. Group A: PRRT™ and Group B: NTM. Following the pre-assessment, a single session of the intervention was administered to each group then immediately a post-assessment was conducted. A double-blinded design ensured that both assessors and participants were unaware of group assignments during pre- and post-assessments.

Quantification of the hip flexor (iliopsoas) tightness was done by measuring the hip flexion angle while performing a modified Thomas test and measuring the hip extension range with the help of a universal goniometer.

The Hip Flexion Angle was measured with the help of a universal goniometer while positioning the subjects for the modified Thomas test in a supine position at the rim of the examination table. The fulcrum was placed on the greater trochanter, the proximal arm at the pelvis's lateral midline while the distal arm was positioned at the femur's centreline and the angle was calculated [8].

Fig. 1: Recording Hip Flexion Angle in Modified Thomas Test with the help of a universal Goniometer.

To measure the range of hip extension, the subjects were positioned lying face down and asked to extend the hip without moving the pelvis. The fulcrum was aligned at the greater trochanter and the stationary arm and the movable arm were aligned in line with the trunk and the femur's longitudinal axis [9].

For Group A (PRRT™) Iliopsoas release– For PRRT to work on iliopsoas, we worked on its antagonist muscles i.e. hip extensor and abductor.

· The subjects lay face down with the practitioner beside the treatment area then they were asked to extend their hip and maintain this position for 12 sec while the therapist tapped the muscle belly of the gluteus maximus using the hacking method.

· The subjects were positioned side-lying with the treated leg up and were asked to abduct the hip and contract isometrically against the therapist's resistance for 12 seconds. While doing this therapist will tap the abductor compartment by the same method.

Fig. 2: PERFORMING PRRT™ Technique.

A. Performing PRRT™ in prone positing. the patient was asked to extend his hip and maintain this position for 12 sec while the therapist tapped the muscle belly of the gluteus maximus and the posterior aspect of the thigh using the hacking method.
B. Patient is positioned in the side-lying. The lower leg knee is bent and the hip is placed in neutral. The patient was asked to abduct the hip. The lateral part of the thigh and leg is stimulated by the hacking method for 12 sec 3 times and then the patient is made to relax.

For Group B (NTM) Iliopsoas release –

· For the femoral nerve's upper segment gliding technique, the subjects were positioned lying on their side with the treated leg elevated. The practitioner was present at the patient's rear and used their cephalad hand to stabilize the ipsilateral pelvis and hip and the caudal hand to support the ipsilateral leg. From this position, the therapist passively extends the hip joint while performing slow and rhythmic oscillations 12 times.

· For the distal gliding technique of the femoral nerve, a similar approach was used with the hip and knee flexed [10].

Fig. 3: Performing NTM Technique.
A. Proximal gliding techniqueof the femoral nerve
B. Distal gliding technique of the femoral nerve

Data Analysis: Analytical analysis was conducted with SPSS software version 20. Descriptive statistics were computed for quantitative variables and Normality was evaluated by using the Shapiro-Wilk test. To assess the difference in mean within the group, a paired t-test was employed and an independent t-test was employed to differentiate between group A and group B mean. A Significant level of 0.05 was used for data analysis.

RESULTS

In the study, 60 subjects were recruited, with 23% (n=14) being male and 77% (*n*=46) being female. The average age for groups A and B was 25 and 27.3 years, respectively. Within the study, 43.3% of the subjects sit for an average of 5-7 or 7-9 hours per day, and 13.3% sit for an average of 9-11 hours per day.

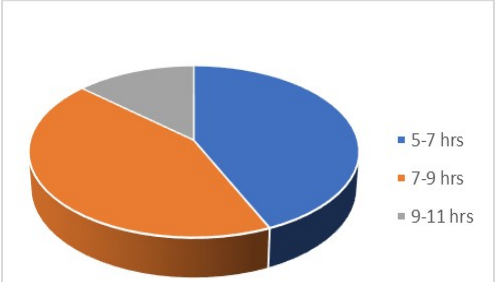

Fig. 4: Average Sitting Hours Per Day Distribution of Sample Studied.

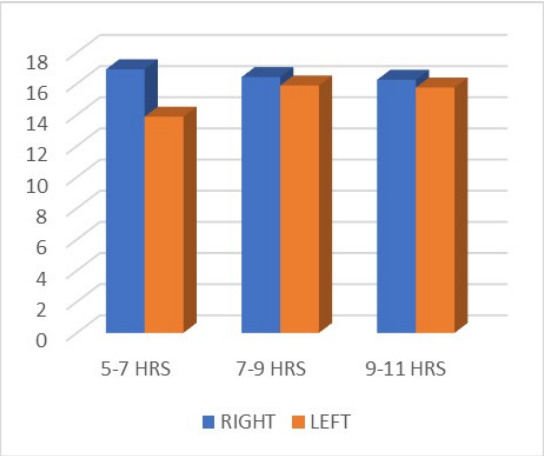

Fig. 5: Mean tightness of muscle concerning average sitting hours.

Group A- Analyzing the Hip Flexion Angle revealed significant differences in Group A on both right and left sides Mean and Standard Deviation (9.50±4.86, 9.10±5.21) when compared with Group A pre-intervention Mean and Standard Deviation (16.33±5.76, 14.80±6.25). Analyzing the Prone Hip Extension Range revealed a significant difference in Group A's post-intervention Mean and standard deviation (23.67±6.79, 24.07±6.09) when compared with pre-intervention of the right and left sides respectively. mean and standard deviation (19.20±6.38, 19.57±6.14).

Group B- Analyzing the Hip Flexion Angle revealed significant differences in Group B on both right and left sides Mean and Standard Deviation (9.5±4.2, 10.07±5.68) when compared with Group B pre-intervention Mean and Standard Deviation (16.9±5.79, 15.2±6.17). Analysing the Prone Hip Extension Range revealed a significant difference in Group B's post-intervention Mean and standard deviation (23.03±7.12, 23±4.63) when compared with pre-intervention of right and left sides respectively. mean and standard deviation (20.63±6.26, 20.60±4.68).

Intergroup comparison- On examining the post-intervention Mean and SD of the Hip Flexion Angle on both the right and left side of Group A (9.50±4.86, 9.10±5.21) and Group B (9.5±4.2, 10.07±5.68), it does not show any significant difference as its p-value exceeds 0.05 (0.37, 0.63) respectively. When the result of the post-intervention Mean and SD of the Prone Hip Extension Range of both Group A (23.67±6.79, 24.07±6.09) and Group B (23.03±7.12, 23±4.63)

were examined, it also didn't show any significant difference as its p-value exceeds 0.05 i.e., 0.75 and 0.2 on the right and left sides respectively.

Therefore, the result indicates that both PRRT™ & NTM are equitably beneficial in decreasing hip flexor tightness in individuals with a sedentary lifestyle.

Table 1: Gender Distribution of the Sample Studied.

Group	Female	Male	Total
Group A	23	7	30
Group B	23	7	30
Total	46	14	60

Table 2: Age Distribution of Sample Studied.

AGE (Years)	NO. OF SUBJECTS	PERCENTAGE
18-30	52	86.6
30-45	8	13.3

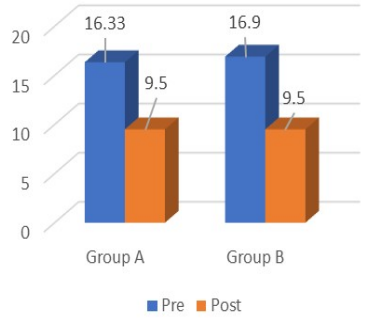

Fig. 6: Hip Flexion Angle (Right).

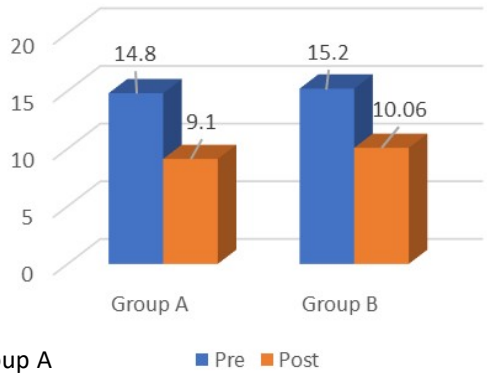

Fig 7: Hip Flexion Angle (LEFT).

Table 3: Within-Group Comparison Of Outcome Measure In Group A (Mean ± SD)

Outcome Variable	PRE (MEAN ± SD)	POST (MEAN ± SD)	p-value
Hip Flexion Angle (Right)	16.33±5.76	9.50±4.86	0
Hip Flexion Angle (Left)	14.80±6.25	9.10±5.21	0
Prone Hip Extension Range (Right)	19.20±6.38	23.67±6.79	0
Prone Hip Extension Range (Left)	19.57±6.14	24.07±6.09	0

Table 4: Within-Group Comparison Of Outcome Measure In Group B (Mean±SD)

Outcome Variable	PRE (MEAN ± SD)	POST (MEAN ± SD)	p-value
Hip Flexion Angle (Right)	16.9±5.79	9.5±4.2	0
Hip Flexion Angle (Left)	15.2±6.17	10.07±5.68	0
Prone Hip Extension Range (Right)	20.63±6.26	23.03±7.12	0.042
Prone Hip Extension Range (Left)	20.60±4.68	23±4.63	0.002

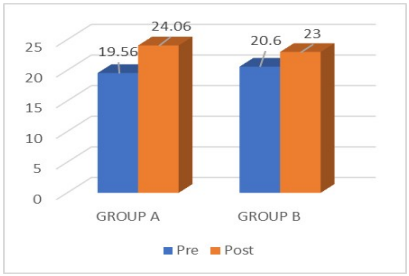

Fig. 8: Prone Hip Extension Range(Right).

Table 5: Intergroup Comparison Of Outcome Measures (Mean±SD).

Outcome variables	Group A Post (MEAN ± SD)	Group B Post (MEAN ± SD)	p-value
Hip Flexion Angle (Right)	9.50±4.86	9.5±4.2	0.37
Hip Flexion Angle (Left)	9.10±5.21	10.07±5.68	0.63
Prone Hip Extension Range (Right)	23.67±6.79	23.03±7.12	0.75
Prone Hip Extension Range (Left)	24.07±6.09	23±4.63	0.19

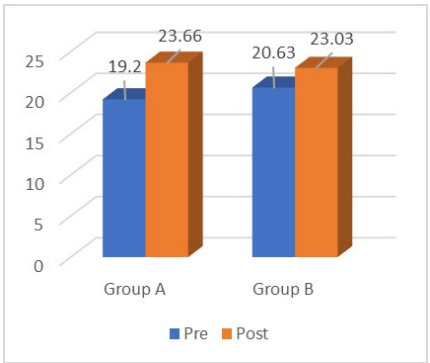

Fig 9: Prone Hip Extension Range (Left).

DISCUSSION

Nowadays people around the world spend most of their time doing sedentary activities especially due to working from home [11]. Sitting time is a common measure of a sedentary lifestyle [12]. In this study, individuals who spend a minimum of 5-7 hours of sitting per day were included and found that 43.3% of the subjects sit for an average of 5-9 hours and about 13.3% for 9-11 hours and as the sitting hours increases the amount of tightness progresses from one leg to both legs.

An existing study executed by Trupti R et al. showed a Significant Prevalence of Hip flexor tightness with decreased physical activities along with long duration sitting hours [13] leads to Decreased iliopsoas length which results in marked anterior tilting of the pelvis or extension of spine, and potentially contributing to LBA [14] that's why various manual techniques are used as an intervention that could perhaps prevent further problems.

The current study was conducted to compare the immediate effect of manual practices- PRRT™ & NTM and find out which one is a better treatment for releasing hip flexor tightness.

Jun-Yong Lee's research compared the iliopsoas tightness in patients with LBA and non-patient population and advised that while practicing physical therapy, emphasis should be on easing iliopsoas muscle thus reducing muscle tension [15], so these manual therapies can be useful for getting immediate results. In different study, the pliability of the iliopsoas was enhanced by stretching it while lying on the back supine, semi-flexed knee, and in side lying which resulted in the pelvis posterior tilt and centralization [16].

Previous case series, on evaluating the use of PRRT™, both Hansberger and Honeycutt observed immediate improvements in pain and function with PRRT™. However, their studies focused on patients with plantar fasciitis and breathing pattern dysfunctions respectively [17]. Likewise in this study, PRRT™ also helped to improve the functional aspect by enhancing the flexibility of iliopsoas along with the range of motion.

Another study conducted by Park J. et al also showed improved hamstring flexibility in healthy individuals by neurodynamic nerve sliding technique. [18] A pilot study conducted by Astha et al (2023) stated that neurodynamic mobilization of the femoral nerve seemed to be effective in comparison to post-isometric relaxation in improving flexibility of iliopsoas muscle in desk-job workers [19] which stated the notion of this study as well that neurodynamic mobilization of the femoral nerve improves flexibility and reduces tightness.

This study used two outcome variables to measure hip flexor tightness- hip flexion angle and prone hip extension range. The single session of PRRT and NTM produced marked improvement in both the outcome variables. The improved Hip extension ROM indicated improved flexibility of the hip joint. The core principle of these improvements includes the proposed mechanism of downregulating the neuromuscular system with PRRT™ and NTM targeting neural tension.

PRRT™ works to alleviate muscle spasm by targeting, resetting of reflexes using reciprocal inhibition to modulate the ANS. During fight or flight response, reflexes can cause the contraction of muscles as a protective mechanism resulting in the release of acetylcholine and serotonin leading to spasms or trigger points. Overactive neurons affect the muscle spindles which in turn affects the length and tension of a muscle. When mechanical tension arises from overactive muscles, stimulating reflexes can be advantageous. This occurs because when the agonist muscle receives a signal to contract, its antagonist muscle simultaneously receives a signal to relax. By targeting reflexes to induce contraction of the antagonist muscle, PRRT™ aims to send a signal from the ANS that helps relax the protective mechanisms in the agonist muscle. This technique leverages the relationship between agonist and antagonist muscles to enhance afferent activity from mechanoreceptors, ultimately leading to a neurological downregulation of muscle tension [20,17].

Neural sliders are a technique used to lengthen the nerve bed at one end, which creates pressure buildup within the nerve from that end while

simultaneously relieving tension from the other end. This approach allows for the promotion of nerve excursion without causing excessive tension buildup. The excursion facilitates the dispersal of intraneural fluid, reducing intraneural edema, alleviating hypoxia, and enhancing axonal transmission. Neural sliders also help restore tissue mobility, decrease neural mechanosensitivity, and alleviate pressure caused by intraneural and extra-neural fibrosis. Additionally, neural sliders can reduce the antidromic impulses generated by malfunctioning type C-fibers, which typically trigger the release of neuropeptides and subsequent tissue inflammation. This technique improves the viscoelastic properties of the nerve, leading to a reduction in pain and disability [21].

Though the mechanisms of both the techniques are different, the analysis between both the groups showed no significant difference between the techniques, indicating both techniques were equally effective. Regardless of the equal effectiveness of both techniques one of the outcome measures i.e. prone hip extension range showed slightly more improvement in PRRT™ (pre-mean ~19, post mean ≃24) group as compared to the NTM group (pre mean 20.6 to post mean 23).

These findings support the effectiveness of both PRRT™ and NTM in releasing hip flexor tightness and thus preventing the risk of discomfort and pain in the lumbar area and Sacroiliac joint.

The study has many limitations including short intervention duration, lack of prolonged monitoring, and a limited participant. Prospective studies can be performed on subjects with low back pain, increased anterior pelvic tilt and lumbar lordosis, a larger sample size, and long-term follow-up.

CONCLUSION

The study determined that PRRT™ and NTM have an equal impact on hip flexor tightness in individuals with a sedentary lifestyle and can mitigate associated risks and enhance the QoL for sedentary individuals.

ABBREVIATIONS

PRRT™- Primal Reflex Release Technique™
NTM- Neural Tissue Mobilization
PNF- Proprioceptive Neuromuscular Facilitation
MET- Muscle Energy Technique
LBA- Low Back Ache
ANS- Autonomic Nervous System
QoL- Quality of Life

AUTHORS CONTRIBUTION

Muskan Jain- contributed towards conceptualization, research process, Data Collection, Manuscript Drafting. **Manish Kumar Jha**- Guided and supervised the research, validation, Data interpretation, visualization writing- review, and editing. **Vamakshi Vijay**- contributed to the data collection and measurement of pre-outcome variables, manuscript drafting, and editing

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Conflicts of interest: **None**

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