# COMPARATIVE EFFECTS OF INSTRUMENT ASSISTED SOFT TISSUE MOBILIZATION AND DEEP TRANSVERSE FRICTION MASSAGE ON PAIN AND GAIT PARAMETERS OF ILIOTIBIAL BAND SYNDROME

## Running Head: IASTM Vs DTF Massage on IT Band Syndrome

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## ABSTRACT

**Objectives:** To examine the impact of instrument-assisted soft tissue mobilization (ERGON) and deep transverse friction massage on pain and gait parameters in patients with Iliotibial band syndrome.

**Methods:** It was a randomized controlled trial study included a sample size of 24 patients with IT band syndrome. Subjects were obtained using purposive sampling with a lottery method, based on predetermined inclusion criteria. Pre and post-treatment readings were taken from each subject for pain using the numerical pain rating scale hip flexion & abduction and Q angle using universal goniometer, respectively. The collected data was analyzed using SPSS version 22.

**Results:** The results of study revealed significant effects within both groups for NPRS, hip abduction and flexion ROM, and Q-angle, with a greater difference observed in the IASTM group compared to the DTFM group, with a p-value < 0.05. Additionally, between-group analysis for NPRS, hip abduction and flexion ROM, and Q-angle demonstrated significant differences between the two groups, with a p-value less than 0.05.

**Conclusion:** In conclusion, the study found that both IASTM and DTFM are effective techniques for reducing pain and improving range of motion (ROM) and flexibility in patients with iliotibial band syndrome. However, the results suggest that IASTM is a superior and more effective technique compared to DTFM in achieving these outcomes.


**Keywords**: Deep transverse friction massage, ERGON, IASTM, Iliotibial band syndrome, Instrument assisted soft tissue mobilization

## INTRODUCTION

The fascia lata is a tough fibrous sheath that lies beneath the superficial layer of skin on the lateral thigh, covering the muscles in that area. It has both vertical and horizontal components. The horizontal fibers connect to the back of the femur bone, while the strong vertical fibers run from the hip bone (iliac crest) to the shinbone (tibia), giving rise to the iliotibial tract [1]. It plays a crucial role in stabilizing the knee joint and protecting the outer thigh. However, when this band becomes tight or inflamed, it can cause friction and irritation on the outer aspect of the knee [2].

Individuals who engage in exercise, particularly runners and cyclists, are more prone to having a tight iliotibial band, which increases the risk of developing iliotibial band-related issues such as patellofemoral pain syndrome (PFPS) and iliotibial band friction syndrome (ITBFS) [3]. The repetitive movement of the iliotibial band during activities like running or cycling, where it moves back and forth over the outer part of the femur bone, can lead to inflammation [4]. The causes of iliotibial band syndrome can vary and may include factors such as being under 34 years of age, previous injury history, tightness of the lateral fascial band, running on hard surfaces, wearing improper footwear, engaging in interval training, having leg length discrepancies, lack of proper recovery, increased knee flexion angle during heel strike, and weakness in the knee and hip muscles responsible for movement and stabilization [5].

Flexibility is crucial for optimal musculoskeletal function and physical performance. Sedentary living can lead to reduced muscle flexibility and decreased range of motion, especially in the Iliotibial band, with a 47% prevalence of tightness in those seated for over 7 hours daily [6]. A study comparing women with IT Band syndrome to healthy distance runners found that those who sat for 5 to 6 hours per day experienced more frequent IT Band tightness and lateral knee pain [7].

Hand mechanical wear can occur from the manual therapy technique of soft tissue mobilization. To address this issue, Instrument-Assisted Soft Tissue Mobilization (IASTM) treatments have been developed, offering therapists a better mechanical advantage [8]. IASTM involves using specialized instruments, like the Graston technique, to manipulate soft tissues and promote connective tissue remodeling, encouraging collagen repair, and releasing scar tissue, adhesions, and fascial limitations [9]. This approach can be beneficial for various conditions, including localized discomfort, tendinopathies, epicondylitis, sprains, strains, and restricted range of motion, ultimately enhancing patients' comfort and functionality [10].

DTFM, a massage technique developed by James Cyriax, is specifically designed for connective tissue, with a focus on soft tissue structures like tendons. This form of massage is commonly used in rehabilitative procedures, particularly in sports medicine, where the transverse or Cyriax method of deep friction massage is frequently applied [11]. By applying physical compression directly to the muscle and tendon attachments, DTFM stimulates the Golgi tendon organs and reduces muscle tension effectively [12]. DFM, on the other hand, is a specialized form of connective tissue massage aimed at maintaining mobility within soft tissue structures like muscles, tendons, and ligaments while preventing the formation of adherent scars. As the name suggests, this massage is deep and performed horizontally on the specific tissue involved, providing therapeutic benefits and preventing the development of scar tissue adhesions [13].

Heyer et al. examined the effects of instrument-assisted soft tissue mobilization (IASTM) on iliotibial band flexibility. The study divided 60 healthy participants into three groups (Graston technique, Gua-Sha technique, and control). Results showed IASTM, particularly the Graston technique, effectively improved iliotibial band flexibility, suggesting its potential benefit for clinicians seeking to reduce strain on their hands during soft tissue mobilization [14].

The study addresses a critical research gap in the field of Iliotibial band syndrome treatment. While there have been studies on various therapeutic approaches, there is limited research specifically examining the effects of Instrument-Assisted Soft Tissue Mobilization (IASTM) and deep transverse friction massage for this condition. As IASTM gains popularity as a soft tissue mobilization technique, there is a need for rigorous scientific investigation to determine its efficacy and compare it with other treatments. Therefore, the purpose of this study was to determine the effects of IASTM and deep transverse friction massage in managing pain and improving gait among patients with Iliotibial band syndrome. By exploring the potential benefits of IASTMand deep transverse friction massage on pain and gait parameters in Iliotibial band syndrome patients, this study seeks to provide essential evidence-based insights that can inform clinicians and therapists in selecting the most effective treatment modalities, ultimately improving patient outcomes and enhancing the quality of care for individuals with this condition.

## Materials and Methods

### Study design

The study employed a Randomized Control Trial (RCT) design to investigate and compare the effects of two different soft tissue mobilization techniques, namely Instrument-Assisted Soft Tissue Mobilization (IASTM) and deep transverse friction massage, on pain and gait parameters in patients diagnosed with Iliotibial band syndrome.

### Study duration

The research was conducted over a duration of four months in various physiotherapy and rehabilitation clinics in Faisalabad.

### Sample size

To determine the sample size, the researchers utilized published literature and statistical software (Open Epi tool). A total of 24 male participants meeting the inclusion criteria were recruited for the study.

### Selection criteria

The inclusion criteria encompassed male patients with IT band tightness, individuals sitting for a minimum of 6-7 hours daily, those with a positive Ober's test, and an age range between 25-45 years. Additionally, participants had to experience pain, rated between 3 to 7 on the numerical pain rating scale, and willingly participate in the study. On the other hand, the exclusion criteria comprised individuals with diagnosed musculoskeletal or autoimmune disorders, co-morbidities like neoplasm, individuals who had undergone lower limb surgery within the past 6 months, those with neurological or vascular disorders, infectious diseases, physical impairments, and participants taking medication such as NSAIDs and steroids.

### Informed consent

Prior to data collection, the participants were thoroughly informed about the data gathering methods, anticipated outcomes, potential risks, and benefits of the study. Informed consent was obtained from each subject who met the inclusion criteria to ensure ethical considerations.

## Interventions

The subjects were divided into two equal groups of 12 each, using purposive sampling with the lottery method. Pre-treatment readings were taken from each participant to establish baseline measurements for pain using the numerical pain rating scale, hip range of motion (abduction), and Q angle using a universal goniometer. The treatment phase spanned three weeks, with both groups receiving treatment independently. The baseline treatment for both groups involved ultrasound sessions. For group A, the intervention included 10 minutes of Instrument-Assisted Soft Tissue Mobilization (IASTM) following the ultrasound warm-up session, while for group B, transverse deep friction massage was administered along with the baseline ultrasound treatment. Three sessions per week were given on alternate days. Following the completion of the three-week treatment period, post-treatment readings were obtained using standardized outcome measures to assess any changes in pain and gait parameters in both groups.

## Data analysis

Data analysis was performed using the Statistical Package for the Social Sciences (SPSS) version 22. Quantitative variables like age were presented as Mean ± S.D, while qualitative variables like gender were presented as frequency and percentage. Paired sample t-test was employed to determine the difference between pre-treatment and post-treatment values (dependent variables). Furthermore, an independent t-test was used to evaluate the difference between the two independent groups for comparison. A significance level of $p \leq 0.05$ was considered statistically significant, and the results were interpreted accordingly.

Figure 1 depicts the technique of Deep Tissue Friction Massage, while Figure 2 demonstrates the application of Instrumental Assisted Soft Tissue Mobilization (IASTM) treatment.

Figure 1 near here

Figure 2 near here

# RESULTS

## Demographic statistics

Table 1 presented the age distribution of 24 participants: 33.4% were in the age group of 25-29 years, 20.9% in the 30-34 years category, 16.8% in the 35-39 years category, and 29.2% in the 40-45 years category. The mean age of the participants was 34.79 ± 7.28 years. Regarding BMI distribution, none of the participants were classified as underweight, 33% were categorized as having a normal weight, 42% were classified as overweight, and 25% were categorized as obese. The mean body mass index of the participants was 26.67 ± 3.80.

## Normality distribution

The normality of the data was assessed using the Shapiro-Wilk test, which is suitable for sample sizes below 50. A significance value greater than 0.05 indicates normal distribution. Results from the test of normality for the study variables (NPRS, Hip abduction and flexion ROM, and Q-angle) showed that all variables had significance values greater than 0.05, confirming their normal distribution. Consequently, parametric tests were applied. Within-group analysis utilized paired t-tests, while between-group analysis employed Independent Sample T-tests.

## Within group analysis of NPRS, Hip ROM and Q angle

Table 2 demonstrates the within-group analysis of Numeric Pain Rating Scale (NPRS), Hip Abduction Range of Motion (ROM), Hip Flexion ROM, and Q-angle for both Group A (IASTM) and Group B (DTFM). In Group A, the pre-treatment mean NPRS was 5.58 ± 0.99, which significantly decreased to 2.08 ± 0.99 post-treatment (mean difference: 3.50 ± 0.67, p-value < 0.05). Hip Abduction ROM improved from 23.85 ± 1.74 to 31.08 ± 2.35 (mean difference: -7.23 ± 1.72, p-value < 0.05), and Hip Flexion ROM increased from 40.91 ± 2.67 to 48.75 ± 2.34 (mean difference: -7.83 ± 1.40, p-value < 0.05) in Group A. In Group B, NPRS decreased from 5.75 ± 0.96 to 3.33 ± 0.98 (mean difference: 2.41 ± 0.51, p-value < 0.05), Hip Abduction ROM improved from 23.96 ± 1.39 to 28.57 ± 1.52 (mean difference: -4.60 ± 0.70, p-value < 0.05), and

Hip Flexion ROM increased from 41.83 ± 2.75 to 45.91 ± 2.67 (mean difference: -4.08 ± 1.16, p-value < 0.05). Both groups also showed reductions in Q-angle, with greater improvement in Group A (mean difference: 1.36 ± 0.21, p-value < 0.05) compared to Group B (mean difference: 0.90 ± 0.17, p-value < 0.05).

## Between group analysis of group A and B

The intergroup comparison of pre and post-intervention values of NPRS, Hip Abduction ROM, Hip Flexion ROM, and Q-angle in patients with ITB syndrome was analyzed using Independent T-tests. At baseline, the pre-NPRS, pre-Hip Abduction ROM, pre-Hip Flexion ROM, and pre-Q-angle values between Group A (IASTM) and Group B (DTFM) were not significantly different (p > 0.05), indicating a similar sample distribution. However, after the treatment, there was a statistically significant difference between the effects of IASTM and DTFM on the post-treatment values of NPRS (p = 0.005), Hip Abduction ROM (p = 0.005), Hip Flexion ROM (p = 0.011), and Q-angle (p < 0.001). Descriptive statistics revealed that the effects of IASTM were more significant than DTFM in reducing NPRS scores and Q-angle, as well as improving Hip Abduction and Hip Flexion ROM among patients with ITB syndrome (Table 3).

## DISCUSSION

Iliotibial band plays a crucial role in stabilizing the knee joint and protecting the outer thigh [2]. Individuals who engage in exercise, particularly runners and cyclists, are more prone to having a tight iliotibial band, which increases the risk of developing iliotibial band-related issues such as patellofemoral pain syndrome (PFPS) and iliotibial band friction syndrome (ITBFS) [3]. The purpose of the study was to determine the effectiveness of IASTM and deep transverse friction massage in managing pain and improving gait among patients with Iliotibial band syndrome.

The findings of this study demonstrate the efficacy of deep transverse friction massage and instrument-aided soft tissue mobilization techniques in effectively alleviating patient discomfort, improving hip abduction and flexion range of motion, and reducing Q-angle in individuals with ITB syndrome. The statistical analysis revealed a significant p-value of 0.05, indicating the strong impact of these interventions. These results are consistent with a previous study conducted in 2023 by Hamna Rahman et al., which similarly highlighted the statistical significance of stretching and myofascial release of the ITB in reducing pain and impairment in patients with knee osteoarthritis [15].

Based on the study's results, there was a significant difference between the effects of IASTM and DTFM on hip flexion range of motion (ROM) in individuals with ITB syndrome. Descriptive statistics indicated that the IASTM technique had a more pronounced effect on improving hip flex ROM compared to DTFM. The post-treatment values of hip flex ROM between Group A and Group B had a significance value below 0.05 (p=0.011), reinforcing the findings. This aligns with the research conducted by Shin and Seungmin et al., which also demonstrated the effectiveness of instrument-assisted soft tissue mobilization in enhancing joint mobility and range [16].

The 2020 study by Jenna Marie Treloar concluded that deep transverse friction massage is not recommended for treating ITB friction syndrome due to challenges in identifying its specific impact amidst multiple treatments used. The limited research available does not support the usefulness of deep transverse friction massage for ITB syndrome [17]. However, the current study's results contradict this, showing beneficial effects of deep transverse friction massage in alleviating symptoms for patients with ITB syndrome. The divergent findings may be attributed to differences in methodology, patient populations, or treatment approaches, necessitating further research to fully ascertain the effectiveness of deep transverse friction massage in managing ITB syndrome.

## Conclusion

In conclusion, this study demonstrated that both IASTM and DTFM are effective techniques for reducing pain, improving hip abduction and flexion ROM, and reducing Q-angle in patients with iliotibial band syndrome. However, the results indicated that IASTM is a superior and more effective technique compared to DTFM in achieving these therapeutic outcomes. These findings highlight the potential benefits of IASTM as a preferred treatment option for individuals with ITB syndrome, warranting further consideration and implementation in clinical practice.

## Limitations

- The study's findings may have limited generalizability due to the small sample size, which may not fully represent the broader population with iliotibial band syndrome.
- There is a possibility of patients over-reporting or under-reporting their symptoms, which could influence the accuracy and reliability of the self-reported data.
- The specific working hours of the selected healthcare settings where the study was conducted might have influenced patient availability and recruitment, potentially introducing biases in the sample population
- The study may not account for potential confounding factors or variables that could influence the outcomes, such as the participants' level of physical activity, adherence to treatment protocols, or the influence of concurrent treatments.
- The study's duration may have been relatively short, and longer follow-up periods could provide a more comprehensive understanding of the treatment effects over time.

## Recommendations

- Future research should aim to conduct investigations with a larger and more diverse sample population. Increasing the sample size will enhance the generalizability of the findings and provide more robust evidence for the effectiveness of IASTM and DTFM techniques in managing iliotibial band syndrome.
- To gain a more comprehensive understanding of the long-term effects and efficacy of the interventions, it is recommended that future studies extend the research duration. This will allow for the assessment of treatment outcomes over an extended period and provide a more reliable estimate of the effect size.
- Exploring the potential impact of practitioner expertise and experience in delivering IASTM and DTFM techniques should be considered in future research. Investigating how the level of practitioner skill influences treatment outcomes can help optimize treatment delivery and improve patient outcomes.
- To address potential biases and enhance the study's validity, future research should implement rigorous methodology, blinding where possible, and standardization of treatment protocols across different sites

- Lastly, sharing the findings of this study and any future research through peer-reviewed publications and conferences will contribute to the dissemination of knowledge, foster collaboration among researchers, and contribute to evidence-based practice in the field of sports physiotherapy

## Acknowledgement

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**Conflict of Interest:** None

**Funding:** No funding was recieved

**Ethical approval:** The study adhered to ethical principles for research involving human subjects. Prior approval for data collection was obtained from the university. Participants were required to provide written consent, assuring the confidentiality and exclusive utilization of their data solely for research purposes.

### Patient consent declaration statement

Informed consent forms were signed by all participants before data collection. The privacy and dignity of all participants were prioritized. All the collected data were kept confidential.

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**Fig 1: DTFM treatment**

**Fig 2: IASTM treatment**

## Consort Diagram

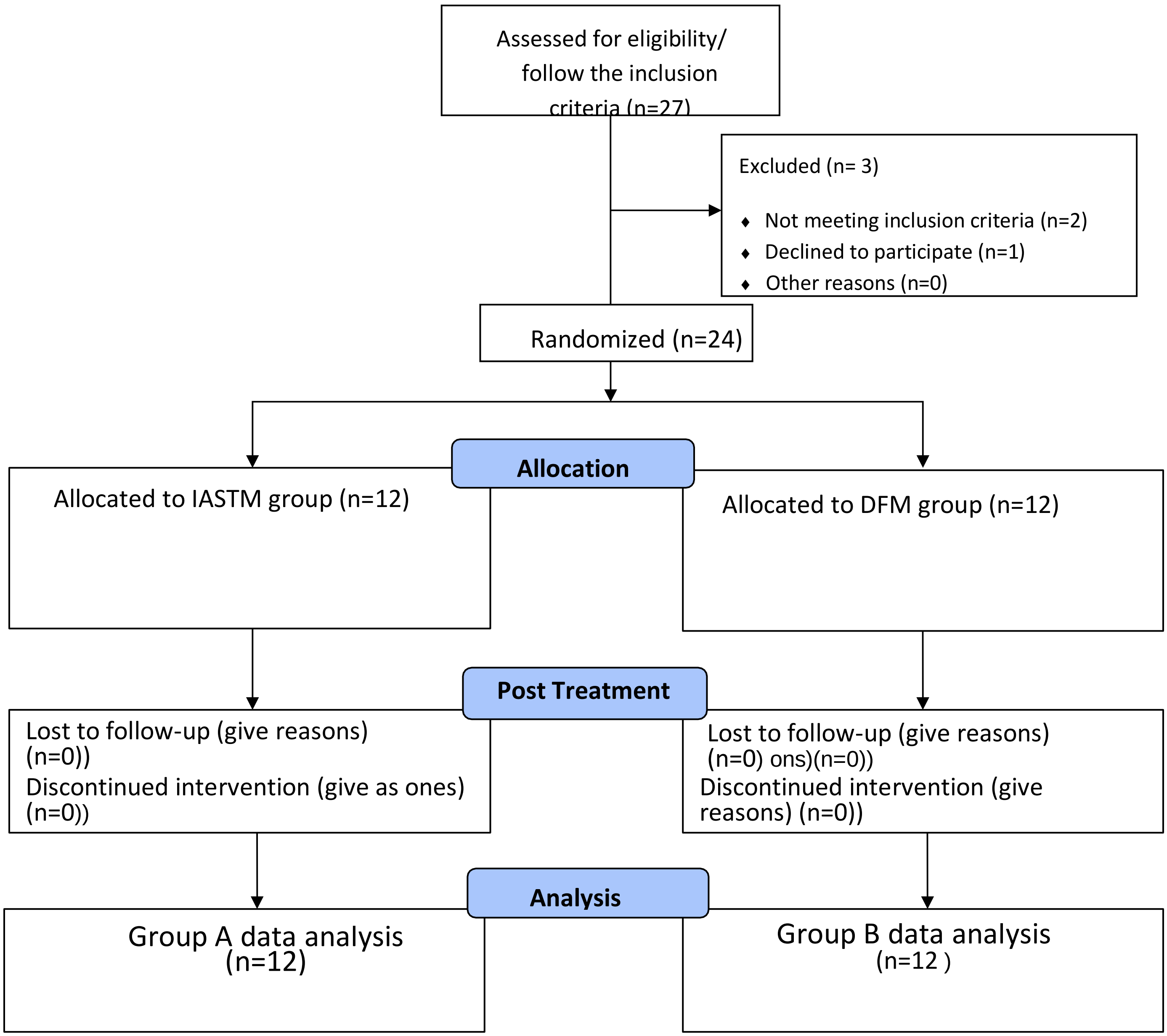


**Figure 3: Consort Flow chart**

| Table 1: Demographic statistics | | |
|---|---|---|
| **Age** | 25-29 | 8(33.4%) |
| | 30-34 | 5(20.9%) |
| | 35-39 | 4(16.8%) |
| | 40-45 | 7(29.2%) |
| **BMI** | Underweight (<18.5) | 0(0%) |
| | Normal (18.5 - 24.9) | 8(33%) |
| | Over-weight(25-29.9) | 10(42%) |
| | Obese(>30) | 6(25%) |

| Table 2 : Within group analysis | | | | |
|---|---|---|---|---|
| **Study Group** | | **Mean±Standard Deviation** | **Mean Difference** | **P-value** |
| Group A | NPRS-PRE | 5.58±0.99 | 3.50±0.67 | **0.000** |
| | NPRS-POST | 2.08±0.99 | | |
| Group B | NPRS-PRE | 5.75±0.96 | 2.41±0.51 | **0.000** |
| | NPRS-POST | 3.33±0.98 | | |
| Group A | Hip Abduction-PRE | 23.85±1.74 | 7.23±1.72 | **0.000** |
| | Hip Abduction-POST | 31.08±2.35 | | |
| Group B | Hip Abduction-PRE | 23.96±1.39 | 4.60±0.70 | **0.000** |
| | Hip Abduction-POST | 28.57±1.52 | | |
| Group A | Hip Flexion ROM-PRE | 40.91±2.67 | 7.83±1.40 | **0.000** |
| | Hip Flexion ROM-POST | 48.75±2.34 | | |
| Group B | Hip Flexion ROM-PRE | 41.83±2.75 | 4.08±1.16 | **0.000** |
| | Hip Flexion ROM-POST | 45.91±2.67 | | |
| Group A | Q-angle-PRE | 14.90±0.24 | 1.36±0.21 | **0.000** |
| | Q-angle-POST | 13.53±0.24 | | |
| Group B | Q-angle-PRE | 14.94±0.19 | 0.90±0.17 | **0.000** |
| | Q-angle-POST | 14.03±0.29 | | |

**Table 3: Between group Analysis**

| **Variable** | **Group A (IASTM) Mean±Standard Deviation** | **Group B (DTFM) Mean±Standard Deviation** | **Mean Difference** | **P-value (2-tailed)** |
|---|---|---|---|---|
| NPRS-PRE | 5.58±0.99 | 5.75±0.96 | -1.667 | 0.681 |
| NPRS-POST | 2.08±0.99 | 3.33±0.98 | -1.25 | **0.005** |
| Hip Abduction ROM-PRE | 23.85±1.74 | 23.96±1.39 | -0.116 | 0.858 |
| Hip Abduction ROM-POST | 31.08±2.35 | 28.57±1.52 | 2.50 | **0.005** |
| Hip Flexion ROM-PRE | 40.91±2.67 | 41.83±2.75 | -0.91 | 0.418 |
| Hip Flexion ROM-POST | 48.75±2.34 | 45.91±2.67 | 2.83 | **0.011** |
| Q-angle-PRE | 14.90±0.24 | 14.94±0.19 | -0.04 | 0.645 |
| Q-angle-POST | 13.53±0.24 | 14.03±0.29 | -0.50 | **0.000** |