

## Original Research Article

# **Comparative Effectiveness of Adductor Pull Back Exercise and Gluteus Maximus Activation Exercise on Pain and Functional Ability among Subjects with Anterior Rotated Sacroiliac Joint Dysfunction**

## **Abstract**

Sacroiliac joint dysfunction (SIJD) is one of the common pain generators resulting in chronic pain. Many of the day-to-day activities involve lifting and twisting of the trunk and pelvis, which commonly leads to anteriorly rotated SIJD. Life-time prevalence of low back pain is 85%. In 10% to 25% of these patients, sacroiliac joint may be the cause of pain. The objective of the study was to compare the effectiveness of adductor pull back exercise and gluteus maximus activation exercise on pain and functional ability among subjects with anteriorly rotated SIJD. A quasi-experimental study with purposive sampling technique was conducted on subjects who were clinically diagnosed with anteriorly rotated SIJD and fit the study's eligibility criteria, and were allocated into two groups. Group A received adductor pull back exercises for 8 weeks, whereas group B received gluteus maximus activation exercises for the same duration. The outcome measures assessed were numerical pain rating scale (NPRS) for pain and modified Oswestry Disability Index (mODI) for functional ability. The study identified that both groups were effective in relieving pain and improving functional ability in anteriorly rotated SIJD.

## **Keywords**

Anterior Rotated Sacroiliac Joint Dysfunction, Adductor Pull Back Exercise, Gluteus Maximus Activation Exercise, Pain, Functional Ability.

## **INTRODUCTION**

Low back pain is a significant health issue that lowers quality of life. One typical source of pain that leads to chronic pain is the sacroiliac (SI) joint. The articular surfaces between the iliac and sacral bones make up the sacroiliac joint. It is a diarthrodial synovial joint that contains synovial fluid. Younger people have greater mobility than older people. Adults develop fibrosis in the top two thirds of the joint.<sup>1</sup>Regardless of treatment, the prognosis was favourable for acute low back pain.<sup>2</sup>Pain in the SI joint region is a symptom of sacroiliac joint dysfunction (SIJD), which is brought on by the improper mobility of the sacroiliac joint.<sup>3</sup>

85% of people will experience low back discomfort throughout their lifetime. The SI joint may be the source of discomfort in 10% to 25% of these people.<sup>3</sup>It appears as a developing issue with varying symptoms that may be brought on by particular daily activities, sports, or exercise.<sup>4</sup>Those who have chronic SIJD may experience muscle atrophy and deconditioning throughout their bodies as a result of being unable to engage in activities and exercises that don't aggravate their low back discomfort. The adult population is most commonly affected by SI joint diseases. People of all racial and gender identities can have SI joint problems.<sup>5</sup>

Exercises to strengthen the adductors are intended to address asymmetry in posture and to realign the lumbopelvic femoral area. Additionally, according to research done by the Postural Restoration Institute, adductor pull back exercise may help with pain management and functional activity restriction brought on by SIJD.<sup>6</sup>

Adductor pull back exercise aims to correct the bone and soft tissue positioning of the trunk and pelvis and is used to treat a number of musculoskeletal dysfunctions. It also helps to alleviate postural asymmetry associated to the anterior-interior chain pattern. Patients would engage in the exercise with the goal of reducing pain and functional abilities if they had subjective complaints and objective examination results related to asymmetry.<sup>6</sup>

Functional impairment results from the inability to stabilize the pelvis, which is caused by abnormal gluteus maximus activation during load transfer via the pelvis and gluteus maximus inhibition. It has been demonstrated that adequate activation of the gluteus maximus increases the force of compression across the SI joint and is crucial for pelvic stabilisation. Consequently, gluteus maximus activation training will help persons with forward rotated SI joint pathology reduce their pain and improve their functional capacity.<sup>3</sup>

There are several evidences available for manual therapy to treat anterior rotated SIJD but there is few articles available for exercise therapy and there is no article to determine the best exercise for anterior rotated SIJD. So this study emphasize for these exercise.

The main purpose of the study is to compare the effect of adductor pull back exercise and gluteus maximus activation exercise on pain and functional ability among anteriorly rotated sacroiliac joint dysfunction (SIJD).

## **MATERIALS AND METHODS**

The study is a quasi-experimental, and the purposive sampling technique was used. The study protocol was approved by the institutional ethics committee. Patients were evaluated and treated in orthopaedic outpatient department of our institution. The eligible participants who matched the selection guidelines provided a written authorization. The following criteria were used to identify people with impairment of the forward rotated SI joint: 1) only localized discomfort in the SI area or previous episodes of unilateral pelvic discomfort; 2) favourable findings from dynamic form closure tests such as the stork test, sitting flexion test, and standing flexion test; 3) positive results from at least three of five sacroiliac joint pain aggravation tests; 4) age between 25 to 40 years; 5) both male and female; 6) subacute pain; 7) patient who willing to participate in study.

Any previous pelvic fractures or spinal injuries, any post-surgical illnesses within the last six months, any neurological symptoms, any cardiac conditions, spondylolisthesis, tuberculosis spine, pregnancy, symptoms that worsened after the initial intervention, limb length discrepancy, and patients who were unable to participate for the entire course of the intervention were eliminated from the study. Sample size calculated by G power with effect size 0.8 and alpha error of 0.05. The calculated total sample size was 52, and with 10% attrition rate, the final sample size was identified as 62 patients.

Patients were assessed with modified Oswestry Disability Index (mODI) questionnaire to assess their functional ability, and Numerical Pain Rating Scale (NPRS) for pain assessment.

#### ***Modified Oswestry Disability Index***

Modified Oswestry Disability Index (mODI) is a questionnaire used to assess disability in chronic low-back pain and SI joint pain patients by determining its impact on daily activities due to pain. The minimal clinically important change score (MCID) ranges from 3.5 to 19.5 for ODI scale, and its minimal detectable change (MDC) is 15.5.<sup>9</sup>

#### ***Numerical Pain Rating Scale***

The NPRS measures subjective intensity of pain. It is 11 point scale score 0 to 10. 0 indicates no pain and 10 indicates most intense pain imaginable. Minimally clinically important change for low back pain is two points. Minimal clinically importance difference at one week of physiotherapy treatment is reported to be 1.5 points, and at four weeks of physiotherapy treatment is 2.2 points.<sup>10</sup>

#### ***Procedure***

62 people with unilateral anterior rotated sacroiliac joint dysfunction were selected on the basis of inclusion and exclusion criteria. Subjects were then divided into two groups using simple randomization method. The outcome measures (NPRS and mODI) were then

assessed. Experimental group A received adductor pull back exercise and group B received gluteus maximus activation exercise. No modalities and conventional exercise given to the patients during this period. After eight weeks of exercise sessions, NPRS and mODI were assessed and recorded. The initial session of treatment was provided at the institution under supervision, and patients were advised to perform other sessions at home. A written exercise protocol was provided for home programme. Patients were assessed weekly twice for the effectiveness and proper technique of exercises performed at the institution. Each session lasted for 20 minutes, and were performed six days in a week. Every exercise begin with a 10-second hold, 10 repetitions, and one set, performed twice daily.

### ***Adductor Pull Back Exercise***

The patient was positioned in sidelying (on the unaffected side). The subject was told to lie on their side with their hips and knees bent about  $90^{\circ}$ , as well as their lumbar spine bent (relative posterior pelvic tilt). For proximal movement stability, the individual were then instructed to contact the wall with their feet. They were asked to use one or two pillows to support their neck while keeping their muscles relaxed. A cloth was used between the knees, and a bolster of the proper size between the feet for proper positioning. It permits the passive affected side hip femoral acetabular internal rotation such that the knee should be lower than the affected side hip and ankle (Figure 1).

The subject were then asked to move their affected side (upper side) leg back while simultaneously pushing the unaffected side foot into the wall and inhaling through their nose. The patient were then told to exhale through their mouth and squeeze into the towel for three seconds as the next stage. The individual should feel their afflicted side inner thigh engaged as they continue to bring back the affected side leg while taking another breath. Patient must continue the procedure until they have taken four to five full breaths in and out. At each inhalation, they should make an effort to move their left leg back even farther. Subjects were

then asked to relax before bending their knees to return to their initial posture, repeating the process four more times.



Figure 1. Adductor Pull Back Exercise

### ***Gluteus Maximus Activation Exercise***

Exercises for gluteus maximus activation included crook lying activation, bridging both unilateral and bilateral activation, and prone lying hip lift (Figure 2).



Figure 2. Gluteus Maximus Activation Exercise

### ***Statistical Analysis***

The statistical analysis were performed using IBM SPSS statistics tool. Baseline normality was checked using Kolmogrov Smirnov test for age, gender, NPRS, and mODI. Paired t-test analysis was performed for NPRS and mODI outcome measures for within-group analysis. Independent t-test was used for the NPRS and mODI for between-group analysis. A p-value of <0.05 was considered statistically significant.

## RESULTS

The study assessed 88 patients with SIJD, of which 62 subjects were recruited and completed the study. The data were normally distributed and the results are projected as mean and standard deviation of NPRS and mODI. The mean age of subjects in the experimental group A was  $39.13 \pm 9.96$  years and in experimental group B was  $36.71 \pm 10.24$  years. There were 30 males and 32 females among the study population. There were no adverse effects experienced by any of the subjects throughout the study. The consort diagram of the study is depicted in Figure 3.

UNDER PEER REVIEW

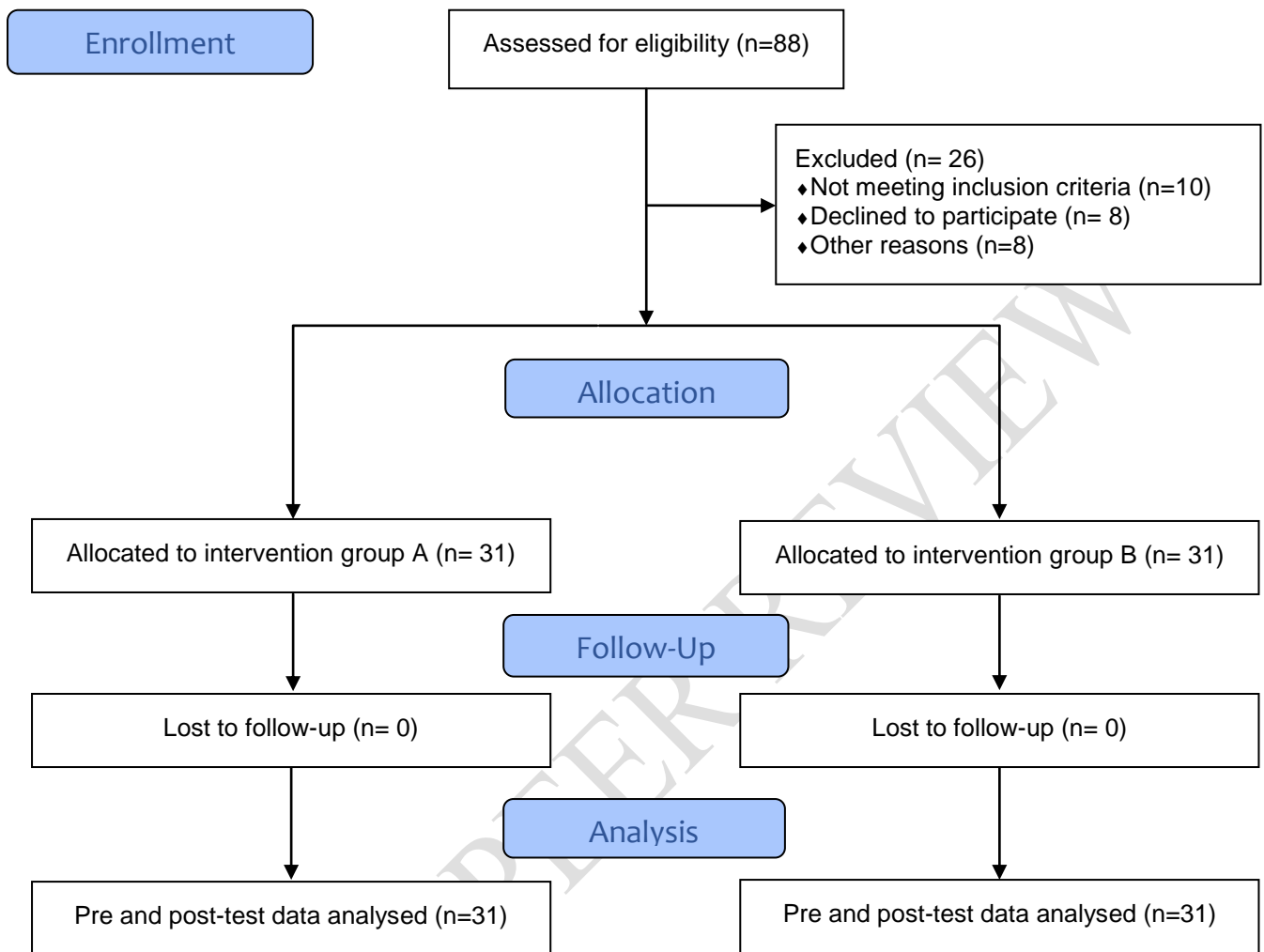


Figure 3. Consort Diagram of the Study

The within group analysis in group A and group B showed improvement in NPRS, with mean score reducing from 6.26 to 0.42, and 6.45 to 0.26, respectively. Post eight weeks of intervention, both groups demonstrated a statistically significant change ( $p$  value  $< 0.0001$ ). In the between group analysis, the mean score of NPRS in group A was 0.42 and group B was 0.26. The analysis reported a  $p$  value of 0.2696, which was statistically not significant. Hence there was no difference between groups at the end of eight weeks of intervention (Figure 4).

The within group analysis in the group A and group B showed improvement in mODI from

49.42 to 22.13 and 60.32 to 22.10, respectively. The changes were statistically significant with  $p$  value  $< 0.0001$ . However, in between group analysis, mODI in group A (22.13) and group B (22.1) did not demonstrate statistical significance ( $p=0.9622$ ) (Figure 4).

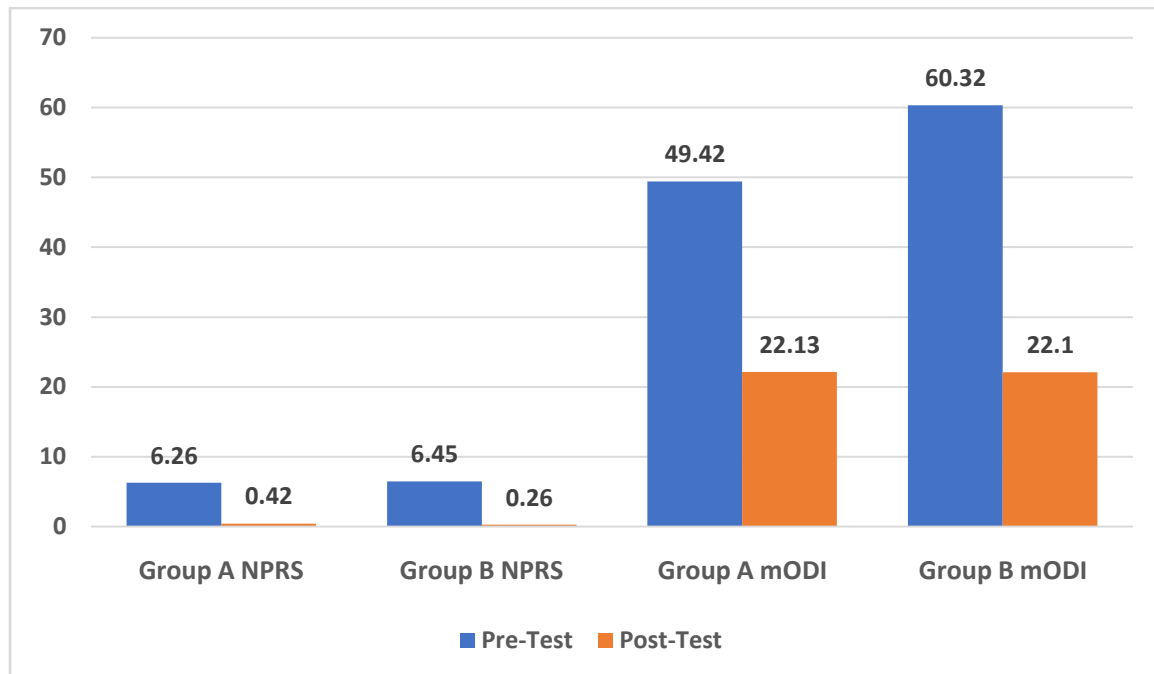


Figure 4. Pre and post-test values of outcome measures in Group A and Group B

## DISCUSSION

The study aimed to compare the effects of adductor pull back exercise and gluteus maximus activation exercise on pain and functional ability on subjects with anteriorly rotated SIJD. Homogenous similarity recorded at baseline for gender and age.

The result of the study demonstrated equal effect of both interventions in improving pain and function in patients with SIJD. But, gluteus activation exercises showed a mean change of 38% in functional ability assessed using mODI, whereas adductor pull back exercises recorded a mean change of 27% only. This may be attributed to an increased mODI scored at baseline in group B.

The adductor pull back exercise approach in group A may have contributed to the improvement in discomfort and functional abilities. Poorly approximated hip and hip capsule constriction, weak and lengthy adductors, internal oblique and transverse abdominis, short overacting paraspinals that can cause pain, and limited functional ability are all symptoms of anteriorly rotated SIJ.<sup>5</sup> Together, the local stabilizer and the global stabilizer form a rigid cylinder within the abdominal cavity, shielding the SIJ from mechanical stress and facilitating normal load distribution to the pelvis and lower extremities.<sup>11</sup> Because of the altered mechanical stress and load transfer caused by the muscles' decreased thickness, SIJ pain and low back pain may occur in the joint. In order to manage lumbopelvic diseases, a suitable exercise programme should be used to train the muscular system.<sup>11</sup>

In adductor pull back exercise it reposition the SIJ and also which activates the adductor magnus and medial hamstring. If these muscles are lengthy or weak, training and stimulating them may help tighten and strengthen them.<sup>5</sup> By activating and shortening the adductors, internal oblique, and transverse abdominis muscles, as well as by inhibiting and lengthening the paraspinal muscles, the adductor pull back exercise technique helps to align the SIJ, the anterior gluteus medius, and the ischio condylar adductor magnus, which in turn activates the ischio condylar adductor magnus. When a muscle group is engaged, its antagonist is inhibited; this phenomenon is known as reciprocal inhibition.

The hip goes into internal rotation and adduction during the inhalation phase, lengthening the ischio femoral ligament and posterior hip capsule. Right anterior outlet and left anterior inlet muscles are lengthened and inhibited by the left hip motion. As a result of compensating for the left AIC, the left posterior hip capsule may tighten and shorten. The left adductor magnus and left medial hamstrings are engaged during this motion, which calls for the hip adductor and internal rotation muscles.<sup>12</sup>

The left posterior pelvic outlet must be forced open by the left pelvic floor fulcrum during

inhalation in order for the left hip to be more easily attained and unrestricted by the pelvis. Using an exercise programme combined with postural restoration technique, Michael et al. investigated the benefits of this technique on SIJ discomfort.<sup>5</sup> The adductor pullback exercise was found to have a considerable positive impact on pain and functional abilities in the current investigation.

Subjects who had lumbopelvic discomfort that persisted and had SIJD positive clinical tests were in group B. After an 8-week plan to activate the gluteus maximus, individuals showed a significant improvement in function and a reduction in pain. Through dynamic muscular action, gluteus maximus strengthening exercises stabilise the SI joint. The theory that the gluteus maximus may produce compressive forces at the SI joint and aid in load transfer between the lower limb and trunk has been substantiated by anatomical and biomechanical research.<sup>13</sup>

The delayed start of gluteus maximus has been hypothesized to affect the compressive force on the SI joint and obstruct mechanisms needed for load transfer. In people with SI joint pain, the initiation of gluteus maximus contraction is delayed. So it makes sense that exercises aimed at enhancing gluteus maximus timing and function should be performed.<sup>3</sup> The findings of this study indicate that strengthening activities for the gluteus maximus should be included for people with anterior rotated SIJD.

Limitations of the study are smaller sample size, unsupervised home programme, and the use of minimal outcome measures to assess the improvements in patients with the interventions. Future suggestions can include the long term effects of interventions, investigate the incidence of relapse, and can include EMG analysis during exercises.

## **CONCLUSION**

The present study concludes that eight weeks of adductor pull back exercise and gluteus

maximus activation exercise found to generate statistically and clinically significant effect on improving pain and functional ability in patients with SIJD. Hence, these interventions can be incorporated with other treatment strategies for better prognosis of the patients.

## REFERENCES

1. Tilvawala K, Kothari K, Patel R. Sacroiliac joint: A review. *Indian Journal of Pain*. 2018 Jan 1;32(1):4.
2. van Tilburg CW, Groeneweg JG, Stronks DL, Huygen FJ. Inter-rater reliability of diagnostic criteria for sacroiliac joint, disc and facet joint pain. *Journal of back and musculoskeletal rehabilitation*. 2017 Jan 1;30(3):551-7.
3. Sanika V, Prem V, Karvannan H. Comparison of Glutes Maximus Activation to Flexion Bias Exercises Along with MET Technique in Subjects with Anterior Rotated Sacroiliac Joint Dysfunction—a Randomised Controlled Trial. *International Journal of Therapeutic Massage & Bodywork*. 2021 Mar;14(1):30.
4. DonTigny RL. Pathology of the Sacroiliac Joint, its Effect on Normal Gait, and its Correction. *Journal of Orthopaedic Medicine*. 2005 Jan 1;27(2):6.
5. Raj MA, Ampat G, Varacallo M. Sacroiliac joint pain. In *StatPearls* [Internet] 2022. StatPearls Publishing.
6. Kumar SN, Akalwadi A, Babu VK, Wani ZR. Efficacy of adductor pull back exercise on pain and functional disability for sacroiliac joint dysfunction. *International Journal of Physiotherapy*. 2015 Aug 1;2(4):667-75.
7. Shori G, Joshi A. Effect of right sidelying respiratory left adductor pull back exercise in subjects with iliotibial band tightness. *Physiotherapy Quarterly*. 2017;25(1):13-6.
8. Cibulka MT. Sacroiliac joint dysfunction as a reason for the development of

acetabularretroversion: a new theory. *Physiotherapy Theory and Practice*. 2014 May 1;30(4):249-53.

9. Hungerford B, Gilleard W, Hodges P. Evidence of altered lumbopelvic muscle recruitment in the presence of sacroiliac joint pain. *Spine*. 2003 Jul 15;28(14):1593-600.
10. Copay AG, Cher DJ. Is the Oswestry Disability Index a valid measure of response to sacroiliac joint treatment?. *Quality of Life Research*. 2016 Feb;25:283-92.
11. Childs JD, Piva SR, Fritz JM. Responsiveness of the numeric pain rating scale in patients with low back pain. *Spine*. 2005 Jun 1;30(11):1331-4.
12. Hossain M, Nokes LD. A model of dynamic sacro–iliac joint instability frommalrecruitment of gluteus maximus and biceps femoris muscles resulting in low backpain. *Medical Hypotheses*. 2005 Jan 1;65(2):278-81.
13. Boyle KL. Clinical application of the right sidelying respiratory left adductor pull backexercise. *International Journal of Sports Physical Therapy*. 2013 Jun;8(3):349.