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# Inter-Rater Reliability of Pain Provocation Tests for Sacroiliac Joint Dysfunction with Low Back Ache in Indian Population

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## ABSTRACT

**Background:** Low back torment (LBP) is normal outer muscle objections in the present social orders. The commonness of low back torment is 70-80% in the western populace. The pervasiveness shows 15-30 % of people with low back pain having inclusion of sacroiliac joint as the origin. Past examinations on the dependability of agony incitement tests have shown uncertain and showing unfortunate unwavering quality when performed with mix of movement palpation tests. The aim of the study is to find the inter - rater reliability of pain incitement tests in low back pain patients to survey sacroiliac joint dysfunctions Indian populace.
**Materials & Methods:** Inter-rater reliability of sacroiliac joint pain provocation tests. Total 30 patients with low back pain were included in the study based on the pain evaluation and inclusion criteria, and patients were assessed by using pain provocation tests.
**Results & Analysis:** The kappa value ranged 0.58-0.60 (p = <0.05) and 0.65- 0.66 (p=0.05), 95% CI – 0.60 – 0.78, when compared to the ICC classification of kappa values.
**Conclusion:** The results are showing modest to strong reliability in this study. These tests are reliable and may be used to detect a SIJ source of low back pain.

***Key words:*** Sacroiliac joint, Low back pain, pain provocation tests, sacroiliac joint dysfunction, Sacroiliac joint pain, lumbar fusion, reliability, inter rater reliability.

## INTRODUCTION

Low back pain is quite possibly of the most well-known skeletal muscle grievance in day-to-day existence. Studies have shown a lifetime commonness of low back pain in 70-80% of the western population.[1] The sacroiliac joint (SIJ) can be a nociceptive source.[2]

The prevalence reveals that the sacroiliac joint is included as the cause of low back pain in 10–64% of cases.[3] Goldthwaite described the SI joint as one of the sources of low back pain in 1905 [4].

SIJ is a bilateral C shaped synovial joint surrounded by a fibrous capsule and affixes the sacrum to the ilia. Several sacral

ligaments and pelvic muscles support the SIJ.[5]

SIJs must support the upper body and mitigate the force of walking; the same ligaments that restrict the joint's mobility also provide it strength. These comprise the interosseous ligaments, sacrospinous, dorsal, anterior, and dorsal SI ligaments, as well as the sacrotuberous and sacrospinous ligaments. Together, they effectively stop the joint from separating and the pelvis from moving along the multiple axis of the sacrum. Finally, as weight is distributed from the torso to lower extremities, these ligaments work together to maintain bracing. Collectively, they provide support and enable mobility by synchronising with the thoracolumbar fascia, gluteus Maximus, piriformis, and latissimus dorsi.[6]

Patients may be predisposed to SIJ pain for a variety of reasons. True and apparent leg length inequalities, transitional anatomy, gait anomalies, low-grade injuries (such as jogging), scoliosis, pregnancy, and spine surgery are some of these. Due to weight growth, an accentuated lordotic posture, ligamentous relaxation brought on by hormones in the third trimester, and pelvic trauma from delivery, pregnancy can cause SIJ pain.[6]

SIJ dysfunction could arise from intra-and extra articular etiologies, including capsular disruption, ligamentous tension, muscular inflammation, shearing, arthritis.[5]Axial loading and sudden rotation have both been proposed as contributing factors in the process of SIJ impairment.[6]

There are biomechanical differences between male and female SIJs, with female SIJs having more mobility, stress, loads, and pelvic ligament stresses than male SIJs. This might be the cause of the increased occurrence of SIJ in females.[7]

As per Mark Laslett review SIJ tests have huge demonstrative utility. Six provocative test were chosen based on recently shown satisfactory between inter examiner reliability. Two of four positive tests (interruption, pressure, thigh push or sacral push or at least three of the full six tests are the best indicators of SIJ dysfunction.[2]

There is limited evidence available on reliability of SIJ pain provocation tests in Indian population, so the purpose of this study is to find out the inter-rater reliability of SIJ pain provocation tests in Indian population

## MATERIALS AND METHOD

The medical ethical committee of Yashoda hospital Secunderabad, India approved this study. A total of 30 subjects aged about 20-60 presenting in physiotherapy department Yashoda hospital Secunderabad with LBA were included in the study, who all met the inclusion criteria. Informed consent is obtained from all the subjects. Patients with LBA with or without buttock pain were included in the study.

If a patient only exhibited symmetrical or midline pain above the level of L5 or radicular pain with neurological signs (sensory or motor loss), they were excluded from the study. Subjects with a history of a spinal procedure, a fracture of the spine, pelvis, or lower extremities, hospitalisation for a catastrophic accident or RTA, a disparity in leg length, hip or knee dysfunction, pregnancy, or any systemic illness were also excluded from the study.

Two physiotherapists, one with 19 years of experience and the other with three years, examined each participant while being blinded to the patient data. Before the test, the two examiners practised the tests on one another to get accurate estimates.

## PROCEDURE

Patients' demographic data such as age, height, weight, and Gender, history, location of pain was investigated and recorded onto patient reports forms. 4 provocation tests, hip thrust, SIJ thrust, Gaenslen's and Faber test were evaluated in the diagnosis of SIJD in this study. SIJD was confirmed if 2 or more tests found to be positive. Every subject was examined by 2 examiners with a break of 30 minutes between examinations. The evaluating physiotherapist (Examiner 1)

conducted the examinations first, out of the view of the Examiner 2. Therapists were blinded for the participants diagnosis, their pain history as well as results.

**Faber test**

During the supine figure-4 test, the patient is positioned lying on their back. Their leg is flexed at the hip and abducted, with the lateral ankle resting on the contralateral thigh proximal to the knee, creating a figure-4 shape. The examiner stabilizes the opposite side of the pelvis at the anterior superior iliac spine. The examiner applies a gentle external rotation, abduction, and posterior force to the ipsilateral knee. The force is gradually increased until the end range of motion is achieved. At this point, the examiner may perform a few small-amplitude oscillations to assess for pain provocation or any limitations in the patient's range of movement. A positive test result occurs if the manoeuvre reproduces the patient's pain or if it restricts their range of motion. This can indicate a potential dysfunction or pathology in the hip, sacroiliac joint, or surrounding structures.

**Hip thrust test**

To perform the test, the examiner flexes the hip and knee of the leg being tested to approximately 90 degrees. The palm of the top hand is placed over the patella with the fingers cupping the knee to provide stabilization. The bottom hand is placed underneath the buttocks, specifically at the sacroiliac joint (SIJ) region, to provide support and stability. Once the hands are in position, the examiner applies a downward force on the leg, pushing it towards the table. This movement puts stress on the SIJ.A positive test result is characterized by the patient experiencing pain at the SIJ during the downward thrusting motion. This pain may indicate SIJ dysfunction.

**Gaenslen's test**

The patient is initially positioned in a supine position, with the painful leg resting on the edge of the treatment table. The examiner then flexes the non-symptomatic hip and knee, both up to 90 degrees. The patient should hold the non-tested leg with both arms to provide stability. The therapist stabilizes the pelvis to prevent any movement and applies passive pressure to the leg being tested, holding it in a hyperextended position at the hip. Simultaneously, a flexion-based counterforce is applied to the flexed leg, pushing it in the cephalad (head ward) direction. This causes a torque or rotational force on the pelvis. During this manoeuvre, the examiner applies a downward force to the lower leg, further extending it at the hip joint. The combined actions of the downward force and the flexion-based counterforce create stress on the sacroiliac joint (SIJ). If the patient experiences a reproduction of their usual pain during this manoeuvre, it is considered a positive test for a SIJ. This suggests that the SIJ may be involved in the patient's pain and dysfunction.

**Sacral thrust test**

The examiner applies pressure directly to the sacrum, which is the triangular bone located at the base of the spine. The heel of one hand is placed on the centre of the sacrum, specifically at the level of S2, and is reinforced by the other hand for stability. To perform the test, the examiner directs an anterior force against the ilia, which are the large pelvic bones on either side, while they are fixed against the examining couch. This anterior force is applied by pushing the sacrum in an anterior direction. A positive test result occurs if the patient experiences pain at the sacroiliac joint (SIJ) during the application of pressure. This may indicate dysfunction.

## RESULTS AND DATA ANALYSIS

| Demographic Distribution of Study participants | | |
|---|---|---|
| **S.No** | **Variables** | **Mean (SD)** |
| 1 | Participants | 30 |
| 2 | Male: Female | 15: 15 |
| 3 | Age (in years) | 51.2 (14.1) |
| 4 | Weight (in Kgs) | 65.7(5.12) |
| 5 | VAS Score | 7.2(0.8) |

| | | | |
|---|---|---|---|
| 1.Hip thrust | 0.40 | 0.50 | 0.68 TO 1.00 |
| 2.Sij thrust | 0.56 | 0.60 | 0.659 TO 1.00 |
| 3.Gaenslean | 0.40 | 0.26 | 0.58 TO 1.00 |
| 4.Faber | 0.40 | 0.46 | 0.60 TO 1.00 |

| ICC | Lower bond | Upper bond | Value | Df1 | Df2 | Sig. |
|---|---|---|---|---|---|---|
| 0.60 | 0.311 | 0.787 | 4.00 | 29 | 29 | 0.00 |

### Item statistics

| | Mean | Std.Deviation | N |
|---|---|---|---|
| Inter Sumanth Hip thrust | .4000 | .49827 | 30 |
| Inter Rashmi Hip thrust | .5000 | .50855 | 30 |

### Inter -item correlation Matrix

| | Inter Sumanth Hip thrust | Inter Rashmi Hip thrust |
|---|---|---|
| Inter Sumanth Hip thrust | .1000 | .680 |
| Inter Rashmi Hip thrust | .680 | .1000 |

### Item statistics

| | Mean | Std. Deviation | N |
|---|---|---|---|
| Inter Sumanth SIJ thrust | .5667 | .50401 | 30 |
| Inter Rashmi SIJ thrust | .6000 | .49827 | 30 |

### Inter -item correlation Matrix

| | Inter Sumanth SIJ thrust | Inter Rashmi SIJ thrust |
|---|---|---|
| Inter Sumanth SIJ thrust | 1.000 | .659 |
| Inter Rashmi SIJ thrust | .659 | 1.000 |

### Summary item statistics

| | Mean | Minimum | Maximum | Range | Maximum/Minimum | Variance | N of items |
|---|---|---|---|---|---|---|---|
| Inter -item correlations | .659 | .659 | .659 | .000 | 1.000 | .000 | 2 |

### Item statistics

| | Mean | Std.Deviation | N |
|---|---|---|---|
| inter sumanth Gaenslen's | .4000 | .49827 | 30 |
| Inter Rashmi Gaenslen's | .2667 | .44978 | 30 |

### Inter -item correlation Matrix

| | Inter Sumanth Gaenslen's | Inter Rashmi Gaenslen's |
|---|---|---|
| Inter Sumanth Gaenslen's | 1.000 | .585 |
| Inter Rashmi Gaenslen's | .585 | 1.000 |

### Summary item statistics

| | Mean | Minimum | Maximum | Range | Maximum/Minimum | Variance | N of items |
|---|---|---|---|---|---|---|---|
| Inter -item correlations | .585 | .585 | .585 | .000 | 1.000 | .000 | 2 |

### Item statistics

| | Mean | Std.Deviation | N |
|---|---|---|---|
| Inter Sumanth Gaenslen's | .4000 | .49827 | 30 |
| Inter Rashmi Gaenslen's | .4667 | .50742 | 30 |

## Item statistics

| | Inter Sumanth Faber | Inter Rashmi Faber |
|---|---|---|
| Inter Sumanth Faber | 1.000 | .600 |
| Inter Rashmi Faber | .600 | 1.000 |

## Summary item statistics

| | Mean | Minimum | Maximum | Range | Maximum/Minimum | Variance | N of items |
|---|---|---|---|---|---|---|---|
| Inter -item correlations | .600 | .600 | .600 | .000 | 1.000 | .000 | 2 |

## Interclass correlation coefficient

| | Inter -item correlations | 95% confidence interval | | F Test with True value 0 | | | |
|---|---|---|---|---|---|---|---|
| | | Lower bound | Upper bound | value | df1 | df2 | sig |
| Single measures | .600 | .311 | .787 | 4.000 | 29 | 29 | |
| Average measures | .750 | .475 | .681 | 4.000 | 29 | 29 | |

| 2 Fleiss' kappa statistics between raters for pain provocation test | | | |
|---|---|---|---|
| Test | Kappa (K) | Standard Error | Sig |
| Hip thrust | 0.67 | 0.13 | < 0.001 |
| SIJ thrust | 0.66 | 0.14 | < 0.001 |
| Gaenslen's | 0.56 | 0.15 | < 0.001 |
| FABER | 0.6 | 0.14 | 0.001 |

| Cross Tabulation for Inter rater reliability for Hip Thrust test | | |
|---|---|---|
| Total Subjects: 30 (100%) | Rater 1:<br>Pain Provocation Positive | Rater 1<br>Pain Provocation Negative |
| Rater 2: Pain Provocation Positive | 11 (36.7%) | 4 (13.3%) |
| Rater 2 Pain Provocation Negative | 1 (3.3%) | 14 (46.7%) |

| Cross Tabulation for Inter rater reliability for SIJ Thrust test | | |
|---|---|---|
| Total Subjects: 30 (100%) | Rater 1:<br>Pain Provocation Positive | Rater 1<br>Pain Provocation Negative |
| Rater 2: Pain Provocation Positive | 15 (50%) | 3 (10%) |
| Rater 2 Pain Provocation Negative | 2 (6.7%) | 10 (33.3%) |

| Cross Tabulation for Inter rater reliability for Gaenslen's test | | |
|---|---|---|
| Total Subjects: 30 (100%) | Rater 1:<br>Pain Provocation Positive | Rater 1<br>Pain Provocation Negative |
| Rater 2: Pain Provocation Positive | 7 (23.3%) | 5 (16.7%) |
| Rater 2 Pain Provocation Negative | 1 (3.3%) | 17 (56.7%) |

| Cross Tabulation for Inter rater reliability for FABER test | | |
|---|---|---|
| Total Subjects: 30 (100%) | Rater 1:<br>Pain Provocation Positive | Rater 1<br>Pain Provocation Negative |
| Rater 2: Pain Provocation Positive | 10 (33.3%) | 4 (13.3%) |
| Rater 2 Pain Provocation Negative | 2 (6.7%) | 14 (46.7%) |

## DISCUSSION

The correlation of the patient's medical history, physical examination, imaging/injection methods, and pain location has become the primary emphasis of identifying sacroiliac joint (SIJ) blockage. Poor interrater reliability for motion palpation tests has been demonstrated in prior studies.[8]. To address this, a new study was conducted to determine the interrater reliability of pain provocation tests for SIJ dysfunction in patients with low back pain.

The available data suggests that pain provocation tests are frequently used in clinical practice to evaluate and diagnose SIJ problems, and they have shown significant to outstanding reliability. In this study, four pain provocation tests were performed to evaluate and identify SIJ dysfunction in low back pain patients.

To minimize bias, two examiners randomly administered the pain provocation tests in a specific order to the patients, and the scores were hidden from the therapists. The tests included hip thrust, SIJ thrust, Gaenslen's test, and Faber test. The kappa coefficient, a

measure of interrater reliability, for these tests ranged from 0.60 to 0.80, indicating modest to strong reliability.

Among the 30 subjects, both raters reported 15 positive pain provocation reactions for SIJ thrust, followed by 11 thigh trust responses, 7 Gaenslen's responses, and 10 Faber responses.

Previous studies have also demonstrated moderate to good reliability for pain provocation tests and established their diagnostic utility. A study by Peter van der Wurff suggested that a combination of multiple tests could be useful in clinical decision making[9], while another study by Kokmeyer focused on five SIJ pain provocation tests and concluded that they are reliable for evaluating SIJ dysfunction[10].

According to the ICC (Intraclass Correlation Coefficient) classification, the combination of pain provocation tests showed a reliability range between ICC = 0.60-0.80, indicating their reliability and usefulness in clinical practice. The results of this current study demonstrated moderate to strong interrater reliability of pain provocation tests specifically in the Indian population.

## CONCLUSION

This study designed to determine the relevance of the cluster of 4 SIJ pain provocation tests and showed good inter-rater reliability

### *Declaration by Authors*

**Ethical Approval:** This research was reviewed and approved by the Institutional Ethics Committee Yashoda Academy of Medical Education and Research.

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**Conflict of Interest:** The authors declare no conflict of interest.

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