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Sacroiliac Joint

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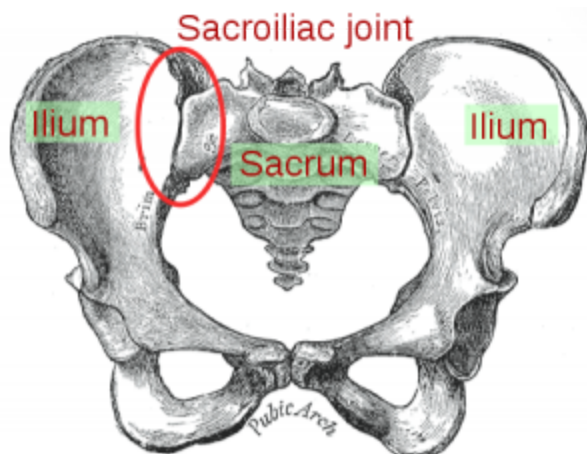
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Description[[edit](#) | [edit source](#)]  Say thanks to
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The Sacroiliac joint (commonly referred to as SIJ) is the joint connection between the spine and the pelvis.

- Large [diarthrodial joint](#)^[1] made up of the [sacrum](#) and the two innominates of the [pelvis](#).
- Each innominate is formed by the fusion of the three bones of the pelvis: the ilium, ischium, and pubic bone.^[2]
- The sacroiliac joints are essential for [effective load transfer](#) between the spine and the lower extremities.
- It functions both as a shock absorber for the spine above and converts torque from the lower extremities into the rest of the body.
- The sacrum, pelvis and spine are functionally interrelated through [muscles](#), [fascia](#) and [ligamentous](#) interconnections.

Movements Available [[edit](#) | [edit source](#)]

The main function of the SIJ is to provide stability and attenuate forces to the lower extremities.

- The strong [ligamentous](#) system of the joint makes it better designed for stability and limits the amount of motion available^[1].
- Nutation and Counternutation: are the movements that occur in the frontal plane at the sacroiliac joint ^[3]
- Torsion is the movement that occurs at the SI joint in the transverse plane around an oblique axis of rotation^[3]

Nutation[[edit](#) | [edit source](#)]

The movement that occurs when force (weight) is absorbed at the sacroiliac joint, and occurs in the direction of gravitational forces (toward the ground)^[4].

Nutation occurs:

- when the sacrum absorbs shock; it moves down, forward, and rotates to the opposite side.
- as the sacrum moves anteriorly and inferiorly, the coccyx moves posteriorly relative to the ilium.^[5]
- This motion is opposed by the wedge shape of the sacrum, the ridges and depression of the articular surfaces, the friction coefficient of the joint surface^[4]
- The integrity of the posterior, interosseous, and sacrotuberous ligaments that are also supported by muscles that insert into the ligaments.^[2]

Counternutation[[edit](#) | [edit source](#)]



The body's response, lifting the joint up against gravity.^[6] In most individuals, this motion is limited to 2 to 4 mm of movement due to the bony architecture and ligamentous structures of the joint.^[7]

Counternutation occurs:

- When the sacrum moves up, backward, and rotates to the same side that absorbs the force.^[5]
- This motion is opposed by the posterior sacroiliac ligament that is supported by the [multifidus](#).^[2]

Torsion[[edit](#) | [edit source](#)]

Torsion occurs when the right or left base of the sacrum moves anterior or posterior, although only 1.5 degrees of torsion occur at the SIJ.^[3]

Torsions are typically classified as: right on right (left sacral base moving anterior around the right axis of rotation); left on left (right sacral base moving anterior around the left axis of rotation); right on left (right sacral base moving posterior around the left axis of rotation); left on right (left sacral base moving posterior around the right axis of rotation).

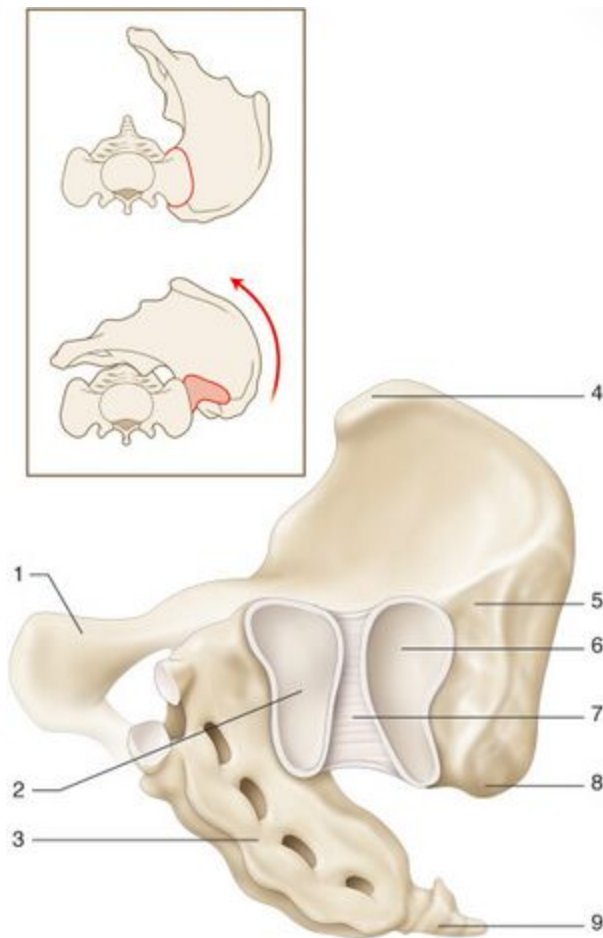
Sacroiliac Joint Movement: Nutation II Counternutation II Sacral Torsi...



Ligaments & Joint Capsule[[edit](#) | [edit source](#)]

Joint[[edit](#) | [edit source](#)]





Anatomy of the sacro-iliac joint: anterior view. 1. Body of the pubic bone. 2. Auricular surface of the sacrum. 3. Sacrum. 4. Antero-superior iliac spine. 5. Iliac tuberosity. 6. Auricular surface of the ilium. 7. Anterior sacro-iliac ligament. 8. Postero-superior iliac spine. 9. Coccyx. © Cyrille Martinet. ^[8]

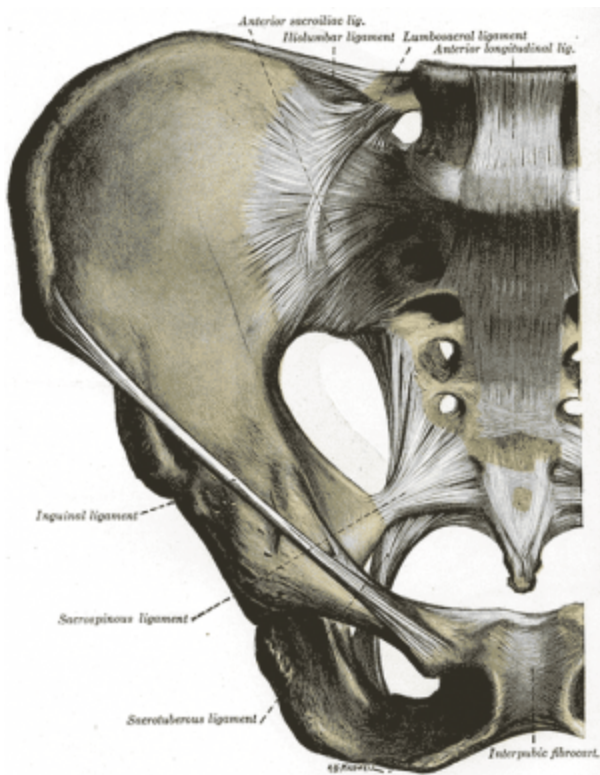
- The SIJ is a diarthrodial synovial joint.
- Surrounded by a fibrous capsule containing a joint space filled with synovial fluid between the articular surfaces.
- Articular surface is made up of two, strong, C-shaped layers.
- It is distinguished from other synovial joints by the unusual articulation of two different types of [cartilage](#).
- The sacral capsular surface is composed of hyaline cartilage (Hyaline cartilage is made from type II collagen and is the weakest type of cartilage)
- Iliac capsular surface is composed of fibrocartilage (Fibrocartilage is made from type I collagen and is the strongest type of cartilage)^[7].

Ligaments[[edit](#) | [edit source](#)]

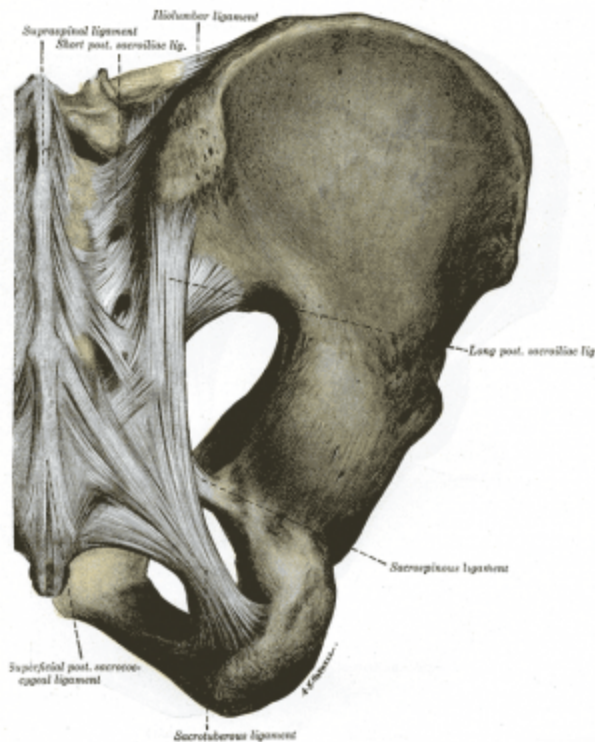
A strong [ligamentous](#) architecture stabilizes the SI joint.

The interosseous sacroiliac ligament forms the major connection between the sacrum and the ilium. It is the strongest ligament in the body and prevents anterior and inferior movement of the sacrum.





- **Anterior Sacroiliac** - an anteroinferior thickening of the fibrous capsule that is weak and thin when compared to the other ligaments of the joint. It connects the third sacral ligament to the lateral side of the preauricular sulcus and is better developed closer to the arcuate line and the PSIS. This ligament is injured most often and is a common source of pain because of its thinness.
- **Interosseus Sacroiliac** - forms the major connection between the sacrum and the innominate and is a strong, short ligament deep to the posterior sacroiliac ligament. It resists anterior and inferior movement of the sacrum.



- **Posterior (Dorsal) Sacroiliac** - connects the posterior crest of the third and fourth segments of the sacrum and is very strong and tough. It resists anterior motion of the sacrum, slackens the

- ligament, and counternutation, which is posterior motion will make the ligament taut. It can be palpated directly below the PSIS and can often be a source of pain.^[9]
- **Sacrospinous** - consists of three large fibrous bands and is blended with the posterior (dorsal) sacroiliac ligament. It stabilizes against nutation of the sacrum and counteracts against posterior and superior migration of the sacrum during weight bearing.
 - **Sacrospinous** - triangular shaped and thinner than the sacrotuberous ligament and goes from the ischial spine to the lateral parts of the sacrum and coccyx and then to the ischial spine laterally. Along with the sacrotuberous ligament, it opposes forward tilting of the sacrum on the innominates during weight bearing.^{[2][5]}

Nerves[[edit](#) | [edit source](#)]

- The sacroiliac joint is well innervated but the pattern of innervation varies among individuals.
- The sacroiliac joint receives its innervation from the ventral rami of L4 and L5, superior gluteal nerve, and dorsal rami of L5-S2.
- The nerve supply to the SI joint varies between individuals and innervation may be almost exclusively derived from the sacral dorsal rami (may account for the variable patterns of referred pain from the SI joint)^[7].

Muscles[[edit](#) | [edit source](#)]

There are 35 muscles that attach to the sacrum or innominates which mainly provide stability to the joint rather than producing movements.^[3]

Specific Pathologies[[edit](#) | [edit source](#)]

Sacroiliac Joint Dysfunction - broad term that refers to the abnormal biomechanical function of the SI joint. Some causes of sacroiliac joint dysfunction include the following:

Trauma[[edit](#) | [edit source](#)]

Increased mobility of the SI joint may be the result of injury to the supporting ligaments. This can be seen in high impact injuries such as a motor vehicle accident, fall, or repetitive trauma from weight lifting or sports and [insufficiency fractures](#)

Hypermobility[[edit](#) | [edit source](#)]

- can be genetic, a term often labeled "multidirectional instability" for ligamentous laxity at multiple joints, not strictly the sacroiliac joint. Other causes of inherited laxity can include [Marfan syndrome](#) and [Ehlers-Danlos syndrome](#).
- Hormonal changes may also cause hypermobility. The ligaments of the sacroiliac joint slacken during pregnancy due to the hormone relaxin. This loosening, along with that of the related symphysis pubis, permits the pelvic rim to widen during the birthing process. The ligaments may also be stretched due to increased lumbar lordosis. Therefore, SI joint pain is common in pregnancy. However, this pain may persist after pregnancy if the ligaments do not return to physiologic tension. Risk factors include extended labor and delivery of large babies.

Degeneration[[edit](#) | [edit source](#)]



Structural abnormalities of the SI joint may also cause dysfunction. Individuals with altered gait patterns, spinal deformities or leg-length discrepancies can have reduced interlocking ability leading to laxity and pain. This equates to repetitive and uneven stress to the SI joint articular surfaces, causing laxity and pain.

Osteoarthritis[[edit](#) | [edit source](#)]

SI joint is also common, and the incidence increases with age. Other risk factors for osteoarthritis include previous trauma.

Inflammation[[edit](#) | [edit source](#)]

Termed [sacroiliitis](#). There are many causes of sacroiliitis. An infectious cause of sacroiliitis includes the presentation of arthritis from brucellosis. Sacroiliitis may also be related to other inflammatory conditions such as inflammatory bowel disease and seronegative spondyloarthropathies.

Epidemiology[[edit](#) | [edit source](#)]

The reported prevalence of sacroiliac joint pain in cases of chronic low back and lower extremity pain is estimated to be between 10 - 27%^[10].

There are several reported predisposing factors for SIJ pain such as a leg length discrepancy, age, arthritis, previous spine surgery, pregnancy and trauma. Compared with face and discogenic low back pain, SIJ pain is more likely to be reported as a specific inciting event, and present unilaterally below L5 and the pain patterns are extremely variable.^[1]

Special Tests[[edit](#) | [edit source](#)]

- The potential differential diagnosis of lower back pain is extensive.
- The clinical examination of the patient with sacroiliac joint dysfunction begins with an evaluation of gait, leg-length inequality, and examination of the lower lumbar region.
- During a physical examination, localization over the SI joint should be attempted using the Fortin finger test. The test is considered positive when the point of tenderness is within 2 cm inferomedial to the posterior superior iliac spine. In addition to the physical exam maneuvers above, the hip joint and spine should be properly evaluated to rule out other pathologies^[7].

SI Joint Stress Tests[[edit](#) | [edit source](#)]



- Fortin finger test - the patient points to the site of pain with their index finger. The result is positive if the site of pain is within 1 cm of the PSIS, generally.



- Gillette test - is done with the patient in the standing position. The patient stands on one leg while flexing the opposite hip and knee into the chest. Motion of the SI joint is assessed by placing one thumb under the posterior superior iliac spine (PSIS) on the side of hip flexion, with the other thumb in the midline at the S2 level. Normally, the thumb under the PSIS drops inferiorly and laterally with hip flexion. Restriction is indicated by decreased motion compared to the normal side^[11].
- [Posterior Distraction test](#)
- [Sacral Thrust test](#)
- [Sacroiliac Distraction Test](#), see image R
- Rotational Stress test

Leg Length Tests[[edit](#) | [edit source](#)]

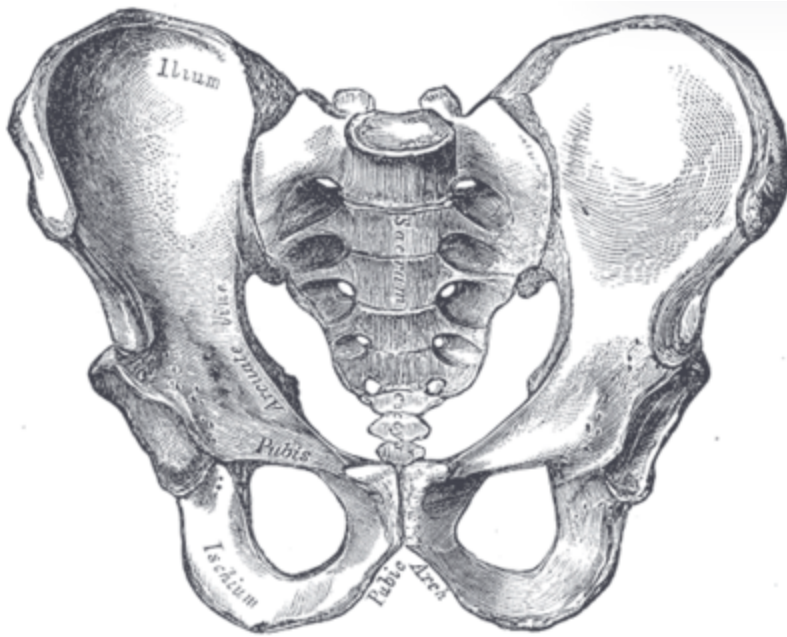
- Prone test
- Standing leg length test
- Functional leg length test

Other Special Tests[[edit](#) | [edit source](#)]

- [Long Sit test](#)
- [Sign of the Buttock](#)
- [Gaenslen's test](#)
- [Yeoman's test](#)
- [FABER \(Figure-Four\) test](#)^[12]

Back Pain[[edit](#) | [edit source](#)]

- The incidence of lower back pain originating from the sacroiliac joint may be as high as 27%.
- Patients often describe a specific trauma or inciting event.
- Pain originating from the sacroiliac joint is likely more common than most providers realize due to difficulty in localizing symptoms and referred pain patterns.
- Using a pain diagram to map out the location of the pain is often very helpful in diagnosis.
- SI joint pain is commonly found 10 cm caudally and 3 cm laterally from the patient's posterior superior iliac spine.
- SI joint pain is commonly referred to the buttocks, lower lumbar region, groin, and lateral thigh. Patients with sacroiliac joint dysfunction describe their pain being aggravated by getting out of a chair, prolonged standing or sitting, with climbing stairs or morning stiffness.
- Numbness and tingling in the leg may also be present. Risk factors for sacroiliac joint pain include leg length discrepancy, age, arthritis, history of spine surgery, pregnancy, and trauma^[7]



Age Changes[[edit](#) | [edit source](#)]

The SI joint goes through many changes throughout life. In early childhood, the surfaces of the joint are smooth and allow gliding motions in many directions.^[5] After puberty, the surface of the ilium becomes rougher and coated with fibrous plaques that will restrict motion significantly. These age-related changes will increase in the third and fourth decade and by the sixth decade motion may become noticeably restricted. By the eighth decade, plaque will form and erosions will be present.^[13]

The ligaments of the SI ligament complex are weaker in women than in men, allowing the ability to give birth.^[14]

Resources[[edit](#) | [edit source](#)]

[Cohen SP. Sacroiliac Joint Pain: A Comprehensive Review of Anatomy, Diagnosis, and Treatment. *Anesth Analg* 2005; 101:1440-1453.](#)

[Dutton M. Orthopaedic Examination, Evaluation, and Intervention. 2nd ed. New York: McGraw Hill, 2008.](#)

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The Sacroiliac Joint The Sacroiliac Joint (SIJ) is a synovial joint between the auricular surfaces of the sacrum bone and the two ilium bones [1]. The auricular surfaces are covered in hyaline cartilage and are broader above and narrower below. The SIJ is also a true

[Biomechanics and Dynamics of the Pelvic Girdle - Physiopedia](#)

Sacral Biomechanics The sacroiliac joint (SIJ) is the largest axial joint in the body. It connects the spine to the pelvis and transfers load between the lumbar spine and the lower extremities. Research has shown the sacrum has very little movement. Numerous

[Functional Anatomy of the Pelvis - Physiopedia](#)

Introduction The pelvis is a complex anatomical structure[1] with many functions, including transmitting body weight to the lower limbs during locomotion, accommodating childbirth in females, and providing support for the abdominal organs.[2] Because of its

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Purpose Posterior ligaments of the pelvis. The long dorsal sacral ligament test is a pain provoking test typically used in combination with the posterior pelvic pain provocation test and the active straight leg raise test (ASLR) when a patient presents with lumbopelvic

[Sacroiliac Joint Syndrome - Physiopedia](#)

Introduction Sacroiliac joint dysfunction is a term used to describe the pain of the sacroiliac joint (SI joint). It is usually caused by abnormal motion (i.e. hyper- or hypo-mobile) or malalignment of the sacroiliac joint. Sacroiliac joint syndrome is a significant source

References [[edit](#) | [edit source](#)]



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