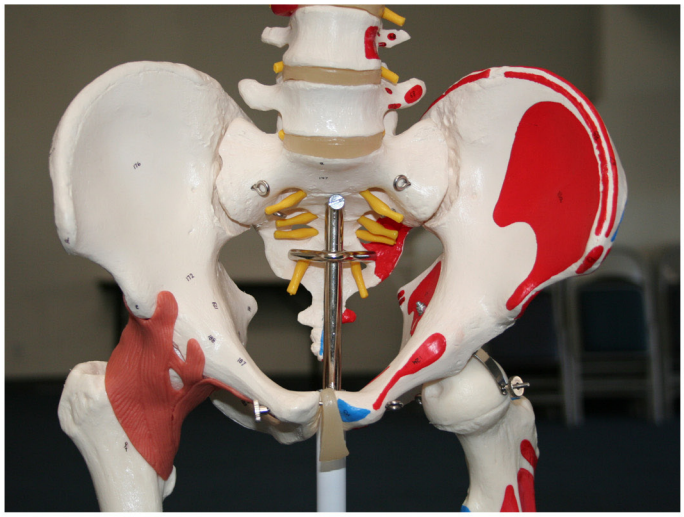
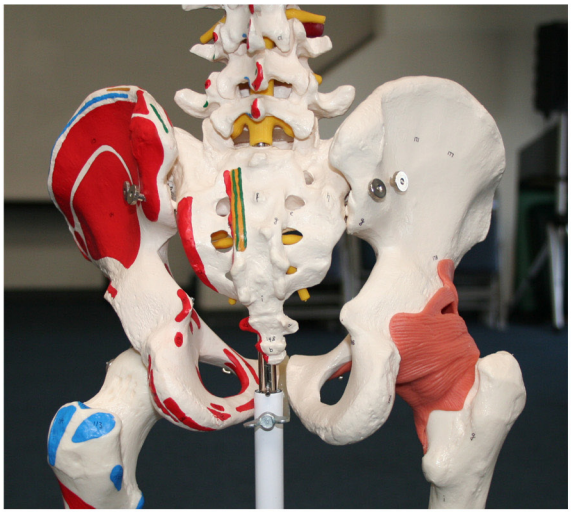
Understanding
SACROILIAC JOINT DYSFUNCTION





by **Paul Chek, HHP**

WARNING

The workouts and other health-related activities described in the programs presented by the C.H.E.K Institute were developed by the author to be used as an adjunct to improved strengthening, conditioning, health and fitness. These programs may not be appropriate for everyone. Individuals who suffer from any disease or are recovering from an injury of any sort should consult their physician regarding the advisability of undertaking any of the activities suggested in these programs. The author has been painstaking in his research and the presentation of the material in these programs. He is neither responsible, nor liable, for any harm or injury resulting from this program or the use of the exercises or exercise devices described herein.

Understanding
SACROILIAC JOINT DYSFUNCTION

It is a well known statistic that eight out of ten people will suffer from low back pain at least once in their lifetime. The etiology of pain is in this area is far ranging and extremely varied, including such problems as disc derangements, internal organ dysfunction, spinal structural pathologies, hormonal imbalances and many more. The sacroiliac (SI) joints may also be a cause of pain in this area, as well as causing pain in the butt and leg. In the early 20th century most pain in the low back and gluteals was thought to originate with the SI joint. Once spinal disc herniation was identified in 1932, the medical professional switched to this as the cause of most low back pain. More recent research estimates that approximately 29% of back pain occurrences can be attributed to the SI joint and 67% are disc-related (Ref. 1).

ANATOMY AND FUNCTION OF THE SACROILIAC JOINT

The SI joint is actually two joints, located between the sacrum at the base of the spine and the ilium bones of the pelvis. (Fig. 1). Unlike many other joints, the SI joint moves very little - 2mm to 4mm during forward flexion and weight bearing or transfer - and does so by a gliding motion. The two joints have to move independently of each other to perform functional movements such as gait; one side of the sacrum moves in the opposite direction to the other as the corresponding ilium moves posteriorly in heel strike, then anteriorly as the leg swings through. (For a detailed discussion of the mechanics of the SI joint see Ref. 2). The main role of the SI joint is to absorb shock for the spine, much as the forefoot acts as a shock-absorber during gait by going into pronation. The SI joints also assist in converting rotational movements of the spine into the linear movement of gait.

Figure 1: Model of pelvis - front (left) and back (right)

STABILIZATION OF THE SACROILIAC JOINT

The SI joint is stabilized both passively and actively. Passive stabilization is provided by the strong, dense ligaments that surround the joint, plus the fibro-cartilaginous interlocking structure of the joint itself, with many large ridges and depressions on the joint surface. The movement of the sacrum on the ilium provides a locking of the joint through mechanical interaction with the ligaments during weight-bearing, which stabilizes the joint and a corresponding unlocking, allowing the leg to swing through.

As you step forward onto the right leg, the right ilium moves posteriorly, and the right SI joint moves forward in nutation. This closes and locks the joint, making it stable. At the same time, the left ilium moves anteriorly and the left SI joint moves in counternutation, unlocking the joint and allowing the left leg to swing through to a new step. If this oblique movement of the sacrum does not occur, as when the SI joints become immobile and fuse with age, stress fracture occur in the sacrum. This is common in the elderly over 70+ years of age.

Active stabilization is provided by the muscles that cross the area and there are several mechanisms in operation here:

Nutcracker effect – Imagine the sacrum as a nut held between the two ilium bones, which are the jaws of a nutcracker. When the transversus abdominius (TVA) is activated, it draws inward pulling the two jaws of the nutcracker - the ilium bones – inward as they pivot around the sacrum. This tightens the SI ligaments, squeezing the "nut" and stabilizing the SI joints.

Posterior system (Ref. 3) - In the propulsive phase of gait, there is a phasic contraction of the gluteus maximus, which occurs in concert with that of the contralateral latissimus dorsi as it extends the arm as a means of counter rotation (Fig. 2). This timed contraction produces tension in the thoracolumbar fascia that assists in stabilizing the sacroiliac joint of the stance leg. (See Ref. 4 for a discussion of the energy storage mechanism that this system also produces.)

The action of the posterior system also creates an energy storage and release mechanism that aids gait. During walking, there is alternate stretch and release on the fascia and tendons of the gluteus maximus and contralateral lat. dorsi, plus compression of the cartilage in the SI joint. This stores kinetic energy and then releases it, much like a spring, providing energy for the leg to swing through. When the posterior system is not working properly, this energy storage mechanism is disrupted.

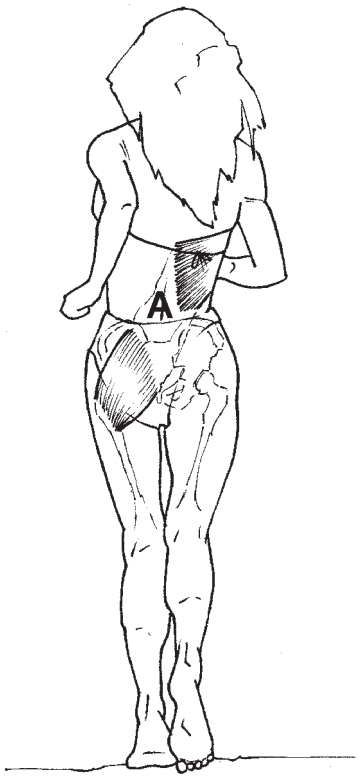


Figure 2: Posterior Oblique Sling

Lateral system (Ref. 3) – This lateral system consists of a working relationship between the gluteus medius, gluteus minimus and ipsilateral adductors, in concert with the contralateral quadratus lumborum (Ref. 5). Proper functioning of this system is important to keep the pelvis level and to provide frontal plane support during one-legged movements such as gait, climbing stairs or during a step class (Fig. 3).

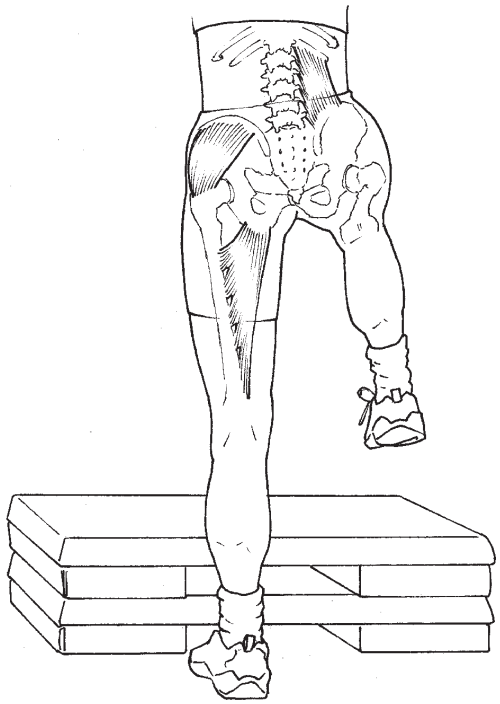


Figure 3: Lateral System

CAUSES OF SACROILIAC JOINT PAIN

Injuries such as a direct fall on the butt, a blow to the side of the pelvis or a weight-lifting accident can strain or tear the SI ligaments, which then allows the joints to move too much, decreasing stability, which in turn leads to pain. In general, excess movement in one or both SI joints leads to inflammation and pain, which in turn shuts down muscles crossing the joint leading to more instability and more pain. Over time, excess motion can wear down the articular cartilage lining the joint, leading to degenerative arthritis. Restricted movement on one side will lead to too much movement on the opposite side, which is common in those with differences in left/right flexibility. For example, asymmetrical flexibility in the hamstrings makes a person particular at risk for SI joint pain, as this puts a torque through the pelvis and SI joints. Also if the pelvis is locked in an anterior tilt (from tight quadratus lumborum, latissimus dorsi, rectus femoris, sartorius and/or adductors) or posterior tilt (from tight hamstrings and/or external obliques), then natural movement through the pelvis, spine and SI joints is disrupted and pain will likely follow. Loss of movement in the SI joints is a particular problem in the elderly, and may lead to stress fractures of the sacrum.

Some other specific issues that increase the risk of SI joint pain include:

1. Women who have experienced several pregnancies may develop hypermobile SI joints due to the repeated action of the hormone relaxin on the ligaments of the pelvis, as well as the mechanical wear and tear or the birthing process.

2. Dysfunction in the lateral system manifesting as a Trendellenburg syndrome (seen as a collapse of or shift away from the weak hip), leading to over-reliance on the ligamentous structures and causing excessive sheering in the SI joints.

3. Dysfunction of the inner unit will reduce or eliminate the nutcracker effect. There are multiple possible causes of inner unit problems, including poor diet, food intolerance, pathology in the underlying organs and abdominal surgery (Ref. 6) that are beyond the scope of this article. It is worth noting here that a weak pelvic floor can indirectly cause SI joint dysfunction and pain, since the pelvic floor musculature is on the same neurological loop as the quadratus lumborum and the transversus abdominus. Trauma or dysfunction to the pelvic floor can shut down the inner unit and so prevent the nutcracker effect from occurring.

In summary, asymmetrical flexibility and poor posture will increase the likelihood of SI joint dysfunction and pain, particularly when additional loads are added to the body. It is also important to remember that SI joint dysfunction can also cause a variety of posture-pain syndromes.

IDENTIFYING SACROILIAC JOINT PAIN

It is difficult to identify if SI joint dysfunction is the cause of low back and/or hip pain. Several diagnostic tests exist, but these are beyond the scope of both this article and the toolkit of most fitness professionals. The best means of differentiation is to look at mechanism of injury or activity that led to the onset of the pain. An acute injury such as falling on your backside can directly damage the area. Any single legged, high-stepping activities can strain the SI joint. Typical such activities of daily living include getting into a car, running up stairs two steps at a time, standing on one leg while getting dressed or having sex in unusual positions. In the gym, the SI joint can be strained during step classes using too a high step, performing box step-ups on a high step, cycling with the seat too high, during lunges or exercising to the point of motor failure. Another common mechanism of injury is bending over without adequate flexibility in hamstrings and a weak inner unit. Performing conventional deadlifts from floor is a common source of strain or tearing of the SI ligaments.

WORKING WITH CLIENTS WITH SI JOINT DYSFUNCTION

The CHEK formula of Flexibility-Stability-Strength-Power should be used with all clients, not just those with diagnosed or suspected SI joint issues! Another general rule is to apply the CHEK maxim, “If you are not assessing, you are guessing!”

FLEXIBILITY

First flexibility must be assessed and any issues need to be addressed, particularly relative flexibility; is the left the same as the right? Large discrepancies in relative flexibility can be more disruptive than all over general tightness, since imbalances will create compression, torque and sheer through joints. Posture needs to be assessed, particularly the position of the pelvis in cases of suspected SI joint dysfunction. Then a stretching program can be designed to address the issues found. A generalized stretching program can be worse than useless, since it may make loose areas less stable and at the same time not correct existing imbalances. Picture a bicycle wheel with a few tight spokes; if you loosen all the spokes to the same extent without first finding which ones are tight, you have just created a dangerous, unstable wheel!

In the following assessments, look for more than 10°difference from the normal, and between right and left sides.

Prone knee flexion test for rectus femoris (Ref. 7)

Lie client face down, legs straight on the floor. Bring one heel towards the butt, stopping just before the hips lift off the floor or the spine is pulled into accentuated lumbar lordosis. Measure the angle through which the shin has moved from its original position when the leg was straight. Normal range of motion = 135°.

Supine knee extension for hamstrings (Ref. 7)

Lie client face up, legs straight on the floor. Lift one thigh up to 90° of hip flexion, with the knee bent. Place finger tips under the spine at the level of the belly button. Slowly raise the foot to the ceiling until the spine attempts to flatten and tightness is felt in the hamstring. Measure the angle through which the lower leg has moved from the thigh. Normal range of motion = 170°.

Side bend test for quadratus lumborum and obliques

Stand up straight in bare feet with arms hanging to sides. Side bend, sliding the fingertips down the leg as far as possible and staying purely in the frontal plane – do not twist or rotate. Keep both heels on the ground at all times. Normal = fingertip to knee.

ASIS / PSIS test for pelvic tilt (Ref. 7)

Pelvic tilt can be measured by using the posterior superior iliac spine (PSIS) and the anterior superior iliac spine (ASIS) as reference points (Fig. 4). Palpate the landmarks with your fingertips from the side of the client. In a female the ASIS should be approximately 1.5cm below the PSIS in the horizontal plane, and 1cm for males. An ASIS higher than this suggests posterior pelvic tilt. Conversely an ASIS lower than this suggests anterior pelvic tilt.

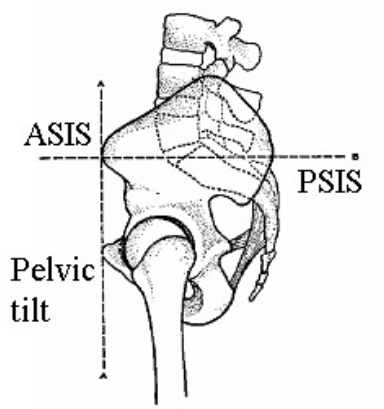


Figure 4: Side view of pelvis

Address any discrepancies with the appropriate stretches. Use a ratio of two sets on the tighter side to one set on the looser side to counteract any right/left imbalances unless the looser side is within normal limits. In this case, do not stretch the normal side and perform three sets on the tight side. Avoid stretching in the Thomas Test position (Fig. 5) or any single knee-to-chest stretches unless directed by a physical therapist or C.H.E.K Practitioner.

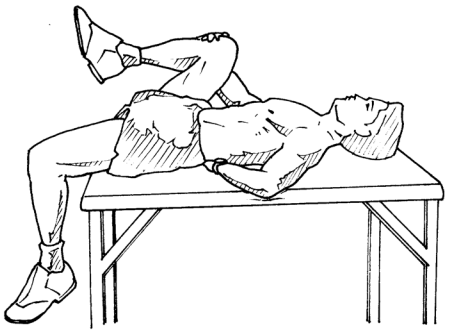


Figure 5: Thomas Test

STABILITY

The two main areas for the fitness professional to assess for functional stability of the SI joint, are the TVA and the lateral system.

Prone TVA test (Ref. 8 modified from Richardson and Jull)

Lie prone on floor, with a blood pressure cuff placed under the spine at the level of the belly button. Inflate the cuff to around 40mmHg. (Fig. 6) With the client lying completely relaxed, ask them to draw their umbilicus upward, off the cuff. Normal = The pressure in the cuff should decease by at least 10mmHg. Any pressure drop less than 10 mm Hg will represent the percentage of lost function of the TVA. If your client can only decompress the cuff 4mmHg, it is safe to say that the client has only 40% normal TVA function.

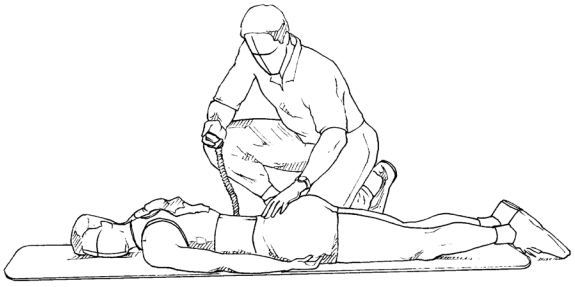


Figure 6: Prone TVA Test

Look carefully for the following cheat mechanisms:

- Activating the hip flexors. Identified by increased pressure on the floor with the knees.
- Pressing on the floor with the shoulders to create a cavity under the trunk.
- Rolling to one side of the cuff.
- Flexing or extending the lumbar spine. The spine should always remain in a neutral posture.
- Coming up onto the toes and/or rolling the tail under.

Toe Touch Drill for the Lateral System (Ref. 9)

Stand on one leg, as if you were in the middle of a clock face. Reach out as far as possible with the toe of the other leg towards 12 'o' clock and touch the ground. Bring the leg back to the center and repeat to 1 'o' clock. (Fig. 7). Note how far the client can reach in each position. A Total Gym grid as shown in the picture is useful for this assessment. Check the hips maintain a good level position and the standing knee stays in-line with the second toe. Any rolling in of the knee or dropping out of the hip indicates probable weakness in the lateral system at that particular position of the clock face.

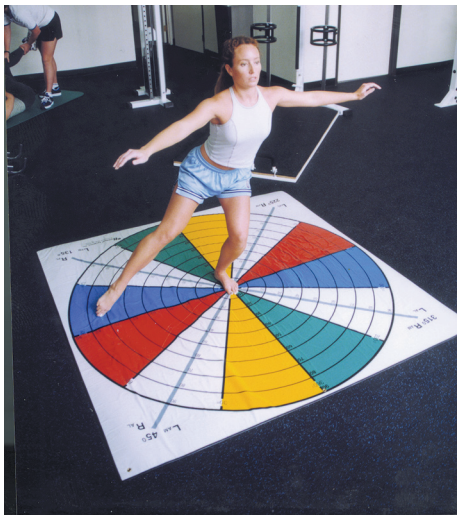


Figure 7: Toe Touch Drill

For both the above, the assessment is also the exercise used to correct any deficits found.

RECOMMENDED EXERCISES

Any exercises that train the lateral system will be useful to both prevent and overcome SI joint dysfunction. The exercises below can be used to develop both stability and then progressed for strength training by changing the acute exercise variables. For stability training, the time-under-tension (TUT) for each set should be at least 120 seconds. For strength development, the TUT should be 60 seconds or less. The less TUT a client can hold when performing an exercise, the higher the intensity is for that particular exercise.

Supine Lateral Ball Roll (Ref. 8. Fig. 8)

- Place head and shoulders on ball.
- Elevate hips until torso is as flat as a table top and the knee is directly over the ankle.
- Tongue in physiological rest position on roof of mouth behind front teeth.
- Arms at 90° to the long axis of the body with the palms up.
- Roll laterally, holding this exact position. Do not allow the head to flex, arms to lose their parallel relationship to the floor, or the hips to drop.
- On subsequent sets, hold the farthest lateral position for a 10-count (for stability) or a "one-thousand-one" count (for strength). Repeat for six to ten reps on each side.

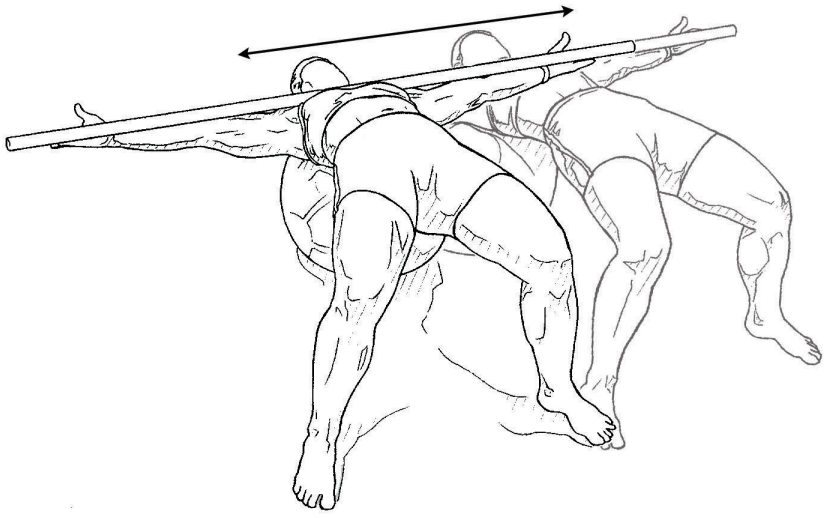


Figure 8: Supine Lateral Ball Roll

Horse Stance Vertical or Horizontal (Ref. 7. Fig. 9A and 9B)

- Place wrists directly below the shoulders and your knees directly below the respective hip joint. The legs are parallel and the elbows should remain turned back toward the thighs with the fingers directed forward.
- Place a dowel rod along your spine and hold perfect spinal alignment. The rod should be parallel to the floor. The space between the lower back and the rod should be about the thickness of the client's hand at the level of the knuckles.
- Activate the TVA by drawing the belly button inward.
- Vertical: Lift one hand off the floor just enough to slide a sheet of paper between the hand and the floor. The opposite knee is then elevated off the floor to the same height.

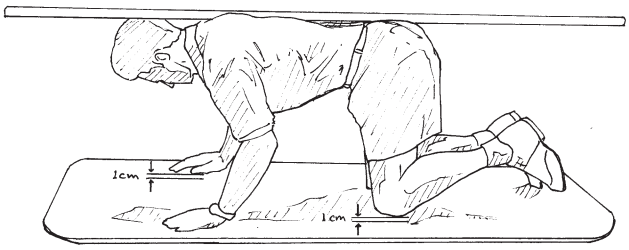


Figure 9A: Horse Stance Vertical

- Horizontal: Raise one arm to a point 45° off the midline of the body, in the same horizontal plane as the back. Elevate the opposite leg to the point at which your leg is in the same horizontal plane as your torso. Keep the shoulder girdle and pelvis parallel to the floor.
- Hold each side for 10 seconds per rep and work up to 10 reps each side per set.

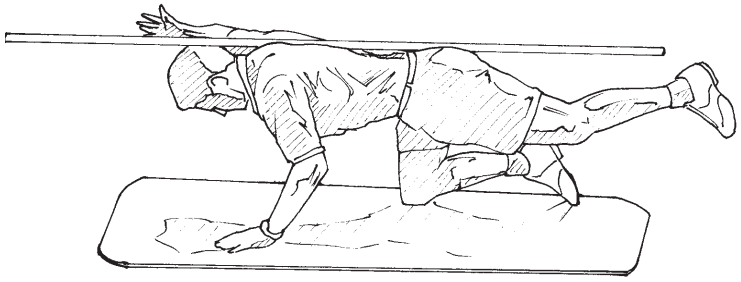


Figure 9B: Horse Stance Horizontal

Alternating Superman on Floor or Swiss ball (Ref. 10. Fig. 10)

- Keep the head and neck in neutral alignment to avoid overuse of the short cervical extensors.
- Keep arms at a 45° angle to the long axis of the body with the thumbs up in a "hitch-hiker" position to activate the lower trapezius muscles (commonly weak muscles, important to posture).
- Avoid pressing on the floor with the down side leg. This is a trick movement used to compensate for weakness of the contralateral hip extensor mechanism.
- 10 x 10 seconds per set builds improved postural endurance.

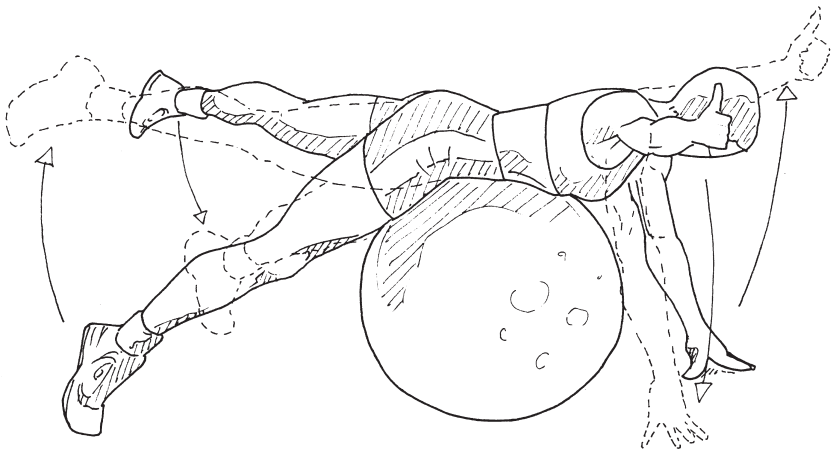


Figure 10: Alternating Superman on Swiss Ball

Once optimal levels of stability are achieved, good integration and strengthening exercises include:

- Single arm high cable pull with a narrow split stance
- Single arm Swiss ball bench press
- Sumo deadlifts – these are preferred over regular or Romainan deadlifts as the wider stance positions enhances the nutcracker effect and so helps to stabilize the SI joint. (Fig. 11)

Figure 11: Sumo Deadlift - start position

A client may be recommended by their physiotherapist to wear a sacroiliac belt. This wraps around the hips and provides a mechanical nutcracker effect by squeezing the SI joints. The belt should be worn during any exercises where the client feels discomfort in the SI region. If they can perform the exercise with good technique without the belt and experience no pain, then encourage them to keep it off during these exercises in order to support active learning. An SI belt is also a good way to assess whether SI joint dysfunction is contributing to instability and low back pain. If wearing the belt improves stability and reduces pain, then the issue likely has an SI joint component.

STRENGTH EXERCISES TO AVOID

When working with clients who have a diagnosed SI joint dysfunction, or those with low back, hip or leg pain that is likely due to SI joint issues, it is best to avoid the following exercises and stretches:

- Split squat
- Lunges any direction
- Conventional deadlift from floor
- Romanian deadlift
- High step-ups and step-downs (low step exercises may be OK)

Pilates instructors need to pay attention to any exercises with single legged movements (particularly supine) that require lumbo-pelvic stability. Frequently the hip flexors overpower the lower abdominals resulting in anterior pelvic tilt which unlocks the SI joint under load and can lead to both joint and ligament injury.

Clients should also avoid group exercise step classes and cardiovascular training on a Stairmaster, elliptical trainer or cycling with the seat too high until the pain has been alleviated or terminated, all flexibility or postural issues have been addressed and they have developed adequate stability in the core, hips and lower body. Running or walking on a treadmill or outside as part of an exercise program should also be reduced or avoided until the issue is resolved, to avoid unnecessary stress on the joint.

CONCLUSION

Recovering from an SI joint problem can be a long, slow process and the area can be easily irritated causing pain to quickly flare up again. Be patient with your clients and don't push them too quickly. Always refer any client you suspect of having SI joint dysfunction to a qualified physiotherapist or similar healthcare provider for diagnosis, and then work with them to modify and adapt the client's exercise program as needed. Always assess and re-assess your clients at regular intervals and use this information to design good stretching and exercise programs. Remember, exercise is like a drug – give the right drug in the right dose, and you can make an individual healthier. But give the same drug in the same dose to another, and you can kill them!

This article has discussed the SI joint and some techniques that the fitness professional can use when working with clients with SI joint dysfunction. It is important to realize, however, that the body is a cybernetic system of systems, and no part can be considered in isolation. Pelvic girdle mechanics can be altered by issues in the psoas, piriformis, gluteus maximus, adductors, tensor fascia latae or neuro-mechanical problems in the cervical spine, visual, masticatory or respiratory apparatus – all systems that are higher in priority for human survival than the musculo-skeletal system. For a more detailed discussion of this hierarchy of survival systems, see Refs. 11 and 12. C.H.E.K Practitioners Levels 3 and 4 are schooled in differential diagnosis methods and are useful referral sources to rule out many of the probable causes of SI joint disorder that fall outside the scope of this article.

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