Strengthening and Stabilising the Sacroiliac Joint: Case Study

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ABSTRACT

Sacroiliac Joint Dysfunction (SI joint dysfunction), is a condition relating to too much movement (hypermobility or instability) or two little movement (hypomobility or fixation) of the SI joint and is generally associated with lower back and leg pain. [8]

The condition, particularly relating to hypermobility, can occur as a result of strain or injury to the SI joint. This may occur through childbirth or as a result of repetitive movements in an unnatural range of motion. There may also be a genetic reason or it could be disease related.

People suffering from SI joint dysfunction with hypermobility often experience sharp and intense pain in the lower back and legs which can make daily activities difficult. [7] This paper focuses on a case study of a young woman who has suffered from this kind of debilitating pain.

Carolyn Westwood, a 30 year old ex-dancer, dislocated her SI joint two years ago on the back of experiencing significant pain in her lower back, glutes and legs for many years. She has been making regular visits to the chiropractor to correct her alignment issues and has been advised that strengthening the muscles surrounding the SI joint is the best course of action for long term rehabilitation.

A Pilates program consisting of exercises focused on strengthening the muscles around the SI Joint and stabilising the joint is recommended for Carolyn, with the ultimate goal of reducing chronic pain and preventing further injury.
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Anatomical Description

The pelvis is considered to be the body’s powerhouse in Pilates. It serves as a bridge between the upper and lower body and is made up of three bones – the ischium, ilium and pubis bound together by cartilage.

Each hip bone is connected in the back to one side of the sacrum at the paired Sacroiliac Joints (SI Joint), which are stabilised by a network of strong ligaments and muscles, which also limit motion in all planes of movement.

The SI Joint is a synovial and fibrous joint, meaning it is slightly movable, so while it does not move freely around like the scapulae, some subtle movement is necessary – approximately 2-4 mm of movement [3] [4]. It is important that the joint does not become immobile so as to avoid undue strain being placed on the pelvis and spine. Conversely, too much mobility in the joint causing it to become loose and unstable, can lead to pain in the lower back and or/hip and even the groin. [1] [2] Hypermobility tends to be more prevalent in young to middle aged woman and commonly occurs during or after pregnancy when the body’s ligaments are more lax due to hormonal changes. It is also extremely common in athletic populations such as in the dance community, due to the excessive range on motion required for many of the movements in the art of dance.

The SI joint distributes weight evenly across the hips and acts as shock absorption to protect the spine during impact. This is one reason that correct pelvic alignment is so important when performing both daily activities such as walking and even sitting, and when exercising. It is said that if the pelvis is out of alignment, the body is out of alignment. This adversely affects the function of the entire body resulting in inefficient movement, muscular imbalances and stress on the structure of the body. [1]

Balanced development of the muscles around the pelvis is fundamental in achieving a well-aligned pelvis and ideal posture. The pelvic floor muscles, spinal flexors and extensors, hip flexors and extensors, hip adductors and abductors, and the hip external and internal rotators are all muscles that act on the pelvic complex. Add to this the list of tendons, ligaments and joints that add support and provide mobility to the pelvis. If the surrounding muscles are week and/or tight, such as the deep core muscles or the gluteals, or the ligaments are lax or damaged, the stability of the SI joint will be compromised. [1] [5]
INTRODUCTION:

The SI Joint is a strong weight bearing joint that connects the sacrum and pelvis. This joint can become inflamed, unstable and dysfunctional.

Pain can be from inflammation of the sacroiliac joint, called sacroiliitis. This is commonly felt as pain on one side of the lower back to the right or left of midline where the joint is located. The inflamed joint can become dislocated. When SI joint dysfunction is severe, pain can refer to the hip, groin, buttocks, and even down the back of the thigh.

Pain may be exacerbated with movements that stress that joint, such as standing up from a seated position, walking up a hill, prolonged sitting or walking, or twisting in an awkward way.

SI joint dysfunction or inflammation can mimic pain associated with degenerative hip disease, hip bursitis, lumbar disc herniation, or pinched nerves. [9]

Treatment for SI joint dysfunction typically involves a combination of steroid injections, medications, and physical therapy. [7] There is, however, much evidence to support the claim that Pilates can reduce pain in people with nonspecific lower back pain with more and more people choosing Pilates as an alternative treatment. [6]

Movements requiring excessive range of motion such as gymnastics and dance, place extreme demands on the SI joint. When looking at the biomechanics of the SI joint, it is no wonder that SI joint dysfunction and associated lower back pain is prevalent in dancers.

Dancers require both great range of motion in their joints as well as mobility due to the demands of the activity, so stability must be created by muscular strength in the full range of motion.

CASE STUDY

Carolyn Westwood is 30 year old female who has danced professionally for many years. Over the years she has experienced instability in her SI Joint resulting in minor lower back pain which she described as her sacrum ‘catching’ when she bent over. The pain and instability was managed by regular visits to the chiropractor for adjustments.

Two years ago Carolyn dislocated her SI joint following an awkward twisting movement of her hips. She had been experiencing increased mobility for the weeks prior to the dislocation, which she identified by a ‘clunking’ feeling and sound in her pelvis. X-rays show that the joint was severely out of alignment, which resulted in significant pain in her hip, buttocks and lower back. The dislocation was rectified through chiropractic manipulation. She has been making regular visits to the Chiropractor to treat the instability, which has worsened since the dislocation, along with regular remedial massages to relax the gluteals which have become extremely tight.

Carolyn is prone to posteriorly ‘tucking’ her pelvis, which is a common fault in postural alignment found in dancers. A sustained posterior tilt was encouraged during Carolyn’s ballet practice, with cues such as ‘squeeze your bottom’ and ‘tuck your tail under’ often used. Carolyn’s pelvis has been trained to operate in a posterior tilt or tuck, which has altered her natural stance, gait and everyday movement. This has resulted in tightness in the psoas, iliotibial band (IT band) and gluteals.
Carolyn has found relief from stretching and using theraballs and foam rollers to release tension in her gluteals and IT Band, which helps to relax contracted muscles and improve blood flow and circulation to the affected area.

Carolyn has been advised that strengthening the muscles surrounding the SI joint, and stretching the gluteals is the best course of action for long term rehabilitation.

It is therefore recommended that a Pilates program be devised specifically to help balance, and strengthen the muscles surrounding the SI Joint with the ultimate goal of stabilising the joint and eliminating the pain associated with hypermobility.

Creating a Pilates Program for the Client

It is important to be mindful of the contraindications of the client’s condition and avoid any exercise that will further irritate the injury or cause more pain. [3]

So many movements in Pilates emanate from the pelvic region, therefore it is important to be aware of the potential imbalances that can occur in the pelvis. Working with precision when performing movements to exercise the pelvic-lumbar region is also vital.

Following many years of Ballet, Carolyn’s posture is bias towards a flat back, regardless of her natural posture being slightly hyperlordotic, as she has conditioned herself to over-tuck her pelvis, placing undue strain on the lower back.

Maintaining pelvic stability during exercise is crucial for a client with hypermobility of the SI Joint. Working in a neutral pelvic position, when appropriate, will encourage balanced muscular development of the pelvic complex and correct muscle recruitment. [3] Carolyn has been practicing Pilates for more than four years and is considered to be at an intermediate level. She has, however, been executing her exercises with her pelvis in a posterior tilt for the majority of the time which has resulted in her trying to stabilise the faulty posture which appears to have exacerbated her issues. Carolyn’s program has been designed to help her to stabilise her pelvis (hips), including the sacrum while working in proper alignment.

It is recommended that Carolyn avoid exercises in which the hips are overly externally rotated, until she develops more strength around the pelvic complex so as to avoid her hips rotating too far causing more strain on the joint.

### BASI Pilates Conditioning Program for Carolyn Westwood

<table>
<thead>
<tr>
<th>Block</th>
<th>Equipment</th>
<th>Exercise &amp; purpose</th>
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<tbody>
<tr>
<td>Warm Up</td>
<td>Mat</td>
<td><strong>Roll downs:</strong> warms up the spine and allows me to identify any imbalances or tightness in the body.</td>
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<td><strong>Pelvic Curl:</strong> important to cue the initiating muscles of the pelvic floor and the abdominals and watch for undesired excessive gluteal engagement, as Carolyn is prone to over engaging her glutes. Keep cueing deep engagement of the abdominals and hamstrings, along with spinal articulation.</td>
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<td><strong>Spine Twist Supine:</strong> Establish a neutral pelvis with feet in table top. If this cannot be achieved the feet will remain anchored on the floor until stability can be maintained. Focus to be placed on the pelvis and the legs moving as one unit</td>
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with deep abdominal and oblique engagement. Also important to minimise the range of movement to avoid placing pressure on Carolyn’s lower back.

**Chest Lift:** Establish and maintain a neutral pelvis with feet on the floor, with the goal of strengthening the abdominals and stabilising the pelvis. Monitor the position of the pelvis, watching for a posterior tuck on each chest lift.

**Chest Lift with Rotation:** As per the chest lift. Place hands on knees as a tactile cue to stabilise the pelvis as the upper body rotates.

NB: The basic warm up on the mat will be utilised initially, keeping Carolyn in the supine position with her pelvis anchored on the mat to help her to achieve and maintain a neutral pelvis. Only once Carolyn is able to stabilise her pelvis, her program will progress to the intermediate mat warm up, incorporating roll ups, double leg stretch and single leg stretch.

<table>
<thead>
<tr>
<th>Foot Work</th>
<th>Reformer Progress to Cadillac and then Wunda Chair as stability improves</th>
<th><strong>Parallel Heels, Parallel Toes, V position Toes, Open V Heels, Open V Toes, - Calf Raises, Prances, Single Leg Heels, Single Leg Toes</strong></th>
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<tbody>
<tr>
<td>Carolyn will be cued to initiate the movement from her hamstrings. Her quadriceps are strong and she has a tendency to rely on them when executing any leg work. She will also be reminded to engage her abdominals to stabilise the pelvis throughout, while relaxing her overactive gluteals to allow smooth, unrestricted hip movement.</td>
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<td>NB: The reformer was selected for foot work initially as lying supine will alleviate the pressure on the lower back. It is also easy to be hands on and see whether she is maintaining neutral or coming into a posterior tuck of the pelvis as the carriage returns to the stopper. As Carolyn’s stability improves we will move her to the Cadillac, which provides a deeper stretch of the hamstrings and gluteals while challenging the pelvis to maintain a neutral position due to the position of the legs. The pelvis acts as an anchor.</td>
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<td>As she achieves greater stability, we will move her to the Wunda Chair, where she will be required to focus more on the co-contraction of the abdominals and the erector spinae.</td>
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| Abdominals | Reformer and Mat Cadillac will also be utilised throughout the initial stages of program. | **Reformer:**
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<tr>
<td>Carolyn’s legs will remain in table top until pelvic stability improves. She will be cued to lift the head and shoulder girdle as one unit, while creating a hollow feeling in the abdominals, with the pelvis firmly anchored on the bed. She can move into hundreds with the legs in table top.</td>
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<tr>
<td>As she progresses we will move into traditional hundreds with both legs extended, and coordination with a focus on controlling the range of the opening, no wider than carriage width.</td>
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Mat:
**Leg circles:** to develop pelvic lumbar stabilisation, improve hip disassociation, develop control of the hip flexors and relax the muscles around the hip joint. While the pelvis remains anchored, the hip joint rotates fluidly as the leg circles around. When executed correctly it may also help to release lower back tension and assist in remedying sacroiliac dysfunction.

**OPTION 2:**
**Cadillac: Instead of reformer and mat**

**Abdominal warm up series:** the Cadillac is an ideal place to strengthen Carolyn’s abdominals, as it is less pressure on the lower back / sacrum with the feet anchored on the floor than with the legs in table top. Her focus can be on stabilising her pelvis while isolating her abdominal engagement.

- Roll-up with RUBar
- Mini roll-up
- Mini roll-up oblique
- Roll-up top loaded

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<tr>
<th>Hip Work</th>
<th>Cadillac</th>
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| **Cadillac: Frog, Circles Down, Circles Up,** **Walking, Bicycle:** | The focus will be on maintaining pelvic stability, on hip disassociation, and restraining the turn out / external rotation in the hips. The size of the hip circles will be minimised until more stability is established. Carolyn will be cued to engage adductors and hamstrings while maintaining a neutral pelvis throughout.  

**Progression:** As Carolyn’s stability improves we will move into single leg hip work on the Cadillac to challenge her pelvic lumbar stability in a safe way. In a supine position, her pelvis will remain anchored on the mat and she will be able to work in a parallel, which will challenge her as she naturally stands with a turn out. |

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<tr>
<th>Spinal articulation</th>
<th>Reformer and Wunda Chair</th>
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| **NB:** Spinal articulation, and any exercise that encourages deep lumbar flexion should be avoided in the first 5 - 10 sessions, then gradually added into the routine. Her progression will be monitored and these exercises will be introduced when appropriate.  

**Bottom Lift on the Reformer and pelvic Curls on the Wunda Chair:** These exercises will be introduced at the appropriate time. Both focus on spinal articulation, hip extensor control along with hamstring and abdominal control. |

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<th>Stretches</th>
<th>Ladder Barrel</th>
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| **Gluteal muscles, Hamstrings, Adductors, Hip Flexors:** | Hold each stretch for 3-5 breath cycles. All essential muscle groups to stretch.  

**Purpose:** Although Carolyn’s gluteals are tight, her hamstrings are flexible and she is prone to ‘flopping’ into a stretch and twisting the pelvis to maximise her range. The |
<table>
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<tr>
<th>Exercise Type</th>
<th>Equipment</th>
<th>Description</th>
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<tr>
<td><strong>Full Body 1</strong></td>
<td>Reformer</td>
<td><strong>Knee Stretch Round Back / Flat Back:</strong> the exercise develops pelvic and trunk stabilisation and strengthens the hip and knee extensors. It also utilises the concept of disassociation. As an intermediate student this will challenge Carolyn, with the focus on the hips as the pivot point.</td>
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<td><strong>Arm Work</strong></td>
<td>Reformer</td>
<td><strong>Arm Supine Series: Shoulder extension, adduction, circles up, circles down and triceps</strong> The supine arm series on the reformer requires significant engagement of the core stabilisers, while working in a neutral spine and pelvis. Carolyn will be cued to maintain pelvic lumbar stabilisation throughout.</td>
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<td><strong>OPTION 2: The Arms standing series on the Cadillac:</strong> this would be a more challenging alternative. The arm work on the Cadillac also requires core stability with co-contraction of the abdominals and erector spinae for trunk stabilisation. The below exercises would be executed:</td>
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|                     |                    | - Chest Expansion:  
- Hug - A - Tree  
- Circles (Up and Down)  
- Punches  
- Biceps |
| **Full Body 2**      | N/A                | Not introducing yet. Over time, as Carolyn’s body gains strength and she has less instability and discomfort, A/M exercises can be introduced or replaced with a second Full Body F/I exercise. |
| **Leg Work**        | Reformer           | **Single Leg Skating:** skating is an excellent hip abductor exercise and helps to develop pelvic lumbar stabilisation. The specific focus is on the gluteus medius which is important for healthy hip function. This muscle is often weak in people with SIJ dysfunction. |
| **Lateral / Rotation** | Ladder barrel   | **Side over prep / side overs:** side over prep provides a more stable base with feet on the bottom rung so it’s suggested that we start here and progress to the full side over. It requires deep activation of the core muscles for stabilisation, and the shape of the barrel supports the body in perfect lateral alignment. It will be easy to identify any instability or rolling off the hip for the instructor in this position. |
| **Back Extension**  | Ladder barrel     | **Back Extension:** the focus will be to strengthen the back extensors and develop trunk stabilisation. Carolyn will be cued to keep the abdominals engaged to protect her back and keep her pubic bone connected with the barrel. |
Conclusion

SI Joint Dysfunction and the associated pain can be debilitating, interfering with daily activities and the quality of a person’s life. Developing and maintaining pelvic stability during exercise is crucial for a client with hypermobility of the SI Joint.

Although Carolyn has been practicing Pilates for more than four years and is considered to be at an intermediate level, the benefits of going back to the fundamentals have been evident. As she has been executing her exercises with her pelvis in a posterior tilt throughout her practice, it has lead to her trying to stabilise a faulty posture which appears to have exacerbated her SI joint issues. The first few sessions have been focused on retraining Carolyn’s body and she is already beginning to feel the benefits of working in a neutral pelvic position, when appropriate.

She has become more mindful of her pelvic position when executing daily activities, even while standing and walking, which is helping to alleviate much of her discomfort.

Carolyn’s program has been designed to strengthen the weak muscles, tendons and ligaments surrounding the SI joint, and establishing pelvic-lumbar stabilisation, with the ultimate goal of eliminating the pain associated with SI joint hypermobility.
Bibliography:

Book


[6] Antonino Patti, MSc, Antonino Bianco, PhD, Antonio Paoli, MD, Giuseppe Messina, MD, Maria Alessandra Montalto, MD, Marianna Bellafiore, BSc, Giuseppe Battaglia, PhD, Angelo Iovane, MD, and Antonio Palma, MD. Effects of Pilates Exercise Programs in People With Chronic Low Back Pain: A Systematic Review. Web. 30 Jan 2015. ttp://www.ncbi.nlm.nih.gov/pubmed/25634166

