Spondylolysis and Spondylolisthesis

Pilates for Improving Spinal Flexibility and Low Back Pain

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Abstract

31 million Americans have suffered from back pain at any given time ("Back Pain Facts and Statistics"). Back pain does not discriminate on the basis of race, gender or age. Most cases of back pain are not caused by serious conditions but result from core weakness. Unlike the rest of our skeletal system, our spine and entire trunk area are solely supported by our abdominal muscles. Weakness in the abdominal muscles leaves the spine more susceptible to pain and injury. However, there are many individuals that suffer from low back pain due to organic issues – or medical conditions. Spondylosis is used to describe a fracture or defect in the vertebra that form the spinal column. If that defected vertebra in the spine slips to one side of the body, the condition is known as Spondylolisthesis. Both of these conditions can cause severe back pain and limited range of motion for the affected person. However, exercises focused on strengthening the core and stretching the spine can greatly improve mobility and reduce spondylosis and spondylolisthesis related symptoms. In this paper, we will focus on how a targeted Pilates practice can benefit those affected by Spondylosis and Spondylolisthesis.
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Anatomical Description of Spondylosis and Spondylolisthesis

The Pars Interarticularis is part of the lumbar spine that joins the upper and lower joints. The middle image shows a fracture in the pars. If the condition worsens, the vertebra may start to slip causing spondylolisthesis as represented in the third image. ("Spondylolysis and Spondylolisthesis.")

There are four grades Spondylolisthesis that refer to the amount of slippage of the vertebra. Typically, the greater the degree of slippage, the greater the symptoms. ("Lumbar Spondylolisthesis")
Introduction

Statistics show that 80% or people will be affected by severe back pain at some point in their lifetime (Isacowitz, pg.51). While low back pain is common, the severity of the pain can vary greatly. An injury or strain to the muscles in the low back may cause pain great enough to warrant an emergency room visit while degenerative disease may only cause mild, occasional discomfort.

The term “lumbar” is derived from the Latin word “lumbus” meaning lion. It is built for both power and limberness, earning the right to its name. The lumbar is required to lift, twist, and bend for most all everyday activities. The lumbar spine is comprised of a complex, interconnected network of spinal muscle, bones, tendons, nerves and discs. The lumbar spine consists of five vertebrae labeled L1-L5. The lower the vertebra is in the spinal column; the more weight it must bear. The L1-L5 vertebra are the biggest unfused vertebra in the spinal column which enable them to support the weight of the entire torso (Davis). Each vertebra stacks on top of each other with an intervertebral disc between them which acts as a shock absorber to protect the vertebra. Because the lower vertebrae (L4 and L5) bear the most weight, they are most prone to strain and injury.

Spondylolysis is a condition where the pars interarticularis has a defect or fracture. Pars interarticularis (or Pars for short) is the bone that connects the facet joints in the back of the spine. In approximately 25% of cases, spondylolysis is associated with a more severe condition called Spondylolisthesis. Spondylolisthesis is defined as the anterior or posterior displacement of a vertebra on top of the one below it. It is estimated that approximately 5-7% of the population has either condition (Ulrich).
Spondylolysis can occur genetically or from trauma. Some might be born with thin vertebra bone and thus the spine becomes more susceptible to fracture. Growth spurts, particularly during the puberty years, can create defects or slippage in the thin vertebra bone. Overuse or trauma can also be a contributing factor to spondylolysis and spondylolisthesis. Activities such as football, gymnastics, or weightlifting that place excessive extension or force on the lumbar spine can cause stress fractures on either side of the spine. The lumbar spine is the most common area in which these injuries are found, particularly in the lowest part of the lumbar spine between the fifth lumbar vertebra (L5) and the first sacral segment (S1). Many people live with spondylolysis and spondylolisthesis pain free. However, these conditions can cause severe pain and limitations in mobility for some patients. Depending on the severity of the condition, patients may have a visible arch or bulge in their low back. In some cases, these conditions can also cause back spasms which contribute to a deterioration of posture and can affect gait (“Spondylosis and Spondylolisthesis”).

Pilates can greatly improve symptoms and mobility for patients affected by spondylosis and spondylolisthesis. By cueing the client into proper engagement of the transverse abdominal muscles, the client can expect to gain core strength to help support a weak or damaged lumbar spine. Stretching the tight back extensor muscles and hamstrings can also improve flexibility and encourage proper posture alignment.
Case Study

Alexandra Burnett is an active, healthy 34-year-old female gymnastics coach. From an early age, Alexandra’s gift as a talented gymnast was evident. She competed for the majority of her adolescent years and continued into her young adulthood years. In her late teens, Alexandra started noticing a dull pain in her lower back. As she continued to compete, her back pain worsened. At the age of 21, Alexandra was diagnosed with spondylosis of the L5 vertebra. In spite of her diagnosis, she continued pursuing her passion of competitive gymnastics. Unfortunately, just 3 years later, Alexandra’s condition progressed to a diagnosis of spondylolisthesis when her L5 vertebra slipped on top the S1 segment. Her spondylolisthesis induced pain eventually progressed to the point that she was no longer able to participate in competitive gymnastics. Alexandra loved the sport so much, she decided to pursue a career as a gymnastics coach to keep active in the gym. Although coaching is not as demanding as actively participating in competitive gymnastics, Alexandra is still required to perform the movements she teaches her students. Even this limited amount of movement aggravates her low back pain.

Alexandra’s doctor prescribed physical therapy which has greatly improved her mobility and lessened her back pain. After a year of physical therapy, her doctor recommended Pilates for long term maintenance of a healthy back. Outside of gymnastics, Alexandra has not maintained a regular work-out routine. Although gymnastics has developed solid upper body, quadriceps, and calf strength, Alexandra’s core is weak and her back muscles are extremely tight. Her doctor has encouraged Alexandra to do Pilates to strengthen the deep core muscles, the transverse
abdominals, while simultaneously stretching the back muscles and strengthening the lumbar multifidus muscles which most closely support the spine.

In our initial session, I noticed several imbalances and areas of weakness in Alexandra’s body. During her roll down, she was able to reach just past her knees which indicates extreme tightness in her hamstrings. Additionally, she could get little to no flexion in her lower back. I also noticed in a standing position, Alexandra tendency is to anteriorly tilt her pelvis resulting in a faulty hyperlordosis posture of the low back. Her shoulders are rounded forward indicating tightness in the chest and weakness in the upper back extensors.

The conditioning program I’ve developed for Alexandra will encompass a full body workout while focusing on specific areas of weakness and tightness. It is imperative that Alexandra learn to properly engage her abdominal muscles during each exercise to strengthen the deep core muscles that support the spine. Co-contraction of the core and back muscles will increase Alexandra’s awareness of how to safely move in both the gym and her everyday activities. Improving her posture will go a long way in reducing the strain on her spine. Alexandra struggles to extend the upper back muscles without cranking into her low back so we will also focus on differentiating the different parts of the spine and how the lumbar and thoracic can move independent of each other. Alexandra’s conditioning program will also focus on stretching areas of extreme tightness in her back, chest, hamstrings and hip flexors. A consistent Pilates practice will be instrumental in managing Alexandra’s back pain and aid in her ability to pursue her passion for gymnastics as long as possible.
BASI Block System Fundamental/Intermediate Level

Warm-up
3 roll-ups to assess body
Pelvic curl
Spine twist supine
Chest lift
Chest lift with rotation

Footwork
Reformer: Parallel Heels, Parallel Toes, V Position Toes, Open V Heels, Open V Toes, Calf Raises, Prances, Single Leg Heel, Single Leg Toes

Abdominal work
Short box series: Round Back, Flat Back, Tilt, Twist, Round About, Climb-A-Tree

Hip work
Cadillac: Frog, Circles Down, Circles Up, Walking, Bicycles (forward and reverse)

Spinal Articulation
Cadillac: Monkey

Stretches
Ladder Barrel: Hip Flexor and Hamstring stretch
Shoulder pole series with stability ball

Full Body Integration 1

Thigh Stretch

Arm Work

Full Body Integration 2

Upstretch 1 and Upstretch 2

Leg Work

Reformer: Single Leg Skating

Lateral Flexion/Rotation

Ladder Barrel: Side Over Prep

Back Extension

Ladder Barrel: Basic Back Extension

Mat: Cat Stretch

Rest Position

Conclusion

Roll down

In our conditioning program, emphasis is placed on co-contraction of the deep core and back muscles while stabilizing through the pelvic region. Alexandra will perform footwork on the reformer as it places less stress on the lumbar spine than the cadillac. The short box series is designed to work the core and obliques while co-contracting the back extensors. Monkey on the tower facilitates a good stretch for the back and hamstrings while engaging the abdominals, and the shoulder stretch pole series focuses on stretching the shoulders and chest while maintaining scapular stabilization. Stabilization of the scapula is also key aspect of the Upstretch series and the thigh stretch encourages co-contraction of the abdominals and back extensors while provide a deep quad stretch. The sitting arm series continues to build upon the co-contraction of the abdominals and back extensors to keep the upper body stable while working the arms. During
our back extension block, it is key to cue Alexandra into engaging her abdominals to support the low back during extension. We include cat stretch on the mat in this block to practice moving the spinal sections independently through thoracic extension while maintaining a neutral lumbar spine and lumbar flexion while keeping a flat upper back. Throughout our session, we incorporate appropriate breath patterns with each movement to encourage concentration and provide a natural rhythm for the movements. (Isacowitz, pg. 10)

**Conclusion**

Almost all of us will experience back pain in some form in our lifetime. Fortunately, for most people, symptoms can be greatly reduced with a regular exercise program focused on the development of key muscles that support the spine. Joseph Pilates is quoted as saying, “A man is as young as his spinal column.” (George) It is especially important for clients with injuries such as Alexandra to learn how to properly engage the core to support the spinal column. Pilates places considerable focus on core strength and increased flexibility by developing the body uniformly. As a result, a regular Pilates practice can greatly improve the quality of life and ability to perform everyday tasks for any client.
References


