Pilates Based Treatment
For Low Back Pain
with Contradicting Precautions :
A Case Study

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Abstract

This case study presents the Pilates based treatment of an individual, AG, with a complex medical history including multilevel cervical and lumbar spondylosis and degenerative disc disease, L5-S1 left-side posterior disc herniation (HNP), L4-5 mild spinal canal stenosis, osteoporosis, and abnormal posture/mild scoliosis. Her multiple spine conditions present a unique challenge to designing a Pilates rehabilitation program. Her spinal stenosis and excessive lumbar lordosis would indicate avoiding spinal extension, while, her discogenic pathologies and osteoporosis indicate avoiding spinal flexion based activities. While these conflicting contraindications heavily influenced AG’s program, the primary consideration in designing her Pilates repertoire revolved around correcting her abnormal posture and lack of right hip extension and hip dissociation in her gait cycle. The primary challenge in designing AG’s program was correcting her excessive lumbar lordosis by choosing exercises that bias a posterior pelvic tilt, while avoiding any exercises with excessive trunk flexion, loaded spinal flexion, or combined flexion/rotation movements that may aggravate AG’s lumbar disk pathology.
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Anatomy Review & Related Lumbar Spine Conditions

Figure 1.

Figure 2. Shows a disc herniating posterolaterally and impinging a nerve.

Figure 3. Shows a person performing trunk flexion and how this creates a gap or space for the disc to bulge even further posteriorly. The image on the right demonstrates the vertebrae as they move into spinal extension which is thought to mechanically push the disc more anteriorly where it is less likely to irritate a nerve root.

Figure 4.

Figure 5.
Introduction

Recent studies show that approximately 85 percent of adults experience back pain and about 20 percent call their back pain severe or disabling. There are many different types of treatments for low back pain and various health care professionals that provide services and options that they claim will cure back pain. For an individual experiencing pain and facing many options for treatment, the situation can feel overwhelming.

While one specific treatment option may work one individual and not for another, there is a strong body of both research based and empirical evidence that supports the use of Pilates based treatment for low back pain. After an initial episode of back pain, key stabilization muscles (transverse abdominus and multifidus) that support and protect the spine weaken dramatically and will not spontaneously recover without rehabilitation to these muscles. The Pilates method uses specific exercises that focus on controlled movement patterns that improve postural stabilization strength and endurance, flexibility, and body awareness.

Some spine conditions have specific precautions and movements that should be avoided in order to prevent causing any further injury to the region. A skilled and knowledgeable instructor will be able to make the necessary modifications to an individual’s program in order to safely work towards an individual’s goals, for example improving a person’s core strength and overall functional mobility. However, what happens when a person presents with two or more spine conditions that have contradicting precautions? For example, a person with the diagnosis of lumbar stenosis should generally avoid trunk extension based movements; and a person with a recent disc injury should avoid trunk flexion based activities. How do you chose which exercises are appropriate? This case study outlines the treatment for an individual with contradicting precautions for rehabilitation and Pilates and her response to these treatments.
Case Study: AG

AG is a 65 year old female who presented for an initial evaluation on 10/2/2013 with primary complaints of chronic right low back pain (LBP) with radiating right hip and thigh pain. Her symptoms had been present for greater than 4 years, but worsened after a posterior fall on a wet floor in August 2013. Her past medical history is significant for multilevel cervical and lumbar spondylosis and degenerative disc disease, L5-S1 left-side posterior disc herniation (HNP), L4-5 mild spinal canal stenosis, osteoporosis, abnormal posture/mild scoliosis, high blood pressure and migraines (averages five per month).

She had recently received steroid injections to L4/5 from her pain management physician which she reports significantly reduced her symptoms for approximately 6-8 weeks. She was referred to physical therapy by her Rhematologist, who also advised her that she would likely need a right total hip replacement in the future.

On subjective examination, she reports 6/10 pain which worsens with right lower extremity weight bearing activities, such as prolonged standing or walking. She also reports an inability to weight bear through her right lower extremity with standing after sitting for greater than 10-15 minutes. She reports having to very cautiously put weight through that leg because “it feels like it is going to give out” due to the pain for about the first ten steps. She is unable to sleep on her right side and often wakes at night because of her pain.
AG’s objective examination revealed the following findings:

Pilates Assessment:

- Abnormal Static Standing Posture: increased upper thoracic kyphosis, severely excessive lumbar lordosis, scoliosis with left trunk and pelvic rotation and left shoulder elevation
- Standing Roll down: hamstring flexibility and trunk range of motion (ROM) within functional limits (WFL); patient reports reproduction of right leg pain with trunk flexion and extension active ROM.

Physical therapy Assessment:

- Abnormal Gait: completely lacks right hip extension in late right stance phase and compensates with excessive trunk and pelvic right rotation
- Impaired hip ROM: flexion, left: WFL; right: 90 deg limited by right LBP; extension, left: 5 deg; right: -5 deg with pain; Internal rotation, left: 45 deg, right: 30 deg limited by right LBP; external rotation, left: 75 deg, right 50 deg limited by right LBP;
- Strength: Poor pelvic floor and transverse abdominus strength, coordination and endurance; Poor hip extension, abduction and external rotation strength, right > left.
- Hypomobile hip joint glides, right > left
- Hypertonic gluteal and piriformis muscles with increased tenderness to palpation
- Impaired static and dynamic single leg stance balance with complaints of increased right hip and LBP with right one leg stand.

Her goals for treatment include:

1. Reducing and ideally eliminating her right hip and low back pain
2. Stand up from a sitting position and be able to walk without any pain or fear of falling
3. Return to walking community distances for exercise and osteoporosis management without pain

Pilates and Rehabilitation Program

AG’s rehabilitation program was comprised of physical therapy techniques including hip joint and soft tissue mobilizations, neuromuscular re-education, as well as Pilates corrective exercises utilizing the Block System from Body Arts and Science International (BASI) approach.

The primary goal in designing AG’s program was to correct her excessive lumbar lordosis with exercises that bias a posterior pelvic tilt, while still avoiding any exercises with excessive trunk flexion, loaded flexion, or combined flexion and rotation that may aggravate AG’s lumbar disk pathology. In addition, AG would benefit from exercises that focus on hip extension range of motion given her limitations in this direction and its adverse effect on her gait cycle. However, her difficulty with hip and lumbopelvic dissociation required most exercises to be slightly modified in order to achieve hip extension while maintaining a more neutral lumbar spine, which for AG feels like a flexion or “C-curve” because of her habitual and chronic excessive lumbar lordosis.

Below is a sample of some of the Pilates exercises that were performed in AG’s program. The exercises are listed according to the BASI Comprehensive Block System and include the exercise name, number of repetitions performed, and a brief explanation of the reasoning for selecting the exercises as well as a desired result. All modifications and assists that were used are included in the descriptions.
Warm Up

**Pelvic Curl**, 1x10: Encourages AG to move into hip extension while simultaneously correcting her excessive lumbar lordosis with an emphasis on maintaining a posterior pelvic tilt

**Leg Lift**, 1x10 - AG was unable to maintain proper lumbopelvic posture and stabilization with this activity at first. In a hooklying position, she lacked the abdominal strength to prevent excessive lumbar lordosis. However, with practice and cuing for isometric pelvic floor and transversus contractions, she was soon able to complete this exercise and progress to performing 10 consecutive repetitions on each side (alternating) without any fatigue or loss of form. AG performs this exercise independently at home once a day to continue to build abdominal strength and work on hip dissociation.

**Leg Circles**, 1x10 - Modified with the use of a blue theraband to facilitate proper lumbopelvic posture and control and to improve hip range of motion

Foot work

**Foot work on the Reformer**, all 1x10, with one red and one blue spring. The supine position on the reformer puts the spine in a relative gravity eliminated position, which enables AG to have better lumbopelvic control and stabilization. In addition, this set of movements promotes hip dissociation. AG has been able to progress to two red springs.

Abdominals

**Mini Roll up on the Avalon Arm Chair**, 1x10. Strengthens abdominals in a flexed lumbar spine position and allows AG to use the springs for assistance and to decrease the overall load on
the spine. It also, emphasizes upper spinal articulation and scapular retraction/stabilization to help with correcting AG’s increased thoracic kyphosis.

Hip Work

**Hip work on Step Barrel**, 1x10 All. The step barrel provides lumbar support and promotes trunk stabilization. The hip work facilitates hip dissociation and works on hip range of motion. AG can progress to hip work on Avalon to utilize the springs for added resistance and strengthening as tolerated.

Spinal Articulation

**Pelvic Curl on the Wunda Chair**, 1x10. The first part of this exercise is good for AG as it focuses on hamstring and hip extension strength; and the pelvic curl motion emphasizes a posterior pelvic tilt and spinal articulation.

Stretching

**Gluteal and hip flexor stretches on Ladder Barrel**, bilateral, 3 x 45 seconds. The ladder barrel provides a stable stretching environment for AG. She performs these in front of a mirror for feedback for proper lumbar posture (i.e. avoiding excessive lumbar extension with hip flexor stretch and avoiding trunk and pelvic side bending with gluteal stretching).

Full Body Integration I (only after >10 sessions)

**Scooter**, 1x10: This is a perfect exercise for AG because it addresses all of her imbalances and especially resembles the hip dissociation movement that is required in the late stance phase of
gait that AG lacks. It focuses on sustaining abdominal engagement for maintaining a slightly flexed lumbar spine while simultaneously activating hip extensors. This exercise is very challenging for AG, however, she has demonstrated significant improvement over time and also shows good carryover of improved right hip extension in her gait cycle.

Arm Work

Arm work on Ped-e-pole, 1x12 All. The Ped-e-pole provides appropriate support to AG in a seated position to allow her to more easily engage her abdominals and maintain a neutral spine position while performing the arm work. Further, it facilitates arm dissociation which is also important in the gait cycle.

Full Body Integration II (only after >20 sessions)

Kneeling Cat Stretch on the Cadillac, 1x8. AG has performed the mat cat stretch as a precursor to this stretch. Both exercises challenge AG to move her kyphotic thoracic spine into extension while maintaining a neural lumbar curve, which for AG feels like moving into lumbar flexion. She continues to demonstrate improved coordination and control with this exercise and the carryover to her upright standing posture is evident.

Leg Work

Gluteal Kneeling Series on the Mat, bilateral 2x10. AG performs this series on the cadillac with her forearms on the short box in front of a mirror. The upper extremity weight bearing on the box works on her scapular stabilization strength and endurance. The mirror provides her with feedback on her posture. The hip extension and abduction movement in this series focuses
on gluteus maximus and medius activation and strengthening. This series had been tremendously challenging and beneficial for AG.

**Lateral Rotation**

**Mermaid on the Reformer**, bilateral 4x20 seconds, one red. Although this exercise incorporates trunk flexion and rotation, AG is able to benefit from multiple aspects of this motion without causing any harm to her spine. She benefits from the hip internal and external rotation stretch that is required for the sitting position on the reformer. In addition, AG has developed tightness in her quadratus lumborum and hypertonicity in her lumbar extensors as a result of her abnormal posture and this stretch helps to relieve tension and elongate the muscles in this region.

**Back Extension**

**Back Extension on the mat**, 1x10. AG began doing this exercise with one pillow placed under her hips to reduce her lumbar lordosis and facilitate abdominal control with the upper back extension. The thoracic extension with this exercise helps to strengthen the postural muscles needed to improve AG’s standing posture and facilitate trunk stabilization.
Conclusion

AG’s was seen for a total of 30 sessions over the course of four months. Her treatment program took into consideration the appropriate precautions given her complex medical history; however, the majority of her treatment plan focused on addressing the muscular imbalances present and working towards correcting her abnormal posture. Throughout her treatment she continued to demonstrate improved recruitment of deep stabilizer muscles (transverse abdominus and multifidus) and reported significant improvements in her functional activities of daily living. She reported decreased complaints of pain and the ability to sleep throughout the night without waking from pain. She no longer feels as though her right lower extremity will “give out on her” when she performs a sit to stand motion and is able to perform prolonged standing and walking without any limitation. She continues to present with an abnormal gait pattern though this is gradually improving and AG demonstrates very good body awareness with this.

This case study demonstrates the therapeutic benefits of the Pilates method for this individual with chronic low back pain. However, it is important to note that other physical therapy interventions were used including hands-on manual therapy treatments and neuromuscular re-education. Therefore it is not enough to prove or disprove the effectiveness of Pilates as a standalone treatment for all individuals with low back pain, but rather suggests that Pilates based exercises can be a useful component in the management of individuals with low back pain.
Bibliography


