Pilates and Lumbopelvic Stability

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Abstract

The contribution of the Transverse Abdominus (TA), Internal Obliques (IO), External Obliques (EO), Pelvic Floor (PF), and Multifidus muscles to spinal stability (particularly lumbopelvic stability) has been well established. This paper discusses the TA, IO, EO, PF, and DM muscles, with particular focus on the DM muscles, and how Pilates can specifically address weakness, improve strength, and improve function.
# Pilates and Lumbopelvic Stability

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Lumbar multifidi

Figure 1

Transversus abdominus

Figure 2

Figure 3

Figure 4
Research shows that over 80% of us will develop back pain in our lifetime, and that approximately 60% of us will have recurrent problems. That is defined as chronic back pain. As a Physical Therapist (PT), I became interested in Pilates because of its focus on the “core” musculature and how to engage it. The core stabilization exercises I use as a PT are similar, and often identical, to those taught by Pilates exercises.

The muscles of the “core”, or, as Joseph Pilates called it, the “powerhouse,” include the abdominals, the pelvic floor, and the back and hip muscles. The abdominal muscles include the Tranverse Abdominus (TA), Internal Obliques (IO), External Obliques (EO), and Rectus Abdominus (RA). The Pelvic Floor (PF) muscles, sometimes referred to as the Pelvic Diaphragm, are the pubococcygeus, iliococcygeous, ischiococcygeous, and levator ani. The relevant back muscles are the Quadratus Lumborum (QL), Multifidus, Erector Spinae (ES), and Latissimus Dorsi. Hip muscles include the Gluteus Maximus, Gluteus Medius, Gluteus Minimus, External Rotators, Internal Rotators, Adductors, Abductors, Hamstrings, and Hip Flexors (primarily Iliopsoas). Also involved is the Thoracolumbar Fascia which connects the lumbar spine and the pelvis to the core muscles.

The Multifidus muscles as a whole run the entire length of the spine, but each individual muscle spans only 2 – 5 vertebral levels. The deep fibers of the lumbar Multifidus (DM) span only 2 -3 levels (Figure 3) and research has shown that these fibers provide the major source of stability for the lumbar spine and sacroiliac joint (SIJ).

Muscles can be classified within two systems, local and global. The local system pertains to those muscles essential for segmental or intrapelvic stabilization, while the global system is responsible for gross movement. With respect to the lumbopelvic region, the muscles that act as local stabilizers are the PF, TA, the Diaphragm, and the DM (Figure 4). This stabilization is achieved through several mechanisms;

- Increasing intra-abdominal pressure
- Increasing tension of the Thoracolumbar Fascia
- Increasing articular (spinal) stiffness

This stabilization means that the lumbar spine and the SIJ will not move excessively when performing pelvic tilts, trunk flexion, trunk extension, and / or trunk rotation.

The “Core” muscles work together to create stabilization:
• The TA and DM have been referred to as the “Circle of Integrity” because when those two muscles are engaged it creates a corset-like effect on the spine and abdominal contents (Figure 1 and 2).

• The pubococcygeous and TA work together to prevent shearing of the pubic symphysis.

• The other PF muscles work together with the DM to allow the sacrum to move appropriately with the spine.

Pilates teaches us to engage (or contract) the TA, pulling the belly button in and up. Pilates also teaches us to engage the pelvic floor which will assist in engaging (contracting) the TA. What very often is missing in some Pilates training programs is instruction on how to engage the DM.

To locate your DM, palpate just lateral to the spine in the “trough” between the spinous processes and the more developed ES muscles. You should feel a “mushiness” as you touch the muscle. To engage the DM first engage your PF, then engage your TA, and finally think of a line connecting your TA in front to your fingers where you are palpating in the back. You should feel a swelling under your fingers as the DM muscles contract. If you don’t feel the swelling, it may mean you have some weakness and atrophy of those muscles fibers. The good news is you can use Pilates exercises to improve the strength of the DM muscle.

Work first to feel the muscle engage when you imagine that connection from the TA to the DM. Once you feel those muscles engage, keep them engaged as you perform the following basic exercises. When you are able to maintain the DM contraction through the entire basic exercise program, we will progress to a more comprehensive Pilates mat and/or equipment program.

**Exercises**

Exercise #1:

1. Lie supine with neutral pelvis and neutral spine. Engage the PF, TA, and DM.

2. Perform pelvic tilt and then return to neutral pelvis keeping PF, TA, and DM engaged.

3. Perform 20x.

*Exercise #2:*
1. Begin on all-fours (hands and knees,) with back and pelvis neutral, PF, TA, and DM engaged.

2. Extend your right leg behind you and raise to horizontal. Keep hips level and spine and pelvis neutral.

3. Repeat with the left leg.

4. Perform 15x each leg.

**Exercise #3:**

1. Begin as in Exercise #2. As you extend the right leg back lift the left arm off the floor also.

2. Repeat with the left leg and right arm.

3. Perform 15x each side.

When you are able to perform these exercises keeping the MD engaged throughout, progress to (BASI Mat exercises) Spine Twist Supine, Front Support, Leg Pull Front, Swimming, Side Leg Lifts, Shoulder Bridge Prep, and Shoulder Bridge.

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**Case Study:**

A 48-year-old female with a 10-month history of hip pain on the left side. She has recently decreased her exercising (step aerobics, Pilates mat and equipment classes, and yoga classes,) due to increased hours at work.

**Findings:**

- Left GM not firing with left hip abduction (side lying and standing).
- Lateral shift of pelvis to right with gait
- Decreased firing of both DM, with left worse than right.

**Beginning Exercise Program:**

- Front Support (Modified, see Exercise #2 and #3 below)
- Swimming
- Side Leg Lift

**Short-term Goals:**

- Increased GM firing with left hip and increased hip stability
Improved DM contraction bilaterally with hip/pelvic movement

**Long Term Goals:**

- Return to full exercise program, without left hip pain
- Full exercise program, including the BASI Block system workout (below).

**Results:**

After performing the basic exercises #1, 2, 3 (see pages 6 and 7) once a day for five days, the client progressed to the “Beginning Exercise Program” listed above. It was noted that she was able to engage GM with side lying leg lifts as well as maintain TA and DM engagement. She performed these three exercises daily for an additional five days. She noted less left hip pain with exercise in the second week, compared to the first week. During week three, she progressed to the full equipment workout (below) and noted no left hip pain during or after her workout program. (She was progressed to the full workout quickly because she was performing these exercises weekly prior to beginning her assessment and therapeutic exercise intervention).

**BASI Equipment Workout**

**Footwork:** Reformer – focusing on keeping TA/DM engagement.

**Abs:** 100s, coordination on Reformer. Mini Rollups and Mini Roll-up Oblique on Cadillac.

**Hip Work:** Basic Leg Springs and Single Leg Springs on Cadillac (more time spent here because we want more emphasis on hip stabilization.)

**Additional Leg Work:** (out of order due to flow – we are already on the Cadillac) Single Leg Side Series.

**Spinal Articulation:** Reformer – Bottom Lift and Short Spine.

**Stretches:** Kneeling Lunge on Reformer.

**FBI-1:** Up Stretch 1, Up Stretch 2, Long Stretch – 4 reps of each.

**Arms:** Arms Kneeling on Reformer (chosen because of the added challenge on lumbopelvic and hip stability in kneeling.)

**Lateral Flex/Rotate:** Mermaid – Reformer.

**Back Extension:** Chair – Swan on Floor.
All of the exercises were chosen for a complete body workout, while specifically challenging the hip and lumbopelvic stabilization. The client was reminded to keep TA and DM engaged while performing exercises.

**Conclusion**

As Pilates instructors, we can assist our clients in learning how to properly engage *all* of the core muscles to stabilize and protect the lumbopelvic area with everyday activities and exercise. These muscles include: the abdominals (particularly the TA), the PF, and the DM. Exercises that specifically target these muscles will not only create a strong “core”, or “powerhouse”, but can assist in decreasing back, SIJ, and hip dysfunction and pain.
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