Pelvic Floor Dysfunction & Low Back Pain

Pilates as preparation for the second pregnancy

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1. Abstract

This paper describes pelvic floor dysfunction (PFD) and low back pain (LBP) in terms of sacroiliac joint dysfunction (SID), the symptoms of these conditions and how they correlate.

It gives an anatomical overview of the pelvis, its muscles and joints and how they can become affected by PFD and SID.

It includes a case study about a 37-year old female who has PFD from her pregnancy and has recently started to develop SI joint pain.

Since she wants to have another baby, this paper also includes an overview of the effects of pregnancy on PFD, LBP & posture.

To improve her conditions and to prepare her for her second pregnancy a conditioning program (using the BASI Block System) has been created based on her postural weaknesses.

A mat homework program and set of exercises for PFM activation and awareness are included in the appendix since it is important that the PFM training will become part of her daily life.

Important note: This paper includes a pre-pregnant program, not a pre-natal program! Since the body changes during pregnancy the whole program has to be revised and modified according to each trimester.
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3. Anatomical Description

3.1. Pelvis

The pelvic girdle is a complex ring of joints, ligaments, and muscles. The three main bones of this region, two ilium and the sacrum, meet together to form three joints. These areas are the pubic symphysis and two sacroiliac joints.

- **Figure 1: Pelvis**
- **Figure 2: Lumbopelvic Cylinder / ISS**

   ![Pelvis Diagram]

   The abdominals (transverse abdominus) and back muscles (multifidus), together with the diaphragm and the pelvic floor, create a cylinder of muscular support in the center of the body. Rael Isacowitz calls this the internal support system (ISS). It is congruent with the powerhouse in Pilates or the core in other forms of training.

3.2. Pelvic Floor Muscles

The “pelvic floor” (PF) refers to a group of postural support muscles that attach to the front, back, and sides of the pelvic bone and sacrum like a sling or hammock. These muscles support the organs in the pelvis, including the bladder, uterus or prostate, and rectum. They also wrap around the urethra, rectum, and vagina (in women).

*The appendix (page 15-19) includes information on how to activate and train PFM.*
The pelvic floor has **three muscle layers**:\(^2\)

<table>
<thead>
<tr>
<th>Layer One - Urogenital Triangle / Superficial layer: <strong>innervated by the pudendal nerve</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Bulbocavernosus • Ischiocavernosus • Superficial transverse perineal • External anal sphincter (EAS)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Layer Two - Urogenital Diaphragm <strong>innervated by pudendal nerve</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>The urogenital diaphragm, also called the triangular ligament, is a strong, muscular membrane that occupies the area between the symphysis pubis and ischial tuberosities and stretches across the triangular anterior portion of the pelvic outlet. The urogenital diaphragm is external and inferior to the pelvic diaphragm.</td>
</tr>
<tr>
<td>• Urethral sphincter • Compressor urethrae • Sphincter urethral vaginalis • Deep transverse perineal</td>
</tr>
<tr>
<td>• Perineal membrane</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Layer Three - Pelvic Diaphragm <strong>innervated by sacral nerve roots S3-S5</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>The pelvic diaphragm is a wide but thin muscular layer of tissue that forms the inferior border of the abdominopelvic cavity. Composed of a broad, funnel-shaped sling of fascia and muscle, it extends from the symphysis pubis to the coccyx and from one lateral sidewall to the other.</td>
</tr>
<tr>
<td>• Levator ani (pubococcygeus, pubovaginalis, puboanalis, puborectalis, iliococcygeus) • Coccygeus • Piriformis • Obturator internus • Arcus tendinosus of levator ani • Arcus tendinosus fasciae pelvis</td>
</tr>
</tbody>
</table>

### 3.3. Pelvic Floor Functions

The PFM serve several important functions for the health of the low back, the sacroiliac (SI) joint and bladder control. Research has shown that these muscles contract together with the TA.\(^3\)

- Support of the pelvic organs (bladder, uterus, prostate, rectum)
- Urinary and fecal continence
- Sexual performance (orgasm)
- Supporting the spine
- Stability of connecting joints (hips, sacroiliac, lumbar joints)
3.4. Pelvic Floor Dysfunctions (PFD)

Pelvic Floor Dysfunction is the "Inability of the pelvic floor to fulfill its supportive role to the pelvic organs and/or its inability to allow these organs to function normally." Associated Dysfunctions include:

- Pelvic Organ Prolapse
- Urinary Incontinence
- Low Back Pain
- Pelvic Pain
- Bowel Disorders
- Sexual Dysfunction

Figure 4: PFD: Prolapse Types

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stress</td>
<td>Urine leakage associated with increased abdominal pressure from laughing, sneezing, coughing, climbing stairs, or other physical stressors on the abdominal cavity and, thus, the bladder; occurs largely in women</td>
<td>Pelvic-floor physiotherapy, surgery, anti-incontinence devices</td>
</tr>
<tr>
<td>Urge</td>
<td>Involuntary leakage accompanied or immediately preceded by urgency; characterized by involuntary detrusor contractions; affects both males and females</td>
<td>Changes in diet, behavioral modification, pelvic-floor exercises, medications, and new forms of surgical intervention</td>
</tr>
<tr>
<td>Mixed</td>
<td>Combination of stress and urge incontinence</td>
<td>Pelvic-floor physical therapy, anticholinergic agents, surgery</td>
</tr>
<tr>
<td>Overflow</td>
<td>Characterized by inability to expel urine; largely affects males</td>
<td>Catheterization regimen, diversion</td>
</tr>
<tr>
<td>Functional</td>
<td>Inability to hold urine for reasons other than neurologic or lower urinary tract dysfunction</td>
<td>Treatment of underlying cause</td>
</tr>
</tbody>
</table>

Source: References 5-10.

Figure 5: PFD: Urinary Incontinence and their Management
PFD does not typically have one specific cause. The major risk factors are: pregnancy/childbirth, age, hormonal changes, obesity, lower Urinary Tract Infection (UTI), and pelvic surgery. The development of PFD most likely involves anatomical, physiological, genetic, reproductive and lifestyle components.\(^5\) \(^6\)

A longitudinal study on younger, middle-age, and older women reported that women with pre-existing incontinence, gastrointestinal problems, and breathing disorders were more likely to develop Low Back Pain than women without such problems.\(^7\) \(^8\)

3.5. **Low Back Pain (LBP) / Sacroiliac Dysfunction (SID)**

Low back pain (LBP) is “a condition of localized pain to the lumbar spine with or without symptoms to the distal extremities whose etiology is commonly unknown”.\(^9\)

One common cause of low back pain is Sacroiliac Joint Pain (SI Joint).

There are two SI Joints, one on each side of the sacrum (see Figure 1).

The SI Joint has a high level of stability from the self-locking mechanisms of the pelvis, which comes from the anatomy and shape of the bones in the SI Joint and also the muscles supporting the pelvis.\(^10\)

One of the primary functions of the SI Joint is to serve as a sort of "shock absorber" as it acts like a transfer station, distributing the weight and forces between the upper and lower body. It coordinates movement between the spine, pelvis and hip.

It is particularly vulnerable to injury because of its location and the crucial balance between stability and mobility that is required for normal SI function.

E.g. excessive SI joint mobility, core weakness or pelvic alignment problems can lead to Sacroiliac dysfunction (SID). SID can cause SI Joint pain and is typically characterized by SI ligament pain, LBP, buttock pain, or pain that radiates into one or both legs.

![Figure 6: LBP & SID - Sacroiliac Dysfunction](image-url)
Under normal conditions, a combination of ligaments, deep core muscles and correct joint alignment will create a compressive stabilization force that pulls the SI joints and pubic symphysis together to stabilize the SI joints and allow normal pain-free function.

3.6. **Posture (in general & during pregnancy)**

“Posture affects every movement, exercise, cue, and decision in an exercise program.”

It is assumed that the Ideal posture & different posture types are known as they were part of the BASI Comprehensive Teacher Training Course.

![Postural Alignment](image1)

**Figure 7: Postural Alignment**

![Postural Alignment - Pregnant Women](image2)

**Figure 8: Postural Alignment – Pregnant Women**

3.7. **Pregnancy**

It is well documented that, from the time a woman conceives to a year after delivery, her body experiences various physiological and physical changes. A combination of muscle weakness and shortening, postural imbalances, and ligament laxity may result in back pain, pelvic pain, diastasis recti, nerve pain, urinary incontinence, constipation, and it may also affect breathing. Most of these reverse after delivery, but some symptoms may persist.

Relevant for this student paper are the influences of pregnancy on the Pelvic Floor Muscles, the Abdominal Muscles, the SI Joint and the Posture. They are summarized in the following Chart.
Influence of pregnancy on the pelvic floor muscles (PFM)

Pregnancy and vaginal delivery can lead to dysfunction of the PFM. It is believed that changes in pelvic floor function as a result of pregnancy can result from damage to the nerves, skeletal muscle and connective tissues. The literature suggests that during pregnancy stretching or pressure on the pudendal nerve can occur as a result of the growing uterus. The pudendal nerve is responsible for innervation of the uterine muscle and therefore over stretching and increased pressure on the nerve can lead to PFD as a result of disruptions to the neural signaling. This neuropathy may start during pregnancy and worsen during delivery where further injury to the nerve can occur causing further weakening in the PFM.

Changes in the function of the PFM during pregnancy can also result from the influence of hormonal changes on smooth muscles. The increased levels of progesterone present in the body during pregnancy causes relaxation of the pelvic floor muscles and reduced muscle excitability to prevent uterine contraction. This can lead to increase stretch and hence weakening of the PFM. Relaxin also causes connective tissue remodeling, with considerable remodeling taking place in the uterine body, cervix and perineal tissue in late pregnancy and parturition, reducing the tensile strength of the tissues.

Influence of pregnancy on the ligaments of the Sacroiliac Joint (SIJ)

Progesterone and relaxin are two key hormones released during pregnancy. Both of these hormones are responsible for increasing the elasticity of collagen fibres at various stages in pregnancy. The role of relaxin and progesterone is to increase the extensibility of the ligaments and smooth muscle to allow the pelvis to expand more readily for the delivery of the baby. However as these hormones are released at 10 to 12 weeks into the pregnancy the ligaments across the joint become lax and therefore do not provide sufficient tension to maintain the joint in its optimum position, especially during movement.

Influence of pregnancy on the abdominal muscles

During pregnancy the abdominal muscles are stretched to allow space for the enlarging uterus, causing rapid lengthening of these muscles. This can lead to loss of muscle tone and strength in the abdominal region, with a lengthened position compromising the amount of tension a muscle can produce. Weakening of transverse abdominus and the internal obliques may reduce the amount of tension produced in the thoracolumbar fascia, resulting in reduced force closure across the SIJ.

In some cases the rectus abdominal muscle can be stretched so far laterally that it becomes separated from the linea alba; a condition known as diastasis recti abdominis. A large diastasis recti abdominis, or distortion of any of the abdominal muscles, can impair the function of the abdominal wall including its role in posture and pelvic stability.

Influence of pregnancy on the posture

Throughout pregnancy the weight of the developing foetus and the uterus increases significantly. It is suggested on average most mothers will gain approximately 11kg in weight. This additional load is predominantly carried on the front of the mother’s body. To compensate for the increased anterior load, most mothers will adopt an exaggerated lumbar lordosis in standing.

As the lumbar spine moves into greater extension; the sacrum moves into greater nutation. The result of this is increased compression at the SIJ in upright postures.

Chart 1: Influence of pregnancy on the Pelvic Floor Muscles, SI Joint and Posture.
4. Introduction

“One in four women will experience incontinence at some point during her life, and nearly three-quarters of the U.S. population will deal with low back pain.”13

According to the anatomy & to research there are the following treatment possibilities. (This paper focusses on the conservative treatments. Medicinal or surgical treatment option are not mentioned.)

4.1. Sacroiliac Dysfunction (SID): Cause & Treatment

Most SI joint related pain is due to one, or a combination of, the following factors: ligament injury or laxity, weakness of deep-core muscles, faulty alignment of the spine/pelvic girdle

Resultant Training Focus:

- Focus on restoring normal pelvic and core stability by strengthening the ISS (transversus abdominis, multifidus and pelvic floor)
- Develop good control and general spinal stability by strengthening the SI joint surrounding muscles (emphasis on the deep abdominals and the deep gluteal muscles)
- Work on pelvic alignment / lumbar pelvis stabilization & posture correction

4.2. Pelvic Floor Dysfunction (PFD): Cause & Treatment

Most of the causes of DFD are unknown. Risk factors as pregnancy/childbirth, age, hormonal changes, obesity, lower Urinary Tract Infection (UTI), and pelvic surgery can contribute to this condition. Many of the PFD are due to improper function of the PFM.

Resultant Training Focus:

- PFM relaxation (e.g. for those with symptoms of constipation and pelvic pain)
- PFM strengthening (e.g. for improved bladder control)14
- Work on pelvic alignment / lumbar pelvis stabilization & posture correction
- How to coordinate the movement of the PFM / how to activate the PFM (different layers)
- How to coordinate PFM contraction with the other muscles (the ISS)
- Regaining deep abdominal muscles (TA) in a functional matter.15 Reason: The pelvic floor can be facilitated by co-activating the abdominals and vice-versa. The abdominals contract in response to a pelvic floor contraction command and the PFM contract in response to a "hollowing or bracing" abdominal command.16
4.3. Correlation of PFD and LBP / SID

There is a correlation between PFD and LBP. Transabdominal ultrasound has proven that the PFM and trunk musculature co-contract to provide stability to the lumbar spine and pelvis. The lack of neuromuscular control in the PFM can be associated with trunk instability, which results in LBP.¹⁷

This was experienced by my client. After studying these two conditions and understanding their correlation (that muscles of respiration and continence provide mechanical support to low back), I agree with the following statement: “The majority of this patient profile (LBP and PFD) will most likely benefit from stabilization interventions.”¹⁸

Stabilization will be one focus of the conditioning program designed for this client.

5. Case Study

My client is a 37 year old woman, mother of a 3 year old son. She is dealing with PFD (stress incontinence and light prolapse) since her pregnancy & childbirth. Her physician recommended to strengthen her PF. She has tried to work her PF during Pilates classes, but has a hard time incorporating it into her daily life. Lately she has developed SI Joint Pain.

She is planning on having another baby. Since all these conditions might become aggravated by another pregnancy (see the Chart on page 9), it is important to improve her conditions and to prepare her body the best.

Currently her exercise regime includes Pilates, Barre Workout and Yoga. Instead of using the car, she tries to walk & bike a lot to get in her cardio training. She has been active throughout her life and has good body awareness.

The Posture Analysis in her first session showed that she has postural weaknesses:

- She has an increased lumbar curvature (hyper lordosis), accompanied by tight low back extensor muscles, tight hip flexors, weak hip extensors and weak abdominals.
- Due to sitting on the computer for long hours she has developed a forward head posture with hunched shoulders and an increased thoracic curvature (kyphosis).
- The muscles of the posterior shoulder and upper back are weakened and stretched (trapezius, rhomboids & lattisimus dorsi). In opposition are tight posterior neck muscles (such as sternocleidomastoid) and tight shoulders and chest muscles (pectoralis major & anterior deltoid).

The first session also showed that although she has a strong sense of body awareness, she has a hard time engaging the TA & the PFM properly. Further I realized that she often forgot to breathe properly
and had a tendency to rush through the exercises. Breathing is essential to increase diaphragmatic engagement and correct firing of the abdominals for optimal PF intraabdominal pressure and stability.

The findings of the first session were taken into consideration when developing her program. Beside the focus on stabilization (as mentioned before) to improve her PFD and SID, another important part of the program is to concentrate on the breathing and to bring awareness to each movement especially to the PF and TA activation prior to the movement.

Since she has done Pilates for years the program incorporates both fundamental and intermediate exercises.

Not part of this paper, but important for the client, was a home exercise mat program and information about the PFM. It helped her to learn how to engage her PFM correctly and to incorporate it into her daily life (see in appendix page 15-19).

### 6. Conditioning Program (in BASI Block System)

<table>
<thead>
<tr>
<th>Block &amp; Equipment</th>
<th>Exercise &amp; Props</th>
<th>Notes (benefits / cues / objectives, muscles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standing Roll Down 2x</td>
<td></td>
<td>Client: awareness of me-time / connect with body</td>
</tr>
<tr>
<td>Add. WARM UP (Mat)</td>
<td>Breathing (Ball) 8x</td>
<td>Pelvic curl position - Ball between knees</td>
</tr>
<tr>
<td></td>
<td>Pelvic Tilt 8x</td>
<td>Focus on IH nose / EH mouth</td>
</tr>
<tr>
<td></td>
<td>PF Exercises</td>
<td>Squeeze ball &amp; activate the PF on each EH while imprinting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>After 8x find neutral p.: Imagine cup of soup on lower abs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PF Exercises e.g. elevator (activate – hold – relax)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ball between knees helps her to think of PF activation – awareness is necessary so that inner thighs are not used without the proper PF activation</td>
</tr>
<tr>
<td>Add. WARM UP (Mat)</td>
<td>Pelvic Curl (ball knees)</td>
<td>Activate PF first, focus on articulation &amp; pelvic lumbar stabilization</td>
</tr>
<tr>
<td></td>
<td>Spine Twist Supine</td>
<td>keep hipbones leveled, low abs &amp; PF activated, shoulders away from ear &amp; keep add. engaged (ball helps), push feet into mat &amp; return to neutral each time.</td>
</tr>
<tr>
<td></td>
<td>Leg Lifts / Leg changes</td>
<td>Keep shoulders relaxed, low back keeps contact with mat, focus on add activation (squeeze ball) &amp; on the breathe, activate PF &amp; TA especially on the way back to center</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Focus on Breathing &amp; PF activation (cue: pull Abs in &amp; up) low abs are engaged throughout, keep rips in, focus on hip dissociation &amp; concentrate on pelvic stabilization</td>
</tr>
<tr>
<td>FOOTWORK (Reformer/Chair)</td>
<td>Parallel Heels / Toes Small V / Open V Heels / Toes Calf raises / Prances (Ref only) Single Leg Heel</td>
<td>Ideally I have her do FW on the Wunda Chair (since the Chair gives good feedback for feeling the PF activation (sit bones), abs &amp; back muscles are co-contracting for trunk stabilization</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Depending on her day, I let her do footwork on the Reformer, which might be less challenging after a whole</td>
</tr>
<tr>
<td>Work</td>
<td>Exercise</td>
<td>Details</td>
</tr>
<tr>
<td>------</td>
<td>----------</td>
<td>---------</td>
</tr>
</tbody>
</table>
| Single Leg Toe | day of working or chasing her 3-year-old.  
• Each way: focus on: breathe & PF activation & low abs in & holding neutral & hip ext. activation / press through heels |
| ABDOMINAL WORK (Step Barrel) | Chest Lift | Abdominal strength & thoracic stretch & shoulder mobility. Ideal for her tight pecs & rounded back / shoulders  
• Avoid rip flaring & keep PF & TA / low abs engaged |
| | Overhead Stretch | |
| HIP WORK (Reformer) | Frog | Adductor strength & pelvic lumbar stabilization  
• Increasing mobility of hips & stability of pelvis  
• Keep neutral / tail bone on carriage / use both legs evenly / squeeze heels together  
• Focus on breathing & PF activation (cue: pull abs in & up)  
• Variation: Sometimes I let her do this whole series with the ball underneath her sacrum, which challenges her core stability more & relaxes her tight low back muscles |
| | Circles Down / Up Openings (Var.: with Ball) | |
| SPINAL ARTICULATION (Reformer) | Bottom Lift (Ball) | Spinal articulation & hip extensor strength & control  
• Headrest down; keep correct foot alignment, keep heels still  
• Keep adductor engaged (with ball between knees)  
• Focus on breathing & PF activation (cue: pull Abs in & up)  
• Helps to open her hip flexors / demands pelvic lumbar stab. |
| | Bottom Lift with extension | |
| STRETCHES | Pole Series: Shoulder Stretch Overhead Stretch Side Stretch Spine Twist Standing | Helps her postural weakness: shoulder stretch / chest stretch / oblique stretch / trunk control  
• Gaining movement through the shoulder region, stretching the upper chest and encouraging scapular awareness  
• Rips engaged, keep pelvis neutral  
• Focus on breathing & PF activation (cue: pull abs in & up) |
| | Pole Series before Leg Work | For a better flow |
| FULL BODY INTEGRATION 1 (Reformer) | Up Stretch 1 | Trunk stabilization (back and abdominal muscles)  
• shoulder stabilization / shoulder stretch  
• Focus on coordinated use of hip extensors & hip flexors |
| | Up Stretch 2 | |
| ARM WORK (Reformer) | Arm Sitting Series: Chest Expansion Biceps Rhomboids Hug-a-Tree Salute | Trunk stabilization (sitting upright by co-contracting back and abdominal muscles), feel sit bones & PFM engagement  
• Ideal exercise for correcting her posture  
• By strengthen the weak muscles latissimus dorsi, biceps, posterior deltoid, triceps  
• Focus on breathing & PF activation (cue: pull abs in & up) |
| FBI 2 | | No time since we need additional time in the beginning for PF Exercises & Breathing |
| LEG WORK (Cadillac/Mat) | Clams or Gluteal Side Lying Series: Side Leg Lift Forward & Lift Forward & Drops Adductor Squeeze (with Circle) | Clams (recommended in the Pilates for Injuries & Pathologies course)  
• Hip abductor strength & pelvic lumbar stabilization  
• Focus on gluteus medius  
• Keep pelvis neutral, ensure correct activation of glutes prior to movement,  
• Focus on breathing & PF activation (cue: pull Abs in & up)  
• Hip adductor strength & PF awareness |
| LAT. FLEXION ROTATION (Cadillac) | Side Lift with PT Bar | Lateral flexor (abd. oblique) strength & stretch  
• Focus on alignment, abs & PF engaged, hips on top of each other, use abs not arm |
| BACK EXTENSION (Cadillac/Mat) | Prone 1 (Cadillac) | • For posture; back extensor strength / scap. & abd. control (cue: chin tuck & focus on sequentially extending the back) |
| • For posture: Cow: focus on mid & upper back extensor strength, abd. control Cat: focus on lumbar spine stretch (use abs to flex the lumber spine) |
| Cat Stretch (Mat) | Rest Position | • Relaxation & lumbar spine stretch, breath & awareness |
| | Final Standing Roll Down | • End session with Roll Down to feel the difference to the beginning of class / awareness. |

**Chart 2: Conditioning Program**

### 7. Conclusion

“Essentially, the pelvis acts as a bridge between the lower limbs and the spine. If the pelvis is out of alignment or not stable, it will directly affect the function of the limbs as well as the alignment and function of the spine.” ¹⁹

The key to prevent these dysfunctions is pelvic lumbar alignment and stabilization. It doesn’t matter if the LBP comes from the PFD or the PFD comes from the LBP. In fact no (high quality) study has directly evaluated that, yet. ²⁰

Regardless, these conditions have to be treated, and Pilates is a great solution. It is known for its benefits of working on stabilization, alignment and core strength and body awareness.

After working consistently twice to three times per week for two months my client has achieved to live a life without PFD and LBP. The Pilates practice has not only improved her pelvic-lumbar health, but it has also improved her overall posture.

She also now realizes that consistency is the key to success. Use it or lose it.

### 8. Appendix: Further explanation & home exercise program

The activation of the PF should not only be practiced in the Pilates session. It has to become part of her daily life.
8.1. Homework Mat Program

<table>
<thead>
<tr>
<th>BLOCK</th>
<th>Exercise</th>
</tr>
</thead>
<tbody>
<tr>
<td>WU &amp; FOUNDATION</td>
<td>Pelvic curl</td>
</tr>
<tr>
<td></td>
<td>Spine Twist Supine</td>
</tr>
<tr>
<td></td>
<td>Chest Lift &amp; Chest Lift with Rotation</td>
</tr>
<tr>
<td></td>
<td>Single Leg Lifts &amp; Leg changes</td>
</tr>
<tr>
<td></td>
<td>Leg Circles</td>
</tr>
<tr>
<td>ABDOMINAL WORK</td>
<td>Hundred Prep</td>
</tr>
<tr>
<td></td>
<td>Single Leg Stretch / Double Leg Stretch</td>
</tr>
<tr>
<td></td>
<td>Criss Cross</td>
</tr>
<tr>
<td></td>
<td>Hamstring Pull 1-3</td>
</tr>
<tr>
<td></td>
<td>Teaser Prep</td>
</tr>
<tr>
<td>SPINAL ARTICULATION</td>
<td>Rolling like a Ball</td>
</tr>
<tr>
<td></td>
<td>Open Leg Rocker / Seal Puppy</td>
</tr>
<tr>
<td></td>
<td>Spine Stretch</td>
</tr>
<tr>
<td>BRIDGING</td>
<td>Shoulder Bridge Prep</td>
</tr>
<tr>
<td></td>
<td>Front Support</td>
</tr>
<tr>
<td></td>
<td>Leg Pull Front</td>
</tr>
<tr>
<td></td>
<td>Back Support</td>
</tr>
<tr>
<td>LATERAL FLEXION / ROTATION</td>
<td>Side lifts</td>
</tr>
<tr>
<td></td>
<td><em>For flow add Block “Additional Leg Work” here</em></td>
</tr>
<tr>
<td></td>
<td>Spine Twist / Saw</td>
</tr>
<tr>
<td>BACK EXTENSION</td>
<td>Back Extension</td>
</tr>
<tr>
<td></td>
<td>Swimming / Single Leg Kick / Double Leg Kick</td>
</tr>
<tr>
<td></td>
<td>Cat Stretch</td>
</tr>
<tr>
<td></td>
<td>Childs Pose/ Rest Position</td>
</tr>
<tr>
<td>Add. ARM Work</td>
<td>Arms – Magic Circle Series:</td>
</tr>
<tr>
<td></td>
<td>Arms Bent/ Straight / Overhead / Single Arm Side Press and Bicep</td>
</tr>
<tr>
<td>Add. LEG Work</td>
<td>Clams</td>
</tr>
<tr>
<td></td>
<td>Legs - Magic Circle Prone Series:</td>
</tr>
<tr>
<td></td>
<td>Ankles Bent Knees / Ankles Straight Knees / Hamstring Press</td>
</tr>
<tr>
<td></td>
<td>Gluteal Side Lying Series:</td>
</tr>
<tr>
<td></td>
<td>Side Leg Lift / Forward &amp; Lift / Forward &amp; Drops</td>
</tr>
<tr>
<td></td>
<td>Adductor Squeeze (with Circle)</td>
</tr>
<tr>
<td>Add. STRETCH</td>
<td>Pole Series:</td>
</tr>
<tr>
<td></td>
<td>Shoulder Stretch / Overhead Stretch / Side Stretch /Spine Twist</td>
</tr>
</tbody>
</table>

Chart 3: Homework Program

These are exercises that she can choose from. The bold ones offer a short version.

8.2. Pelvic Floor Cueing & Awareness

A lot of people don’t know how to feel or even activate their pelvic floor muscles.

Here are some guidelines / cues that might be helpful:
### How to locate & contract the PF

- Pull in the stomach muscles without tightening the buttocks, the abs & the inner thighs
- Then pull up the muscles of the pelvic basin
- Tip of tailbone to tip of pubic bone – feeling of tightening
- Engage the muscles you would use to interrupt the flow of urine
- Women can section them in: back = anal / middle = vagina / front = uretha - passage
- For men: draw the testicles up / draw the boys up ;)

*It can also help to show a picture of the pelvic floor muscles*

### 3 Layers of the PF²¹

1. **Layer:**
   - Close / engage all body openings / Draw every body opening together & up
   - As if you would pull up a Tampon
   - Reflex zone: between eyebrows (engage)

2. **Layer:**
   - Draw your sit bones toward each other without using the glutes
   - Reflex zone: bra-line (engage) draw shoulder blades down

3. **Layer:**
   - Draw your bellybutton in and up & elevator exercise
   - Tailbone reaches towards the floor
   - Reflex zone: press the tongue against the palate

### PFM awareness

- Practice often & in different positions: prone, supine, kneeling, standing, sitting

*Caution: if a woman suffers from Haemorrhoids she should do PF exercises in 4 point kneeling.*

### Routine:

- It’s important to create a personal routine, rather only 3 movements a day than none
- Incorporate the exercises into your daily life, e.g. as routine for a red light / or while brushing the teeth / or first thing in the morning in Bed or last thing in the evening

### Posture / Healthy lifestyle habits:

- Standing & walking: posterior tilt pelvis, rectum engaged, arches lifted, knees ER
- Lifting: engage PF prior to lifting, exhale while engaging, long spine
- Getting up: roll to the side first
- Sneezing/ Coughing: engage PF prior to it/ sneeze sideways
- Release: during the day change position into supine or 4-point kneeling

### Chart 4: PFM Awareness / Activation / Routine / Posture / Lifestyle Habits

Treatment should include education on healthy lifestyle habits. Including good posture, maintenance of a healthy body weight, proper diet, routine exercise, and refraining from smoking.

### 8.3. Exercises for the PF

**Breathing / Diaphragmatic breathing or abdominal breathing / Exercises**
The way of breathe is very important and affects the tone in the deep abdominal and PFM because the diaphragm and the PF are closely connected to each other.

It is important that breathing and the movement of the diaphragm are coordinated so that the PFM can contract powerfully, as well as relax enough. This is a vital first step in undertaking PF rehabilitation for prolapse or incontinence problems in women and men.

Figure 9: Pelvic Floor & Diaphragm

The pelvic floor shown in imagery: When inhaled the tension increases, like the floor of a trampoline. The slight suction effect of the diaphragm during exhalation is shown as a plunger.

Breathing

- On an **Inhale** the **diaphragm contracts** and moves **downwards** into the abdomen. This downward movement creates a vacuum inside the chest causing air to enter and fill up the lungs. The **pelvic floor stretches** out and sinks **downward**. (eccentrically)
- On the **Exhale** the **diaphragm relaxes** and rises back **up** into the chest allowing air to leave the lungs. The **pelvic floor muscles contract**, and the pelvic floor **rises** again.

Benefits of Diaphragmatic breathing or abdominal breathing

- On deep **Inhale** during diaphragmatic breathing or abdominal breathing, the pressure inside the abdomen is increased so that the PFM need to contract even more strongly to maintain continence.
- Deep abdominal breathing strengthens the abs & effectively relaxes & contracts the PFM
- It can help to promote the coordinated activity of the deep abdominals and PFM.

### Breathing Exercises / Variations

These exercises can help you become more aware of your breathing:

- Lie down on your back so that you are comfortable. Make use of gentle slight chin tuck. Place your legs slightly apart with your knees bent, and rest one hand lightly on your stomach. Breathe in and out steadily. When you breathe in your stomach rises slightly, and when you breathe out your stomach falls again.

- Imagine that there is a balloon inside your belly: when you breathe in the balloon fills with air and expands in all directions, and your pelvic floor sinks. When you breathe out the air escapes from the balloon and your belly contracts while your pelvic floor rises again.

- Practice breathing in & out through the nose

- Practice rhythmic breathing in through nose & out through the mouth

- Work on gradually increasing the ratios of both Inhalation & exhalation, to strengthen the lungs & balance the nervous & respiratory systems

- Breathing recommendation for workout, Inhale – relax PFM Exhale – contract PFM

### Chart 5: Breathing: Pelvic Floor & Diaphragm

![Chart 5: Breathing: Pelvic Floor & Diaphragm](image)

### Kegels

- Kegels can be done in any comfortable position with an empty bladder
- Work on the PFM gently, gradually & rhythmically without jerking
- To locate the PF: *sit on something with a feedback (chair / roller / Swiss ball / mat edge)*
- Pull in the stomach muscles without tightening the buttocks, the abs & the inner thighs
- Then pull up the muscles of the pelvic basin
- Women can section them in: Back = anal / middle = vagina / front passage = uretha

### Isolated Kegel Contractions
- Breathe in (squeeze the anus, as if trying to hold in a stool) & then release as breathe out
- Breathe in (squeeze the vagina, as if trying to hold in a tampon) & then release as breathe out
- Breathe in (squeeze the bladder, as if trying to hold in urine) & then release as breathe out
  - Contract 1-2 seconds, release 1-2 seconds. Work up to 10 times
  - Extended Kegel contractions, hold for 20 seconds: build up to 10 times per day

### Elevator Exercises
- Imagine your PFM are like an elevator, basement to 5th floor
- Deepen the contraction holding on an inhale and draw up deeper on each exhale
- Reverse the process by slowly lowering the pelvic basin from 5th to basement
- Focus on full contractions & full relaxation

### More Pelvic Floor Exercises

#### Strength training
- Contract PFM for 5 seconds / Than take a break for 10 seconds (repeat 10x)

#### Elasticity training
- Contract & Release quickly / Than take a break for 5 seconds (repeat 10x)

#### Endurance Training
- No full contraction just 20% but hold for 20 seconds (1x)

#### Cat Cow / Cat Stretch
- Exhale (Cat) round back – draw PFM & TA in
- Inhale (Cow) carefully & controlled slightly arch the back & release the PFM & extend upper back

#### Heel Press
- Beginners: Supine / Knees bent --- variation: sitting on big exercise ball
- Advanced: Supine / Pelvic Curl Position / Shoulder bridge
- Exhale: activate PF / TA & press heel into ground
  - a) single leg  b) double leg  c) lift leg

#### Adductor squeeze
- Beginners: Supine / Knees bent (pillow or ball between knees)
- Advanced: Supine / Pelvic Curl Position / Shoulder bridge (pillow or ball between knees)
- Exhale: activate PF / TA & squeeze pillow

#### Tone / sing / speak to stimulate muscles
- PKT sounds, these letters affect the diaphragm & accordingly the PFM. E.g. say: lick, lack lock
- Superficial layer / M. Bulbospongiosus: oooooooo
- Rectum / M. Sphincter Ani: krrrrrrrr
- Middle layer/ urogenital Diaphragm / M. transversus perinei: hhaa
- Deepest layer / Pelvic Diaphragm: III (=L)

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Chart 6: Summary of helpful exercises that I have learned about in the last years.
During the research for my paper I found an interesting study about the connection between PFD and LBP, which I am sharing here:

The pelvic floor can be facilitated by co-activating the abdominals and vice-versa. The abdominals contract in response to a pelvic floor contraction command and the PFM contract in response to a "hollowing or bracing" abdominal command.[8]

**Rehabilitation of PFM utilizing the stabilization**

| Stage                  | Process                                      | Goal                                                                 | Dosing |
|------------------------|----------------------------------------------|                                                                     |        |
| Diaphragmatic Breathing| The client is seated with upright posture, one hand on chest, other on stomach (for self-awareness); the client expands his/her stomach while breathing in. | To minimize ribcage elevation and increase intra-abdominal pressure. This creates a slight stretch on abdominal muscles, enhancing the contractile force and promoting a stronger PFM contraction. | consistent and correct breathing pattern throughout daily activities |
| Tonic Activation       | The client places his/her fingers medial to ASIS for tactile feedback. The client activates the TA, which influences the PFM to co-contract. | To promote a gentle and prolonged muscle hold of the PFM through the TA co-contraction mechanism. | 5reps 5xday; gradually increase to 30-40 sec holds |
| Muscle Strengthening   | The client in supine, performs the abdominal drawing in maneuver (ADIM) and maintains a strong hold while pulling up the PFM as far as possible as if to stop the flow of urine. | To strengthen the PFM to decrease urinary leakage and strengthen abdominal muscles to promote spinal stability | client should hold for 3-5sec; count out loud |
| Functional Expiratory Patterns | The client sits upright, and initiates a sustained nose blow. The client should self-evaluate PFM activation during expiration. | To retrain the PFM to activate in response to functional stresses (i.e. - nose blowing, coughing, sneezing) | repeat 5 times |
| Impact Activities      | Progress the client to his/her functional high impact activity while maintaining abdominal and PFM contraction. (i.e. - running, exercise, lifting objects) | To transfer newly learned activation patterns into functional activities, once the client achieves coughing/sneezing without loss | specific to each client |

**Chart 7: Exercise Progression to Address PFD/LBP**

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Exercise</th>
<th>Dosage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transvers Abdominus</td>
<td>Abdominal bracing</td>
<td>8s hold x 20reps</td>
</tr>
<tr>
<td></td>
<td>Bracing with heel slides</td>
<td>4s hold x 20reps</td>
</tr>
<tr>
<td></td>
<td>Bracing with leg lifts</td>
<td>4s hold x 20reps</td>
</tr>
<tr>
<td></td>
<td>Bracing with bridging</td>
<td>8s hold x 30reps</td>
</tr>
<tr>
<td></td>
<td>Bracing in standing</td>
<td>8s hold x 30reps</td>
</tr>
<tr>
<td>Multifidus</td>
<td>Quadruped arm lifts with bracing</td>
<td>8s hold x 30reps</td>
</tr>
<tr>
<td></td>
<td>Quadruped leg lifts with bracing</td>
<td>8s hold x 30reps</td>
</tr>
<tr>
<td></td>
<td>Quadruped alt. arm/leg lifts with bracing</td>
<td>8s hold x 30reps</td>
</tr>
<tr>
<td>Oblique Abdominals</td>
<td>Side planks with knees flexed</td>
<td>8s hold x 30reps</td>
</tr>
<tr>
<td></td>
<td>Side planks with knees extended</td>
<td>8s hold x 30reps</td>
</tr>
</tbody>
</table>

**Chart 8: Lumbar Stabilization Exercises**
9. References

All illustrations provided by Google Images:

**Figure 1:** Pelvis ([http://activeortho.com/sacroiliac_pain.html](http://activeortho.com/sacroiliac_pain.html))

**Figure 2:** Lumbopelvic Cylinder (PF / Diap. / TA/ Multifidii)

[https://osteopathysouthwest.files.wordpress.com/2013/09/abdominal-muscles.jpg](https://osteopathysouthwest.files.wordpress.com/2013/09/abdominal-muscles.jpg)

**Figure 3:** Pelvic Floor Muscles


**Figure 4:** PFD Prolapse Types

[http://www.qmedicine.co.in/top%20health%20topics/G/images/demo/genitourinary%20prolapse.jpg](http://www.qmedicine.co.in/top%20health%20topics/G/images/demo/genitourinary%20prolapse.jpg)

**Figure 5:** PFD - Urinary Incontinence and their Management

[http://www.uspharmacist.com/CMSImagesContent/2014/8/_DrugInducedUI-T1.gif](http://www.uspharmacist.com/CMSImagesContent/2014/8/_DrugInducedUI-T1.gif)

**Figure 6:** Figure 6: LBP & SID - Sacroiliac Dysfunction


**Figure 7:** Postural Alignment

[https://s-media-cache-ak0.pinimg.com/736x/2f/12/78/2f1278e9ad10014dcd6e2e4ae6987642.jpg](https://s-media-cache-ak0.pinimg.com/736x/2f/12/78/2f1278e9ad10014dcd6e2e4ae6987642.jpg)

**Figure 8:** Postural Alignment – Pregnant Women


**Figure 9:** Pelvic Floor & Diaphragm


All charts are created to give an organized overview:

**Chart 1:** Influence of pregnancy on the Pelvic Floor Muscles, SI Joint and Posture

**Chart 2:** Conditioning Program

**Chart 3:** Homework Program

**Chart 4:** PFM Awareness / Activation / Routine / Posture / Lifestyle Habits

**Chart 5:** Breathing: Pelvic Floor & Diaphragm

**Chart 6:** Summary of helpful exercises that I have learned about in the last years.

**Chart 7:** Exercise Progression to Address PFD/LBP

**Chart 8:** Lumbar Stabilization Exercises
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