# Weightlifting and the Pelvic Floor

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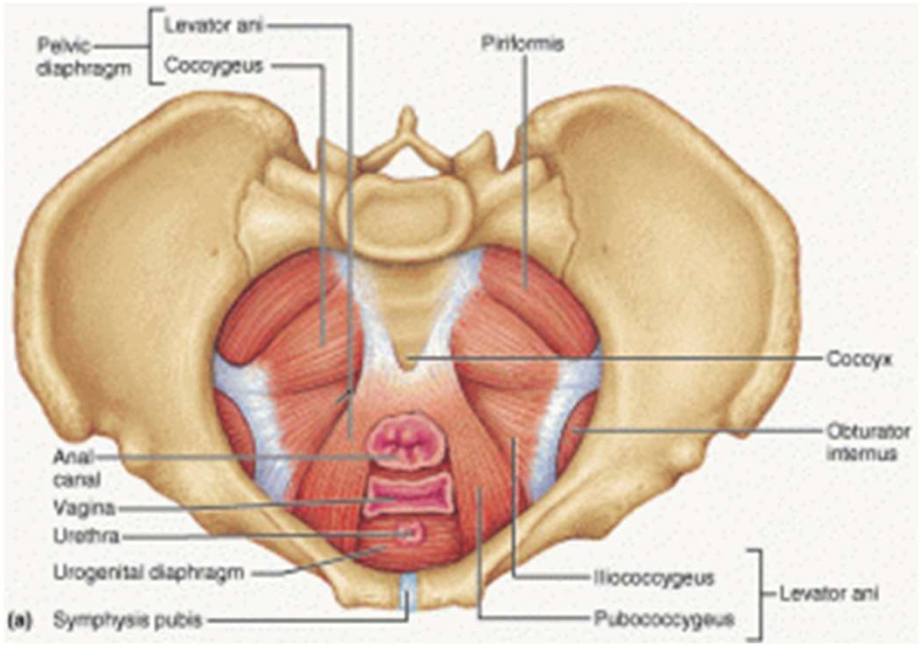
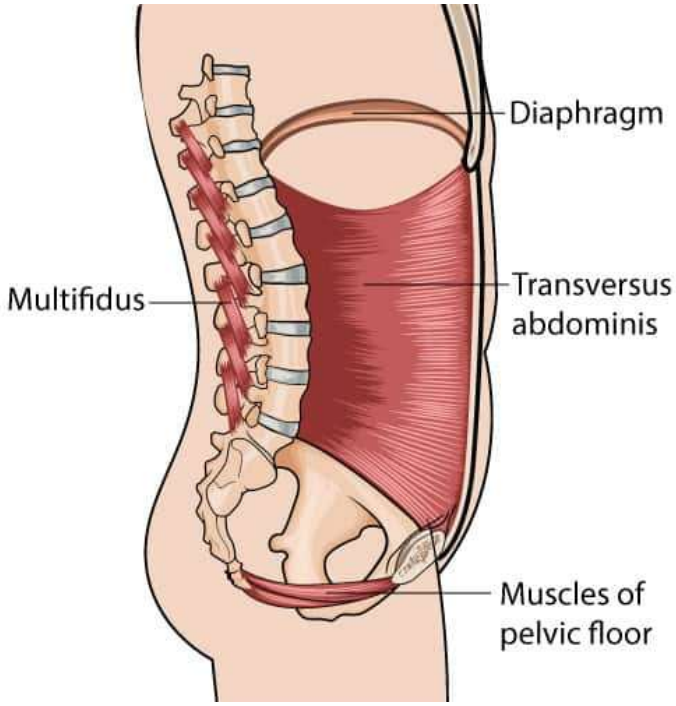
# What is the Pelvic Floor?




- The pelvic floor musculature is a group of muscles that sits like a sling within the pelvis and plays a vital role in providing stability, support and daily function
- The pelvic floor muscles, tissue, fascia and nerves work together to support and maintain function of the pelvic region
- The pelvic floor works to provide support for pelvic organs, stability to the low back, hip and pelvis, and controls bowel, bladder and sexual function
- It is part of a “canister” system that works as a unit for proper pressure modulation stability and support

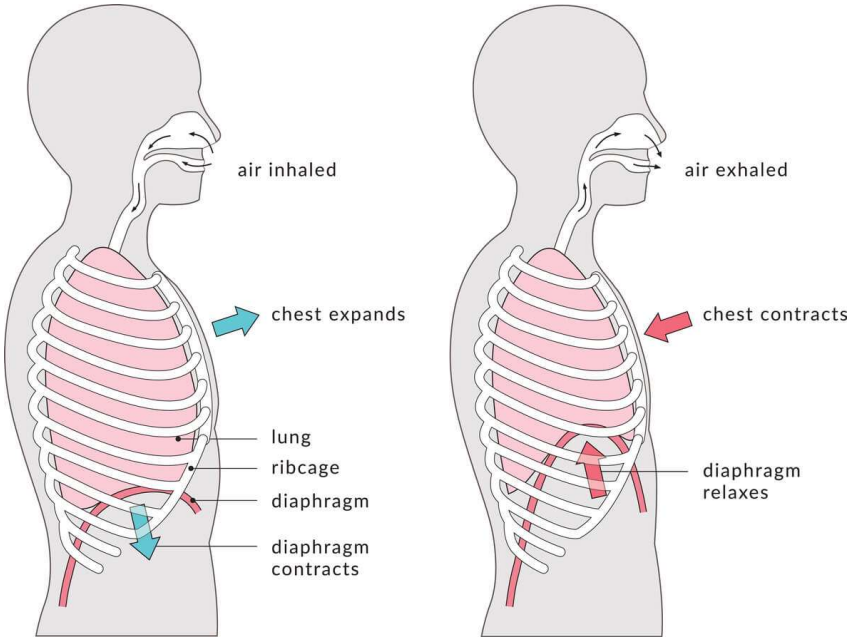
# “Core” Canister System

- Multifidi
  - Works to support the lower back, pelvis/hips and trunk through movement
- Diaphragm
  - Works to modulate intraabdominal pressure through respiration
- Transverse Abdominus
  - Supports low back, pelvis/hips and trunk through movement
- Pelvic Floor Muscles
  - Pelvic organ support
  - Bowel, bladder and sexual function
  - Works synergistically with the diaphragm to help regulate intraabdominal pressure
  - Lumbopelvic stability



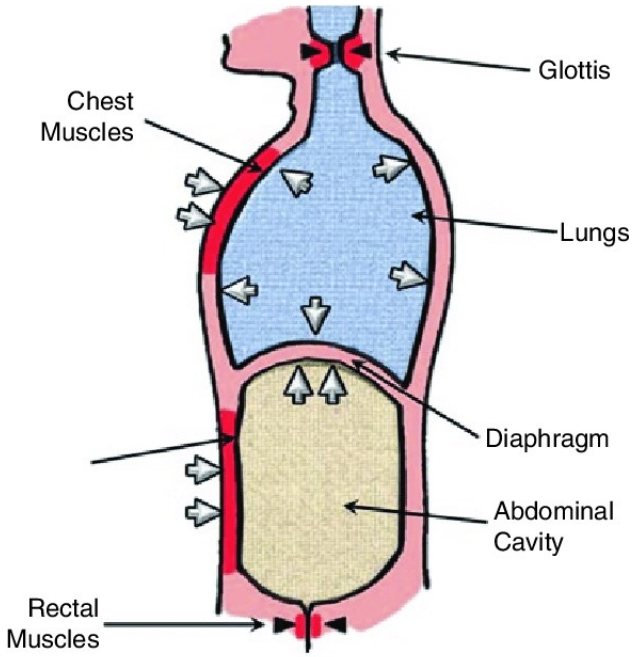
# Core Canister and Weight Lifting

- In weight lifting, breathing and bracing mechanics are critical functions for proper form and technique
- Breathing Mechanics
  - Inhalation: diaphragm contracts and moves downward to allow for lungs to have space to fill with air
    - Intraabdominal pressure (IAP) increases with inhalation resulting in force generation
    - Rib cage mobility is very important in this stage to allow for full movement of air and pressure modulation
  - Exhalation: diaphragm relaxes and moves upward to allow for lungs to deflate with expiration of air
    - Intraabdominal pressure (IAP) decreases with exhalation and uses force/pressure generated for movement
    - Diaphragm elevates leading to rib cage depression, increased deeper core/abdominal recruitment and contraction of pelvic floor musculature



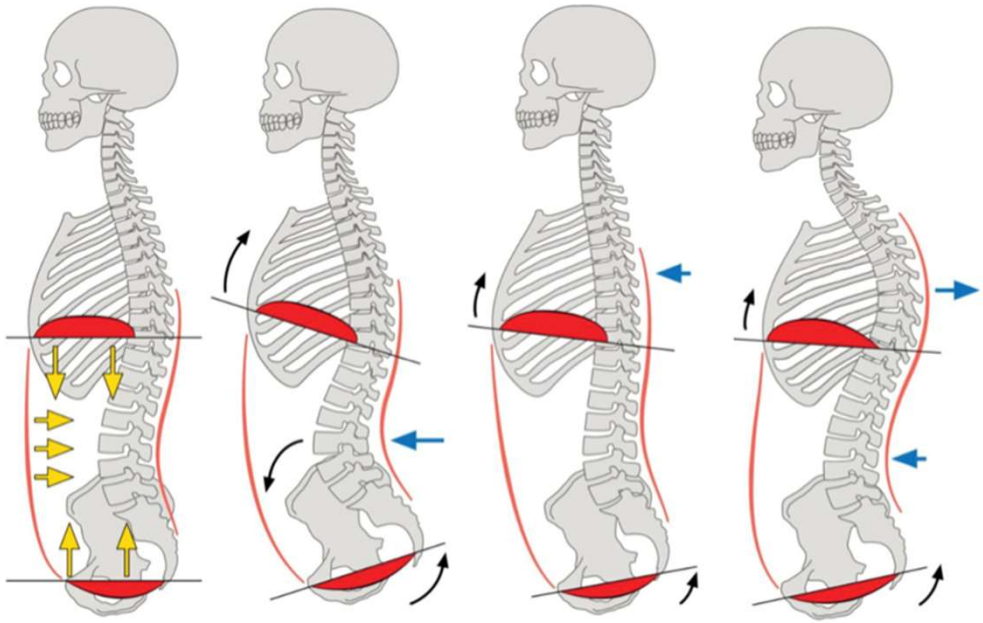
# Core Canister and Weight Lifting

- In weight lifting, breathing and bracing mechanics are critical functions for proper form and technique
- Bracing Mechanics
  - Forced exhalation: increased recruitment outside of the core canister unit system
    - Valsalva maneuver
  - Diaphragm elevates leading to rib cage depression, recruitment of serratus posterior inferior, internal intercostals, abdominal wall, pelvic floor musculature, lat dorsi and quadratus lumborum



# Core Canister and Weight Lifting

- Effective core canister function contributes to modulation of intraabdominal and intrathoracic pressure
- Diaphragm and pelvic floor need to work synergistically to control pressure throughout the abdominal cavity
  - If the diaphragm and pelvic floor are not working synergistically, increased intraabdominal and intrathoracic pressure can occur
  - Increased intraabdominal and intrathoracic pressure can lead to a ”break down” in the core canister system
    - Can lead to faulty weight lifting mechanics, pain, dysfunction, etc.
- Multifidi and transverse abdominus offer support to lumbar, pelvis and hip region through movement



# Pressure Management and Weight Lifting

- There is variability in pressure demands of different lifts
  - Intraabdominal pressure
  - Intrathoracic pressure
  - Use of Valsalva maneuver (>80% of 1 rep max)
  - Use of weight lifting belt vs. no weight lifting belt
- Squat[1]
  - IAP without belt: approximately 200mmHg
  - IAP with belt: approximately 219mmHg
- Deadlift[1]
  - IAP without belt: approximately 156-161 mmHg
  - IAP with belt: approximately 176mmHg

# Pressure Management and Weight Lifting

- Due to the variability in pressure demands of lifting, a thorough analysis of mechanics should be performed
- Assessing for mechanics of the entire kinetic chain from head to toe during the lift can offer feedback on how the person manages their pressure and moves their body
- It is not just about “one joint” or “one muscle group” but about how is the body moving or not moving in a synergistic fashion
- To optimize pressure management, the body needs to move and breathe effectively and efficiently
- Increased force generation of IAP allows for potential improvement in stability of the trunk

# Squat Biomechanics[2]

- Eccentric phase
  - Hip Flexion, Knee Flexion, Ankle Dorsiflexion
  - Standing with feet shoulder width apart, toes forward faced, knees over 2nd and 3rd toes
  - Keeping weight evenly distributed through feet, initiate with hips (hip hinge) and then flex knees
  - Thoracic/chest and cervical spine should remain in neutral position
  - Inhalation of breath with abdominal expansion during this phase
- Concentric phase
  - Hip Extension, Knee Extension, Ankle Plantarflexion
  - Contraction of gluteals, hamstrings, adductor magnus and quadriceps to facilitate extension phase of the squat
  - Weight distribution through mid to rear foot/heel region into end phase of extension
  - Exhalation of breath with abdominal and pelvic floor recruitment as well as rib cage depression
    - IF using Valsalva (>80% of 1 rep max), maintaining IAP without overstressing the core canister is crucial for injury prevention and proper form/technique

# Deadlift Biomechanics[3]

- Concentric Phase
  - Start in a hinged squat position with no more than 45 degree angle of the torso to the ground
  - Head is in alignment with spinal position
  - Bodyweight distributed from midfoot to heel region with feet shoulder width apart
  - Weight should be as close to person as possible to decrease amount of swinging of the weight for improved control
  - Initiate lift off with hip and knee extension to return to standing position following into a "locked out" position
    - "Locked Out" is hip extension, knee extension, shoulders in neutral with slight scapula depression
    - Contraction of quadriceps, gluteals, adductor magnus and hamstrings for extension phase of the deadlift
    - Exhalation of breath with abdominal and pelvic floor recruitment as well as rib cage depression
    - IF using Valsalva (>80% of 1 rep max), maintaining IAP without overstressing the core canister is crucial for injury prevention and proper form/technique
- Eccentric Phase
  - Lowering of weight back to hinged squat position maintaining spinal neutral position
  - Inhalation of breath with abdominal expansion during this phase

# Clinical Implications

- Manual labor professions
- Pregnancy and postpartum populations
- History of pelvic organ prolapse and/or other pelvic floor dysfunctions
- History of low back, thoracic, hip and pelvic pain and/or surgeries
- History of hernia and abdominal surgeries
- History of shoulder, knee, ankle and foot injuries and/or surgeries
- Weightlifters, cross fitters and strength training populations
- Patient populations who have difficulty with functional movements such as bending forward or sit to stand
- History of COVID that included increased amounts of coughing and difficulty breathing

# Training Considerations

- Optimize form and programming with factoring in loads
  - Increase loads as patient shows improved tolerance with proper form and technique
- Be aware of “straining” and if the load exceeds the patient’s capacity
  - Look for a lower abdominal bulge resulting in downward pressure on the pelvic floor
  - If the load exceeds the patient’s capacity, patient may experience symptoms such as urinary incontinence, pelvic pain, etc.
  - Perform ASLR test to assess for pelvic rocking, breath hold/straining and breathing with abdominal/core stabilization mechanics for pressure management strategies of the patient
- Modify internal loads if needed such as water intake or reducing bladder irritants
- Offer variations of exercise to build up to proper form and technique
  - Leg press to squat
  - Hip hinge to deadlift
- If patient is experiencing pain or dysfunction, reintegrate and rebuild
  - Step back, analyze/assess, offload and rebuild for proper form and technique

# Potential Treatment Options

- Diaphragmatic Breathing
  - Assess for “360 degrees of breathing” throughout the abdominal/rib cage region
  - Is there symmetry throughout the rib cage in all directions?
    - Forward, lateral and backward expansion?
  - Is there accessory muscle recruitment with attempted diaphragmatic breath cycle?
    - “Chest Breathers”
    - Look for increased scalene and upper trap recruitment during the breathing cycle
  - Is the patient’s breathing variable based on position?
    - Differences in breathing patterns while laying supine, sitting, standing, laying on their side, etc?
  - What does the patient do on exhalation?
    - Does the patient “bulge” the abdominal region or draw in?
  - Can the patient ”feel” excursion of their pelvic floor musculature with inhalation and exhalation of breath?
    - Is patient unable to take full diaphragmatic breath due to pelvic floor over activity?
    - Over activity of the pelvic floor could result in the pelvic floor being unable to move and react with the diaphragm in a synergistic fashion

# Potential Treatment Options

- Diaphragmatic Breathing
  - Check for spinal mobility at cervical, thoracic and lumbar regions
  - Assess rib mobility/springing
    - Is there a rib flare present? What is the costal angle like?
  - Assess for “upper abdominal gripping”
    - Rectus abdominus and oblique dominant posture positions can cause downward pressure and inability to effectively generate full intraabdominal pressure
    - Visceral and myofascial restrictions in the abdominal cavity
    - Assess for diastasis recti (both males and females)
  - Assess upper quadrant strength
    - How is the function of serratus and lat dorsi?
  - Assess for postural deficits that may be restricting rib cage and diaphragm motion
    - Forward head, rounded shoulders, thoracic kyphosis, lumbar lordosis, anterior and posterior pelvic tilt positions, etc
  - Are there lumbar, thoracic and/or hip joint and fascial restrictions that are restricting generation of intraabdominal pressure?

# Potential Treatment Options

- Hip/Knee/Ankle Dysfunction
  - Is there ”pinching” in the anterior hip region?
    - Check for posterior hip capsule tightness/myofascial posterior hip restrictions
    - Check hip adductors due to their attachment to the pubic rami region
    - Assess for FAI symptoms (FADIR, etc)
    - Visceral and myofascial restrictions of the abdominal cavity
  - Is the patient unable to “hinge” at the hip?
    - Does patient lack lumbopelvic dissociation?
    - Try hip hinge with a dowel to re-educate patient on how to properly perform
    - Try kneel to tall kneel transition with diaphragmatic breathing to integrate hip hinge with proper breathing strategies
  - Does the patient complain of pain or tightness in the hip?
    - Don’t forget about the pelvic floor!
    - Pelvic floor musculature overactivity can commonly present as a “deep ache” and/or “tightness” in the hip region
    - Obturator internus is a pelvic floor muscle that controls ER of the hip and can influence ability of the hip to move into rotational movements

# Potential Treatment Options

Hip/Knee/Ankle Dysfunction

- Is the patient glute or hamstring dominant?
  - If hamstring dominant, may not be able to effectively perform full hip extension in squatting and deadlifting motions
- Does the patient shift weight through the lifting motion?
  - Are there joint and/or mobility restrictions at the thoracic, lumbar, hip, knee or feet/ankle forcing the patient to do this?
  - Is it a strength or motor control/coordination issue throughout the kinetic chain?
  - Elevated fear avoidance behavior due to current or past injury?
  - Assess single leg squat bilaterally to see if there are differences between each limb
- What is being observed at the knee and ankle?
  - Restrictions in ROM of the knee and/or ankle can influence how the hip/knee/ankle are able to move
  - Strength deficits down the kinetic chain can influence how the patient stabilizes in the lumbopelvic region
- Anterior knee pain present with squatting motions?
  - Check form/technique and modify if necessary
  - Can try squatting in a smaller ROM and building into a larger ROM
  - What is the mobility of the ankle, foot, knee and hip region?
  - Quad strength throughout all ranges of motion? What is the patient's strength at end range vs other parts of the range?

# Potential Treatment Options

- Hip/Knee/Ankle Dysfunction
  - During deadlifts and squats, does the patient have more lower back/hip discomfort?
    - Check quad strength and ability to fully extend the knees throughout the entire lifting motion
      - Deadlifts: struggling to initiate lifting weight from the ground due to inability to extend knees
      - Squats: struggling to stand from bottom of the squat due to inability to extend knees
  - Does the patient ”lift” their heels up with attempted squatting motions?
    - Check ankle and foot joint mobility
      - Lack of ankle dorsiflexion, decreased foot pronation
    - Check muscle tension/length/fascia restrictions of the posterior lower extremity, including gastroc region
  - Check for neural tension of sciatic nerve
    - Tibial nerve (L4-S3), branch of the sciatic nerve, shares sacral roots (S2-S3) that innervate the pelvic region
    - Check for patient’s ability to perform IR of the hip
      - If unable to internally rotate at the hip, the patient will have decreased ability to perform knee flexion and ankle dorsiflexion during the full squat motion
        - May overcompensate with an anterior pelvic tilt and increased lumbar extension

# Clinical Application

- Don’t forget about breathing and/or bracing mechanics for pressure management as preventative measures to reduce risk of injury
- Assess and re-assess technique and form for optimal performance
- Analyze the kinetic chain throughout the lifting motions
- It is never a “one size fits all” approach and cater to the individual needs of the patient
- If you suspect pelvic floor dysfunction as a contributing factor to restrictions and/or symptoms during lifting motions, consult with and potentially refer to a pelvic health physical therapist

# Thanks for your time!

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