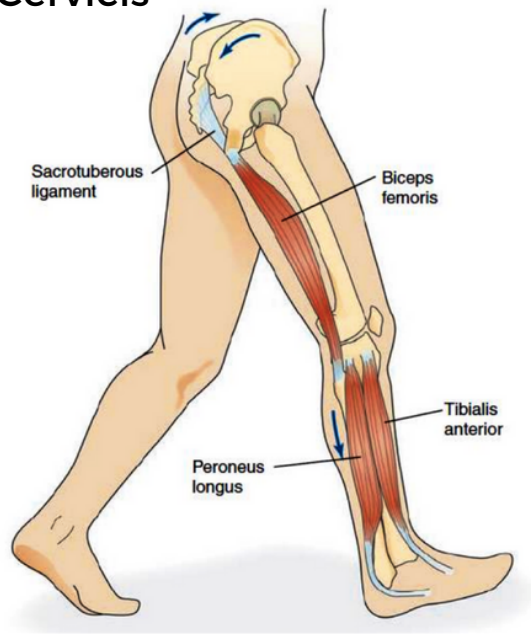
DEEP LONGITUDINAL SUBSYSTEM - STUDY GUIDE

The Deep Longitudinal Subsystem (DLS) is Comprised of:

- **Thoracolumbar Fascia (Deep Posterior Layer)**
- Erector Spinae
- Rhomboids
- Splenius Capitis and Splenius Cervicis
- **Sacrotuberous Ligament**
- Biceps Femoris
- Adductor magnus
- Piriformis
- Obturator internus (and deep hip external rotators)
- **Head of Fibula**
- Fibularis Longus



WANT AN IN-DEPTH BREAKDOWN & VIDEO DEMONSTRATIONS?

Check out the course "Deep Longitudinal Subsystem"

SCAN ME

BROOKBUSHINSTITUTE.COM

FUNCTION OF THE DEEP LONGITUDINAL SUBSYSTEM

FUNCTION:

The DLS is comprised of muscles with a propensity to act synergistically; rarely do these muscles act as prime movers. This subsystem plays an important role in the motion of the tibiofibular joints, hip joints, sacroiliac joints, and spine, and may aid in proprioception by altering recruitment strategies based on the load and stretch imparted on the system during heel strike. The DLS is active during gait, forward bending (more so when knees are near full extension), and lumbar extension, and eccentrically decelerates spine flexion, hip flexion, and ankle inversion. Over-activity of the DLS is often accompanied by relative inhibition of the PosteriorOblique Subsystem (POS).

Concentric Function:

- Heel strike to push-off during gait, assists with lifting from a forward bent position, and lumbar hyper-extension

Isometric Function:

- Stabilization of tibiofibular joints, hip joints, sacroiliac joints, and all segments of the spine

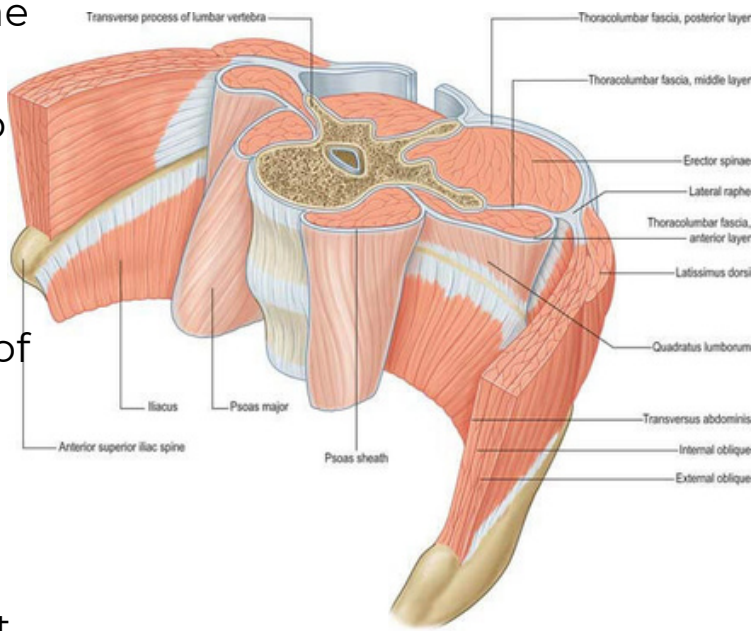
Eccentric Function:

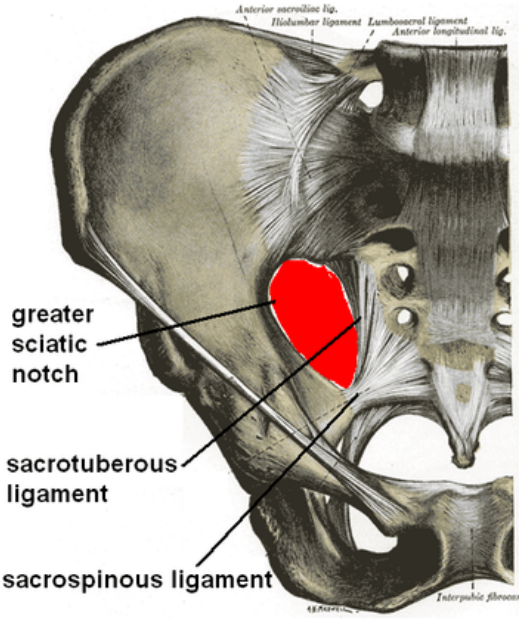
- Decelerates leg swing and impact during heel strike, eccentrically decelerates forward bending, and eccentrically decelerates ankle inversion

DLS ANATOMY SUMMARY:

Deep Laminae of the Posterior Layer of the Thoracolumbar Fascia (TLF):

The anatomy of the deep laminae is the fascial link between the upper body muscles of the Deep Longitudinal Subsystem (DLS). The deep laminae runs from the splenius capitis and splenius cervicis, to the superficial fascia of the rhomboids, enveloping the erector spinae (investing in and reinforcing the paraspinal retinaculum), and is continuous with the sacrotuberous ligament.





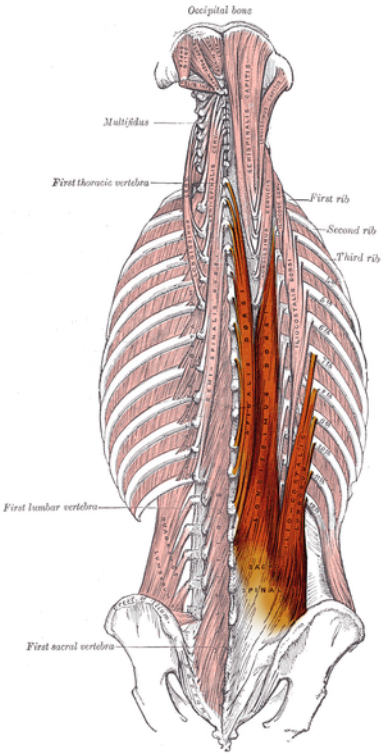
Sacrotuberous Ligament:

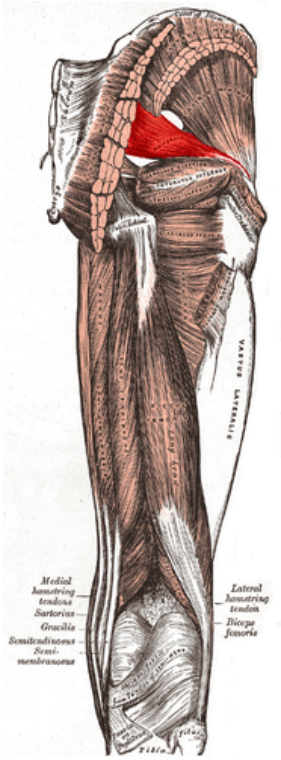
The sacrotuberous ligament is a complex structure that plays a significant role in sacroiliac joint (SIJ) function and serves as an attachment site for several muscles. Research has demonstrated that the biceps femoris and gluteus maximus may increase tensionin the sacrotuberous ligament, further, the piriformis, semitendinosus, semimembranosus, obturator internus, and multifidus have been implicated by researchers due to their attachments.

DLS ANATOMY SUMMARY:

Erector Spinae

The erector spinae fills the majority of the cross-sectional area of the extensor retinaculum, is invested in the extensor retinaculum and deep laminae from cranium to sacrum, and invests in the common fascial sheath (composite) of the sacrum running continuous with the sacrotuberous ligament. Although more research is needed investigating the relationship between erector spinae activity, deep laminae tension/stiffness, and recruitment of the DLS, there is a fair amount of research on erector spinae function and compensatory behavior.



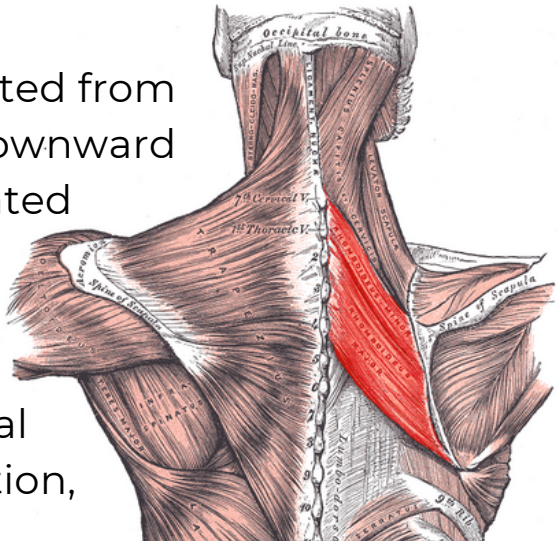


Biceps Femoris, Piriformis, Deep Rotators, and Adductor Magnus

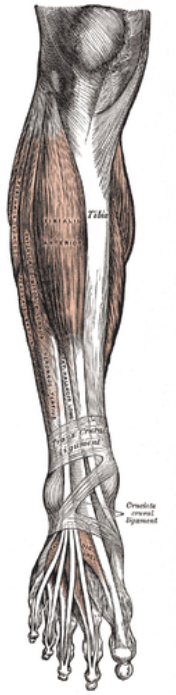
The biceps femoris, adductor magnus, and piriformis all have attachments to the sacrotuberous ligament. Clinically, it has been observed that these muscles behave similar to one another, in a manner congruent with the behavior of the DLS, and addressing all of these muscles together seems to improve outcomes related to DLS and sacroiliac joint (SIJ) dysfunction.

DLS ANATOMY SUMMARY:

Rhomboids:



The rhomboids behave as might be expected from a synergist for retraction, elevation, and downward rotation. Their activation cannot be separated from other scapular movers, and their activity increases with less trapezius activity during arm elevation. They play a role in positioning the scapula for optimal glenohumeral mechanics during arm motion, are more active during "rows/pulling" (retraction), and less active during arm elevation/overhead pressing or pushing. Rhomboid activity is likely important for stabilization as it was noted that activity increases with gripping, and increased re-activity (decreased latency) was noted in the trained arm of pitchers and the dominant arm of untrained individuals.



Fibularis (Peroneal) Muscles:

The fibularis muscles extend the DLS from knee to ankle via fascial continuity with the biceps femoris at the fibular head. This may imply the DLS has an important role in core function, as well as knee, proximal and distal tibiofibular joint, and ankle function.

COMMON MALADAPTIVE BEHAVIOR:

- Over-active

SUBSYSTEMS SUMMARY:

- **Intrinsic Stabilization Subsystem:** Under-active
- **Anterior Oblique Subsystem:** Over-active
- **Posterior Obliques Subsystem:** Under-active
- **Deep Longitudinal Subsystem:** Over-active

SIGNS OF DLS DYSFUNCTION:
OVERHEAD SQUAT ASSESSMENT

- Shoulders elevate
- Anterior pelvic tilt
- Asymmetrical weight shift
- Knees bow in
- Knees bow out
- Feet turn out
- Feet flatten

PRACTICAL APPLICATION:

- **Release (self-administered, vibration, or manual):**
  - Erector Spinae
  - Rhomboids
  - Splenius Capitis and Splenius Cervicis
  - Biceps Femoris
  - Adductor magnus
  - Piriformis, Obturator internus (and deep rotators)
  - Fibularis Longus
- **Core:**
  - Avoid exercises that focus on erector spinae, adductor, and/or hamstring strengthening
- **Integrated Exercise:**
  - Avoid straight-legged deadlifts and kettlebell windmills

Rhomboid Static Release

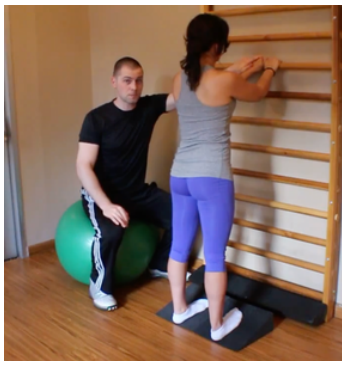
SAMPLE PROGRAM:
KNEES BOW OUT

MOBILITY

- Release
  - Biceps Femoris Release
  - Piriformis Release
  - Adductor Magnus Release
  - Fibularis Release
  - Calf Release
- Mobilization
  - Open Books
- Lengthen
  - Childs Pose (Erector Spinae)
  - Biceps Femoris Active Stretch
  - Slant Board Calf Stretch


Piriformis Release


Open Book


Slant Board Calf Stretch

ACTIVITY

- Isolated Activation
  - Glute activation circuit
  - Tibialis anterior activation
  - Terminal knee extension
- Core Integration
  - Ultimate Glute Bridge
- Subsystem Integration
  - Step-up to Row


Ultimate Glute Bridge

SOME OF OUR FAVORITE DSL EXERCISES:

Biceps Femoris (Self-Administered) Static Release

KEY POINTS:

- It may be beneficial to teach your patient/client about the location of the biceps femoris (lateral hamstring from gluteal fold to knee), and if necessary palpate the biceps femoris to demonstrate where they should exert pressure with the release tool.
- Have your patient/client sit on a box, table or chair that is high enough to allow their leg to hang without touching the floor.
    - This technique does not work as well when performed while sitting on the floor, or on a low seat that results in the lower leg being supported by the floor.
- Have your patient/client place a softball or similar release tool under the biceps femoris .
- Have your patient/client slide back and forth, using the release tool to scan the entire biceps femoris for tender points (gluteal fold to knee).
- Once the most tender point is located have your patient maintain pressure and attempt to relax, while waiting for a sensation of release or reduction in discomfort (generally 30 - 120 seconds).
- Move on to another tender point or the next muscle to be released.

Biceps Femoris Self-Administered Static Release

Biceps Femoris (Self-administered) Dynamic Release Technique (Pin and Stretch):

KEY POINTS:

- Have your patient/client slide back and forth, using the release tool to scan the entire biceps femoris for tender points (gluteal fold to knee).
- Once, the most tender point is located have your patient move the foam roll just distal to that point, so it abuts the tender point on the distal side.
- **Instruct your patient/client to extend their knee, holding for 1 - 2 seconds at end range, and then slowly returning to the starting postition. Perform 10 - 15 repetitions.**
- Move on to another tender point or the next muscle to be released.

Biceps Femoris Self-Administered Dynamic Release (Pin and Stretch)

Complete review and bibliography:

“Deep Longitudinal Subsystem (DLS)” online course

BROOKBUSHINSTITUTE.COM

WANT AN IN-DEPTH BREAKDOWN & VIDEO DEMONSTRATIONS?

Check out the course "Deep Longitudinal Subsystem"

SCAN ME