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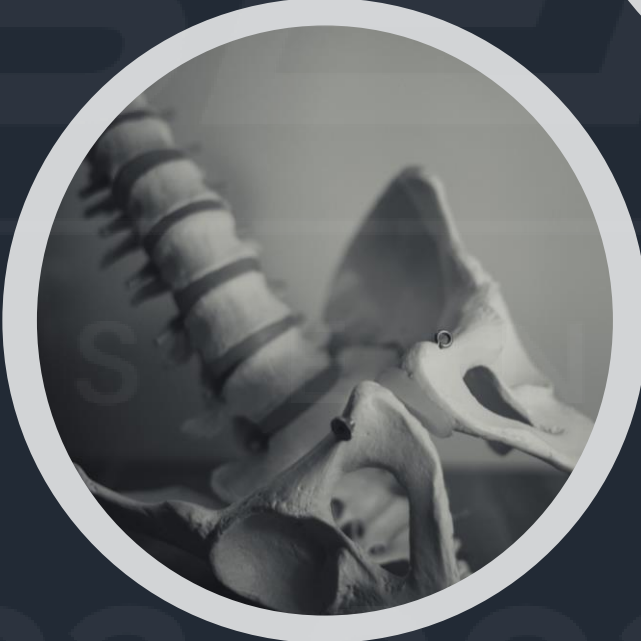
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Anatomy & Physiology of the Lumbar Spine

Module 3



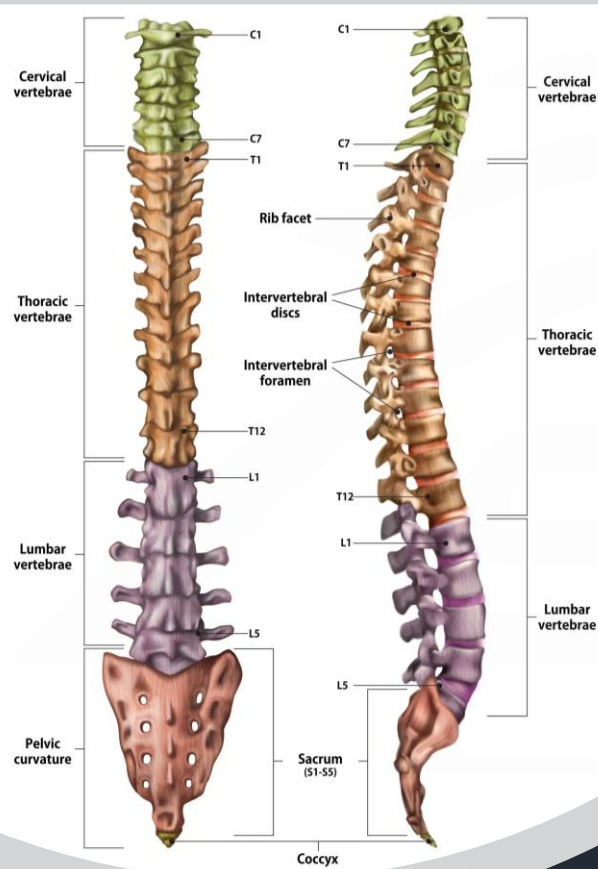
Back Anatomy

Key Facts



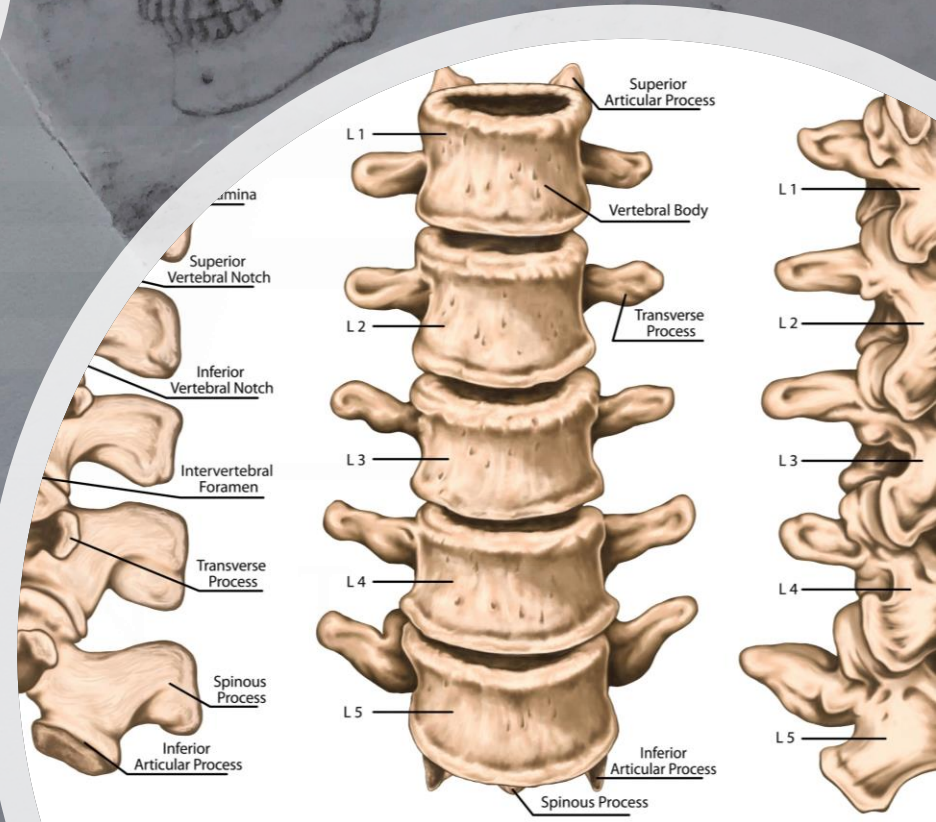
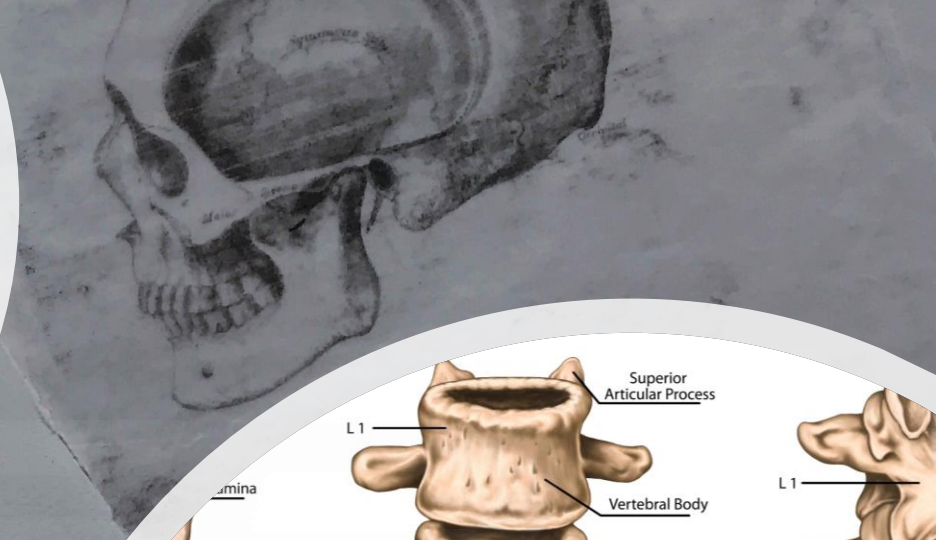
Bones	Vertebral column: 7 cervical, 12 thoracic, 5 lumbar, 5 sacral (sacrum), 3-5 coccygeal (coccyx) vertebrae
Joints	Intervertebral discs, zygapophyseal joints
Muscles	Extrinsic (Superficial) muscles Intrinsic (Deep) muscles
Nerves	Posterior rami of the spinal nerves, intercostal nerves, cervical plexus, lumbar plexus, accessory nerve (CN XI)
Arteries and veins	Vertebral, ascending cervical, occipital, posterior intercostal, subcostal, lumbar, lateral sacral, deep cervical arteries and veins
Function	Protection of the spinal cord, absorption of mechanical force, maintains the posture of the body and head, coordination of limbs movements and assists with respiration





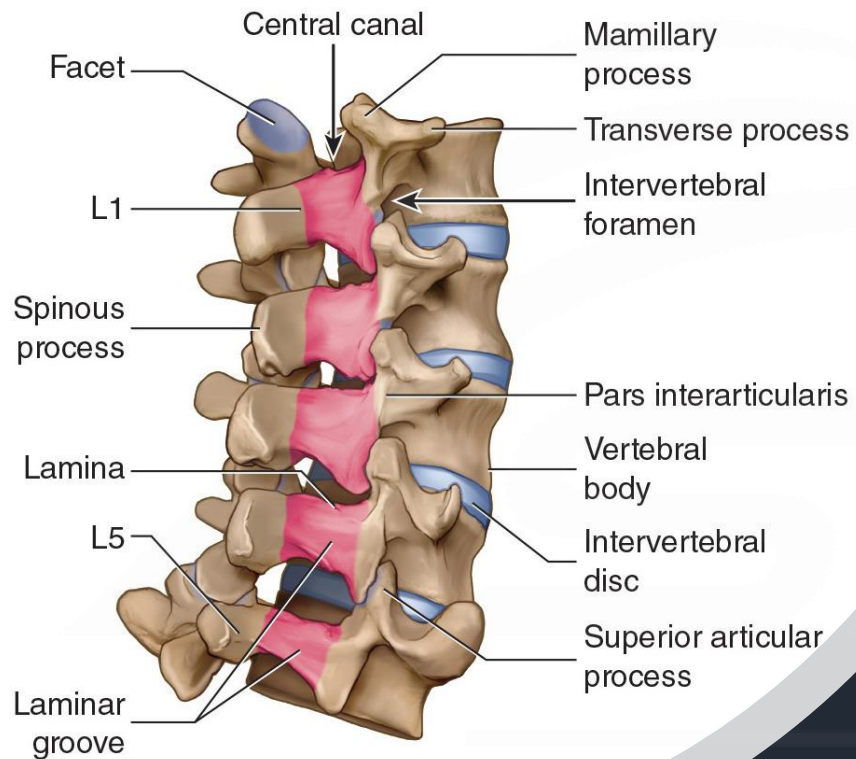
The Spine

- Spine (Vertebral Column) 33 interconnected vertebra
- Forms the axial skeleton with the skull & rib cage
- Numerous muscles, ligament and tendon provide support and flexibility
- 4 Curvatures: C.Lordosis, T.Kyphosis, L.Lordosis & S.Kyphosis



“The Lumbar Spine/Lower Back”

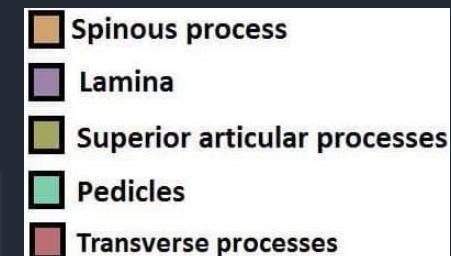




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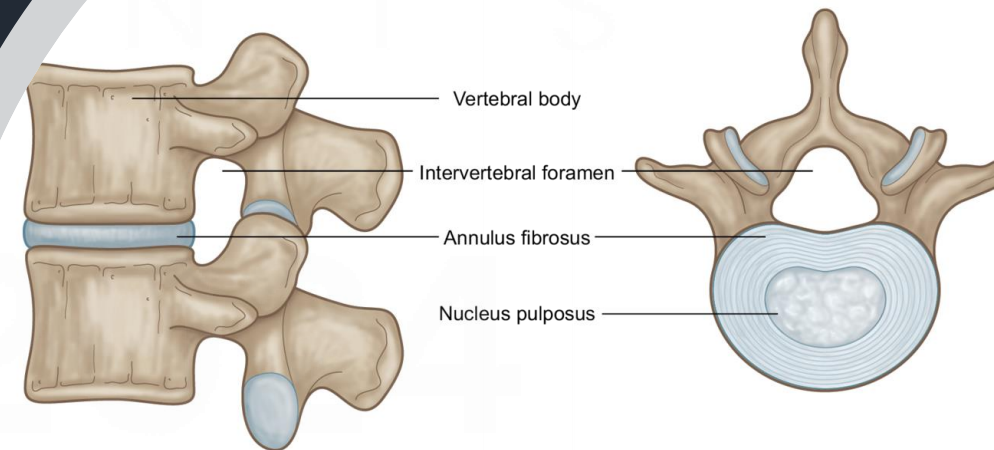
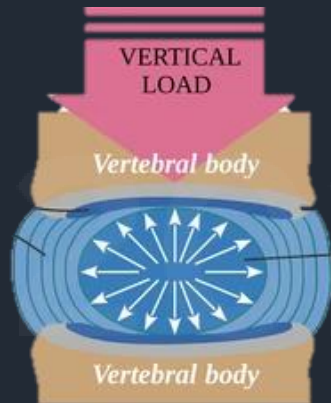
The Lumbar Spine

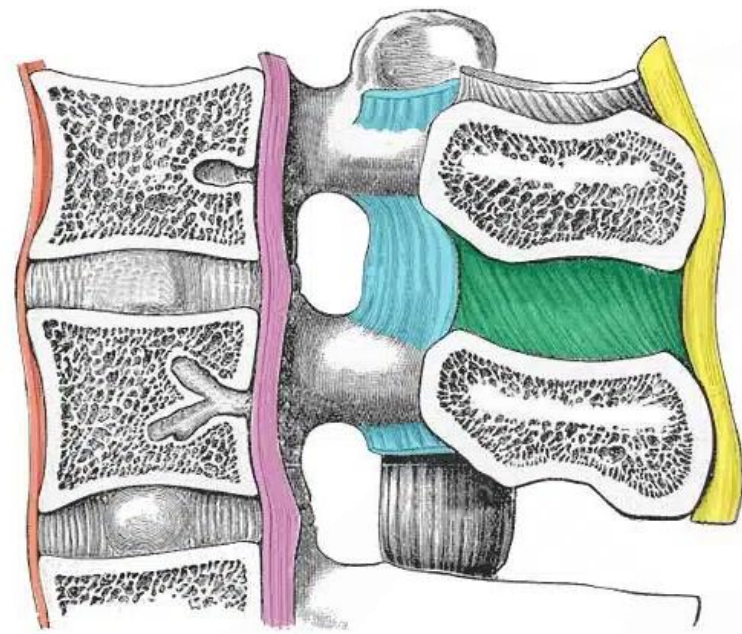
- 5 Lumbar Spine Vertebrae
- **Vertebral Body, Arch and 3 Processes**
- Intervertebral joints are connected via intervertebral discs and zygapophyseal joints
- **Facet Joints of the lumbar spine allow for flexion extension of the back**



Intervertebral Discs

- Discs are fibrocartilages lying between the adjacent vertebral surfaces
- 5 Lumbar Intervertebral discus approx. 7-10mm thick and 4cm in diameter
- Consist of annulus and nucleus pulposus
- Intervertebral discs function to: Absorb shock/load and prevent friction between moving vertebrae





- Anterior longit. ligament
- Posterior longit. ligament
- Ligamentum flavum
- Interspinous ligament
- Supraspinous ligament

Ligaments

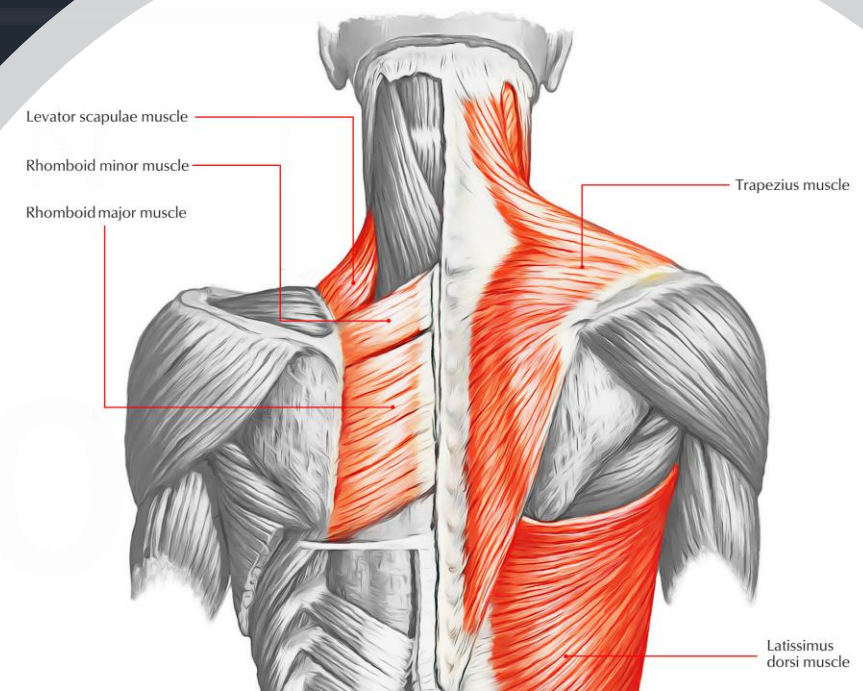
- Ligaments of the vertebral column support and stabilize the spine during movement
- Anterior & Posterior Longitudinal Ligaments (ALL & PLL) extend full length of spine and primary support the intervertebral joints
- Accessory ligaments; ligamentum flava, interspinous, supraspinous, nuchal and intertransverse ligaments although support the spine



Muscles of the Back Posterior

Superficial

- Trapezius, Latissimus Dorsi, Levator Scap and Rhomboids
- These muscles are located posteriorly and main function is to support and move the scapula

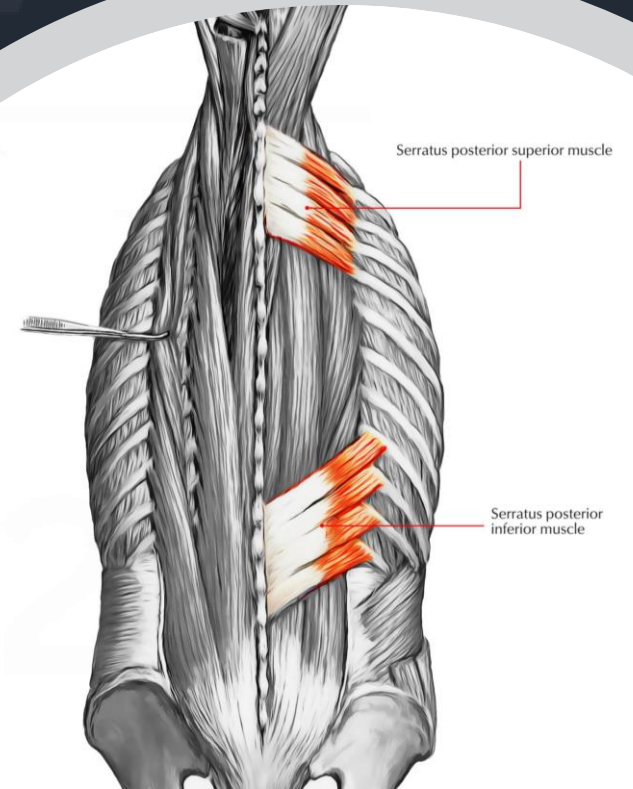


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Muscles of the Back Posterior

Intermediate

- Serratus Posterior (Superior & Inferior)
- These two muscles elevate and depress the ribs; Serratus Post Sup (Elevates ribs II to V) & Serratus Post Inf (Depresses ribs IX to XII)

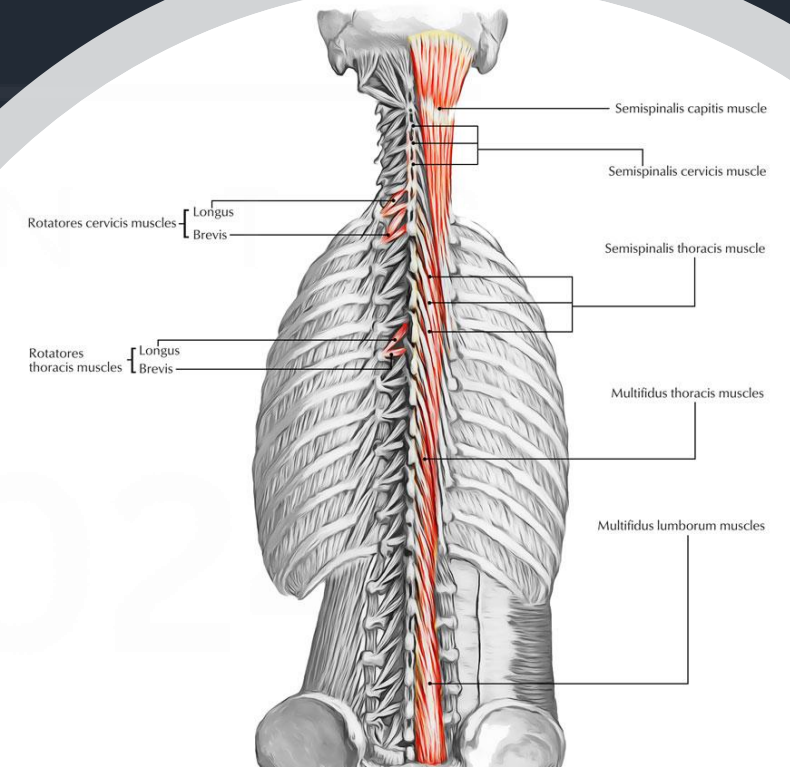


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Muscles of the Back Posterior

Deep/Intrinsic

- Transversospinales (Semispinalis, Multifidus & Rotatores)
- Extend, Laterally Flex, Contralaterally rotate the neck and spinal joints
- They also have a role in anteriorly tilting and rotating the pelvis



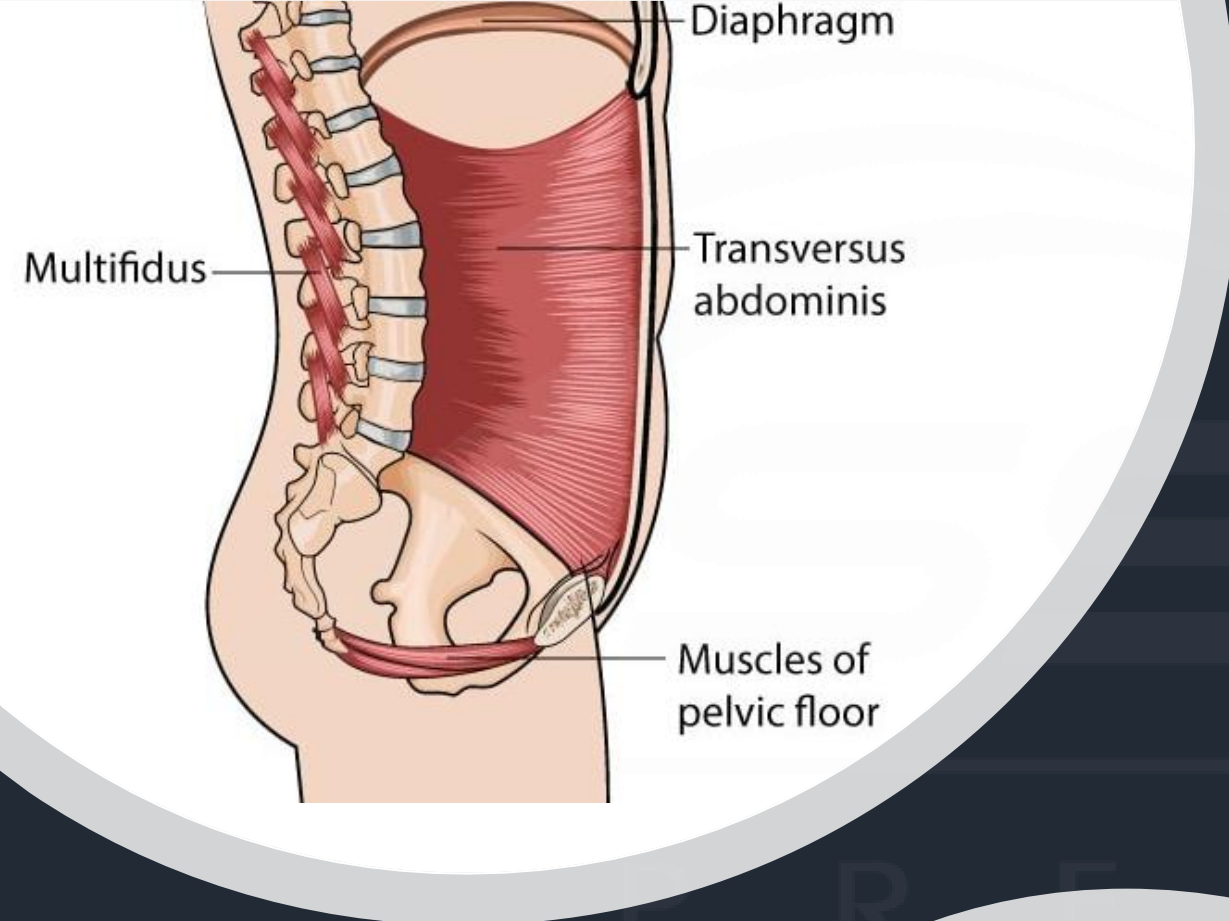
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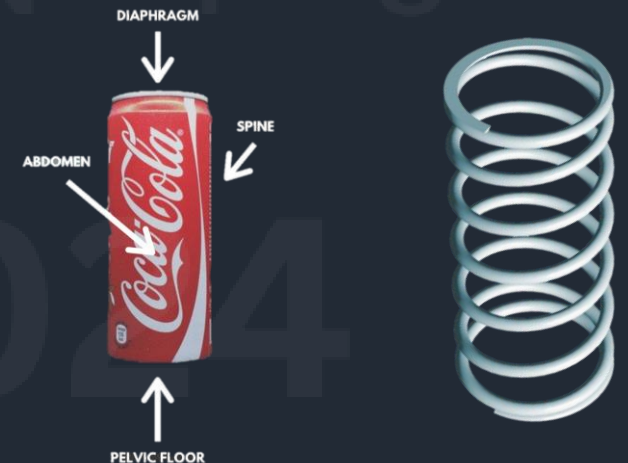
“The Core”





The Core

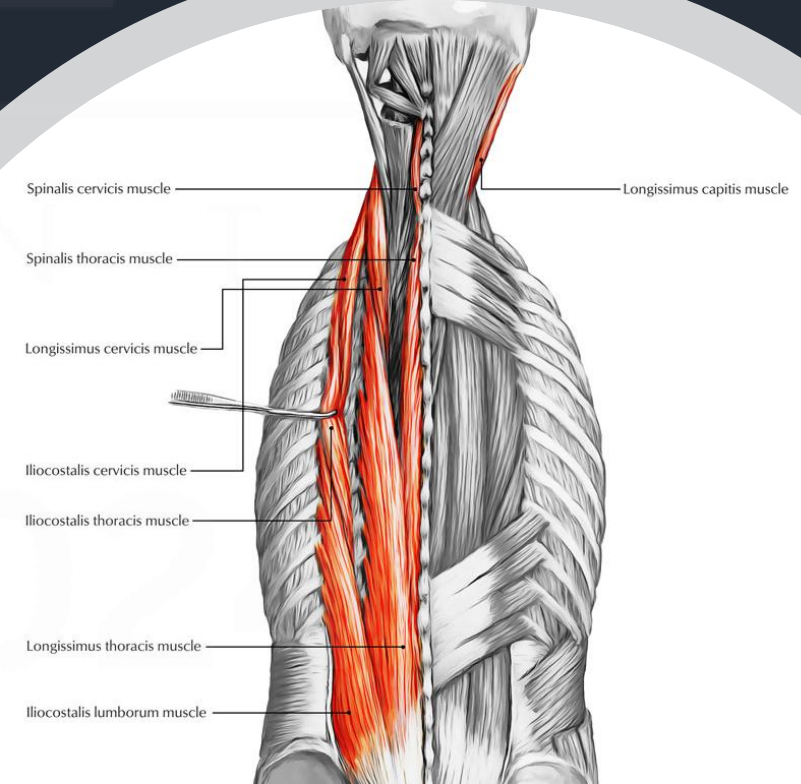
- Various descriptions/analogies
- Simply the core muscles work to both resist AND assist with movement
- Education regarding 'The Core' should detail the benefits of spinal stability, mobility, strength, endurance and power
- Goals for improving 'The Core'



Inner, Deep or Local Stabilizing Muscles

The Core

- Transverse Abdominis, Internal Oblique, Diaphragm, Pelvic Floor, +/- Psoas & Hip Rotators
- Some research has suggested this muscle group work in an anticipatory way prior to the global muscle group
- These muscles are primarily made up of slow twitch fibres which are suited to control intersegmental motion during extrinsic loading responses



Inner, Deep or Local Stabilizing Muscles

The Core Actions (1)

- **Transverse Abdominis** – Stabilize/Flex Trunk/Increase Abdominal Pressure
- **Internal Oblique** – Lat Flex/Rotate
- **Multifidus** - Stables/Extend/Rotate



Inner, Deep or Local Stabilizing Muscles

The Core Actions (2)

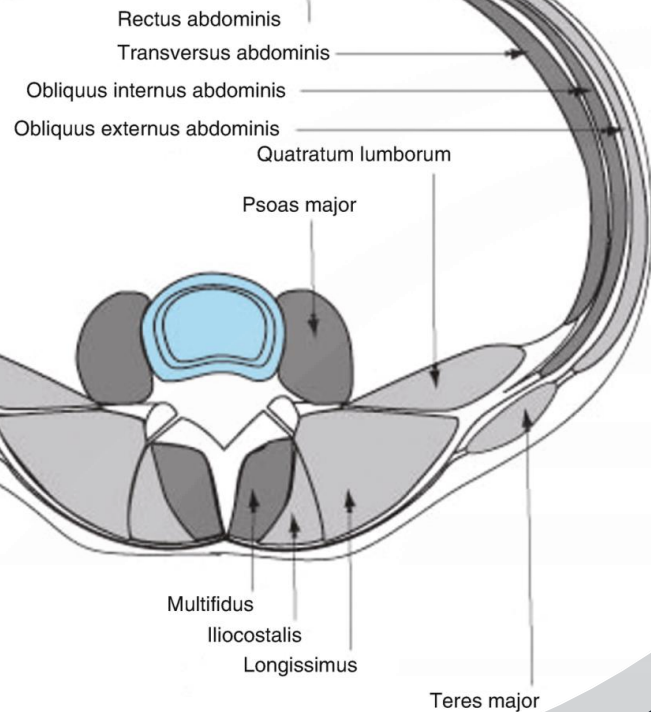
- **Diaphragm** - contraction and relaxation to $>/<$ Abdominal pressure & Inspiration/Expiration
- **Pelvic Floor** – Support Abdominal Viscera and constrict orifices
- + - **Psoas & Hip Rotators** – Contribute to trunk flexion & lumbo-pelvic stability



Global, Outer or Prime Movers

The Core

- Rectus abdominis, External obliques, Erector spinae, Quadratus lumborum +- Hip muscle groups
- The outer core muscles main role is to provide movement to the spine and trunk
- These muscles are primarily made up of fast-twitch fibers





Global, Outer or Prime Movers

The Core Actions

- **Rectus abdominis** – Trunk Flexion
- **External obliques** – Lat Flexion and Rotation
- **Erector spinae** – Extension and Lat Flexion
- **Quadratus lumborum** – Extension & Lat Flexion
- +/- **Hip muscle groups** – Dynamic support of the hip, trunk and lumbo-pelvic region



Review of Learning #3 Anatomy and Physiology

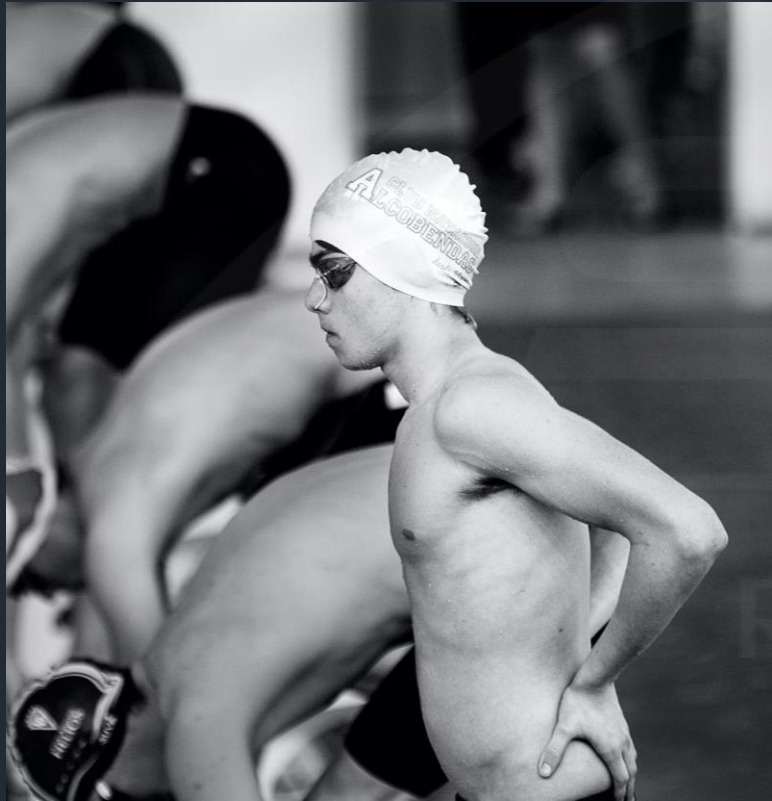
- You have been referred a young swimming athlete by a local squad coach
- He is 14yrs old and very tall for his age, the squad coach reports he lacks core strength and has reported some previous episodes of lumbar discomfort
- The coach reports he swings his hips from side to side and has an unbalanced stroke that lacks efficiency



Review of Learning #3 Primary Management



How would you explain “the core” to this young athlete? What functions of the core will be important for improving his swimming efficiency?



Review of Learning #3

Primary Management



- The Core muscles work to stabilize the trunk and assist with maximizing and transferring forces from the arms and legs during your swimming stroke
- Improved core strength with flexion, extension, rotation and lateral flexion & resistance of these movements with upper and lower limb loading will improve efficiency, body control and power output during your stroke





Anatomy & Physiology of the Lumbar Spine

Quiz 2

