The Spine

The spine is one of the most important parts of your body. Without it, you could not keep yourself upright or even stand up.

It gives your body structure and support.

It allows you to move about freely and to bend with flexibility

The spine is also designed to protect your spinal cord.

The spinal cord is a column of nerves that connects your brain with the rest of your body, allowing you to control your movements.

Without a spinal cord, you could not move any part of your body, and your organs could not function. This is why keeping your spine healthy is vital if you want to live an active life

What exactly is the spine?

Your spine is made up of small bones (vertebrae) that are stacked on top of each other to create the spinal column.

Between each vertebra is a soft, gel-like cushion called a disc that helps absorb pressure and keeps the bones from rubbing against each other

Each vertebra is held to the others by groups of ligaments

There are also tendons that fasten muscles to the vertebrae

The spinal column also has joints (just like the knee or elbow or any other joints) called facet joints

The facet joints link the vertebrae together and give them the flexibility to move against each other

Vertebrae

- **7** cervical vertebrae C1 - 7
- 12 thoracic vertebrae T1 - 12
- 5 lumbar vertebrae L1 - 5
- Sacrum - Fusion of 5 vertebrae
- Coccyx - Fusion of 4 vertebrae

- The vertebral column
  - Body of vertebra
  - Disc
  - Spinous process
  - Transverse process
  - Facet joint

Cartilaginous joints - Cartilaginous joints are connected entirely by cartilage (fibrocartilage or hyaline). Cartilaginous joints allow more movement between bones than a fibrous joint but less than the highly mobile synovial joint

Cervical vertebrae

- Considerably smaller vertebrae compared to the lumbar region
- Supports the head
- Flexion and extension
- Side bending and rotation
- C1 C2 Atlas and Axis
- Secondary Lordosis

Thoracic vertebrae

- 12 thoracic vertebrae
- Articulating with the ribs
- More rigid and less flexible than the cervical vertebrae
- Spinous process - long, slopes downward
- Allow for more spine rotation
- Kyphosis

Lumbar Vertebrae

- 5 lumbar vertebrae
- Inward curve called lordosis
- larger vertebrae body than the cervical and thoracic vertebrae body
- Allow for flexion and extension and some rotation
- Weight baring
- More flexible than the thoracic spine
- Less flexible that the cervical spine
- Spinous process - short and slightly flat

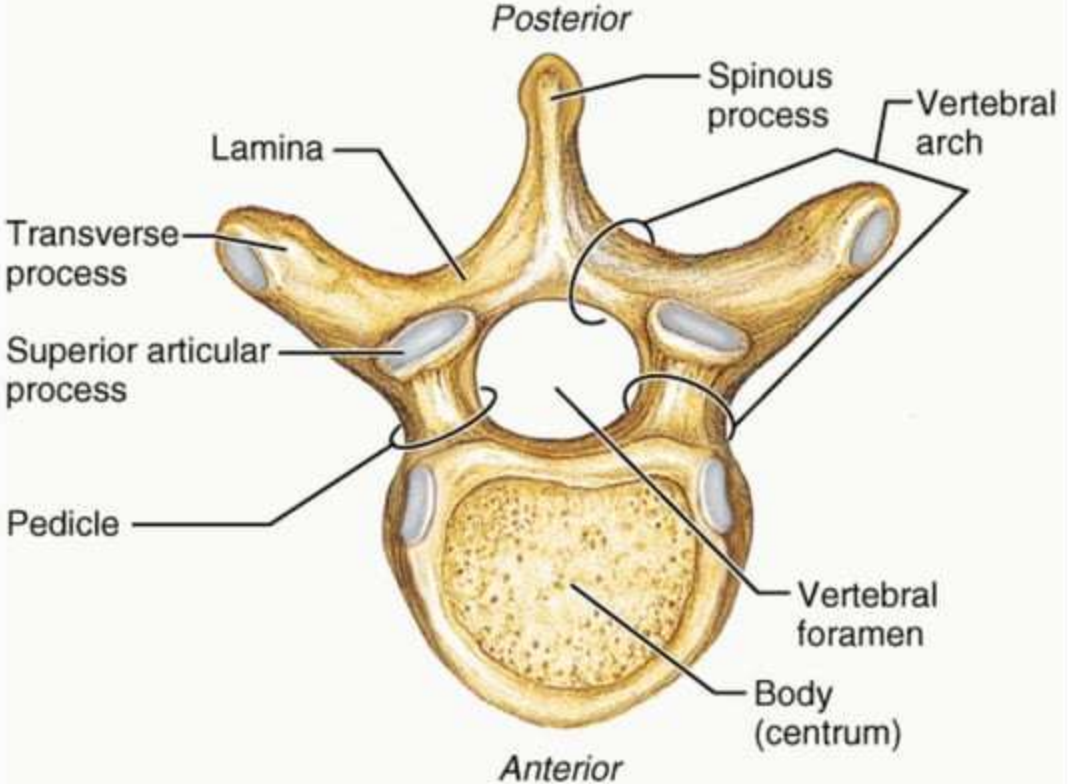
Sacrum

- Triangular in shape and curved
- 5 fused vertebrae
- Connects the spine to the pelvic
- Articulates with the illiim - S I joint
- Forces from the upper body transmit here
- Slight movement possible

•During development (those nine months before birth), these vertebrae grow together or fuse creating one large "specialized" vertebral bone that forms the base of your spine and center of your pelvis

Coccyx

- Tail bone seat of the soul
- 3-4 bones fused
- When sitting it shifts slightly more forward
- sacrococcygeal joint - slightly moveable
- Bears more weight when sitting of leaning backwards
- Tail bone pain - can be caused by falling backwards
- coccyx dysfunction - Hooked coccyx



Facet joints

The facets are the "bony knobs" that meet between each vertebra to form the facet joints that join your vertebrae together

There are two facet joints between each pair of vertebra, one on each side

They extend and overlap each other to form a joint between the neighboring vertebra facet joints

Without the facet joints, you would not have flexibility in your spine, and you could only move in very straight and stiff motions

The facet joints are what are known as synovial joints

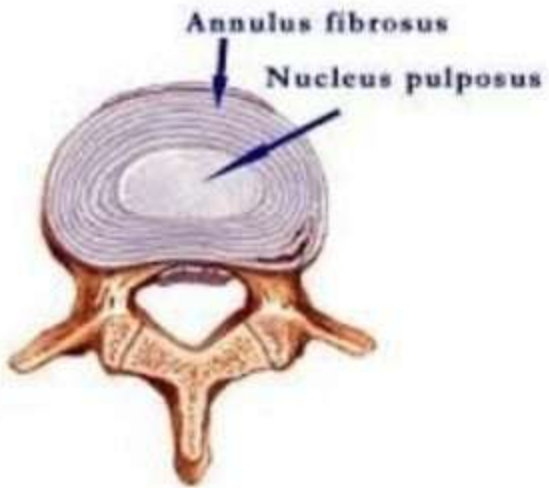
In a synovial joint, the ends of the bones are covered with a material called articular cartilage.

This material is a slick spongy material that allows the bones to glide against one another without much friction.

- The vertebral column = stack of vertebral bodies
- Between is a cushion-like structure known as the **intervertebral disc**
- Disc = absorbs the stress and shock that is placed on the vertebral column when a person walks, runs, moves, bends, or twists.
- The discs prevent the vertebral bodies from grinding against each other.
- Discs have no blood supply of their own, so absorb the nutrients they need from circulating blood

Each disc is made up of two parts:

- Annulus fibrosus (the fibrous ring) - Fibrocartilage
- Nucleus pulposus (the pulpy interior).



Annulus fibrosus

- Encases the nucleus pulposus.
- The purpose of the annulus fibrous is to stabilise the disc
- Insure that the spine can rotate properly
- resist compression or other stresses put on the spine.
- Made of water and strong elastic collagen fibers.

Nucleus pulposus

- Gel-like elastic substance
- The purpose of nucleus pulposus is to help transmit and transfer stress and weight placed on vertebrae during movement and activity.
- Made of the same basic ingredients as the annulus fibrosis, but contains more water.

Disc injury

Bulging and Herniated disc

- A **bulging** disc injury is a common spine injury sustained to your spine's intervertebral disc. It can occur in your lumbar spine (lower back), thoracic spine (upper and mid-back) or your cervical spine (neck).

- when the disc bulge is significant enough for the disc nucleus to come out of the annulus, it is known as a **herniated disc**. See diagram.

Modifications

- While back pain persists, do not bend forward past 90 degrees with straight knees.
- Avoid all seated forward bends if acute pain. Mild pain use props. If theres pain stop
- Avoid rounding your back.
- If a pose causes any pain, tingling, or numbness, stop immediately.

Interesting fact…

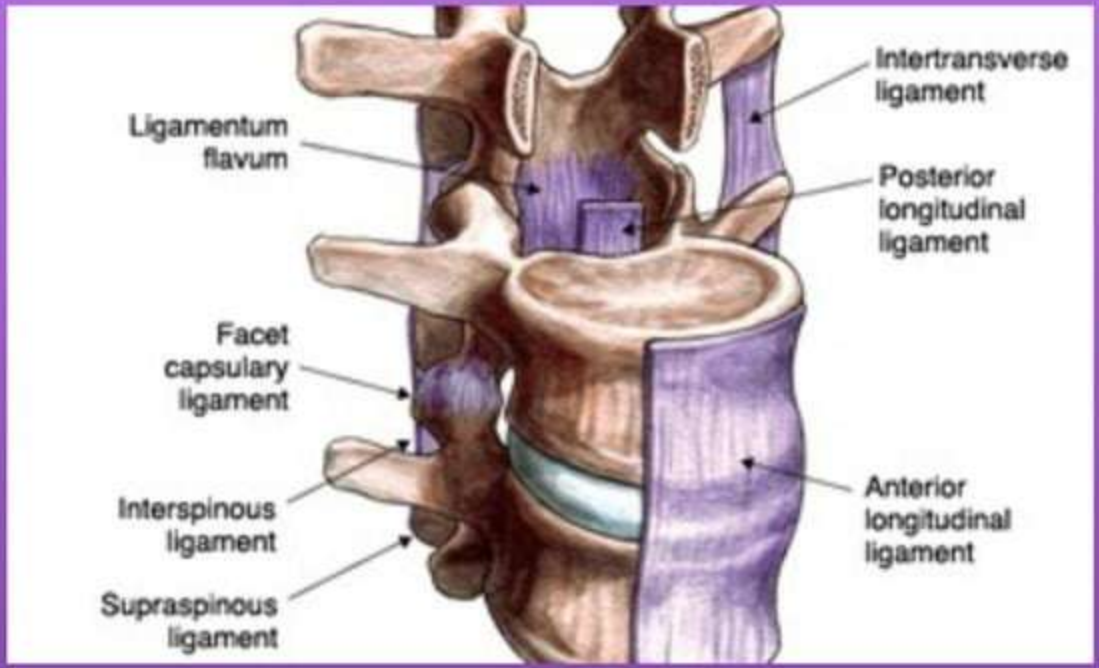
- **Intervertebral discs contain more fluid in the morning so we are slightly taller!**

Keep discs healthy

- Once you've lost the fluid in your discs its gone.
- Let's keep the spine healthy!!!
  - Keep the spine moving in all directions within a safe range
  - Lengthen people out with a savasana adjustment
- 70-80% of disc herniations go back and to the side – right to where the nerve roots are. Ouch!

3 Main Ligaments

- Anterior longitudinal
- Posterior longitudinal
- Interspinous
- Give stability, support posture



Ligaments of the spine

Movements of the spine

- Flexion
- extension
- Rotation
- Lateral flexion

Spine movers and stabilisers

Erector spinae (spine extension, lateral flexion, maintains posture)

Iliacus (Hip flexor)

Psoas (Hip flexor)

Quadratus lumborum (Lumbar spine stabiliser, lateral flexion)

Rectus abdominus (flexion of the spine)

Internal abdominal oblique
External abdominal oblique

(support the abdomen, flexion, rotation, lateral flexion of the spine, assist in forced exhalation)

Transversus abdominus (compress the abdomen, stabilise, assist forced exhalation)

Muscle spasm

you have a pulled muscle or muscle strain of the back muscles. The muscles can also cause problems indirectly, such as when the muscles are in spasm after injury to other parts of the spine

When you experience a muscle spasm, it is because your muscle tightens up and will not relax. These spasms usually occur as a reflex - meaning that you cannot control the contraction of these muscles

When any part of the spine is injured including: a disc, ligaments, bones, or muscles, the muscles automatically go into spasm to reduce the motion around the area. This protective mechanism is designed to protect the injured area

When muscles are in spasm they produce too much of the chemical, lactic acid. Lactic acid is a waste product produced by the chemical reaction inside muscle cells that must occur to allow the muscle to contract

If the muscle cell cannot relax, too much lactic acid builds up inside the muscles. The buildup of lactic acid causes a painful burning sensation

When the muscle relaxes, the lactic acid is eventually washed away by fresh blood flowing into the muscle as the blood vessels open up


Yoga works mainly on the spine

Axial Skeleton: From skull down to pelvis

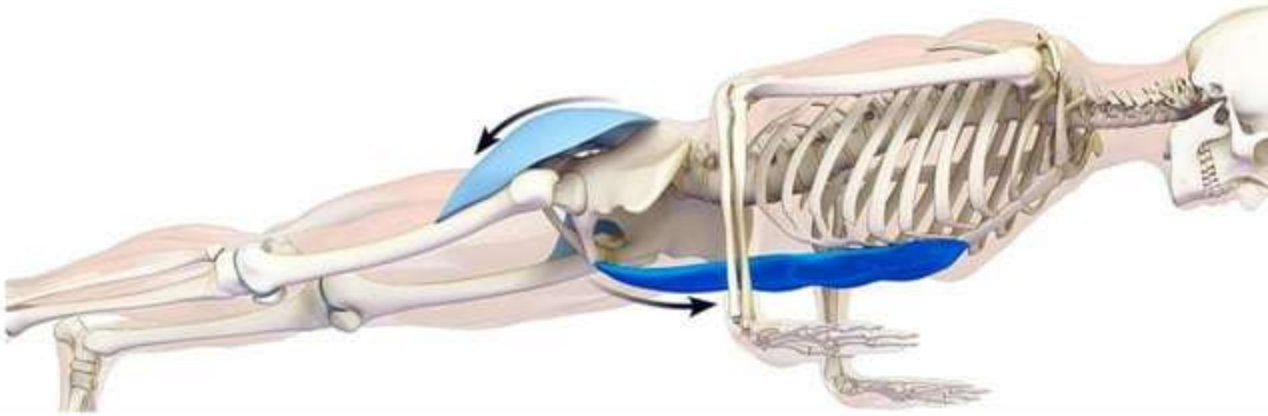
Appendicular skeleton: Arms and legs

Often we get caught up with looking at what the arms and legs are doing in a pose…But the most crucial aspect is the torso.

Have you ever considered the crazy way our body is made?

- Heavy bowling ball at the top
- Stack of coins vertebra
- Small base in feet
- High centre of gravity

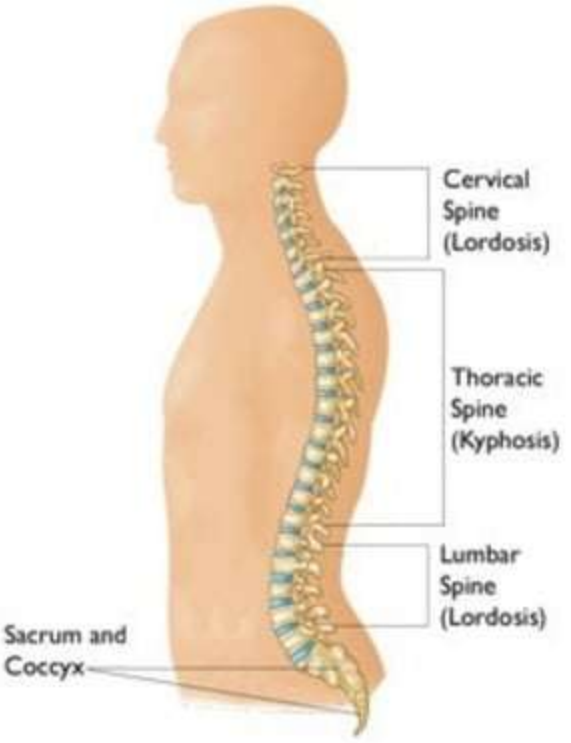
It's a marvel we can even stand up!



The waist, weakest point?

Divisions of the spine

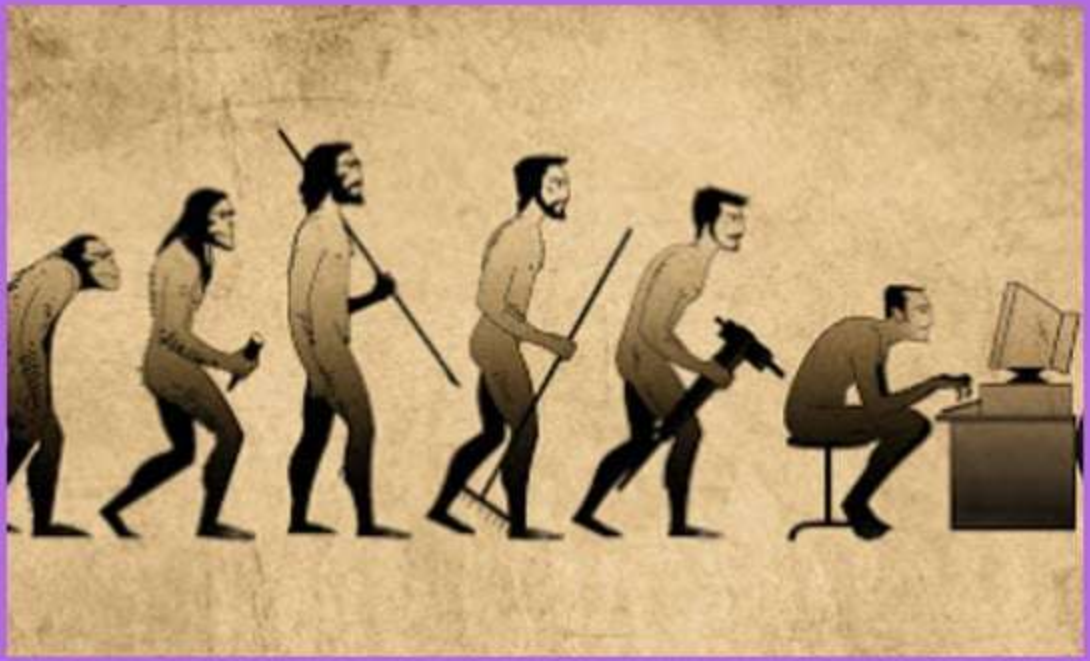
- Cervical
- Thoracic
- Lumbar
- Sacrum
- Coccyx



Curves of the spine

- Lordosis - normal but can be in excess
- Kyphosis - normal but can be in excess
- Scoliosis (Lateral curve)

Where the spine changes it's curve is typically where we can do damage



The sitting epidemic

Kinetic chain

Lumbar – Sacroilliac Joint - Hip joint (femur)

Sacrum and SI joint

- Large triangular bone - 5 fused bones
- Joint between the sacrum and illiim
- Transmits forces from the upper limbs and spine to the hip joints and lower limbs
- Articular surfaces, hyaline cartilage
- muscles influence the movements + stability of the SI joint
- Anterior posterior SI joint ligaments provide further stability and compression
- Due to the boney position position, muscles and strong ligaments the SI is pretty stable
- Allows for small movements - Nutation and counternutation
- Nutation = stable counternution = unstable

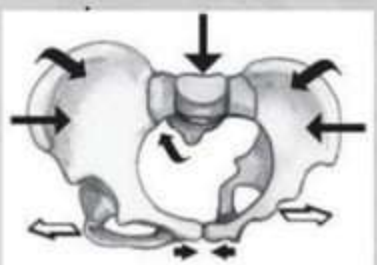
Sacroilliac joint problems.....

- The body's centre of gravity is located at the hip. Any imbalances in this region have a profound effect on overall body alignment
- The stability of the joint is thought to be most affected by the Piriformis, Gluteus Maximus, Biceps Femoris and Erector Spinae muscles.
- Symptoms like sciatica
- It is important to build and maintain strength in the hip area
- certain yoga poses can be highly problematic for the Sacroiliac joint, namely: warrior 1 and standing backbends
- asymmetrical forces into the Sacroiliac area and can cause misalignment.
- Salabhasana recommended

Small amount of movement is ok and desirable

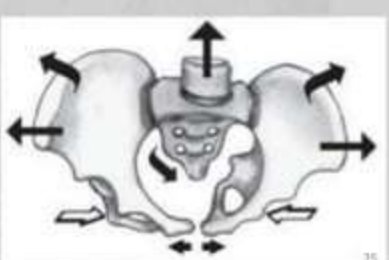
NUTATION

- Movement of sacral promontory anteriorly & inferiorly
- Posterior ilium-on-sacrum rotation



COUNTER NUTATION

- Anterior tip of sacral promontory moves posteriorly & superiorly
- Anterior ilium-on-sacrum rotation



Review

- Areas of the spine
- Spinal movements
- Structure of a intervertebral disc
- Disc pathologies and modifications
- Spinal ligaments
- Muscles that support the spine
- Axel and apendicular skeleton
- SI pain