



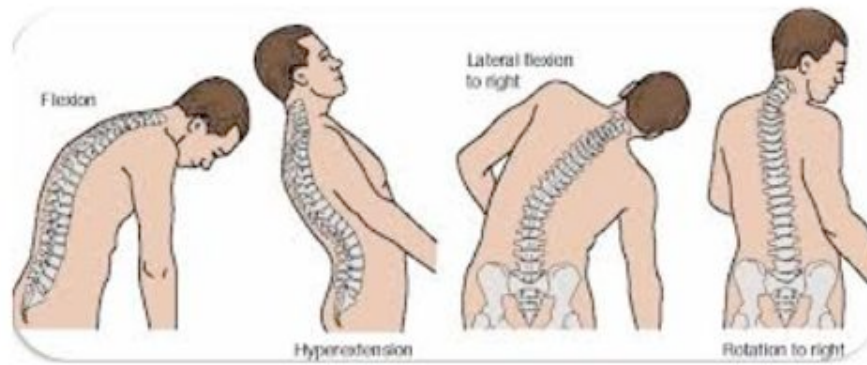
*Anatomy of Movement*  
Sequencing Force Through the Body

## Introductions

Who has a knowledge of anatomy?

Why? - profession, injury, etc?

## *Six Movements of Spine*

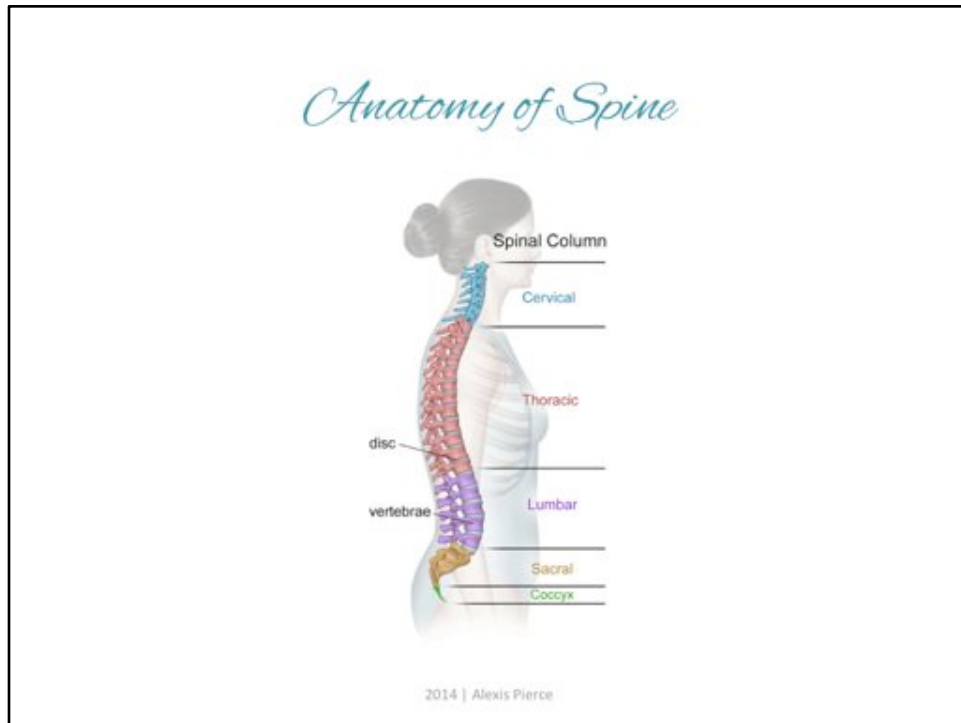


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Spine has 6 ranges of motion:

- Flexion
- Extension
- Sidebend left
- Sidebend right
- Rotate left
- Rotate right

Important to move through them all every day.



Spine has 4 curves.

**PURPOSE OF CURVES:**

1. Shock absorption.
2. Weight-bearing – ribcage & head.

**SHAPE MIMICKING:**

- PRIMARY CURVES: Thoracic and Sacral curves move together – in utero curves.
- SECONDARY CURVES: Cervical and Lumbar curves move together – birth and early childhood curves.

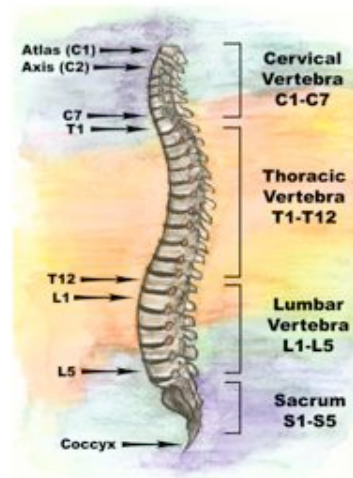
**\*\*Very important to keep the neck in line during backbends or you lose the integration of the lower back\*\***

33 bones:

- 7 cervical
- 12 thoracic
- 5 lumbar
- 5 fused sacral and 2-4 coccygeal segments

Image: [allaboutbackandneckpain.com](http://allaboutbackandneckpain.com)

## *Joints of the Spine*



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Joint = “to unite”. Two structures join to become one mobile unit (Linda Hartley, *Wisdom of the Body Moving*, 140).

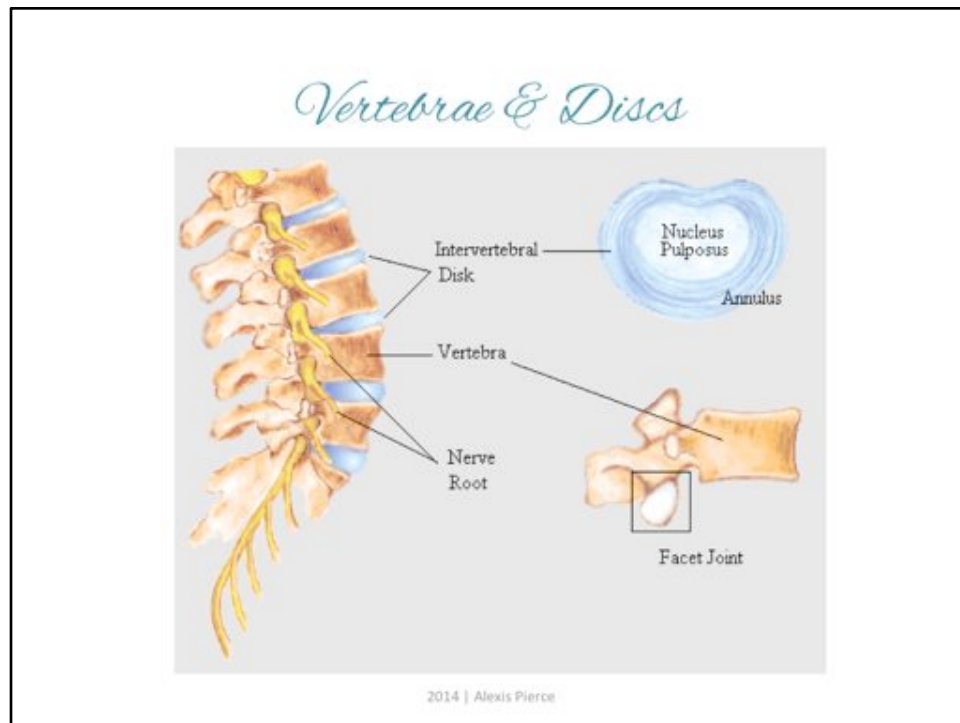
### MOVEMENTS:

Rotational – movement of vertebra around axis.

Translational – whole vertebra moves by same amount in a given direction.

- Cervical – Flexion / extension, axial rotation, lateral extension (side-bending) – more extension than flexion
- Thoracic – Flexion, rotation, lateral extension, limited extension (back-bending).
- Lumbar – Flexion and extension, limited rotation (only 5 degrees). Slight rotation.
- Sacrum – Nutation (flexion), counter-nutation (extension)

Joints are prone to injury because of the meeting of different types of movement and different shapes of vertebrae.



#### COMPONENTS:

- Vertebral body – the chunky, round part
- Spinous process – the fin
- Transverse process – the wings
- Facet joint – where transverse processes meet with vertebrae above/below
- Disc – prevents vertebrae from grinding against each other.
- Nucleus

Discs have no independent blood supply after twenty years of age. To keep them juicy – move in every plane (squeeze and release).

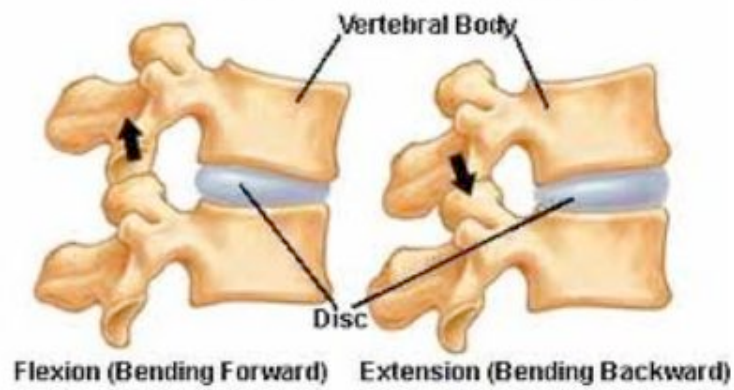
“In adulthood the cartilage endplate and the disc itself normally have no blood vessels of their own but rely on the blood supply of adjacent tissues, such as ligaments and vertebral body, to transport nutrients and remove waste products.” [[http://www.ilo.org/safework\\_bookshelf/english?content&nd=857170059](http://www.ilo.org/safework_bookshelf/english?content&nd=857170059)]

#### ISSUES:

- “Slipped disc” – herniation, prolapse
- Degeneration: Discs degenerate far earlier than do other musculoskeletal tissues; the first unequivocal findings of degeneration in the lumbar discs are seen in the age group 11–16 years [5]. About 20% of people in their teens have discs with mild

## *Discs During Movement*

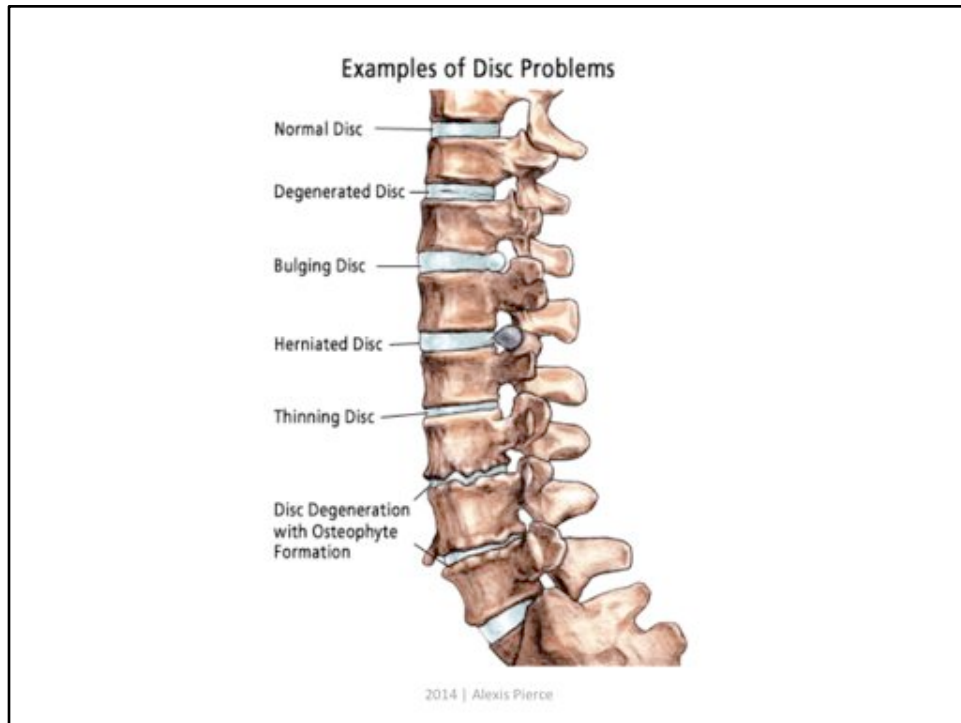
### **Facet Joints in Motion**



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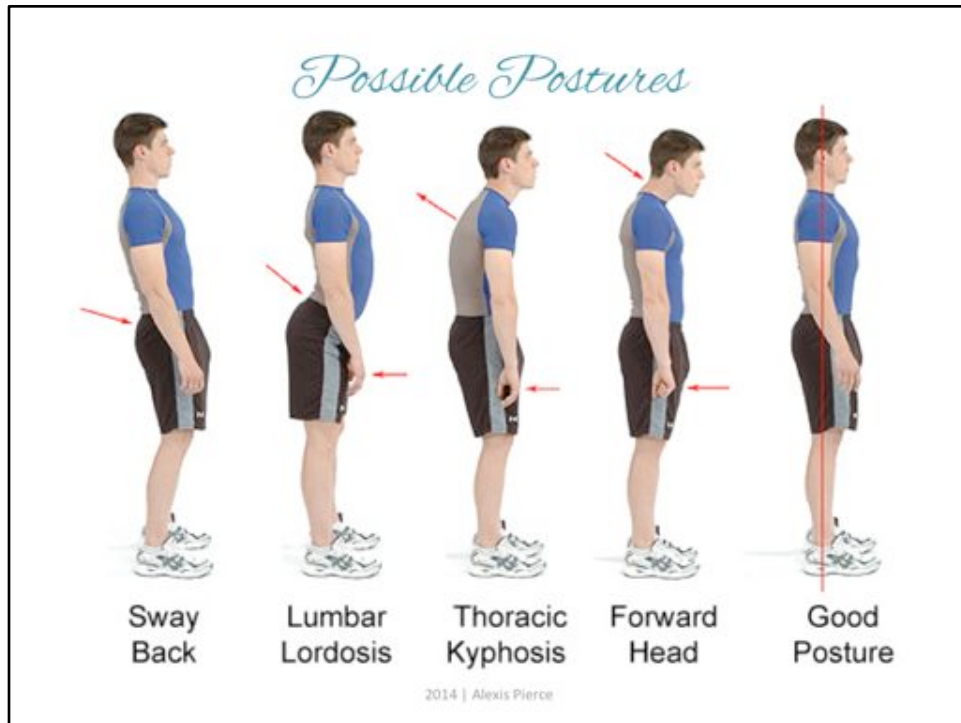
Disc accommodate movement

Image: [http://www.spineuniverse.com/sites/default/files/legacy-images/facetjoints2\\_250-BB.jpg](http://www.spineuniverse.com/sites/default/files/legacy-images/facetjoints2_250-BB.jpg)



What different challenges really mean in the spine.

Image: [http://pivotalwellness.com/clients/2513/images/degenerative\\_spine.gif](http://pivotalwellness.com/clients/2513/images/degenerative_spine.gif)



Most common postural issues:

#### KYPHOSIS

Often functional; sometimes structural (osteoporosis)

Forward head – back pain

Muscle tension

Stronger flexor than extensor tone

Tight, sore pectorals

Diaphragm restricted

Tight, weak (upper) psoas

Scapula too far from spine (rhomboids weak)

Less movement of shoulder

Eye position possibly off

Digestive problems

Pressure on heart and lungs

Can't breathe fully – diaphragm and chest movement restricted

#### LORDOSIS

Pressure on abdominal organs - dumping

#### FORWARD HEAD



## Neutral Curves



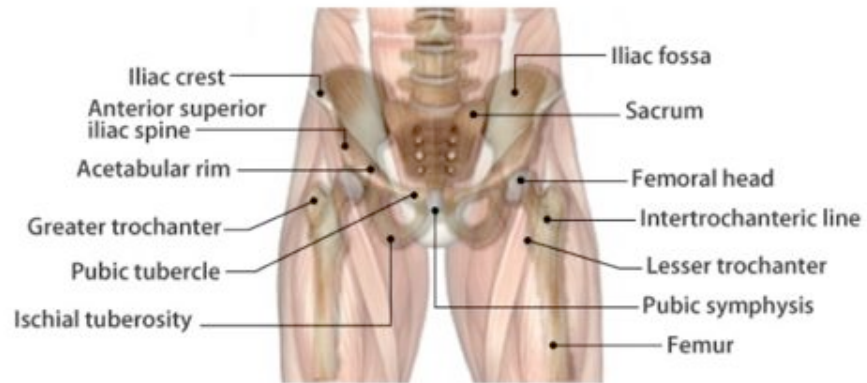
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If you don't have core stability through the lower back and trunk, then you lose the neutral position of pelvis and spine, including its curves.

## *Movement Inquiry - Spine*

- Tadasana visualization (Donna Farhi, Yoga Mind, Body, Spirit, 46)
  - Long tail of brain (spinal chord) sweeps through central spinal canal – smooth curves
  - Scan from brain to lower back – vertebrae like beads around central thread
  - Area where beads jammed together? Rotated? Abrupt transitions between segments?
  - Gently adjust bones around central thread until equally spaced.
  - Adjust until spine feels light and fine.
  - Special attention – head, sacrum – smooth transitions between segments.
  - Walk, sit – maintain neutral position
- Goddess pose,
- Triangle pose,
- Warrior II,
- Extended side angle,
- Warrior I
- Lay on belly and breathe – feel spine elongate and condense
- Cobra
- Cat / Cow with partner
- Spinal rolls – not for all students, but for you to understand as teacher – press down, pelvis comes in line quickly so force goes up legs thru pelvis to torso. If shoulders are lifted up and back at the end, possible result of not yielding into final

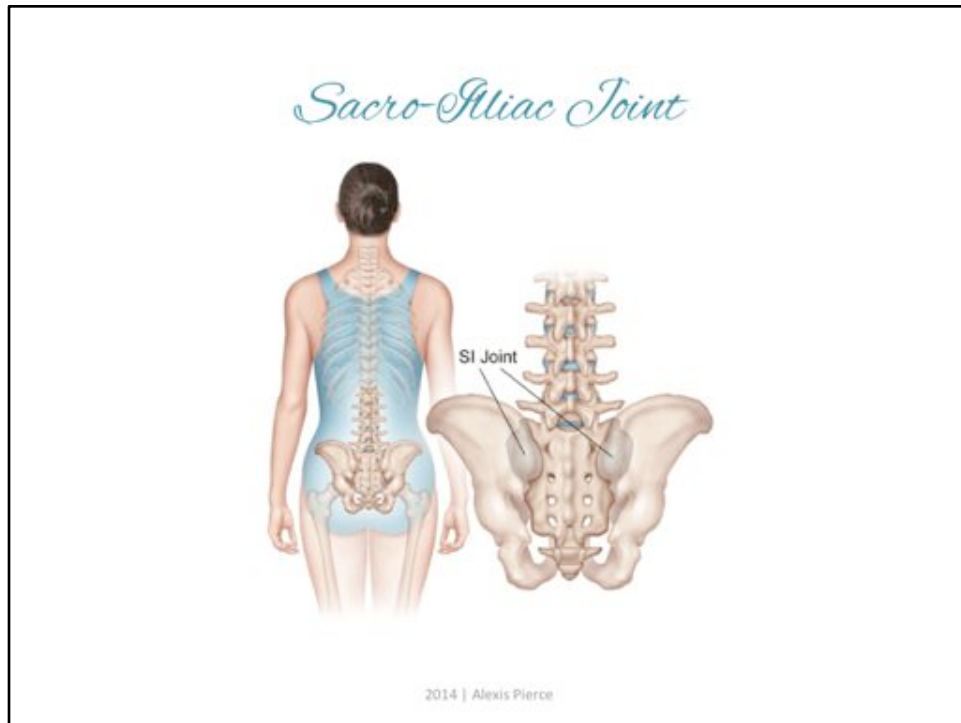
## *Anatomy of the Pelvis*



MendMeShop™ © 2011

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- Review on skeleton
- Wide variety of shapes.



**ROLE:**

Provide stable mobility. Main hub for transmission of force through the body – legs to femoral heads, then into ilium through SI joint and then into the spine. And vice versa.

If alignment off in pelvis, force can't transfer evenly through spine

**MOVEMENT:**

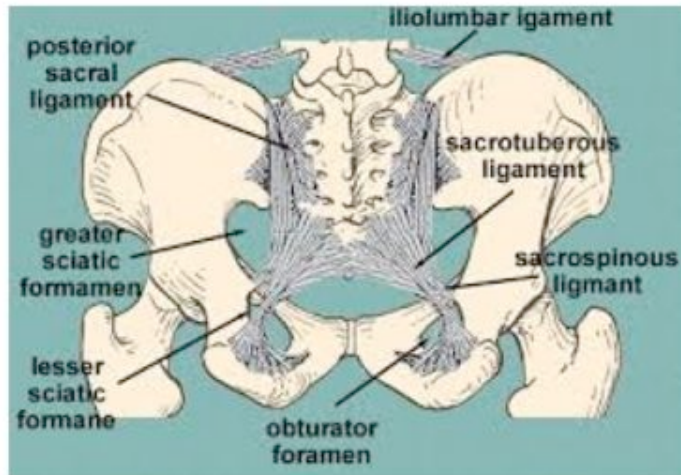
Review movement of pelvis on skeleton. Doesn't open out to sides (legs spreading away from each other).

**FELT EXPERIENCE:**

Pelvis functions as one unit, not 3 parts.

Feels snug.

## *Pelvic Ligaments*



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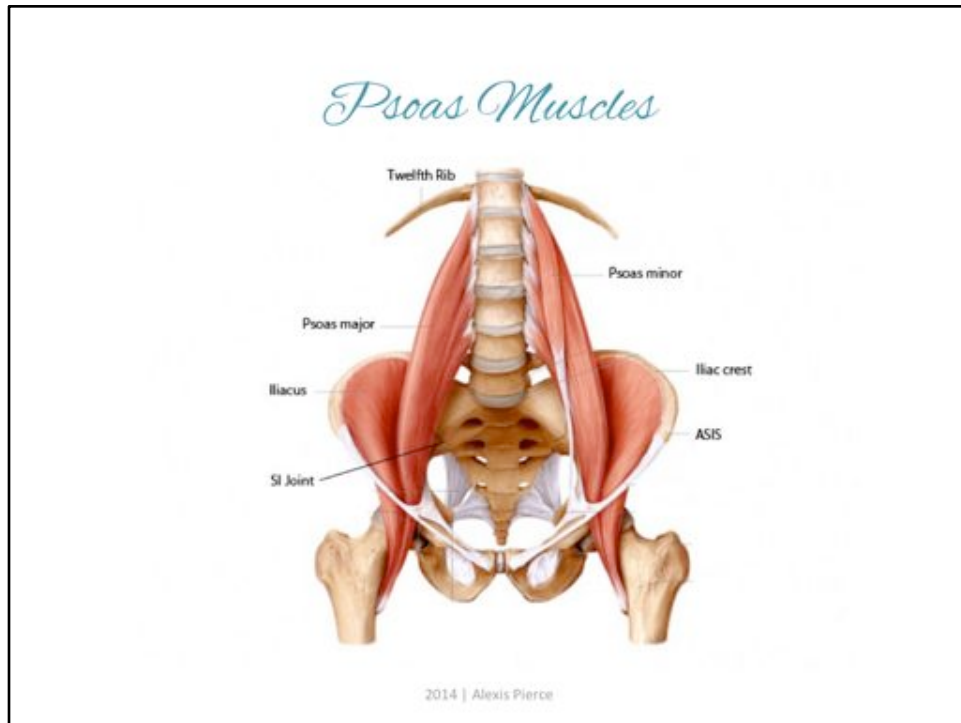
This is how SI joint is stabilized. When femur has moved as far as it can go, the ligaments take stretch by opening the SI joint.

Tendons – stretch and contract like rubber band.

Ligaments – don't bounce back.

**WOMEN:**

- Ligaments can be hypermobile during menses, pregnancy, birth, and lactation due to the hormone relaxin. During these times, avoid twists and long passive forward bends.



Key to centered pelvis & core stability, when combined with iliacus.  
Connect spine to legs

#### ISSUES:

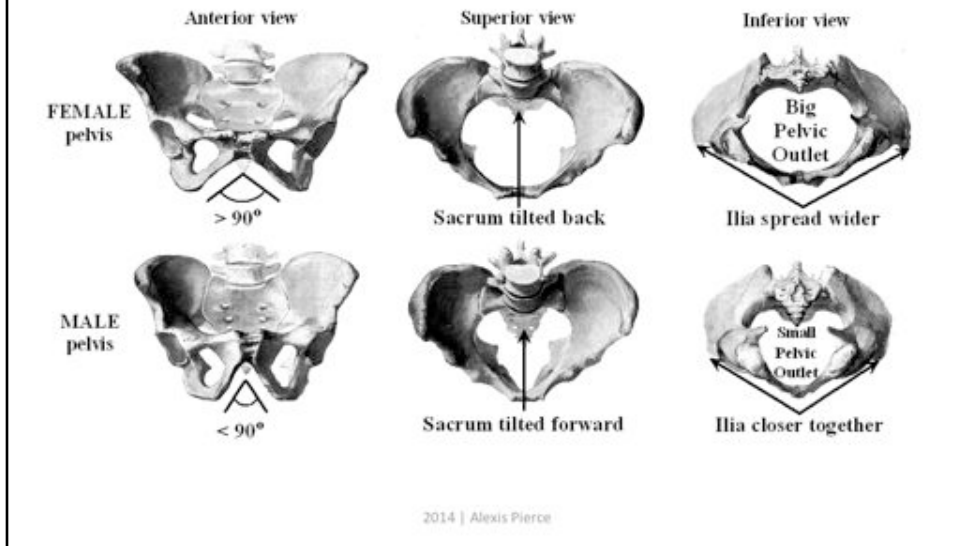
When tight and weak, can literally pull you off your central axis, as well as cause of lumbar lordosis and other back pain.

#### ANATOMY:

Superficial (minor) and deep (major):

- Superficial arises from lateral surfaces 12<sup>th</sup> thoracic and 1-4<sup>th</sup> lumbar & discs
- Deep arises from costal processes of 1-5<sup>th</sup> lumbar

## *Pelvic Differences by Gender*

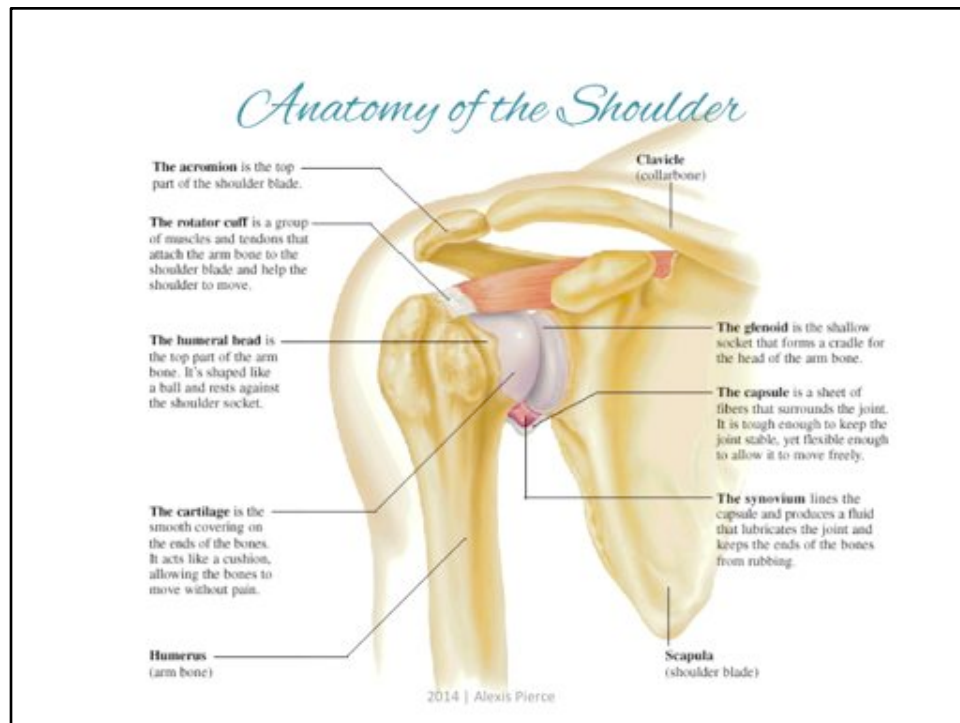


Note there are differences between men and women – range of movement will be different.

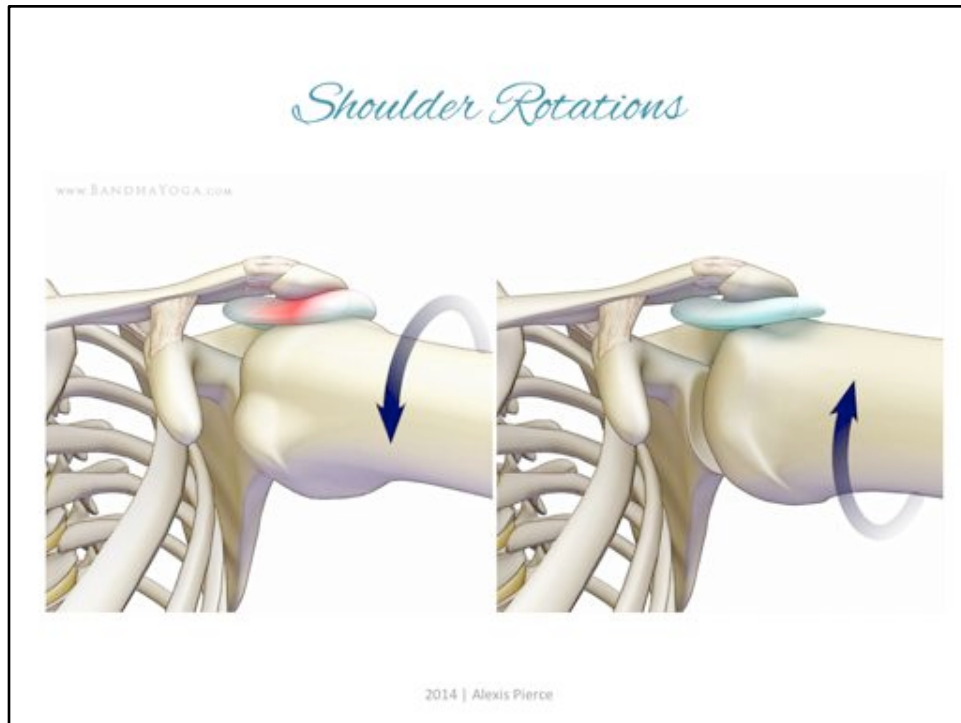
## *Movement Inquiry - Pelvis*

- Pelvic rocks, circles, cross-country skis, then raise hips - tilts, lift one hip then other, & figure 8s
  - Hip openers – legs open like book, legs cross at midline
  - Psoas lengtheners with somatic breathing – exhale lift, hold breath lower, inhale relax
  - Bolster – hug knee into chest and extend other leg
  - Warrior I
  - Warrior II
  - Parsvatanasana – test stability and weight – make fist, press down, if move then unaligned.
  - Triangle
  - Half Moon with foot into wall
- (Not discussed but key skill: Forward bends – maintain long spine, tilt from pelvis, isolate stretch in the legs by maintaining curve of the lower back)





Joint is held together through muscles and tendons

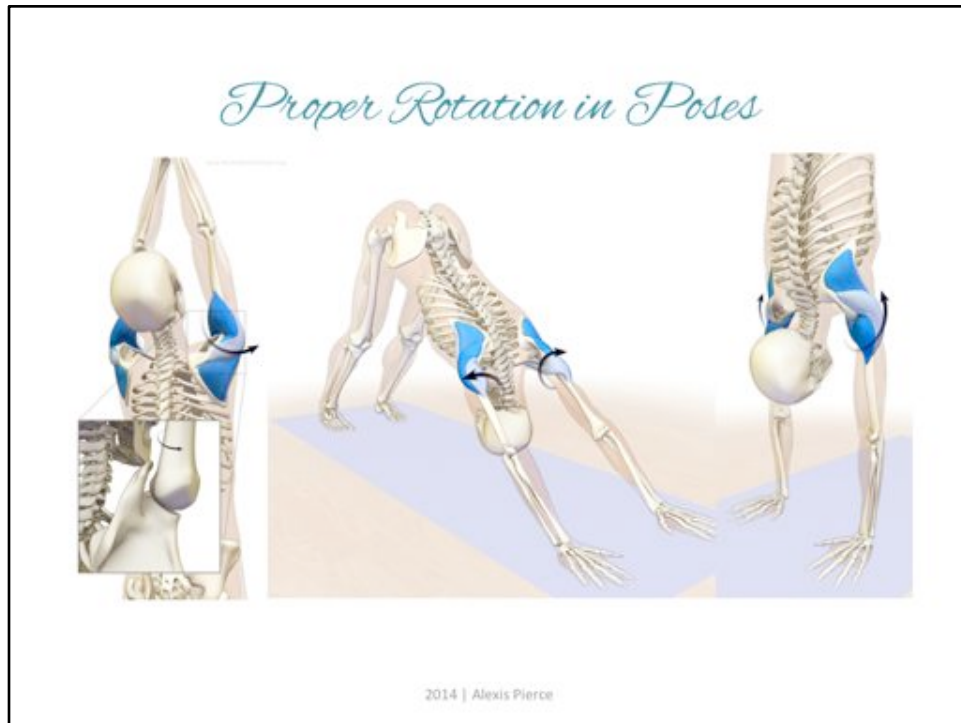


Review movement and structure on skeleton – raise hands above head palm down, then palm up.

“When the arm is raised, either to the side or in front of the body, the greater tuberosity can “impinge” on the undersurface of the acromion, compressing the subacromial bursa and irritating the supraspinatus tendon.”

“[The bursa] is a sac-like structure that facilitates gliding of the greater tuberosity and tendons of the supraspinatus and infraspinatus muscles on the undersurface of the acromion.”

Image and quotes: <http://www.dailybandha.com/2011/04/shoulder-kinematics-in-yoga.html>



“Particularly in Vinyasa, there is a tendency to do the same movement many times, which can lead to repetitive stress injury, such as inflammation of the subacromial bursa and supraspinatus tendon—“rotator cuff syndrome” in the orthopedic nomenclature.

You can help to avoid this by engaging the infraspinatus and teres minor muscles and, to a lesser extent, the posterior third of the deltoid.

These muscles act to externally rotate the humerus and bring the greater tuberosity away from the undersurface of the acromion.”

Images and quotes: <http://www.dailybandha.com/2011/04/shoulder-kinematics-in-yoga.html>

*Movement Inquiry - Shoulders*

- Tadasana exploration – raise arms with palms down, then facing up.
- Shoulder clock on the wall
- Half dog on wall
- Adho Mukha Svanasana