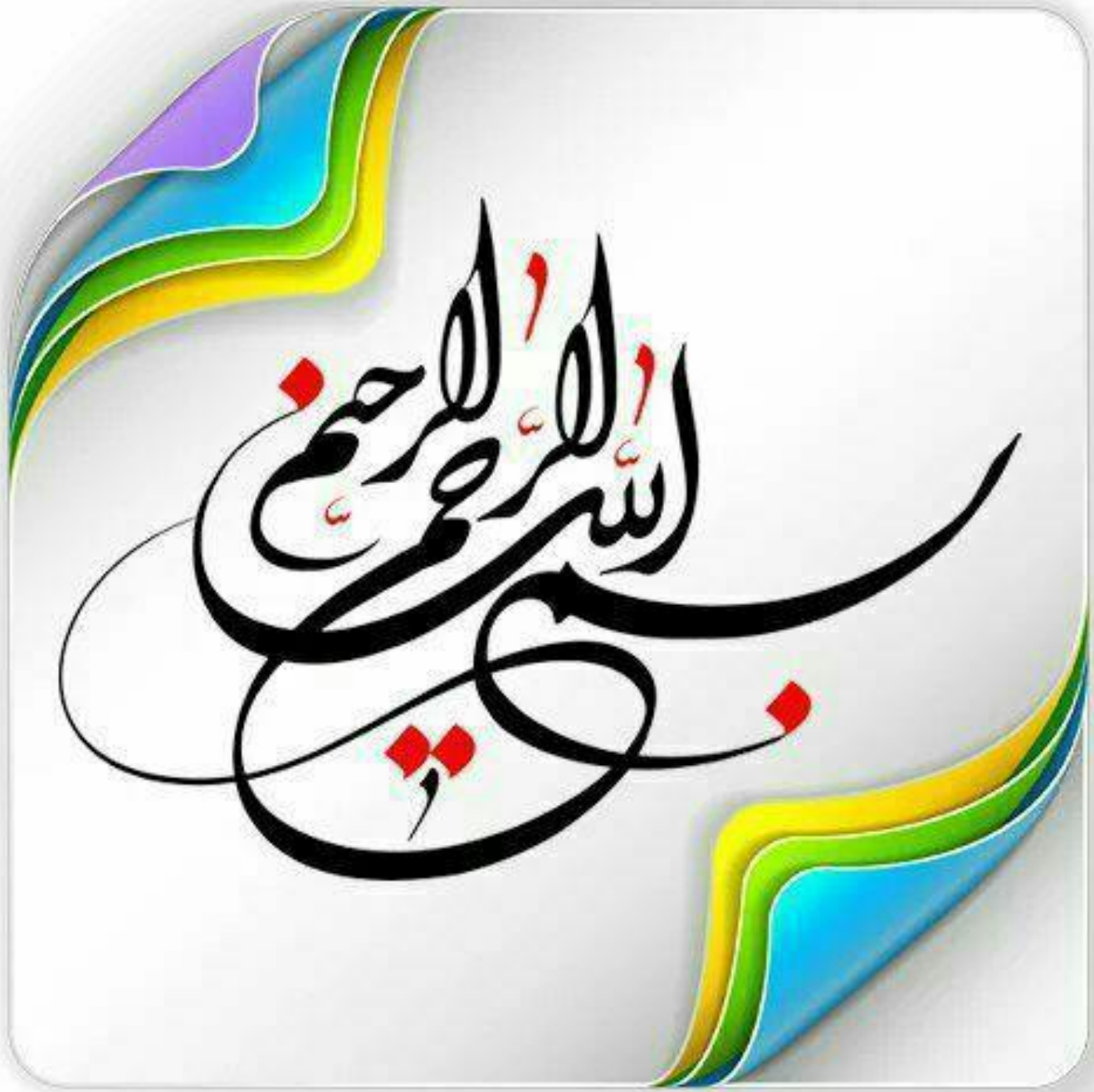

بسم الله الرحمن الرحیم

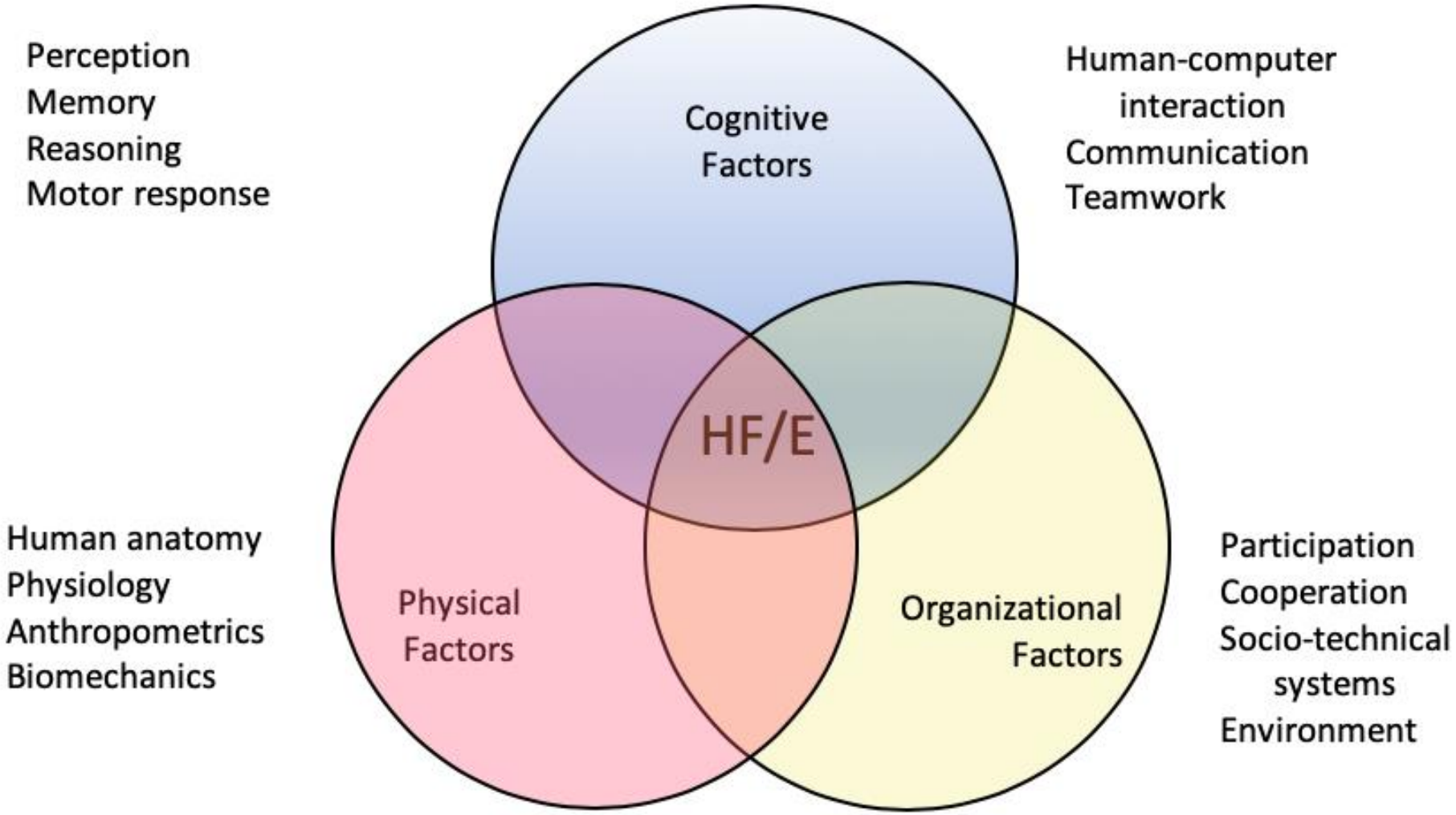
Ergonomics (1)

ارگونومی-۱

مدرس: احسان گروسی

دکتری تخصصی(PhD) ارگونومی

Domains of the HF/E or E/HF



Physical Ergonomics

Review on Human Anatomy

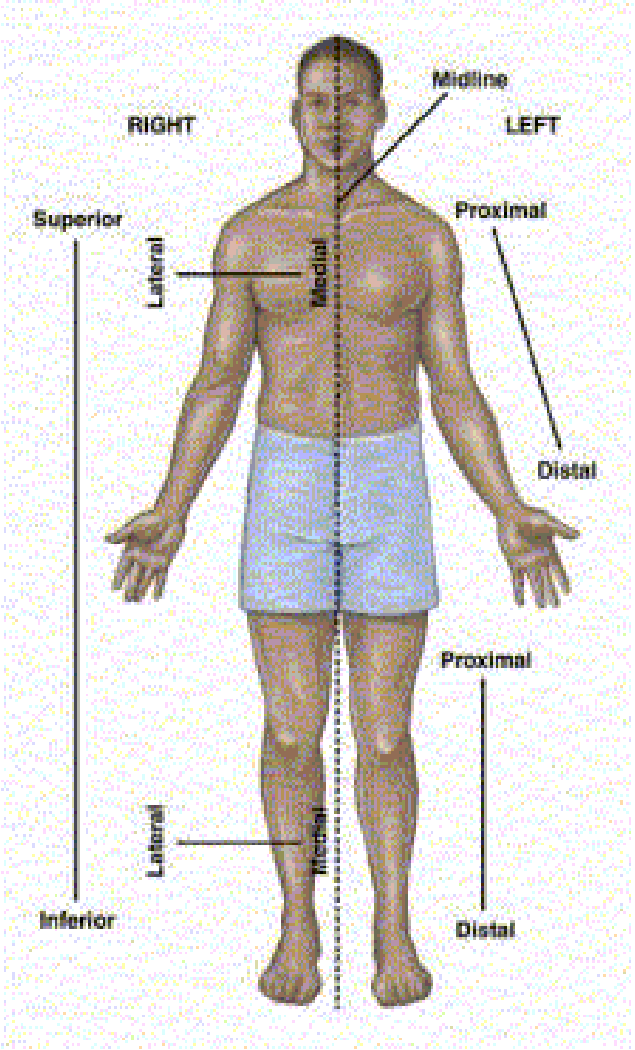
knowledge of anatomy

- A working knowledge of anatomy is important
- Helps to communicate correct information
- Known about your body
- Undemanding medical term and importance of the body structure
- Better understanding of anthropometry
- ….

Term definition

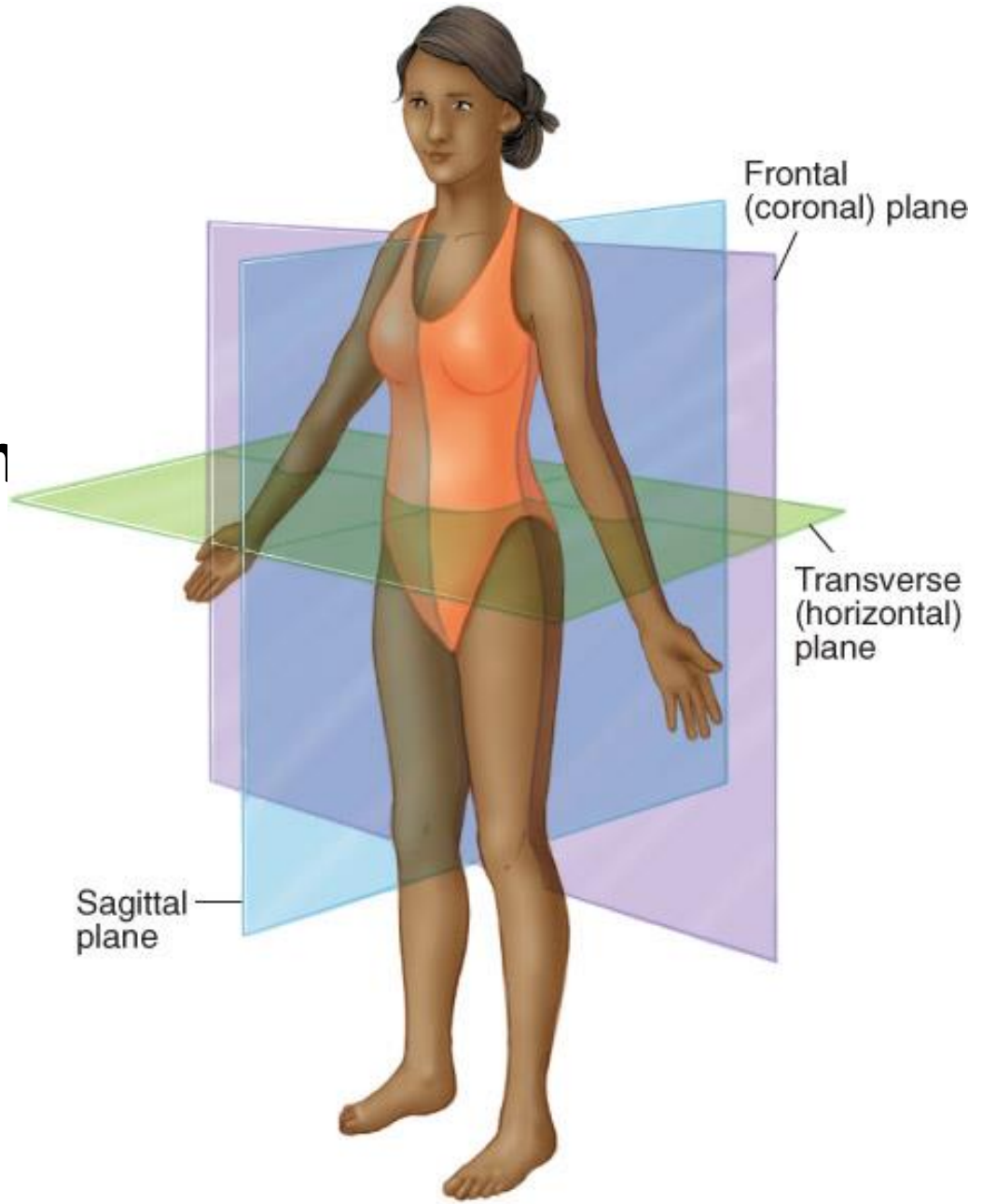
- **Superficial landmarks**
  - Serve as guides to structures that lie beneath them

- **Topographic anatomy**
- applies to a body in the anatomic position.
  facing you, arms at side, palms forward.



Planes of the Body

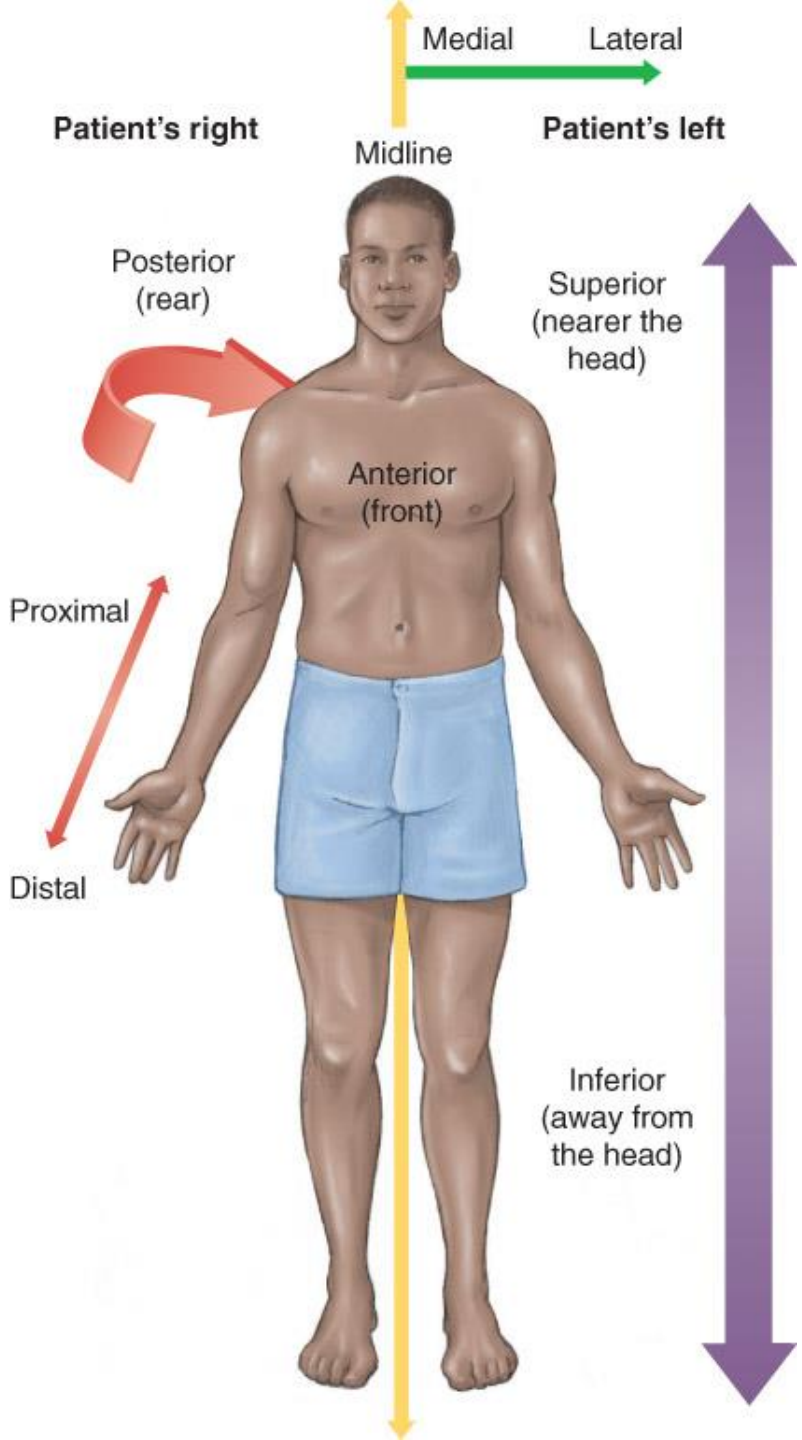
- **Coronal plane: front/back**
- **Transverse (axial) plane: top/bottom**
- **Sagittal (lateral) plane: left/right**



Directional Terms

- Important when discussing injury location or pain radiation. Examples include:
  - Anterior (ventral)
  - Posterior (dorsal)
  - Right, left (patient’s right or left)
  - Superior (closest to head)
  - Inferior (closest to feet)

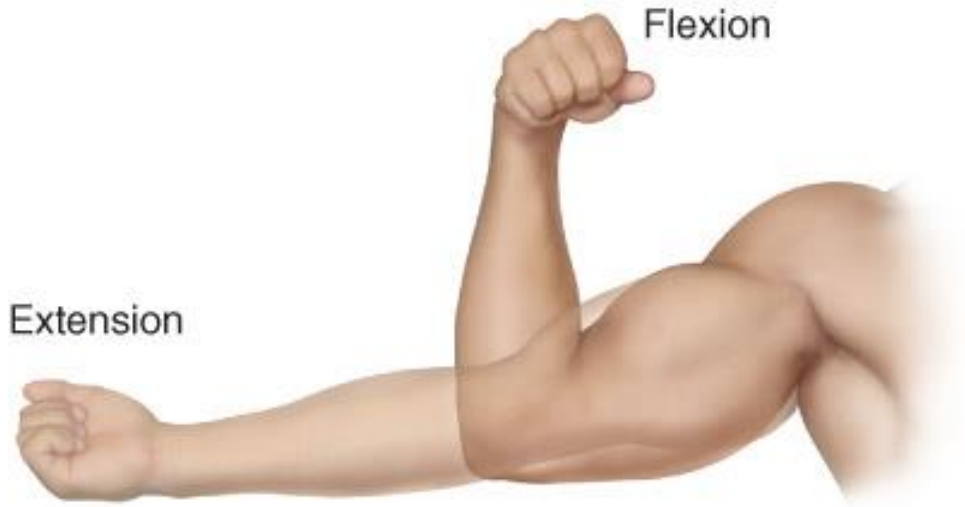
Directional Terms



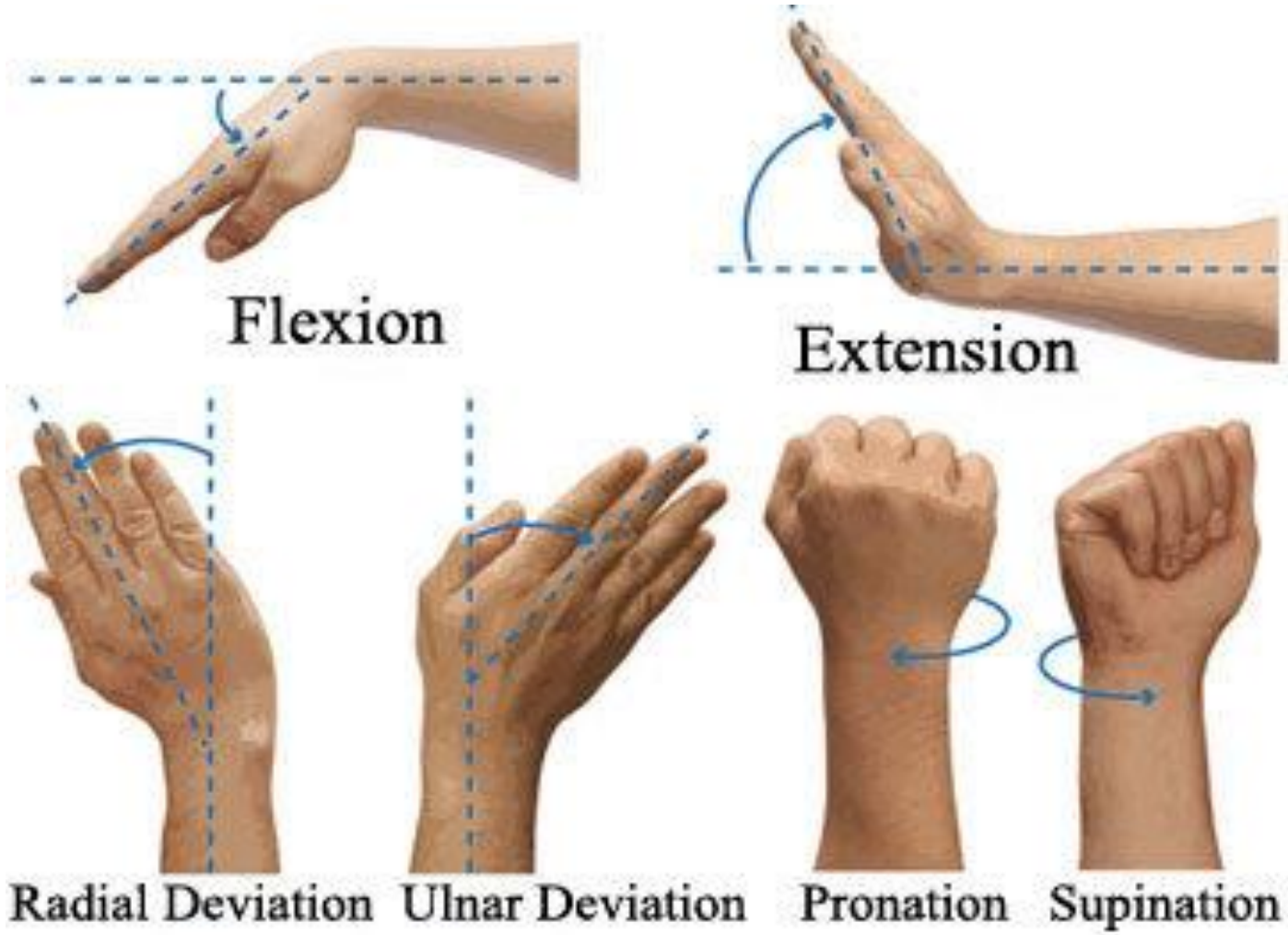
Movement Terms

- *Flexion* is the bending of a joint.
- *Extension* is the straightening of a joint.
- *Adduction* is motion toward the midline.
- *Abduction* is motion away from the midline.

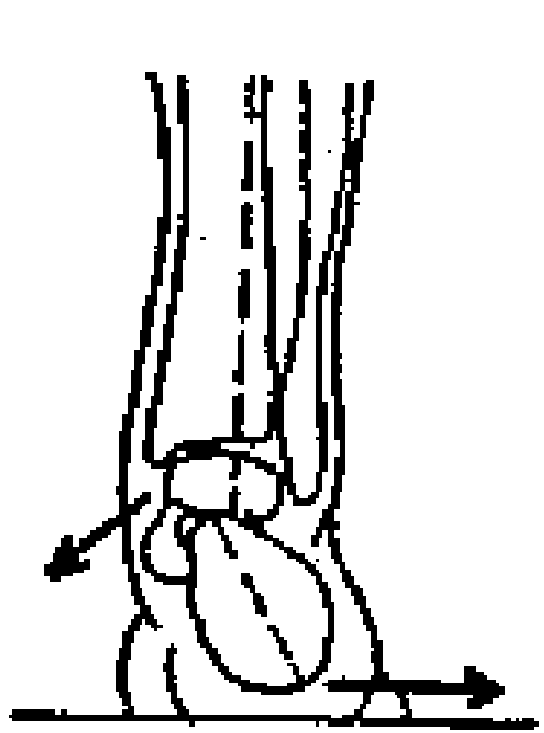
Movement Terms



Movement Terms

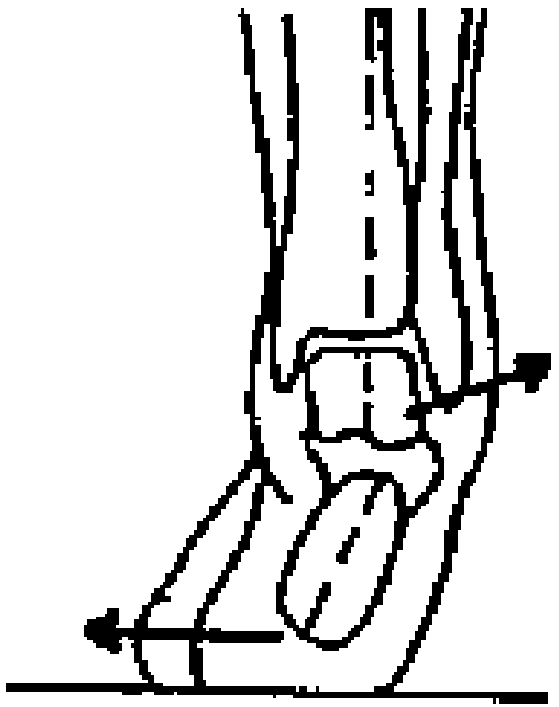


Movement Terms

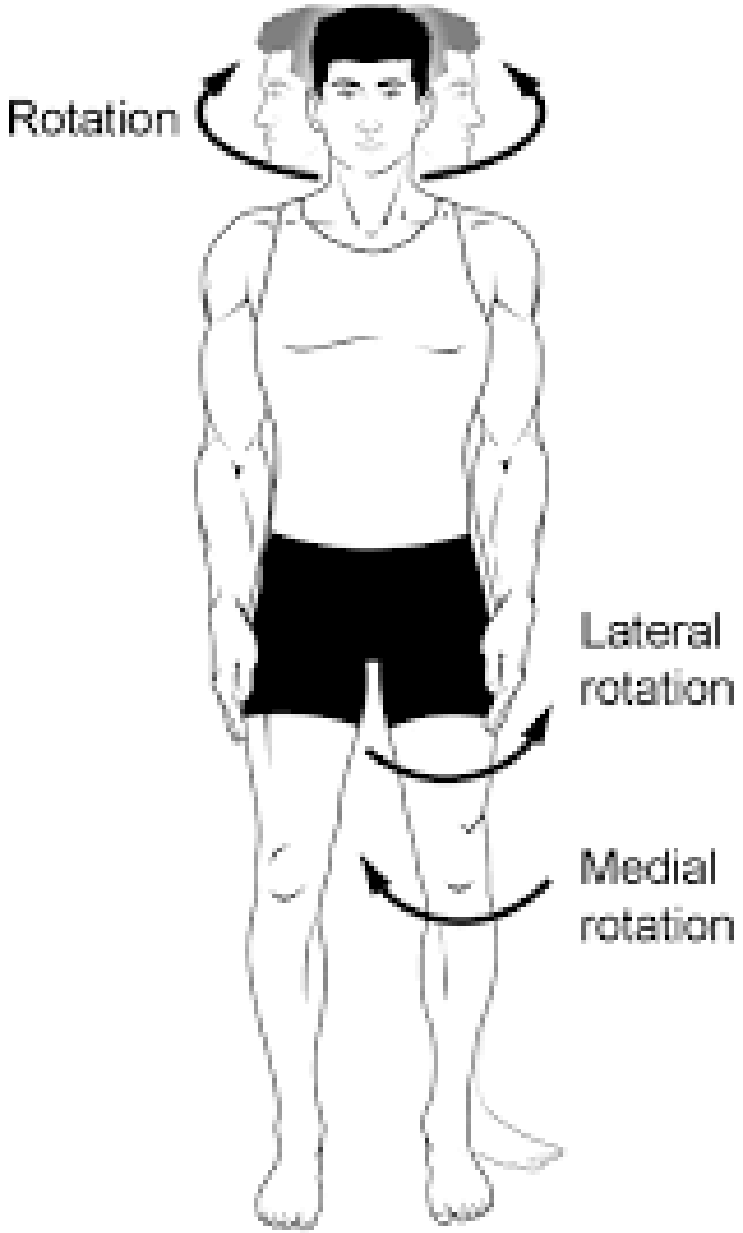


PRONATION

RIGHT
FOOT



SUPINATION

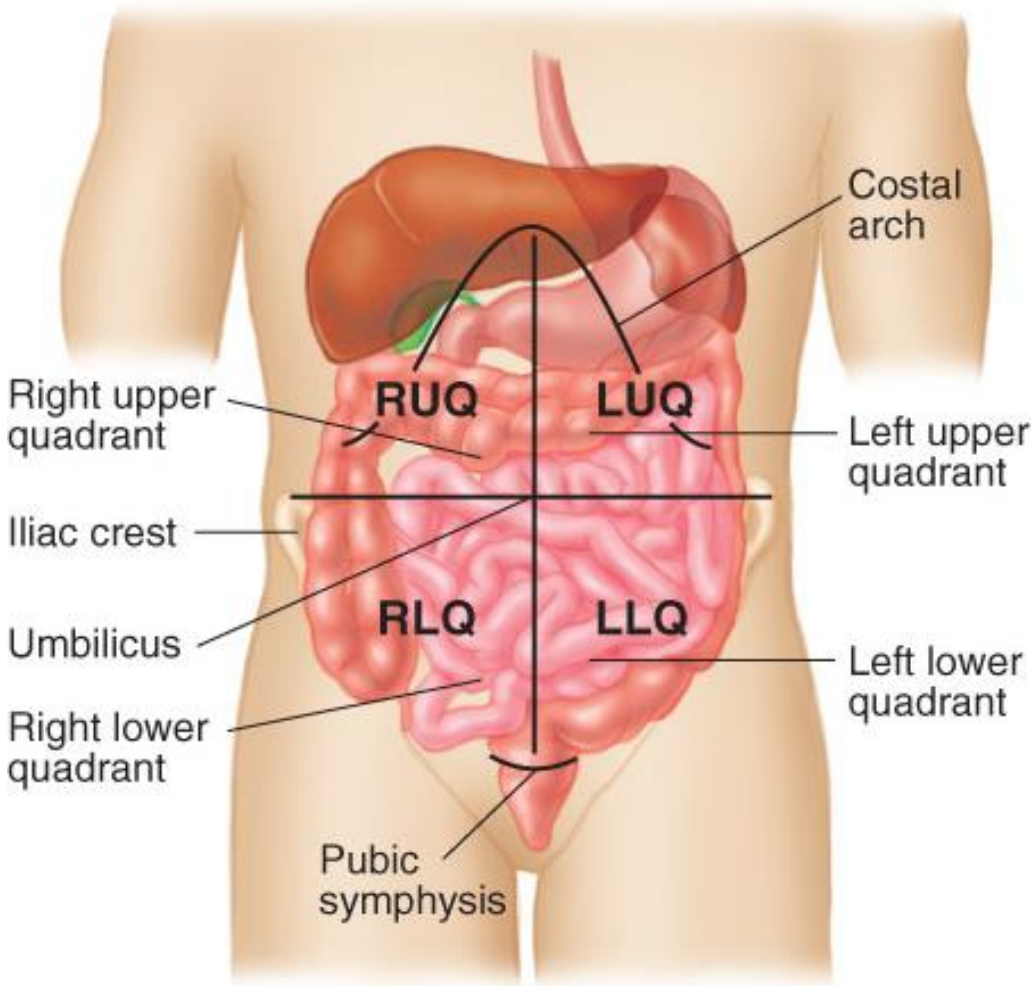


Rotation of the head, neck, and lower limb

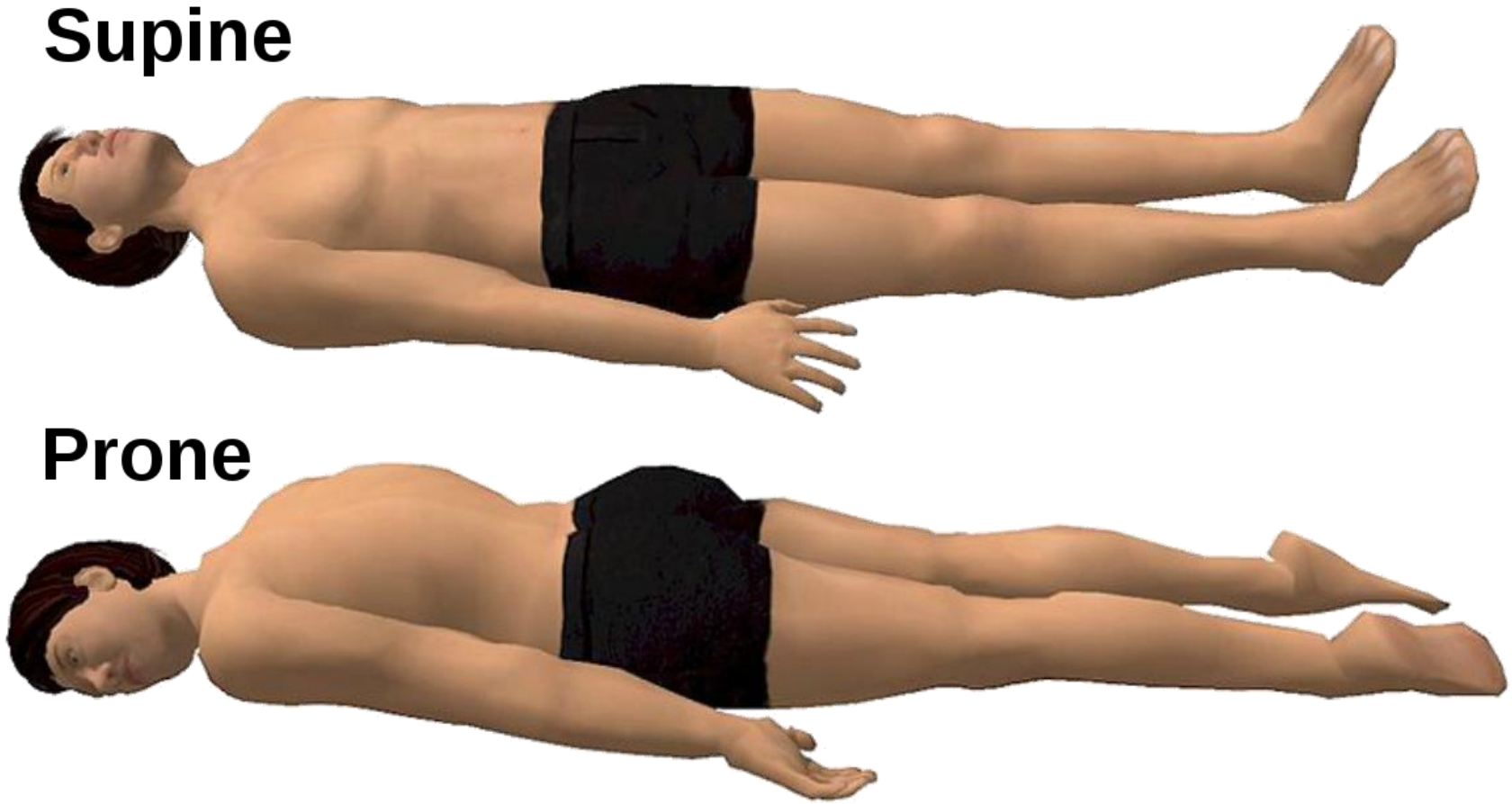
Other Directional Terms

- Many structures are bilateral, appearing on both sides of midline.
- Abdomen is divided into quadrants for communication purposes.
  - RUQ
  - LUQ
  - RLQ
  - LLQ

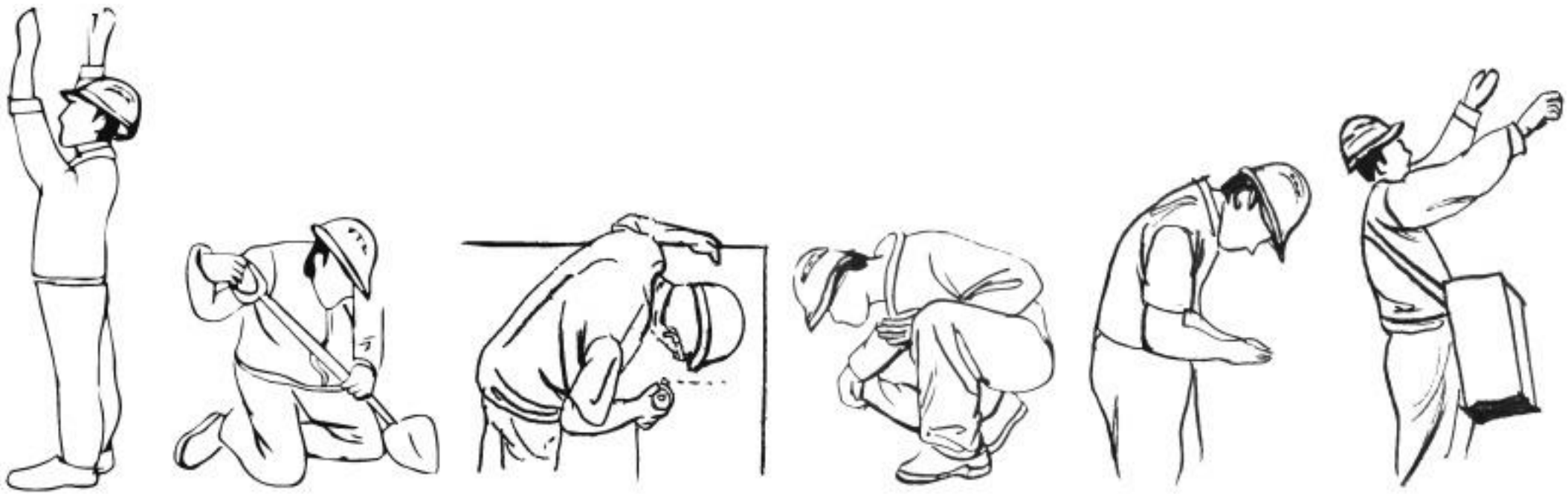
Other Directional Terms



Anatomic Positions



Other working posture



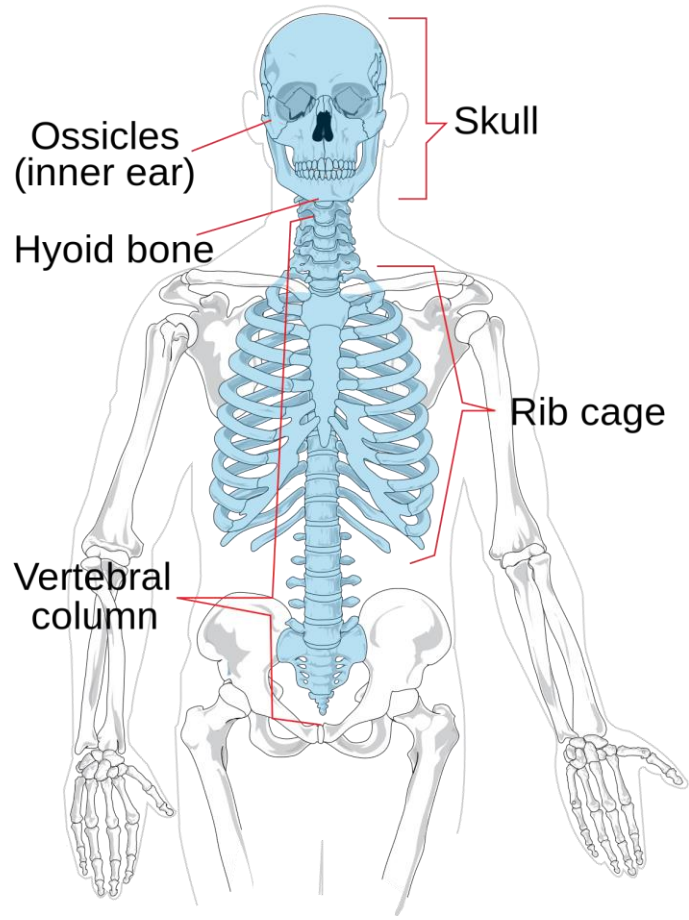
(a) Working Overhead (b) Kneeling (c) Back Bending Forward (d) Squatting (e) Neck Bending (f) Reaching

The Skeletal System: Anatomy

- Skeleton gives us our recognizable human form.
- Protects vital internal organs
- Contains:
  - Bones
  - Ligaments
  - Tendons
  - Cartilage

The Axial Skeleton

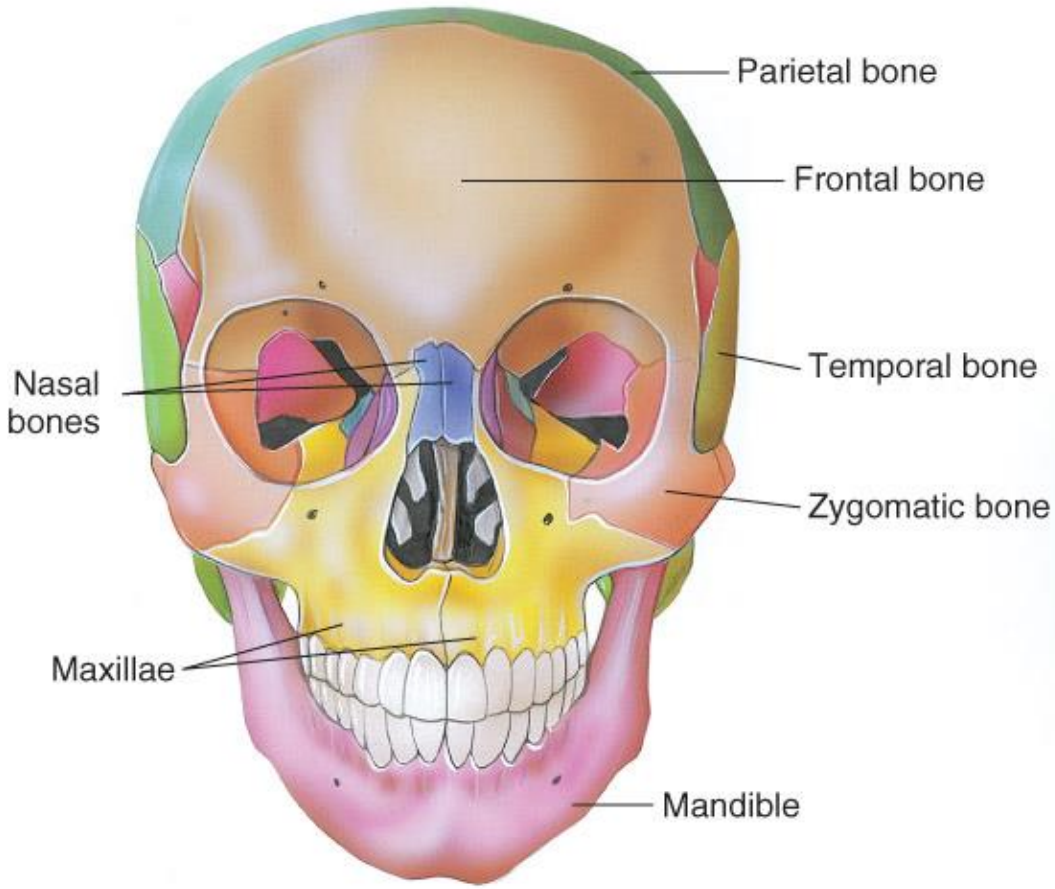
- Foundation on which the arms and legs are hung. Includes:
  - Skull
  - Spinal column
  - Thorax

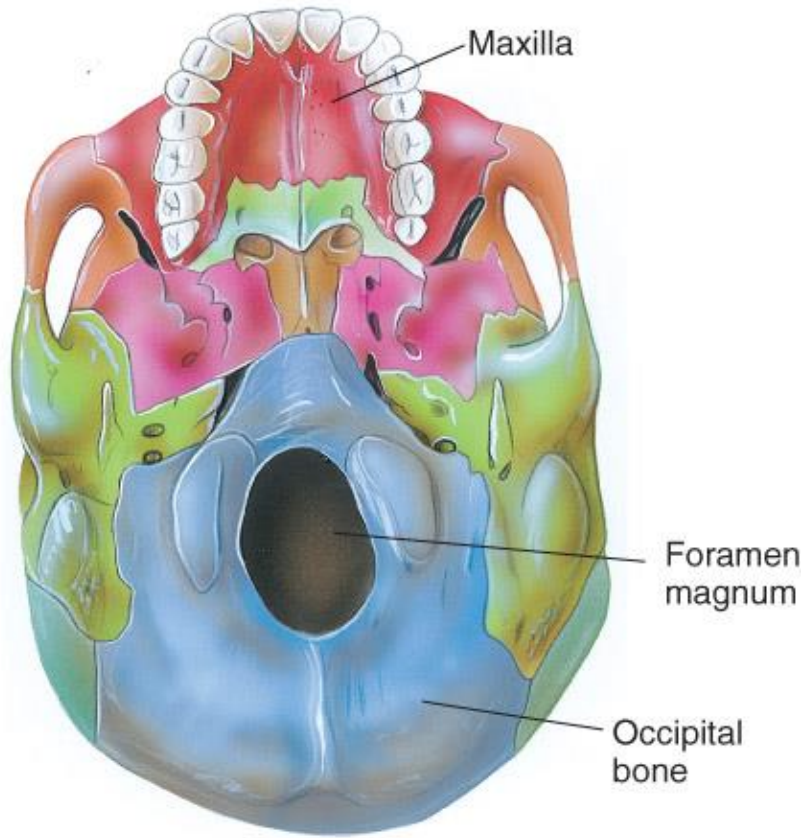


The Skull

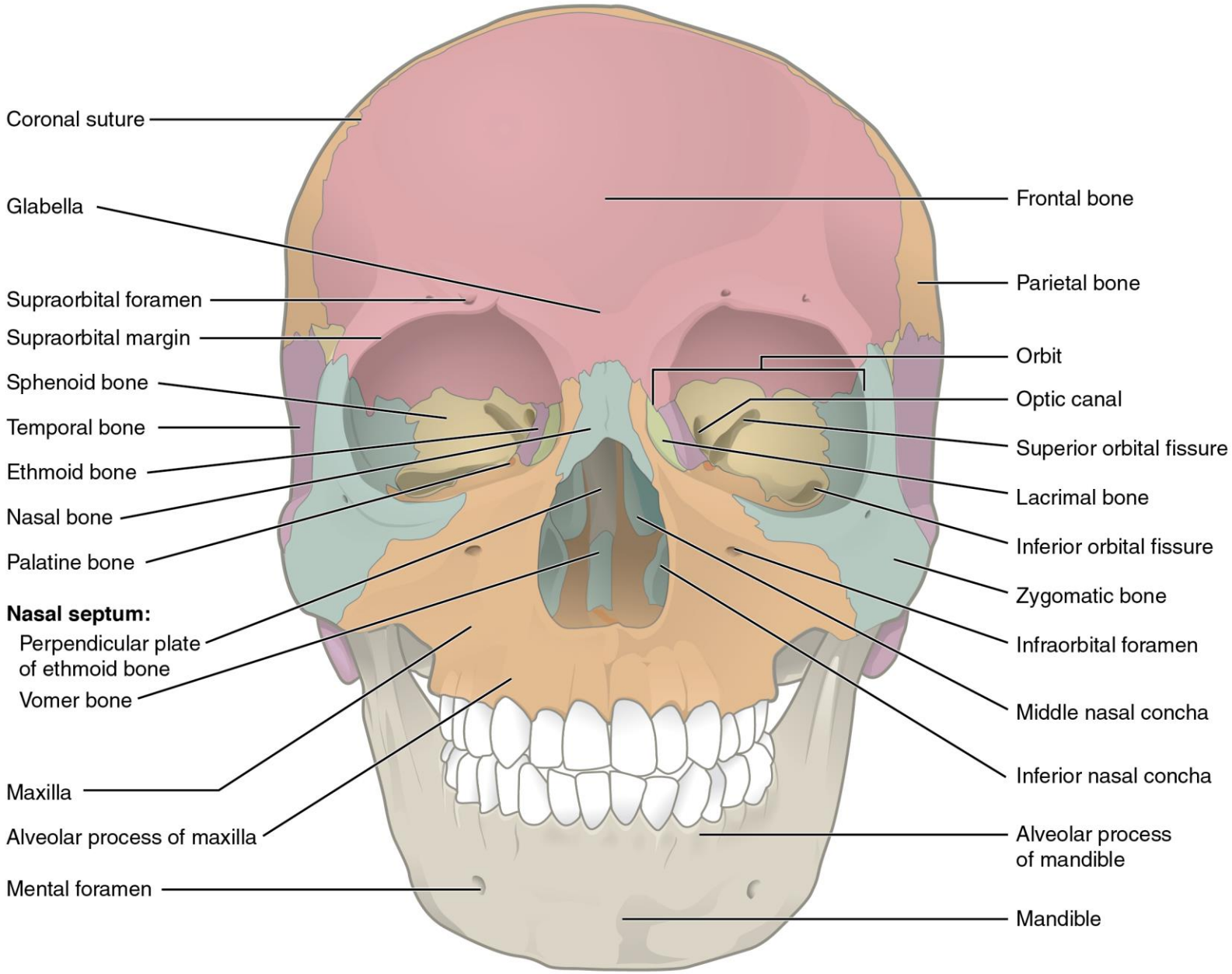
- Cranium—made up of 4 bones
- Face—made up of 14 bones
- Foramen magnum is the opening at base of skull to allow brain to connect to spinal cord

The Skull


Parietal bone
Frontal bone
Temporal bone
Nasal bones
Zygomatic bone
Maxillae
Mandible


Maxilla
Foramen magnum
Occipital bone

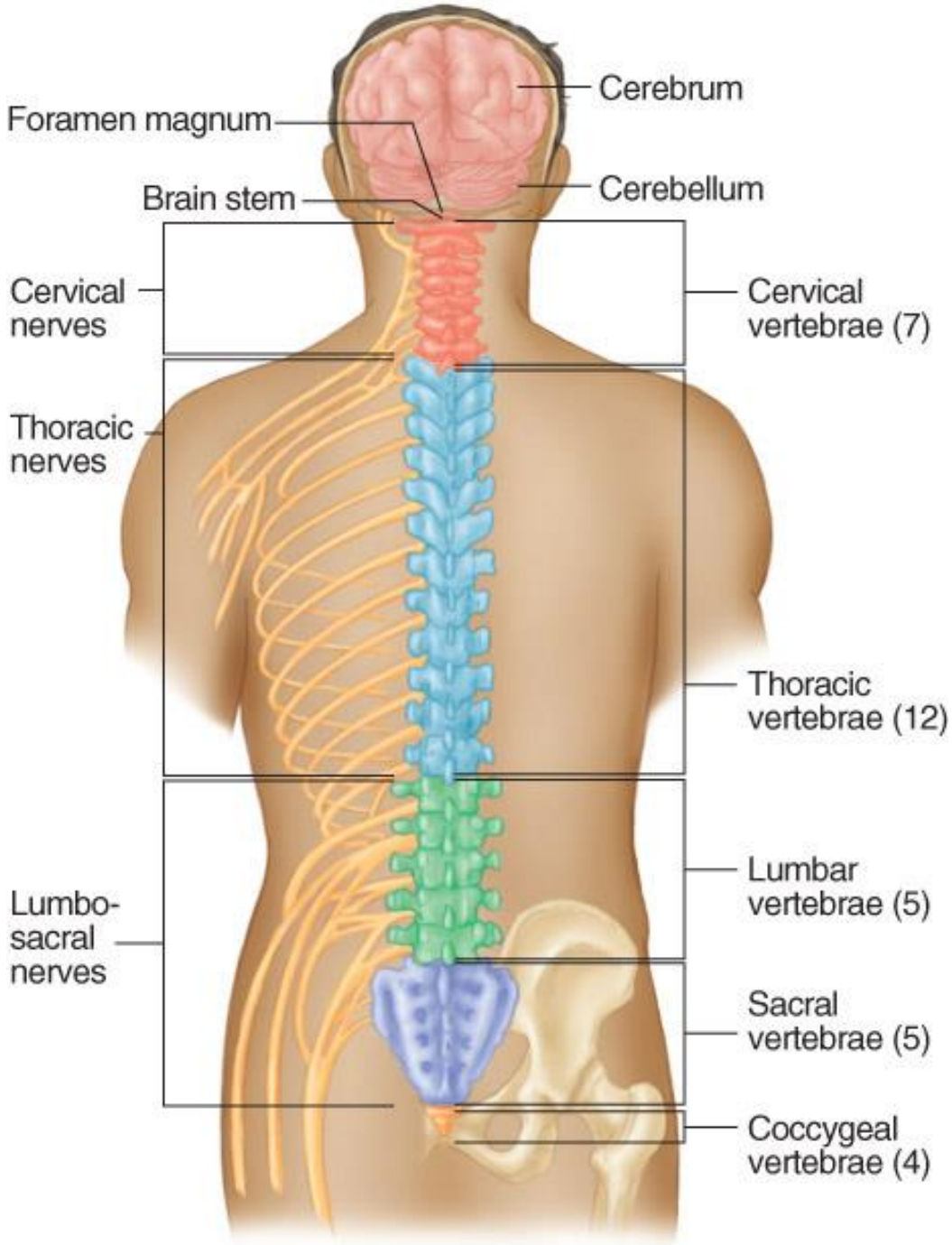
The Skull

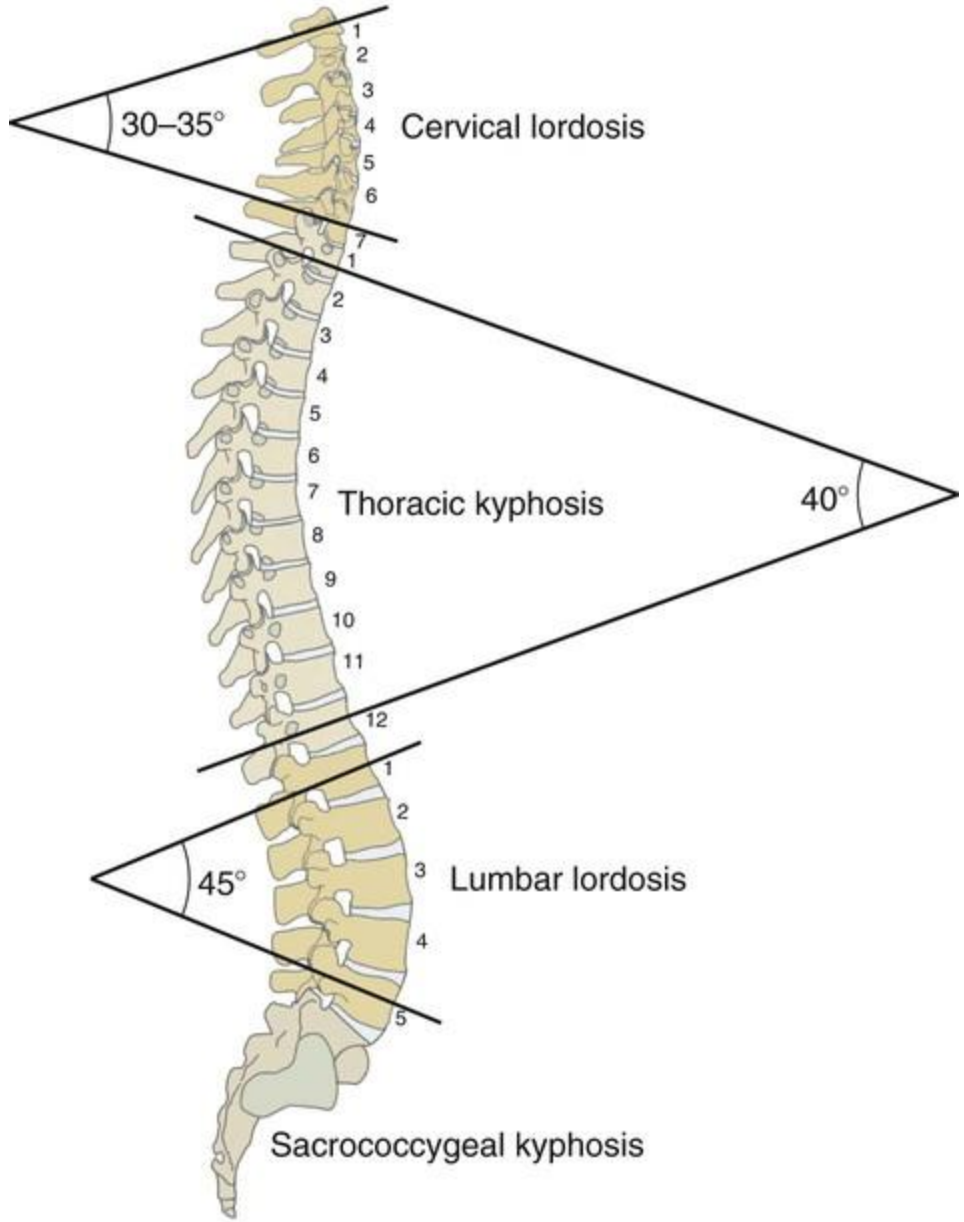


Anterior view

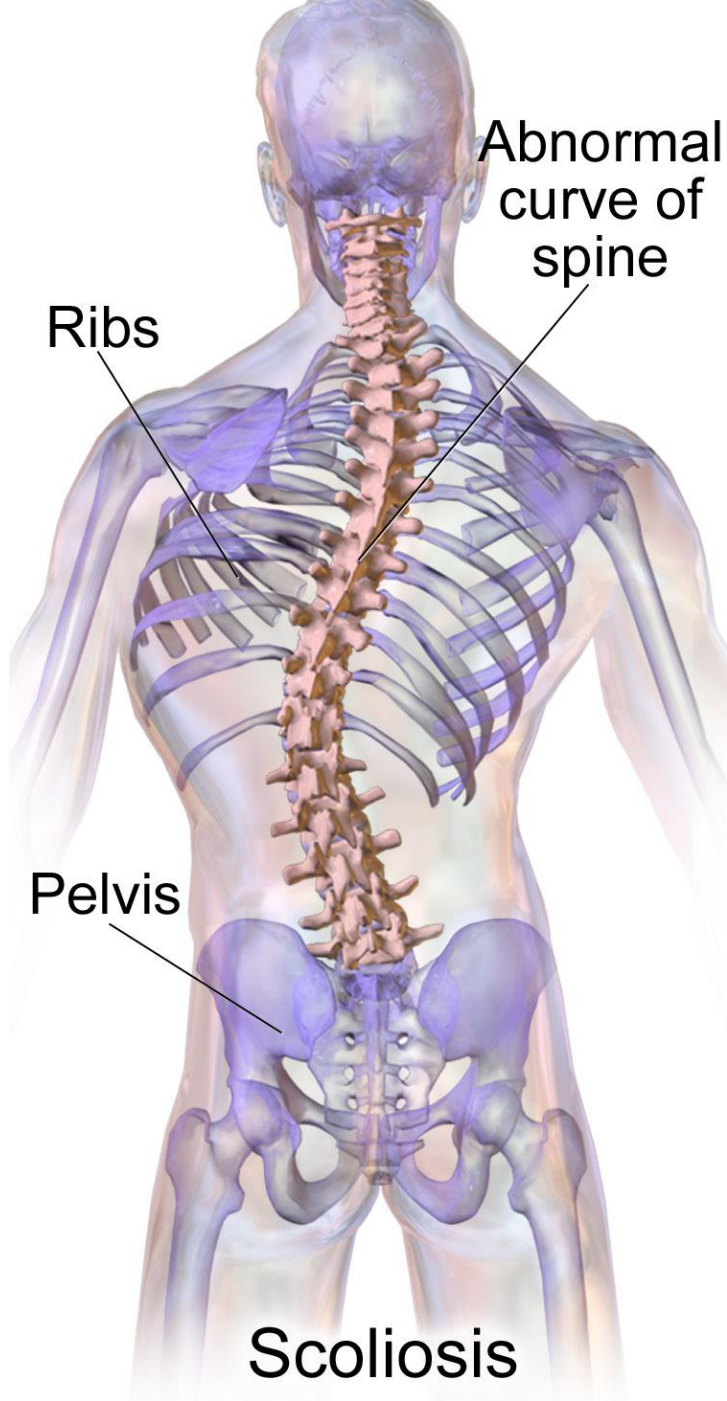
Spinal column

- **Composed of 33 bones (vertebrae)**
- **Spine divided into 5 sections:**
  - **Cervical**
  - **Thoracic**
  - **Lumbar**
  - **Sacrum**
  - **Coccyx**



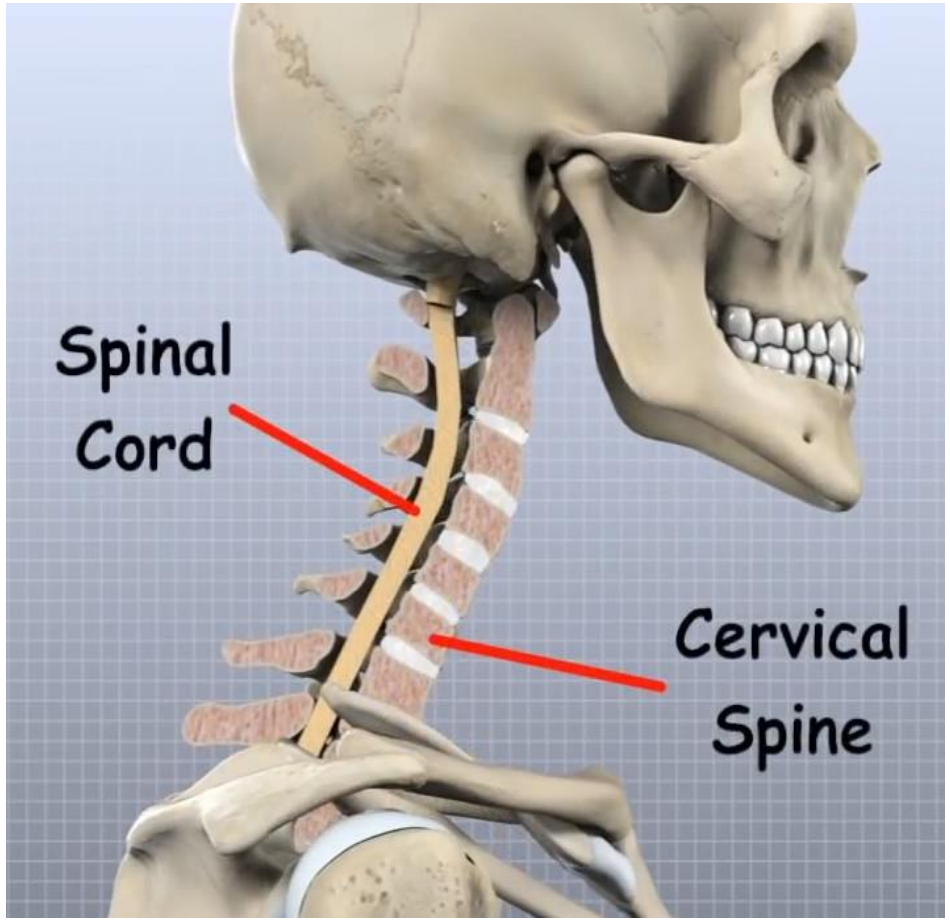

30–35°
Cervical lordosis
Thoracic kyphosis
40°
45°
Lumbar lordosis
Sacrococcygeal kyphosis


Kyphosis

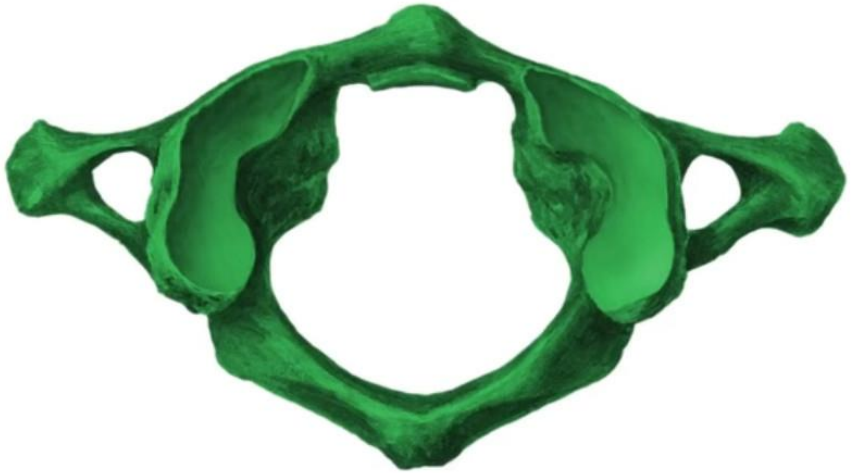

Abnormal curve of spine
Ribs
Pelvis
Scoliosis

A brief review of cervical spine anatomy

Cervical spine



A brief review of cervical spine anatomy



Atlas

Supports the skull.

anterior arch

posterior arch

No body or spinous process.

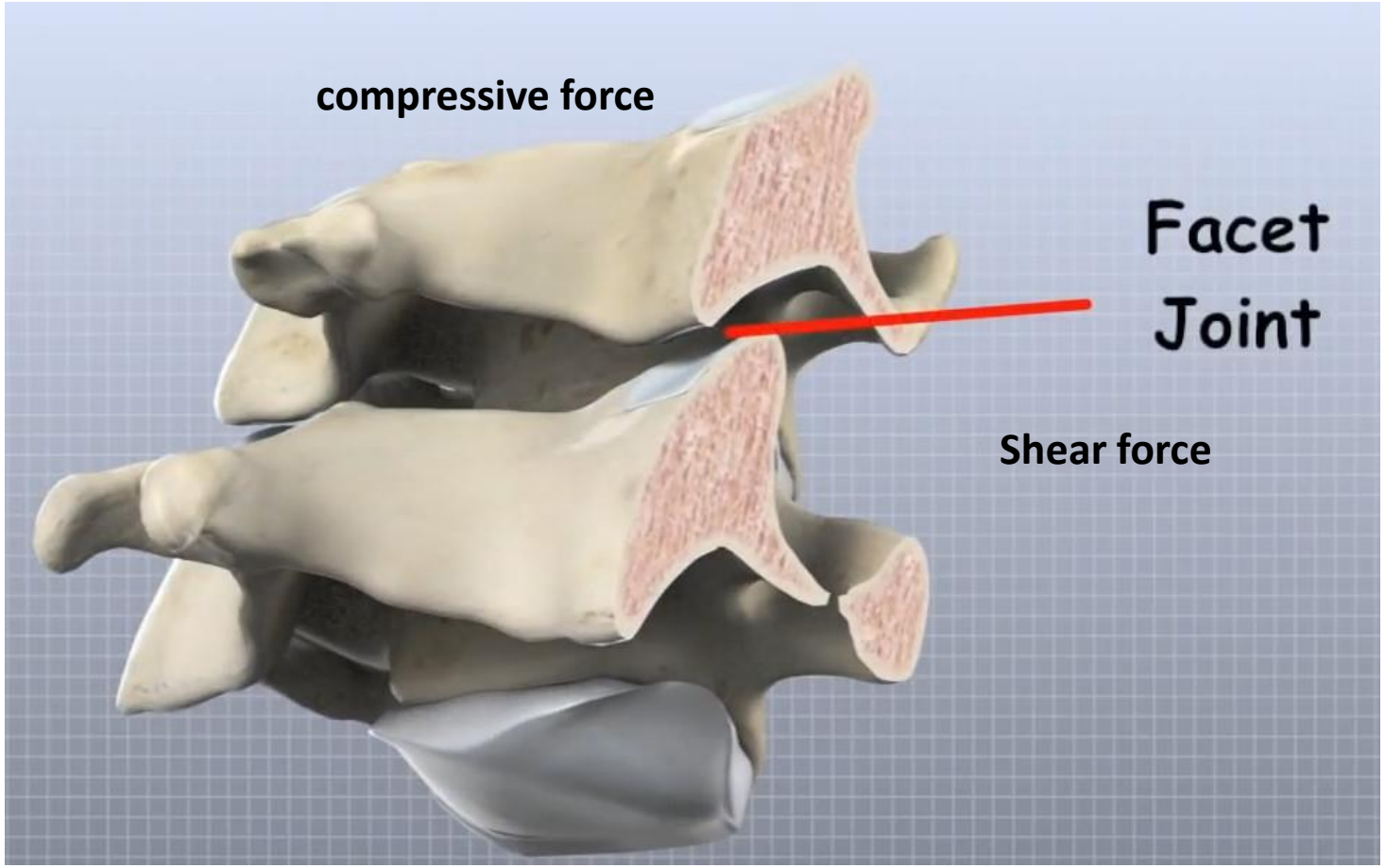
Dental fovea

Groove for the vertebral artery.

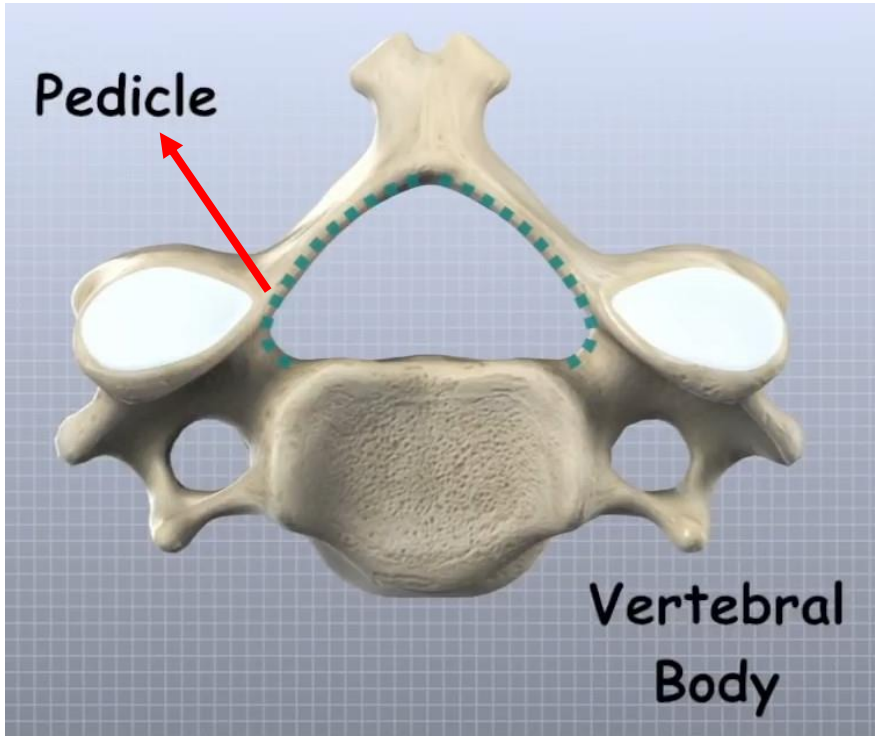
Axis

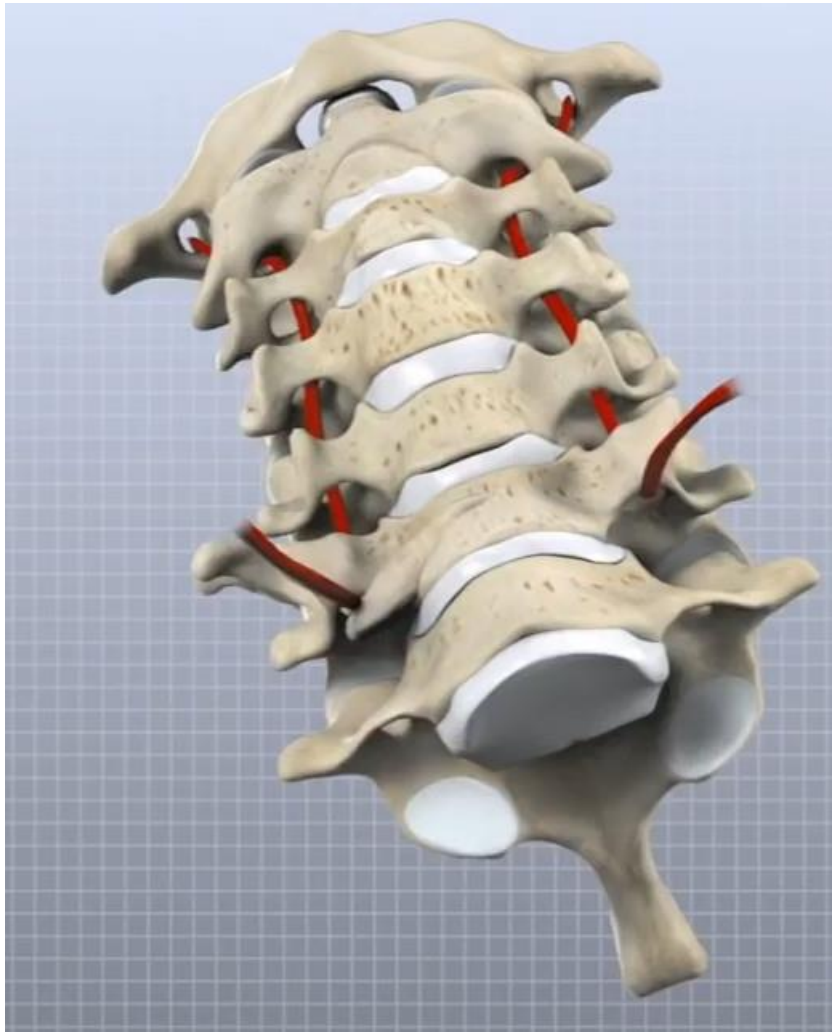
Odontoid process or dens.

A brief review of cervical spine anatomy

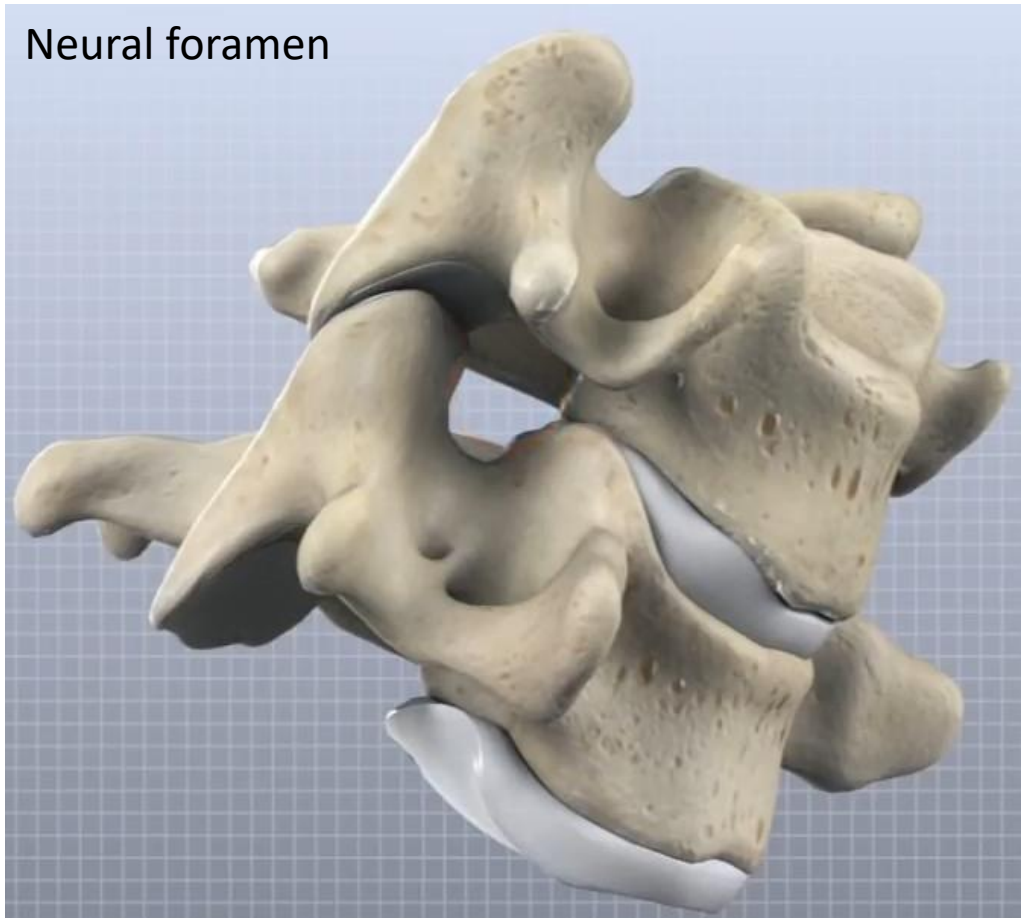


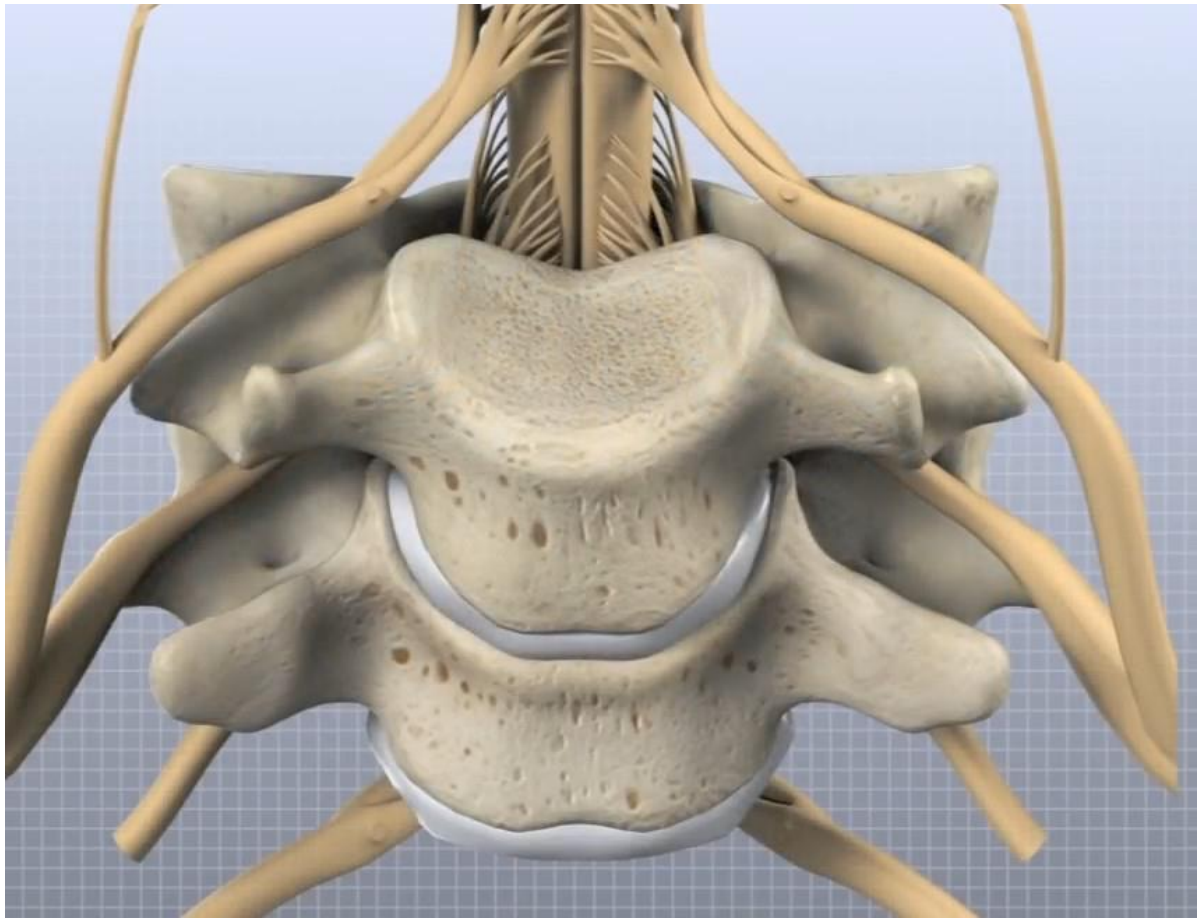
A brief review of cervical spine anatomy

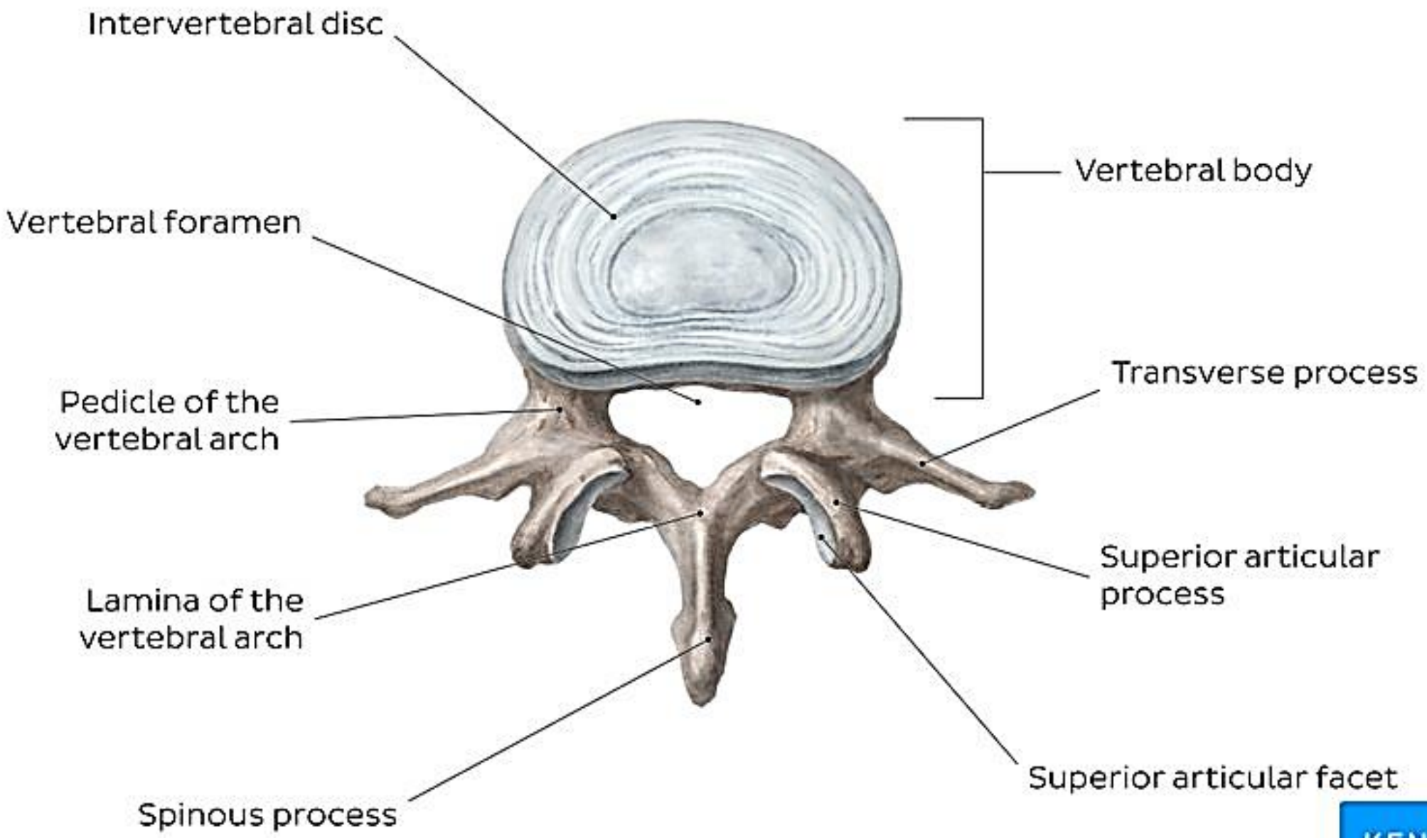




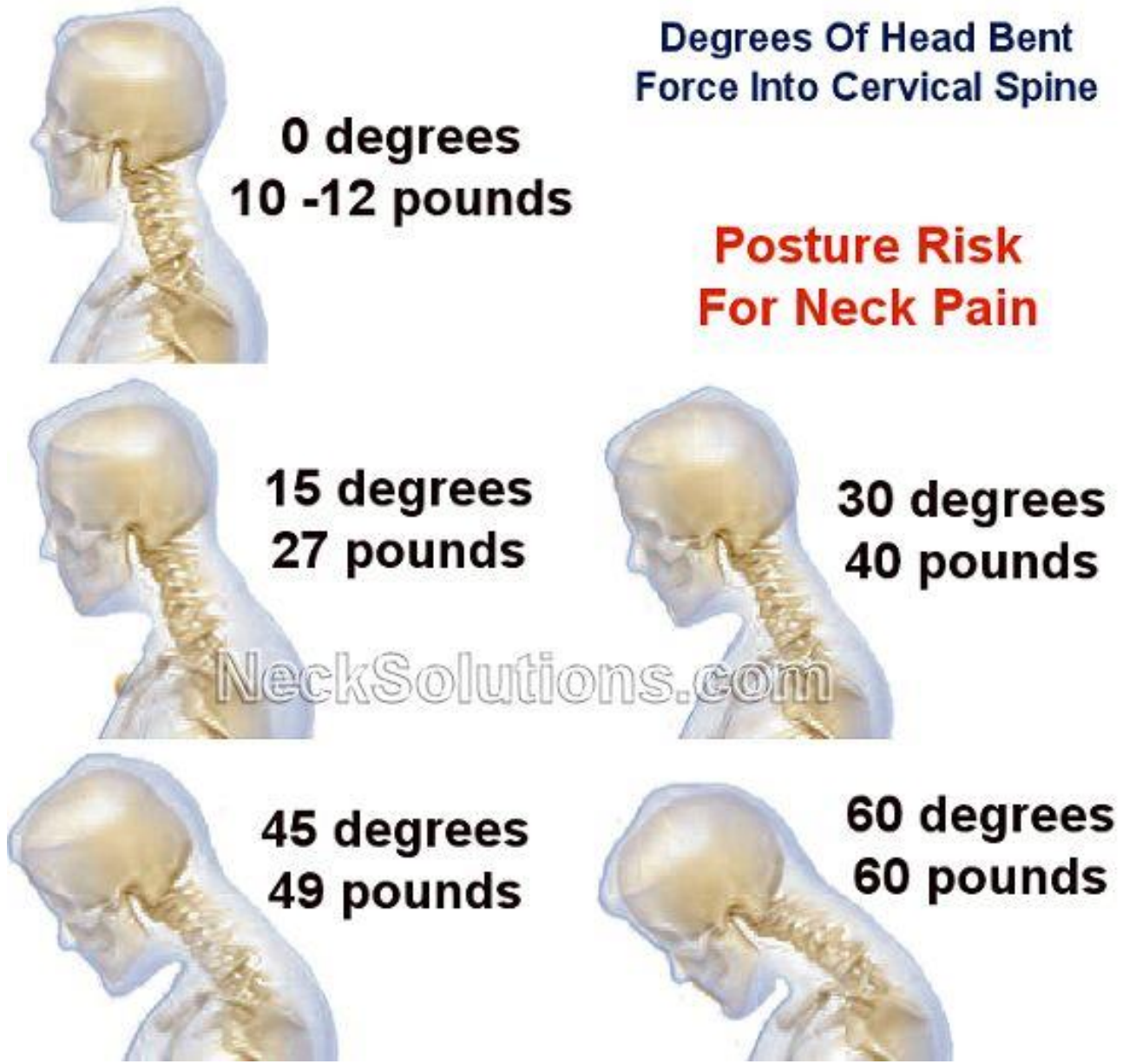
A brief review of cervical spine anatomy





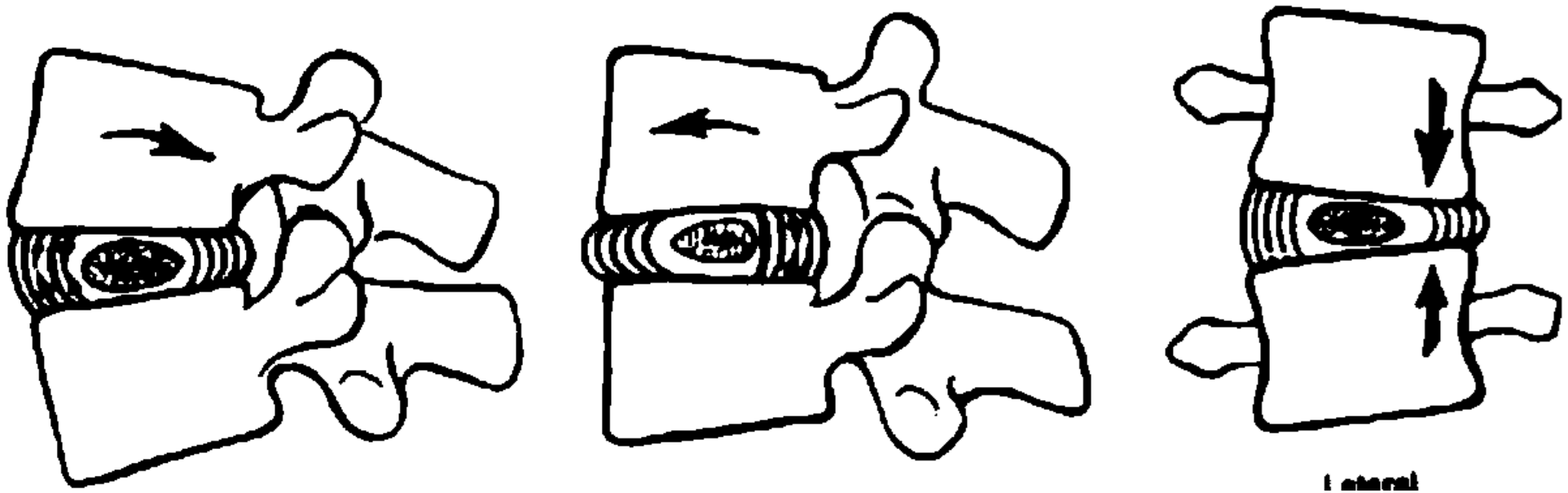

Intervertebral disc
Vertebral body
Vertebral foramen
Transverse process
Pedicle of the vertebral arch
Superior articular process
Lamina of the vertebral arch
Superior articular facet
Spinous process

1lb= 0.453 Kg


Degrees Of Head Bent
Force Into Cervical Spine
0 degrees
10 -12 pounds
Posture Risk
For Neck Pain
15 degrees
27 pounds
30 degrees
40 pounds
NeckSolutions.com
45 degrees
49 pounds
60 degrees
60 pounds

Anterior

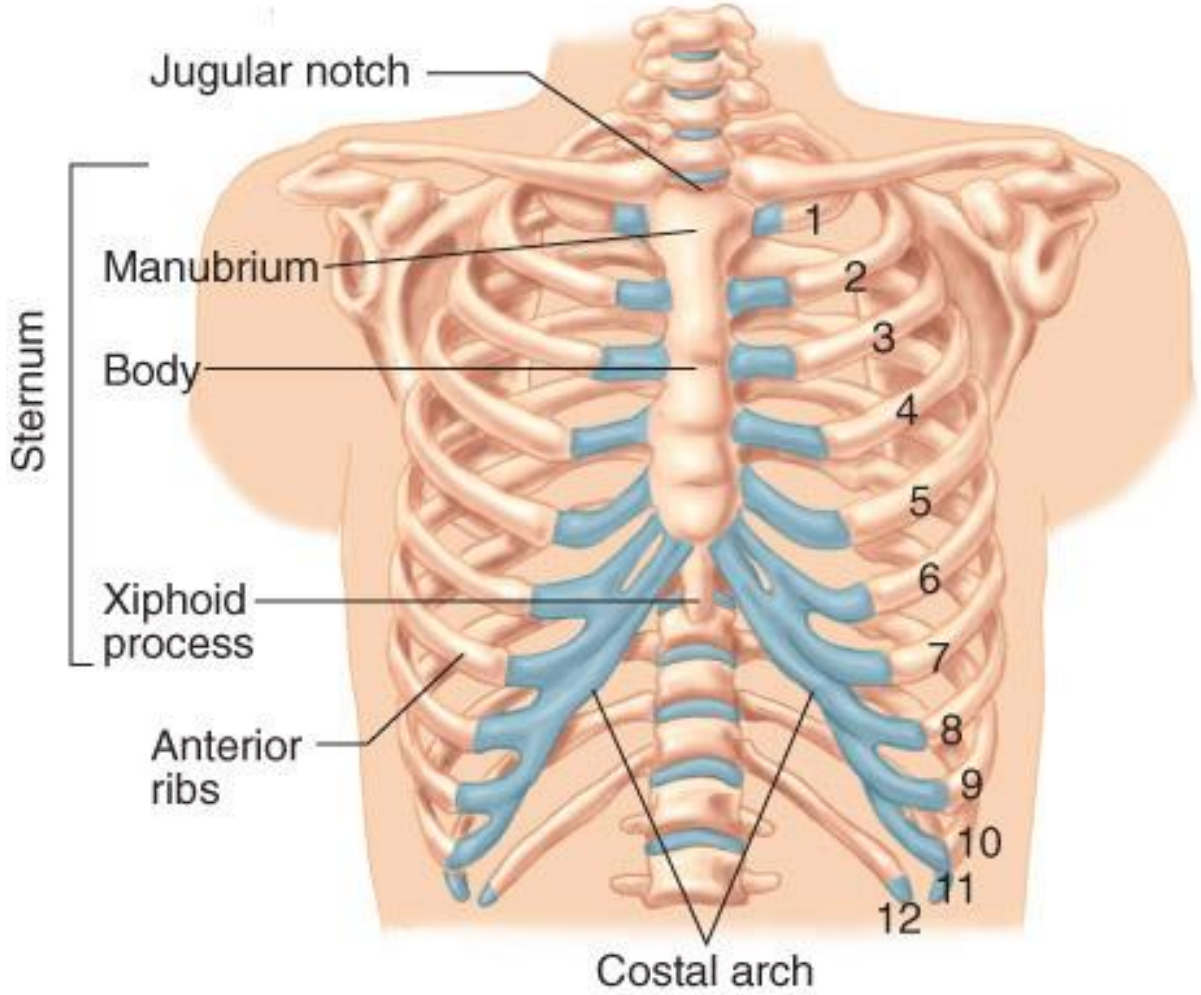
Posterior



Extension Flexion lateral bending

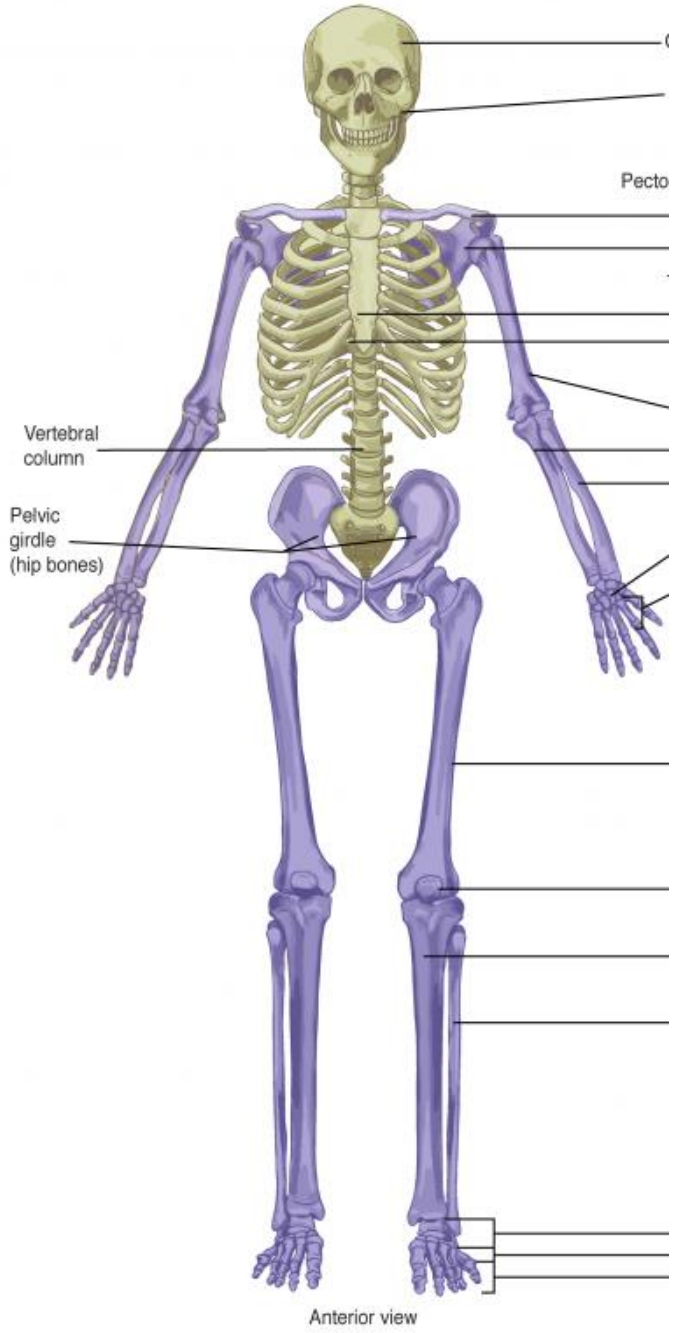
Thorax

- Formed by of 12 thoracic vertebrae and 12 pairs of ribs
- Thoracic cavity contains
  - Heart
  - Lungs
  - Esophagus
  - Great vessels



The Appendicular Skeleton

- Arms, legs, their connection points, and pelvis
- Includes:
- Upper extremity
- Pelvis
- Lower extremity

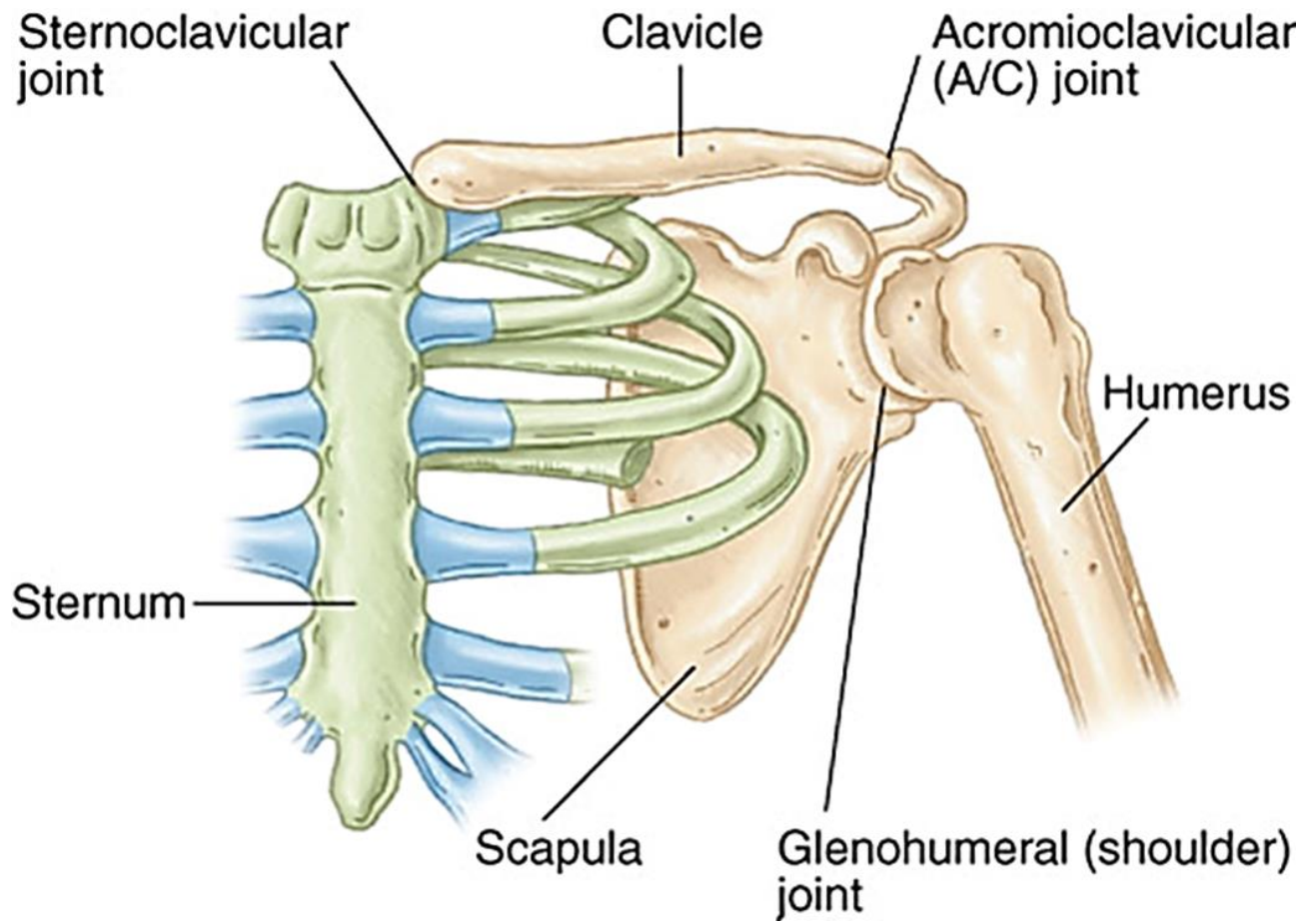


Upper extremity

- Extends from shoulder girdle to fingertips
- Composed of arms, forearms, hands, fingers

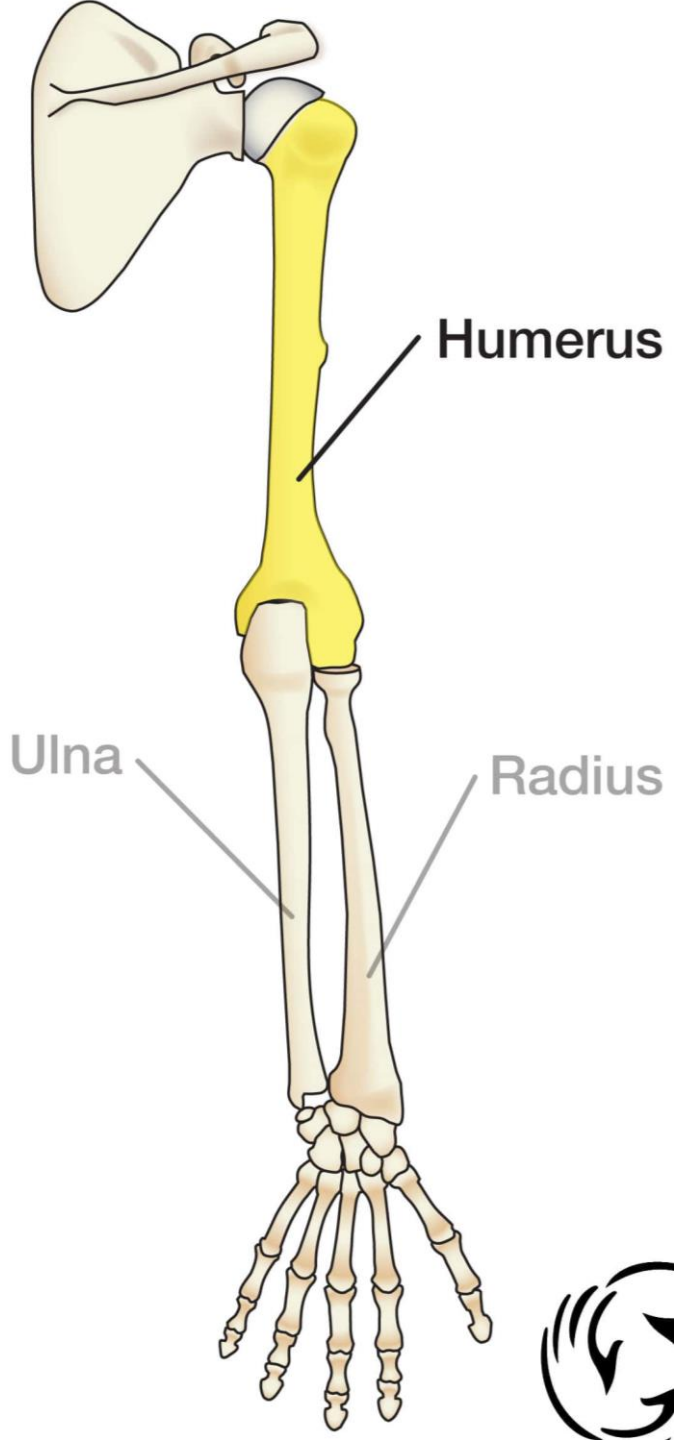
Shoulder girdle

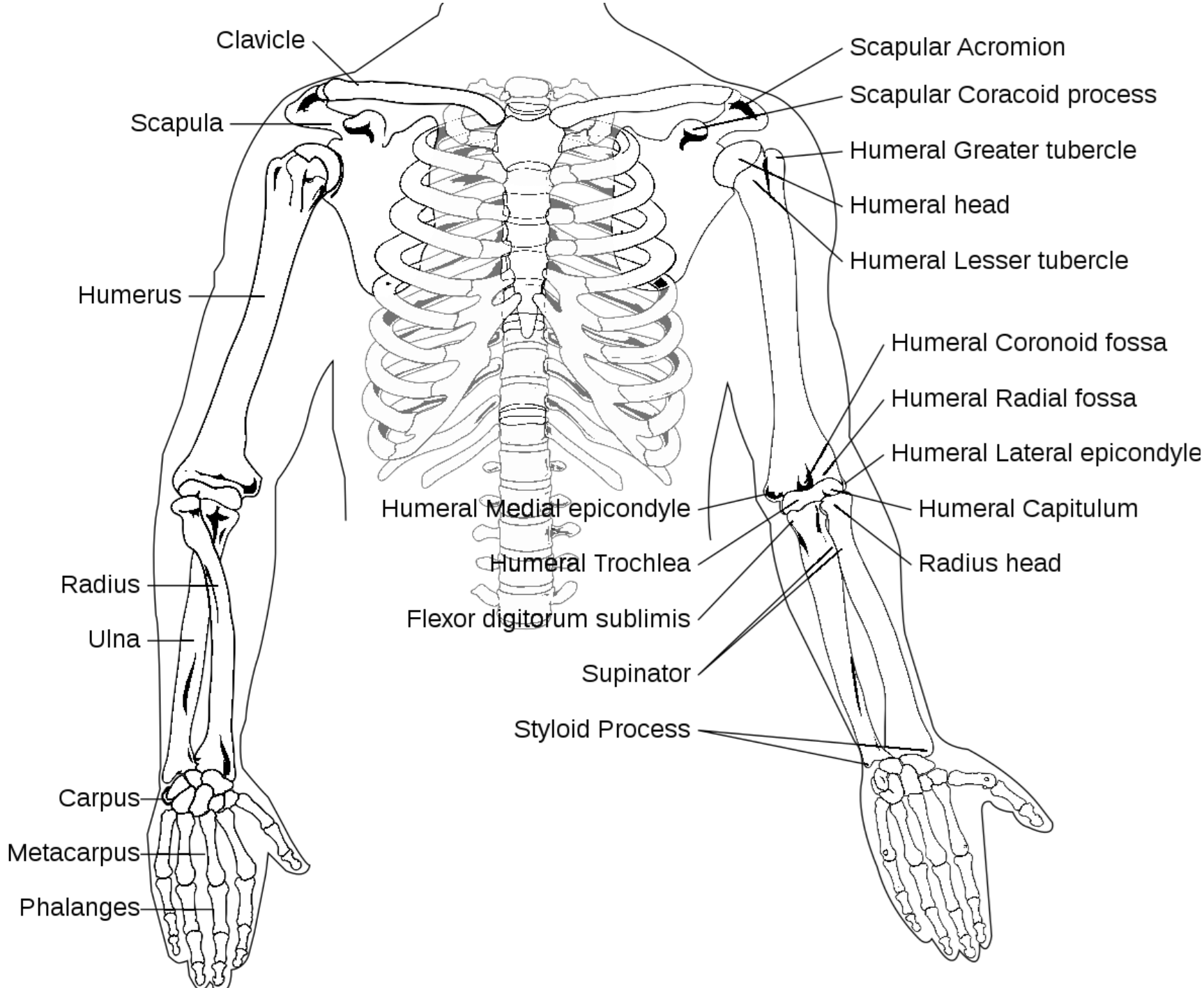
- Three bones come together, allowing arm to be moved:
  - Clavicle, scapula, humerus



The Upper Extremity

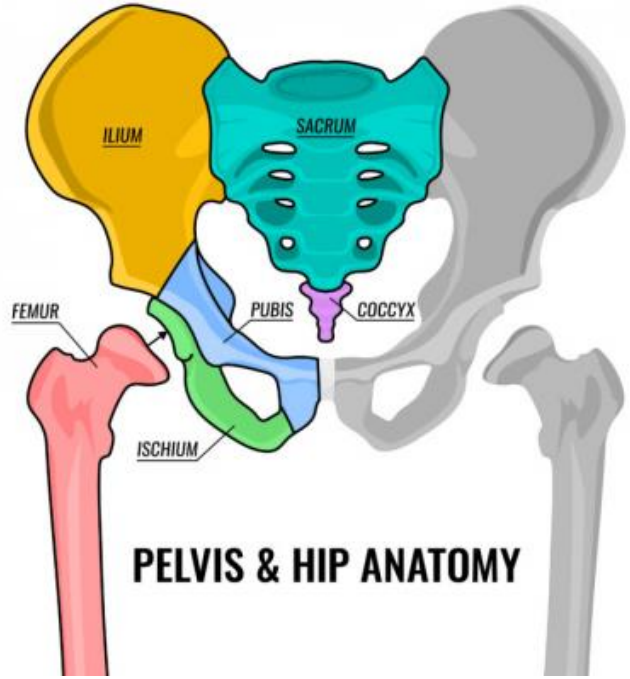
- Arm
  - The humerus is the supporting bone of the arm.
  - The forearm consists of the radius and ulna.
    - Radius on lateral side of forearm
    - Ulna on medial side of forearm



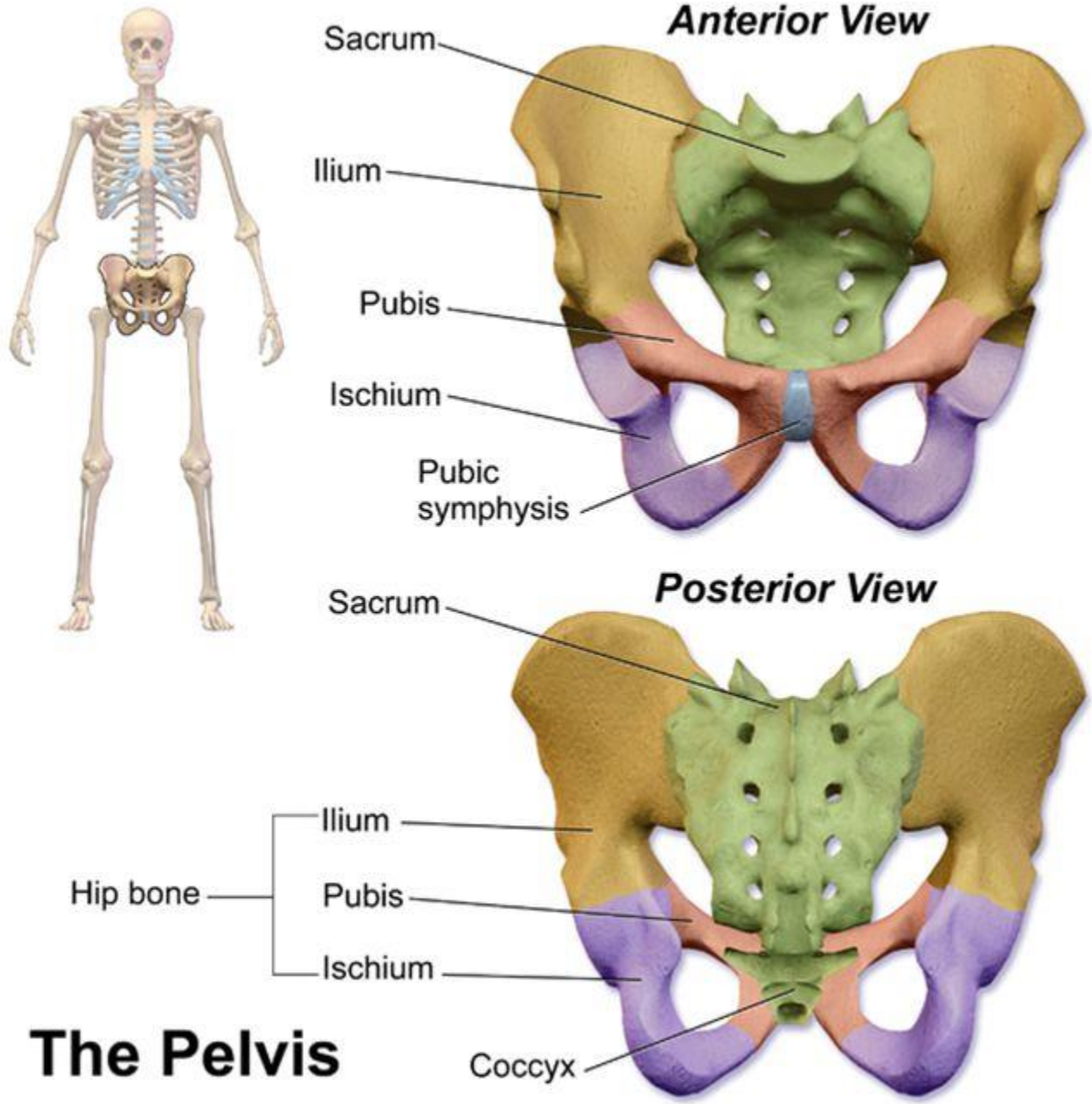

Clavicle
Scapula
Humerus
Radius
Ulna
Carpus
Metacarpus
Phalanges
Scapular Acromion
Scapular Coracoid process
Humeral Greater tubercle
Humeral head
Humeral Lesser tubercle
Humeral Coronoid fossa
Humeral Radial fossa
Humeral Lateral epicondyle
Humeral Capitulum
Radius head
Humeral Medial epicondyle
Humeral Trochlea
Flexor digitorum sublimis
Supinator
Styloid Process


Phalanges
Distal
Middle
Proximal
Metacarpals
5
4
3
2
1
Carpals
Hamate
Triquetrum
Lunate
Trapeziod
Trapezium
Capitate
Scaphoid
Ulna
Radius
902946200

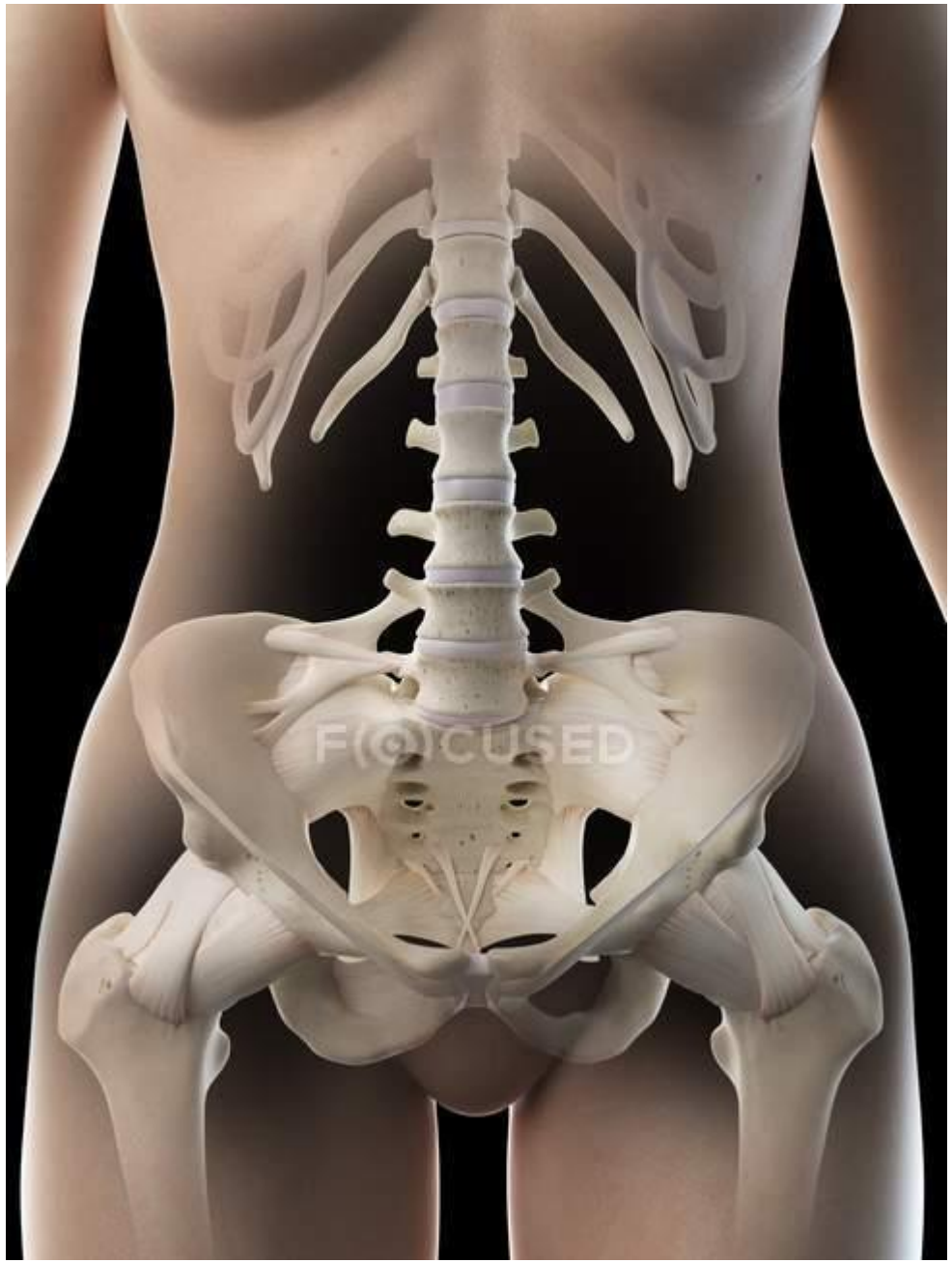
The Pelvis

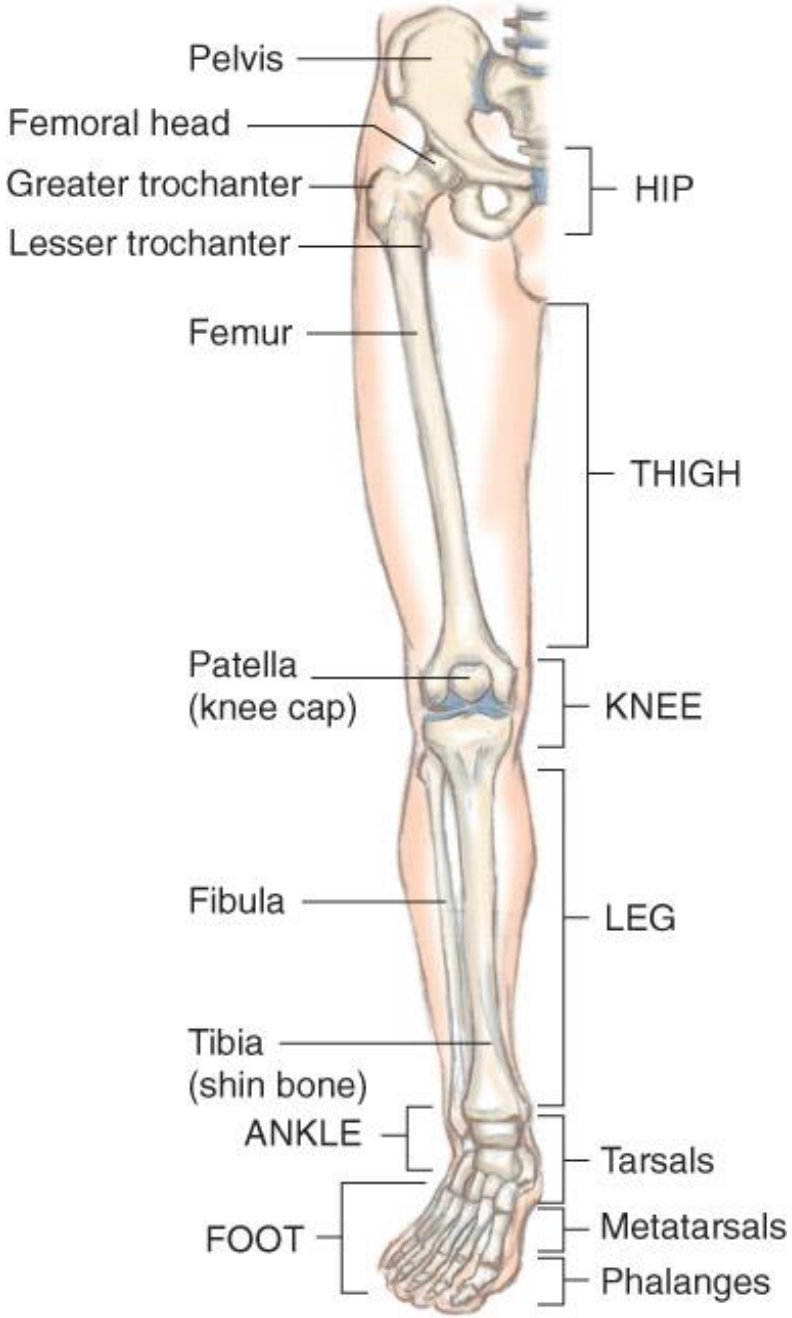


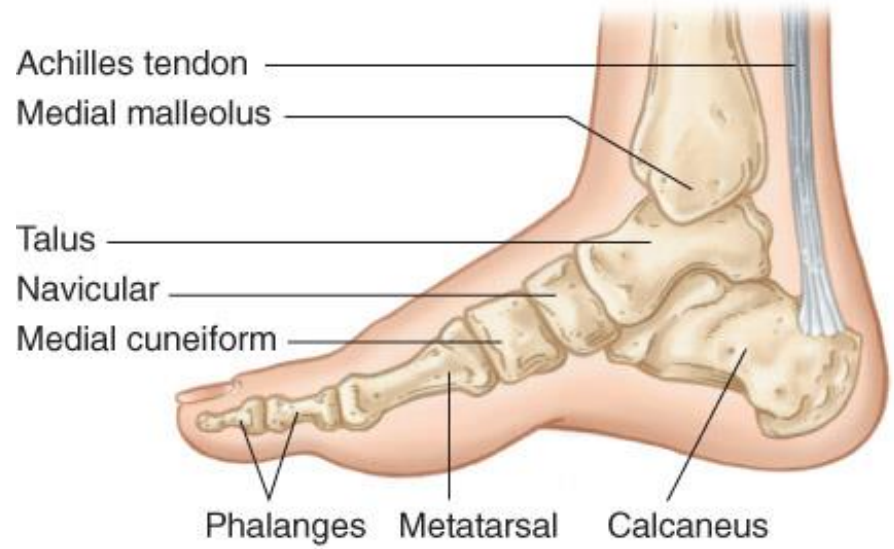
- Closed bony ring consisting of three bones
  - Sacrum
  - Two pelvic bones
    - Each pelvic bone is formed by fusion of ilium, ischium, and pubis.


Anterior View
Sacrum
Ilium
Pubis
Ischium
Pubic symphysis
Posterior View
Sacrum
Ilium
Hip bone
Pubis
Ischium
Coccyx

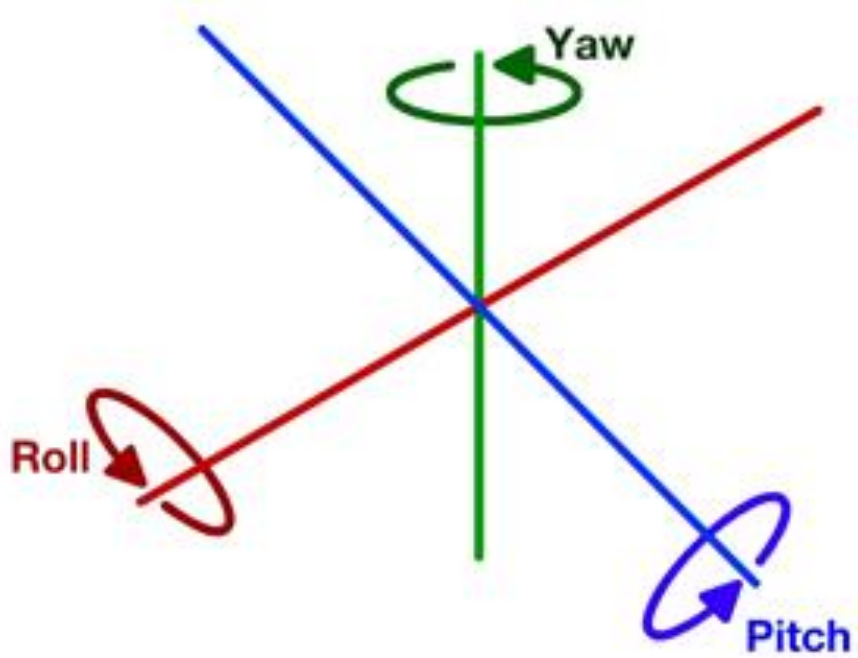
The Pelvis

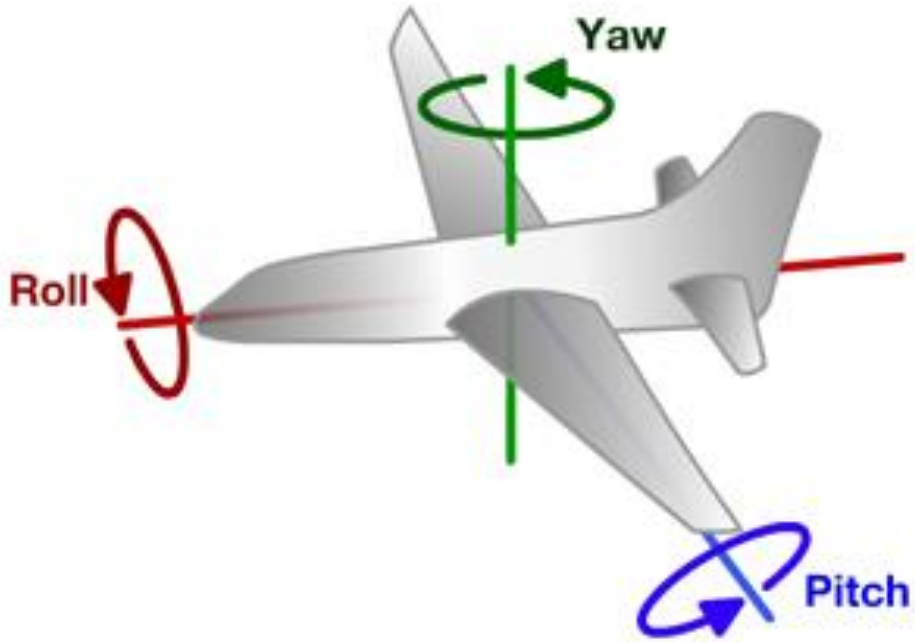


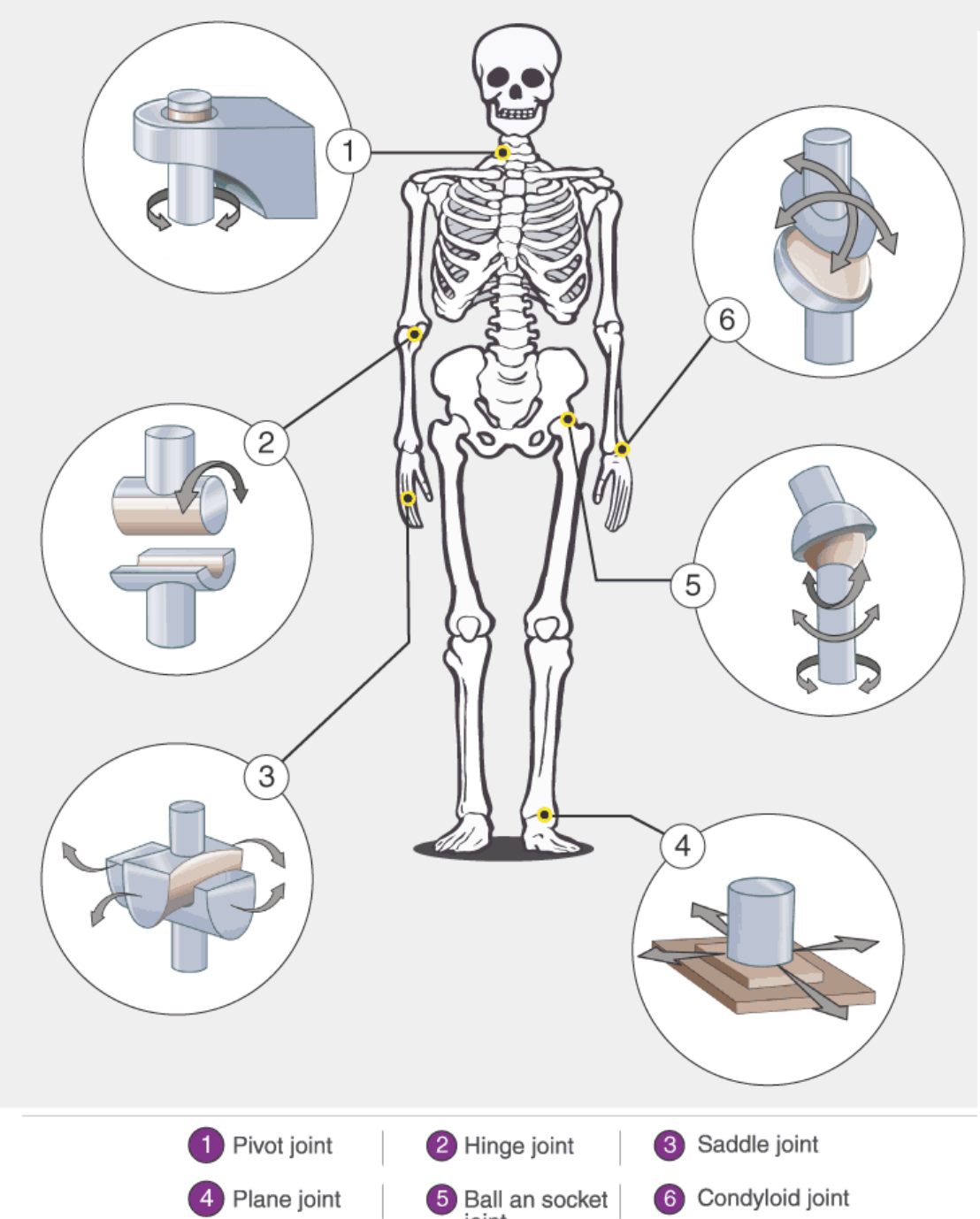

Pelvis
Femoral head
Greater trochanter
Lesser trochanter
HIP
Femur
THIGH
Patella
(knee cap)
KNEE
Fibula
LEG
Tibia
(shin bone)
ANKLE
Tarsals
FOOT
Metatarsals
Phalanges


Achilles tendon
Medial malleolus
Talus
Navicular
Medial cuneiform
Phalanges
Metatarsal
Calcaneus

Joints

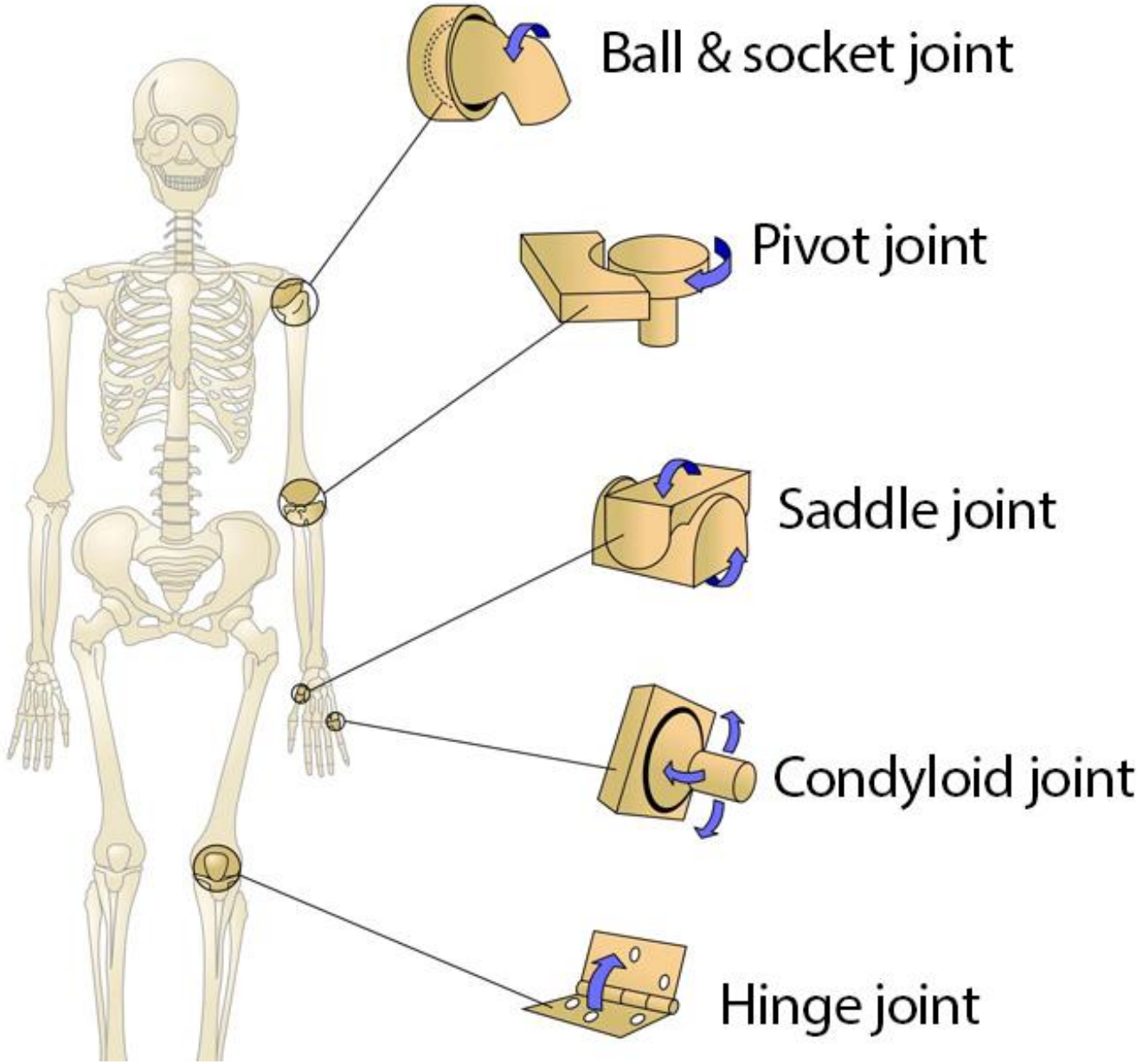


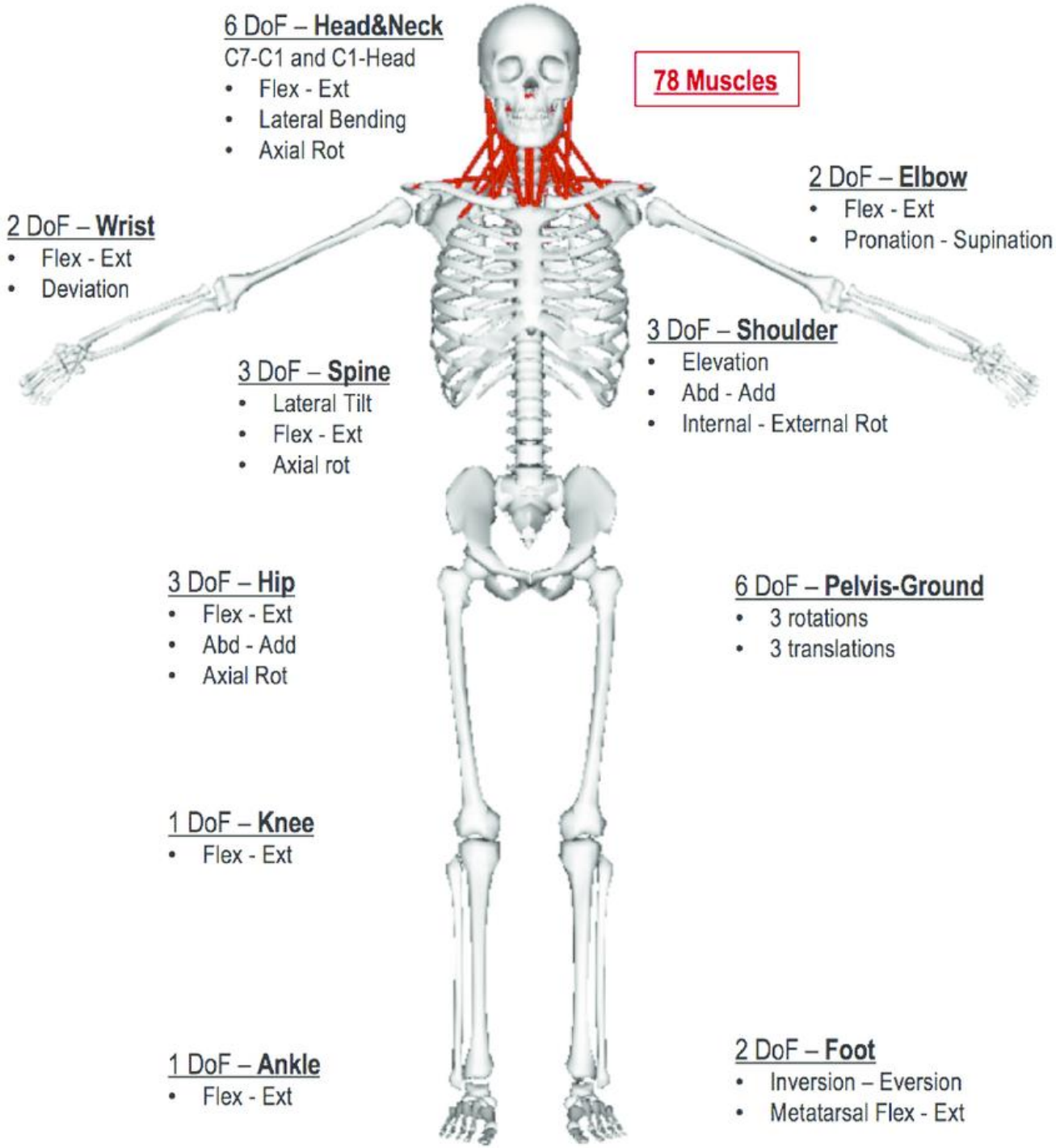




1 Pivot joint | 2 Hinge joint | 3 Saddle joint

4 Plane joint | 5 Ball an socket joint | 6 Condyloid joint





6 DoF – **Head&Neck**
C7-C1 and C1-Head
- Flex - Ext
- Lateral Bending
- Axial Rot

78 Muscles

2 DoF – **Elbow**
- Flex - Ext
- Pronation - Supination

2 DoF – **Wrist**
- Flex - Ext
- Deviation

3 DoF – **Shoulder**
- Elevation
- Abd - Add
- Internal - External Rot

3 DoF – **Spine**
- Lateral Tilt
- Flex - Ext
- Axial rot

3 DoF – **Hip**
- Flex - Ext
- Abd - Add
- Axial Rot

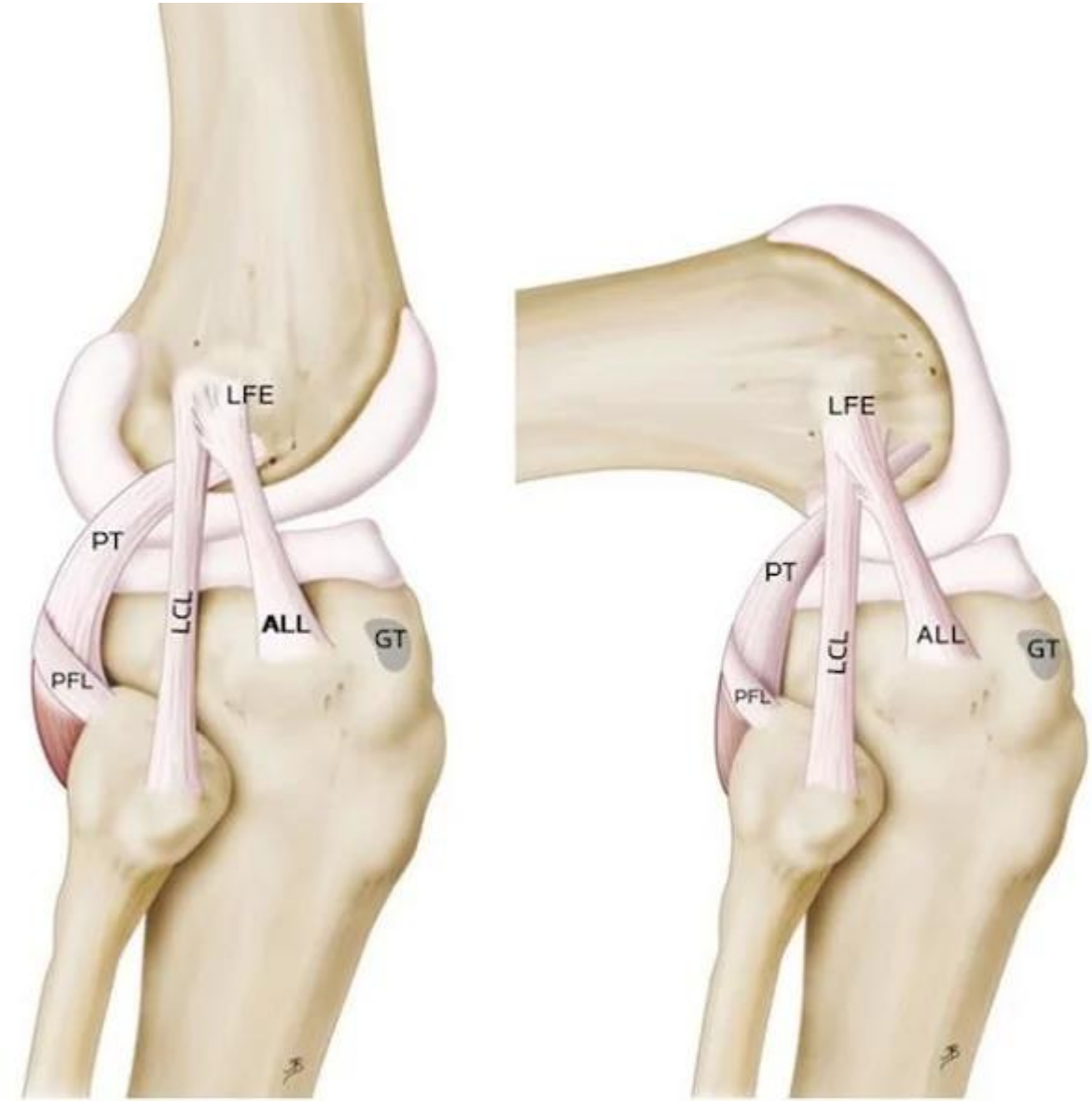
6 DoF – **Pelvis-Ground**
- 3 rotations
- 3 translations

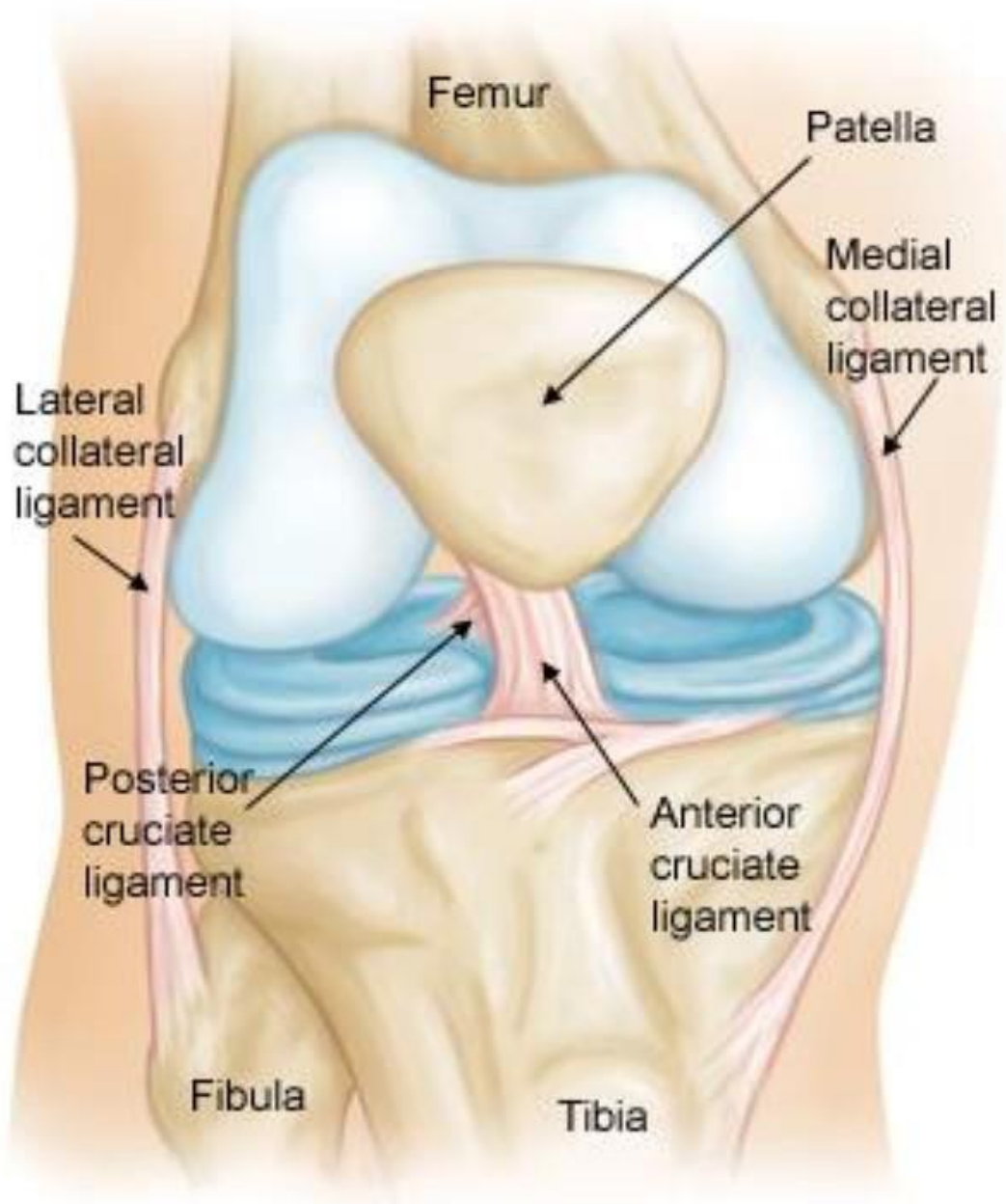
1 DoF – **Knee**
- Flex - Ext

1 DoF – **Ankle**
- Flex - Ext

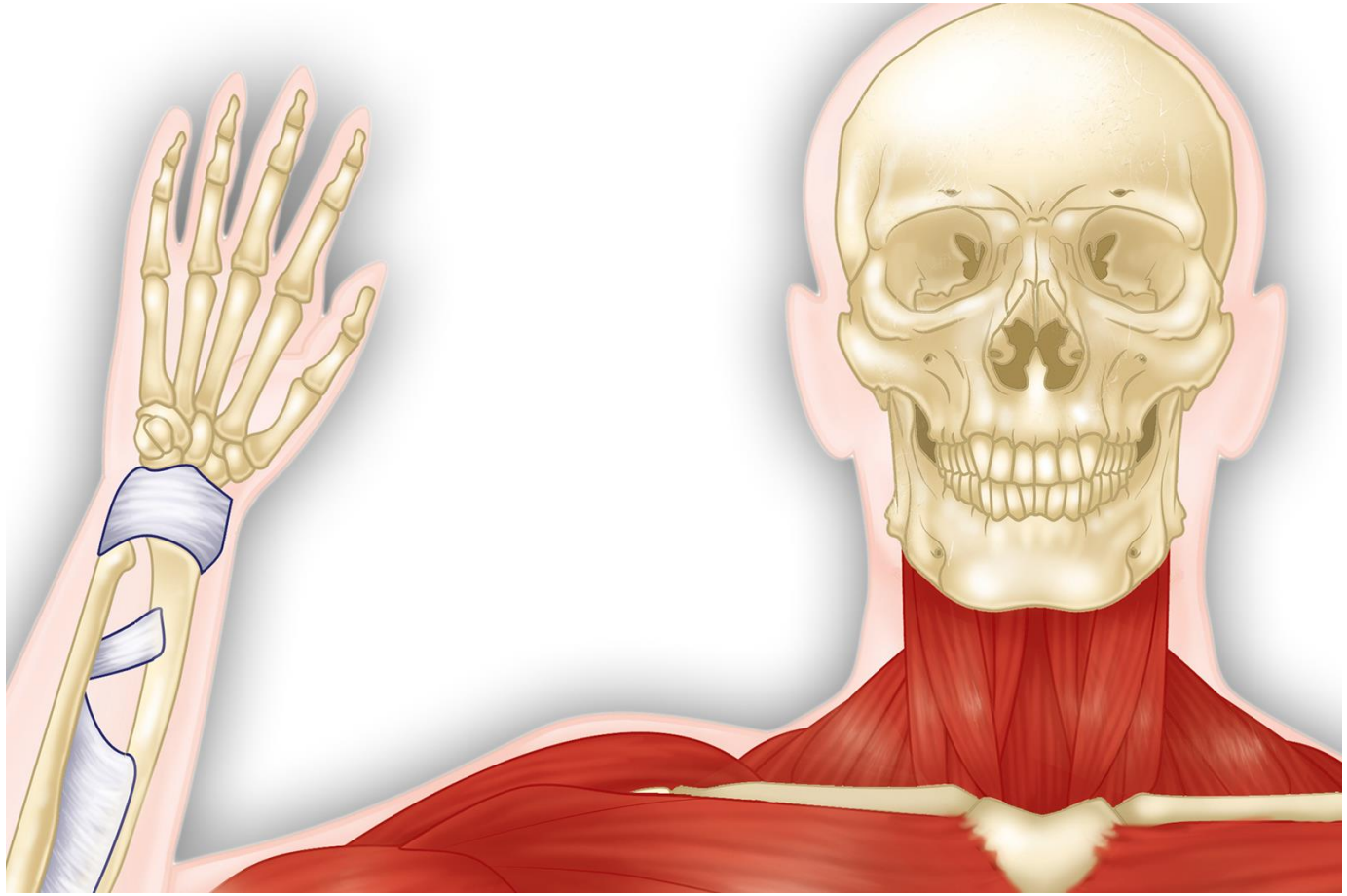
2 DoF – **Foot**
- Inversion – Eversion
- Metatarsal Flex - Ext

Ligaments




Femur
Patella
Medial collateral ligament
Lateral collateral ligament
Posterior cruciate ligament
Anterior cruciate ligament
Fibula
Tibia

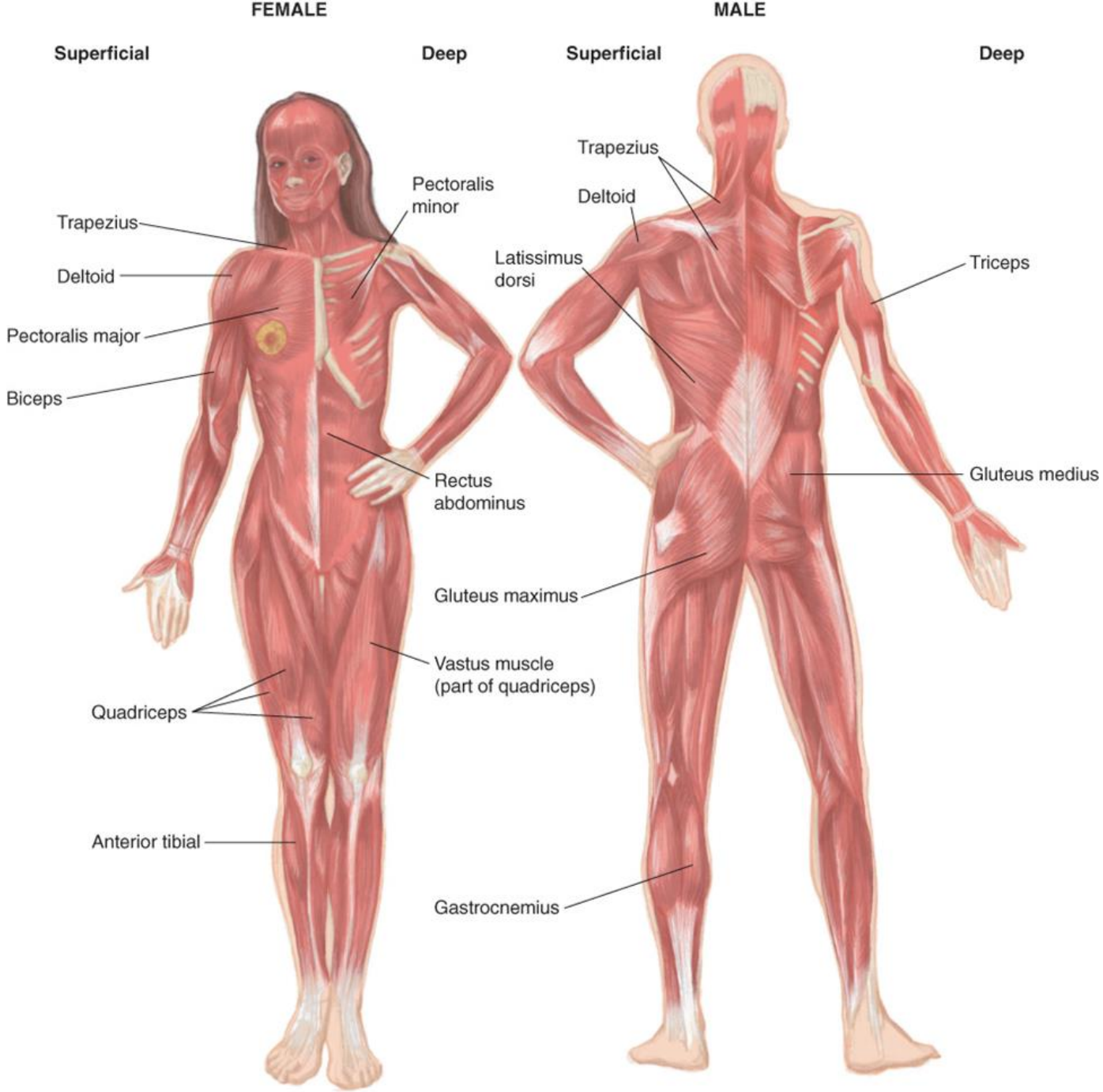
The Musculoskeletal System: Anatomy



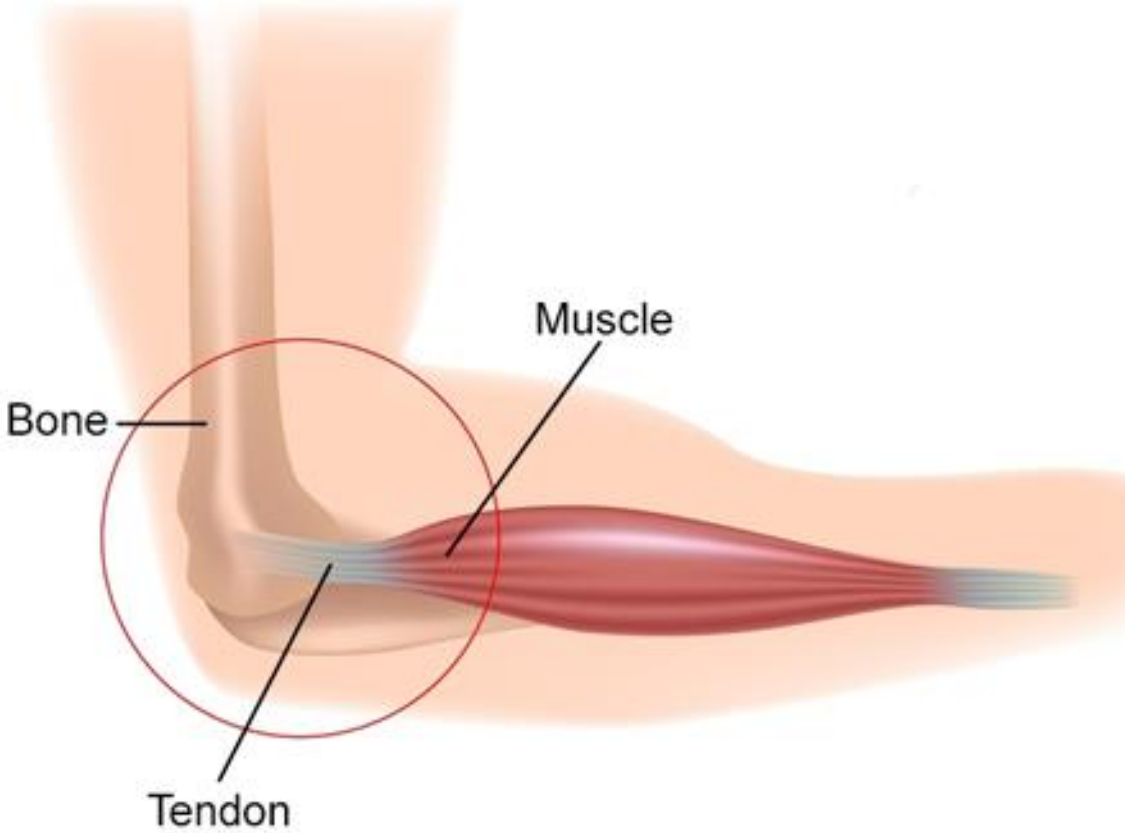
Musculoskeletal system

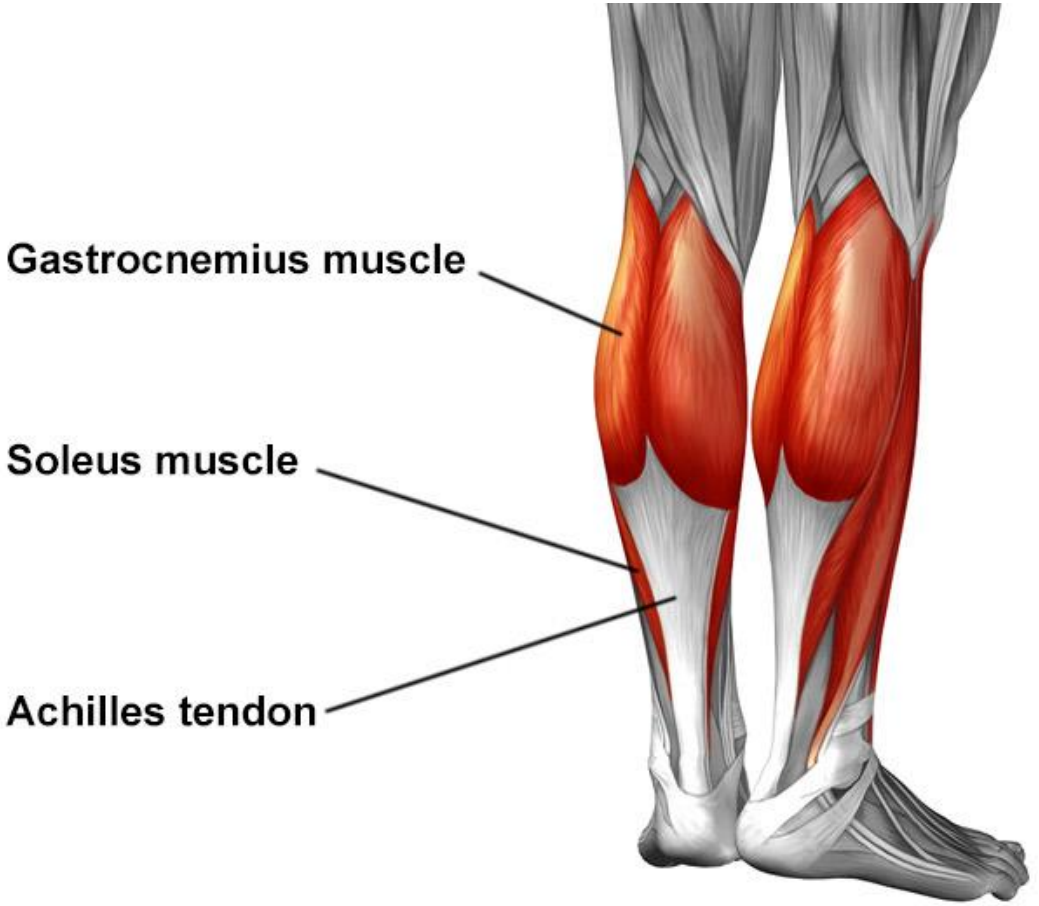
- Musculoskeletal system provides:
  1. Form
  2. Upright posture
  3. Movement
- More than 600 muscles attach to bone.

  -Called skeletal (or voluntary) muscles

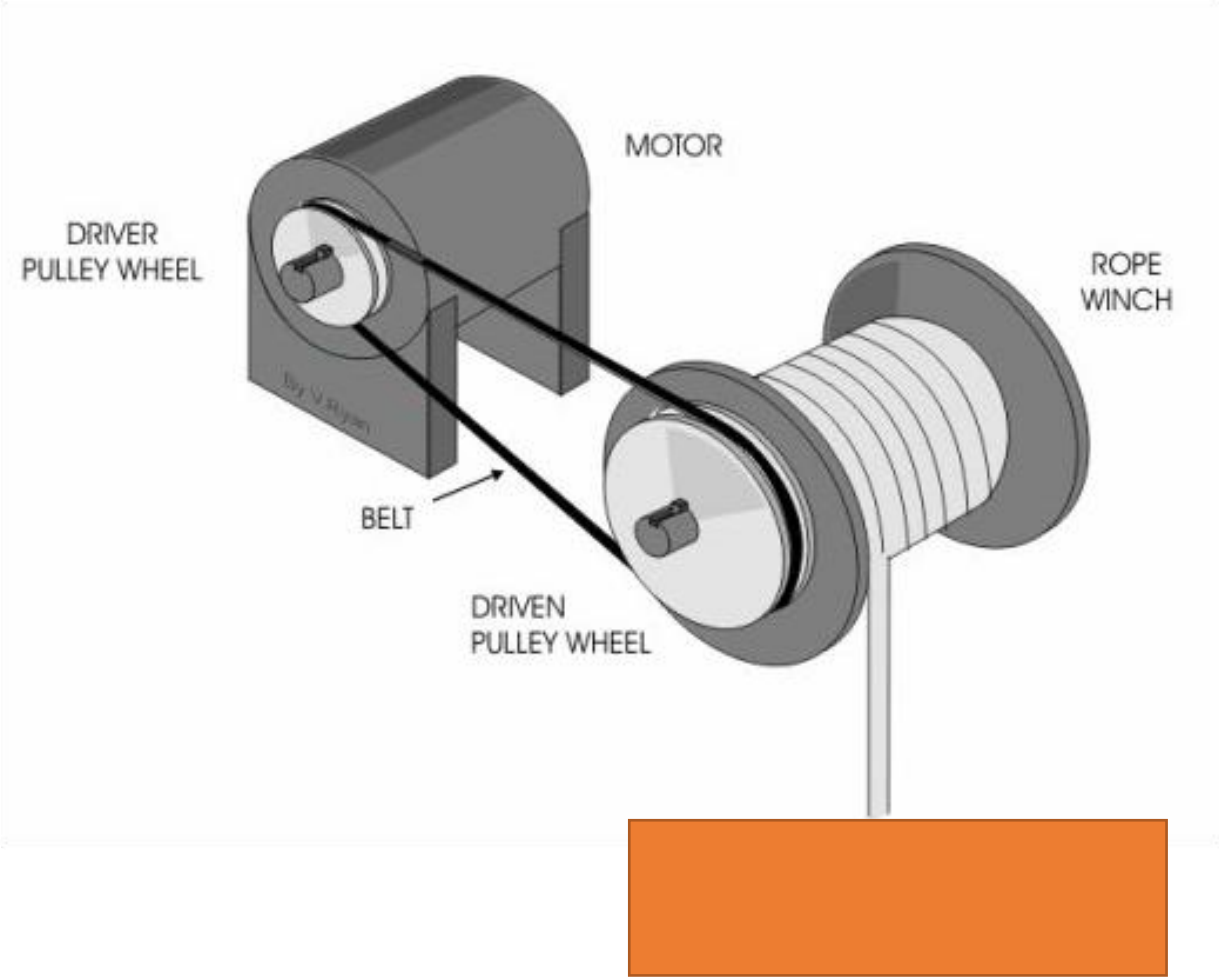

FEMALE
Superficial
Deep
Trapezius
Deltoid
Pectoralis major
Biceps
Pectoralis minor
Rectus abdominus
Vastus muscle (part of quadriceps)
Quadriceps
Anterior tibial
MALE
Superficial
Deep
Trapezius
Deltoid
Latissimus dorsi
Triceps
Gluteus medius
Gluteus maximus
Gastrocnemius

Tendon

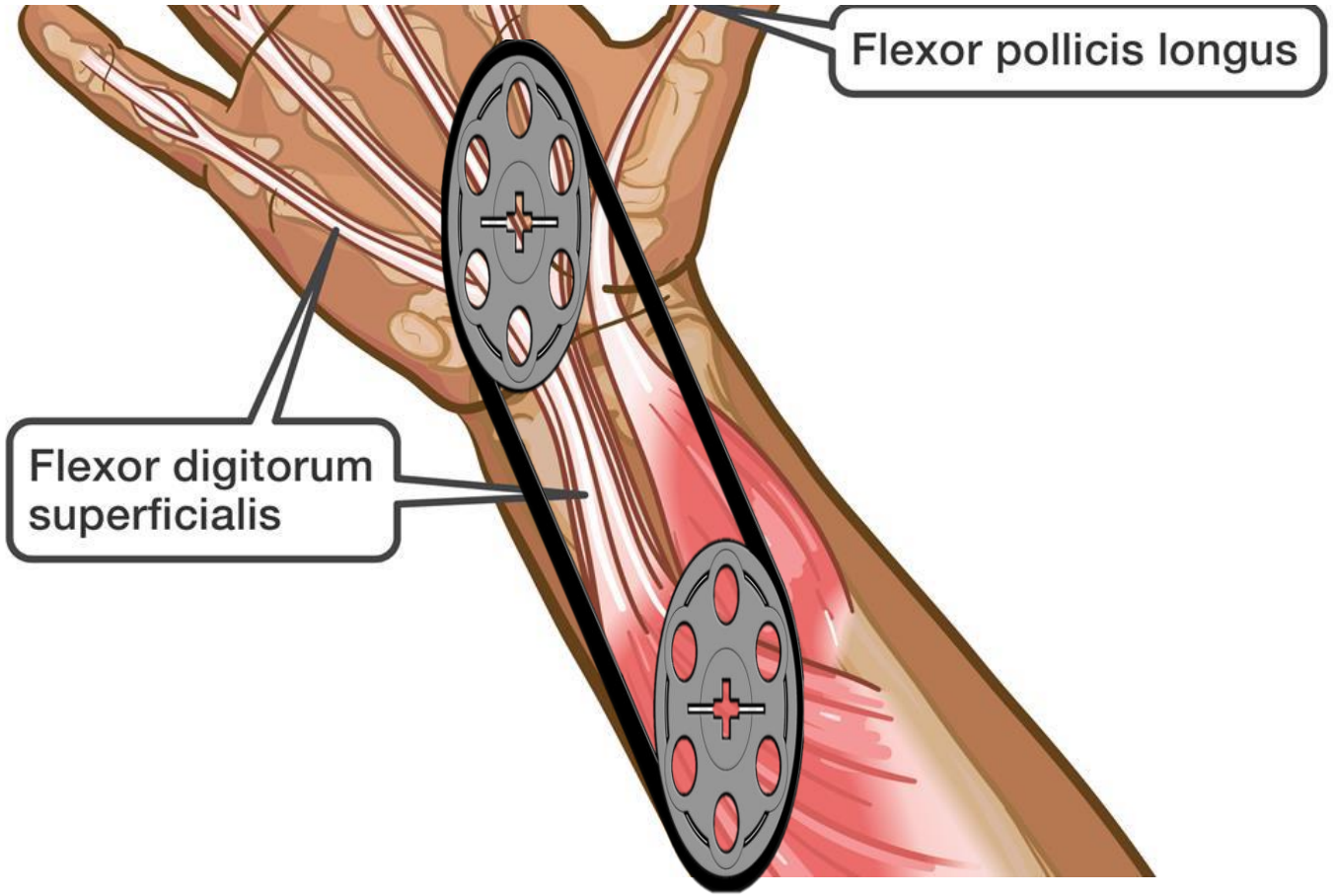

Muscle
Bone
Tendon

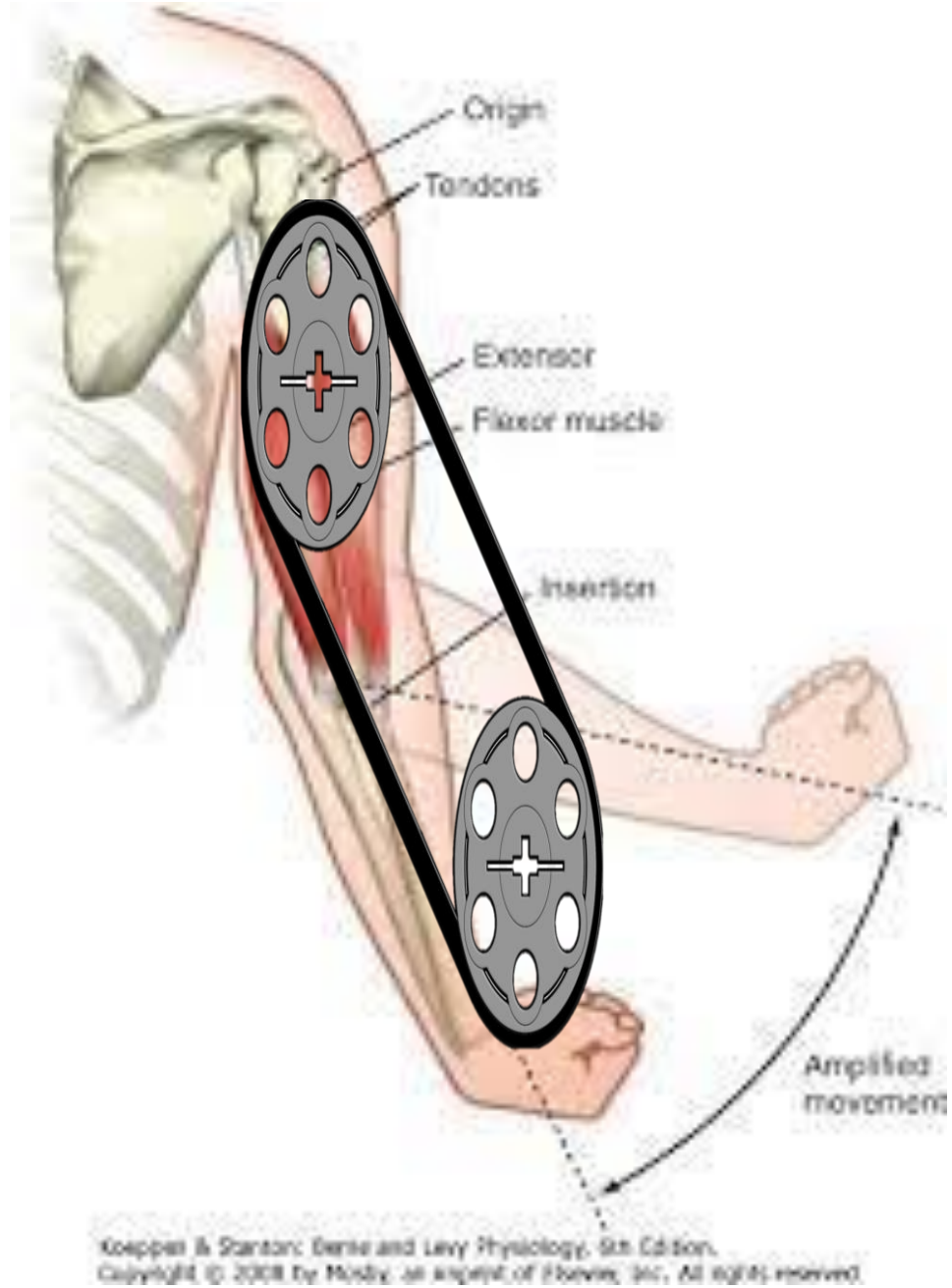

Gastrocnemius muscle
Soleus muscle
Achilles tendon

Body movements



Body movements





Koeppen & Stanton: Berne and Levy Physiology, 6th Edition.
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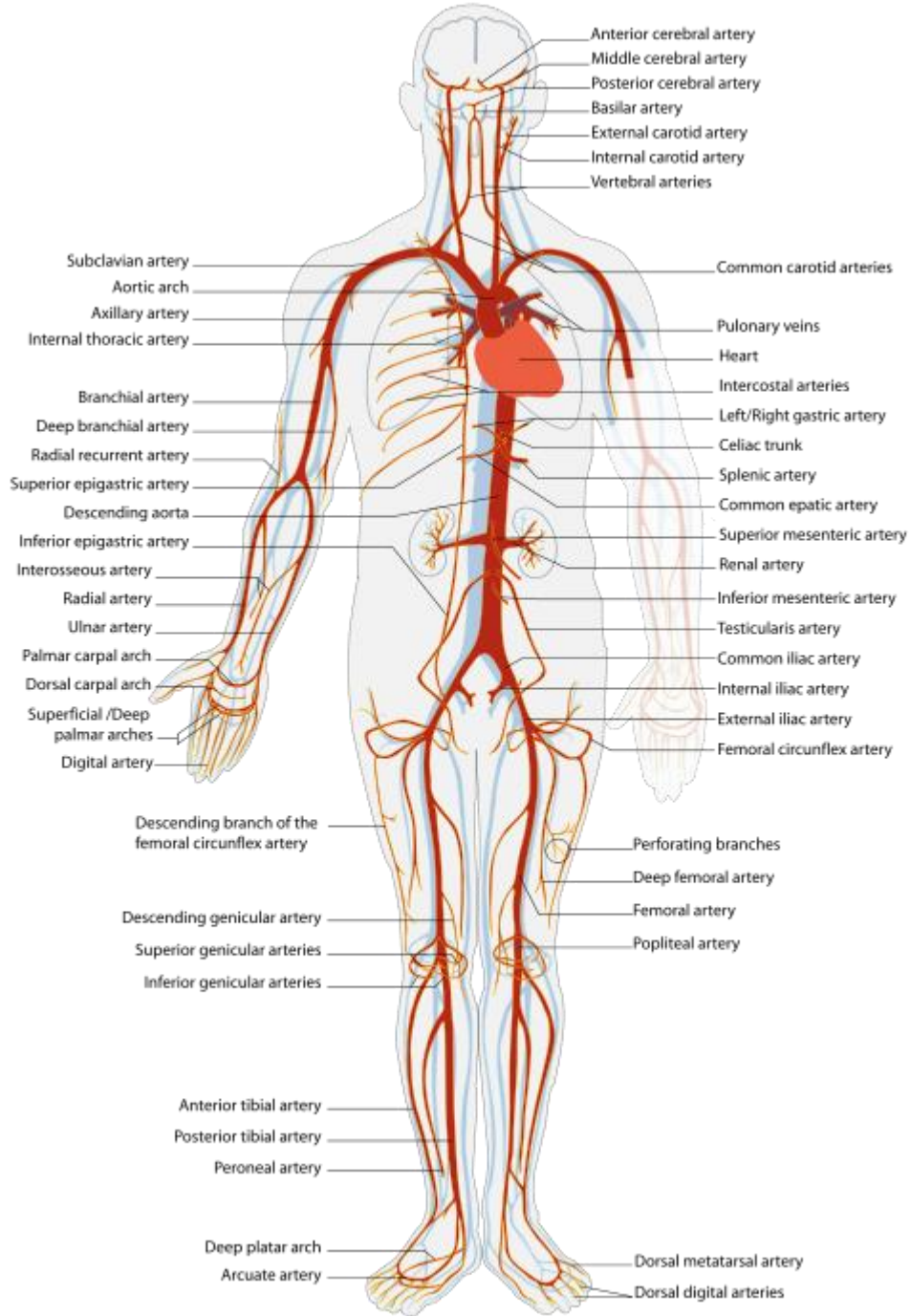
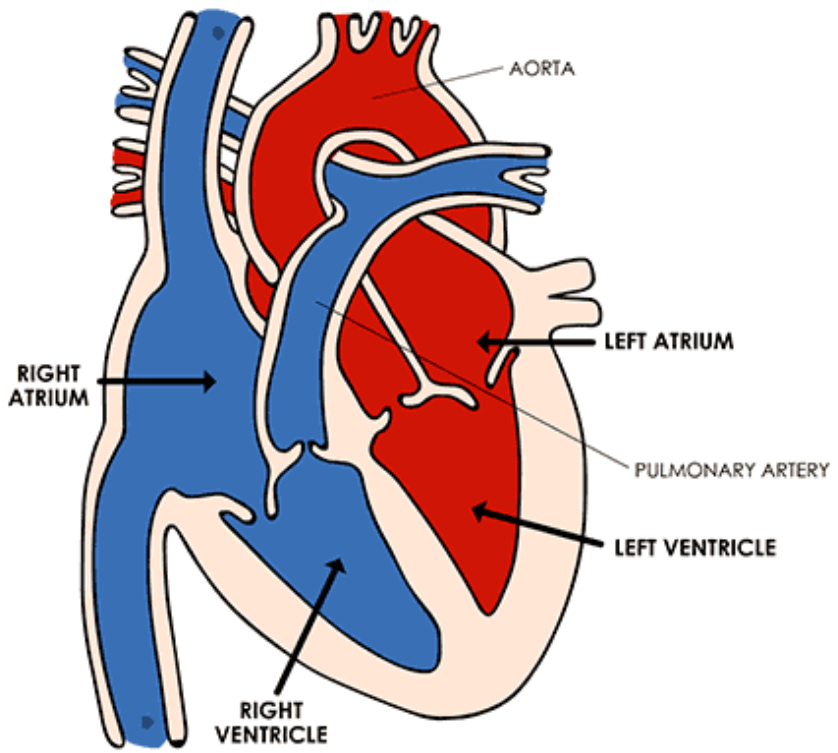
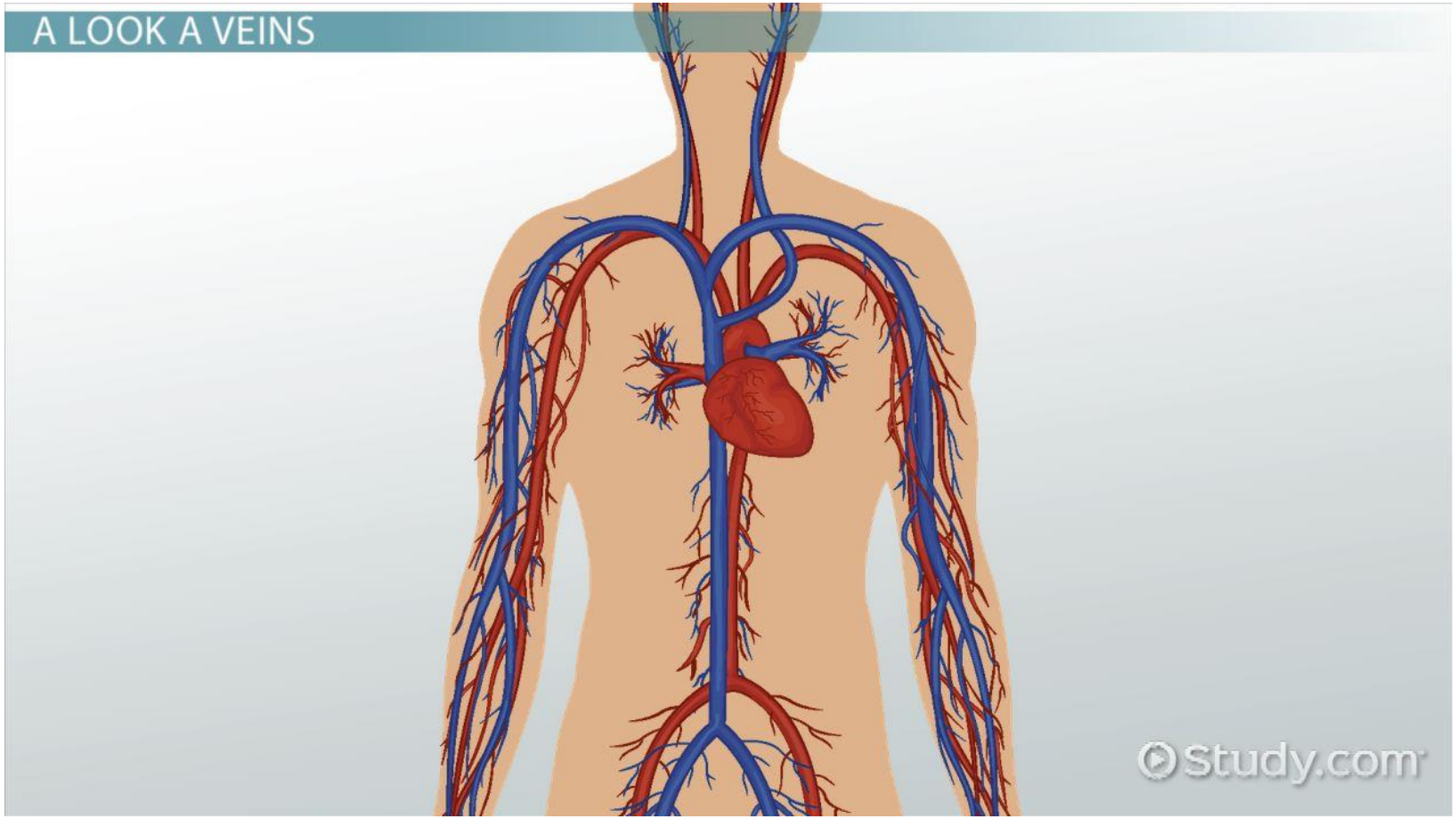
Circulatory system


Anterior cerebral artery
Middle cerebral artery
Posterior cerebral artery
Basilar artery
External carotid artery
Internal carotid artery
Vertebral arteries
Subclavian artery
Aortic arch
Axillary artery
Internal thoracic artery
Branchial artery
Deep branchial artery
Radial recurrent artery
Superior epigastric artery
Descending aorta
Inferior epigastric artery
Interosseous artery
Radial artery
Ulnar artery
Palmar carpal arch
Dorsal carpal arch
Superficial /Deep palmar arches
Digital artery
Common carotid arteries
Pulonary veins
Heart
Intercostal arteries
Left/Right gastric artery
Celiac trunk
Splenic artery
Common epatic artery
Superior mesenteric artery
Renal artery
Inferior mesenteric artery
Testicularis artery
Common iliac artery
Internal iliac artery
External iliac artery
Femoral circunflex artery
Descending branch of the femoral circunflex artery
Perforating branches
Deep femoral artery
Femoral artery
Popliteal artery
Descending genicular artery
Superior genicular arteries
Inferior genicular arteries
Anterior tibial artery
Posterior tibial artery
Peroneal artery
Deep platar arch
Arcuate artery
Dorsal metatarsal artery
Dorsal digital arteries

The Heart


AORTA
LEFT ATRIUM
RIGHT ATRIUM
PULMONARY ARTERY
LEFT VENTRICLE
RIGHT VENTRICLE


A LOOK A VEINS
Study.com

با آرزوی موفقیت

دکتر گروسی