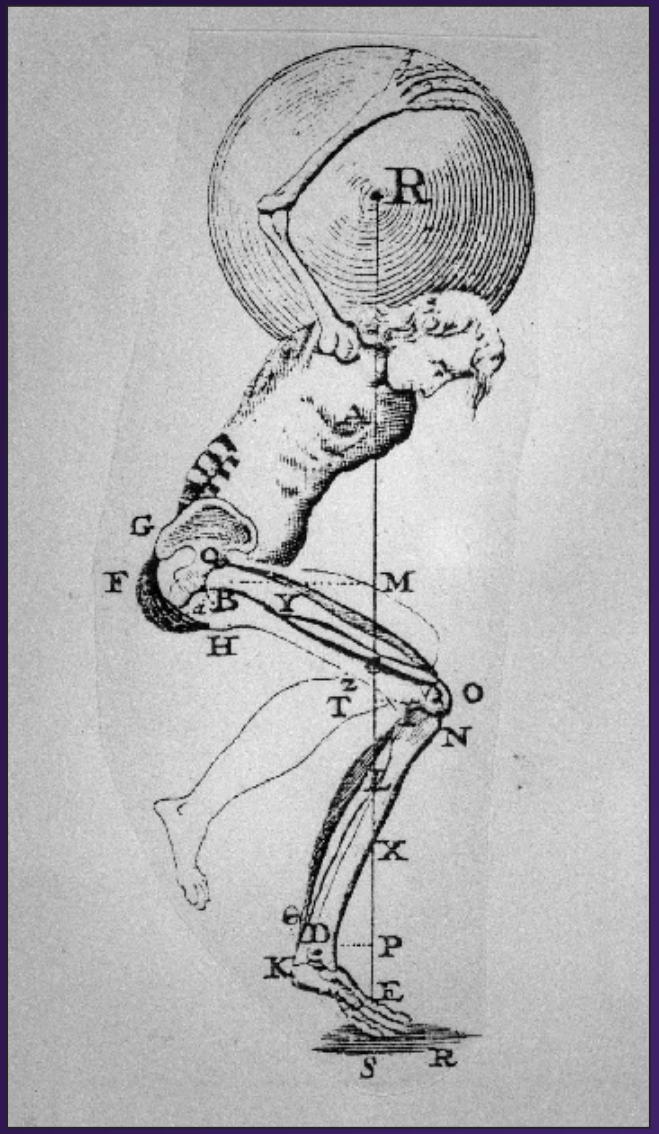


Musculoskeletal Biomechanics

BIOEN 520 | ME 527

Mini-Lab 1

Basic Anatomy

Anatomy: General

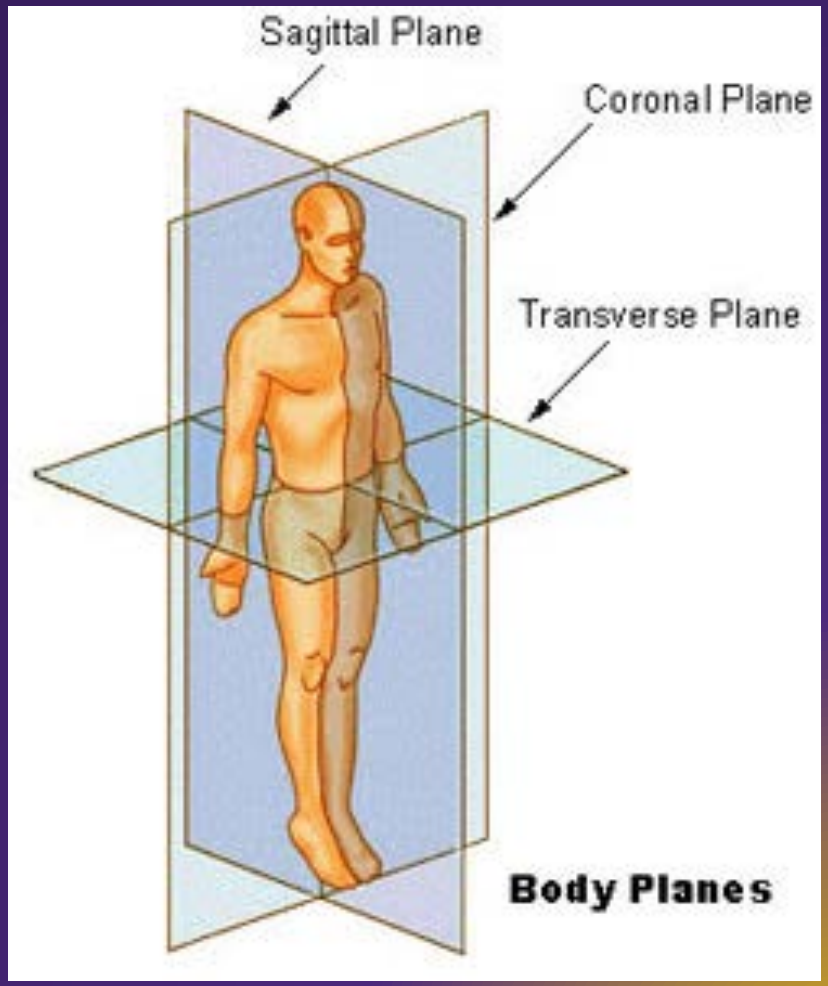
- Planes of the body
- Directional terms
- Joint motion/position
- Primary musculoskeletal structures

Anatomy: Foot and Ankle

- Foot and ankle anatomy (emphasizing the musculoskeletal system – no nerves or vessels)
- Dissection video(s)
- Practical examination

Planes of the body

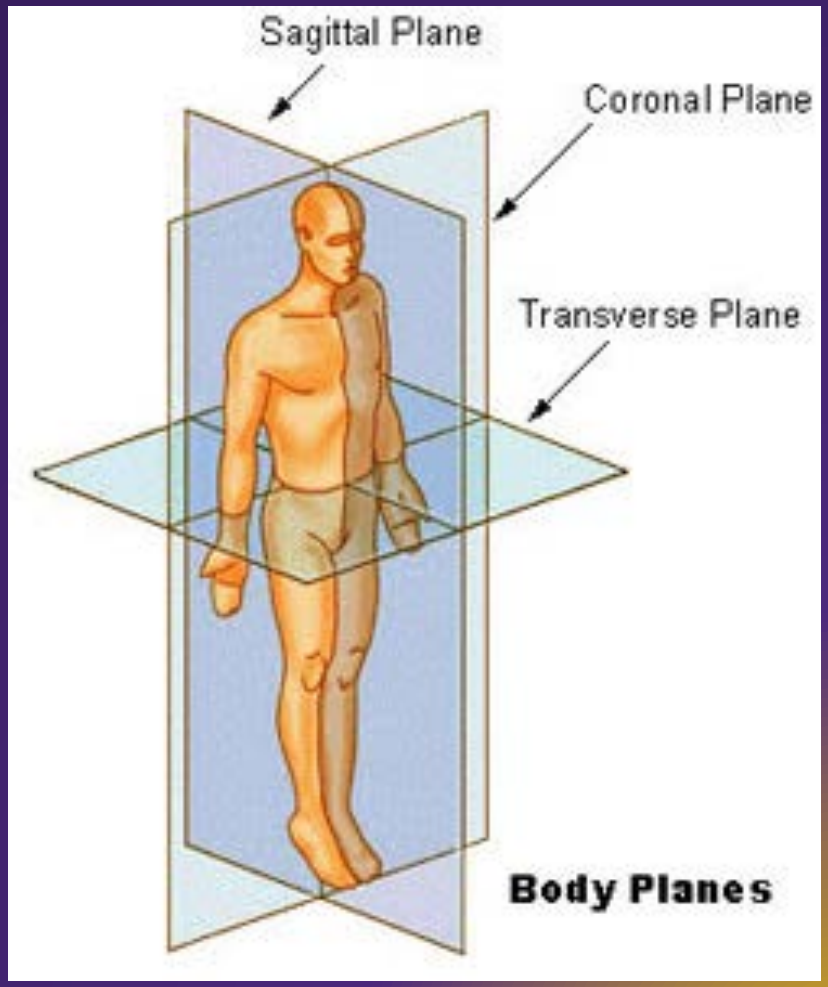
- **Coronal Plane (Frontal Plane)** - A vertical plane running from side to side; divides the body or any of its parts into anterior and posterior portions.



http://training.seer.cancer.gov/anatomy/body/terminology.html

Planes of the body

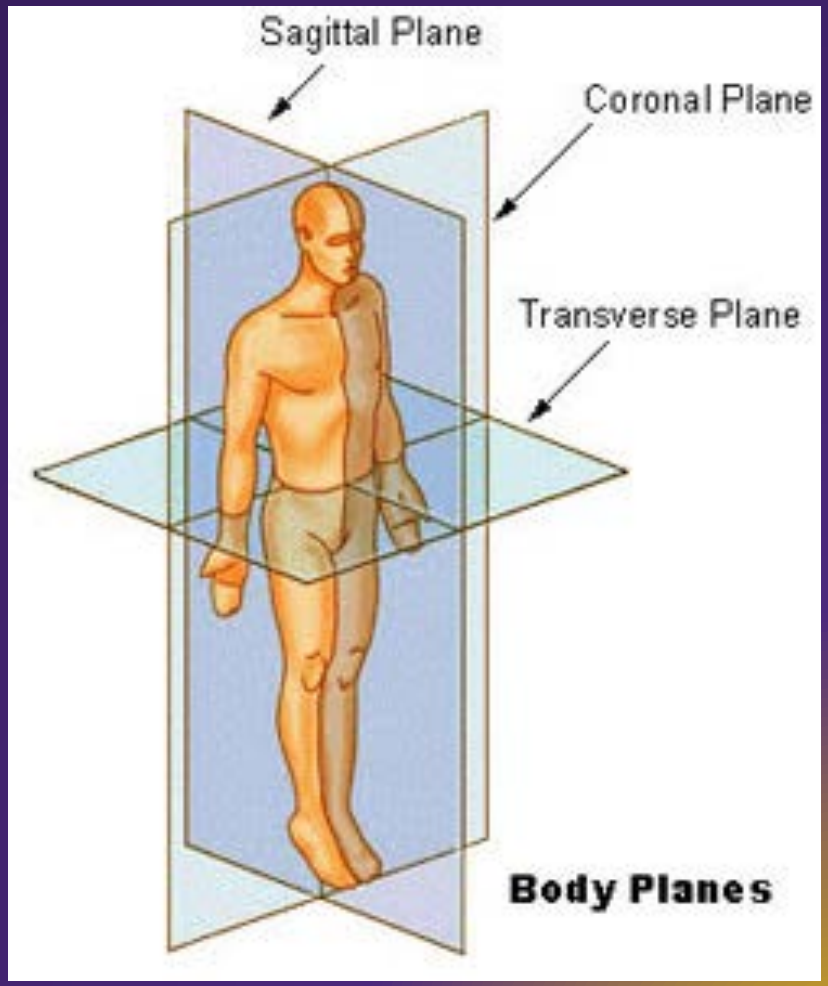
- **Sagittal Plane (Lateral Plane)** - A vertical plane running from front to back; divides the body or any of its parts into right and left sides.



http://training.seer.cancer.gov/anatomy/body/terminology.html

Planes of the body

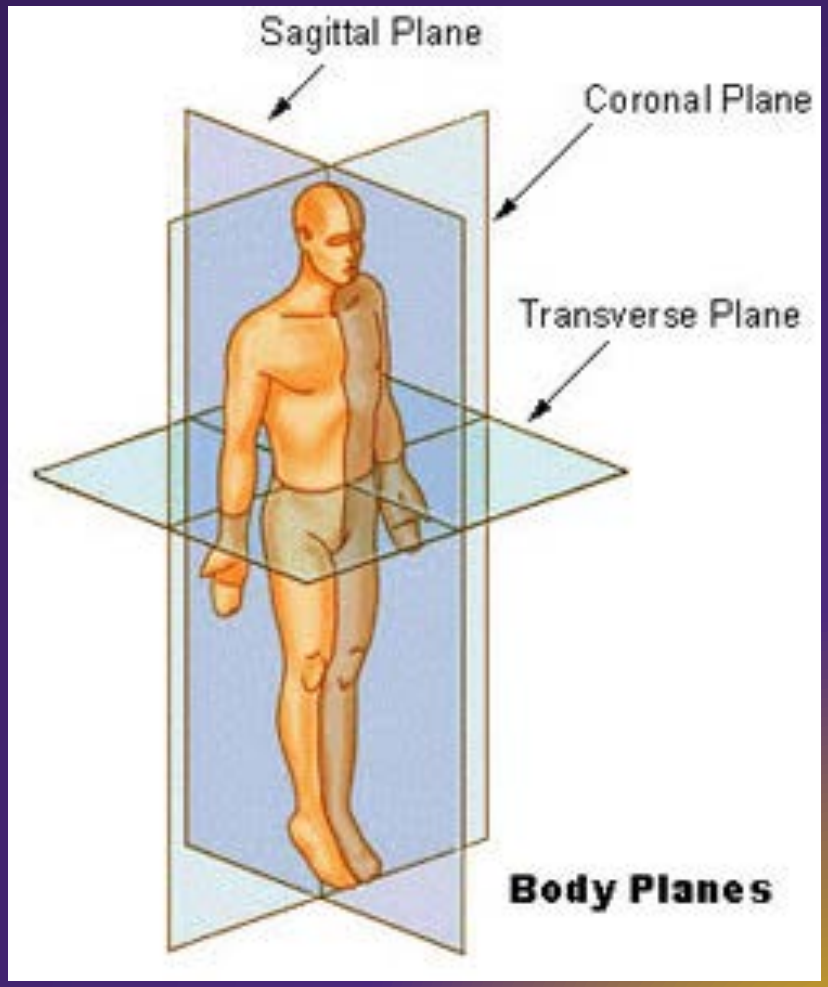
- **Axial Plane (Transverse Plane)** - A horizontal plane; divides the body or any of its parts into upper and lower parts.



http://training.seer.cancer.gov/anatomy/body/terminology.html

Planes of the body

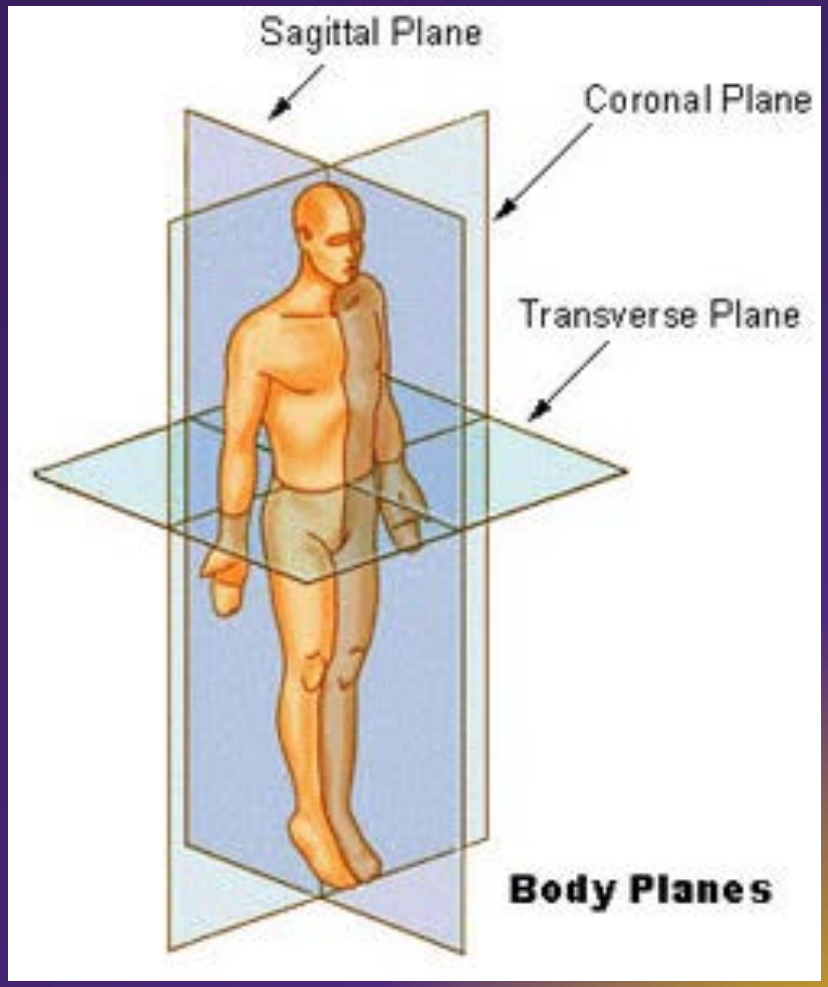
- **Median plane** - Sagittal plane through the midline of the body; divides the body or any of its parts into right and left halves.



http://training.seer.cancer.gov/anatomy/body/terminology.html

Directional terms

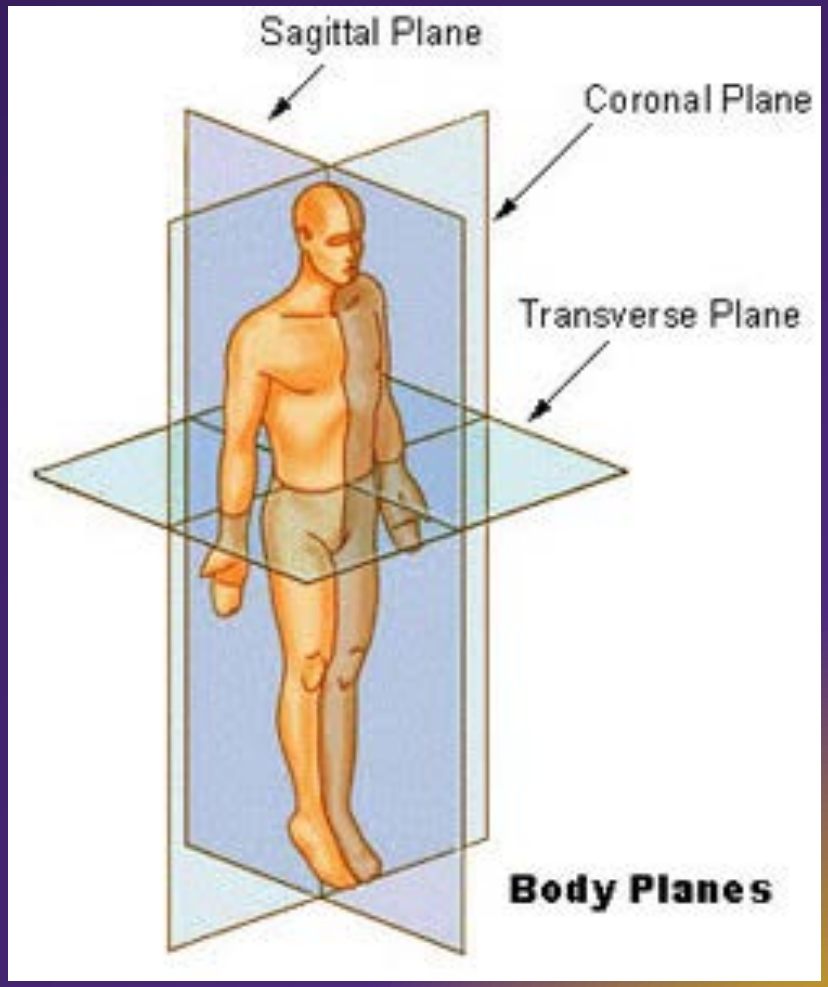
- Directional terms describe the positions of structures relative to other structures or locations in the body.



http://training.seer.cancer.gov/anatomy/body/terminology.html

Directional terms

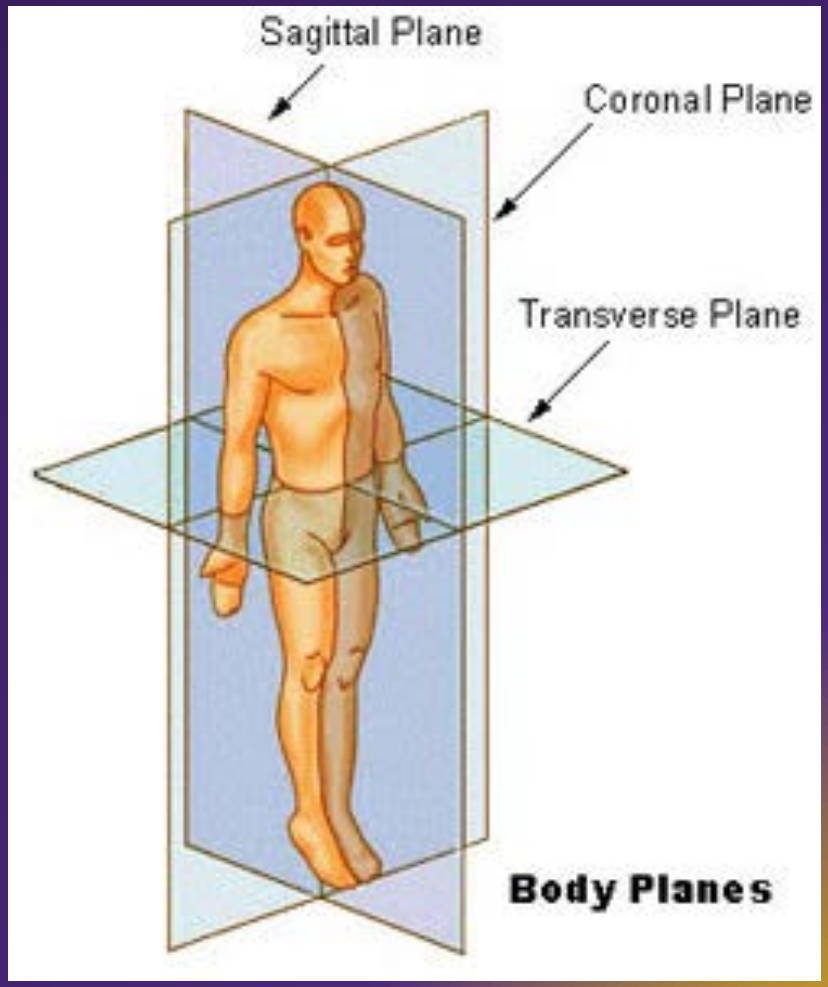
- **Superior or cranial** - toward the head end of the body; upper (example, the hand is part of the superior extremity).



http://training.seer.cancer.gov/anatomy/body/terminology.html

Directional terms

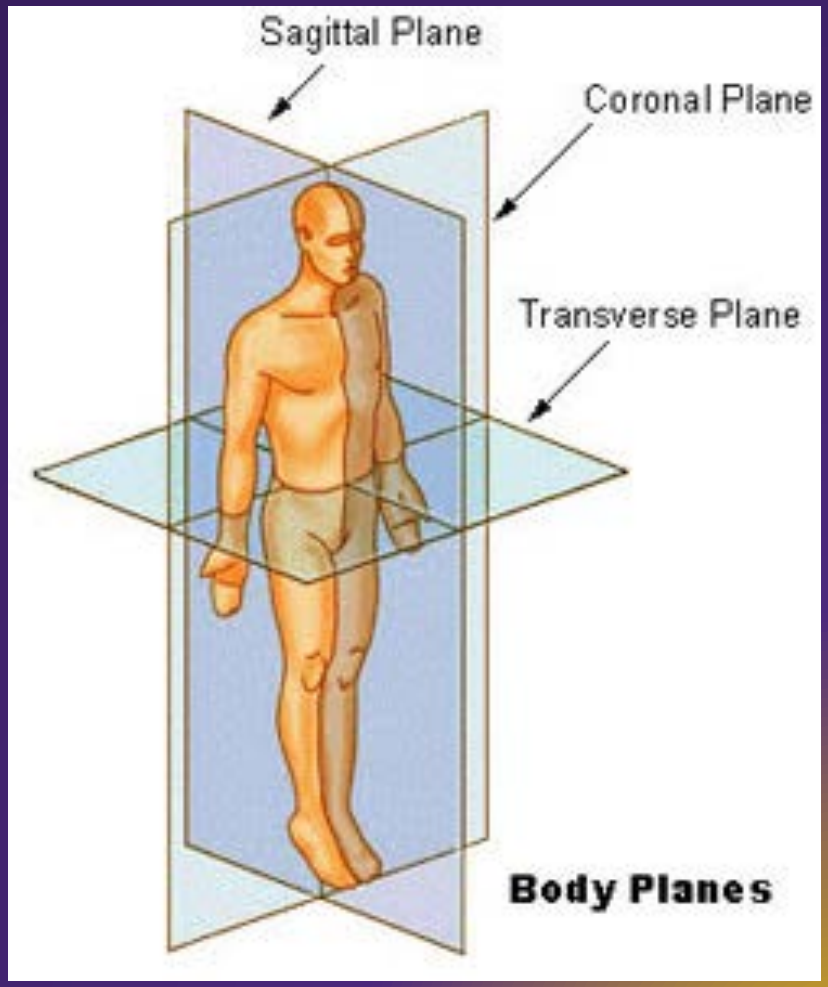
- **Inferior or caudal** - away from the head; lower (example, the foot is part of the inferior extremity).



http://training.seer.cancer.gov/anatomy/body/terminology.html

Directional terms

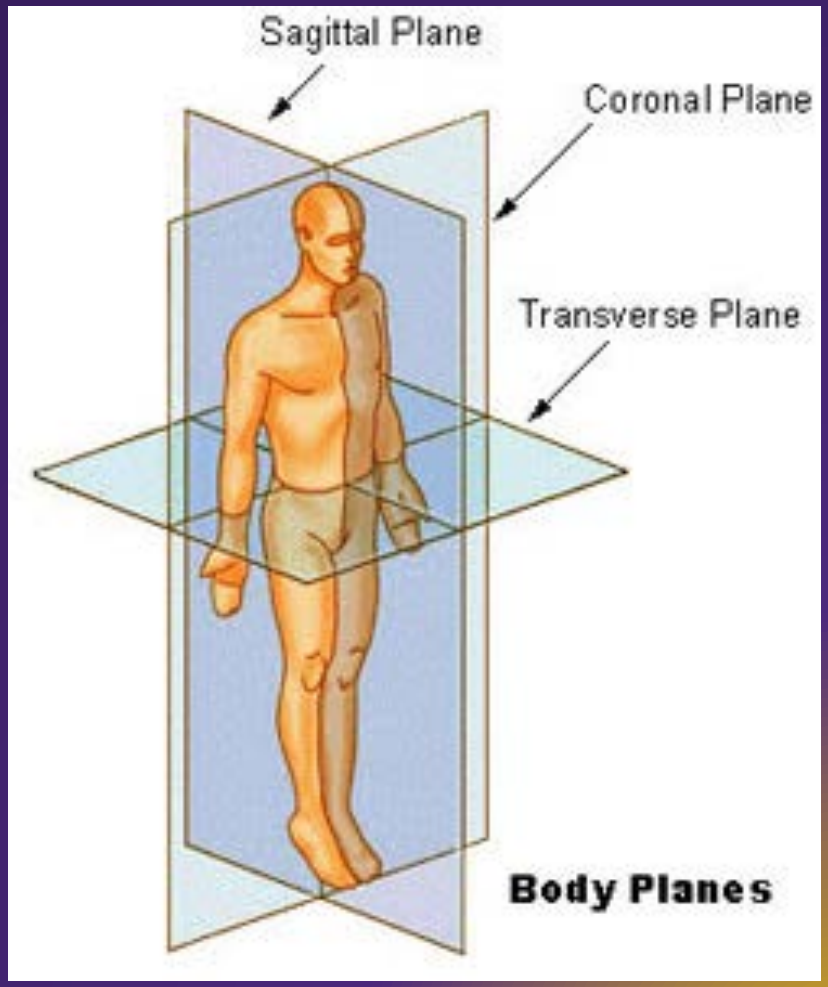
- **Anterior or ventral** - front (example, the kneecap is located on the anterior side of the leg).



http://training.seer.cancer.gov/anatomy/body/terminology.html

Directional terms

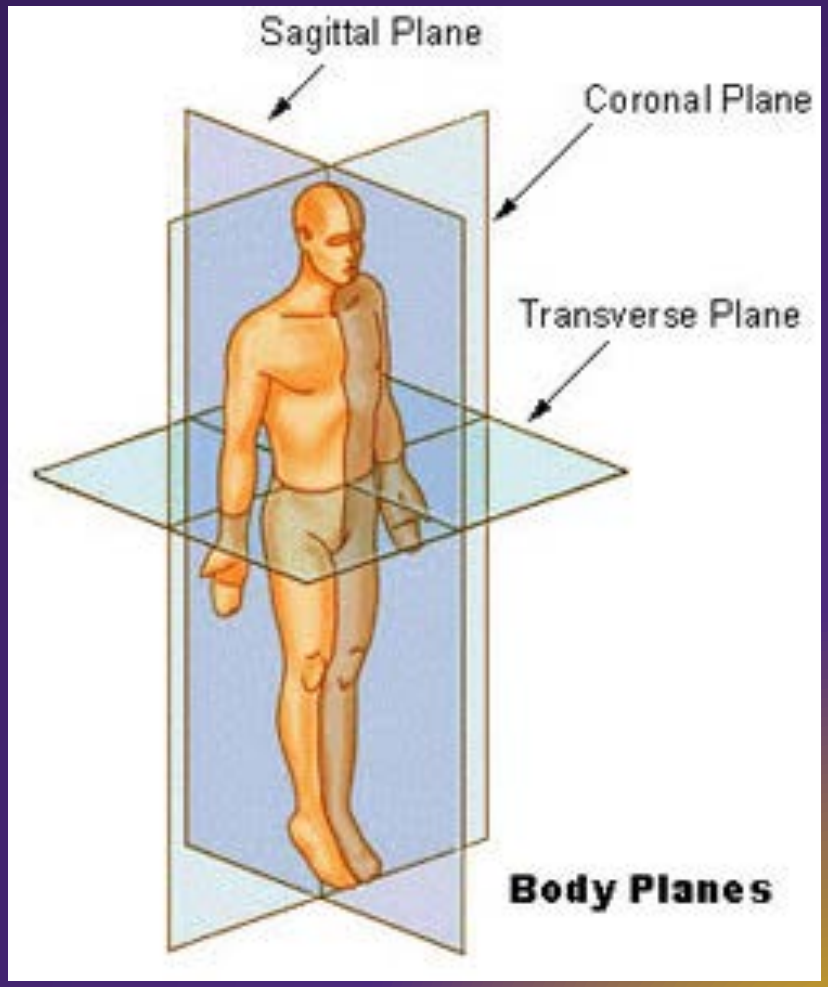
- **Posterior or dorsal** - back (example, the shoulder blades are located on the posterior side of the body).



http://training.seer.cancer.gov/anatomy/body/terminology.html

Directional terms

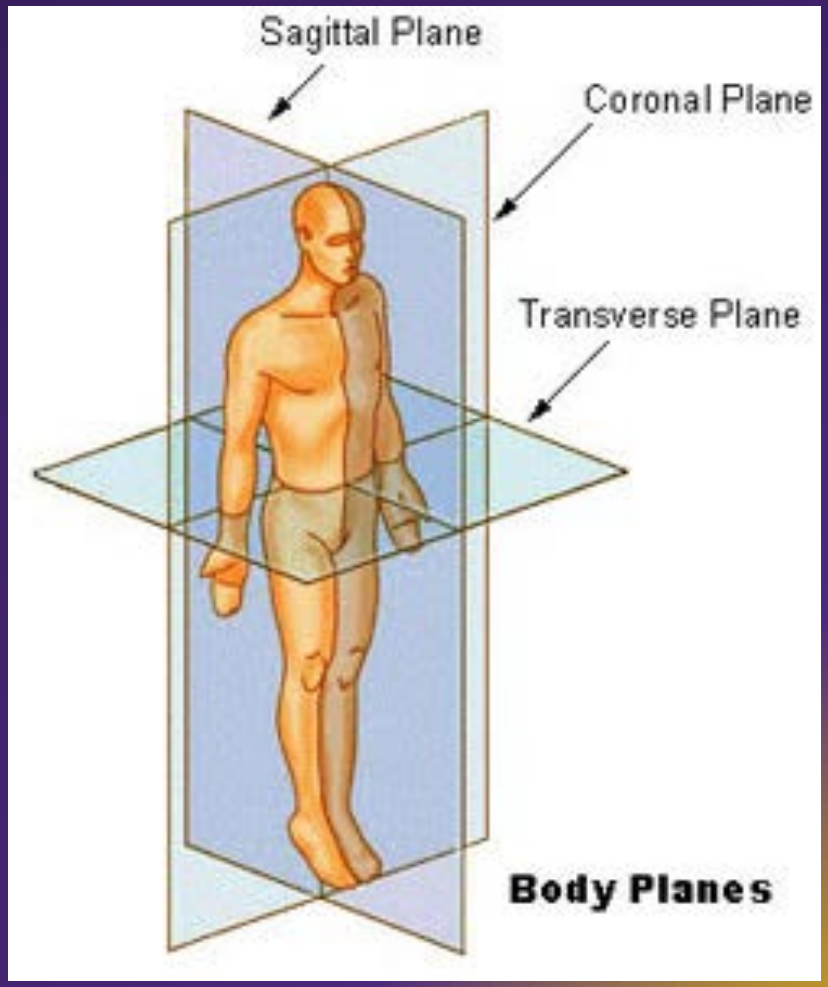
- **Medial** - toward the midline of the body (example, the middle toe is located at the medial side of the foot).



http://training.seer.cancer.gov/anatomy/body/terminology.html

Directional terms

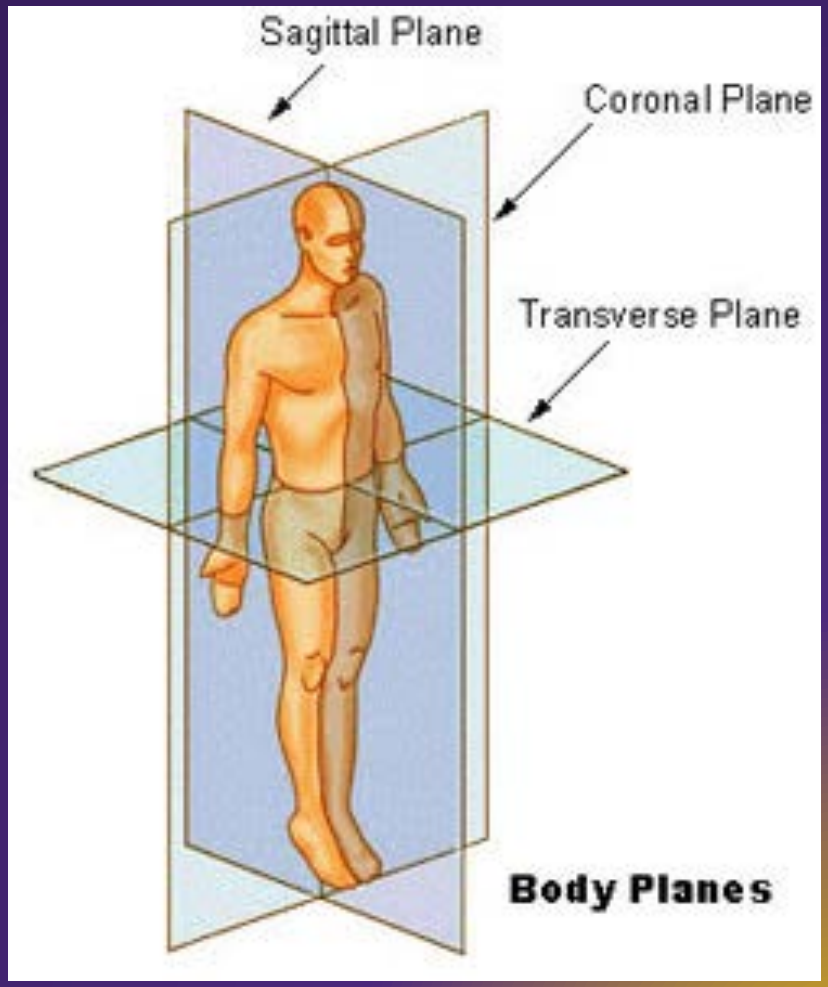
- **Lateral** - away from the midline of the body (example, the little toe is located at the lateral side of the foot).



http://training.seer.cancer.gov/anatomy/body/terminology.html

Directional terms

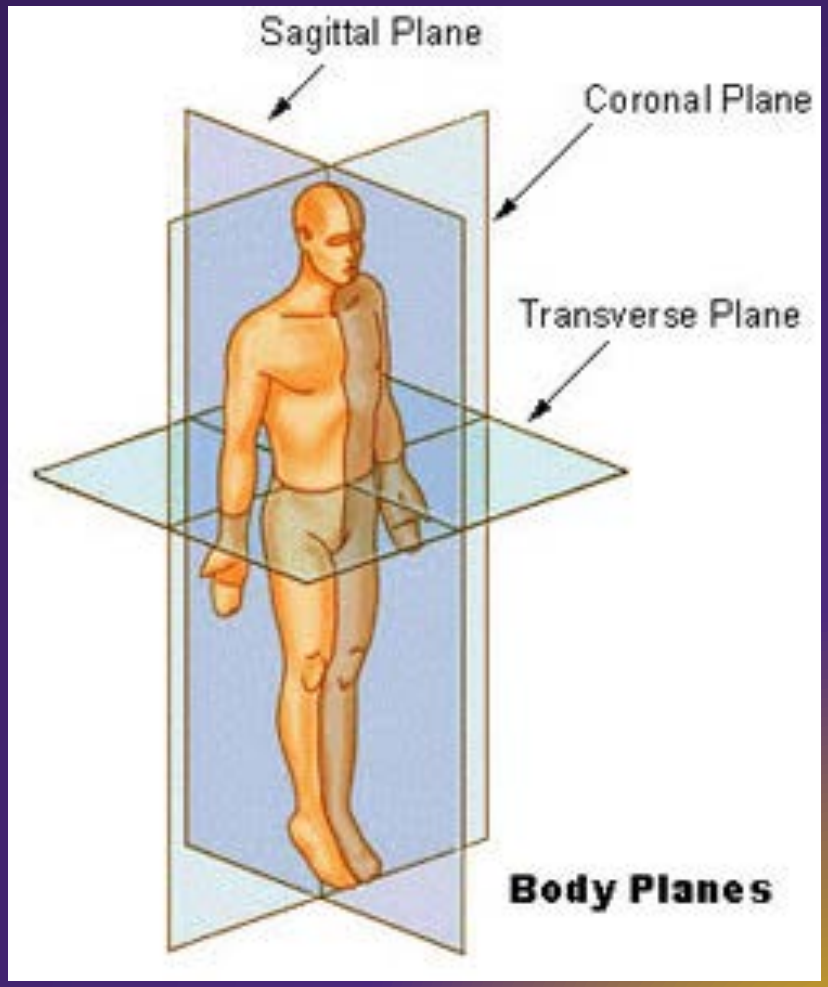
- **Proximal** - toward or nearest the trunk or the point of origin of a part (example, the proximal end of the femur joins with the pelvic bone).



http://training.seer.cancer.gov/anatomy/body/terminology.html

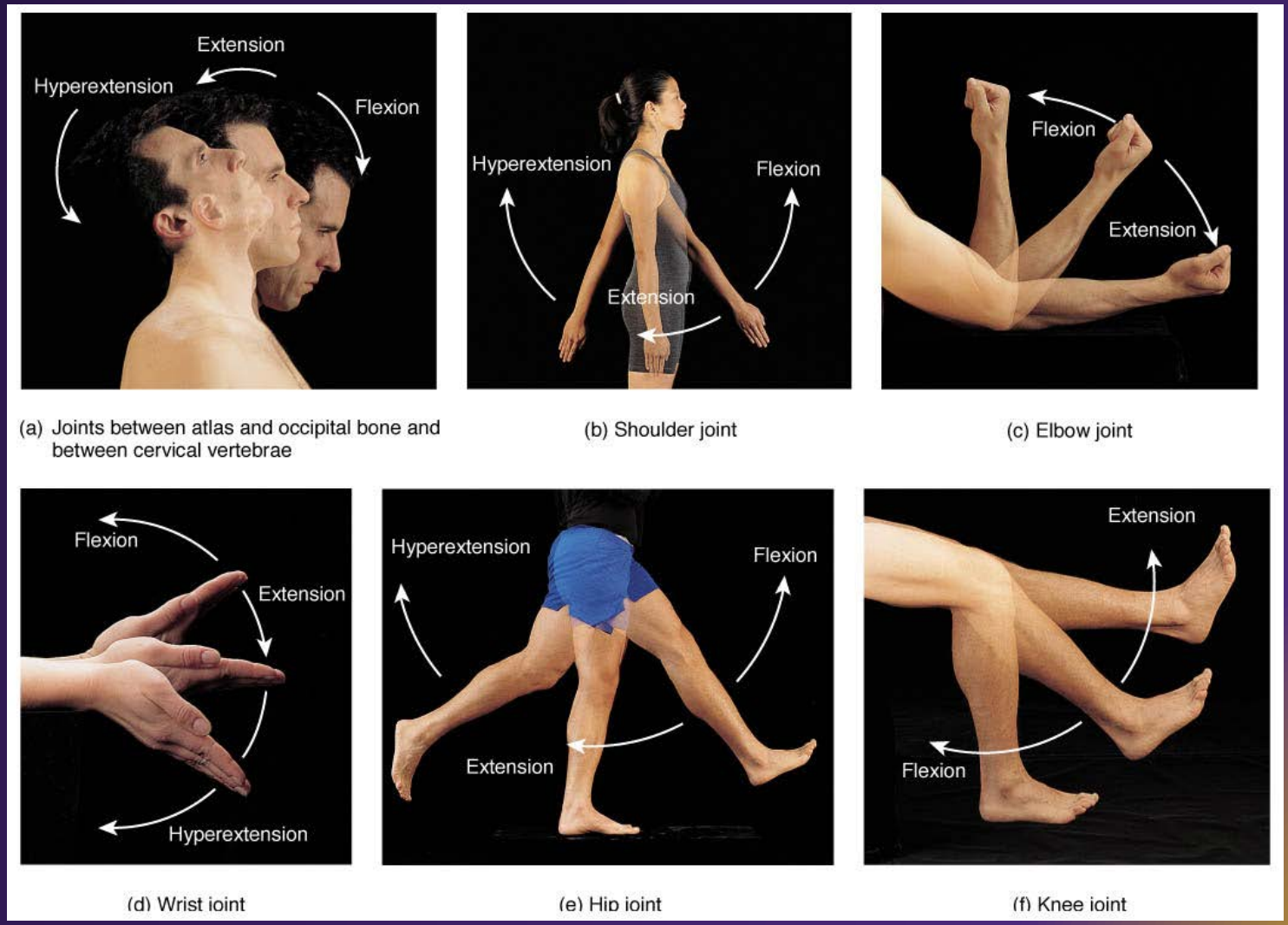
Directional terms

- **Distal** - away from or farthest from the trunk or the point or origin of a part (example, the hand is located at the distal end of the forearm).



http://training.seer.cancer.gov/anatomy/body/terminology.html

Joint motion: flexion/extension



(a) Joints between atlas and occipital bone and between cervical vertebrae

(b) Shoulder joint

(c) Elbow joint

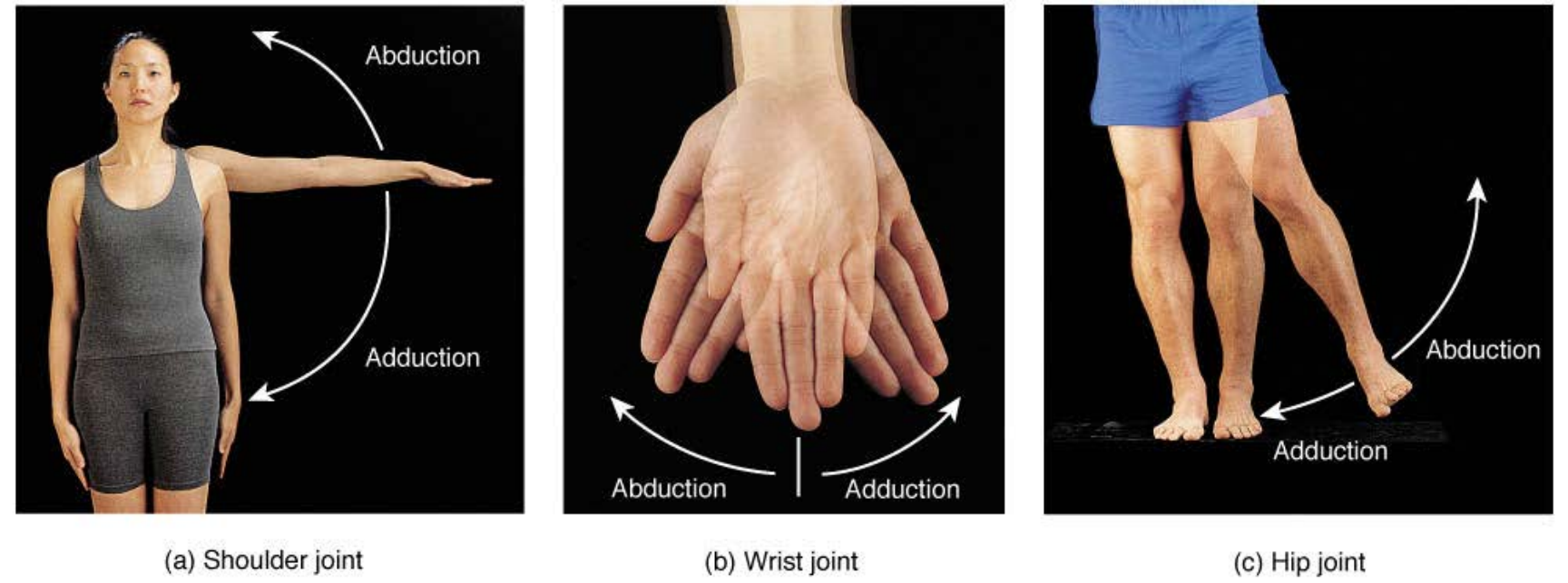
(d) Wrist joint

(e) Hip joint

(f) Knee joint

http://classroom.sdmesa.edu/eschmid/chapter7-zoo145.htm

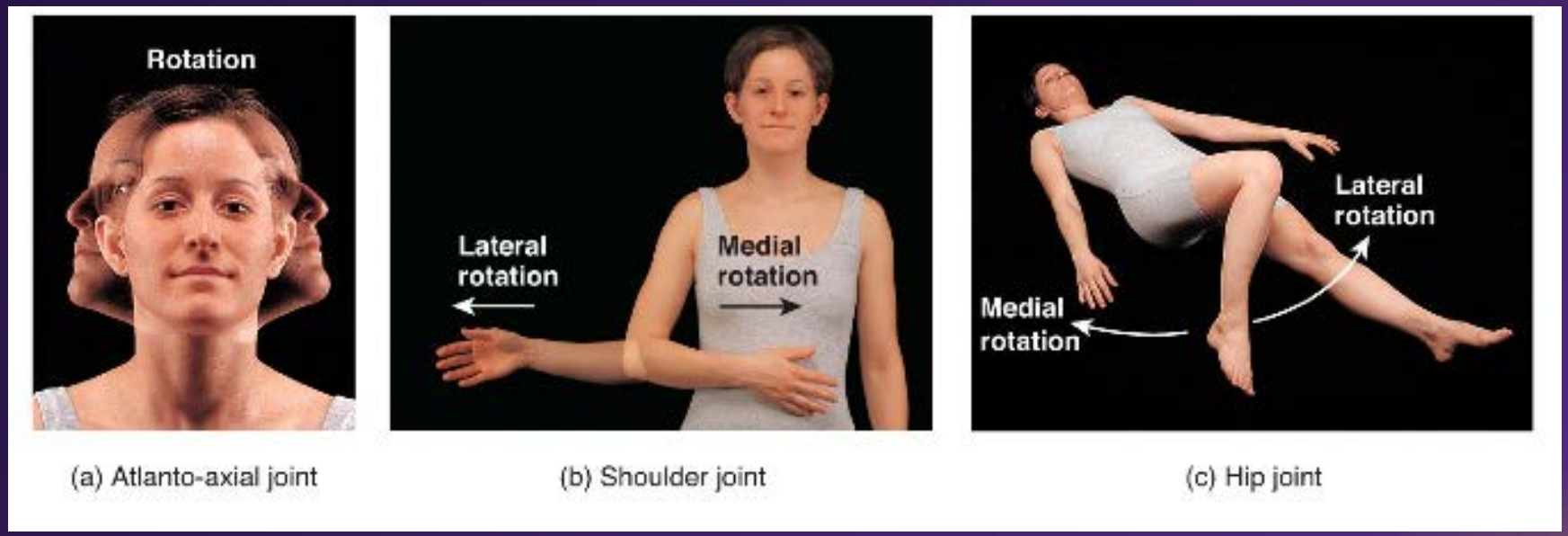
Joint motion: abduction/adduction



(a) Shoulder joint (b) Wrist joint (c) Hip joint

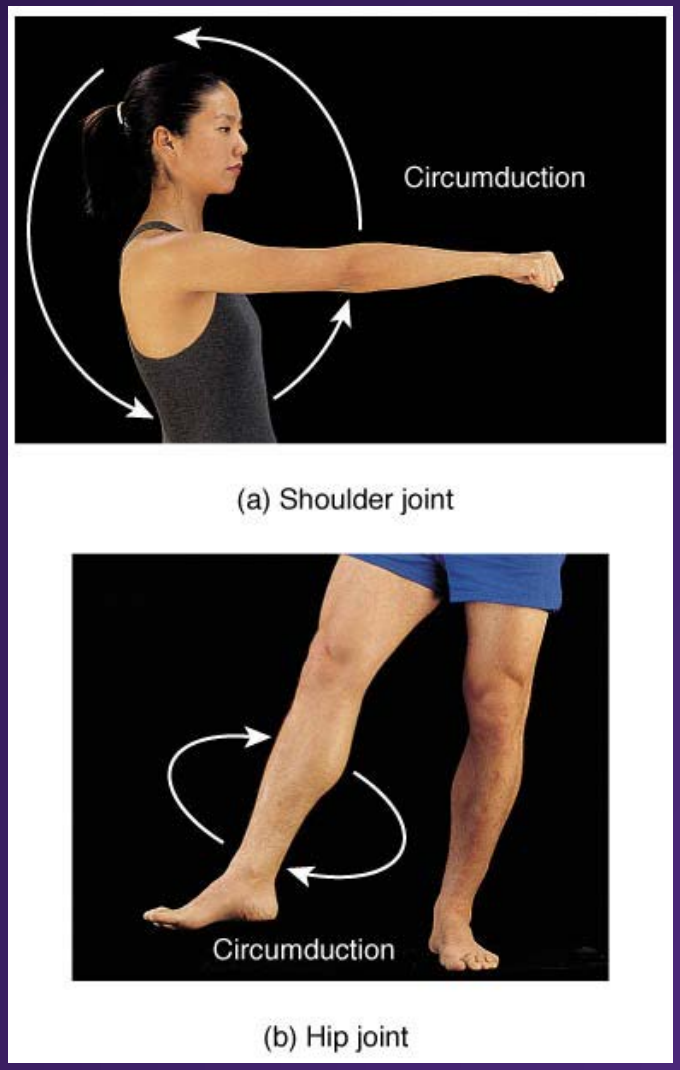
http://classroom.sdmesa.edu/eschmid/chapter7-zoo145.htm

Joint motion: rotation



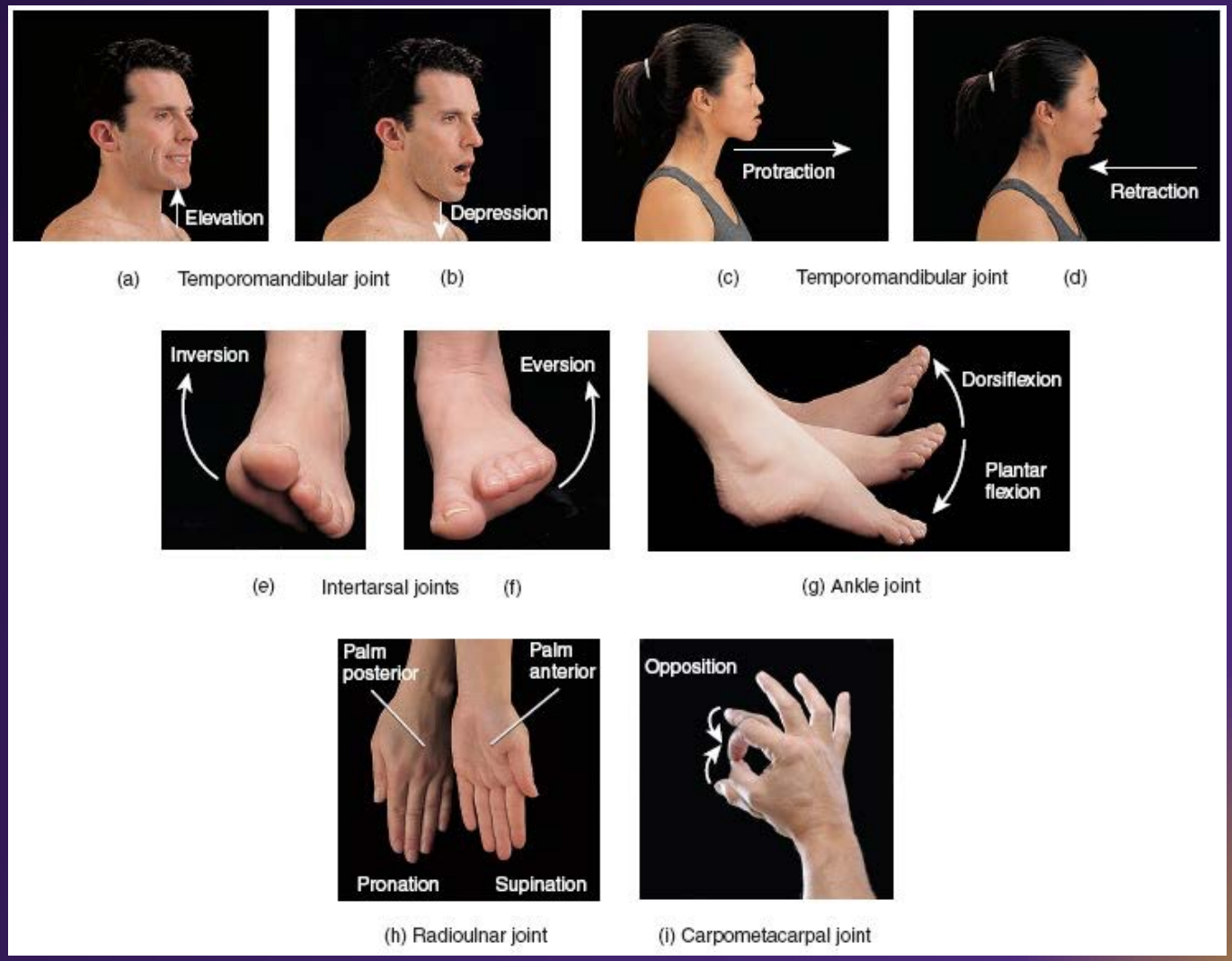
https://www.studyblue.com/notes/note/n/chapter-9-sub--movement-of-synovial-joints-w-images/deck/8107735

Joint motion: circumduction



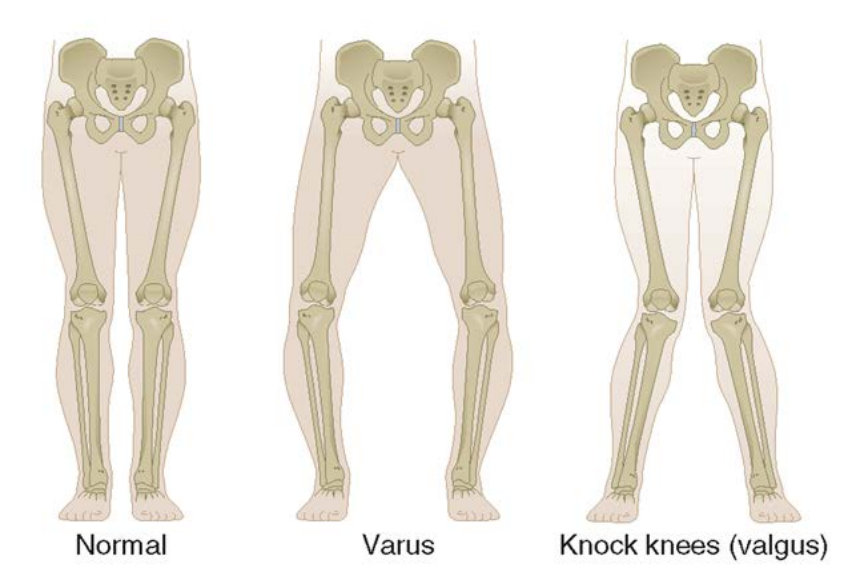
http://classroom.sdmesa.edu/eschmid/chapter7-zoo145.htm

Joint motion: special motions

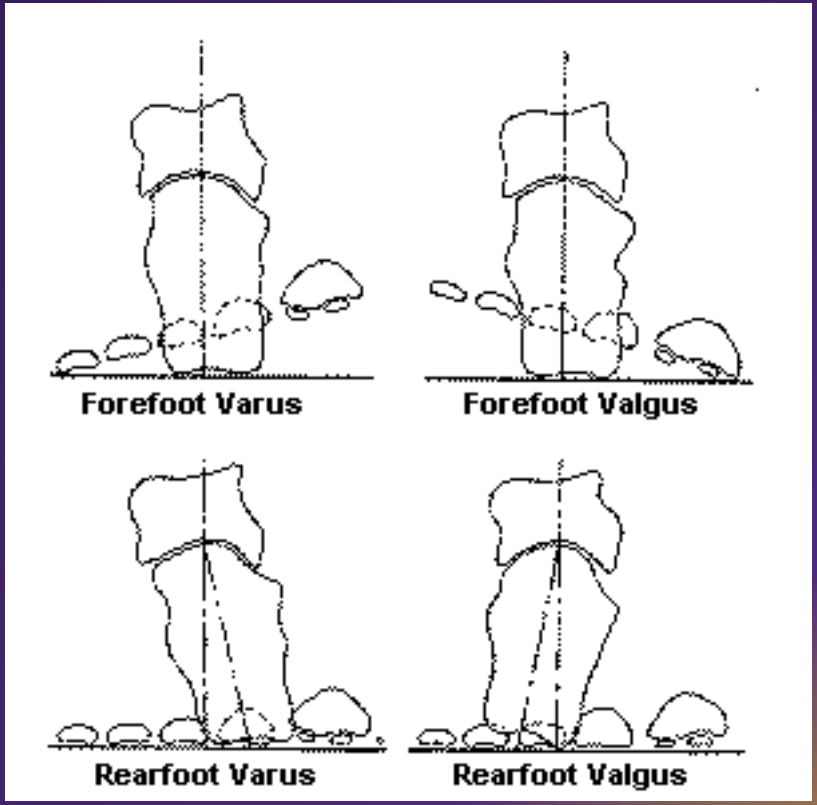


http://higheredbcs.wiley.com/legacy/college/tortora/0470565101/hearthis_ill/pap13e_ch09_illustr_audio_mp3_am/simulations/hear/synovial_joint_special_movements.html

Joint position: varus/valgus



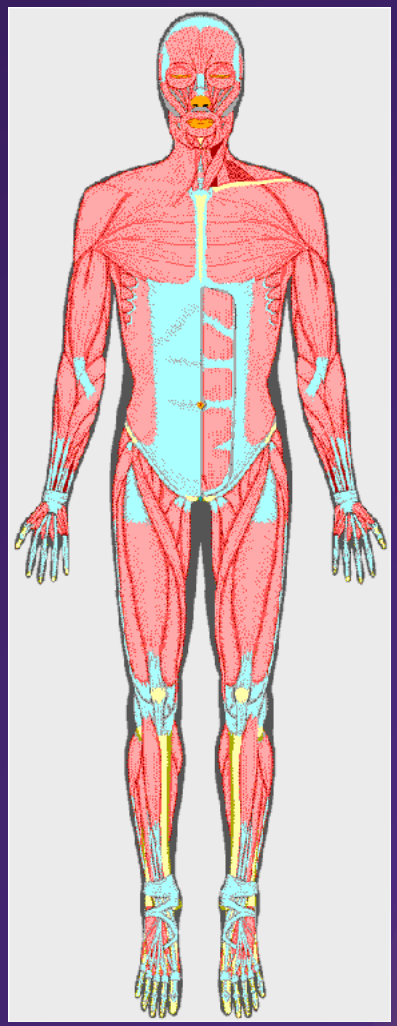
http://www.compedgept.com/blog/knee-pain-and-running-common-and-misunderstood



http://bikedynamics.co.uk/fit01.htm

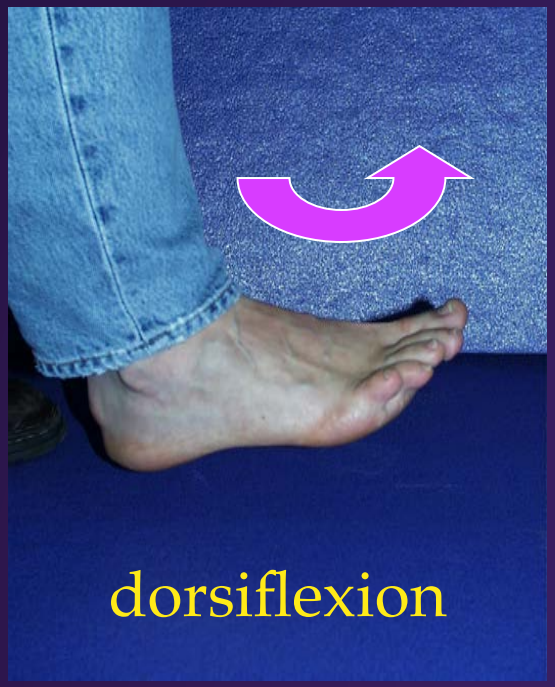
Primary Musculoskeletal Structures

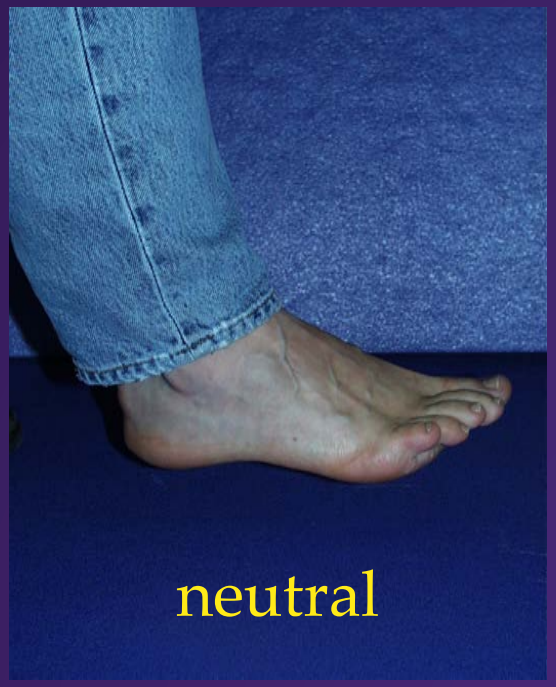
- Bone
- Muscle
- Ligament
- Tendon
- Cartilage
- Others: (disc, meniscus, labrum, plantar fat)

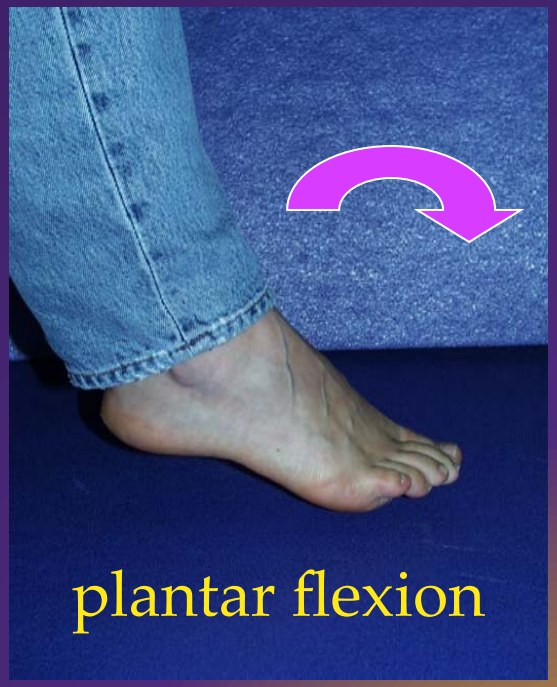


Foot: motion

sagittal plane







Foot: motion

frontal plane

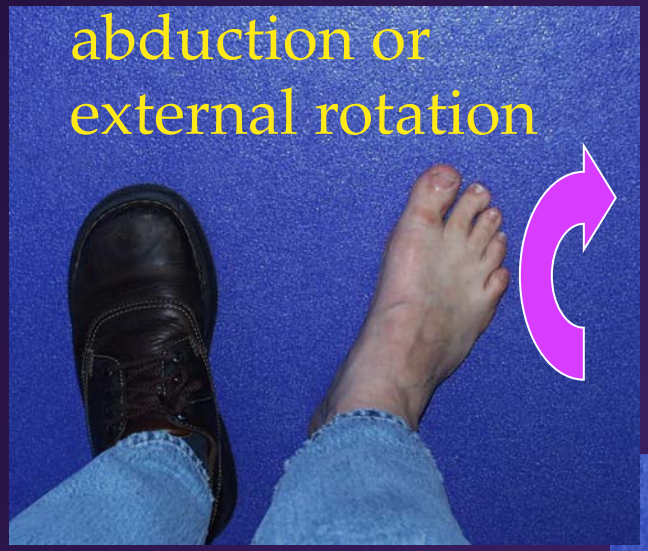
eversion or valgus

neutral

inversion or varus

Foot: motion

transverse plane



Foot: motion

- Pronation
  - dorsiflexion
  - abduction/external rotation
  - eversion/valgus
  - flat foot
- Supination
  - plantar flexion
  - adduction/internal rotation
  - inversion/varus
  - high arched foot

- issues with pronation and supination:
  - works well for hand, but not for foot due to 90˚ ankle
  - neutral position vs. anatomic position
  - in some texts, refers to pure frontal plane motion
  - in flat foot (hyperpronated foot or pes planus), forefoot actually supinated relative to hindfoot

Foot and ankle anatomical terms

- Discuss the foot with ankle at 90˚ (i.e., neutral position) and not with the ankle plantar flexed (i.e., anatomical position), except if we are taking about the toes.
- Avoid use of pronation/supination (see last slide); instead discuss motion/position in specific cardinal planes.
- Coronal rather than frontal (minor point)

Foot and ankle anatomical terms

- Sagittal plane motion at all joints is referred to as dorsiflexion/plantar flexion.
- Hindfoot (calcaneus to tibia, calcaneus to talus, talus to tibia) ankle at 90˚
  - coronal plane motion = inversion/eversion (and position varus/valgus)
  - transverse plane motion = adduction/abduction or internal/external rotation

Foot and ankle anatomical terms

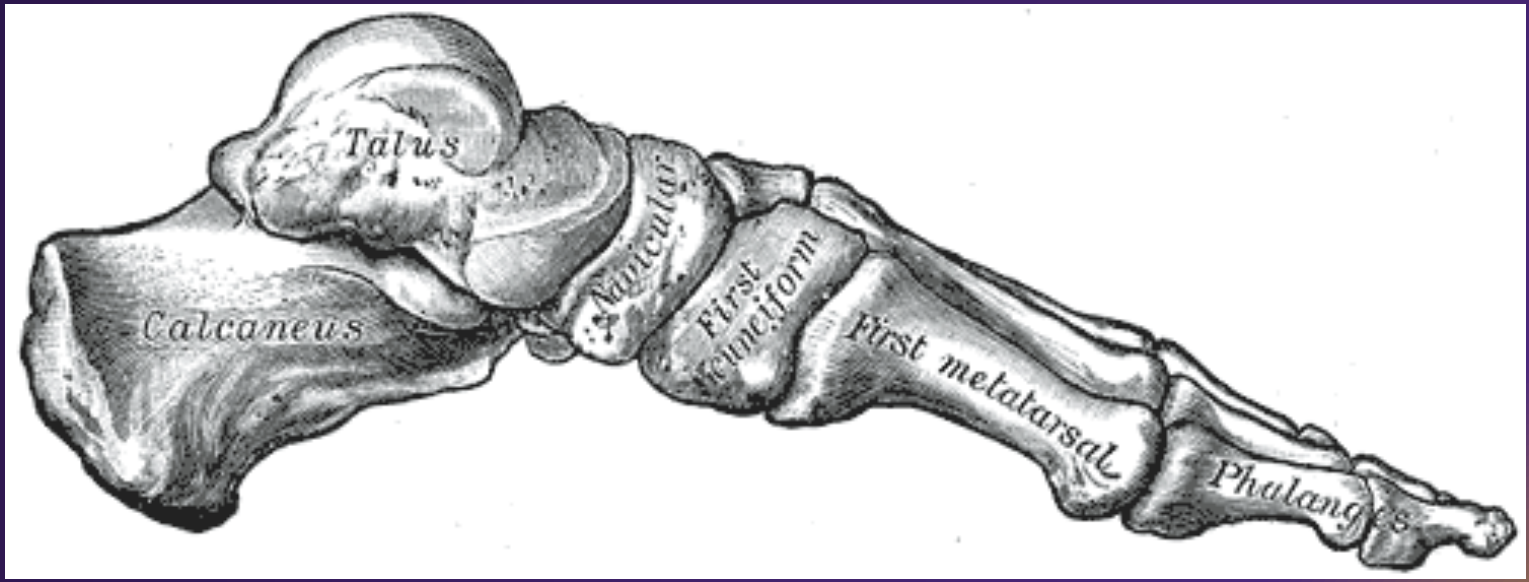
- Forefoot to hindfoot (first metatarsal to talus) ankle at 90˚
  - coronal plane motion = inversion/eversion (and position varus/valgus)
  - transverse plane motion = adduction/abduction or internal/external rotation
- Hallux to first metatarsal
  - coronal plane motion = inversion/eversion
  - transverse plane motion = varus/valgus
    - hallux valgus = bunion

Foot and ankle anatomical terms

- Use hindfoot not rearfoot
- Use neutrally aligned not rectus
- Can not say “pes planus foot type”, as that literally means “foot flat foot type”. Say “pes planus” or “planus foot type”.

Foot: bony anatomy

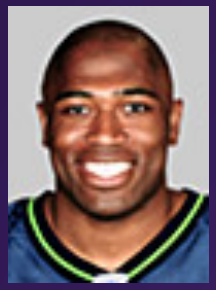
medial column: calcaneus, talus, navicular, medial cuneiform, first metatarsal



Foot: bony anatomy

lateral column: calcaneus, cuboid, fifth metatarsal

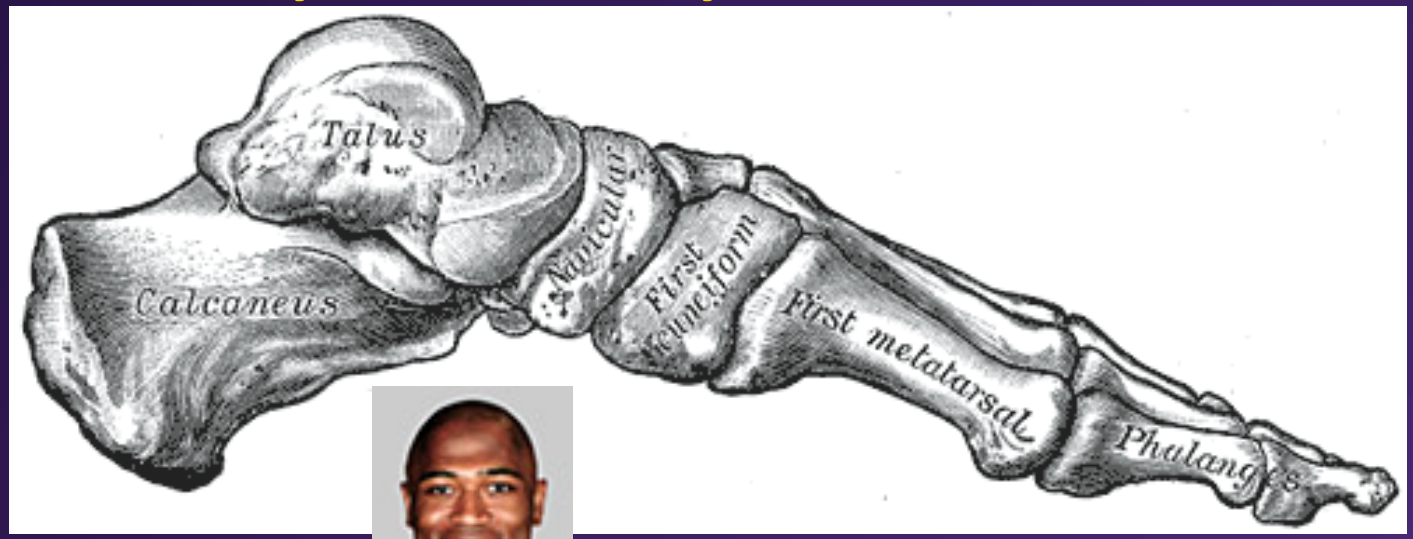
Foot: bony anatomy

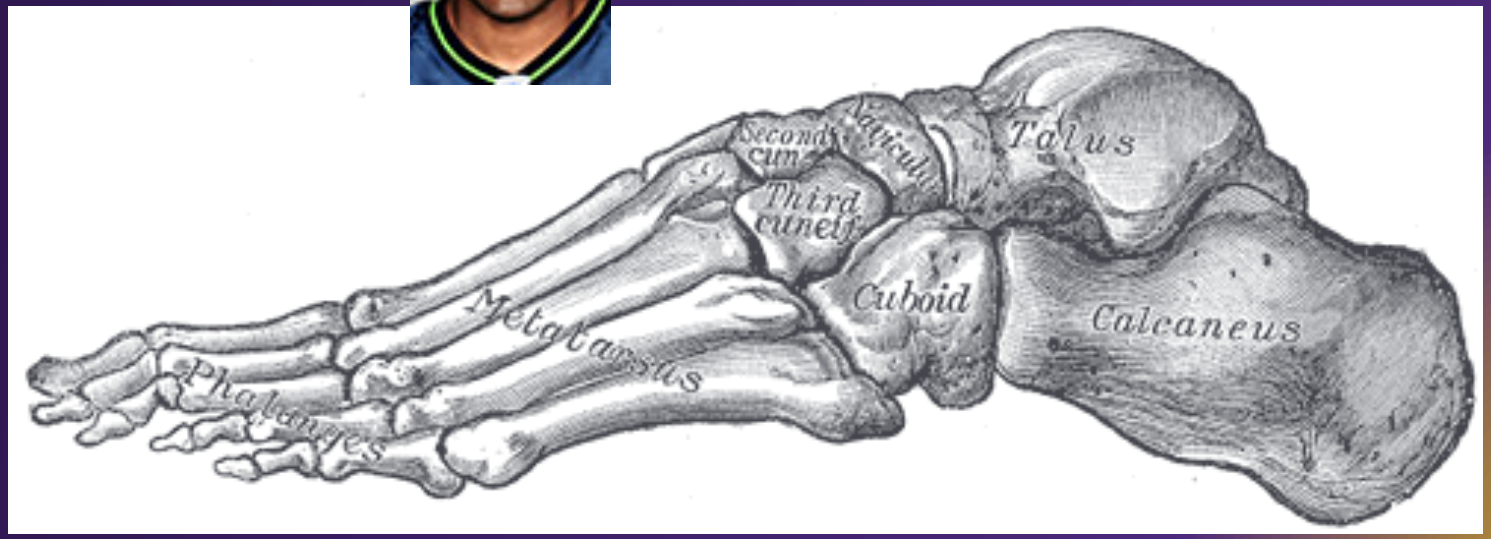


Coach Mike Holmgren said Monday that a bone scan revealed Alexander sustained a "small crack" and "displaced fracture" on a non-weight-bearing bone in his foot sometime during the Seahawks' 42-30 win over the New York Giants on Sunday.

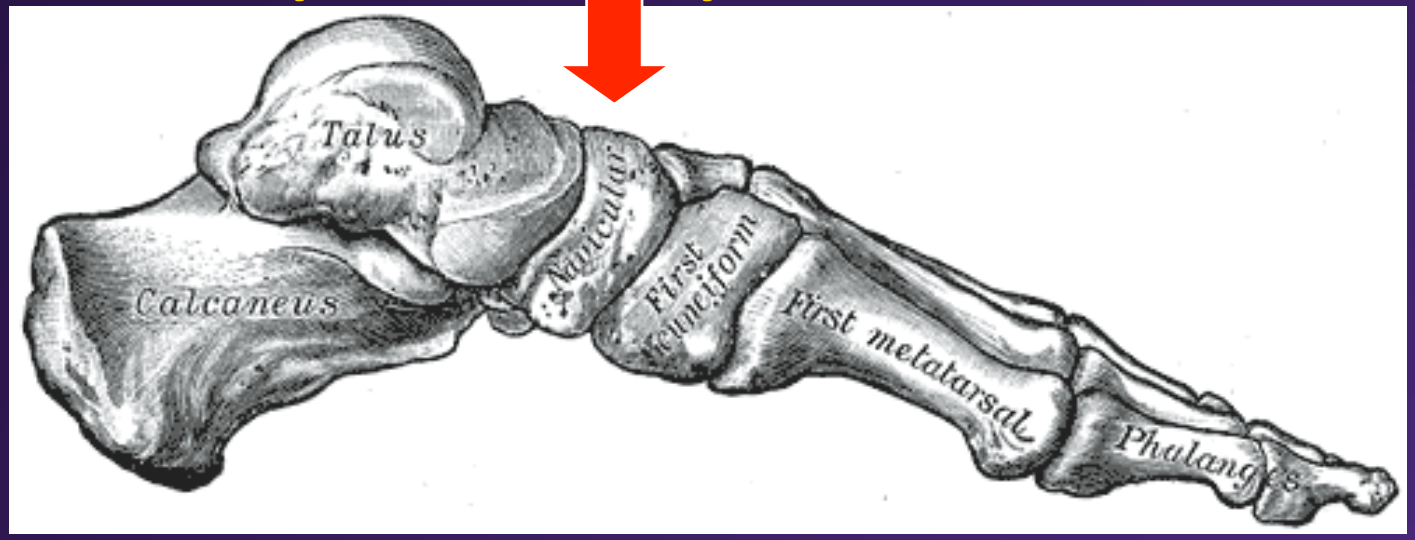
http://sports.espn.go.com/nfl/news/story?id=2602571

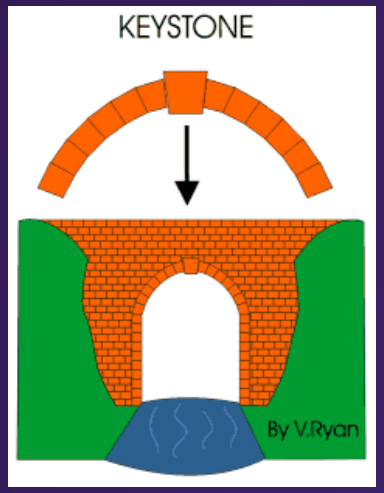
Foot: bony anatomy





Foot: bony anatomy



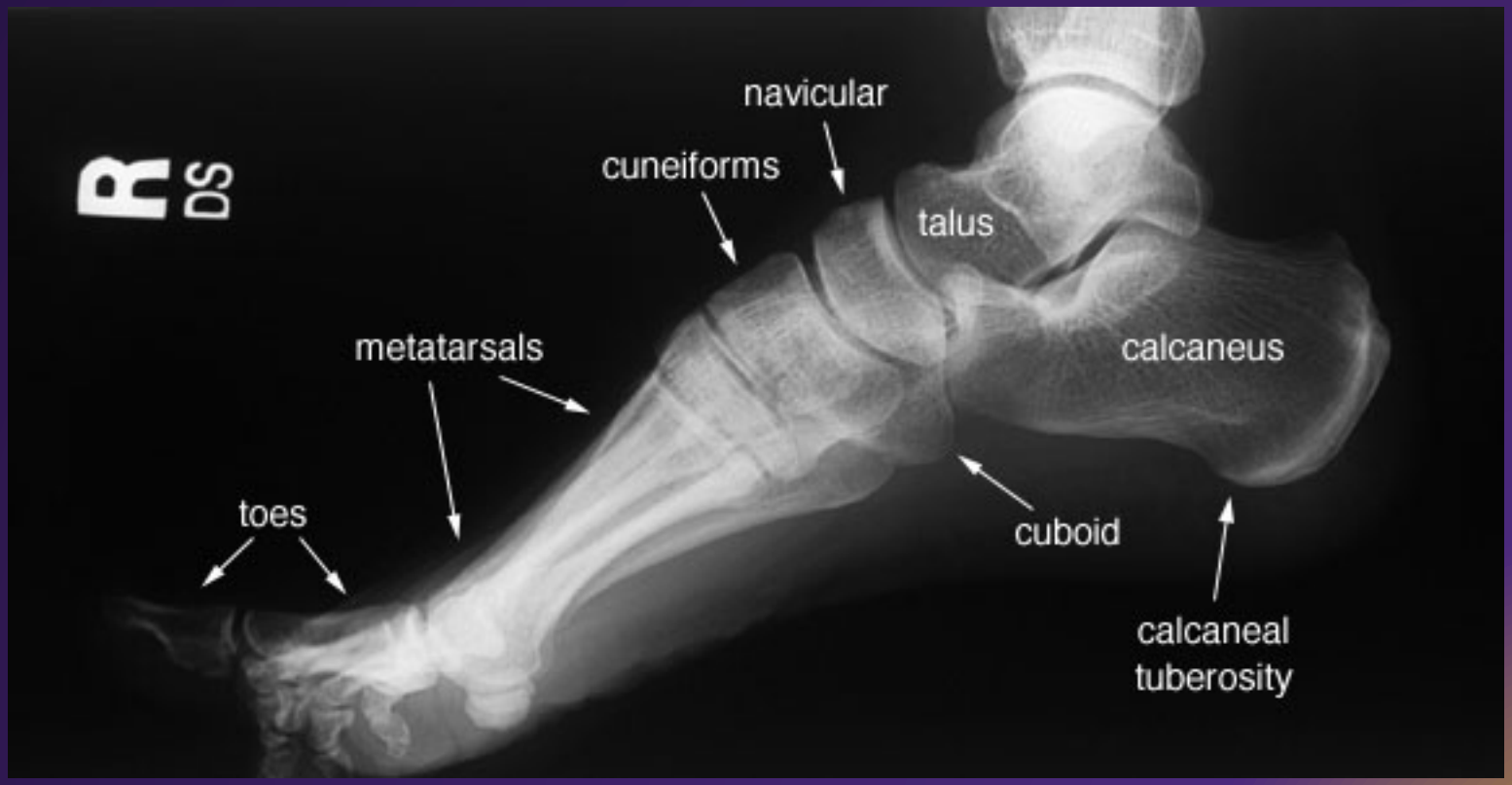



POND DE GARD (South of France)

http://www.technologystudent.com/struct1/arch1.htm

Foot: bony anatomy

medial/lateral X-ray



Radiographic Anatomy of the Skeleton, Michael L. Richardson, M.D.
http://www.rad.washington.edu/radanat/Foot.html

Foot: bony anatomy

medial/lateral X-ray

Radiographic Anatomy of the Skeleton, Michael L. Richardson, M.D.
http://www.rad.washington.edu/radanat/Foot.html

Foot: bony anatomy

anterior/posterior
or dorsal/plantar
X-ray

Radiographic Anatomy of the Skeleton,
Michael L. Richardson, M.D.
http://www.rad.washington.edu/radanat/Foot.html

Foot: bony anatomy

anterior/posterior
or dorsal/plantar
X-ray

Radiographic Anatomy of the Skeleton,
Michael L. Richardson, M.D.
http://www.rad.washington.edu/
radanat/Foot.html

Foot: bony anatomy

oblique
X-ray

Radiographic Anatomy of the Skeleton,
Michael L. Richardson, M.D.
http://www.rad.washington.edu/radanat/Foot.html

Foot: bony anatomy

oblique
X-ray

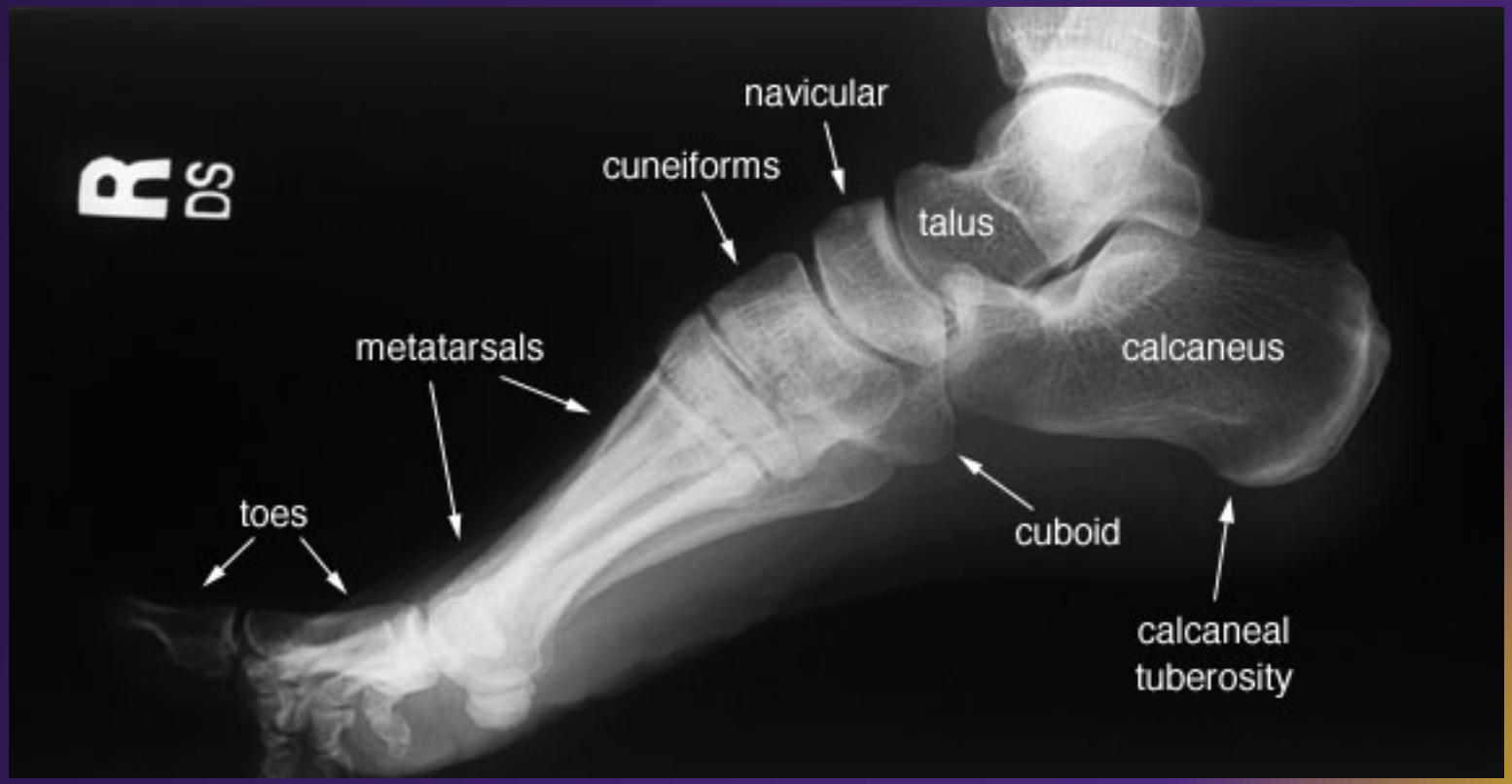
Radiographic Anatomy of the Skeleton,
Michael L. Richardson, M.D.
http://www.rad.washington.edu/radanat/Foot.html

Foot: bony anatomy (n=28)

- hindfoot: calcaneus, talus, (tibia, fibula)
- midfoot: navicular, cuboid, and medial, intermediate and lateral cuneiform
- forefoot: metatarsals (n=5) and phalanges (n=14)
- ¼ of bones in the body (n=206)

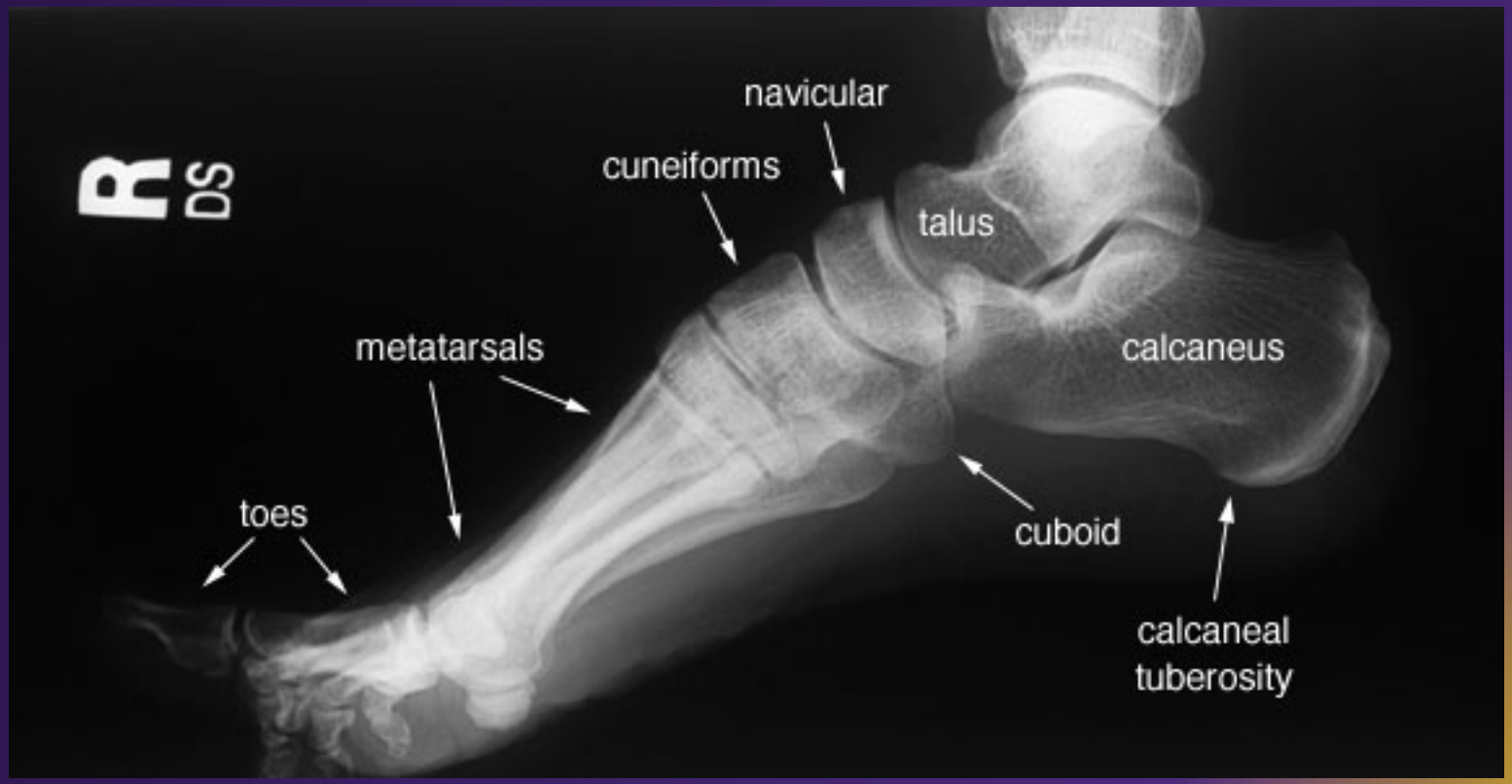
Foot: joints (n=19 major, n=57 total)

- talocrural (ankle)
- talocalcaneal (subtalar)



Foot: joints (n=19 major, n=57 total)

- talonavicular (Chopart's)
- calcaneocuboid (Chopart's)

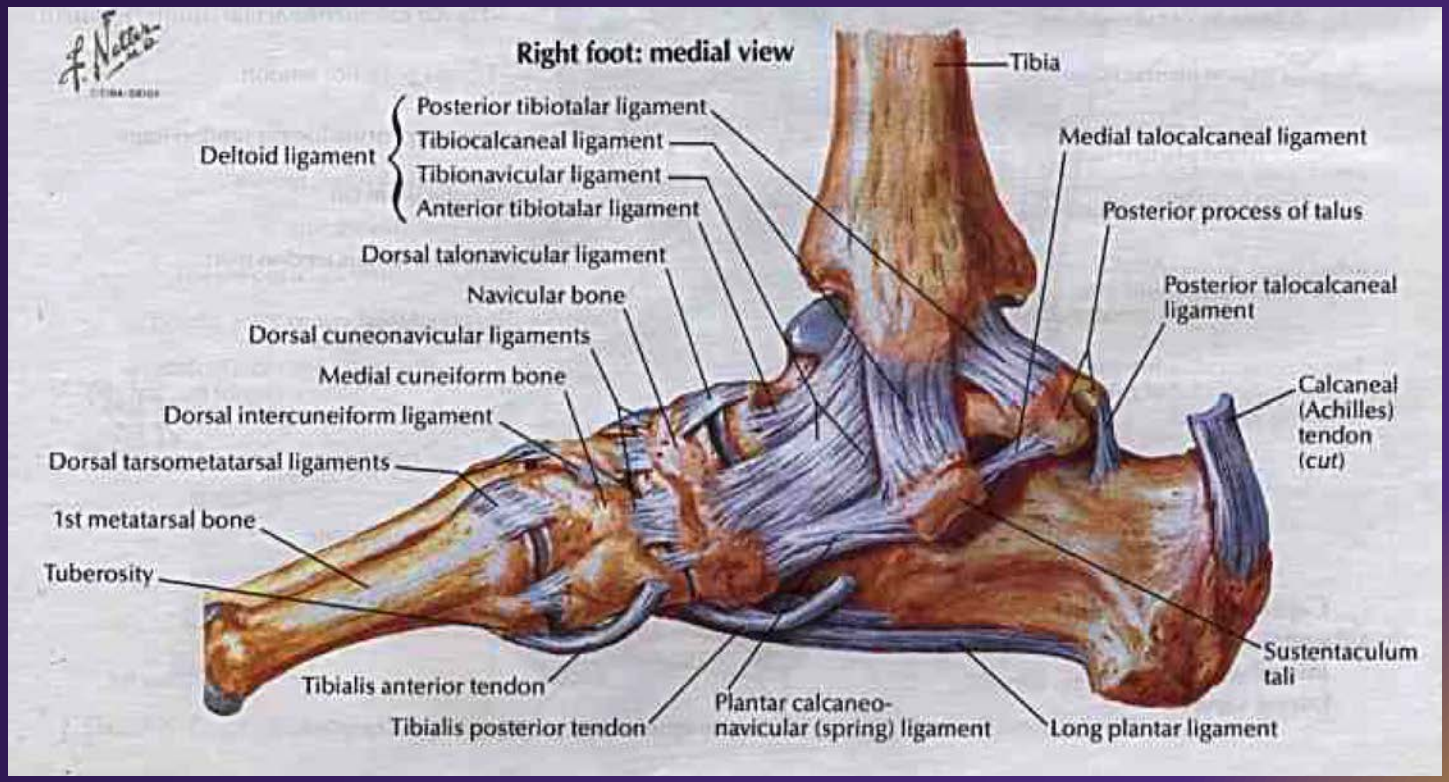


Foot: joints (n=19 major,

- tarsometatarsal (Lisfranc's)
- first metatarsophalangeal

Foot: ligaments (n=108)

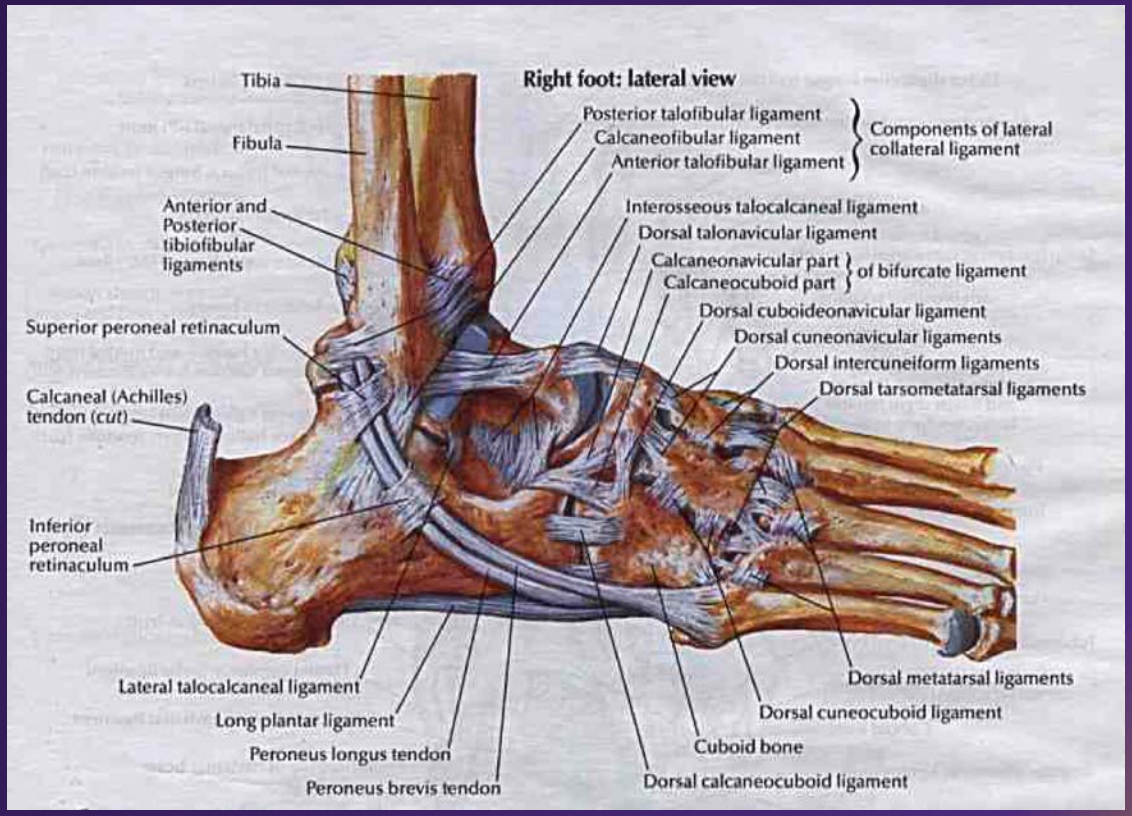
medial ligaments: deltoid



Frank Netter, Atlas of Human Anatomy

Foot: ligaments (n=108)

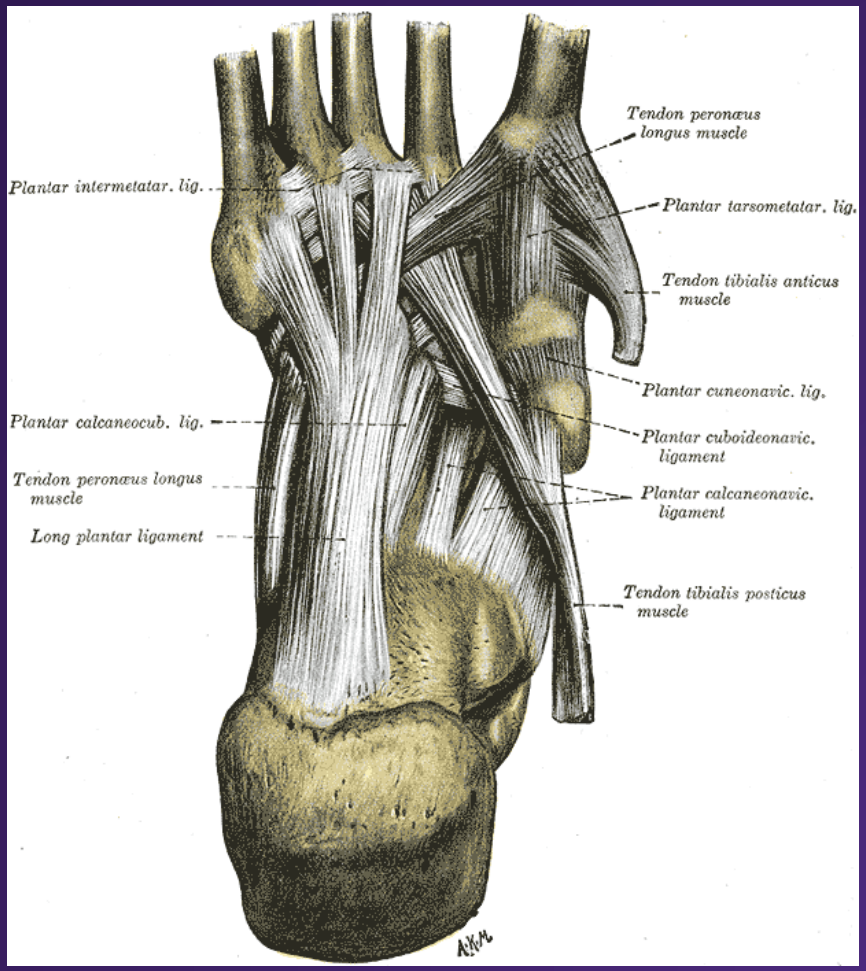
lateral ligaments: lateral collateral ligament



Frank Netter, Atlas of Human Anatomy

Foot: ligaments (n=108)

plantar ligaments: long plantar and spring

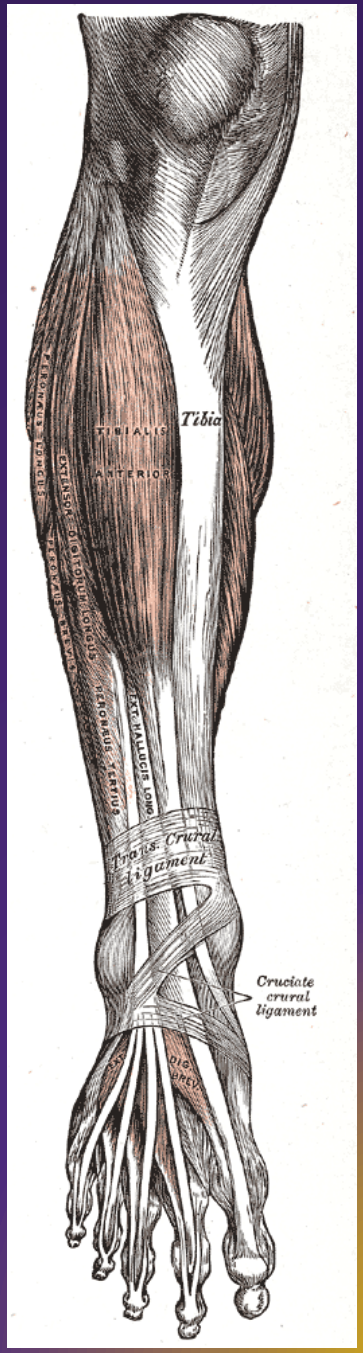


Gray's Anatomy, www.bartleby.com/107/

Foot: extrinsic muscles (n=12)

anterior extrinsic muscles (extra credit)

- tibialis anterior
- extensor hallucis longus
- extensor digitorum longus
- peronius brevis
- peronius longus
- peronius tertius

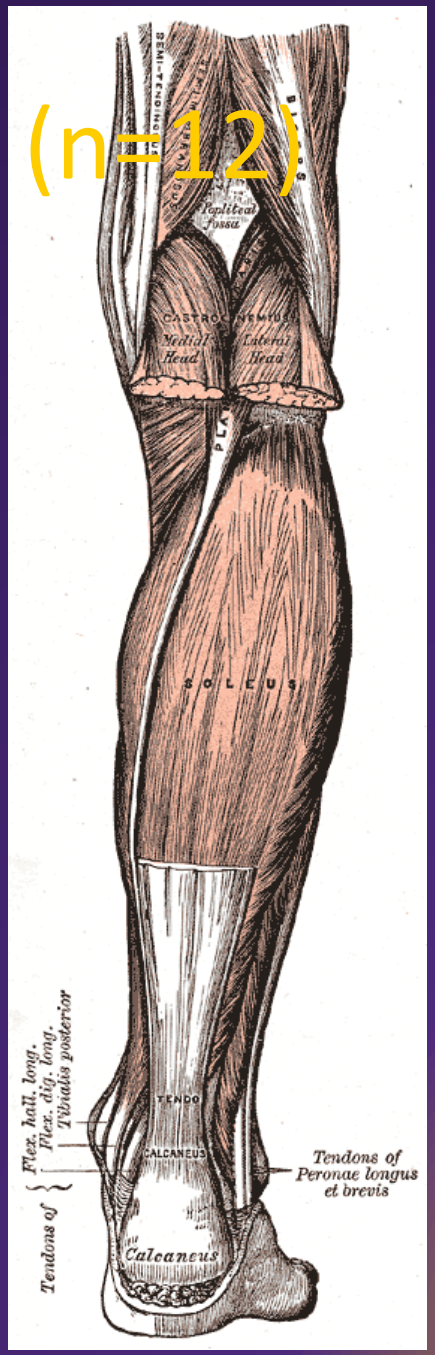


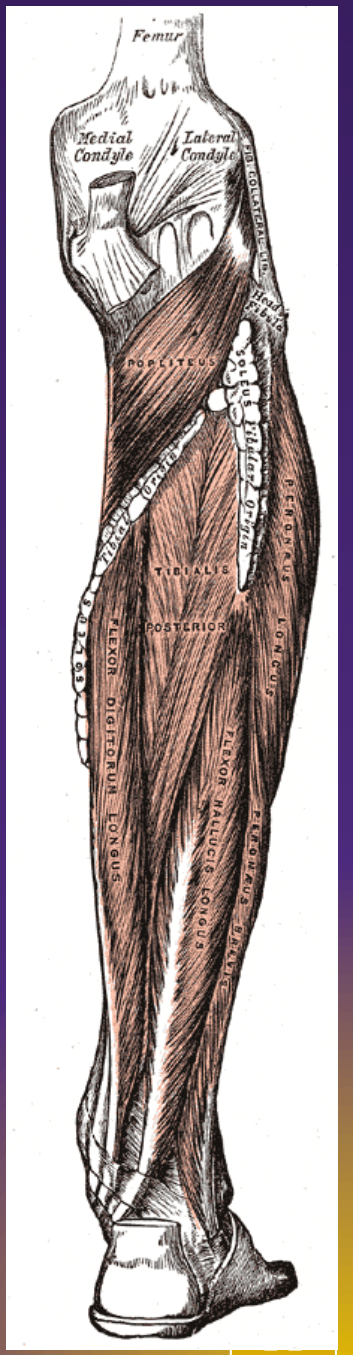
Gray's Anatomy, www.bartleby.com/107/

Foot: extrinsic muscles (n=12)

posterior extrinsic muscles (extra credit)

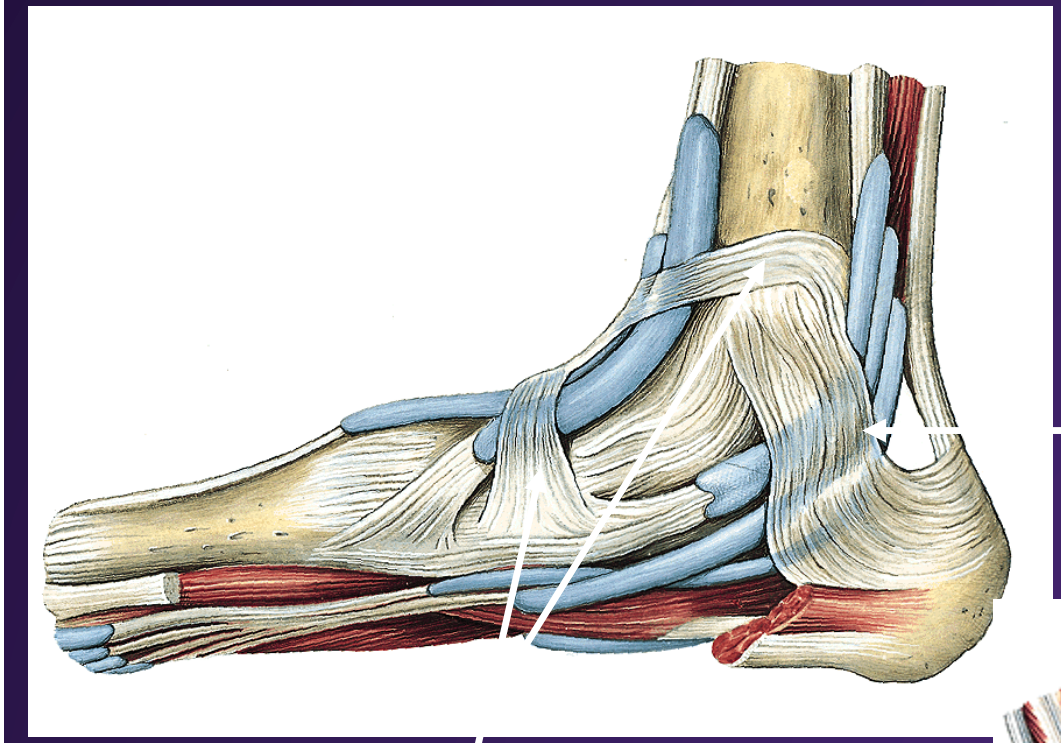
- soleus
- gastronemius
- tibialis posterior
- flexor hallucis longus
- flexor digitorum longus
- plantaris





Gray's Anatomy, www.bartleby.com/107/

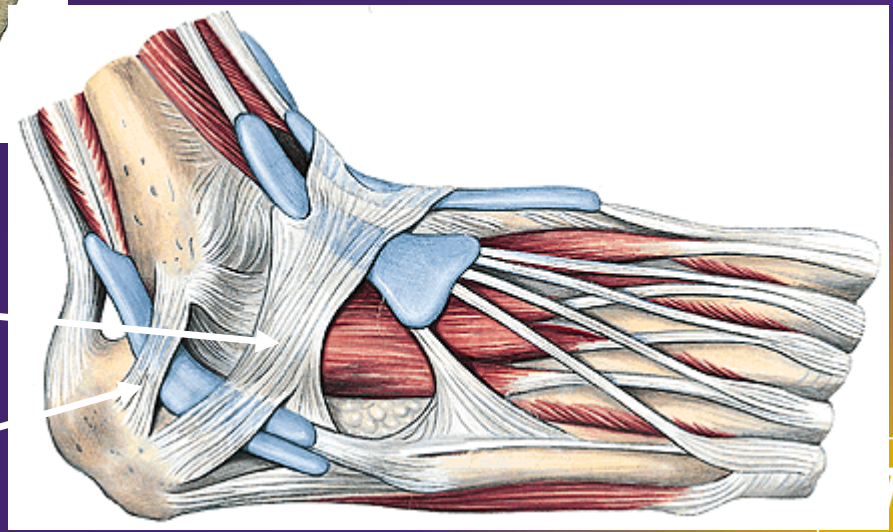
Foot: retinaculum



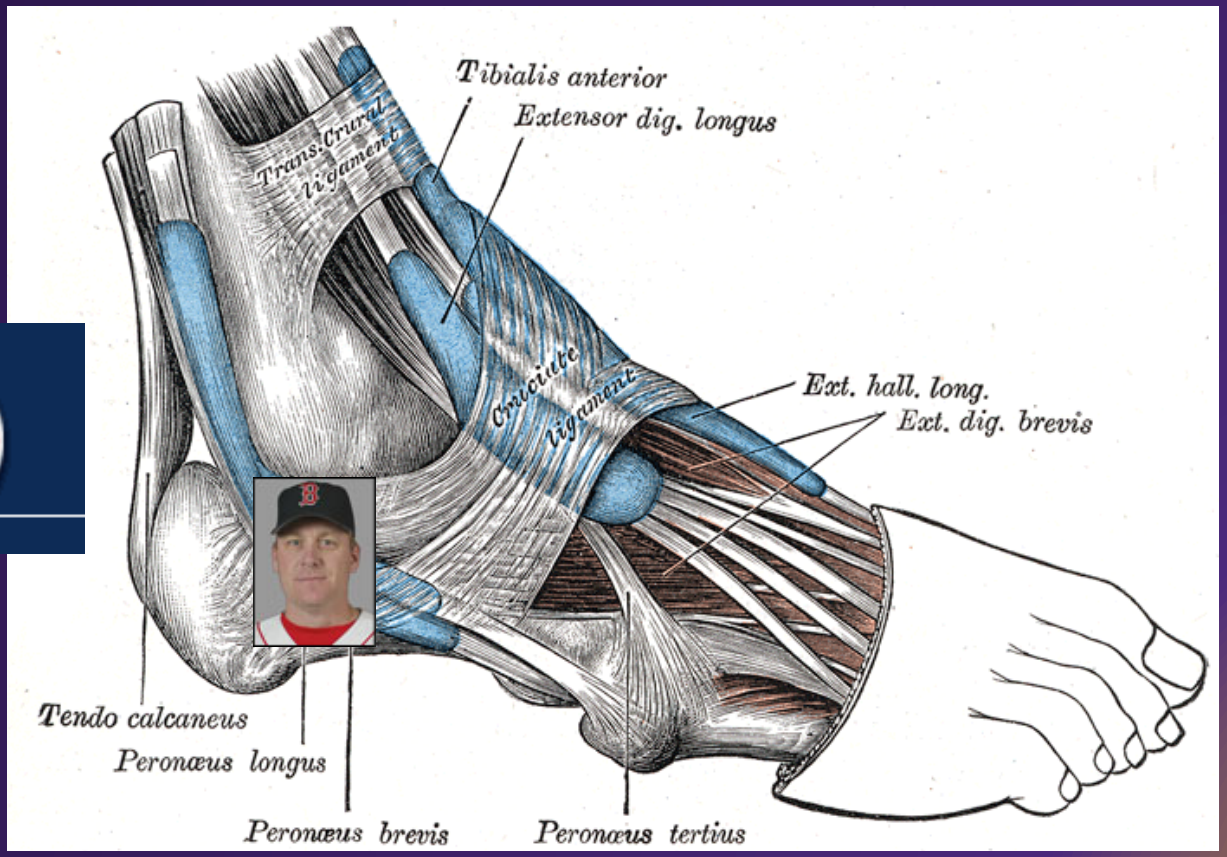
Flexor retinaculum

Extensor retinaculum

Peroneal (Fibular) retinaculum



Foot: retinaculum



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Foot & Ankle: anatomy

Schilling Tendon Procedure - Wikipedia, the free encyclopedia

http://en.wikipedia.org/wiki/Schilling_Tendon_Procedure

schilling and tendo

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Schilling Tendon Procedure

From Wikipedia, the free encyclopedia.

The **Schilling Tendon Procedure** is a temporary surgical procedure developed by Boston Red Sox team physician William Morgan, MD to stabilize the peroneus brevis tendon so that it is prevented from anterior displacement with ankle flexion. If the peroneal retunaculum is torn, the peroneal tendons are no longer stabilized. This allows the pereoneal brevis tendon to move untethered over the lateral malleolus, creating pain. During pitching mechanics, the snapping of the tendon over the bone is painful and distracting to the pitcher.

The procedure involves the placement of three sutures through the skin anterior to the path of the peroneus brevis tendon and into the underlining deep connective tissue. These sutures provide a temporary barrier, preventing the tendon from moving anteriorly over the malleolus. The procedure is performed with local anaesthetic, about 24 hours before the player begins to pitch. The stitches must be removed immediately following the cessation of play, and indications are that the stitches may tear during the course of a game.

The procedure is named for Major League Baseball pitcher Curt Schilling, who required the surgery to be able to pitch for the Boston Red Sox in Game 6 of the 2004 American League Championship Series and Game 2 of the 2004 World Series. Schilling was the winning pitcher in both games, and his blood-soaked sock gave a new meaning to the term Red Sox during the team's improbable run towards their first world championship in 86 years.

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Categories: Sports stubs | Medical treatment stubs

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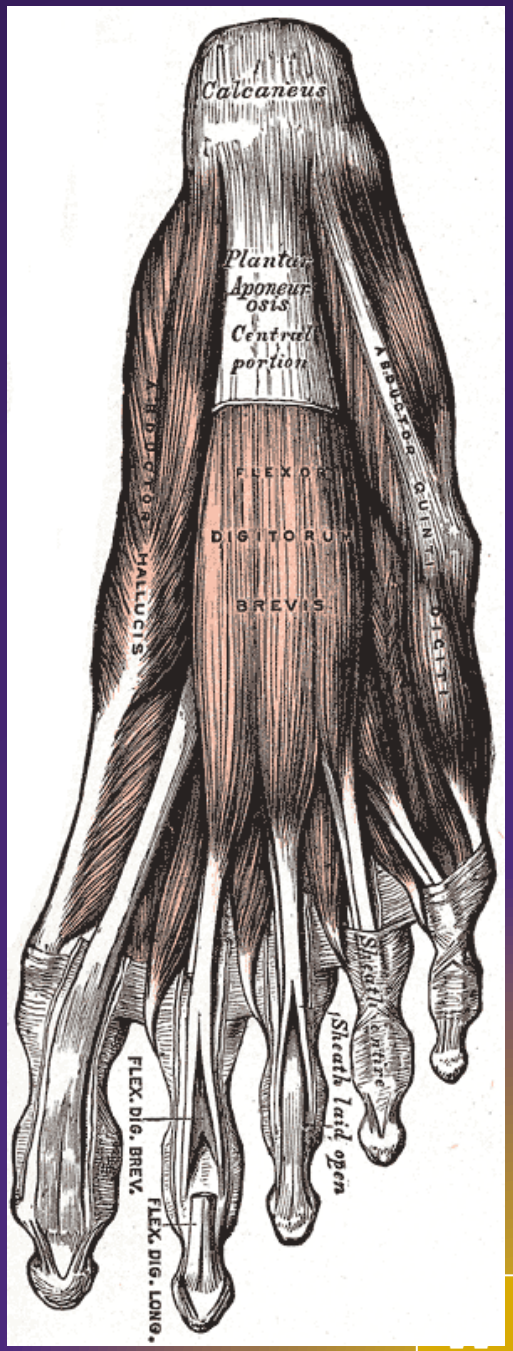
Foot: intrinsic muscles (n=20)

intrinsic muscles - layer 1



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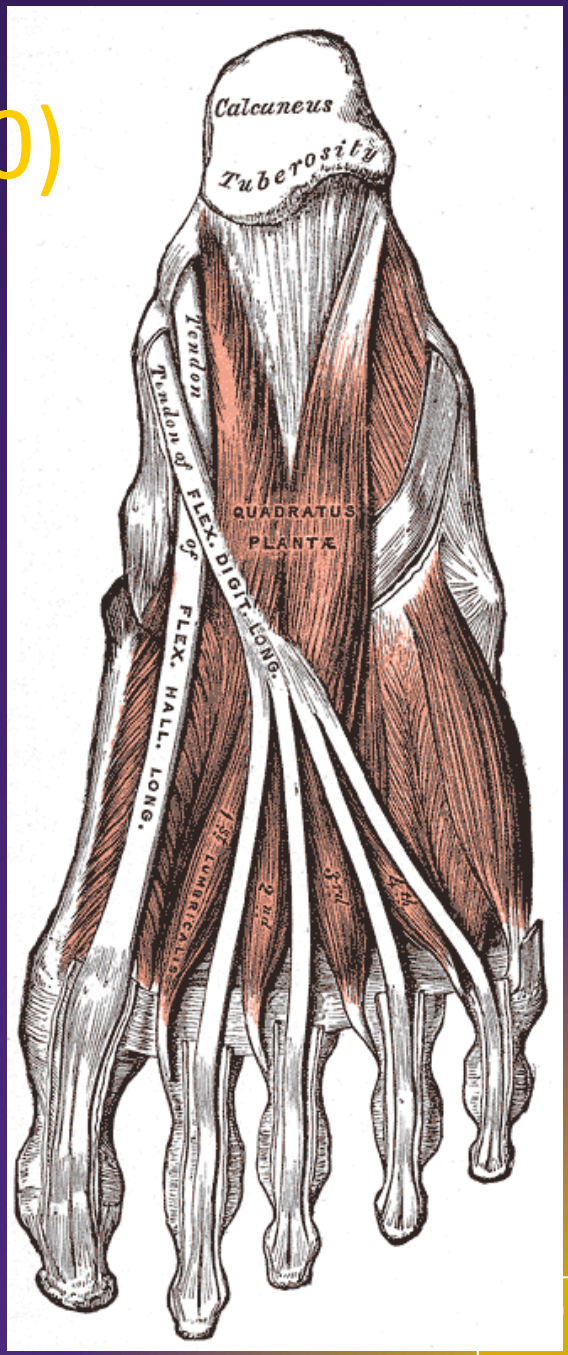
Foot: intrinsic muscles (n=20)

intrinsic muscles - layer 2



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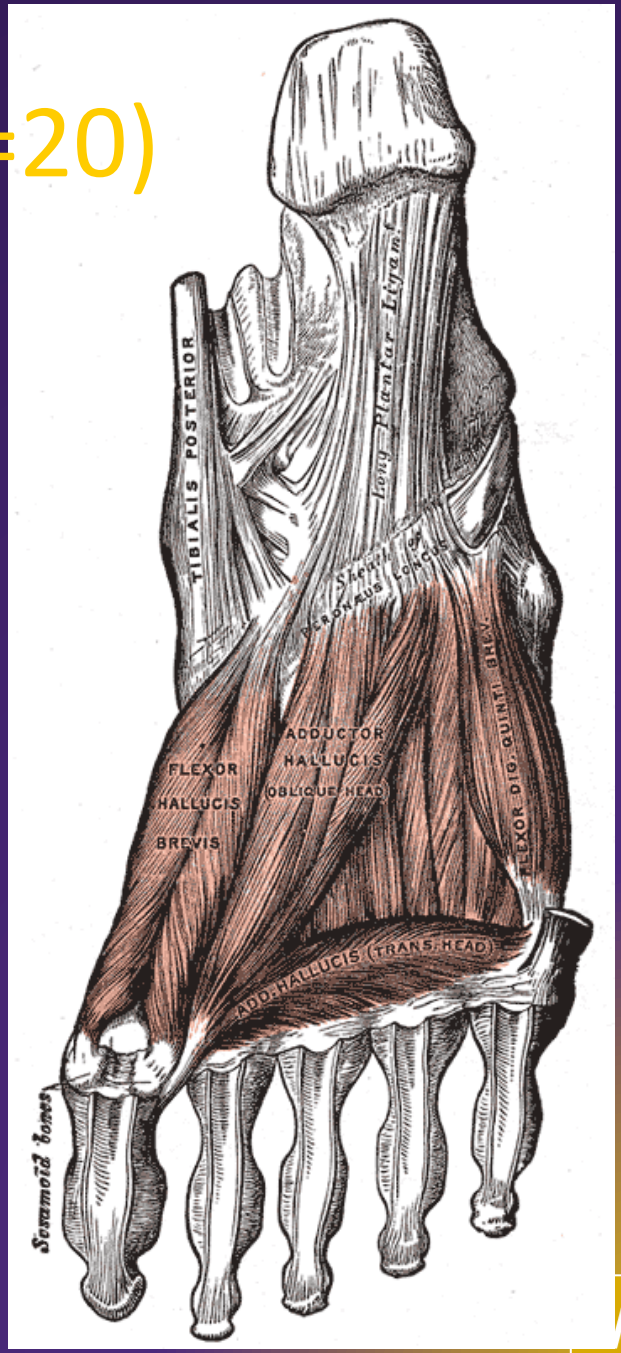
Foot: intrinsic muscles (n=20)

intrinsic muscles - layer 3



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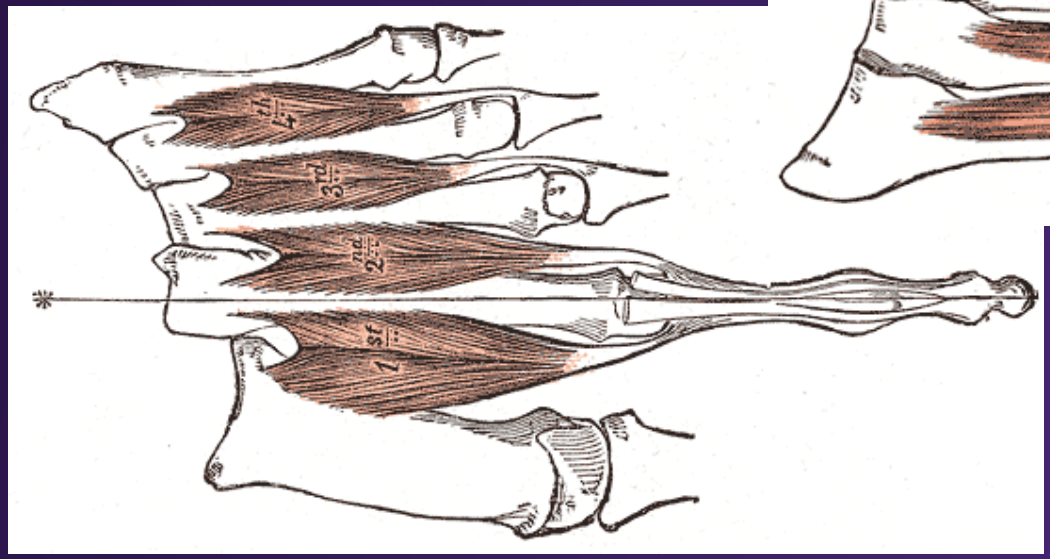
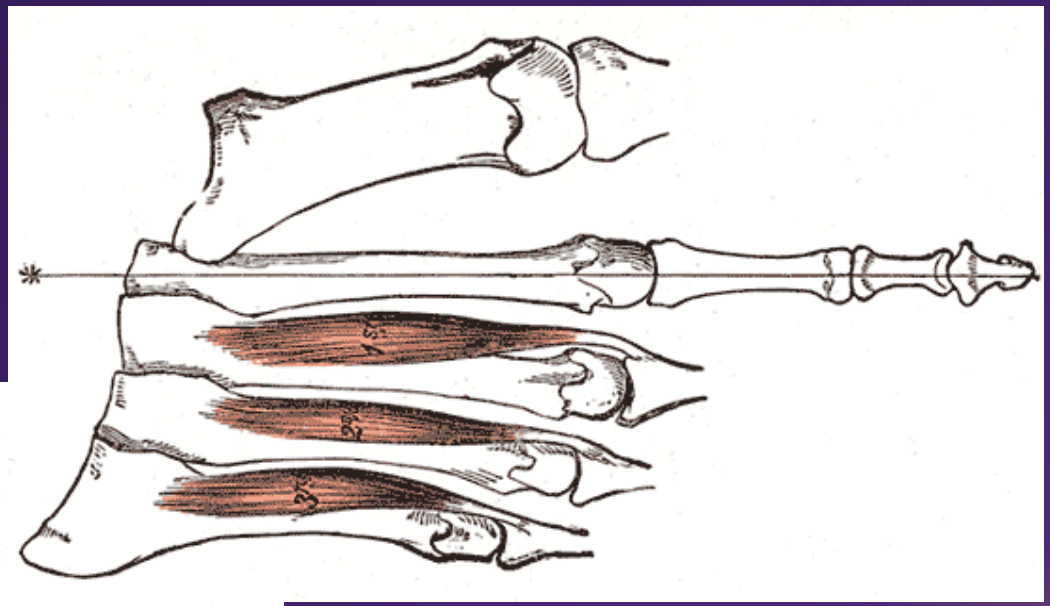
Foot: intrinsic muscles (n=20)

intrinsic muscles - layer 4





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Foot: plantar aponeurosis

Foot: plantar aponeurosis

medial/lateral view

http://www.medicalmultimediagroup.com/pated/foot/heelspur/heelspur.html

Foot: plantar aponeurosis

medial/lateral X-ray

http://www.jointenterprise.co.uk/heel_pain_or_plantar_fasciitis.htm

Foot in Art

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