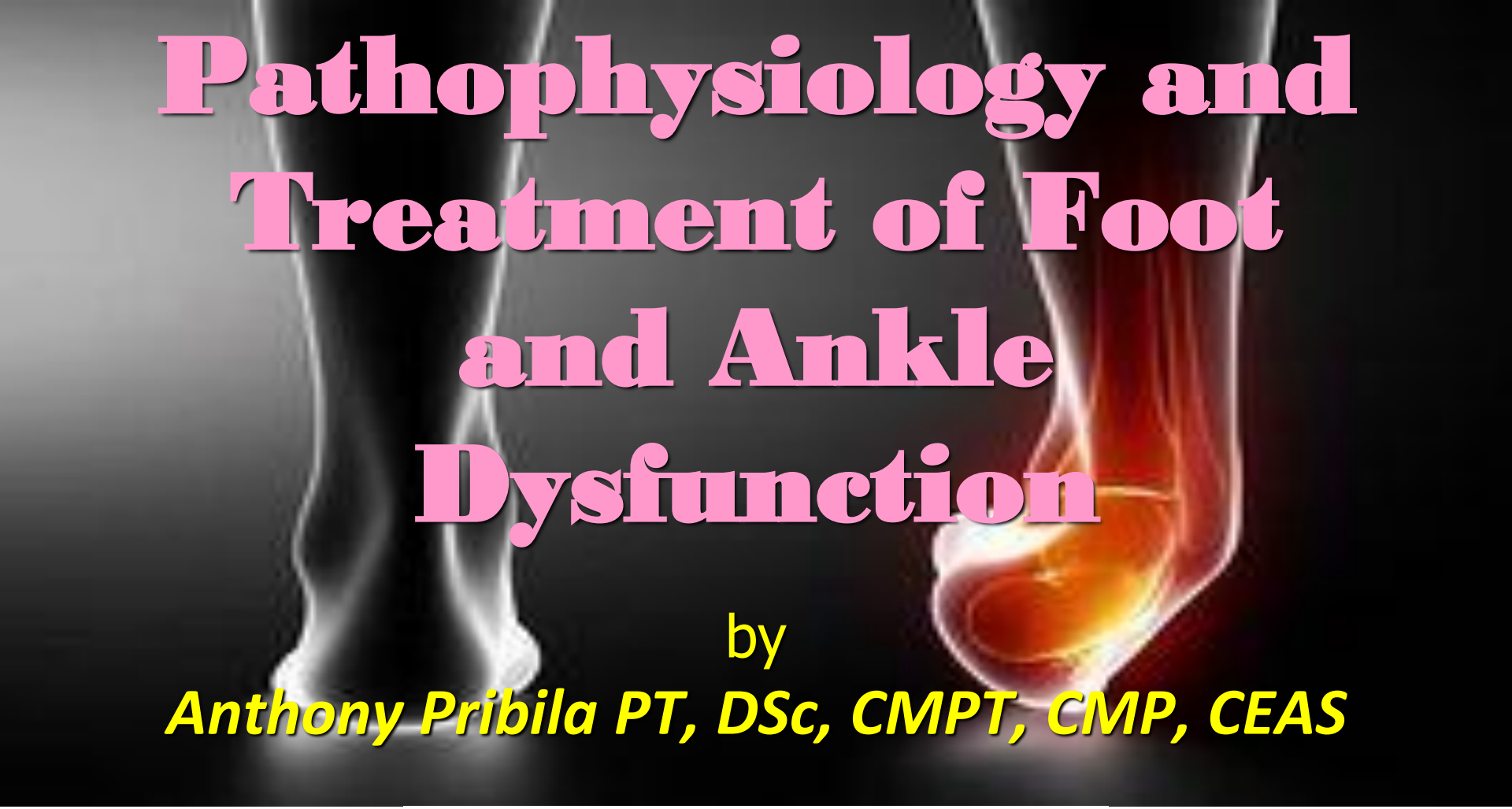
Pathophysiology and Treatment of Foot and Ankle Dysfunction



by

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Pathophysiology and Treatment of Foot & Ankle Dysfunction

- In order to completely understand and manage patients with foot and ankle dysfunction it is important to understand the anatomy of the foot and ankle and the clinical testing used to determine the integrity of the foot and ankle joints.

Pathophysiology and Treatment of Foot & Ankle Dysfunction

- This course will provide a overview of the pathophysiology of common clinical conditions that affect patients as well as the physical therapy intervention utilized to facilitate return to work or sport.

Risk factors for foot & ankle pain

- Occupation/Sports activities
- Genetic/body weight/height
- Age/Gender
- Nutritional factors
- Smoking
- Depression/psychosocial
- Posture, foot and knee alignment/position
- Improper footwear
- Poor biomechanical movement patterns

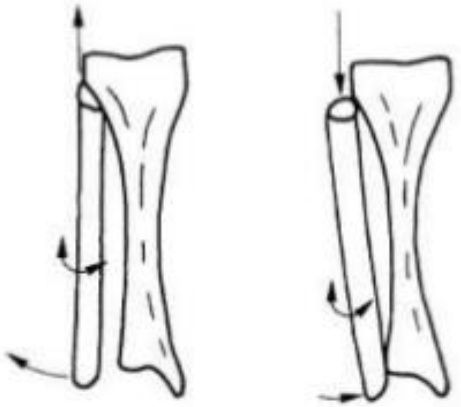
Anatomy of the Foot & Ankle

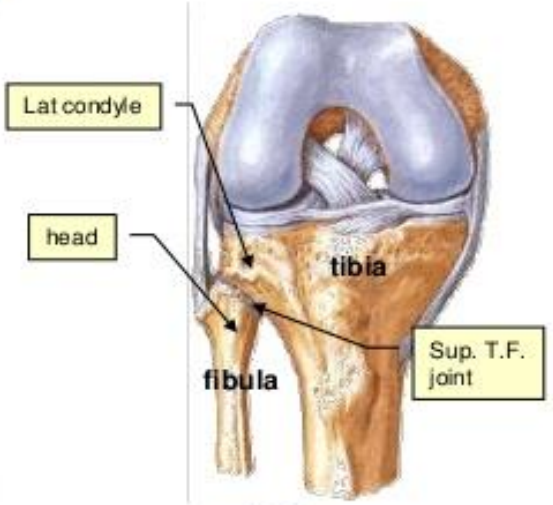
- The ankle is made up of 2 bones.
- The foot is made up of 26 bones.
  - 7 Tarsals
  - 5 Metatarsals
  - 14 Phalanges
- The foot/ankle complex form 25 component joints

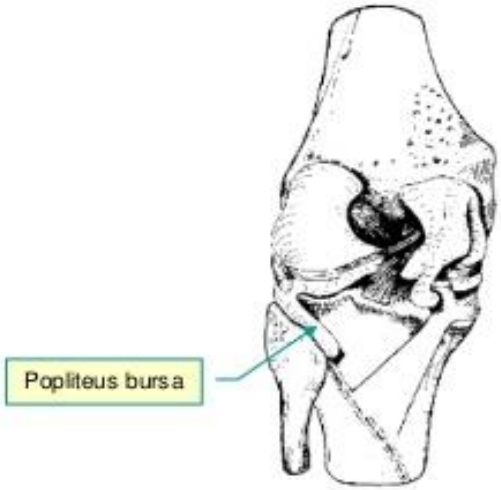
Anatomy of the Superior Tib-fib jt.

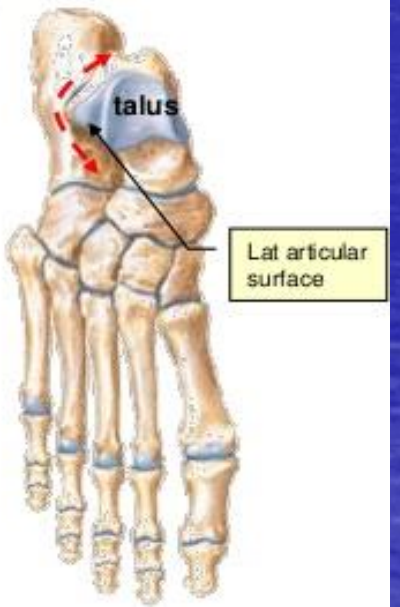
Superior tibio-fibular joint

- Plain type of synovial joint
- Between the head of the fibula and the lateral condyle of the tibia.
- Some passive rotation of the fibula around its own axis takes place at the proximal tibio-fibular joint during dorsi and plantar flexion at the ankle joint because of the antero-posterior, convexity of the lateral articular surface of the talus.
- Its cavity may communicate with popliteus bursa, which always communicate with the knee joint cavity.





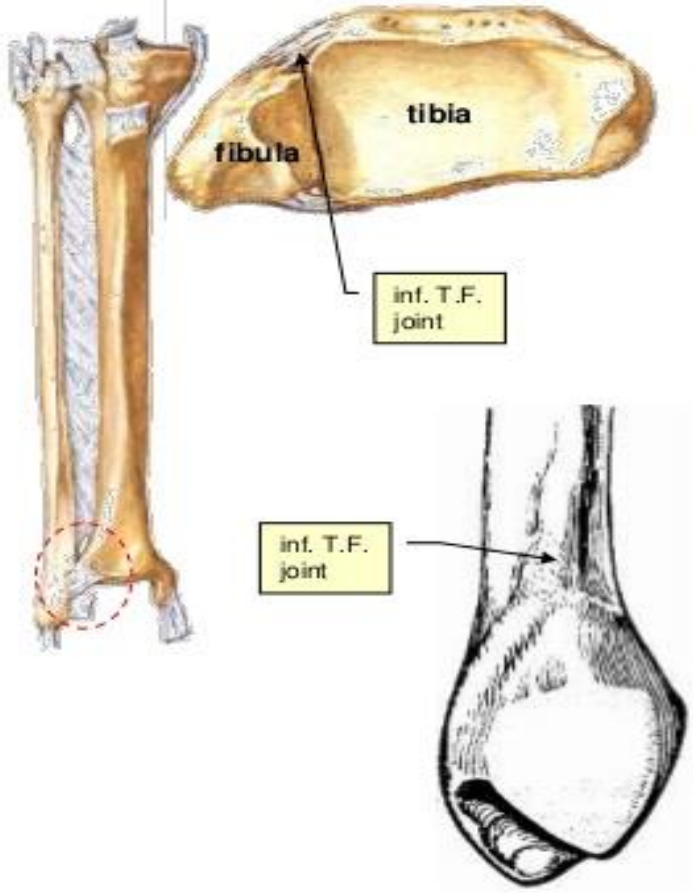




Anatomy of the inf. Tib-fib jt.

Inferior tibio- fibular joint

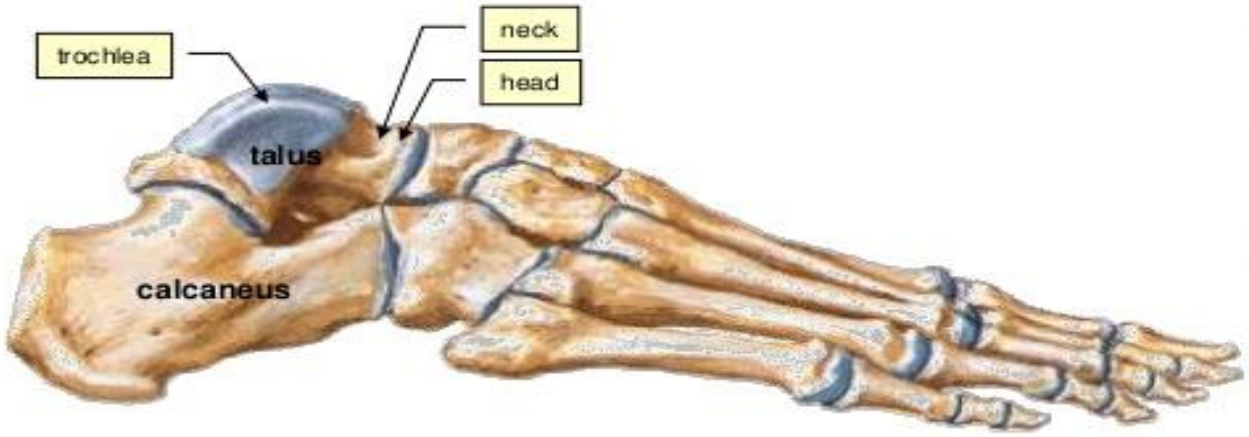
- Fibrous joint of syndesmosis type
- Between the inferior ends of the tibia and fibula.
- Its integrity is important for the stability of the ankle joint
- It holds the 2 malleoli together forming a socket for the talus.



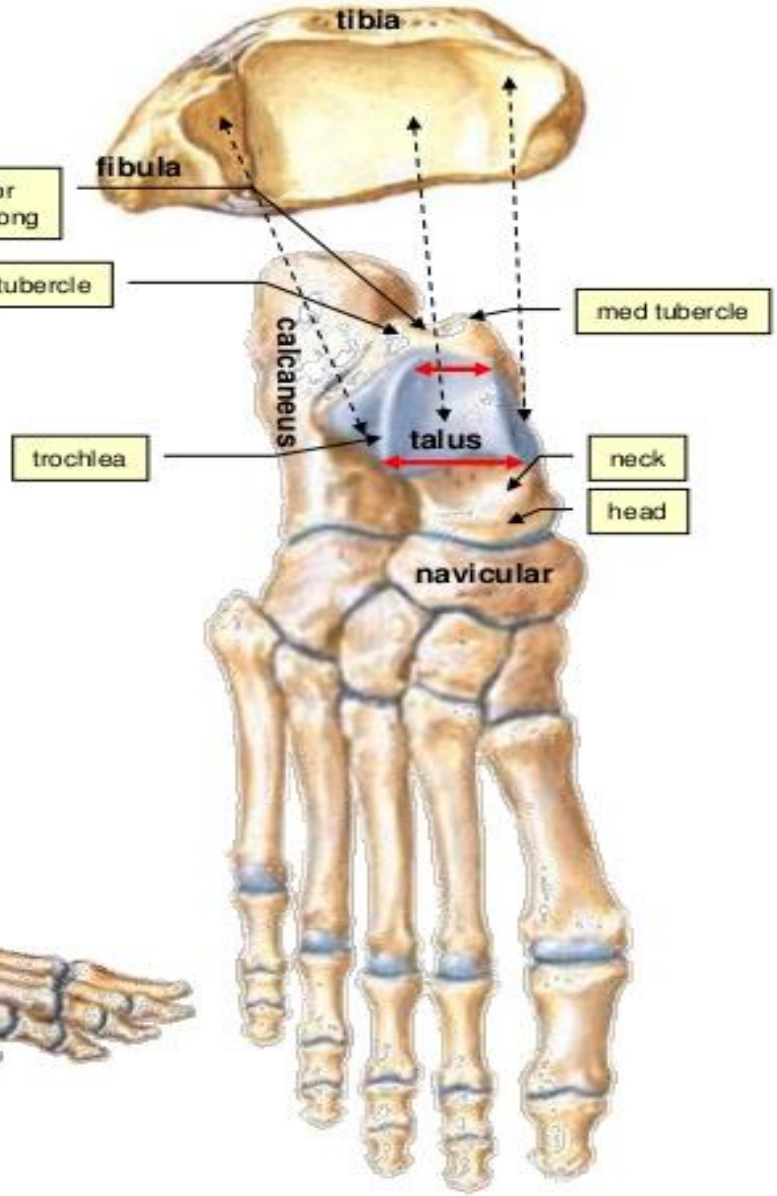
Anatomy of the Ankle

The talus

- The trochlea of the talus has three articular surfaces
  - Inferior surface of the tibia: trochlea is wider anteriorly than posteriorly.
  - Medial malleolus
  - Lateral malleolus



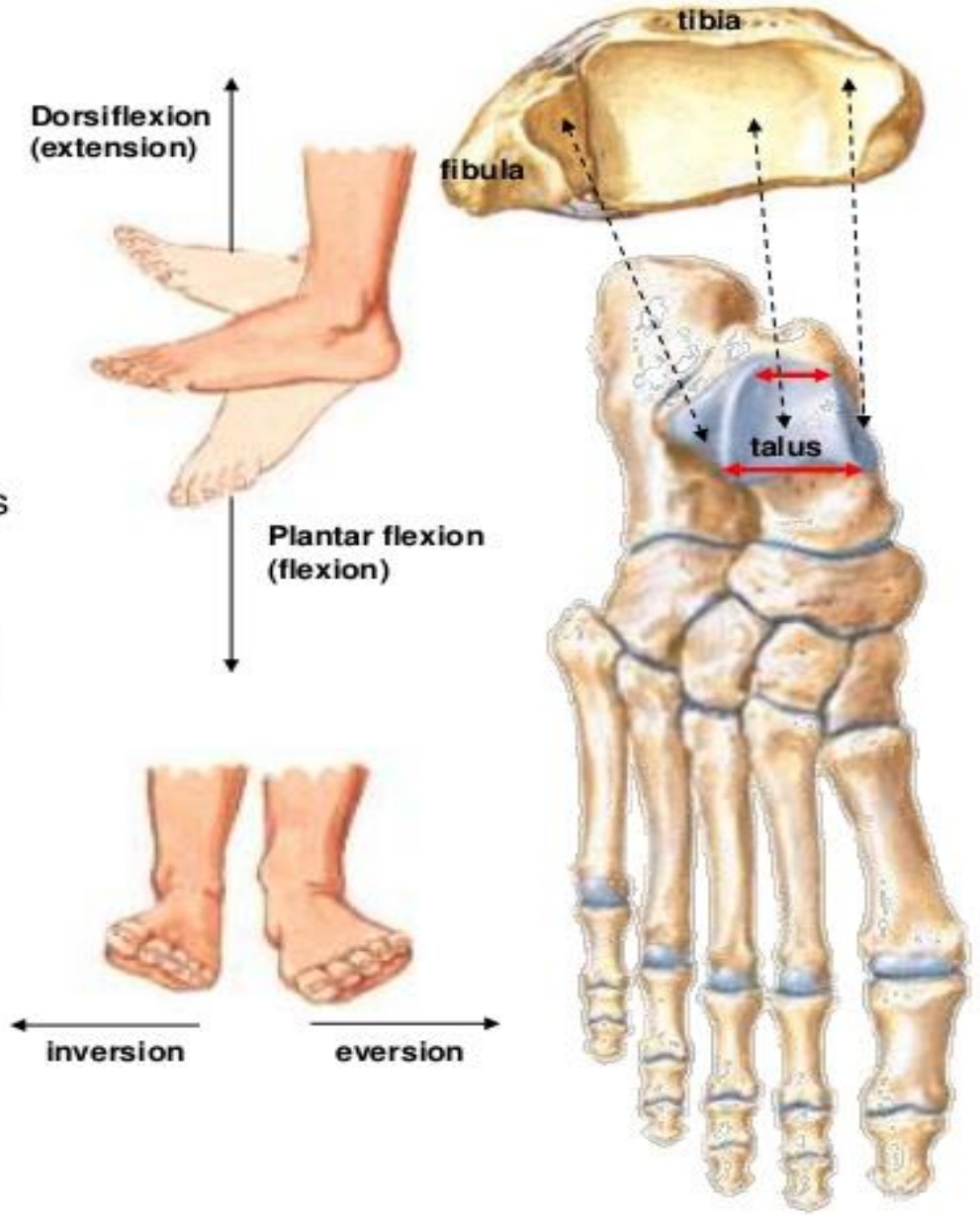
No muscle is attached to the talus



Anatomy of the Ankle

Ankle joint

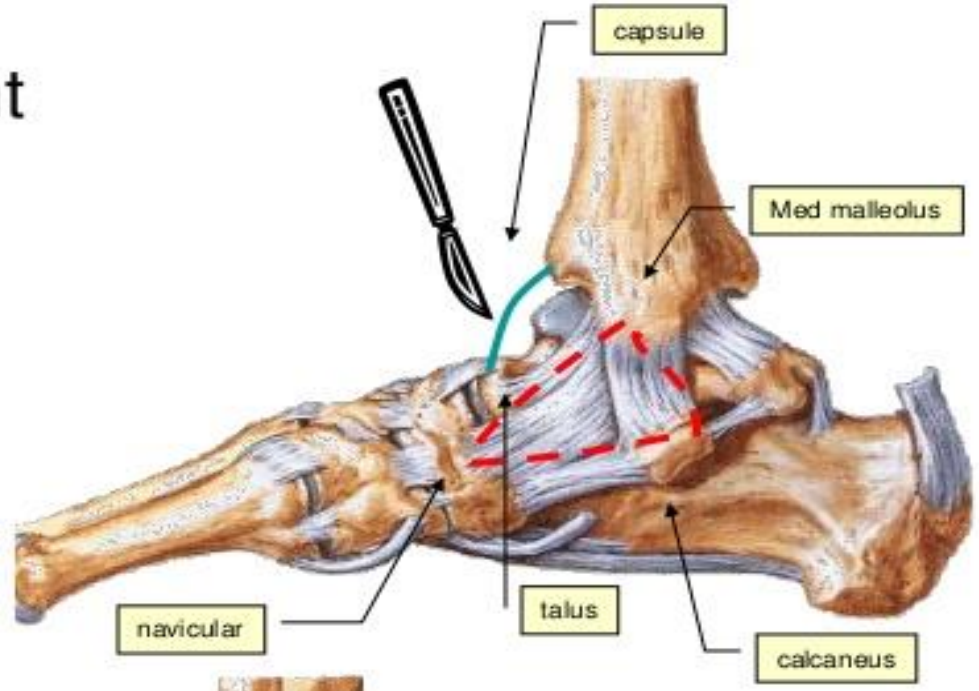
- **Movements**
  - Mainly dorsi flexion and plantar flexion
  - Some degree of rotation (inversion and eversion) is possible when the foot is plantar flexed.
- The joint is relatively unstable during plantar flexion. **WHY?**



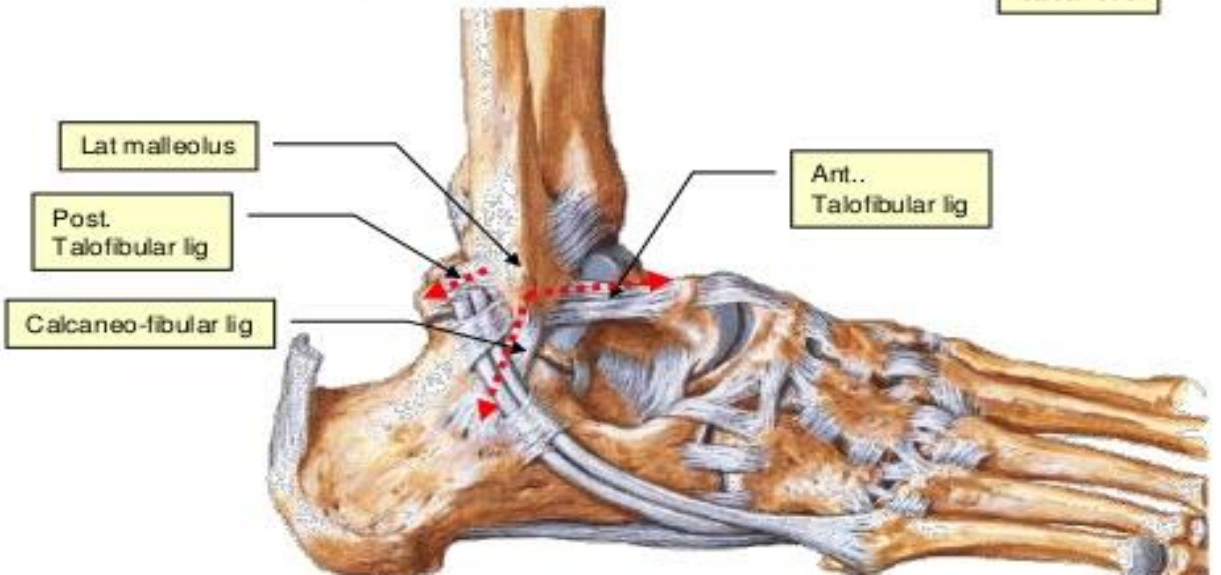
Anatomy of the Ankle

Capsule of the ankle joint

- Extends anteriorly onto the neck of the talus.
- Strengthened by collateral ligaments.
  - **Medial collateral ligament (deltoid)**
    - Delta-shaped
    - Very strong.



  - **Lateral collateral ligament**
    - Consists of 3 slips connecting the lateral malleolus to the talus and calcaneus.

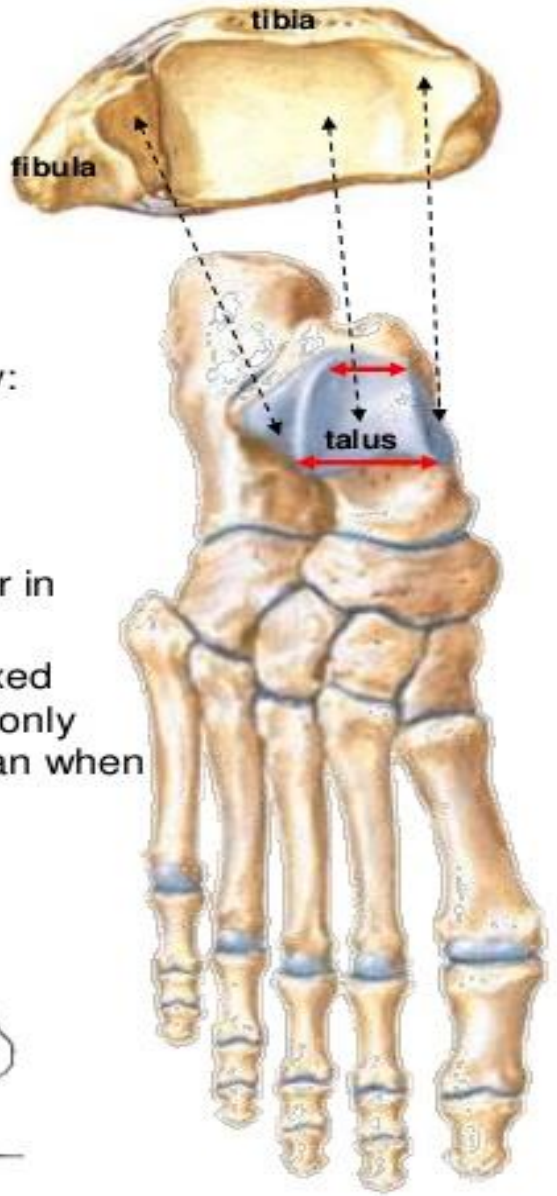


Anatomy of the Ankle

Stability of the ankle joint

- Bone: mortise
- Ligaments: collateral & tibiofibular
- Muscle: surrounding tendons.

- Forward sliding of the leg on the talus is prevented by:
  - The mortise is deepened at the back
    - Posterior lip of the tibia
    - Posterior tibio-fibular ligament
  - The superior articular surface of the talus is wider in front than behind.
    - The joint is unstable with the foot plantar flexed (walking downhill) → ankles are more commonly sprained whilst walking downstairs rather than when going upstairs.



Anatomy of the Foot

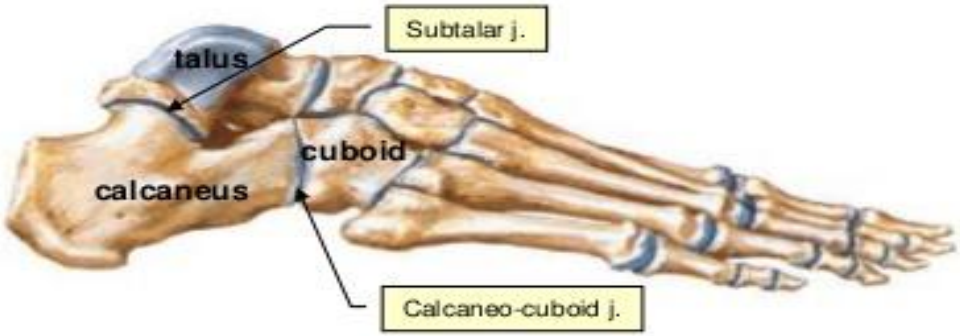
Parts of the foot

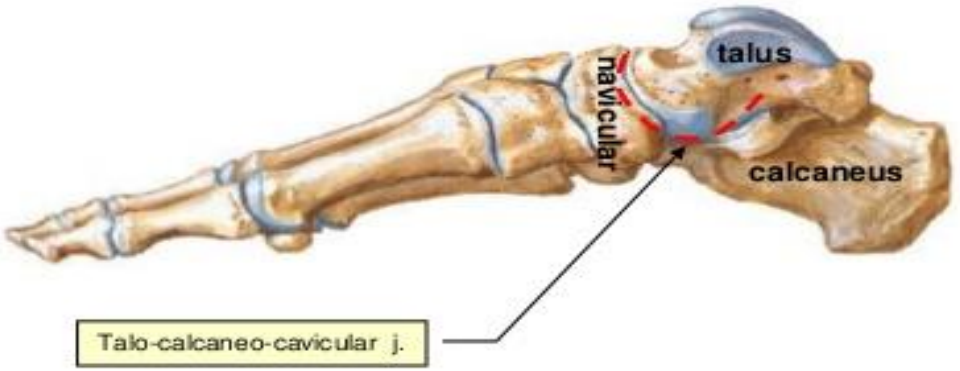
- Hindfoot
- Midfoot
- Forefoot

Anatomy of the Foot (Joints)

Joints of inversion and eversion: anatomical classification

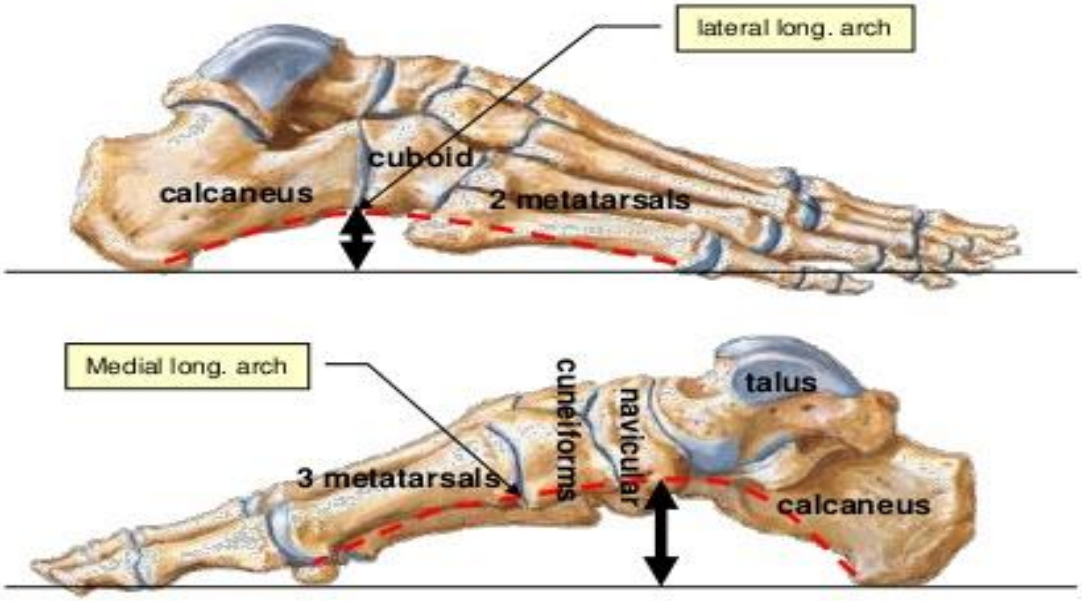
- **Subtalar joint**
  - Synovial joint between the inferior surface of the body of the talus and the superior surface of the calcaneus.
- **talocalcaneonavicular joint**
  - Synovial joint between the head of the talus on one side and the posterior surface of the navicular, superior surface of the spring ligament, and the sustentaculum tali of the calcaneus on the other side.
- **calcaneocuboid joint**
  - Synovial joint between the anterior surface of the calcaneus and the posterior surface of the cuboid.

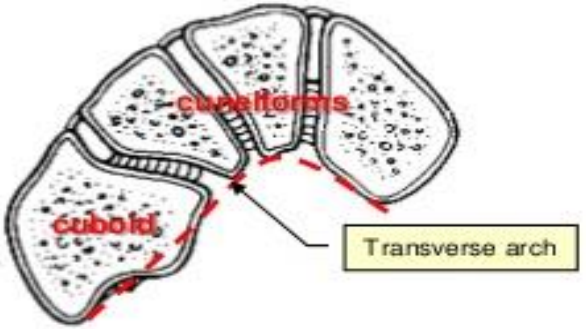




Anatomy of the Foot (arches)

Formation of the arches of the foot



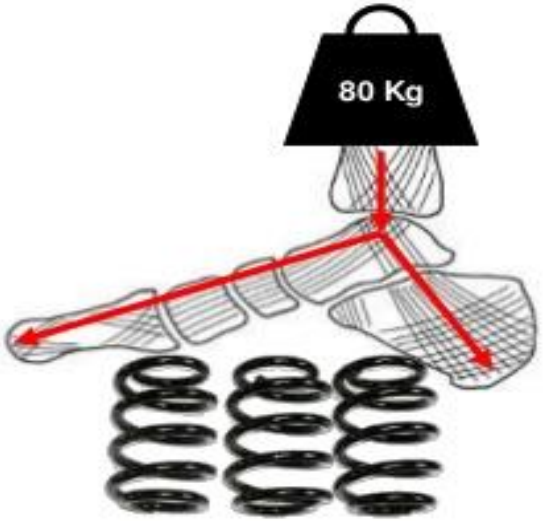


- **Medial longitudinal arch**
  - formed by the calcaneus, talus, navicular, 3 cuneiform bones, and the medial three metatarsals
- **Lateral longitudinal arch**
  - formed by the calcaneus, cuboid, and the lateral two metatarsals
- **Transverse arch**
  - formed by the cuneiforms, cuboid, and the bases of the metatarsals.

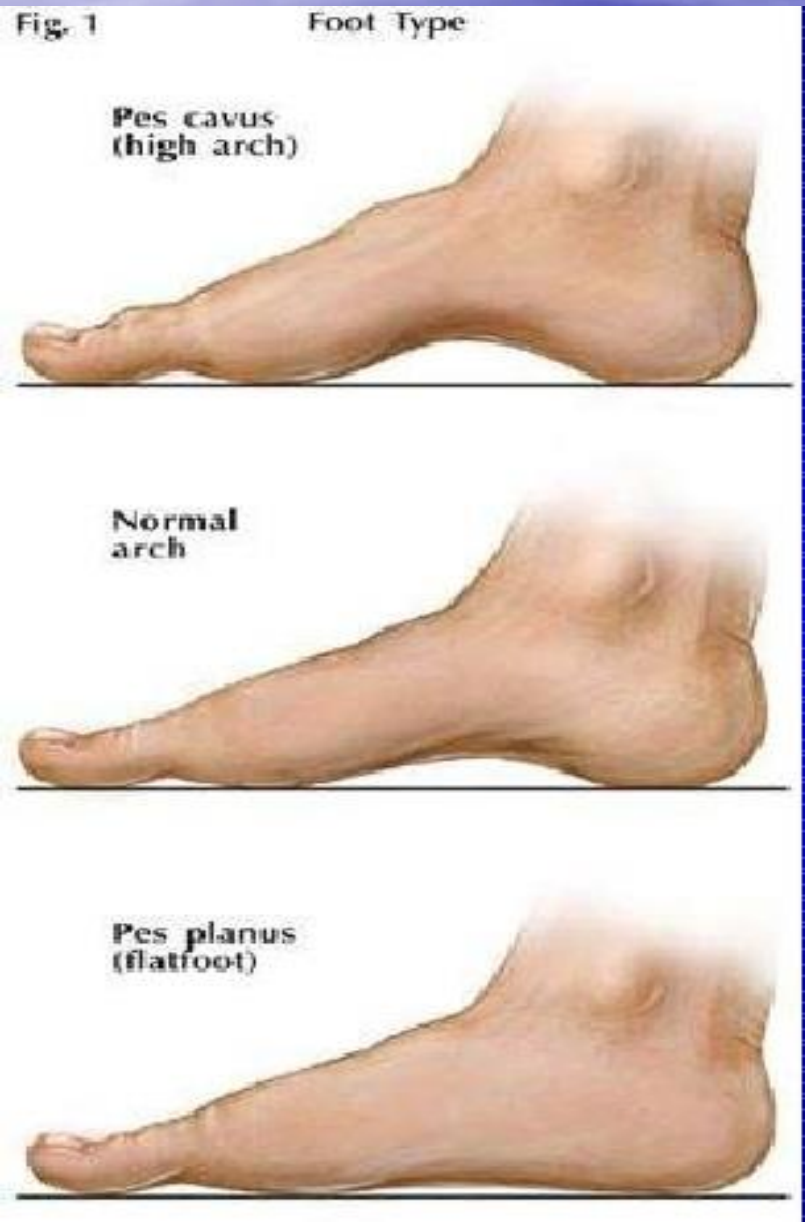
Anatomy of the Knee

Function of the arches of the foot

- Support and divide the body weight about equally between the calcaneus and the heads of the metatarsal bones.
- Propel the body in walking or running:
  - Allow the long flexors and the muscles of the foot to act on the bones of the fore part of the foot and toes (take-off part) and greatly assist the propulsive force of gastricnemius and soleus muscles.
- Shock absorption.
- Adapt to changes when walking on uneven surfaces.



Anatomy of the Foot



Arches of the Foot

Functional Anatomy of the Ankle/Foot

Functions of arches

5. Invertors lift foot on medial side shifts weight to lat.border
   Tibialis anterior, Tibialis posterior

   Evertors lift foot on lateral side shift weight to med. Border
   Peroneus longus, brevis assisted by Per. Tertius

MEDIAL

Tib.Posterior
Tib.Anterior

LATERAL

Per.Longus
Per.Brevis
Per.Tertius

Functional Anatomy of the Foot

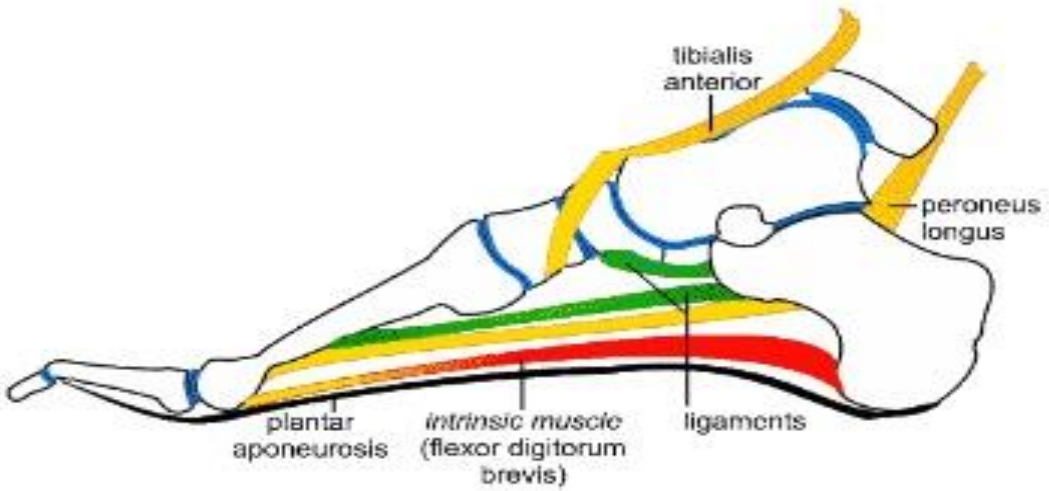
Factors that maintaining the arch

1. Bones
2. Ligaments

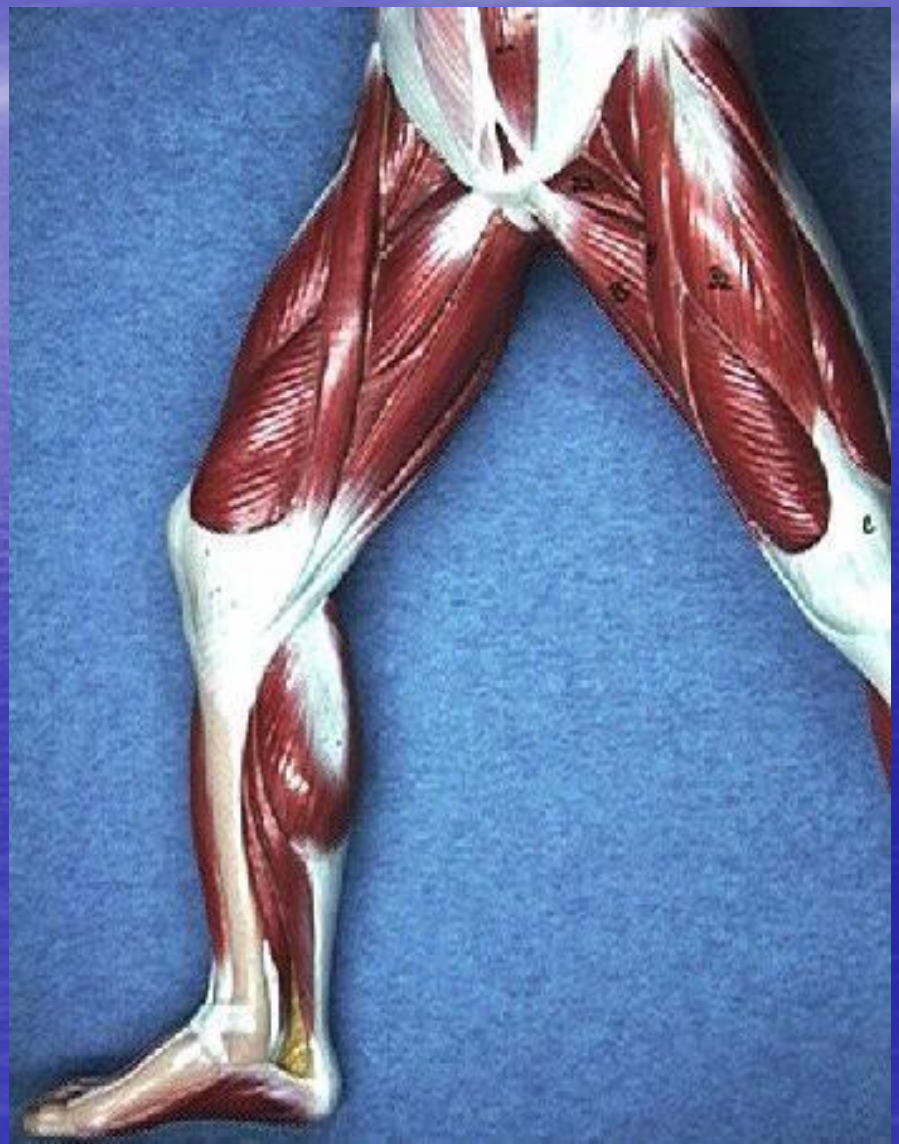
Static stabilizer

3. Muscles
4. Tendons

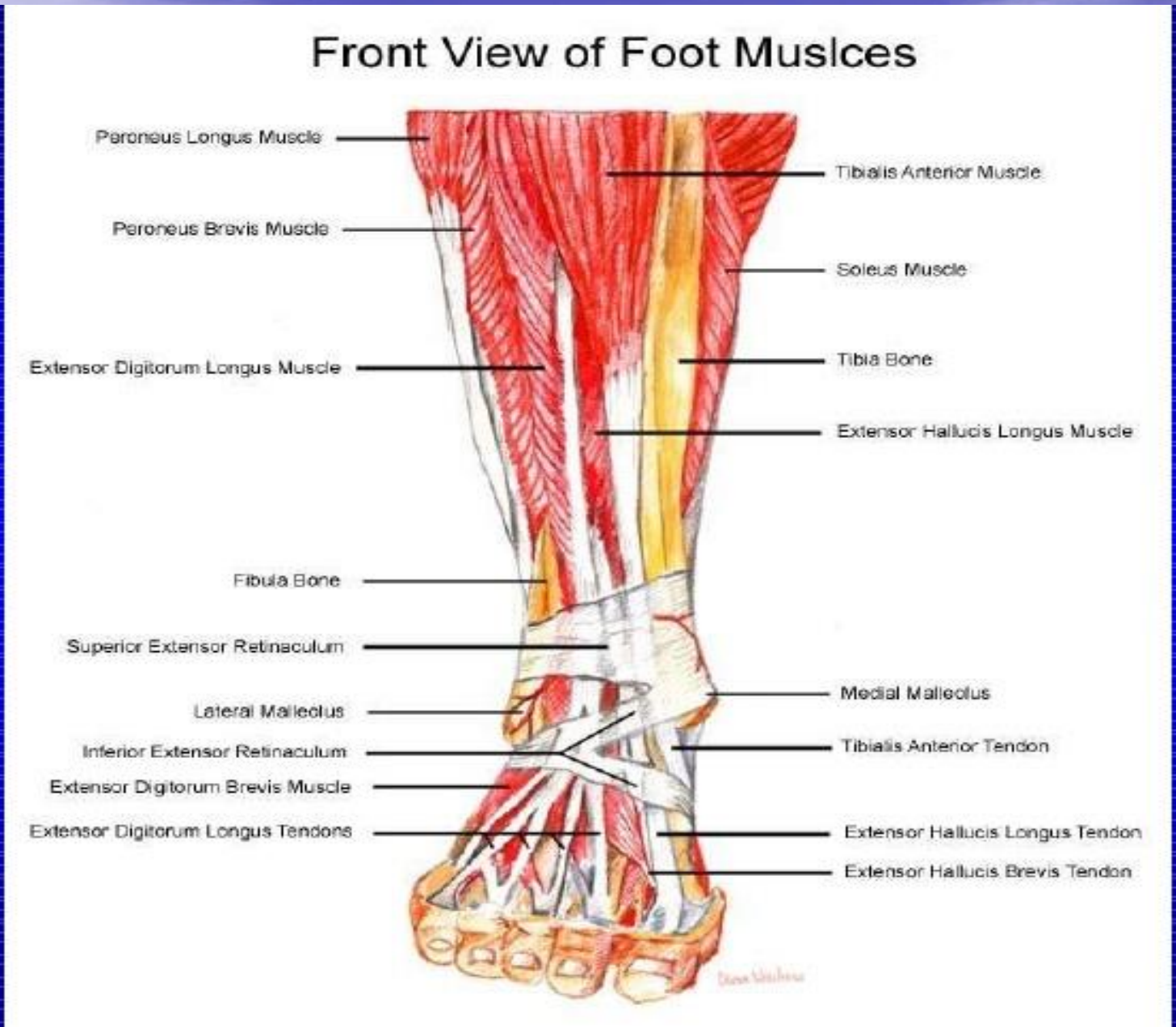
Dynamic stabilizer



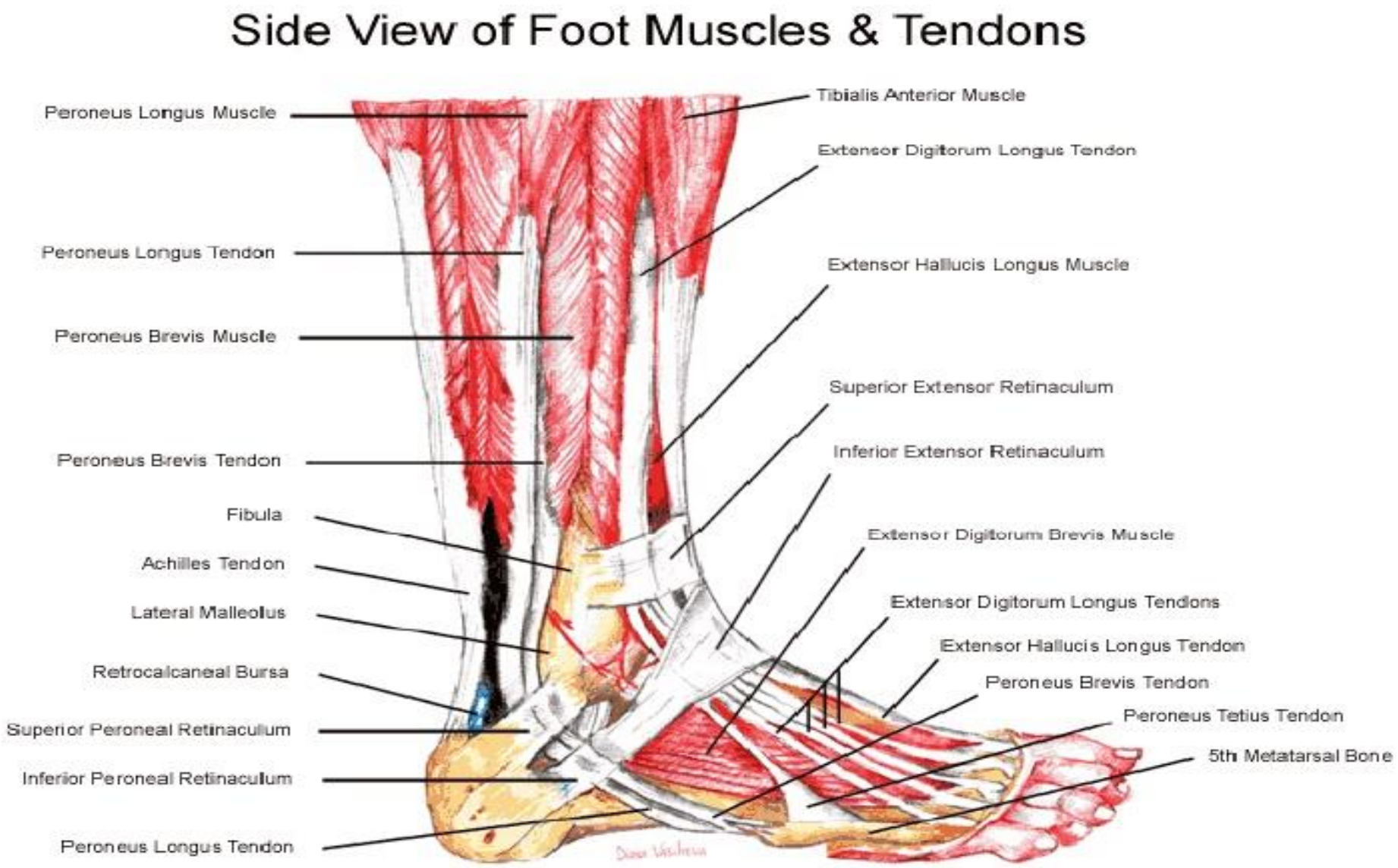
Muscular Anatomy of the lower leg and foot



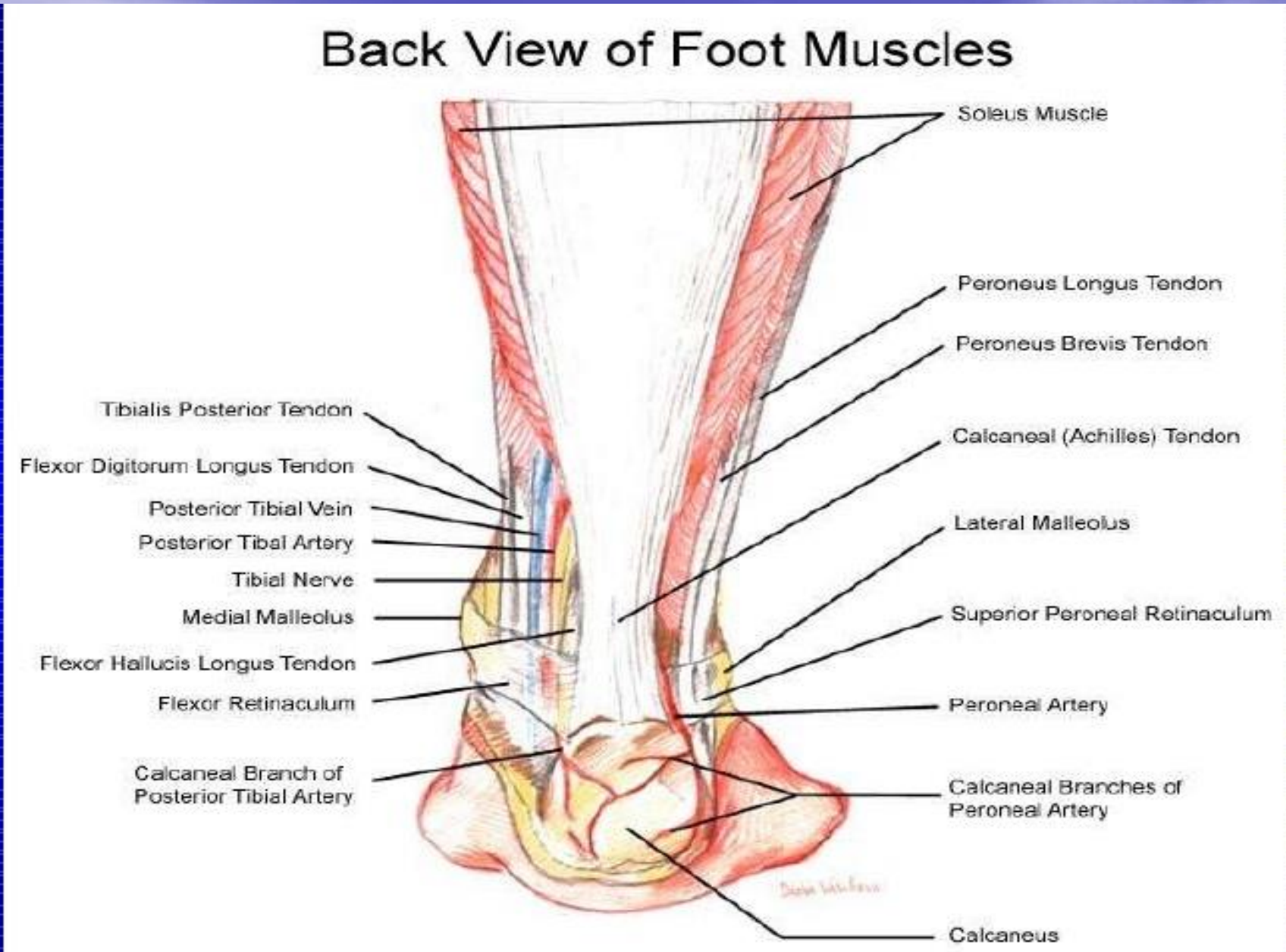
Anatomy of the lower leg & foot



Anatomy of the lower leg & foot



Anatomy of the lower leg & foot



Muscle	Origin	Insertion	Action
Gastrocnemius	- Just above medial femoral condyle (medial head) - Just above lateral femoral condyle (lateral head)	- Calcaneus (via lateral portion of Achilles tendon)	- Plantarflexion - Contributes to knee flexion when non-weight bearing - Stabilizes ankle and knee when standing.
Soleus	- Superior fibula - Soleal iine of superior tibia - interosseous membrane	- Calcaneus (via medial portion of Achilles tendon)	- Plantarflexion
Tibialis Anterior	- Lateral tibial condyle - Proximal 2/3 of anteriolateral tibial shaft - Interosseous membrane - Anterior intermuscular septum and crural fascia	- Medal and plantar surface of base of the 1st metatarsal - Medial and plantar surface of the cuneiform	- Strongest dorsiflexor - Inverts and adducts the foot

Anterior Compartment of the Leg

Name	Origin	Insertion	Innervation	Function
Tibialis Anterior	lateral surface of tibia	medial side of foot (medial cuneiform and base of 1st metatarsal)	deep fibular nerve	- dorsiflexes the foot - inverts the foot (elevation of the medial side of the foot)
Extensor Digitorum Longus	- interosseous membrane - fibula (EDL superior to the EHL)	distal phalanx of the 2nd-5th digits		extends 2nd-4th digits
Extensor Hallucis Longus		distal phalanx of the 1st digit (big toe)		extends 1st digit (big toe)

Lateral Compartment of the Leg

Name	Origin	Insertion	Innervation	Function
Fibularis (prev. Peroneus) **Longus**	lateral surface of the fibula (longus, upper part; brevis, lower part)	medial cuneiform and base of 1st metatarsal	superficial fibular nerve	everts the foot
Fibularis (prev. Peroneus) **Brevis**		styloid process of the 5th metatarsal		

Posterior Compartment of the Leg

Name	Origin	Insertion	Innervation	Function
Gastrocnemius	above the knee joint	tendocalcaneus	tibial nerve	plantar flexion of the foot
Soleus	below the knee joint			
Plantaris	lateral epicondyle of the femur			
Tibialis Posterior	interosseous membrane	tuberosity of the navicular bone (medial side of the sole of the foot)		
Flexor Digitorum Longus	tibia	distal phalanx of the 2nd-5th digits		
Flexor Hallucis Longus	fibula	distal phalanx of the 1st digit		

Muscle	Proximal Attachment	Distal Attachment	Innervation[a]	Main Action(s)
First layer				
Abductor hallucis	Medial tubercle of tuberosity of calcaneus, flexor retinaculum, and plantar aponeurosis	Medial side of base of proximal phalanx of 1st digit	Medial plantar nerve (S2, **S3**)	Abducts and flexes 1st digi (great toe, hallux)
Flexor digitorum brevis	Medial tubercle of tuberosity of calcaneus, plantar aponeurosis, and intermuscular septa	Both sides of middle phalanges of lateral four digits		Flexes lateral four digits
Abductor digiti minimi	Medial and lateral tubercles of tuberosity of calcaneus, plantar aponeurosis, and intermuscular septa	Lateral side of base of proximal phalanx of 5th digit	Lateral plantar nerve (S2, **S3**)	Abducts and flexes 5th dig
Second layer				
Quadratus plantae	Medial surface and lateral margin of plantar surface of calcaneus	Posterolateral margin of tendon of flexor digitorum longus	Lateral plantar nerve (S2, **S3**)	Assists flexor digitorum longus in flexing lateral fou digits
Lumbricals	Tendons of flexor digitorum longus	Medial aspect of expansion over lateral four digits	*Medial one:* medial plantar nerve (S2, **S3**) *Lateral three:* lateral plantar nerve (S2, **S3**)	Flex proximal phalanges; extend middle and distal phalanges of lateral four digits

Third layer				
Flexor hallucis brevis	Plantar surfaces of cuboid and lateral cuneiform	Both sides of base of proximal phalanx of 1st digit	Medial plantar nerve (S2, **S3**)	Flexes proximal phalanx of 1st digit
Adductor hallucis	*Oblique head:* bases of metatarsals 2–4 *Transverse head:* plantar ligaments of metatarsophalangeal joints	Tendons of both heads attach to lateral side of base of proximal phalanx of 1st digit	Deep branch of lateral plantar nerve (S2, **S3**)	Adducts 1st digit; assists in maintaining transverse arch of foot
Flexor digiti minimi brevis	Base of 5th metatarsal	Base of proximal phalanx of 5th digit	Superficial branch of lateral plantar nerve (S2, **S3**)	Flexes proximal phalanx of 5th digit, thereby assisting with its flexion
Fourth layer				
Plantar interossei (three muscles)	Bases and medial sides of metatarsals 3–5	Medial sides of bases of proximal phalanges of 3rd–5th digits	Lateral plantar nerve (S2, **S3**)	Adduct digits (2–4) and flex metatarsophalangeal joints
Dorsal interossei (four muscles)	Adjacent sides of metatarsals 1–5	*First:* medial side of proximal phalanx of 2nd digit *Second to fourth:* lateral sides of 2nd–4th digits		Abduct digits (2–4) and flex metatarsophalangeal joints

Functional Anatomy of the Knee

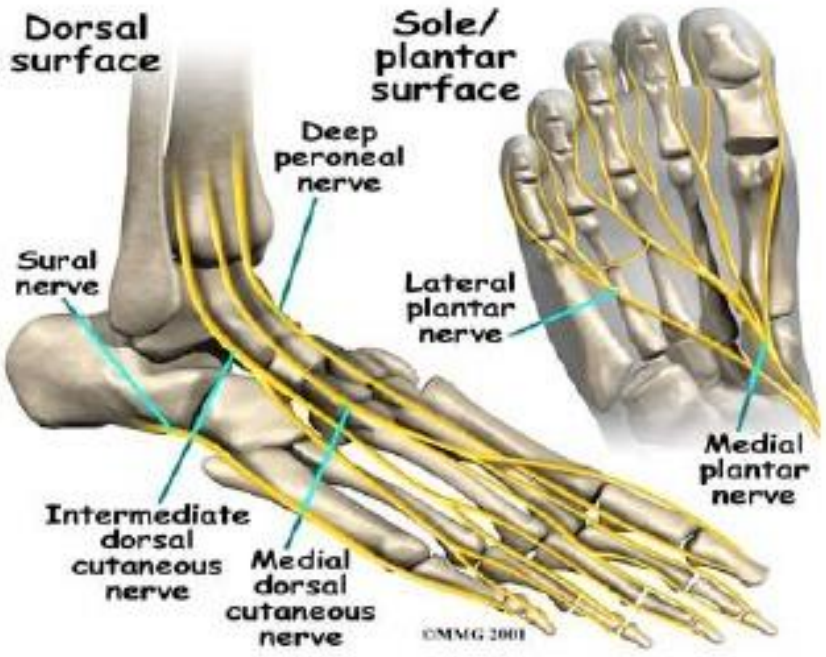
- The gastrocs assist in flexing the knee and prevent posterior translation of the tibia
- These muscles balance each other and control the length tension relationships of each other in gait.
- Poor endurance or strength in the tibialis anterior can lead to shin splints.
- A weak glute medius is often the cause of ankle sprains.

Neural Anatomy of the Lower Leg

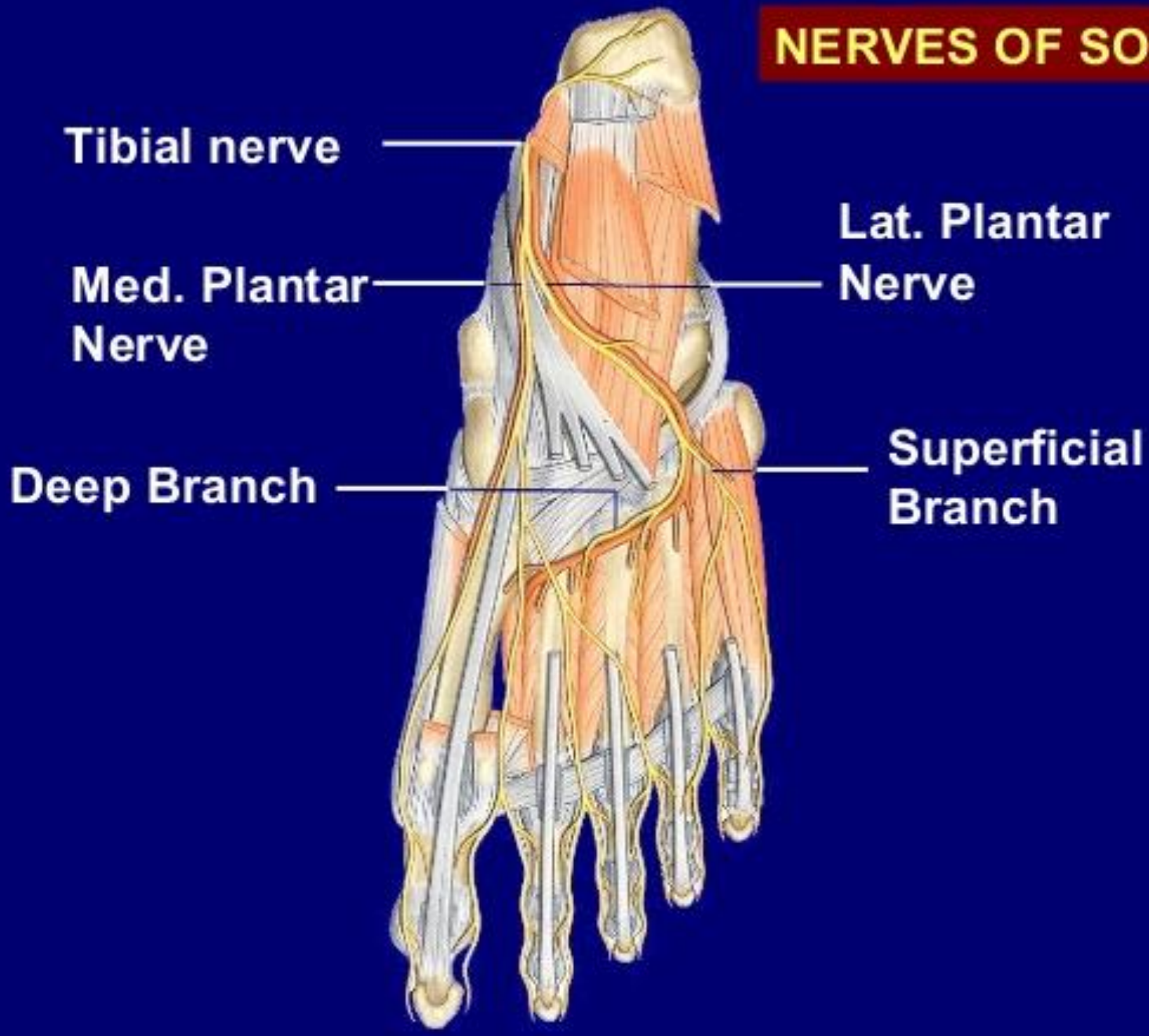
- The nerves at the knee are the sciatic nerve and the femoral nerve. The sciatic nerve divides into tibial and peroneal branches.
- The tibial nerve may be compressed in the body of the soleus muscle.
- The peroneal nerve may be compressed by direct trauma to the lateral knee or prolonged posture (cross leg sitting).
- The saphenous nerve can be compressed at the sartorius muscle near the pes anserine insertion.

Nerves of the foot

The foot is supplied by the tibial, deep peroneal, superficial peroneal, sural, and saphenous nerves.



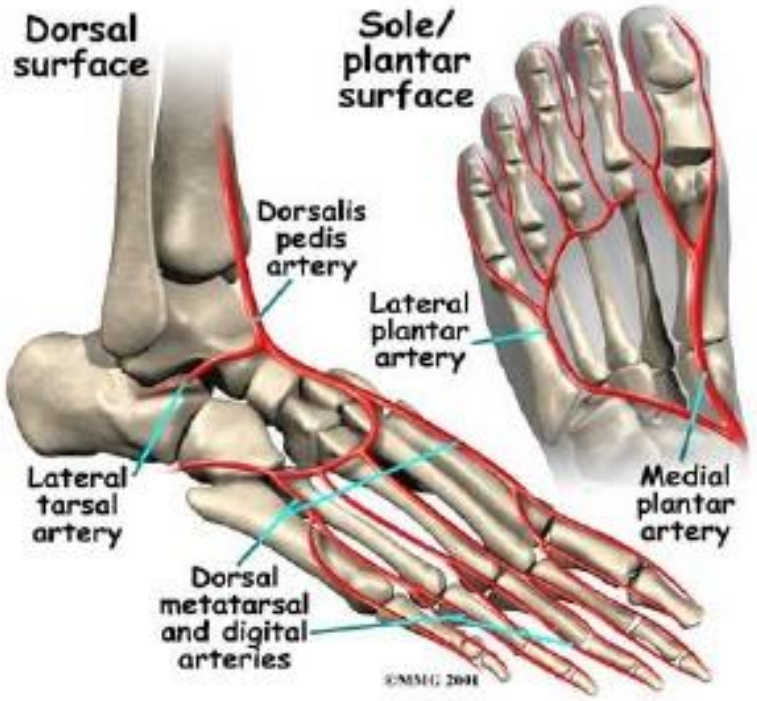
NERVES OF SOLE



Cutaneous distribution of sole of foot

Arteries of the foot

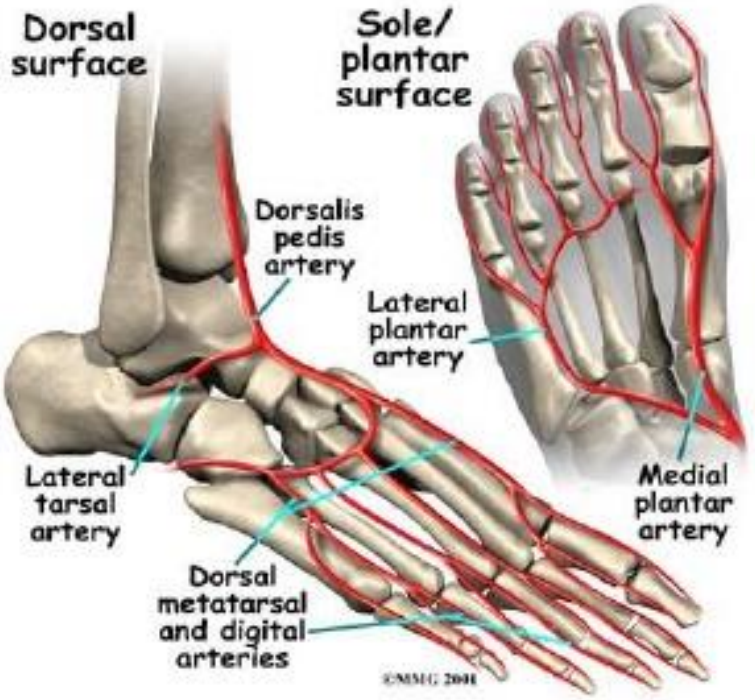
Blood supply to the foot is by branches of the **posterior tibial** and **dorsalis pedis** (dorsal artery of the foot) arteries



Arteries of the foot

Posterior tibial artery and plantar arch:

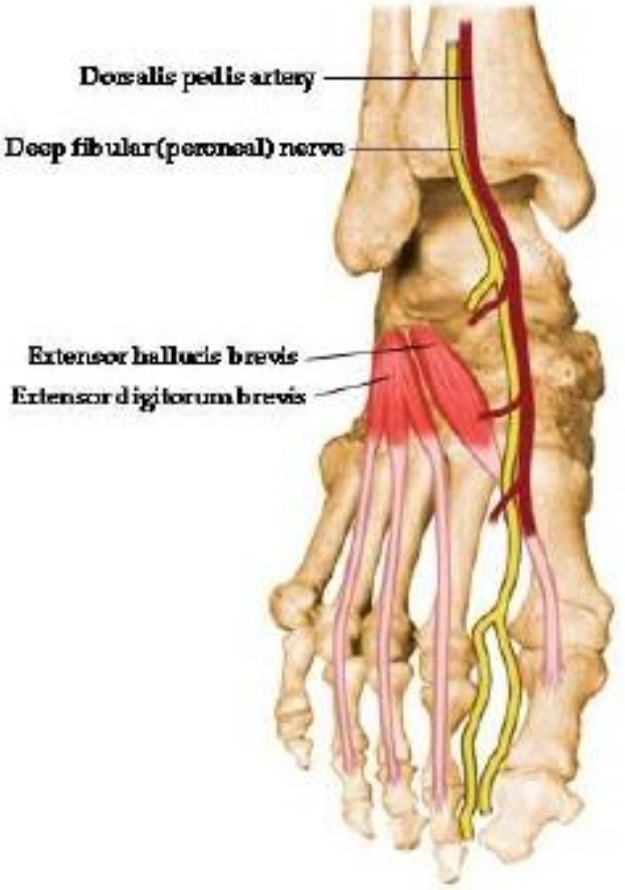
- The posterior tibial artery enters the foot through the tarsal tunnel on the medial side of the ankle and posterior to the medial malleolus.
- It bifurcates into a small **medial plantar artery** and a much **larger lateral plantar artery**.



Arteries of the foot

Dorsalis pedis artery :

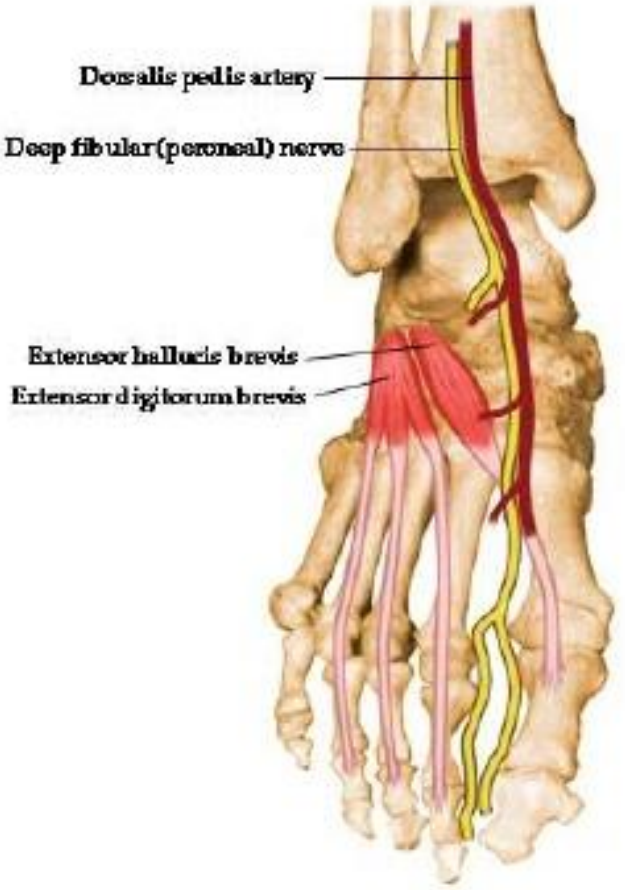
- It is the continuation of the anterior tibial artery and begins as the anterior tibial artery crosses the ankle joint .
- It passes anteriorly over the dorsal aspect of the talus, navicular, and intermediate cuneiform bones, and then passes inferiorly, as the deep plantar artery, between the two heads of the first dorsal interosseous muscle to join the deep plantar arch in the sole of the foot.



Arteries of the foot

Dorsalis pedis artery :

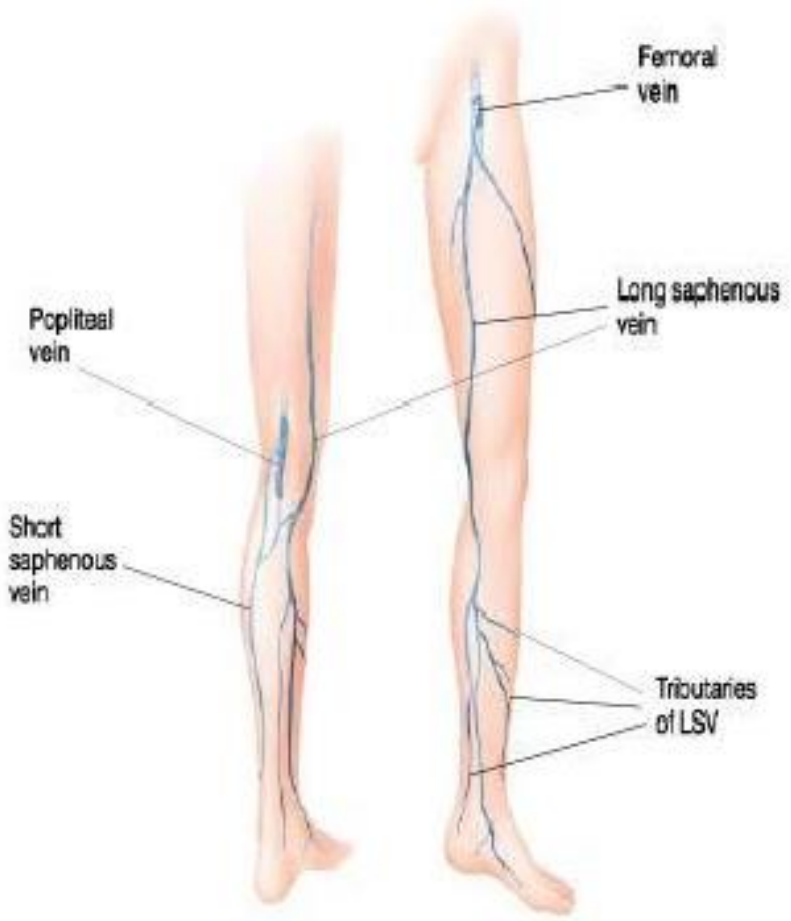
- Pulse of the dorsalis pedis artery on the dorsal surface of the foot can be felt by gently palpating the vessel against the underlying tarsal bones between the tendons of **extensor hallucis longus** and the tendon of **extensor digitorum longus** to the second toe.



Veins of the foot

Superficial veins drain into a dorsal venous arch on the dorsal surface of the foot over the metatarsals:

- The **great saphenous vein** originates from the medial side of the arch and passes anterior to the medial malleolus and onto the medial side of the leg
- The **small saphenous vein** originates from the lateral side of the arch and passes posterior to the lateral malleolus and onto the back of the leg.



How can dysfunction of these structures lead to lower leg pain?

- ***Nerves-*** Irritation, compression, or stretching can cause muscle spasm, weakness, pain, or altered sensation.
- ***Muscles-*** Reduced flexibility from prior injury may cause muscle inhibition or shortened structures to be irritated until lengthened.
- ***Discs-*** A bulging annulus or HNP can impinge on nerve roots causing altered movement patterns leading to ankle weakness, hypertonus and/or pain.
- ***Ligaments-*** Shortened scar tissue with a loss of elasticity.
- ***Capsule-*** Capsular tightness can limit normal movement causing altered movement patterns.
- ***Vascular-*** Restricted blood flow can lead to swelling, poor neural transmission and even necrosis.

Examination of the Ankle Joint

- Anterior, posterior, and lateral observation
- Active, passive, and accessory mobility: Ankle P.Flex: (50°) D.Flex: (+5°-10°) INV: (40°), EV: (30°)
- Strength testing
- Neurological & vascular testing
- Palpation
- Special tests (musculotendinous, ligamentous stress tests, joint mobility, effusion, joint, functional)
- SFMS and or FMS

Examination of the Ankle Joint

- Anterior drawer test (Tests for ant. Ligamentous structure tears or laxity (ATFL & CFL))
- Talar tilt- neutral to DF position and invert the ankle.
- Posterior drawer test - Posterior Talofibular ligament injury and/or ligamentous instability
- Varus stress test: (Lateral lig. Complex- Calcaneofibular Ligament and Anterior Talofibular Ligament, Post. Talo. Fib Lig.)
- Valgus Stress test: (Medial lig. Complex -Deltoid Ligament: ant. tibiotalar lig., tibiocalcaneal lig., post. tibiotalar lig. and the tibionavicular lig.)
- Pt. graded as (-) (+1, +2, or +3 laxity)

Common Clinical Conditions-
Ankle Instability

- Excessive laxity usually lateral with poor control.
- History - gradual onset
- Tests: lig. Stress tests, balance, proprioception
- Symptoms - Ankle pain, edema, pain with prolonged standing, stair climbing squatting, running
- Treatment - anti-inflammatory drugs, immobilization, physical therapy focused on improving: joint mobilization (ankle), pain modalities, active stability (foot)and accessory muscle integration

Common Clinical Conditions- Ankle Instability

Physical therapy intervention at TRS includes:

- Patient education
- SFMA
- Manual and functional mobilization
- Functional closed chain activities (bicycling, treadmill, balance board, drills)
- Stretching exercises
- NMS re-education (biofeedback, electrical stimulation)
- U.S.
- Edema control (ice and interferential)
- Footwear analysis
- Taping
- Work/sport simulation

Lower extremity muscular strain

- Presents as a more localized and at times slightly referred pain to the calf and present in a variety of positions and may be referred to the knee, ankle, shin or calf.
- Decreased ability to lengthen *rapidly* leads to eccentric activity *muscle tears*.
- Hypotonicity- Failure to recruit or incomplete recruitment.

3 degrees of muscular Strain

Grade	Symptoms	Signs	Pathologic Correlation
Grade 1	Sharp pain at time of injury or pain with activity. Usually able to continue activity	Mild pain and localized tenderness. Mild spasm and swelling No or minimal loss of strength and ROM	<10% muscle fiber disruption
Grade 2	Unable to to continue activity	Clear loss of strength and ROM	>10-15% disruption of muscle fibers
Grade 3	Immediate severe pain, disability	Complete loss of muscle function Palpable defect or mass. Possible positive Thompson's test	50-100% disruption of muscle fibers; tendon retraction

CALF MUSCULAR STRAIN

- Phase one: Rest, ice, activity modification
- Medications may be provided such as anti-inflammatory medications, non-steroidal anti-inflammatory medications (NSAIDS), oral steroids, or muscle relaxants
- Trigger point injections and therapy maximize steroid effects

Lower Extremity Strain

- Phase Two: Exercise, massage, stretching, manual therapy, modalities
- Phase Three – Settled stage
- Manual therapy – Being phase out, mostly hands off approach
- Exercise – Improving motor control with exercises including trunk and ankle stabilization, HEP
- Work or sport re-conditioning – Job specific training and conditioning

Plantar Fasciitis

- Is an inflammation of the tissue that runs across the bottom of your foot and connects your heel bone to your toes (plantar fascia).
- A stabbing pain that usually occurs with your first steps in the morning. It might return after long periods of standing or after rising from sitting.
- Common in runners, overweight, poor footwear and poor heel mobility.

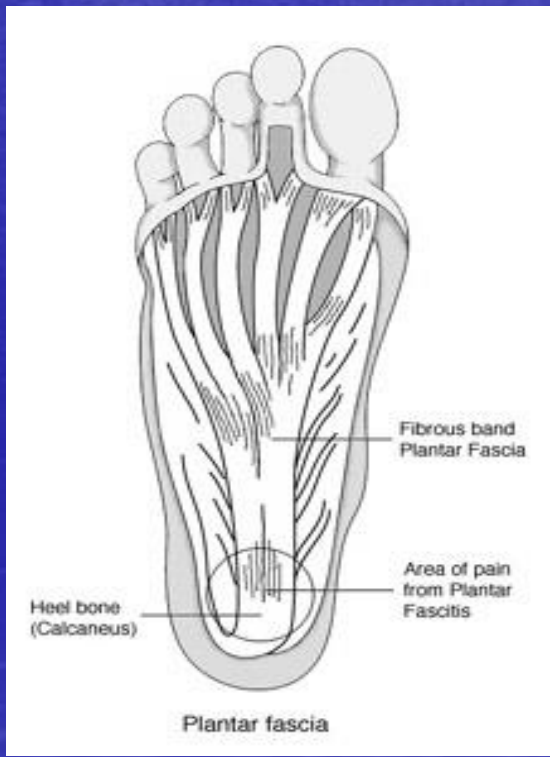
The Agony of De-Feet

Physician Plantar Fasciitis Treatment

- **Steroid injections** injected in the most painful part of your plantar fascia to ease pn.
- **Shock-wave therapy**. Sound waves stimulates blood flow in the foot and helps the tissue heal. It also stuns your nerves to stop pain.
- **Surgery**. Usually the last resort for severe pain or a stubborn injury that other treatments don't help. NWB and in a boot or cast post procedure.

PT Plantar Fasciitis Treatment

- **Exercises: Tib. Post, F.D.B (stretch/strengthen)**
- **Friction Massage, IASTM, U.S. Ionto**
- **Talocrural & Subtalar Mobilization/Manipulation**
- **Rest, Ice rolling, cont. meds,**
- **Proper Footwear /Orthotics**
- **Night Splints**
- **Taping**



Heel pain

- **Heel pressure w/ B stance= 50% of body wt.**
- **Unilateral 100% of body wt.**
- **Gait = 85-100% of body wt.**
- **Running= up to 250% of body wt.**
- **Age= ↓collagen, elastin & ↓ water**

Often affected by pl. fasc. Or Achilles

Can develop spurs

Heel pain

- **Exercises: Tib. Post, F.D.B (stretch/strengthen)**
- **Massage, U.S. Ionto.**
- **Talocrural & Subtalar Mobilization/Manipulation**
- **Rest, Ice rolling, cont. meds,**
- **Proper Footwear and Orthotics**
- **Int. Dry Needling in (approp. States)**
- **Taping**
- **Injections/shock wave therapy**

Hallux Valgus (Bunion) Greek for turnip

1st MTP joint has 2 degrees of freedom- flexion/ext and Abd/add. (>15⁰ of add)

- **Typically caused from poor 1st ray ext. and /or poor hip/knee valgus positioning (IR)**
- **Leg Length Discrepancy**
- **Heel issues typically pes planus**
- **Common in dancers**
- **High Heels** >2.25”
- **Heredity**

Hallux Valgus (PT Options)

- **Exercises: E.H.L (stretch/strengthen)**
- **Hip and ankle stability ex's**
- **1st MTP ext. mobilization, U.S.**
- **Talocrural & Subtalar Mobilization/Manipulation**
- **Rest, Ice, cont. meds,**
- **Proper Footwear and Orthotics**
- **Correcting the biomechanical cause**

Hallux Valgus (Surgical Options)

Surgical procedures for bunions might involve:

- Removing the swollen tissue from around your big toe joint (1st MTP)
- Straightening your big toe by bone excision straightening out the abnormal angle in your big toe joint
- Fusion of the MTP or IP joints
- Some studies have found up to 35% of pt's report being unsatisfied post sx.

Ankle/foot function

- Rigid feet- (high arches) Do better with running and poor with static standing- They need loose shoes to allow for mobility
- Loose feet- (flat feet) Do better with walking than jogging and need rigid shoes to absorb stress

The Keys to Stability

- ***Inert Structures***
- Active muscular control
- Joints
- Capsule
- Ligaments

Systems of Control

Neurological- ***Control system***

Skeletal system- ***Passive or inert system***

Musculature- The active system

MOVEMENT CLASSIFICATION

- 0: ANKYLOSIS
- 1: HYPOMOBILITY (STIFFNESS)
- 2: NORMAL
- 3: HYPERMOBILITY
- 4: INSTABILITY

Purpose of CPP, LPP and CPR

- CPP: *closed packed position* is a position of stability for the joint. This is useful in manipulation of another prox. Or distal joint and for protection of that joint.
- LPP: Largest intra-articular volume of the joint. Where mobilization or traction is performed most effectively
- CPR: A particular sequence in passive limitations in joints that are controlled by muscles exhibit a *capsular pattern of restriction.*

Ankle capsular findings

- Closed Packed Position of the **Talocrural jt**.: Full DF
- Loose Packed Position: 10° of PF.
- Capsular Pattern of Restriction: PF > DF

- Closed Packed Position of the **Subtalar jt.:** Full Supination
- Capsular Pattern of Restriction: INV in Chronic OA., EV in Traumatic OA.
- Loose Packed Position: INV > PF.

Don't forget the Sup./Inf. Tib-Fib jt.

- Closed Packed Position of the prox. Tib-Fib jt.: full wt. bearing DF
- Loose Packed Position: 25° of knee flexion and 10° of PF
- Capsular Pattern of Restriction: pain w/ stress
- Closed Packed Position of the dist. Tib-Fib jt.: maximum DF
- Loose Packed Position: 10° of PF and 5° of INV
- Capsular Pattern of Restriction: pain w/ stress

Joint by Joint approach Theory

Joint	Need	Plan for mobility/stability
Upper Lumbar	Mobility	Sagittal -segmental multiplanar
Lumbosacral	Stability	Sagittal- segmental multiplanar
S/I Joint	Mobility	Multiplanar
Pubic Symphysis	Stability	Sagittal A/P and Sup/Inf.
Hip	Mobility	Multiplanar
Knee	Stability	Torsional/Sagittal/Coronal
Patellofemoral	Stability	Coronal
Tibiofibular	Stability	Oblique Sagittal
Talocrural	Mobility	Sagittal
Calcaneal/fib.	Mob/Stability	Sagittal (Inv/EV)
Foot	Stability	Multiplanar

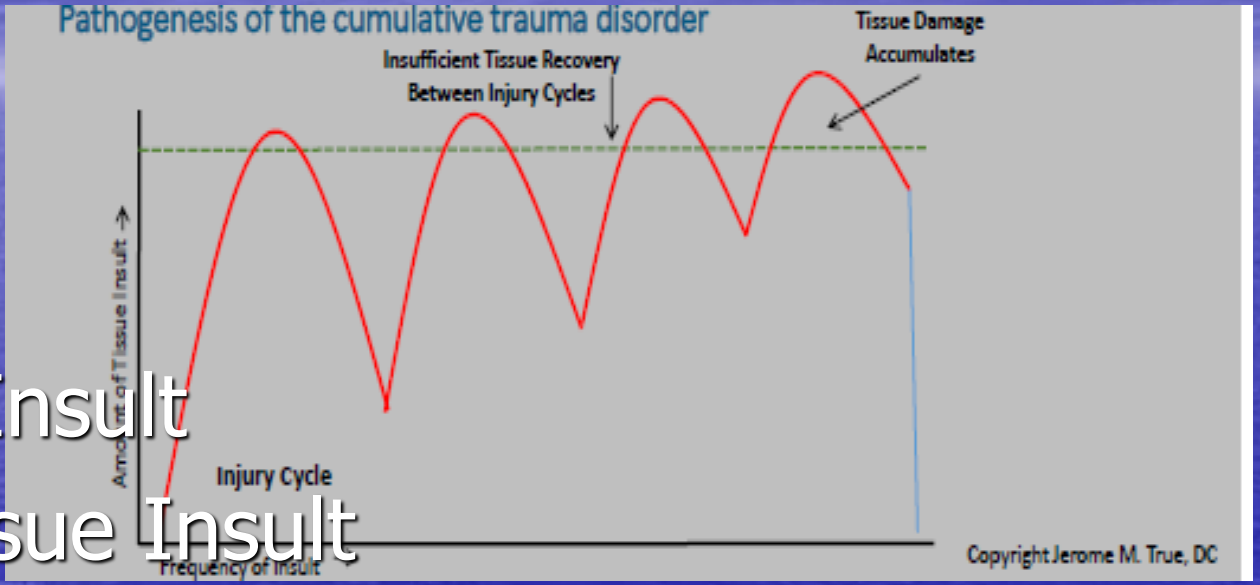
What does this mean?

- Loss of foot stability= ankle pn
- Loss of ankle mobility= knee pain
- Loss of hip mobility= low back pain
- Loss of thoracic mobility= neck or shoulder or LB pain

- Many basketball players with PFPS have stiff ankle and often too stiff shoe styles
- The hip can be immobile and unstable> Immobility causing LB pain and instability causing knee pain
- Or weak hip ext. or loss of ext. from tight psoas causing LB pn from compensatory ext.
- Glute med. inhibition can cause stress to the knee and is a common indicator of ankle sprains

Pathogenesis of the cumulative trauma disorder

- **Recovery**
- **Cycle**
- **Injury Cycle**
- Frequency of Insult
- Amount of Tissue Insult
- **Insufficient Tissue Recovery Between Injury Cycles**
- **Tissue Damage Accumulates**



The recurrent ankle sprain

- Often happens due to lack or lateral control with weak hip external rotators and abductors causing the ankle to roll inward and results in excessive correction with the knee going out and causing excessive ankle inversion.
- Or due to poor ankle dynamic stability.

3 Grades of an Ankle Sprain

Treatment of the Ankle Sprain

- Old School- rest, ice elevate, gradual exercise, tape to prevent motion.
- New School- rest, ice, elevate, MOBILIZE, tape to encourage proper motion, progressive ex's to functional ex's.

The Lateral Ankle Sprain explained

- With an ankle sprain it is said there is typically an inversion trauma said to tear the ATF lig.
- So creating a stretch to this ligament should reproduce pain?
- Due to the separation of the fibula from the tibia causes the talus to roll inward causing an ant. inf. translation of the fibula with distal ant. Inf. Tib-fib lig. disruption.

Mulligan mobilization and taping technique

Mulligan mobilization and taping technique

A posterior lateral glide is performed to the distal fibula and repeated inversion is performed.
Taping is to hold the joint positioning and allow for function.

Mulligan mobilization and taping technique effects

- Near to full ROM regained
- Decrease in swelling
- Immediate reduction in pain
- Return to function
- Reduction of future injuries.

Alignment Matters!

- Sooner or later it will wear out.
- Not only is the single tire (or foot) affected, but it can adversely affect the other tires – or the rest of our body.
- The steering also becomes misaligned – just like our body.

The majority of people with misaligned feet *DON'T* have pain in their feet.

Instead, the pain will show up elsewhere,
such as the knees, hips or back.

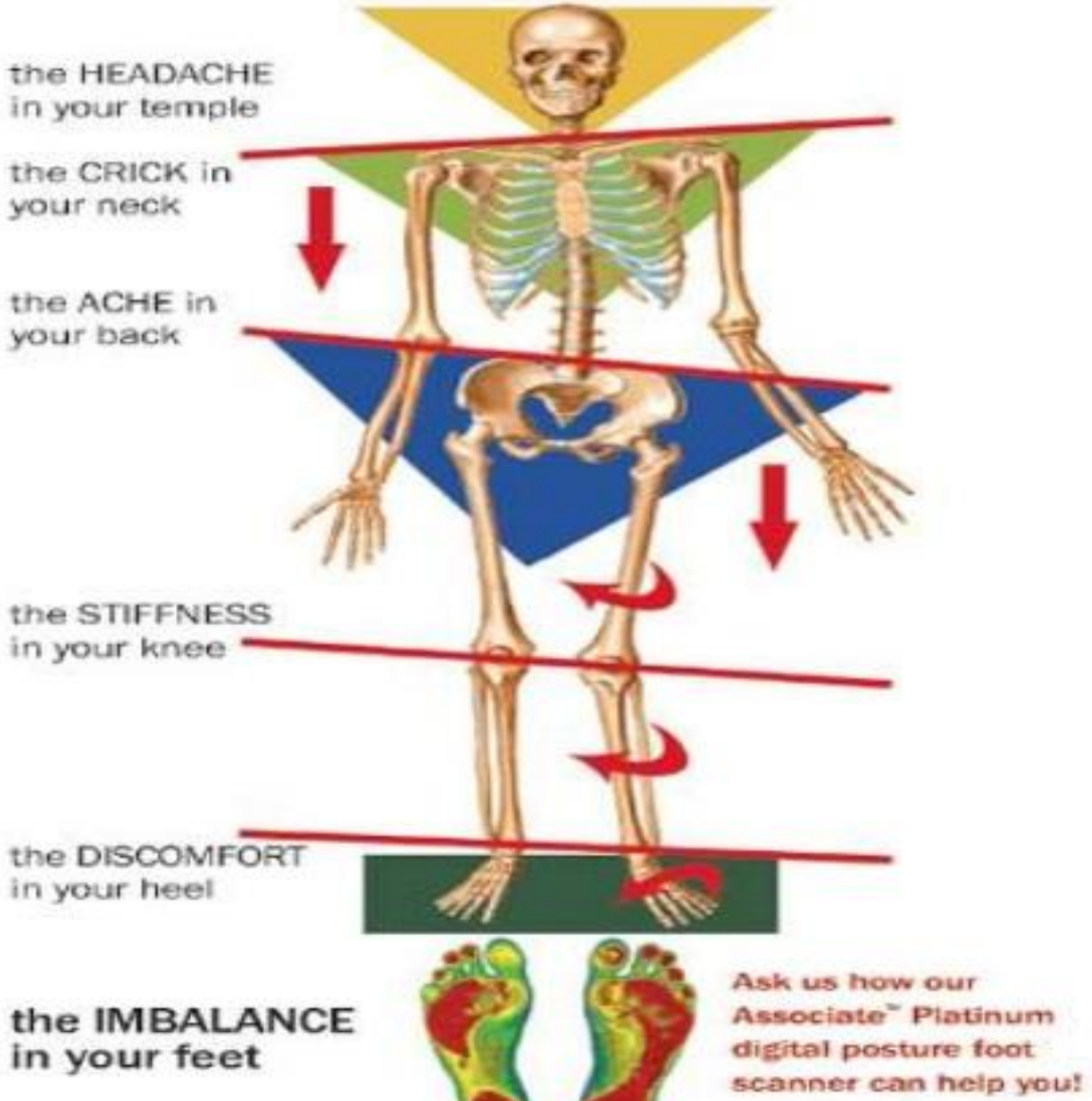
The symptom(s) of mis-aligned feet will show up at the
"weakest link in the chain."

Biomechanical Exam

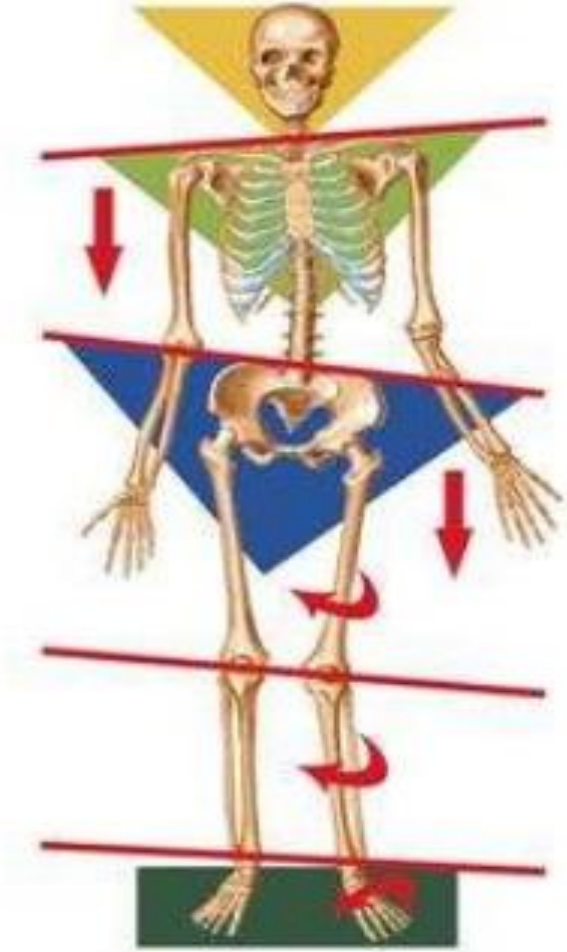
Functional standing tests

- Raise up on toes
- Half squat with heels down
- Twist left
- Twist right

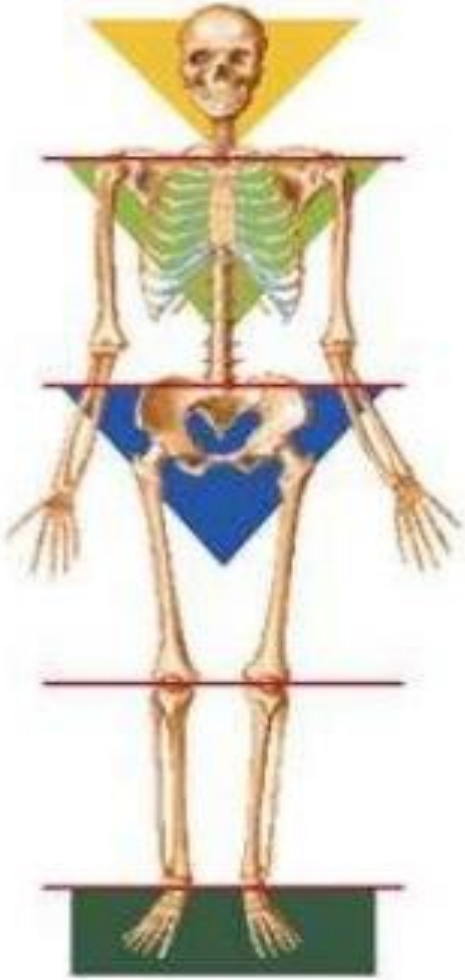
Alignment Matters!



Orthotics



Imbalance in the feet leads to stress and misalignments in the feet, knees and hips and spine.



Foot Orthotics align the body reducing stress and strain on your nervous system and joints.

Orthotics

Other foot mobilization tech.

Regaining DF With a posterior glide to the talus with repeated DF.

Other foot mobilization tech.

Regaining PF
With an anterior glide to the talus with repeated PF.

Other foot mobilization tech.

- Regaining DF
- Regaining EV
- 1st toe MTP ext. mob.
- 5th Met flexion mob

Taping and foot mobilization tech. for shin splints

An ant. mobilization of the prox. fib with post lat. dist. fib mob and taping.

Ankle and foot manipulation

Talo-Crural jt. DF manipulation

Subtalar Eversion Manipulation

Calcaneal-Cuboid superior glide manipulation

The role of movement screening

- The FMS is a ranking and grading system that documents movement patterns that are key to normal function.
- The FMS readily identifies functional limitations and asymmetries effecting f training conditioning and body awareness.

The role of movement screening

- The FMS generates the Functional Movement Screen Score, which is used to target problems and track progress. This scoring system is directly linked to the most beneficial corrective exercises to restore mechanically sound movement patterns.

The role of movement screening

- Exercise professionals monitor the FMS score to track progress and to identify those exercises that will be most effective to restore proper movement and build strength in each individual.

The FMS

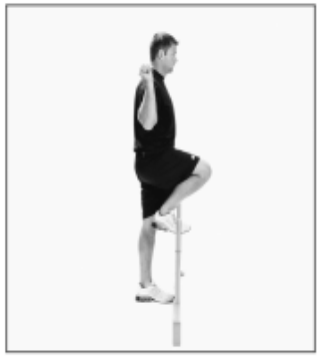
DEEP SQUAT

3

Upper torso is parallel with tibia or toward vertical | Femur below horizontal
Knees are aligned over feet | Dowel aligned over feet

HURDLE STEP

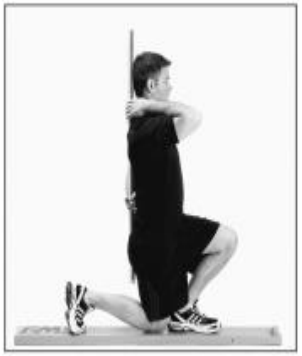
3



Hips, knees and ankles remain aligned in the sagittal plane
Minimal to no movement is noted in lumbar spine | Dowel and hurdle remain parallel

INLINE LUNGE

3



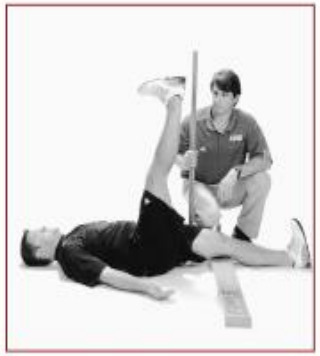
Dowel contacts maintained | Dowel remains vertical | No torso movement noted
Dowel and feet remain in sagittal plane | Knee touches board behind heel of front foot

3

The FMS

ACTIVE STRAIGHT-LEG RAISE

3



Vertical line of the malleolus resides between mid-thigh and ASIS
The non-moving limb remains in neutral position

TRUNK STABILITY PUSHUP

3

The body lifts as a unit with no lag in the spine

Men perform a repetition with thumbs aligned with the top of the head
Women perform a repetition with thumbs aligned with the chin

ROTARY STABILITY

3

Performs a correct unilateral repetition

The FMS

- Test is Scored for (L and R) for a Final Score
- Each movement is scored from 1-3 for non-painful movements and a (0) for pain during movement.
- A score of 14 or higher is desired.
- <14 puts client at risk for injury
- Max score of 21

The FMS

- 3= Full mobility w/o any compensation
- 2= Full mobility with mild compensatory patterns
- 1= Compensation with loss of balance or moderate restrictions in mobility
- 0= Pain with the movement- examine the area and refer out.

The SFMA

- Goals are:
- Reset- Manual therapy: Joint or soft tissue mobs for a mobility problem
- Reinforce- Taping, Orthotics, Bracing, Stretching, biomechanics, work or sport modification.
- Reload- Teach exercise and look for a pattern to reinstate motor control. Do not reload something until we have good reinforcement.

The SFMA (12 tests)

1.

2.

3.

4.

5.

6.

The SFMA

7.

8.

9.

10.

11.

12.

Scoring the SFMA

- FN= Functional Normal
- FP= Functional Painful
- DN= Dysfunctional Painful
- DP= Dysfunctional Painful

Scoring the SFMA

- Functional Normal (FN) for top tier (Stop)
- DN, DP or FP= possible SMCD, JMD or TED.
- SMCD= limited mobility in wt. bearing but full mobility (FN) in NWB.
- JMD or TED= for DP or DN
- (FP)= stop and treat

Mobility Problems (TED)

- Muscle shortening
- Active/passive muscle dysfunction
- Neural tension
- Fascial Tension
- Hypertrophy
- Tr. Points
- Scarring and Fibrosis

Mobility Problems (JMD)

- OA
- Osteoarthrosis
- Fusion
- Subluxation
- Adhesive Capsulitis
- Dislocation
- Positional fault

SMCD

- Proprioceptively driven
- Mechanical Breathing dysfunction
- Motor Control dysfunction
- Prime mover or global muscle compensation behavior or asymmetry
- Local dysfunction or asymmetry
- Poor static or dynamic stability, postural control, asymmetry or structural alignment

Assessment (Hip Rotation)

- Limited Supine hip flexion & IR= possible glute medius tightness, Glute max., Obturator, QL or piriformis
- Limited Prone IR= Iliopsoas or sartorius tension

- Limited Supine hip flexion & ER= TFL/IT band or Glute Medius and Minimus tension
- Limited Prone ER= Hip adductor tension.

SFMA Breakouts (Tibial. Rotation)




Look for up to 40° of Tibia ER, and 30° of tibial IR.

SFMA Breakouts (Ankle Mobility)

Look proper DF and PF during toe/heel walks

INV and EV= 40°/20°

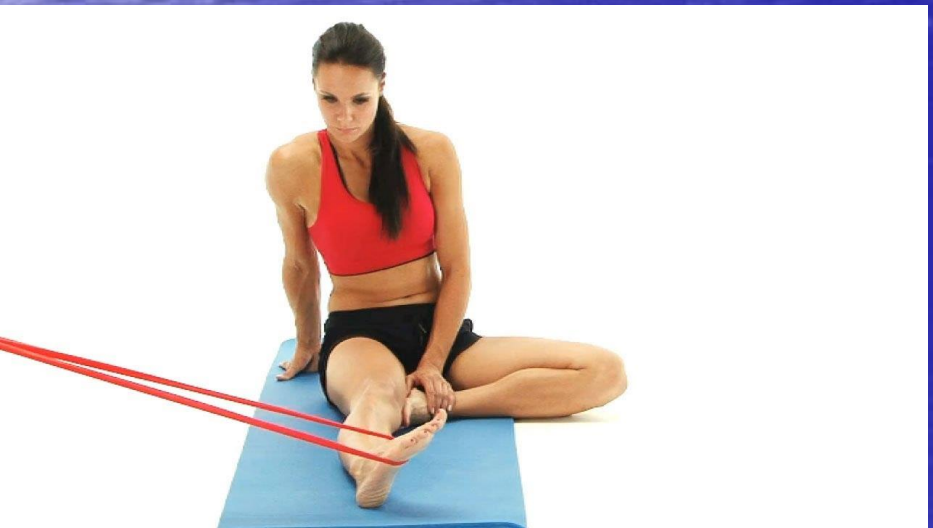
SFMA Breakouts (Squat Breakout)

Look improved squat with hands clasped, for proper DF, and for proper knee to chest with hands under and over knees (Hip vs. knee flexion lim. If good maintenance with assisted squat vs. loss of balance= SMCD

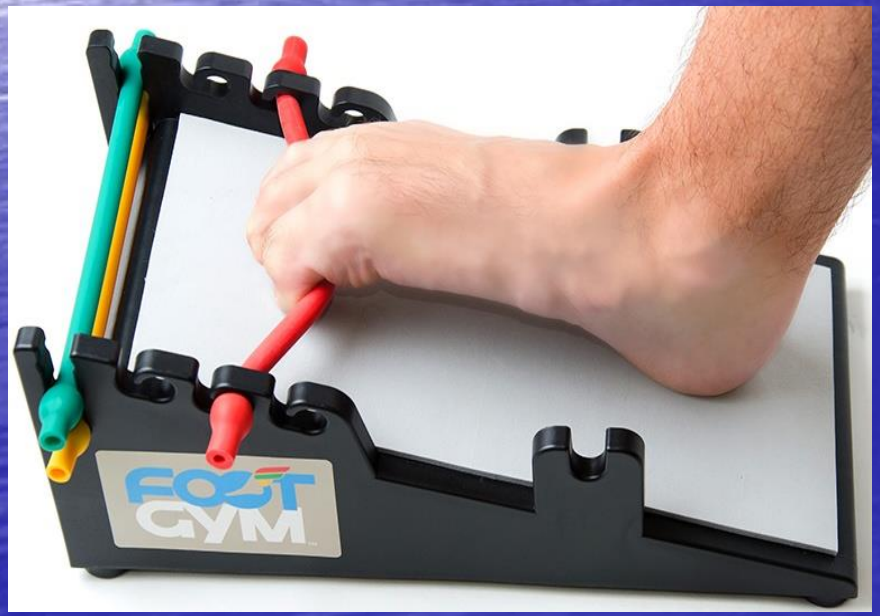
Correct Body Mechanics with squatting technique

- Squat through the hips which break parallel
- Maintain head upright and shoulders level w/ dowel over feet
- Tibia is parallel w/ torso
- Maintaining sagittal plane alignment (knees over feet)
- Good motor control, effortless and no wt. shifting w/ lumbar ex
- Heels stay in contact with ground
- No pain!

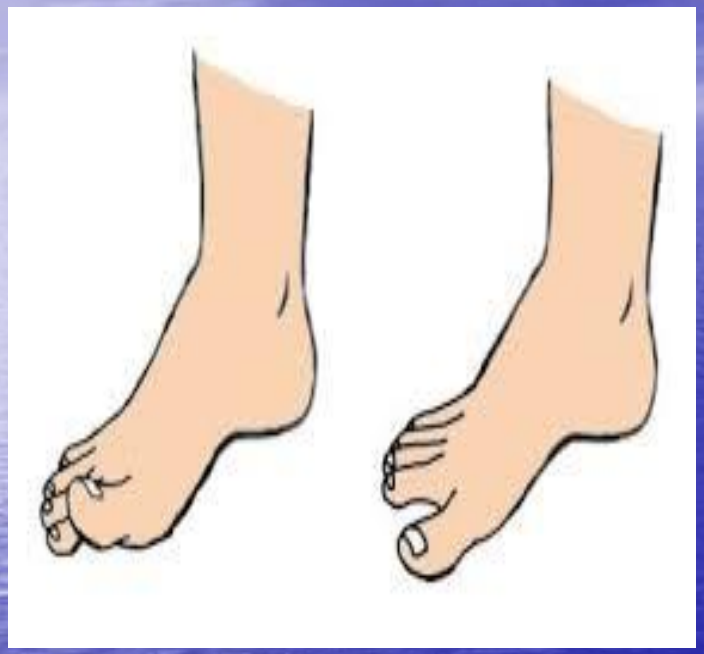
Ankle exercises



Foot exercises



Toe/ Foot mobility & exercises

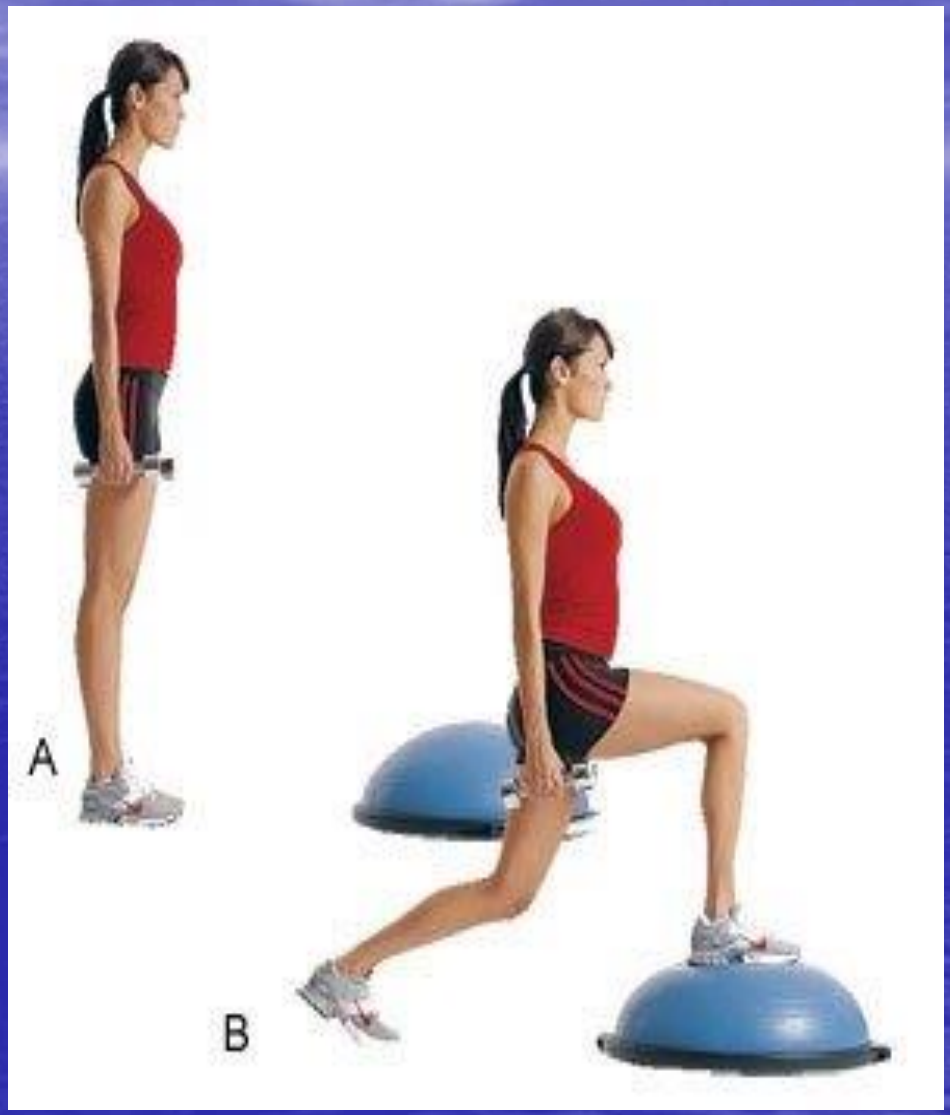


Foot mobility & balance exercises

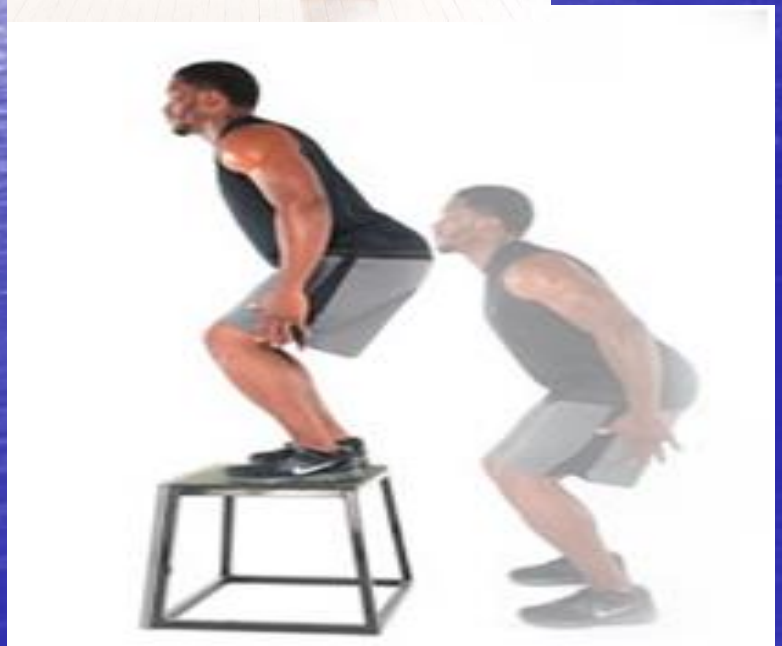
Foot techniques

- Graston
- Kinseo Taping
- Rolling

Exercises for ankle strength and stability



Advanced exercises for knee strength and stability



Advanced exercises for knee strength and stability

Stretching exercises for the foot and ankle

Stretching exercises for the foot and ankle

Work Site or Training Modification

- New ex's, job or sport based on things we can't change
- Allow for active rest and healing with meds
- Work on core strengthening and address footwear
- Bracing or taping
- Allow for adequate warm up, and stretching of restricted areas prior to strengthening exercise

Questions

Therapeutic Rehab Specialists

Clinic Locations

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Pinellas Park, FL 33781

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