MedFit Classroom
Orthopedic Fitness Specialist Course

Module 4: The Foot & Ankle

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Learning Objectives

- Lesson 1
  - Skeletal anatomy
  - Arches
  - Skin
  - Fat pad
- Lesson 2
  - Muscles
- Lesson 3
  - Functional connectivity
  - Interview with Dr. Emily Splichal
- Lesson 4
  - Common foot injuries
- Lesson 5
  - Common ankle and shank injuries
- Lesson 6
  - Barefoot science
  - Shoes
- Lesson 7
  - Common foot and ankle exercises
  - Uncommon foot and ankle exercises

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Lesson 1: Foot & Ankle Anatomy

Talocrural joint - distal tibia meets talus
- Distal tibia forms medial malleolus

Subtalar joint - talus meets calcaneus (posteriorly) & talus meets navicular (anteriorly)
- aka talocalcaneonavicular joint

Inferior Tibiofibular joint - distal tibia meets distal fibula
- Distal fibula forms lateral ankle/malleolus

Foot - 26 bones, 33 joints and >100 muscles, ligaments and tendons

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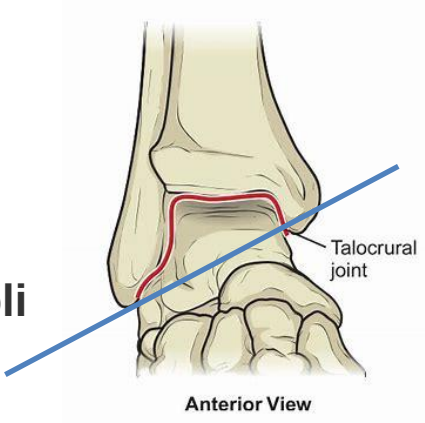
Talocrural Joint

AKA Talotibial joint (a mortise joint)

Sagittal plane: dorsi/plantar flexion

Oblique/transverse plane: dorsi+abd, plantar+add

Note alignment of lateral-to-medial malleoli



Splichal, Idea Fit webinar, 2019, “From the ground up glute strength”
Image: proprio.tistory.com

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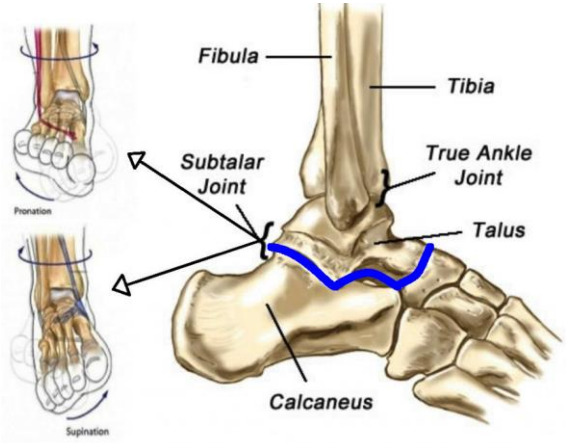
Subtalar Joint

Talus + Calcaneus + Navicular

Primarily frontal/diagonal plane: inversion/eversion
Secondary transverse plane: rotational
Combine to be triplanar: like a ball and socket



https://www.verywellhealth.com/what-is-the-subtalar-joint-1337686
Image: mobilephysiotherapyclinic.in

The Rest of the Foot

Tarsal bones

7 irregularly shaped

Metatarsals

long bones connecting tarsal bones and phalanges/toes

Phalanges

3 per toe

The Arches d'Triumph

- Longitudinal Arch - bottom, from metatarsal heads to calcaneus
  - Functional Synergy of Longitudinal Arch Load-Sharing System (LALSS): *Windlass Effect*
- Transverse Arch - across tarsals
  - Maintains mid-foot arch

Both arches infused with glabrous s… …mechanoreceptors

Image: nursinglecture.com

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Glaborous Skin Mechanoreceptors

Sense pressure, tension between two endings, vibration, motion
(Ruffin's, Pacinian, Meissner's corpuscles)

- Slow-adapting are for posture and balance
- As we age, we lose these, have more sway in standing
- Peak sensitivity at age 40
- By 70, need twice the stimulation to create same response
    - @age 3 - 69 per mm
    - @age 32 - 27 per mm
    - @age 83 - 8 per mm

Fast-adapting are for quick response to stimuli but then shut down

Splichal, LER Mar, 2018, Pg. 52

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Fat Pads

Fat Pads - Heel and Forefoot

- Shock reducers
- Energy dissipation - do NOT act as ‘springs’ like Achilles tendon and arch
- Protects against excessive plantar pressure - proprioceptors for vibration upon heel strike and pain sensors

From I Davis, D Lieberman, et al. Stepping Back to Minimal Footwear: Applications Across the Lifespan. Exerc Sport Sci Rev. 2021 Oct 1;49(4):228-243. doi: 10.1249/JES.0000000000000263.2021

Lesson 2: Muscles of the Anterior Lower Leg

Tibialis Anterior

- Dorsiflexes ankle at talocrural joint
- Inverts foot at subtalar joint
- Supports medial longitudinal arch as it inserts on the medial cuneiform
- Implicated in anterior tibial stress syndrome

Muscles of the Posterior Lower Leg

Gastrocnemius + Soleus = Triceps Surae

- Gastroc - 2-joint muscle (ankle, knee)
  - Medial head - medial rotation moment
  - Lateral head - lateral rotation moment
- Soleus - 1-joint muscle

Tibialis Posterior

- Inverts foot and supports longitudinal arch

Muscles of the Lateral Lower Leg

Peroneals

- Peroneus longus - primary everter and lateral stabilizer of ankle; assists plantar flexion; assists transverse arch of foot
- Peroneus brevis - assists eversion and plantar flexion
- Peroneus tertius - nominally assists eversion and plantar flexion

Functional Connectivity

The foot bone’s connected to the shin bone….

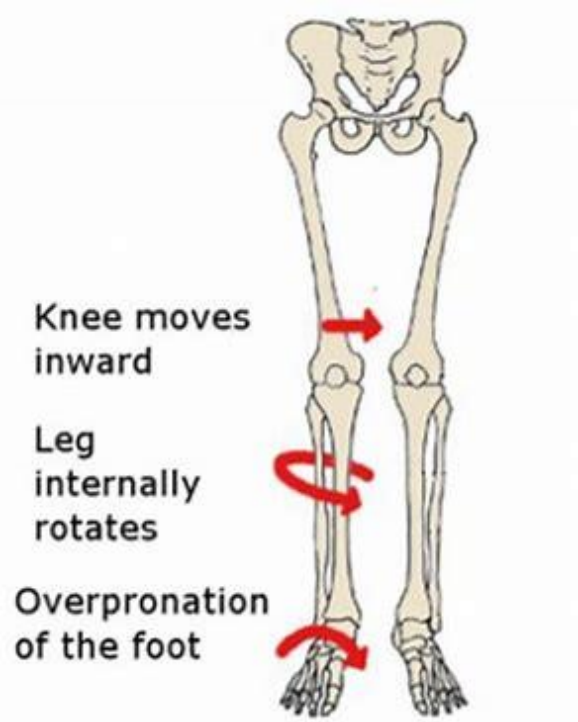

Image: fixflatfeet.com

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Ankle ROM Up the Kinetic Chain

“If someone moves the ankle in sagittal plane but lacks transverse motion, [the ankle] will go into excessive frontal plane motion and inappropriate motion up the kinetic chain”

e.g. tibial torsion, knee valgus/varus, hip int/ext rotation

Splichal, Idea Fit webinar, 2019, “From the ground up glute strength”

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Inversion vs. Eversion

Inversion	Eversion
Supination	Pronation
Acceleration	Deceleration
Plantar-flexed	Dorsi-flexed
Stable, locked	Unstable, hypermobile
Power-producing	Shock-absorbing
Tibial external rotation	Tibial internal rotation
Knees roll out (varus)	Knees turn in (valgus)
Hip externally rotates	Hips internally rotate

Splichal, Idea Fit webinar, 2019, “From the ground up glute strength”

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Myofascial Linkage?

- Posterior tibialis (PT) inserts on navicular bone (highest arch bone) + 9 other tarsal/metatarsals
  - Primary stabilizer of arch qua supinator
  - Associated with distal peroneus longus (PL), lateral stabilizer of arch

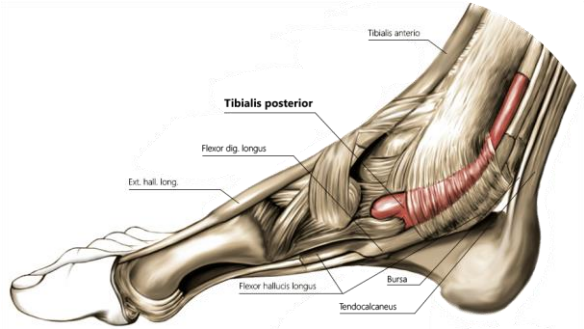

Image: nydnrehab.com

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Emily Splichal, Functional Podiatrist,MS, CES

- Functional Podiatrist and Human Movement Specialist
- Founder of Evidence-Based Fitness Academy Global
- Creator of the Barefoot Training Specialist® Certification
- Author of Barefoot Strong
- CEO/Founder of Naboso Technology
- Specializing in postural alignment and human movement as it relates to barefoot science, foot to core integration and sensory integration.

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Interview with Dr. Splichal

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Lesson 4: Common Foot Maladies

Bone
- Hammer toes
- Lisfranc
- Morton’s toe
- Morton’s neuroma
- Jones
- Bunions
- Stress fractures

Functional
- Adult-acquired flatfoot deformity (AAFD)
- Oversupination
- Plantar fasciitis
- Posterior tibialis tendinopathy/tendon dysfunction (PTTD)

Image: canyonoaksfootankle.com

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Hammer and Mallet Toes

- Hammer - affects middle phalangeal joint, #2,3,4
- Mallet - affects most distal phalangeal joint, #2,3,4
- Type of shoe, foot structure, Morton's toe, trauma, certain disease processes (arthritis, diabetes, heredity)—> hypermobility/instability of 1st metatarsal ——>corns and callouses
- Treatments: large toe-box shoes, inserts to lift the first metatarsal head, surgery

Mayo Clinic, https://www.mayoclinic.org/diseases-conditions/hammertoe-and-mallet-toe/symptoms-causes/syc-20350839

Lisfranc Fracture

Mid-foot fractures of metatarsals with/without ligament tears

- **Usually traumatic, low-energy (twist & fall) or high-energy (direct trauma)**
- **Depending on severity damages cartilage setting up arthritis, collapsed arches**

Image: radiopaedia.org

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Morton’s (long 2nd) Toe Pathology

- Leads to overpronation, inability to supinate and have a ‘rigid lever’ at push-off
- Associated with metatarsalgia, metatarsal stress fractures, plantar fasciitis, ankle pain and shin splints (from overcompensation)

Image: blog.ohmyarthritis.com

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Morton’s Neuroma

- Inflamed nerve most commonly between 3rd and 4th metatarsal heads
- Feels like a stone under the forefoot, burning pain, numbness/tingling in toes
  - When shoes are off, symptoms abate
- Common causes include the types of shoes worn (narrow forefoot, high heels), type of foot (overpronated/supinated), other deformities

https://www.mayoclinic.org/diseases-conditions/mortons-neuroma/symptoms-causes/syc-20351935

Jones Fracture

- Fifth metatarsal (FMT), most commonly proximal; stress or acute
- Causes - misstep or fall with foot supinated, adducted, and plantar flexed
- Treatments - no weight bearing, short-leg brace or hard-sole shoe + short-leg brace; treatment depends on which part of FMT is broken

Bunions

Hallux rigidus/arthritis vs Hallux valgus

A biomechanical misfit between the bones that control your big toe—but not just in 1 direction or on one plane; misalignment can occur in any of the 3 planes in which foot bones move

Traumas and arthritic conditions that disrupt the normal anatomic stabilizing structures; during pregnancy when several body ligaments become more lax

Overpronated/flat feet- the muscle that controls the big toe into a weakened state

Poorly-fitted shoes

PJ Betschart. https://lermagazine.com/article/patient-guidance-is-there-conservative-care-for-bunions. LER Feb. 2021.

Bunions

Treatments - orthotics, spacers, surgery

- Cheilectomy - remove bone spurs; 2 wks in boot, 6 wks in shoes if…

- Bunionectomy - straighten, realign bones, remove spurs, fusion; 6-8 wks in boot, PT for several weeks, regular activity by 3-6 months

Stress Fractures

Low-risk bone stress injuries (BSIs) of the tibia and metatarsal diaphyses account for more than half of BSIs in runners

Non- or partial-weight bearing til symptoms abate - 4-6 weeks. Especially if pain at night remains

Return-to-Run program - once pain free for 5 consecutive days

- Volume first, then speed
- May include load management (pads, inserts), no jump training

SJ Warden, WB Edwards, RW Willy. Optimal Load for Managing Low-Risk Tibial and Metatarsal Bone Stress Injuries in Runners: The Science Behind the Clinical Reasoning. J Orthop Sports Phys Ther 2021;51(7):322–330. Epub 7 May 2021. doi:10.2519/jospt.2021.9982

Adult-Acquired Flatfoot Deformity (AAFD)

- Overpronation, everted foot (pes planus)
  - Internal tibial rotation, knees and hips turn in
  - Unstable, unlocked, hyper mobile, poor shock absorber
- Structural origins - foot shape
- Functional origins - posterior tibialis dysfunction; weak flexor hallucis longus; foot-knee-hip mechanics; pregnancy; excess weight; standing long hours

Emily Splichal, Idea Fit webinar, 2019 or 2020, “From the ground up glute strength”

Ian Engelman. Expert Opinion: Quantification of Arch Height in a Foot Orthotic: Defining A Standardized

Oversupination

- Pes cavus = Inverted foot
- Plantar flexed
- High arch
- Stable, locked, rigid, force producing, for power
- Poor shock absorption

Emily Splichal, Idea Fit webinar, 2019 or 2020, “From the ground up glute strength”

Plantar Fascia

Anatomy - ligamentous, thus passive; originates from the plantar aspect of the medial calcaneal tubercle and spreads distally to form five separate slips that each insert into the bases of the proximal phalanges of all five digits

Forms the “longitudinal arch load-sharing system” of the foot

Kevin A. Kirby, DPM , BEHOLD the Human Arch! Biomechanics of Longitudinal Arch Load-Sharing System of the Foot, LER Feb. 2021

Image: nydnrehab.com

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Plantar Fascia

Flattens as weight is applied, shortens to create a spring (in your step) like a bowstring or leaf-spring

"…multiple components work together as a unit within the load-sharing system. In doing so, if one component fails, the system as a whole will not fail; rather, the working loads on all the remaining components of the system **will be increased** in response to the failure of one of its components"

Plantar Fasciosis, formerly known as Fasciitis

- Chronic irritation/inflammation of plantar fascia
- Pain at anterior calcaneus (sometimes creating bone spur), radiating anteriorly
- Often related to tight triceps surae; overpronation; weak intrinsic muscles; weak peroneus longus; weak flexor hallucis longus

Dealing with Plantar Fasciosis

- Stretch triceps surae
- Soft tissue massage for PF, peroneus longus
- Strengthen posterior tibialis and flexor hallucis longus
  - Short foot/foot doming
  - Toe curls
  - Standing forward leans

Posterior Tibialis Tendinopathy (or PT Tendon Dysfunction: PTTD)

Tests/Signs and Symptoms

- pain on tendon palpation
- swelling around the tendon
- pain/weakness with tibialis posterior contraction

- Pain during or inability to perform a single-leg heel raise (SLHR: most reliable but not precise)

MH Ross, MD Smith, R Mellor, G Durbridge, B Vicenzino. Clinical Tests of Tibialis Posterior Tendinopathy: Are They Reliable, and How Well Are They Reflected in Structural Changes on Imaging? JOSPT April 30, 2021. 51(5): 253-260.

Lesson 5: Common Ankle & Shank Injuries

- Ankle sprain
  - FAI
- Calf strain
- Achilles strain/tear/tendinopathy
- Shin Splints

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Ankle Sprains

- Inversion of plantar flexed foot
- Stretch or tear lateral ligament complex - usually anterior talofibular ligament (ATFL), sometimes with calcaneofibular ligament (CFL)
- Nearly half due to sports (basketball 41%, football 9%, soccer 8%)
- 10% - 34% of all sports injuries

RL Martin, TE Davenport, S Paulseth, DK Wukich, JJ Godges. JOSPT 2013; 43(9): A1-A40

Ankle Sprains

- Muscle proprioceptors too slow to halt sudden inversion
- Anticipatory muscle contraction may be more important than a reflexive response
- May be linked to weak/slow responding gluteus medius (GMed); may cause weakness of bilateral gluteus maximus, biceps femoris and erector spinae
- Damaged cutaneous nerves alter “afferent cutaneous feedback receptors”

Downstream Effects of Ankle Sprains

- GMax, hamstrings weakness
- Plantarflexion, supination, pronation weakness
- Active dorsiflexion and supination ROM reduced
- Gait asymmetries
- Postural control deficiencies when challenged
  - “that worse postural control is associated with greater T1ρ relaxation times (i.e. **worse cartilage health**) in those with CAI, particularly in the talar dome”
- Delayed peroneal muscle reaction time

M Wenning, D Gehring, M Mauch, H Schmal, R Ritzmann, J Paul. J Ortho Surgery Research 2020; 15(304)

Erik A Wikstrom, Kyeongtak Song, Joshua N Tennant, Brian Pietrosimone. MSSE Feb. 2022 Publish Ahead of Print, DOI: 10.1249/MSS.0000000000002867

Functional Ankle Instability

- “Chronic ankle instability may be due to mechanical instability, functional instability, or most likely, a combination of these two phenomena.”
  - Altered reflex, NM inhibition, weakness, balance deficits, altered movement patterns, reduced PA
- Probability of recurrence plateaued till 2 months post-injury, then increased again more if PT was delayed

Lee, Son, Kim, Han, Seeley, Hopkins. LER Nov. 2021
DI Rhon, JJ Fraser, J Sorensen, TA Greenlee, T Jain, CE Cook. Journal of Orthopaedic & Sports Physical Therapy. JOSPT 2021;51(12):619–627. doi:10.2519/jospt.2021.10730

FAI

- Impaired proprioception impacts postural control/balance, even to injured side
    - Lee et al: “proprioceptive deficits in the force steadiness and accuracy of ankle eversion and inversion”
- Studies show injured athletes who do not participate in proprioception/balance training upon ability to bear weight are very prone to re-injury
    - Neuromuscular warm-ups reduce rate of re-injury

RL Martin, TE Davenport, S Paulseth, DK Wukich, JJ Godges. JOSPT 2013; 43(9): A1-A40

Achilles Tendon Injuries

- Typical treatment: 2 wks immobilization, 6-8 wks ortho-boot, 2-4 months active rehab, resume ambulation > 6 months
- Substantial abnormalities prevail in asymptomatic individuals; more in >40, higher BMI, and athletes
- Injury-recovered AT remains thickened, weaker, (31% so) longer, stiffer, with “compensatory remodeling” - shorter fascicles

SI Docking, HF Hart, E Rio, MC Hannington, JL Cook, AG Culvenor. JOSPT 2021. 5(5): 232 - 252

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Calf Strain

- Gastrocnemius - Tennis leg - forceful knee extension with dorsiflexion; pain in muscle belly or musculotendinous junction
- Plantaris - combined and treated like gastroc strains
- Soleus - rare since it only is an ankle plantar flexor; presents as less dramatic, more chronic; pain is more lateral
- Treat with pain/inflammation management, decreased load-bearing, unloaded isometrics followed high rep/low load isotonics, then high load/high rep eccentrics

JB Dixon. Gastrocnemius vs. soleus strain: how to differentiate and deal with calf muscle injuries. *Curr Rev Musculoskeletal Med* 2009. 2:74-77.

Medial Tibial Stress Syndrome
“Shin Splints”

- Pain along medial tibia due to inflamed muscles, tendons, periosteum (aka Chronic exertional compartment syndrome (lateral tibia))
- Overuse - too much, too soon, too fast, wrong shoes, hard surfaces
- Failure to absorb shock - overpronators, oversupinators, high arches
- Nutritional deficiencies, especially ED - Female Athlete Triad (loss of menses)
- Bad during exercise, worse after exercise
    - Swelling has no where to go

Cleveland Clinic, https://my.clevelandclinic.org/health/diseases/17467-shin-splints
Ortho Info, https://orthoinfo.aaos.org/en/diseases--conditions/shin-splints

MTSS Contributing Factors

- Deficient Passive ROM
- Muscle weakness - hip abductors
  - Tighter ITB
- Plantar pressure distributions
  - Longer durations of foot eversion
- Mediolateral pressure balance
- Proximal (pelvis, hip) AND Distal (foot, ankle) kinematics

J Becker, M Nakajima, WFW Wu. MSSE 2018. 50(10): 2092-2100.

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Gout

- Urate chrystals deposited in joints, most often in ankle due to excess uric acid or kidneys unable to process it
- Linked to foods high in purines - red meat, organ meat, sardines, mussels, tuna; alcohol intake
- Risk factors - family history, diet, weight, medical conditions (met syndrome, diabetes) age (>30 in males, >menopause), surgery/trauma

Mayo Clinic, https://www.mayoclinic.org/diseases-conditions/gout/symptoms-causes/syc-20372897

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Gout

- Associated with weaker foot/leg muscles, alters gait, increased risk of Achilles and patellar tendinopathies
- May change tissue elasticity - makes AT less stiff relatives to age/gender peers
  - Thicker tendon, increased vascularity
  - “Less effective at transmitting muscle force”

Simon Otter, Catherine Payne, Anna-Marie Jones, Nick Webborn, and Peter Watt Achilles Tendon Stiffness in Gout, LER Feb. 2021. https://lermagazine.com/article/achilles-tendon-stiffness-in-gout

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Ankle Arthritis

- Of 1294 studies surveyed, 43 met the inclusion criteria
- No studies found significant correlations between joint injury, physical activity, body weight (overweight or obese), or occupation (even among veteran parachutists) and ankle OA
- “Volleyball players were more likely to radiologic evidence of ankle OA”

SA Richmond, RK Fukuchi, A Ezzat, K Schneider, G Schneider, CA Emery. J Orthop Sports Phys Ther 2013;43(8):515-524

Medical Options

- Arthrodesis/Fusion - removes cartilage; screw and plate bones together; limits ROM but reduces pain; shorter steps; rocker shoes work; non-impact/cutting forbidden
- TAA - 80% last 15-20 years; metal on talus and tibia, plastic between; not option for those with particular types of deformity or nerve problems in legs

Cleveland Clinic Arthritis Advisor Sept. 2021. 20(9): 6-7

Ankle Replacement

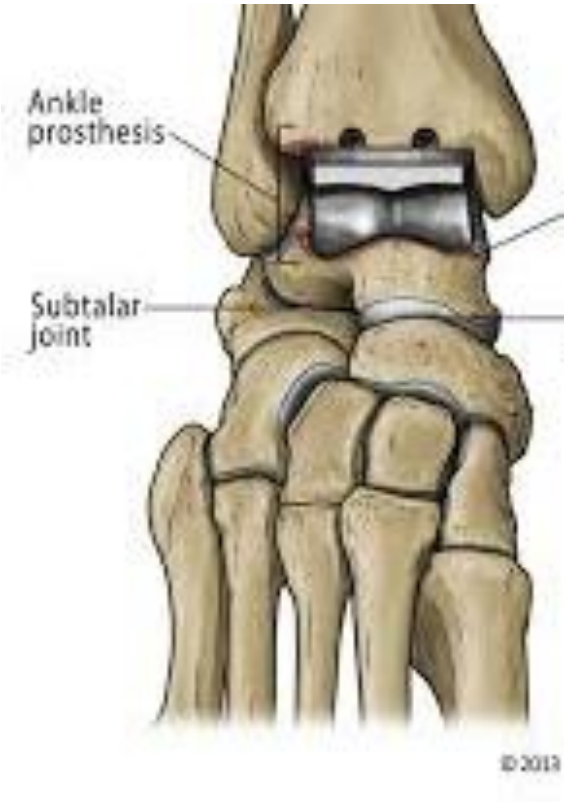

Image: ankle arthritis.co.uk

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Prosthesis Wear & Tear

- Mobile-bearing 3-component
  - 3 x higher rate of revisions of early implants
- Fixed-bearing 2-component

"…present study supports the use of a fixed-bearing design in terms of short-term failure"

M. Assal, H. Kutaish, A. Acker, MD, J. Hattendorf, A. Lubbeke, X. Crevoisier, J Bone Joint Surg Am. 2021;103:2080-8 d http://dx.doi.org/10.2106/JBJS.20.02172

Arthroplasty, Arthrodesis: Gender, Pain, Function

- >2-yr follow-up study of 629 arthroplasty, 243 arthrodesis patients
- Women had more pain pre- and post-surgery but similar rates of pain-reduction post-surgery
- Women had more disability and functional scores pre- and post-surgery with similar rates of disability and functional improvement
- Conclusion: men and women benefit similarly from arthroplasty or arthrodesis

A Dodd, E Pinsker, ASE Young, MJ Penner, KJ Wing, PJ Dryden, M Glazebrook, TR Daniels. Sex differences in end-stage ankle arthritis and following total ankle replacement or ankle arthrodeis. JBJS Feb. 2, 2022; 104(3): 221. 10.2106/JBJS.21.00287

Lesson 6: Barefoot or Shod? Why & How to Pick Your Footwear

Daniel Lieberman, Father of the SCIENCE of barefoot running

Harvard professor of Human Evolutionary Biology

Prolific researcher on bipedal gait

Popularized by Chris McDougall's "Born to Run"

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Review of the Science of Barefoot Running

Rearfoot Strike (RFS) - heel makes first contact

Forefoot/Midfoot Strike (FFS) - heel does not make contact

Heel pad protects against excessive plantar pressure - proprioceptors for vibration upon heel strike and pain sensors

Is FFS in minimalist shoes a protective mechanism?

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The Door Opens…

Premise 1: “the adaptations which produce shock absorption…are related to deflection of the medial longitudinal arch of the foot on loading.”

Premise 2: “the known inability of this arch of the shod foot to deflect without failure (foot rigidity) is responsible for the high injury frequency in shod populations.”

Method: filmed medial longitudinal arch of 17 runners

Results: “**sensory feedback largely from the glabrous epithelium** of the foot is the element of barefoot activity which induced [arch] adaptations. The sensory insulation inherent in the modern running shoe appears responsible for the high injury frequency associated with running.”

ROBBINS, S. E. and A. M. HANNA. Running-related injury prevention through barefoot adaptation. MSSE, **1987**; 19(2): 148–156.

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Non-Western vs Western Running Injuries

- Do “habitually forefoot striker [runners] have different rates of injury than runners who habitually rear foot strike”
- Most college X-country runners are RFS; experience nearly twice the repetitive stress injury rate as FFS
- Hypothesis: RFS have 2 impact peaks vs 1 in FFS

Al Daoud, GJ Geissler, F Wang, J Saretsky, YA Daoud, DE Lieberman. Foot strike and injury rates in endurance runners: A retrospective study. MSSE 2012 Jul; 44(7): 1325-34.

RFS to FFS

- FFS distance runners revert to RFS later in race
- Converting style is inexact science
  - Transfer injuries from RFS-related heel contact and shock absorption injuries to forefoot and Achilles issues

I Davis, K Hollander, DE Lieberman, ST Ridge, ICN Sacco, SC Wearing. Getting back to minimal footwear: Applications across the lifespan. Ex Sci Sports Rev. 2021. 49(4): 228-243.

RFS to FFS

- History of running shoes: build up heel to absorb shock and support foot/ankle motion
  - Slow rate of impact loading
  - Decrease sensory perception, delay absorption mechanisms
  - Excessive support reduces intrinsic muscle demands ——-> weaker feet
  - Alter foot mechanics ——> lateral heel flare demands heel-to-forefoot landing

RFS to FFS

- Sudden transition to minimalist shoes and FFS did not allow adaptation
  - Increased rates of Achilles strain and metatarsal head pressure and impact injuries vs tibial stress fractures, PFPS, and plantar fasciitis in RFS
- FFS shown to reduce PFPS - shorter stride, more strides/unit distance, greater knee flexion at foot strike (increased patellofemoral contact area) & decreased vertical ground reaction forces

Motion Control Shoes???

“Research aiming to identify risk factors for injury should distinguish between injuries that are related to that risk factor and injuries that are not….Motion-control footwear may be effective in reducing (1) the amount of foot pronation during running and (2) running-injury risk among regularly active recreational runners. However, we suggest that it is more accurate to investigate the effect of motion-control shoes on the development of injuries **specifically related to foot pronation**…”

T.M. Wilems, C Ley, E Goetghebeur, D Theisen, L Malisoux. Journal of Orthopaedic & Sports Physical Therapy. Published Online:February 28, 2021Volume51Issue3Pages135-143
https://www.jospt.org/doi/10.2519/jospt.2021.9710

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Do they influence injuries as expected?

The probability of sustaining a pronation-related running injury with the motion-control shoe is ***lower compared*** to that of the standard shoe….Shoe type was a significant predictor of pronation-related running injuries, but not of other RRIs (running-related injuries.)

“Running with motion-control shoes diminished the hazard for a pronation-related running injury… but [had a] nonsignificant effect on non-pronation injuries.”

Conclusion: "specifically targeting injury types that might benefit from the intervention were more accurate for estimating treatment effect than lumping all injury types.”

In other words, focusing on one type of shoe and one type of injury might be useful only for that type of injury. So the jury is still out regarding type of shoe.

T.M. Wilems, C Ley, E Goetghebeur, D Theisen, L Malisoux. Journal of Orthopaedic & Sports Physical Therapy, Published Online:February 28, 2021Volume51Issue3Pages135-143
https://www.jospt.org/doi/10.2519/jospt.2021.9710

Randomized Prospective “Proof”

Meta-analysis of “three studies used a randomized prospective design employing an experimental (E) group in which subjects were assigned motion control, stability, or cushioned shoes for plantar shapes judged to represent low, medium, or high foot arches, respectively; a control group (C) received a stability shoe regardless of plantar shape.”

Assigning running shoes based on plantar shape did not reduce injury risk in basic military training.

JJ Knapik, D Trone, L Brosch, K Hauret, T Grier, SB. Bullock, B Jones. ACSM 2010 Annual Meeting, Abstract 1048.

Common Preventive and Therapeutic Exercises: The Foot

- Foot doming/Short foot
    - seated, standing, balancing
- Forward Leans
    - metatarsal plantar flexors/tibialis posterior
- Towel Curls

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Lesson 6: Common Preventive and Therapeutic Exercises: The Ankle

Eccentric Heel Raises:

- 2-Leg heel raise, down on one leg
- Theraband

Dorsiflexion

- Standing
- Resistance - tubes, weights
- Seated

Inversion/Eversion with band

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Heel Raises

Toe Raises

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Eccentric Calf Exercise

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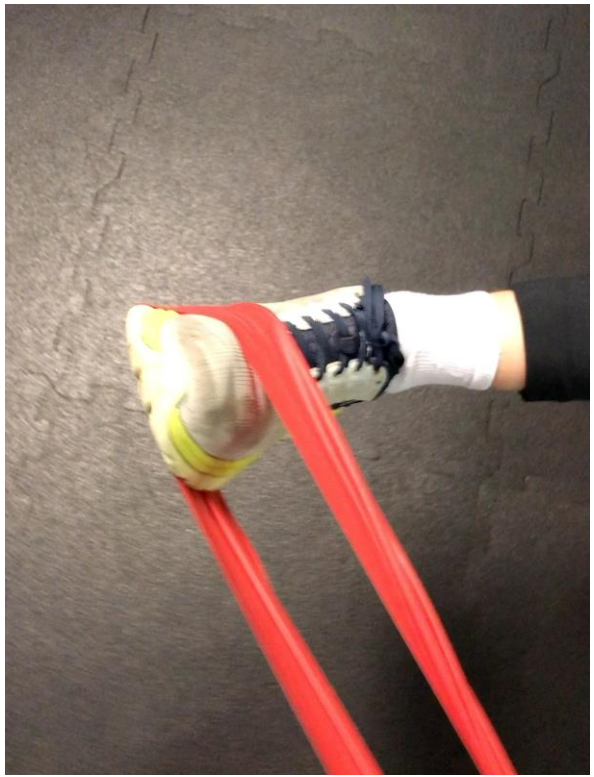
Inversion



Eversion

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Uncommon Preventive and Therapeutic Exercises: Foot & Ankle

External Rotation - Eversion

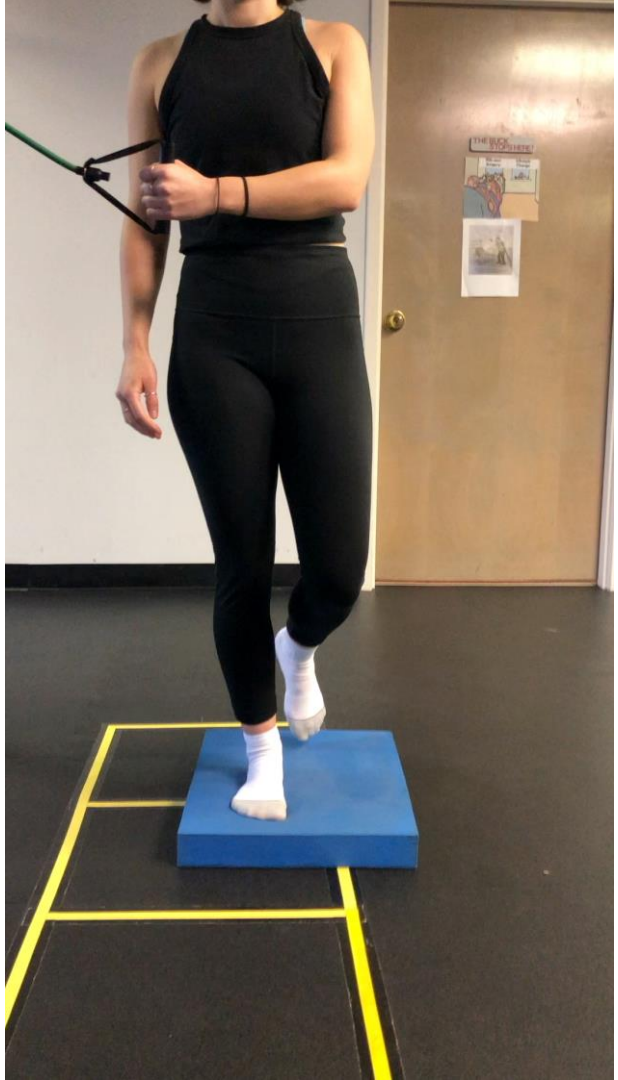
Tubing + Airex/Disk Medial Pull

Internal Rotation - Inversion

Tubing + Airex/Disk Lateral Pull

Perturbation training - mirror + devices (Airex, foam half roller, balance boards, Bosu, BAPS board)

Perturbation sans mirror - lifting, walking/tandem walking, med ball throws



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Plyo-Perturbation

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Foot & Ankle QUIZ

At this time, please complete and successfully pass the "Foot & Ankle Quiz" before continuing to the next section.

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