

PHYE 281 - Applied Kinesiology

Lecture 11

The Ankle and Foot Joints

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Objectives

Identify the bones of the ankle and foot joints

Identify specific anatomic landmarks on these bones

List the movements of the ankle and foot joints

Identify the muscles of the ankle and foot joints

Know the origin, insertion and action for each of the muscles of the ankle and foot joints

Understand the mechanism of injury and affected anatomy in specific ankle joint injuries

Master detailed kinesiological analysis of the ankle and joint

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Bones of Ankle and Foot

28 bones in each limb including tibia and fibula

Each foot has:

Seven tarsals

Five metatarsals numbered I-V starting from the big toe

The toes have a total of 14 phalanges - each toe has three, the big toe has two

Sesamoid bones of the toes are common but not counted in this total

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Bones of the Ankle

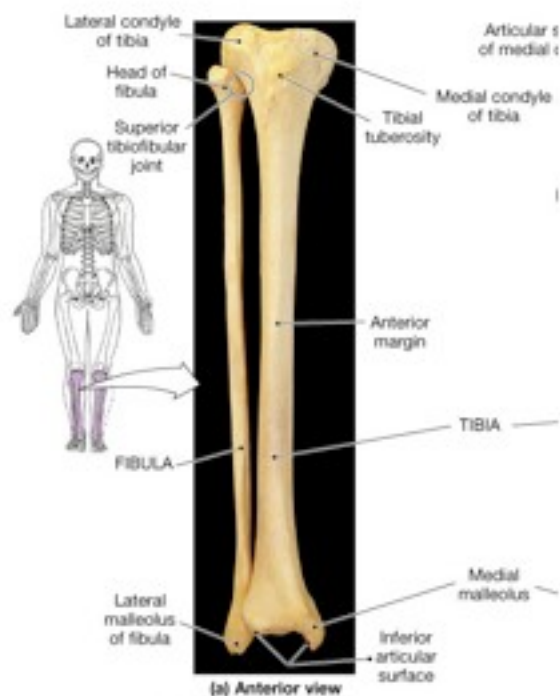
Hinge joint between distal tibia and fibula with the talus

Tibia

Medial malleolus

Fibula

Lateral malleolus



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Bones of the Foot

Seven tarsals

Talus

Calcaneus

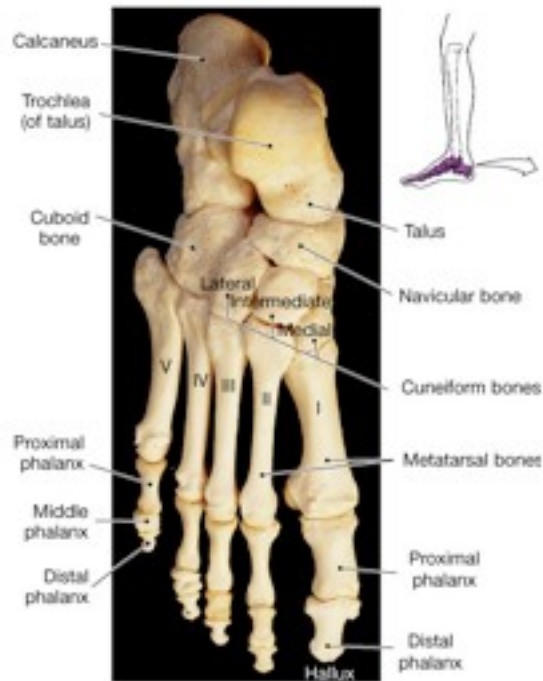
Navicular

Cuboid

Medial cuneiform (I)

Intermediate cuneiform (II)

Lateral cuneiform (III)



(a) Superior view, right foot

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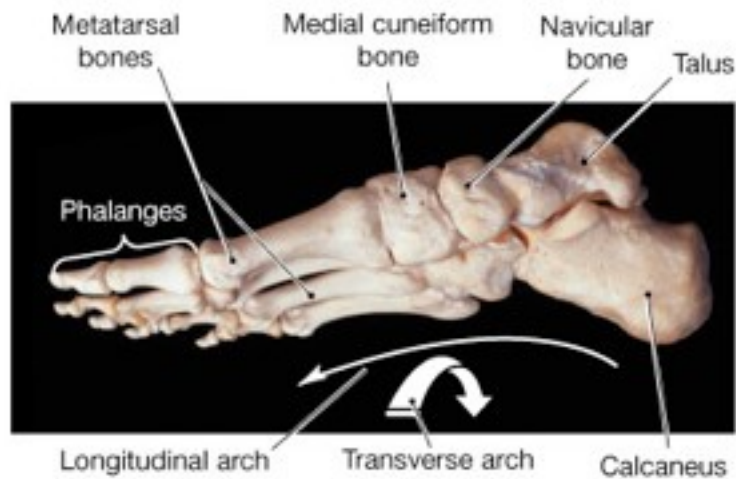
Arches of the Foot

Longitudinal arch

Runs along the long axis of foot from calcaneus to distal aspects of metatarsals

Transverse arch

Runs along metatarsals perpendicular to long axis of foot



(b) Medial view, right foot

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Movements of the Ankle

Dorsiflexion
Plantar flexion



Dorsiflexion



Plantar flexion

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Movements of the Ankle

Inversion
Eversion



Transverse tarsal and
subtalar inversion



Transverse tarsal and
subtalar eversion

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Movements of the Ankle

Pronation

Dorsiflexion,
 eversion and
 abduction of
 forefoot (toe-out)

Supination

Plantar flexion,
 inversion and
 adduction of
 forefoot (toe-in)



Pronation



Supination

Muscles of the Ankle

Plantar flexors

Gastrocnemius

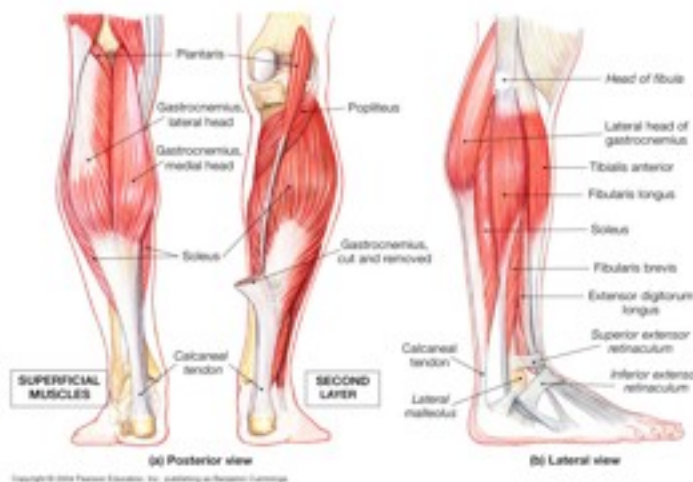
Soleus

Plantaris

Evertors

Peroneus (fibularis)
 longus

Peroneus (fibularis)
 brevis



Muscles of the Ankle

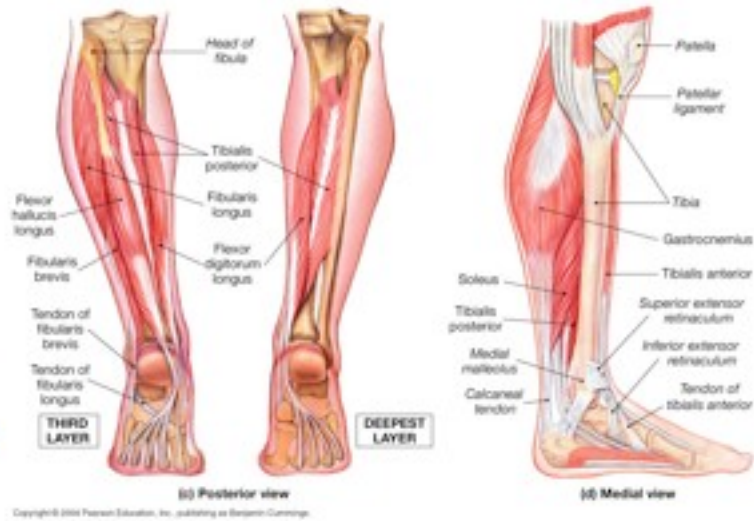
Dorsiflexors

Tibialis anterior

Invertors

Tibialis anterior

Tibialis posterior



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Gastrocnemius

Origin

Posterior femur
above condyles

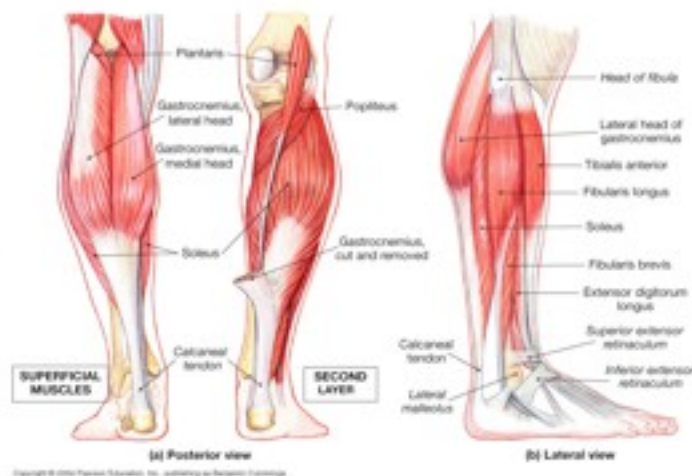
Insertion

Calcaneus via
calcaneal
(Achilles) tendon

Action

Ankle plantar
flexion

Knee flexion



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Soleus

Origin

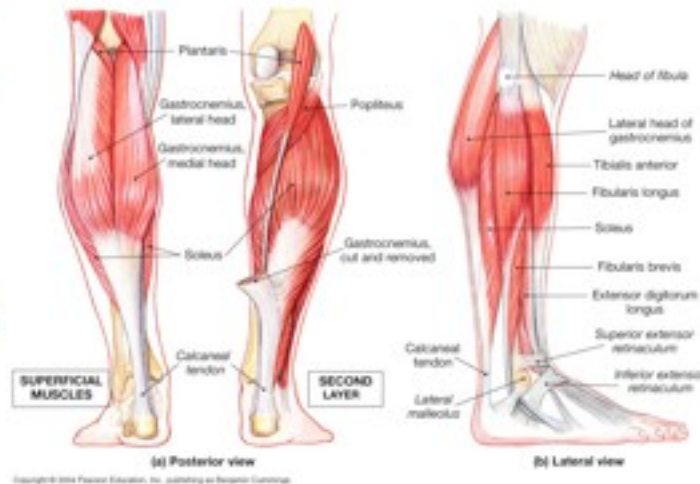
Proximal aspect of posterior tibia and fibula

Insertion

Calcaneus via calcaneal (Achilles) tendon

Action

Ankle plantar flexion



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Plantaris

Origin

Posterior femur above lateral condyle

Insertion

Posterior calcaneus

Action

Ankle plantar flexion

Knee flexion

*Absent in 7-10% of population



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Peroneus longus

Origin

Head and upper lateral fibula

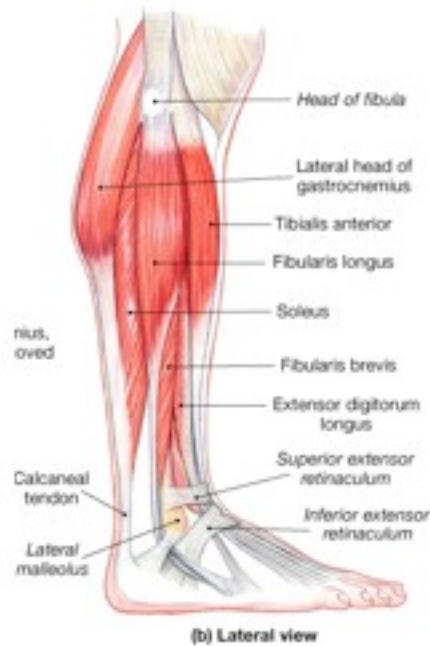
Insertion

Plantar surface of foot

Action

Eversion of ankle

Plantar flexion of ankle



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Peroneus brevis

Origin

Distal lateral fibula

Insertion

Plantar surface of foot

Action

Eversion of ankle

Plantar flexion of ankle



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Tibialis anterior

Origin

Upper lateral tibia

Insertion

Medial foot

Action

Dorsiflexion of ankle

Inversion of ankle



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Tibialis posterior

Origin

Posterior tibia and fibula

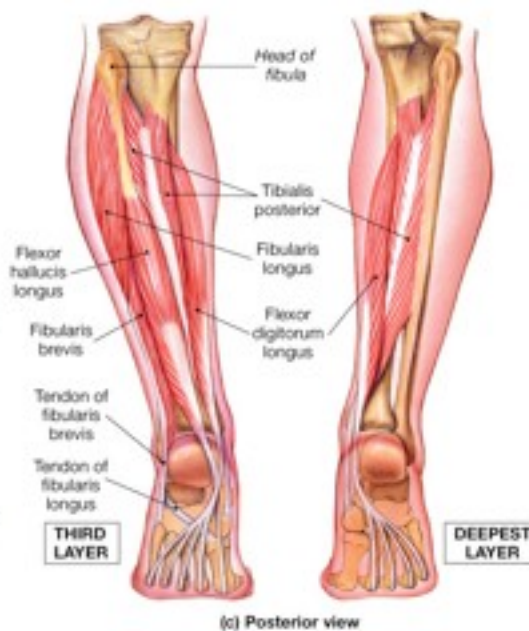
Insertion

Plantar surface of foot via medial ankle

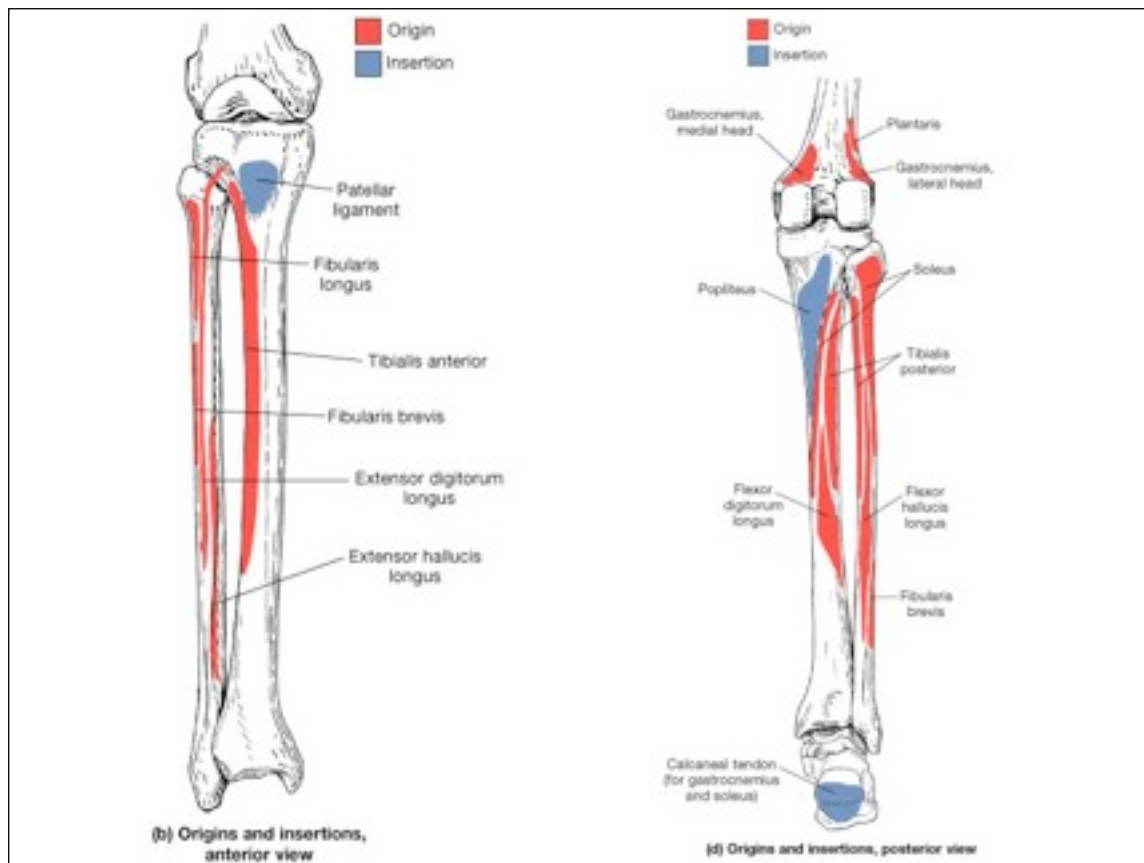
Action

Plantar flexion of ankle

Inversion of ankle



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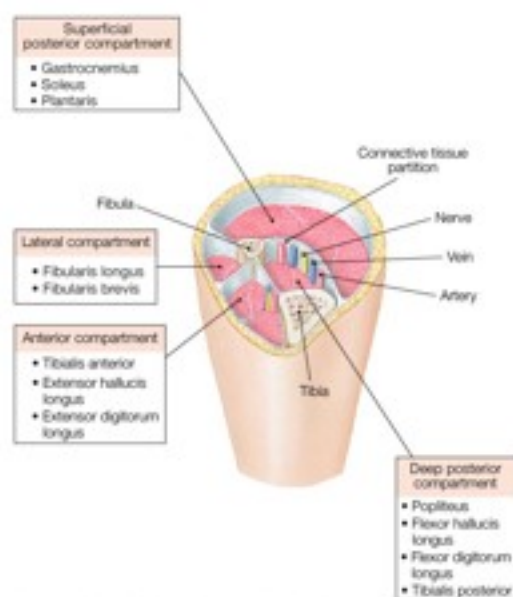
Compartments of Leg

Four compartments

Facilitate venous return

Prevents excessive swelling of muscles during exercise

One common leg malady is anterior compartment syndrome which is high pressure causing decreased venous outflow during exercise - not necessarily shin splints



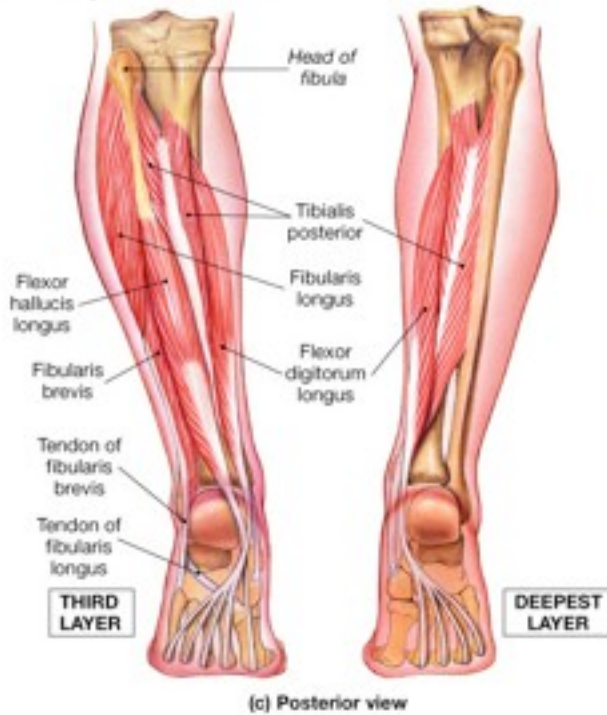
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Shin Splints

Generic term describing anterior leg pain during exercise

Most often a falling arch stretches muscles and tendons from attachments on tibia and fibula

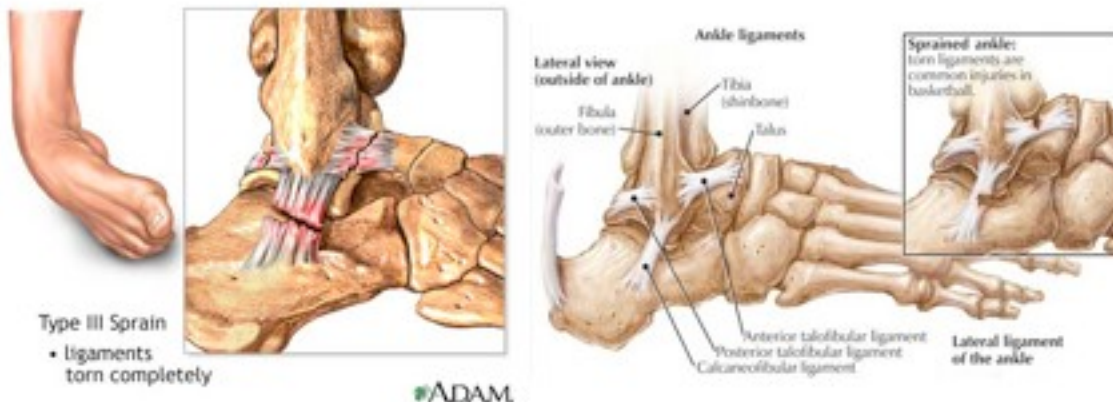
Also could be stress fractures or anterior compartment syndrome



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Sprained Ankle

Forced inversion damages ligaments on lateral ankle



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