



الهندسة مرتبطة بالخدمة



Al-Mustaqbal University

Collage of Engineering

Prosthetics and Orthotics Engineering

Second Stage

PRINCIPLES OF PROSTHETICS AND ORTHOTICS

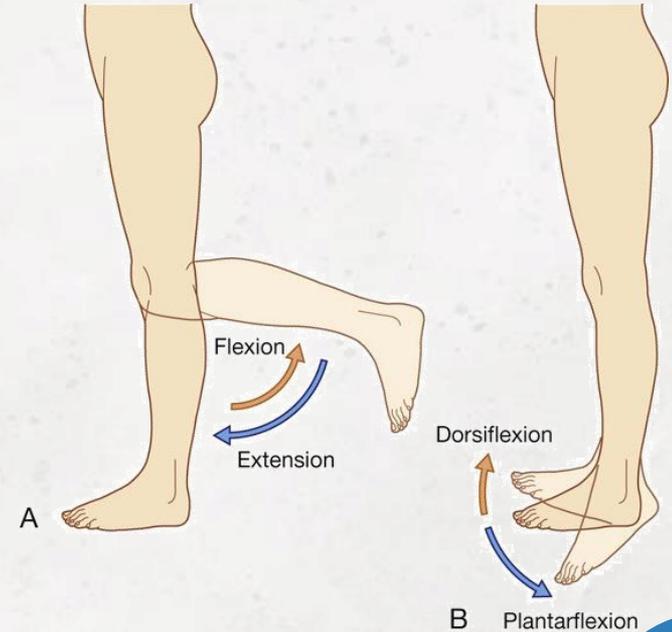
Asst. Lec. Muntadher Saleh Mahdi

1st term – Lecture 5

2025-2026

Muntadher.saleh.mahdi@uomus.edu.iq

UOMU0103031



1

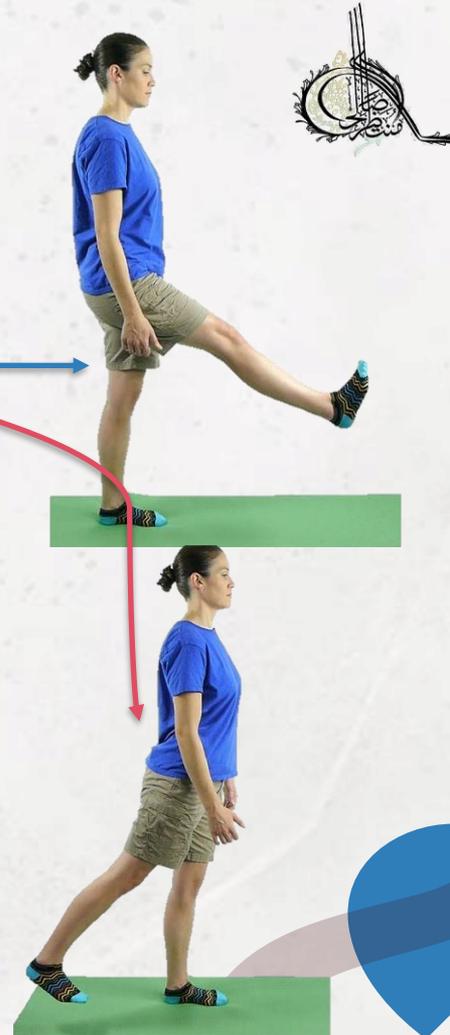
Movement of the Lower Limb

Hip Joint

Flexion and Extension

Flexion of the hip joint is extensive and is only limited when the thigh comes into contact with the anterior abdominal wall. When the knee is extended, hip flexion is further restricted by the tension in the hamstring muscles. The range of flexion is approximately 120–130°.

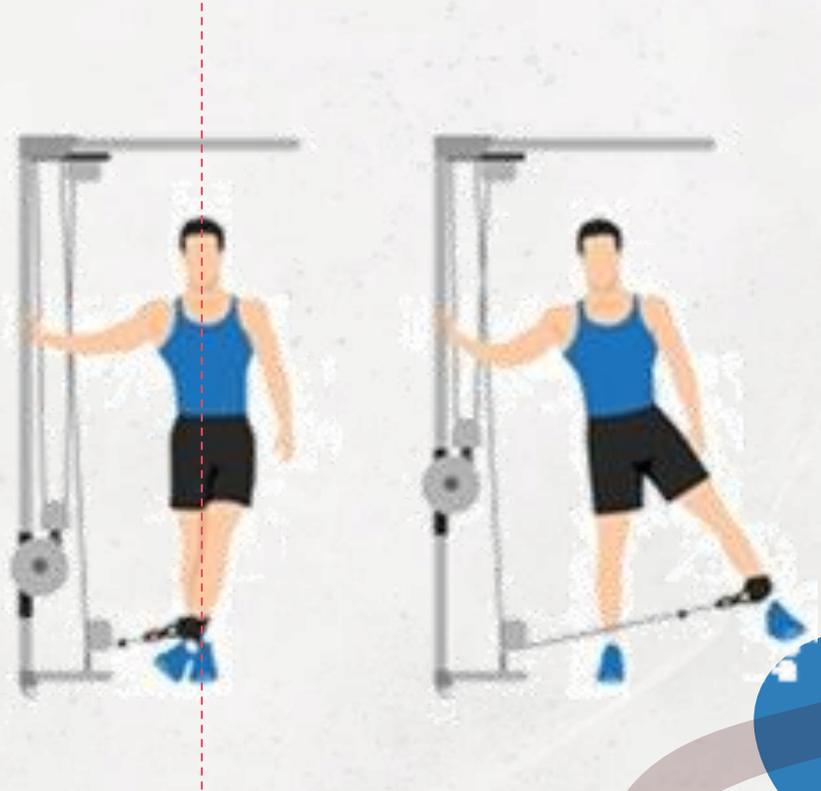
Extension of the hip beyond the vertical is restricted partly by the tension of the associated ligaments and partly by the shape of the articular surfaces. Normally, extension beyond 30° is not possible.





Abduction and Adduction

Abduction and adduction of the hip joint involve moving the leg away from the midline of the body (abduction) and toward the midline (adduction). The range of adduction is approximately 30° , while the range of abduction is about 45° .

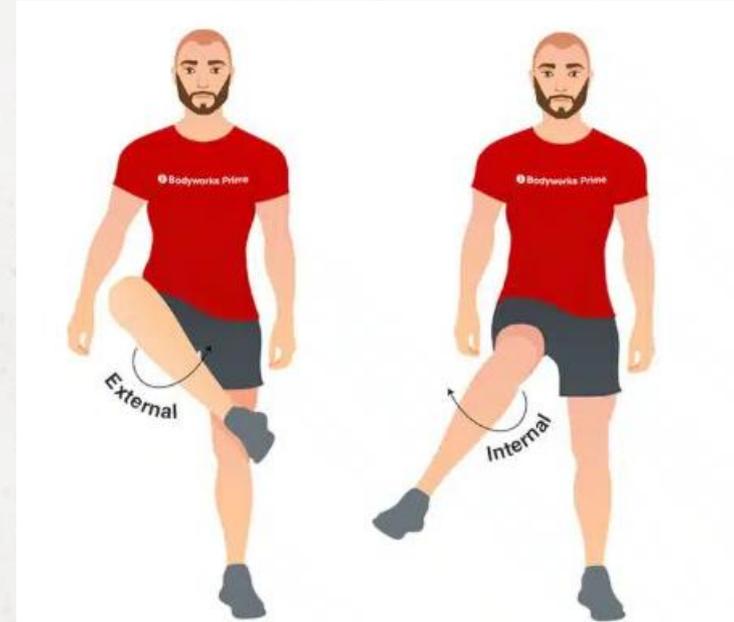




Internal and External Rotation (Medial and Lateral Rotation)

Internal Rotation: In internal rotation, the kneecap (patella) turns inward toward the midline of the body. The range of movement is approximately 45° , though it can be limited by muscle tightness when the hip is flexed.

External Rotation: In external rotation, the kneecap turns outward, away from the midline of the body. The range of movement is approximately 45° , but may also be restricted by muscle tightness.



4

Knee Joint

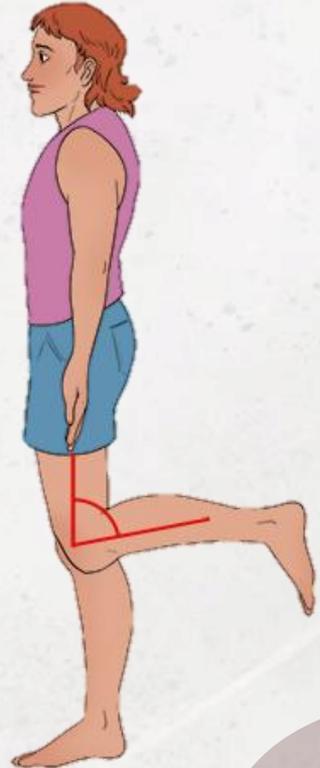


Flexion

Flexion is the movement of the leg so that the posterior aspect of the calf moves toward the posterior aspect of the thigh. The range of flexion depends on the position of the hip.

When the hip is flexed, there is more flexion movement at the knee than when the hip is extended.

This is due to muscles, some of which act on both the knee and the hip. Knee joint flexion is usually around 140° , but it can be pushed to 160° .



5

Knee Joint



Extension

Extension is the movement that brings the lower leg back to a straight position.

The range of extension is usually 0° , which represents full straightening, though some people have slightly more movement. This extra movement is called hyperextension.

When the hip is flexed, knee extension may be reduced, as some muscles act on both the hip and the knee.



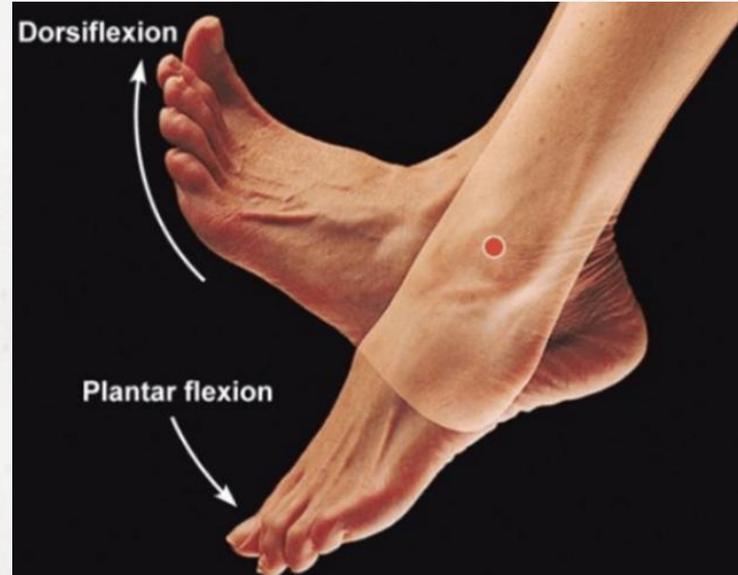


Plantarflexion and Dorsiflexion

The movements of plantarflexion and dorsiflexion occur at the ankle joint. Dorsiflexion is the movement that brings the top of the foot toward the shin. Plantarflexion is the movement that points the toes toward the ground. These movements are measured from 0° , which is when the foot and lower leg are perpendicular to each other.

The range of plantarflexion is approximately 45° .

The range of dorsiflexion is approximately 20° .





Eversion (Pronation) and Inversion (Supination)

The movements of inversion and eversion occur at the subtalar joint, not the ankle joint. This is a subtle but significant difference. Eversion is the movement that causes the sole of the foot to become flat on the floor, or even lifts the outside of the foot off the floor. Inversion is the movement that causes the sole of the foot to form a high arch, or even lifts the inside of the foot off the floor.

The range of inversion is approximately 50° .

The range of eversion is only 25° – 30° .

