

AAPA/ AAOS
Musculoskeletal Galaxy

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Lower Extremity and Lumbar Spine
Physical Exam Techniques

Tom Gocke, MS, ATC, PA-C, DFAAPA
Travis Randolph, MS, ATC, PA-C

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Foot/ Ankle Physical Examination

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Inspection

- Weight-bearing position (longitudinal arch of the foot- pes cavus/ pes planus, hind foot abnormalities- varus/ valgus)
- Toe alignment (straight/ flat/ proportion to each other, think bunion/ hammer toes/ claw foot)
- Callus formation- plantar aspect, metatarsalgia? Painful callus?
- Any swelling noted- where? Compare to the opposite foot/ ankle

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Palpation

- Know your bony land marks!
- Medial aspect- 1st MTP joint, 1st Metatarsalcuneiform, Navicular tubercle, head of the talus, medial malleolus, Sustentaculum Tali (attachment of the spring ligament)
- Lateral aspect- Fifth metatarsal bone, styloid process of 5th MT, cuboid, calcaneus, Lateral malleolus, Sinus tarsi area
- Plantar aspect- Sesamoid bones (2 within flexor hallucis brevis), Metatarsal heads, Medial tubercle of the calcaneus (plantar fascia attachment)

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Ligaments/ Tendons

- Lateral Ankle- Anterior Talofibular Ligament (ATFL), Calcaneofibular ligament (CFL), Posterior Talofibular Ligament (PTFL), Anterior and Posterior Tibiofibular Ligament
- Medial Ankle- Deltoid Ligament
- Achilles Tendon/ Posterior Tibial Tendon/ Peroneal Brevis Tendon

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Range of Motion

- Ankle Dorsiflexion- 20 degrees
- Ankle Plantar flexion- 50 degrees
- Subtalar Inversion- 5 degrees
- Subtalar Eversion- 5 degrees
- Forefoot adduction- 20 degrees
- Forefoot abduction- 10 degrees
- First Metatarsophalangeal Joint (MTP)- flexion 45 deg/ ext 70-90 deg

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Muscle Testing

- Dorsiflexors- Tibialis Anterior (dorsiflexion and inversion), Extensor Hallucis Longus, Extensor Digitorum Longus
- Plantar flexors- Peroneus Longus and Brevis (plantar flexion and eversion), Gastrocnemius and Soleus (plantar flexion), Flexor Hallucis Longus, Flexor Digitorum Longus, Tibialis Posterior (plantar flexion and inversion)

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Special Test

- Rigid (longitudinal arch absent in all positions) or supple flat feet (absent in weight-bearing)
- Homan's sign- test of DVT; DF with knee extended- pain, tenderness with deep palpation
- Single leg heel raises- Posterior tibial tendon dysfunction "Toe rise test"
- Lateral Squeeze test- Morton Neuroma
- Thompson Test- Achilles tendon rupture
- Anterior Drawer test- ATFL Sprains
- Inversion/ Eversion Stress
- Tinel's Test for Tarsal Tunnel Syndrome

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Knee/ Hip Physical Examination

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History Questions??

- Timing: morning, evening, all day?
- Onset: today? This week? Last month? Over the last year?
- Location of the pain
- Associated effusion: all day, soon after the injury, intermittent, only after activity
- High energy vs Low energy
- Instability: giving out, buckling, locking
- Aggravating factors: going up/ down stairs, sitting for long periods, only with activity, worse at night, worse in morning
- Associated with systemic factors: fever, weight loss/ gain, nightsweats
- Alleviating factors: meds., ointments, ice/ heat, bracing, PT, massage
- Similar injuries in the past

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Lower Extremity Gait Evaluation

- Can they weight bear?
- Obvious deformity?
- Antalgic gait? Coxalgic? Trendelenburg?
- Using crutches? Walker? Wheelchair? Stretcher?

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Inspection

- Bruising
- Obvious effusion
- Erythema
- Alignment: valgus/ varus/ neutral/ recurvatum (knee)
 - Externally rotated/ flexed/ internally rotated/ shortened? (hip)
- Abrasions
- Pulses/ temperature of skin
- Sensation
- Hair distribution

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Patella

- Peripatellar tenderness
- Distal pole, proximal pole, medial facet, lateral facet
- Apprehension
- Glide/ tracking/ crepitus
- If suspect instability issues: Q angle measurement? Miserable malalignment triad? True J sign test
- Good time to gently palpate the entire knee: Warm? Tender? Red?

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Knee Range of Motion

- Active and passive
- Normal extension to 0 degrees and flexion to approx. 135 degrees
- Goniometer vs Eyeball (experience)
- Watch for pain in terminal flexion

- Joint Line Tenderness: most sensitive sign for meniscal pathology
 - Distal pole of the patella/ medial and lateral adjacent to fat pads
 - Test in extension and flexion

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Special Testing for Knee

- McMurray's Test: palpate joint lines, flex and internally/ externally rotate the knee and bring into extension
- Apply Grind Test: patient must be prone
- Patella Apprehension
- Valgus and Varus stress test: at 0 degrees (posteromedial capsule and/ or cruciate injury or MCL/ LCL/ PCL injuries) and 30 degrees (superficial MCL or LCL fibers)
 - Grade 1: 1-4 mm
 - Grade 2: 5-9 mm
 - Grade 3: > 10 mm

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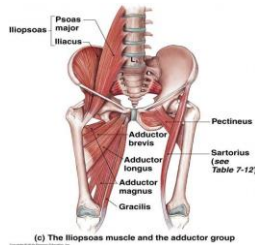
Special Testing for Knee

- Lachman Test: most sensitive for ACL rupture
 - A or B: firm or no endpoint
 - Grade 1: 3-5 mm translation
 - Grade 2: 5-10 mm translation
 - Grade 3: > 10 mm translation
- Anterior/ Posterior Drawer: most accurate for diagnosis of PCL injury; performed in neutral, knee flexed to 90 deg and 10 deg internal rotation
- Posterior Sag Sign: hips and knee flexed with knees at 90 degrees observing for a posterior sag of the tibia on the femur
- Dial Test (Prone): externally rotate at 30 degrees and 90 degrees; pathologic for anything greater than 10 degrees of external rotation

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Palpation for Hip

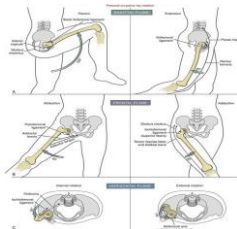
- Anterior thigh
- ASIS
- Iliac Crest
- Groin
- Lateral hip/ Trochanteric bursa
- IT Band
- Ischial tuberosity
- Gluteal area



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Hip Range of Motion

- Flexion: 120-135 degrees
- Extension: 30 degrees
- External rotation: 45 degrees
- Internal rotation: 35 degrees
- ABDuction: 45-50 degrees
- ADDuction: 20-30 degrees
- Assess for leg length discrepancy



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Special Testing for Hip

- FADIR: Forward Flexion ADDuction Internal Rotation
 - May suggest labral pathology or FAI
 - FABER: Forward Flexion ABDuction External Rotation
 - May suggest Iliopsoas pain or SI joint dysfunction
 - Ober's test- assessing IT band
 - Stinchfield Resisted Hip flexion test- knee ext./ hip flexed 30-45 degrees
 - May suggest intraarticular hip pathology
 - Trendelenburg Test- strength of gluteus medius muscle
 - Thomas Test- assessing for hip flexor contracture
- Full Lumbar spine exam including strength and sensory

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Lumbar Physical Examination

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Lumbar History Question

- Location (localized or radiation of pain or radicular symptoms- numbness, paresthesias)
- Duration (inciting event- falls, injuries, exertion, MVA)
- Quality: constant/ intermittent/ character
- Severity
- Alleviating/ aggravating factors
- Important to ask about prior episodes, history of back issues, cancer, bony tumors

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RED Flags for the Lumbar Spine

- Pain that does not improve with laying down
- Accompanying fever of chills
- Known history of cancer (esp. prostate/ breast/ lung cancer)
- Osteoporosis
- ANY Neurological deficit

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Lumbar Inspection

- Signs of trauma, skin changes, erythema, ecchymosis, masses
- Alignment- viewed from the rear and from the side- asymmetry, abnormal curvature, scoliosis
- Is the lordotic curve normal/ flattened/ exaggerated?

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Observation

- Observe the patient rise from sit to stand, then walking toward and away from the examiner
- Does the patient walk and stand with an erect posture?
- Do they have a smooth or antalgic gait?
- Difficulty climbing on/ off the exam table
- Do they move around easily or are they struggling

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Lumbar Spine

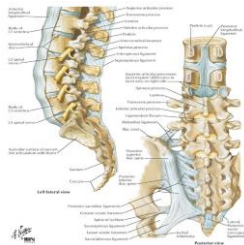
- 5 Lumbar Vertebrae
- 5 Lumbar Nerves
 - Lumbar nerve exits below the corresponding lumbar vertebrae
- Lordosis Curvature
- Examine gait, posture, strength, ROM, atrophy, clonus
- Upper vs Lower Motor Neuron Lesion



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Lumbar Palpation

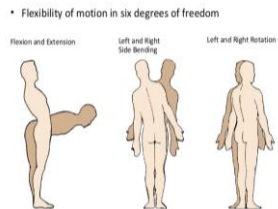
- Spinous process
- Paraspinal musculature
- SI Joints
- Assess for tenderness?
- Muscle spasm? Guarding?



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Lumbar Range of Motion

- Flexion
- Extension
- Lateral Bending
- Rotation



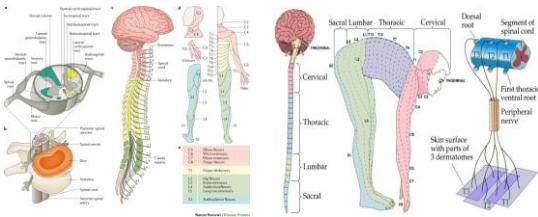
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Sensory/ Strength/ Deep Tendon Reflexes

Lumbar Nerve Root	Muscle Group	Sensory Distribution	Deep Tendon Reflex
L2	Hip flexor	Anterior medial thigh	None
L3	Quadriceps	Anterior thigh to knee	Patellar
L4	Anterior tibialis	Medial calf/ankle	Patellar
L5	Extensor hallucis longus	Lateral ankle/dorsum of foot	None
S1	Gastrocnemius/soleus/peroneals	Plantar-lateral foot	Achilles

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Sensory/ Strength/ Deep Tendon Reflexes



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Lumbar Special Test

- Pathologic Reflexes
 - Babinski Test- run a sharp instrument on the plantar surface of the foot
 - If negative, the toes either don't move or all bunch up uniformly
 - If positive, the great toe extends while the other toes flex
 - Positive test is indicative of an upper motor neuron lesion
 - Reflex will be present in newborns and disappear soon after birth
 - Oppenheim Test- run your fingernail along the crest of the tibia
 - If negative, there will be no reaction at all
 - If positive, you will notice the great toe extend while other toes flex; concerning for an upper motor neuron lesion

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