

EXAMINATION OF THE BACK

GAIT

- Stance phase (heel strike → mid-stance → toe-off)
- Swing phase, stride length
- Smoothness, symmetry, ability to turn quickly
- Antalgic gait (identify point at which pain occurs)
- Trendelenberg gait (weak hip abductors)
- Transition from sitting to standing (useful to find source of pain)

INSPECTION

Ensure adequate exposure while preserving patient's modesty

- Swelling
- Erythema
- Atrophy
 - Sternocleidomastoid, shoulder girdle, chest wall, intercostals
 - Paraspinals, gluteal muscles
 - Abdominal obesity or muscle laxity
- Deformities
 - Posture and alignment: *expect 4 normal curvatures*
 - Cervical lordosis
 - Thoracic kyphosis
 - *Increased in ankylosing spondylitis (AS) and fractures from osteoporosis*
 - Lumbar lordosis
 - *Increased in flexion contracture of hip*
 - *Flattened in AS*
 - Sacrococcygeal kyphosis
 - Scoliosis (asymmetric shoulder height)
 - **Adam's Forward Bend Test**
 - *Patient bends forward with knees in full extension*
 - Inspect from behind, scapula will be elevated on the side of convexity
- Skin
 - Scars or skin changes
 - Sinus or hair tuft in keeping with spina bifida

Evidence-Based Medicine: Scoliosis

Adam's Forward Bend Test

Sensitivity 92%, Specificity 60%

Diagnostic Value: Ruling out thoracic spine curvature
Côté P, Cassidy JD. Spine (Phila Pa 1976). 1999 Nov 15;24(22):2411-2.

PALPATION

- Systematic approach from the occiput down (stabilize the patient - don't push over!)
- Assess for muscle bulk/tenderness and bony tenderness
- Spinous processes and interspinous ligaments
 - **C7**: bony prominence at **base of neck**
 - **T3**: corresponds to **spine of scapula**
 - **T7**: corresponds to **angle of scapula**
 - **L3-L4**: corresponds to **iliac crests** (useful for landmarking lumbar puncture)
 - **S2**: posterior superior **iliac spine**

- Space between ribs and iliac crest (normal is 4 fingers, decreased in kyphosis)

RANGE OF MOVEMENT

- **Cervical Spine**
 - Flexion
 - Chin should touch chest
 - Extension (look up)
 - Chin should pass level of ear
 - Lateral flexion
 - Ear to shoulder
 - Rotation
 - Normal $\geq 70^\circ$ to each side (can estimate but best to measure with a goniometer)
- **Thoracolumbar Spine**
 - Chest expansion (see "Special Tests")
 - **Flexion** (touch toes while keeping knees straight)
 - Finger to Floor distance
 - Not specific - can be limited by hip, tight hamstrings, abdominal obesity, etc. May be useful as a tracking measurement.
 - Observe rhythm: lumbar lordosis should transition to a kyphosis
 - Modified Schober's test (see "Special Tests")
 - **Extension** (ensure legs are kept straight)
 - Best done with patient against a surface (eg. bed) while leaning backwards
 - **Lateral Flexion**
 - Finger-fibula distance (normal 0 cm) on each side
 - Measure finger-floor before and after bending to side (normal > 10 cm)
 - *Useful in following patient over time*
 - **Rotation** (patient sitting, arms crossed across chest)
 - May apply overpressure while observing for pain

SPECIAL TESTS

- **Occiput-to-Wall** (cervical or thoracic kyphosis)
 - *Patient stands with back to wall, nose and ear must be at same horizontal level to ensure patient is not hyperextending neck*
 - Occiput-to-wall should be 0 cm
 - Increased in abnormal cervical or thoracic kyphosis (eg. ankylosing spondylitis, thoracic fractures in osteoporosis)
- **Chest expansion**
 - **Quick screen**
 - *Hands on back at 10th rib level; thumbs should move apart 4 cm with inspiration*
 - *Measure at level of xiphisternum: normal ≥ 4 cm*
 - May be reduced in thoracic scoliosis, ankylosing spondylitis, or COPD

Evidence-Based Medicine: Vertebral Fractures

Occiput-wall distance of >4.0 cm: **Sensitivity 41%, Specificity 92%**

Diagnostic Value: Ruling in thoracic vertebral fracture
[J Musculoskelet Neuronal Interact.](#) 2011 Sep;11(3):249-56.

Rib-pelvis distance of <2 finger breadths: **Sensitivity 88%, Specificity 46%**

Diagnostic Value: Ruling out lumbar vertebral fractures
Siminoski K et. al. 2003. *Am J Med* 115(3):233-236.

- **Modified Schober's Test**(restricted lumbar flexion)
 - Place mark in midline between Dimples of Venus, then mark 10 cm above and 5 cm below
 - Patient then bends forward trying to touch floor (knees straight)
 - Normal ≥ 5 cm increase

- **Straight Leg Raise** (for sciatic nerve root irritation: L4, L5, S1, S2))
 - With patient lying supine, passively raise straight leg (knee extended)
 - Pain radiating down the back of the leg into the foot is a positive test (usually between 30-70°)
 - Pain in thigh only may be due to hamstring muscles.
 - If positive test, slowly lower leg just until the pain stops, then dorsiflex ankle
 - Return of pain is a positive Lasegue's sign

- **Crossed Straight Leg Raise** (sciatic nerve root irritation)
 - With patient lying supine, passively raise asymptomatic leg (with knee extended)
 - Pain radiating down the symptomatic leg is a positive test (good specificity for sciatica, but poor sensitivity)
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- **Femoral Nerve Stretch** (for femoral nerve root irritation: L2, L3, L4)
 - With patient lying prone, passively flex knee and extend hip lifting thigh off bed
 - Positive if the patient experiences pain in the anterior thigh

Evidence-Based Medicine: Lumbar Disc Herniation

Straight Leg Raise

Sensitivity 91%, Specificity 32%

Diagnostic Value: Ruling out lumbar disc herniation
Vroomen PC et. al. 1999. *J Neurol* 246(10):899-906

Crossed Straight Leg Raise

Sensitivity 32%, Specificity 98%

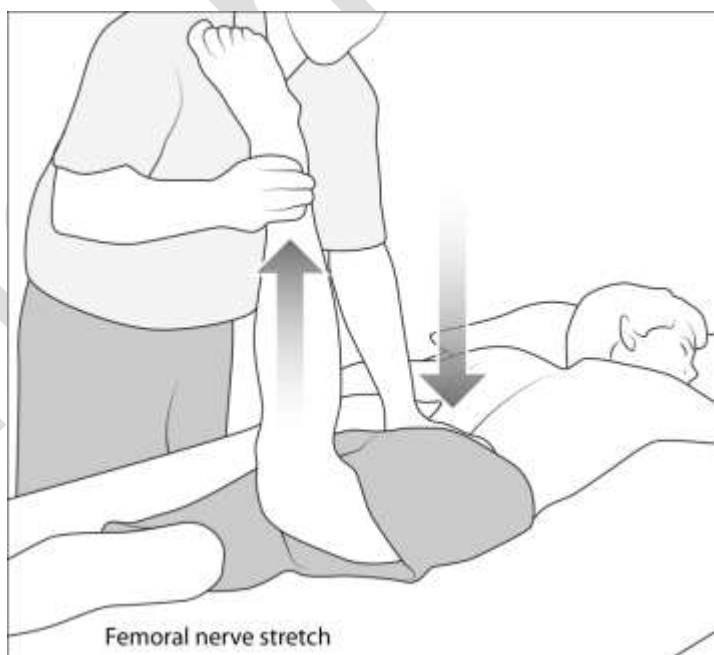
Diagnostic Value: Ruling in lumbar disc herniation
Vroomen PC et. al. 1999. *J Neurol* 246(10):899-906

Evidence-Based Medicine: Nerve Impingement

Femoral Nerve Stretch

Sensitivity 50%, Specificity 100%

Diagnostic Value: Ruling in mid-lumbar nerve impingement
Spine (Phila Pa 1976). 2011 Jan 1;36(1):63-73.



- **Sacroiliac Joints**

- **FABER Test**

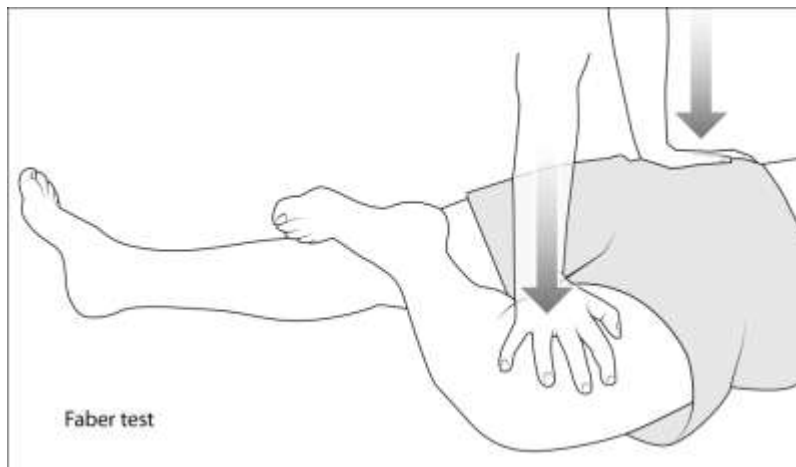
- *With patient supine:*

- *Flex, ABduct, Externally Rotate one hip (by placing heel on the opposite knee)*

- Then push

- *down on knee, while stabilizing the opposite hemipelvis*

- Lower back or sacroiliac joint pain is a positive test



- **Gaenslen's Test**

- *Patient lies supine at the edge of bed with one leg hanging off bed, while using his/her hands to bring the other knee to the chest*

- Pain in back or buttock is a positive test

NEUROLOGIC EXAM

- **Tone**

- Hip, knee, ankle
 - Look for ankle clonus

- **Power**

Nerve Root	Action
L1, L2, L3	Hip flexion
S1, S2	Hip extension
L2, L3, L4	Knee extension
L5, S1, S2	Knee flexion
L4, L5	Ankle dorsiflexion
S1, S2	Ankle plantar flexion
L5, S1	Great toe dorsiflexion

- **Reflexes**

- Patellar: L2-L4 (mainly L4)
 - Achilles: S1-S2 (mainly S1)
 - Plantar response (upgoing toes with upper motor neuron lesion)

- **Dermatomes of lower limb**

Nerve Root	Area of sensation
L1	Groin
L2	Just below L1
L3	Medial aspect of knee
L4	Lateral aspect of knee
L5	Dorsum of foot
S1	Lateral border of foot