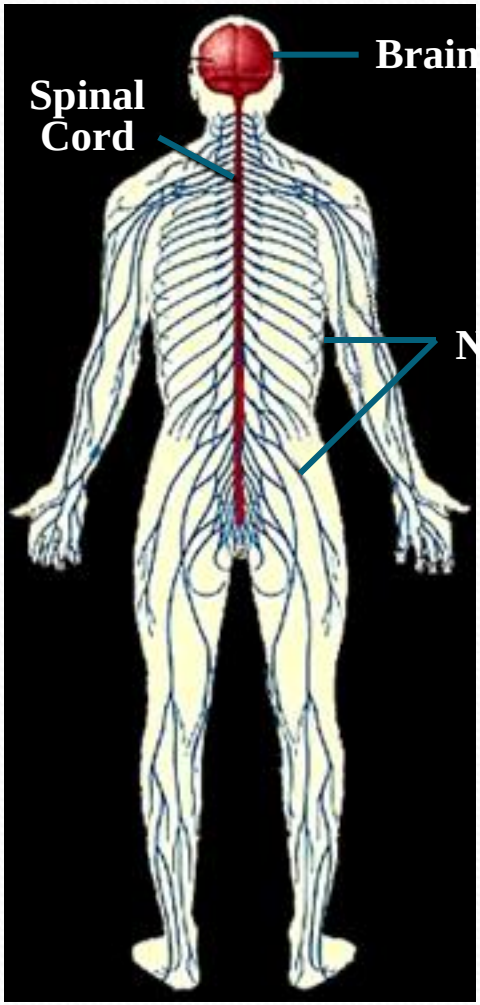
THE NEUROLOGICAL EXAMINATION

The nervous system

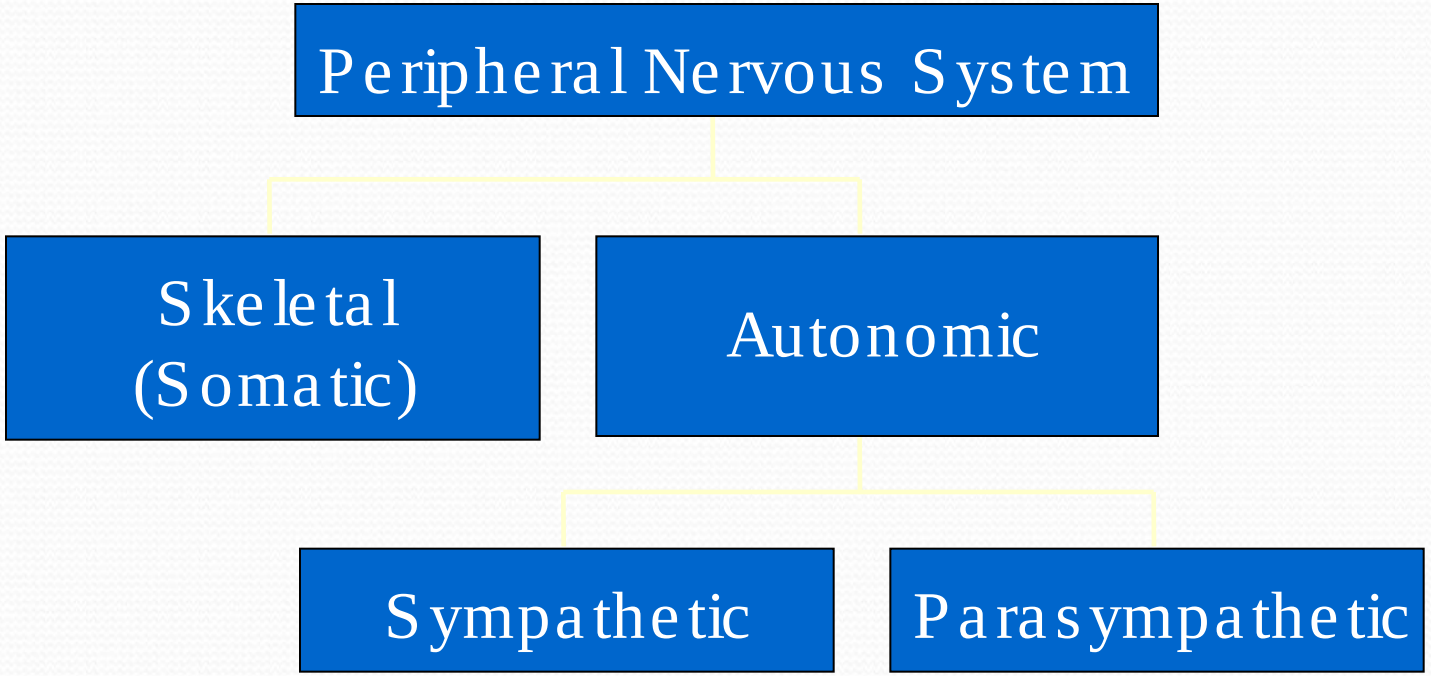
- Major division - Central vs. Peripheral
- Central or CNS- brain and spinal cord
- Peripheral- nerves connecting CNS to muscles and organs

Peripheral Nervous System

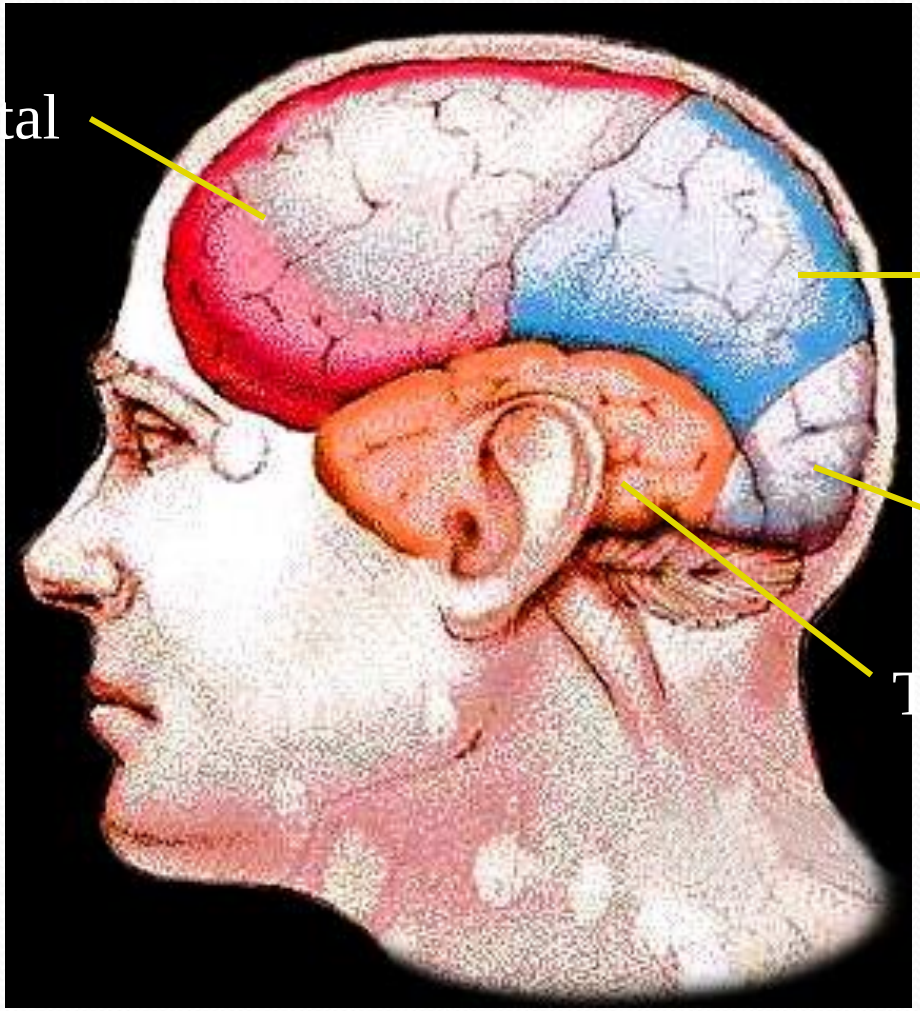
- 3 kinds of neurons connect CNS to the body
  - sensory
  - motor
  - interneurons
- Motor - CNS to muscles and organs
- Sensory - sensory receptors to CNS
- Interneurons: Connections Within CNS



Peripheral Nervous System



Each hemisphere is divided into 4 lobes



NEUROLOGICAL EXAM

- MENTAL STATUS
- CRANIAL NERVES
- MOTOR EXAM
  - STRENGTH
  - GAIT
  - CEREBELLAR
- REFLEXES
- SENSATION

MENTAL STATUS

Level of Consciousness

- Awake and alert
- Agitated
- Arousable with
  - **Voice**
  - **Gentle stimulation**
  - **Painful/vigorous stimulation**
- Comatose

LANGUAGE

- **FLUENCY**
- **NAMING**
- **REPETITION**
- **READING**
- **WRITING**
- **COMPREHENSION**

Aphasia vs. dysarthria

MEMORY

- IMMEDIATE
  - REALLY A MEASURE OF ATTENTION RATHER THAN MEMORY
- REMOTE
- 3 OBJECTS AT 0/3/5 MINUTES
- HISTORICAL EVENTS
- PERSONAL EVENTS

ORIENTATION

- **PERSON**
- **PLACE**
- **TIME**

OTHER COGNITIVE FUNCTIONS

- **CALCULATION**
- **ABSTRACTION**
- **SIMILARITIES/DIFFERENCES**
- **JUDGEMENT**
- **PERSONALITY/BEHAVIOR**

CRANIAL NERVES

CRANIAL NERVE EXAM

- I - OLFACTORY
  - COFFEE, LEMON EXTRACT
- II - OPTIC
  - VISUAL ACUITY
  - VISUAL FIELDS
  - FUNDOSCOPIC EXAM

CRANIAL NERVE EXAM

- III/IV/VI OCULMOTOR, TROCHLEAR, ABDUCENS
  - PUPILLARY RESPONSE
  - EYE MOVEMENTS
    - 9 CARDINAL POSITIONS
  - OBSERVE LIDS FOR PTOSIS
- V - TRIGEMINAL
  - MOTOR - JAW STRENGTH
  - SENS - ALL 3 DIVISIONS

CRANIAL NERVES

- VII - FACIAL
  - OBSERVE FOR FACIAL ASYMMETRY
  - FOREHEAD WRINKLING, EYELID CLOSURE, WHISTLE/PUCKER
  - Central vs. peripheral facialis
- VIII - VESTIBULAR
  - ACUITY
  - RINNE, WEBER

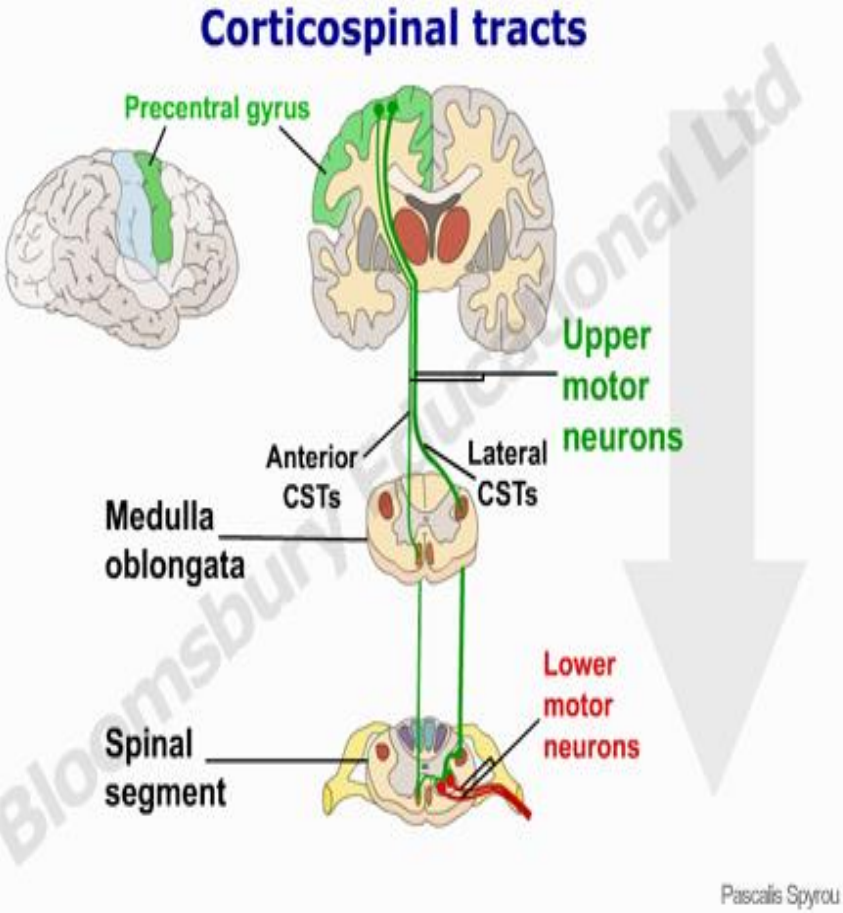
CRANIAL NERVES

- IX/X - GLOSSOPHARYNGEAL, VAGUS
  - GAG
- XI - SPINAL ACCESSORY
  - STERNOCLEIDOMASTOID M.
  - TRAPEZIUS MUSCLE
- XII - HYPOGLOSSAL
  - TONGUE STRENGTH
  - RIGHT XII THRUSTS TONGUE TO LEFT
  - DYSARTHRIA-CRANIAL 5,7,10,12

MOTOR EXAMINATION

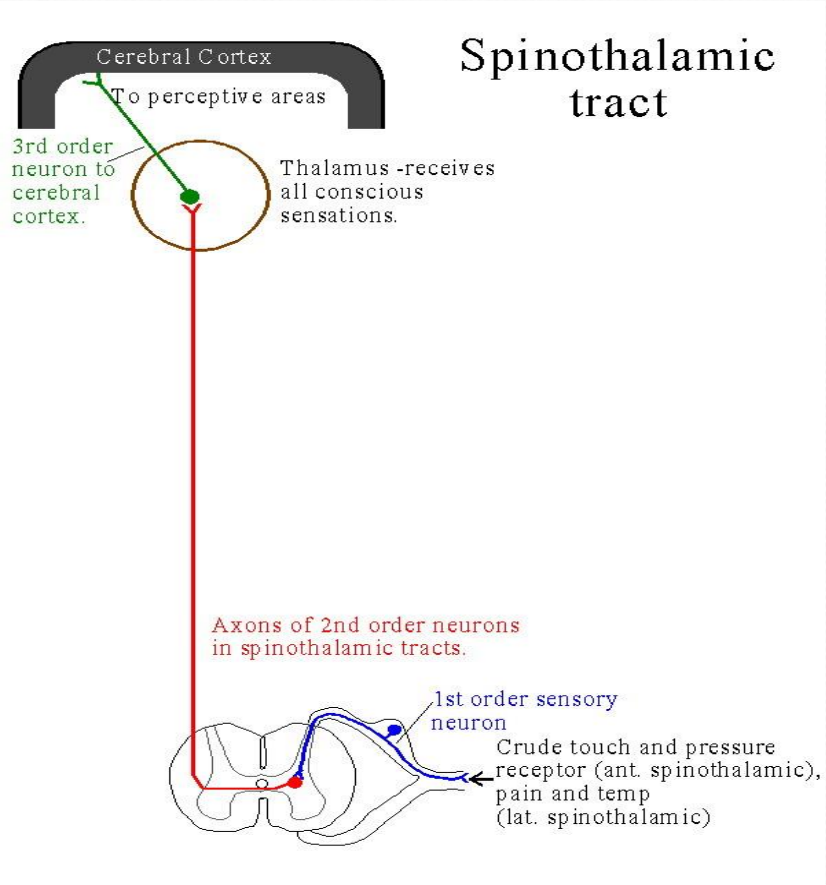
MOTOR PATHWAYS

- UMN>synapse in brainstem/spinal cord>LMN
- 3 motor pathways:
- 1. corticospinal tract - voluntary delicate movement
- 2. basal ganglia – muscle tone, automatic, gross movements
- 3. cerebellar system – equlibrium, coordination, posture

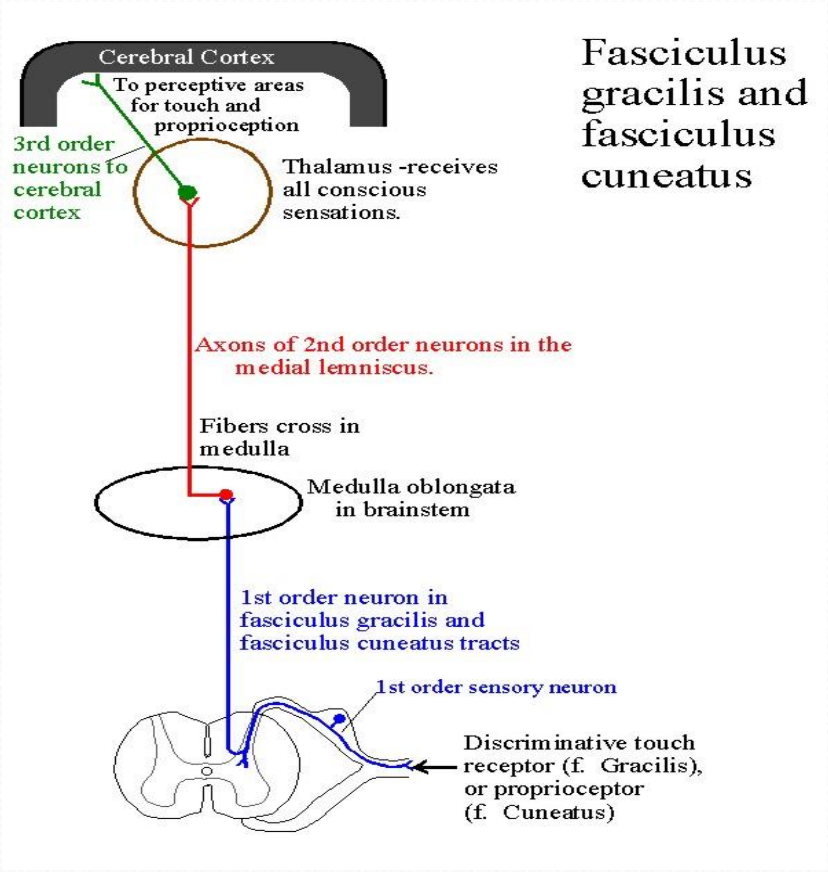


SENSORY PATHWAYS

Spinothalamic tract – pain and temprature, crude touch



Dorsal coloumn – position and vibration, fine touch



STRENGTH

- **STRENGTH**
  - **GRADED 0 - 5**
  - **0 - NO MOVEMENT**
  - **1 - FLICKER**
  - **2 - MOVEMENT WITH GRAVITY REMOVED**
  - **3 - MOVEMENT AGAINST GRAVITY**
  - **4 - MOVEMENT AGAINST RESISTANCE**
  - **5 - NORMAL STRENGTH**

STRENGTH EXAM

- UPPER AND LOWER EXTREMITIES
- DISTAL AND PROXIMAL MUSCLES
- MYOPATHY VS. NEUROPATHY
- SUBTLE WEAKNESS
  - TOE WALK, HEEL WALK
  - OUT OF CHAIR
  - DEEP KNEE BEND- proximal weakness

Motor exam, cont

- **Subtle signs of weakness on a cortical/subcortical basis**
  - **Pronator drift**

Gait evaluation

- Include walking and turning
- Posture,balance,leg movements, arm swinging
- Hill to toe-tandem (ataxia), toes and hills (distal vs corticospinal weakness)
- Examples of abnormal gait
  - Waddling
  - High steppage- LMN
  - Shuffling,Turns en bloc
  - Sensory/cerebellar ataxia

MUSCLE OBSERVATION

- **ATROPHY**
- **FASCIULATIONS**

ABNORMAL MOVEMENTS

- **TREMOR**
  - **REST**
  - **WITH ARMS OUTSTRETCHED**
  - **INTENTION**
- **CHOREA**
- **ATHETOSIS**
- **ABNORMAL POSTURES**

CEREBELLAR FUNCTION

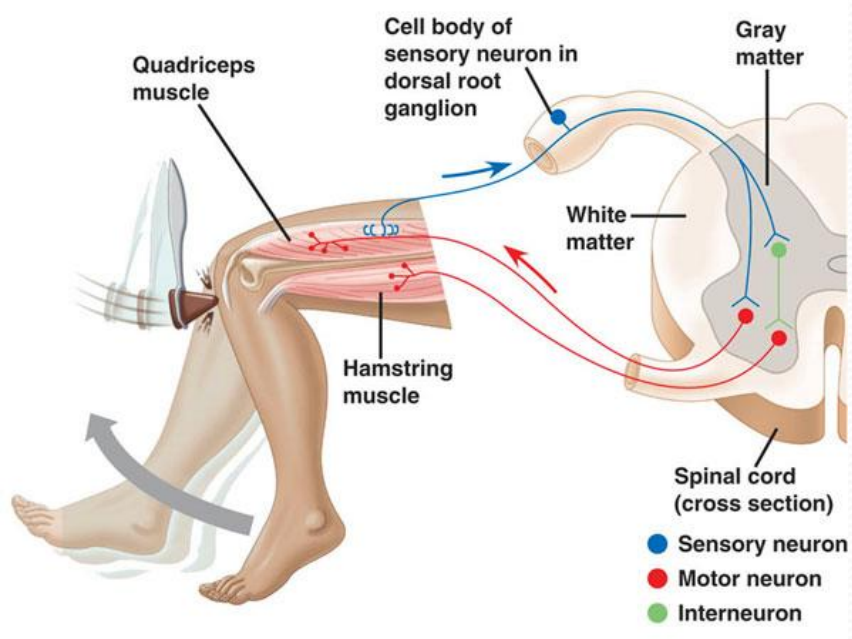
- RAPID ALTERNATING MOVEMENTS
- FINGER TO NOSE TESTING
- HEEL TO SHIN
- GAIT- ATAXIA, TANDEM
- DYSMETRIA, INTENTIONAL TREMOR
- DIADOCHOKINESIS

Romberg Sign

- Stand with feet together - assure patient stable - have them close eyes
- Romberg is positive if they do worse with eyes closed
- Measures
  - Cerebellar function
    - **Frequently poor balance with eyes open and closed (WORSENS WITH EYES CLOSED)**
  - Proprioception
    - **Frequently do worse with eyes closed**
  - Vestibular system (WORSENS WITH EYES CLOSED)

REFLEXES

DEEP TENDON REFLEXES



- Deep tendon reflex – involuntary stereotypical response which involves at least 2 neurons – afferent(sensory) and efferent (motor) across a single synapse
- All structures must be intact for reflex to work- sensory fibers, spinal cord synapse, motor fibers, NMJ, muscle fibers.

DTR

- Because each tendon reflex involves specifc spinal segments, an abnormal reflex can help us locate a pathologic lesion
- ANKLE-S1
- KNEE-L2,3,4
- BRACHIORADIALIS/SUPINATOR-C5,6
- BICEPS-C5,6
- TRICEPS C6,7
- ABDOMEN-UPPER:T8,9,10 LOWER:T10,11,12
- PLANTAR FLEXION–L5,S1

MUSCLE STRETCH REFLEXES (DEEP TENDON REFLEXES)

- **GRADED 0 - 5**
  - **0 - ABSENT**
  - **1 - PRESENT WITH REINFORCEMENT**
  - **2 - NORMAL**
  - **3 - ENHANCED**
  - **4 - UNSUSTAINED CLONUS**
  - **5 - SUSTAINED CLONUS**

OTHER REFLEXES

- Upper motor neuron dysfunction
  - BABINSKI
    - present or absent-CNS lesion in the corticospinal tract
    - toes dorsiflexion +fanning of toes
  - CLONUS
- Frontal release signs
  - GRASP
  - SNOUT
  - SUCK
  - PALMOMENTAL
  - GLABELLAR

TONE

- **INCREASED, DECREASED, NORMAL**
- **Rigidity- COGWHEELING/ LEAD PIPE**
- **SPACTICITY - CLASP KNIFE**
- **FLACCIDITY**

SENSORY EXAM

SENSORY EXAM

- VIBRATION – PERIPHERAL NEUROPATHY
  - 128 hz tuning fork
- JOINT POSITION SENSE
- BOTH HINT FOR POSTERIOR COLOUMN DISEASE OR LESION OF PERIPHERAL NERVE
- DISCRIMINATIVE SENSE – 2 POINT DISCRIMINATION, STEREOGNOSIS, GRAPHESTHESIA
- PIN PRICK
- TEMPERATURE

MENINGEAL SIGNS

- Nuchal rigidity (dd-arthritis, neck ijury)
- Brudzinsky's sign- flexion of hip and knees
- Kernig sign-discomfort behind the knee during extension