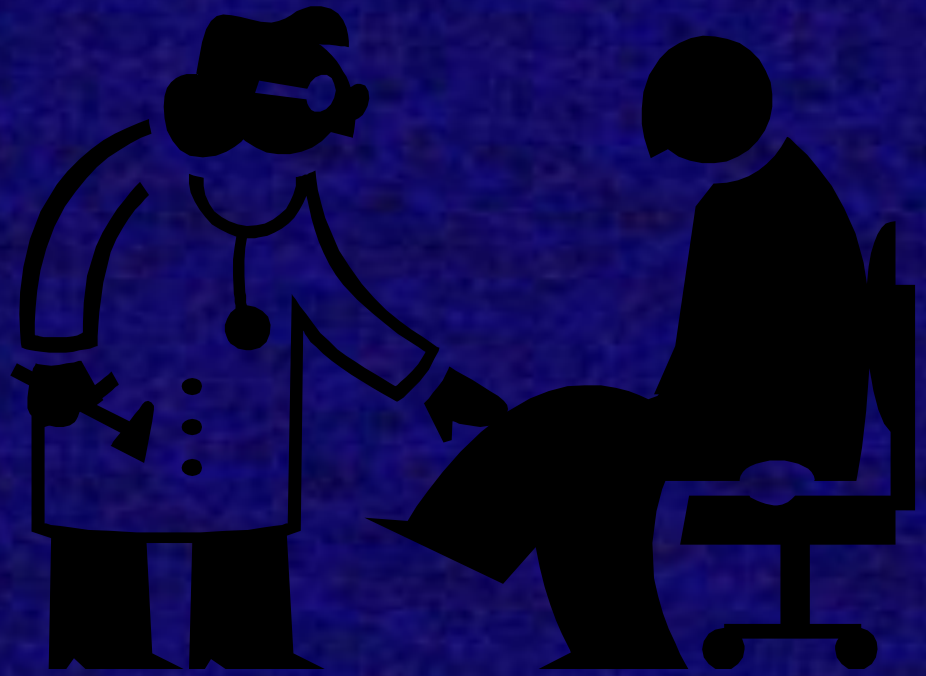
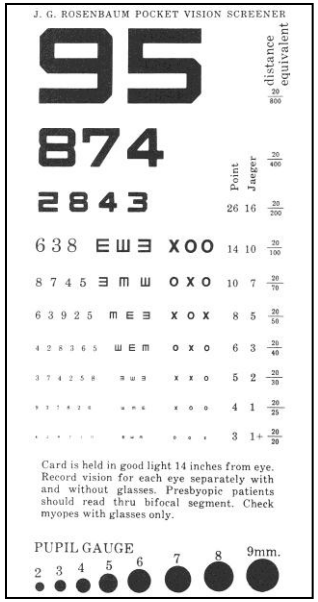
The Neurological Examination



Neuro Exam Tools



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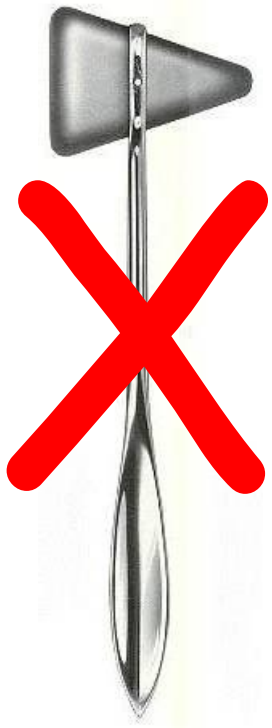
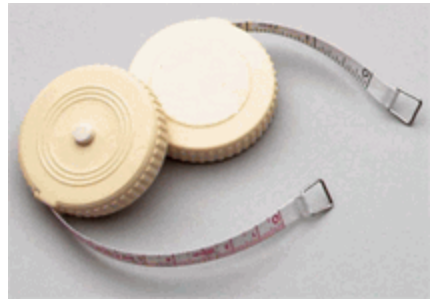




7 categories of the neurological exam

- Mental status
- Cranial nerves
- Motor system
- Reflexes
- Sensory system
- Coordination
- Station and gait

7 components of the mental status exam

- **Level of consciousness**
- **Attention**
- **Orientation**
- **Language** — fluency, comprehension, repetition, naming, reading, writing
- **Memory** — immediate recall, recent, remote
- **Higher intellectual function**—general knowledge, abstraction, judgment, insight, reasoning
- **Mood and affect**

CNI: Olfactory nerve

- Cannot evaluate if nasal passages obstructed by rhinitis, polyps, etc.
- Eyes closed
- Occlude one nostril and test other
- Compare 2 sides
- Use nonirritating substances
  - Avoid those that stimulate trigeminal nerve endings or taste buds (e.g., peppermint, menthol, ammonia)

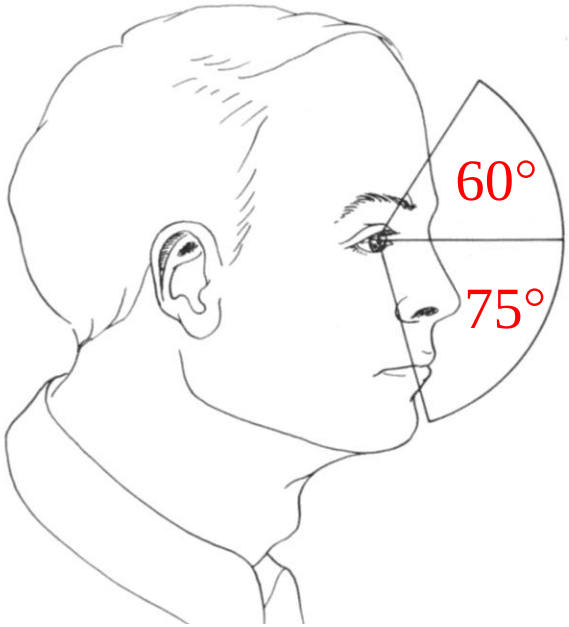
CNII: Optic nerve

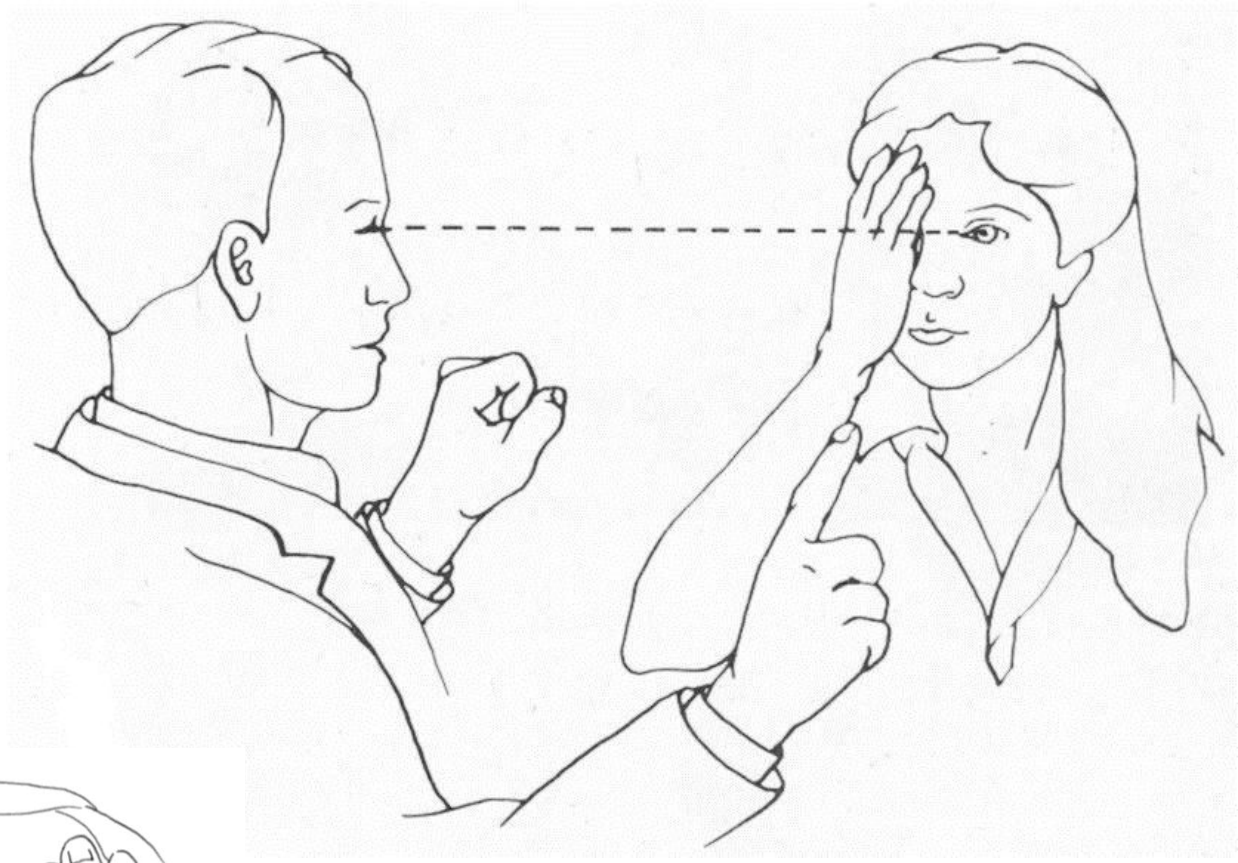
- Visual acuity
- Visual fields
- Fundoscopy
- Afferent limb of pupillary function

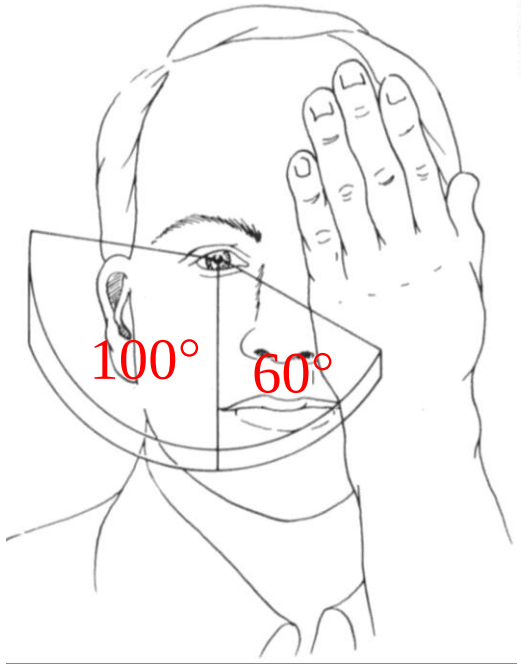
CNII: Visual acuity

- Hold card at comfortable reading distance
- Cover 1 eye
- Glasses <u>on</u> (looking for optic nerve lesion, not refractive error)

CNII: Visual fields





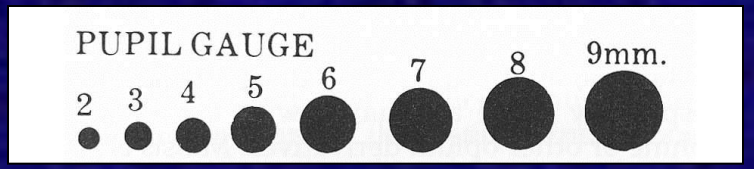


Greenberg *Clinical Neurology*, 1993

CNII: Fundoscopic exam

CNII & III: Pupillary function

- Normal pupils are equal in size and shape and are situated in center of iris
- Pupillary size varies with intensity of ambient light, but at average intensity is ≈ 3-4 mm
  - ***Miosis*** < ≈2 mm
  - ***Mydriasis*** > ≈5 mm
  - ***Anisocoria*** = pupillary asymmetry



CNII & III: Light reflex

- Dim lights
- Fix gaze on opposite wall to eliminate effects of accommodation
- Shine bright light obliquely into each pupil
- Look for both direct (same eye) and consensual (opposite eye) reaction
- Record pupil size and shape

CNII & III: Accommodation

- Hold finger ≈10 cm from patient's nose
- Alternate looking into distance and at finger
- Observe pupillary response

CNIII, IV, VI: Ocular nerves

- CNIII Oculomotor nerve
- CNIV Trochlear nerve
- CNVI Abducens nerve

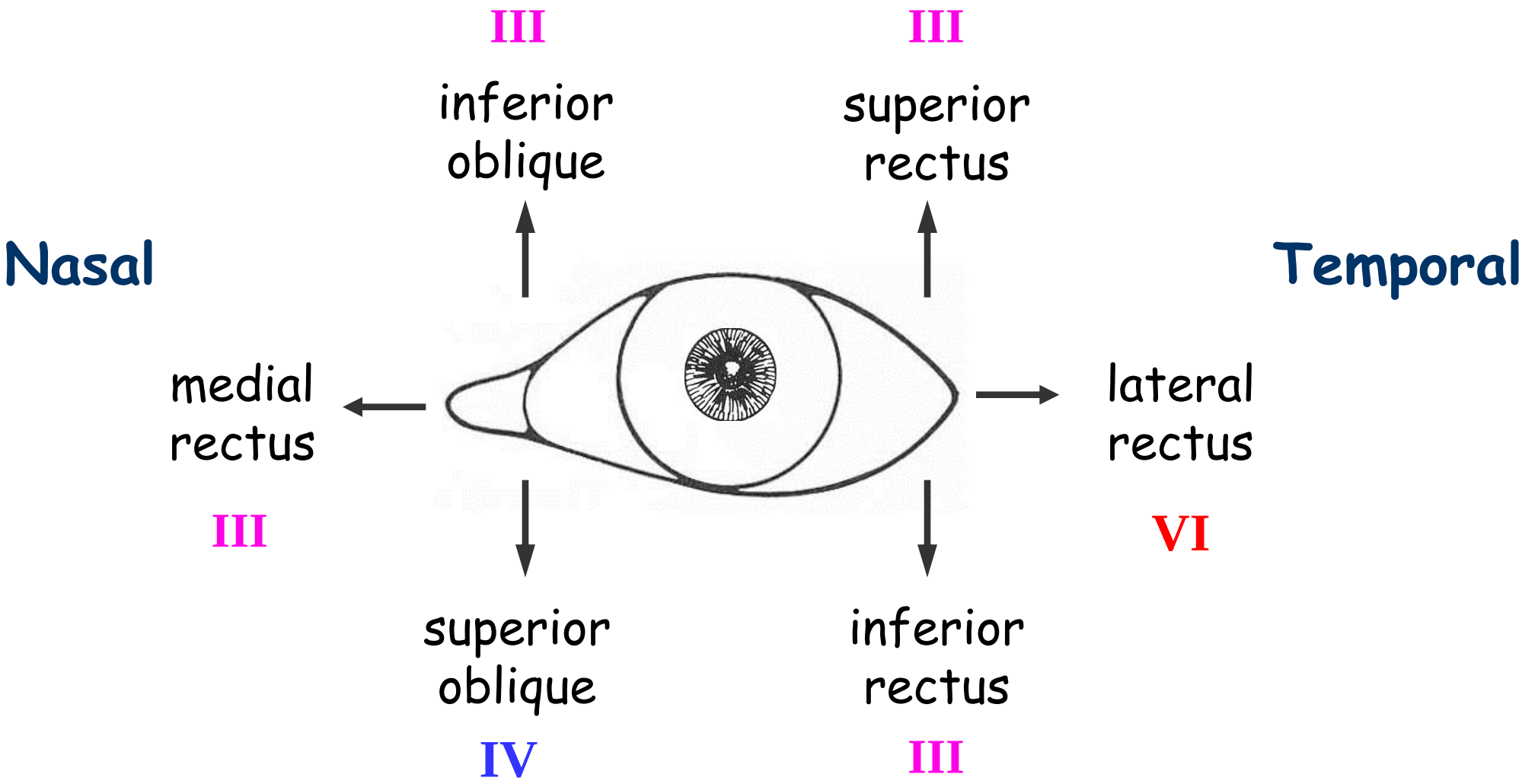
- Visual inspection: ocular alignment, lids
- Convergence
- Smooth pursuits
- Saccades
- Nystagmus
- 6 cardinal directions of gaze

Smooth Pursuits

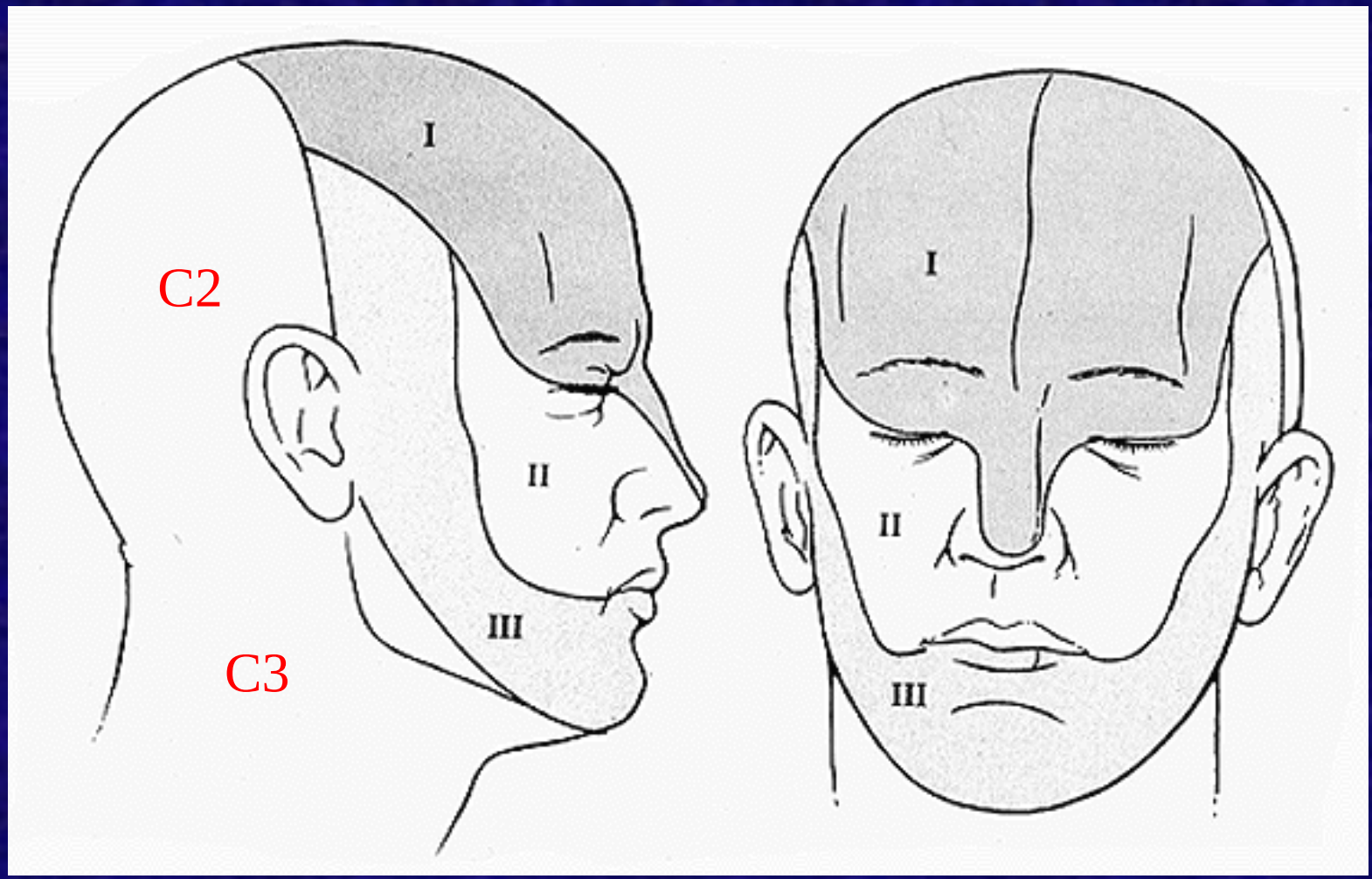
Saccades

Optokinetic Nystagmus

Extraocular movements



CNV: Trigeminal nerve



CNV: Trigeminal nerve

Corneal reflex

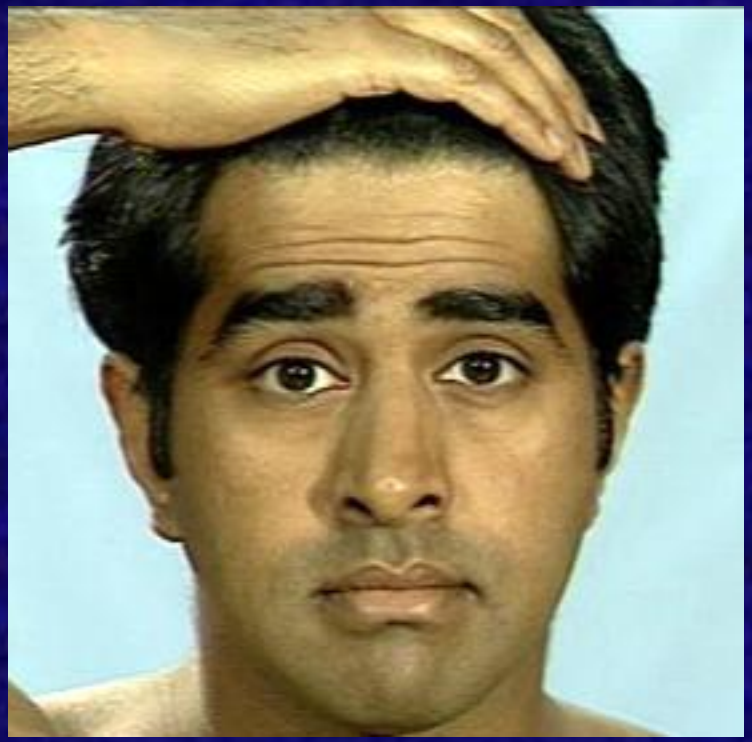
(CN V-afferent limb
CN VII-efferent limb)

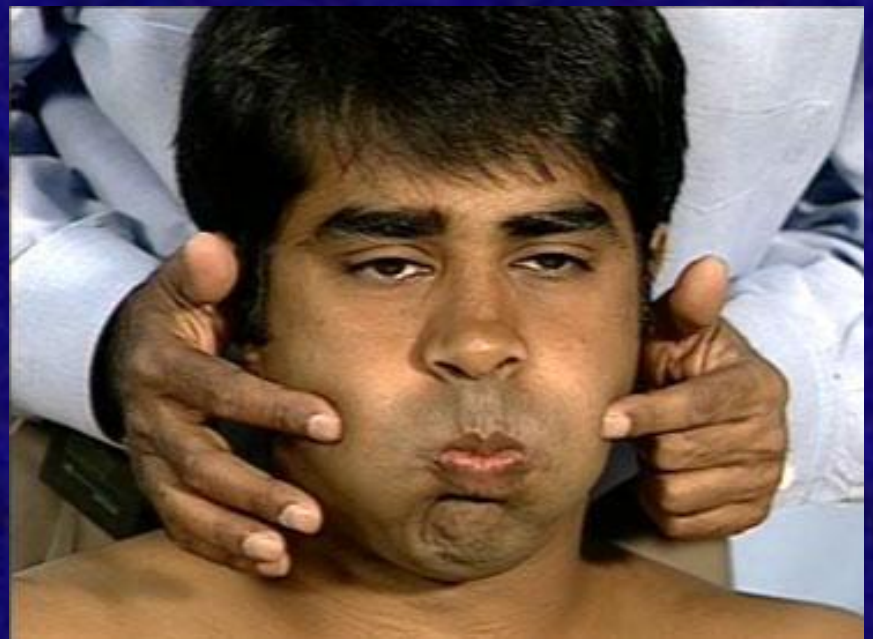
Masseter strength

Jaw jerk

Corneal Reflex

CNVII Facial nerve





CNVIII: Auditory nerve

- **Hearing** (cochlear nerve)
  - Test with finger rubbing at arm's length
    - If can't hear strong rubbing→impaired
    - If can hear faint rubbing→normal

- Tuning fork tests (Weber, Rinne) have extremely poor sensitivity

CNIX & X: Glossopharyngeal & vagus nerves

- Testing centers on motor function
  - Palate elevation
  - Swallowing
  - Voice
  - Cough
  - Gag reflex

Examination of the palate

CNXI: Spinal accessory nerve

- **Trapezius**
  - Push head back against resistance
  - Shrug shoulders
- **Sternocleidomastoid**
  - Place hand on lower face and have patient rotate head toward that side
  - Observe contraction of opposite SCM

CNXII: Hypoglossal nerve

- Note tongue position at rest and on protrusion
  - Does tongue deviate in either position?
- Note strength and rapidity of movements
- Have patient push tongue into each cheek

Motor exam

- Compare left to right, proximal to distal, arms to legs
  - Bulk (muscle mass)
  - Tone (muscle tension at rest)
    - Test with passive manipulation
  - Strength
  - Speed of movement; extraneous movement
  - Endurance

Muscle strength testing

Direct muscle strength testing more sensitive to lower (alpha) motor neuron dysfunction, while tests of dexterity/coordination more sensitive to upper motor neuron (corticospinal tract) dysfunction

- Isolate muscle
- Fix proximal joint when testing distally
- Always give yourself the advantage
- Increase sensitivity in lower extremities with heel/toe walking and deep knee bend
- Normal variability—age, sex, muscle, handedness
- "Giveway weakness"

Grading muscle strength
(Medical Research Council scale)

0 No muscular contraction

1 Visible muscle contraction, but no movement at joint

2 Movement at the joint, but not against gravity

3 Movement against gravity, but not against resistance

4 Movement against some resistance, but < full

5 Movement against full resistance; normal strength

Upper extremity muscles you should know how to test

- **Deltoid**—abduction (elevation) of upper arm
  - (C5-6, axillary nerve)
- **Biceps**—flexion of forearm at elbow
  - (C5-6, musculocutaneous nerve)
- **Triceps**—extension of forearm at elbow
  - (C6-8, radial nerve)
- **Extensor carpi radialis**—dorsiflexion of hand at wrist
  - (C5-6, radial nerve)
- **Abductor pollicus brevis**—palmar abduction of thumb w/ thumb at right angle to palm
  - (C8-T1, median nerve)
- **Interrosei**—finger abduction (dorsal) & adduction (palmar)
  - (C8-T1, ulnar nerve)

Lower extremity muscles you should know how to test

- **Iliopsoas**—hip flexion
  - (L1-3, femoral nerve)
- **Quadriceps**—knee extension
  - (L2-4, femoral nerve)
- **Hamstrings**—knee flexion
  - (L5-S2, sciatic nerve)
- **Tibialis anterior**—ankle dorsiflexion
  - (L4-5, deep peroneal nerve)
- **Gastrocnemius/soleus**—ankle plantar flexion
  - (S1-2, tibial nerve)

Muscle stretch reflexes

- **Biceps** (C5, C6; musculocutaneous)
- **Triceps** (C6, C7; radial)
- **Patellar** (L2-L4; femoral)
- **Ankle** (S1-S2; tibial)

Reflex grading

0 absent
1 hypoactive
2 normal
3 brisk/hyperactive
4 markedly hyperactive with clonus

Biceps reflex

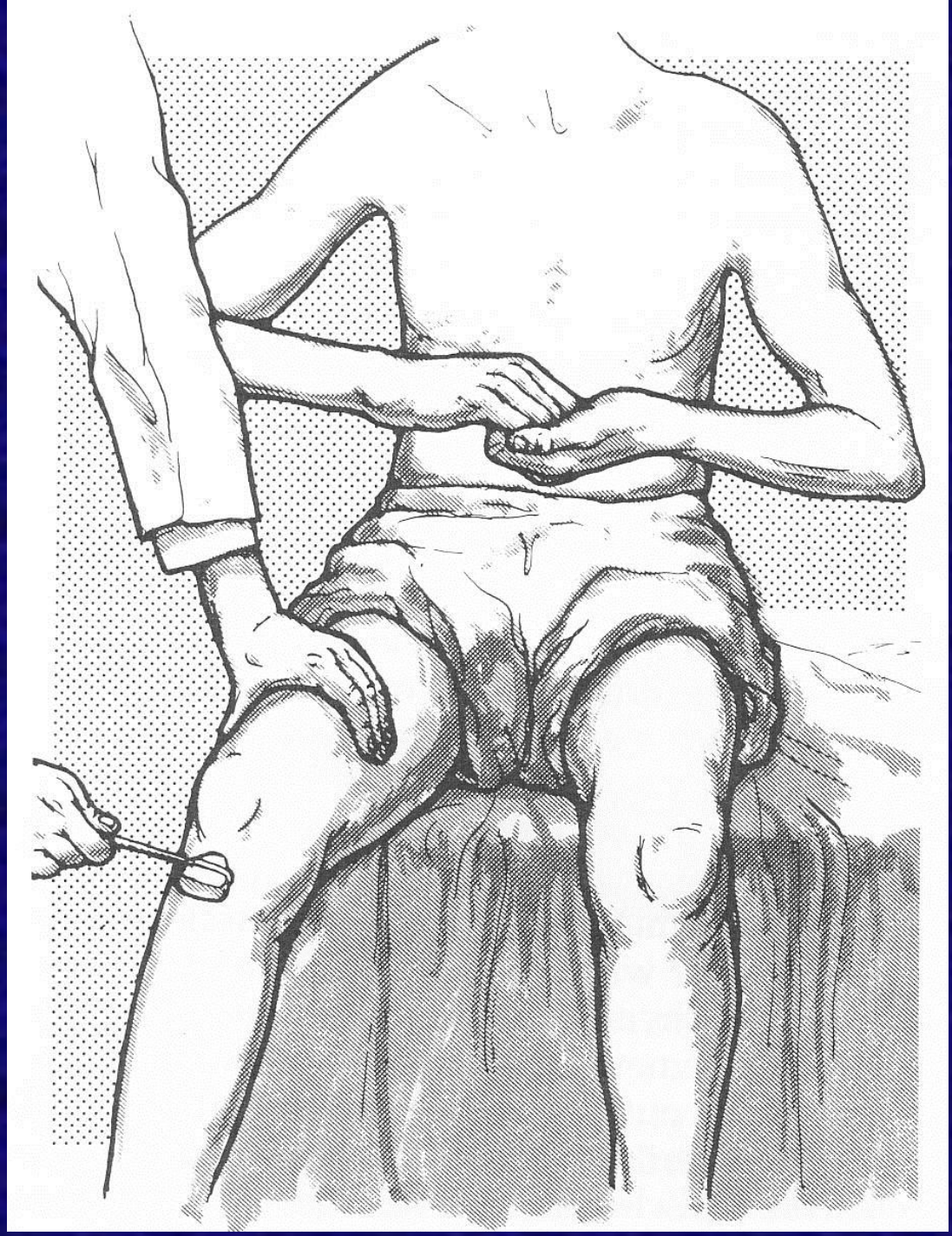
Triceps reflex

Knee Jerk

Ankle Jerk

Reflexes: Reinforcement

- Isometric contraction of other muscles (Jendrassik maneuver, teeth clenching)
- Distraction
- Slight tension in muscle group being tested

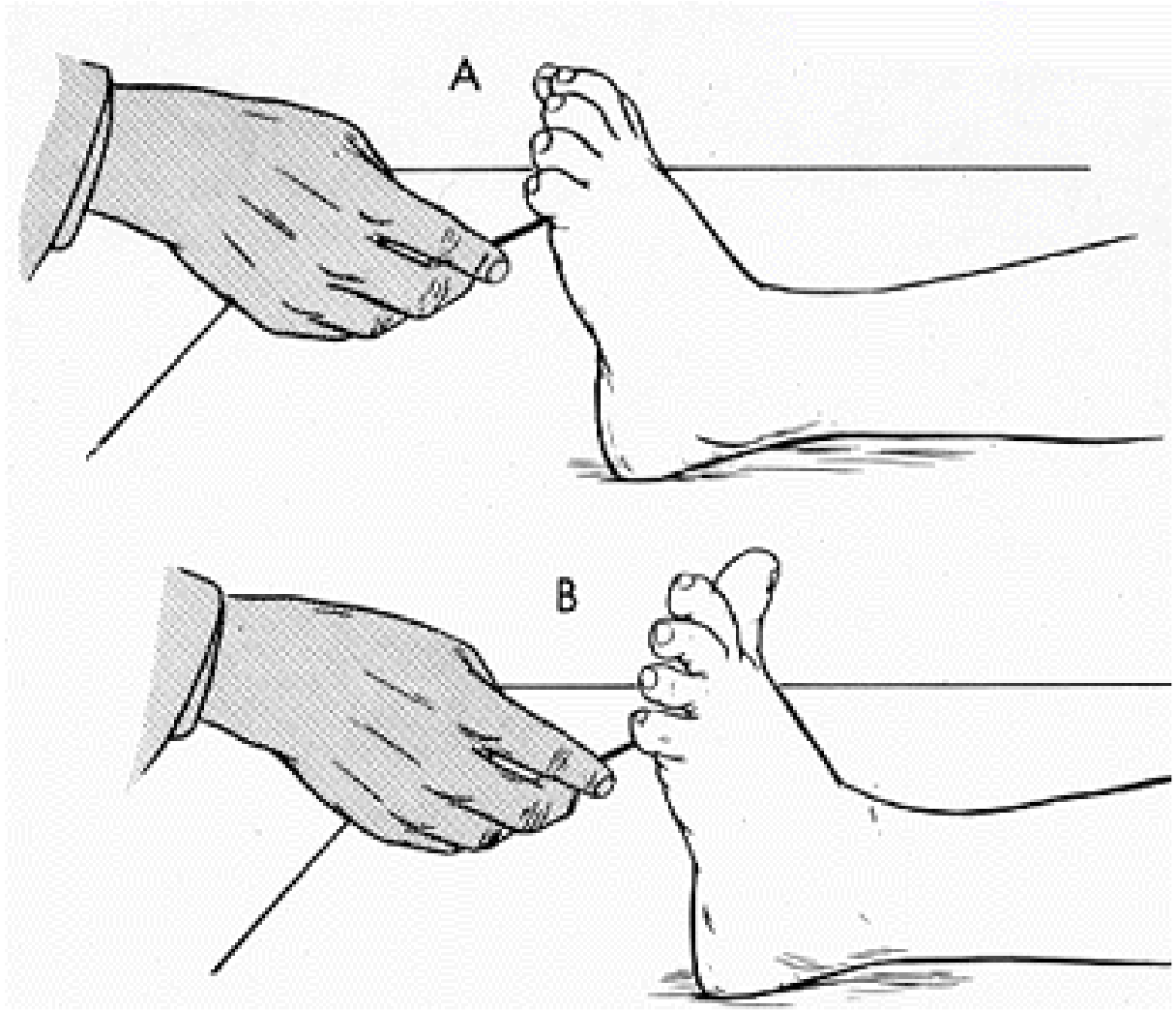


Haerer *DeJong's The Neurologic Exam*, 1992

Superficial reflexes

- **Plantar** (L4-S2, esp S1; tibial nerve)
  - Babinski, etc.
  - Normal response = flexion (toes go down)
  - Abnormal response = extension (dorsiflexion of great toe as the extensor hallucis longus is recruited)
    - Sign of hyperexcitability associated with corticospinal dysfunction

Plantar reflex



Plantar reflex

Sensory Exam: General Points

- Explain each test before you do it
- Patient's eyes should be closed during testing
- Test all 4 extremities
- Avoid leading questions like "Is this sharp?"
- Compare side-to-side and distal-to-proximal asking if they are "about the same"
- When you detect an area of sensory loss, map out its boundaries in detail

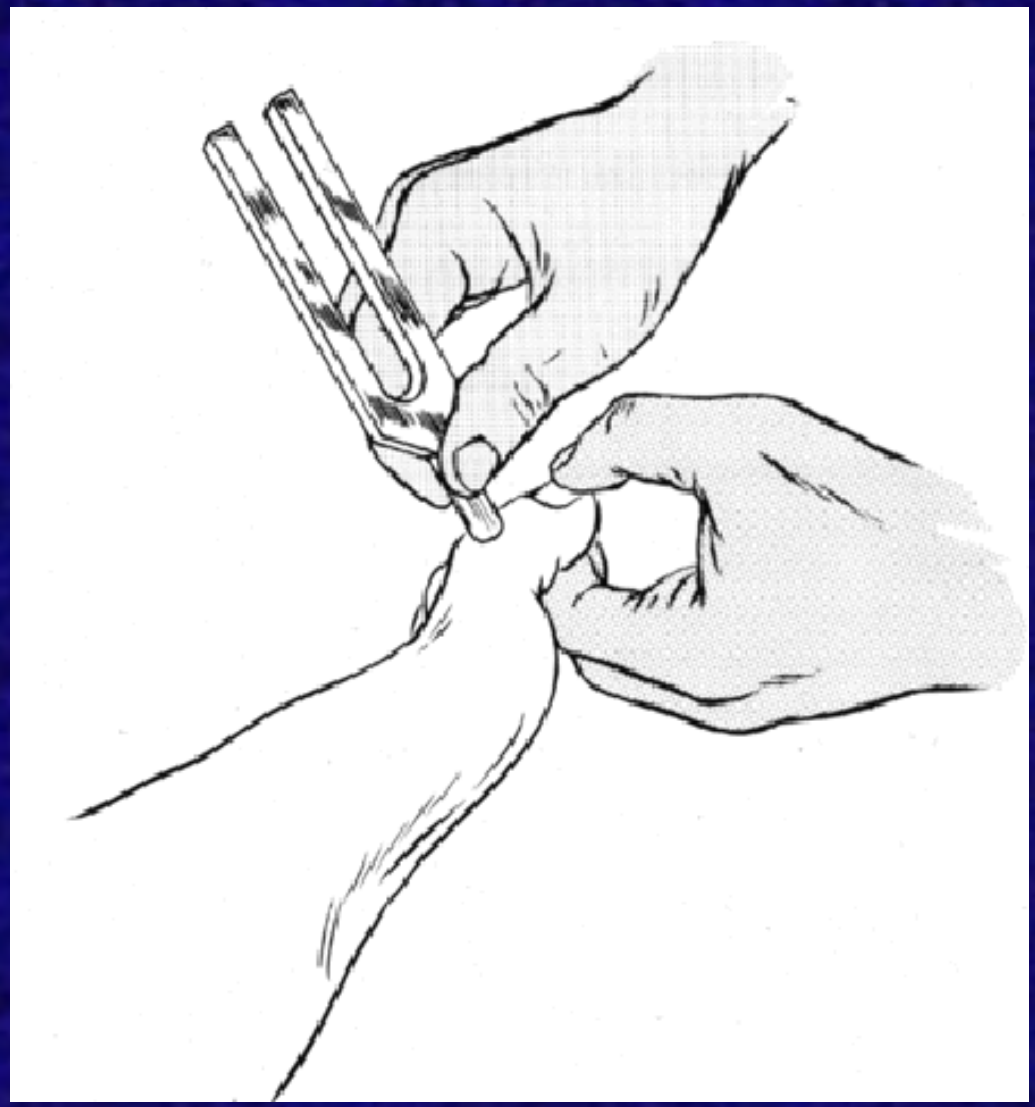
Sensory exam

- **Primary sensation**
  - Pain and temperature
  - Light touch/pressure
  - Vibration
  - Proprioception

  Characterize as normal, absent, reduced, exaggerated, or perverted (*dysesthesias*)

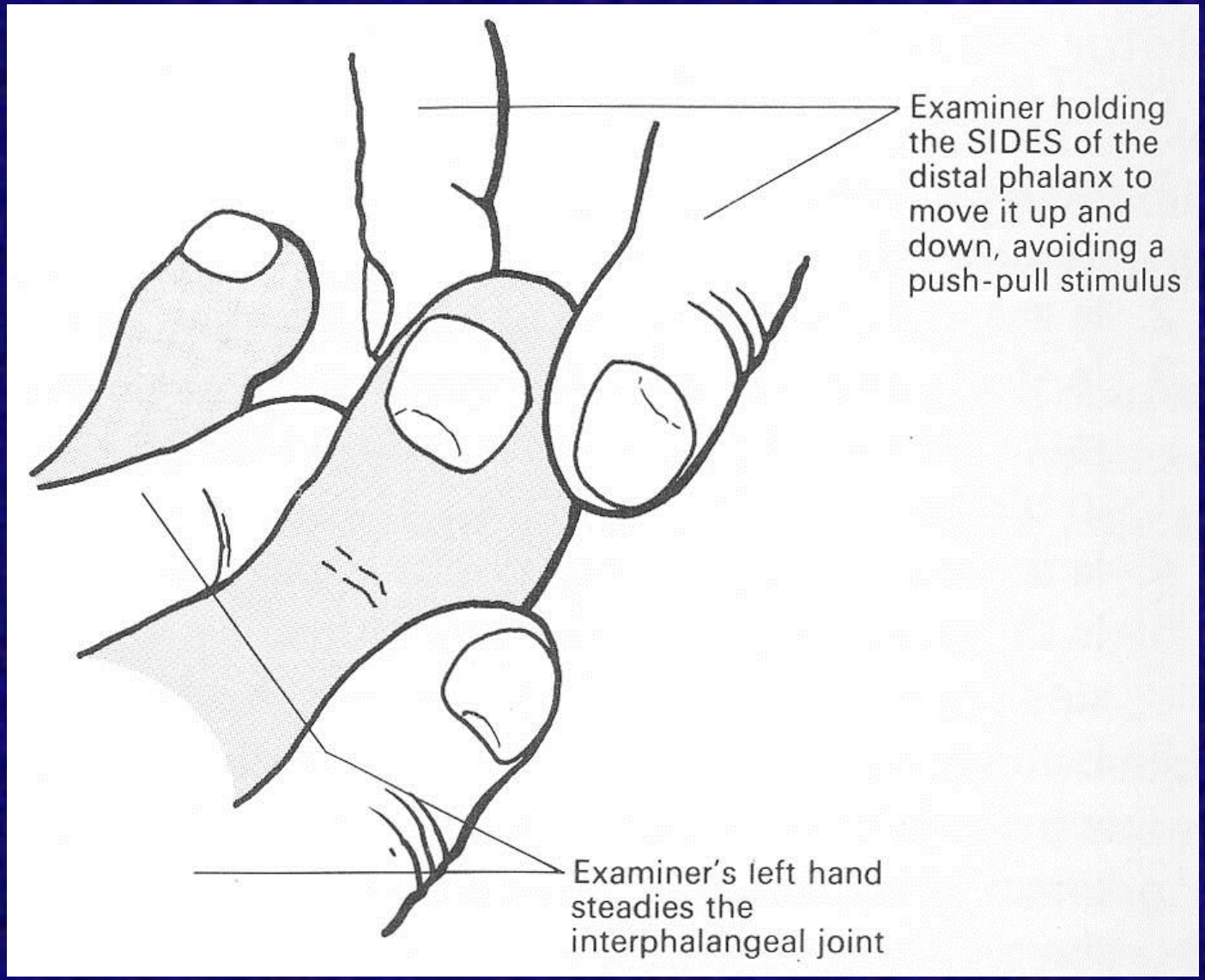
- **Integrative sensation**
  - Graphesthesia
  - Stereognosis
  - Double simultaneous stimulation

Vibration sense



- 128-Hz tuning fork
- Test toe & finger
- What do you feel?
- Count seconds til stops
- Compare side to side
- If impaired, move proximally

Joint position sense



- Test toes and fingers
- Move digit only a few degrees
- If impaired, move digit greater distance -> test more proximally

Patten *Neurologic Differential Diagnosis*

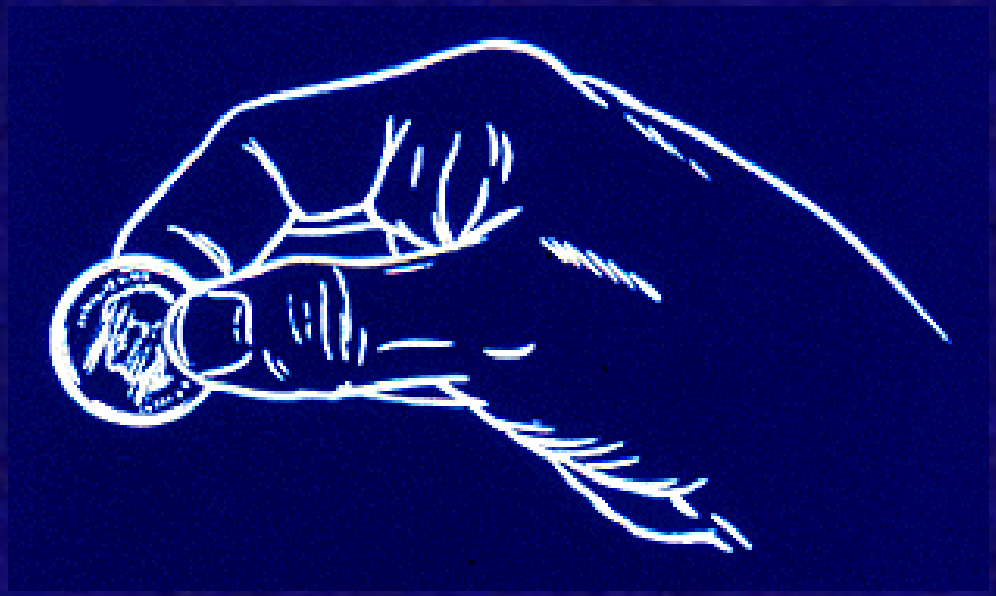
Pain sensation

- Test for distal gradient of sensory loss in the leg
- Test for sensory loss in most commonly affected nerve and nerve root distributions
  - Palmar aspect of index finger (median nerve).
  - Palmar aspect of 5th finger (ulnar nerve)
  - Web space between thumb and index finger on dorsal surface of hand (radial nerve).
  - Lateral surface of foot (L5).
  - Posterior aspect of leg (S1).
- Ask patient if the sensation is "about the same"

Light Touch & Double Simultaneous Stimulation

- Lightly touch face and extremities in random order, asking patient to respond whenever a touch is felt
- Touch both sides of face or body simultaneously, asking patient to indicate whether touch is felt on left, right, or both sides

Stereognosis & Graphesthesia



Romberg sign

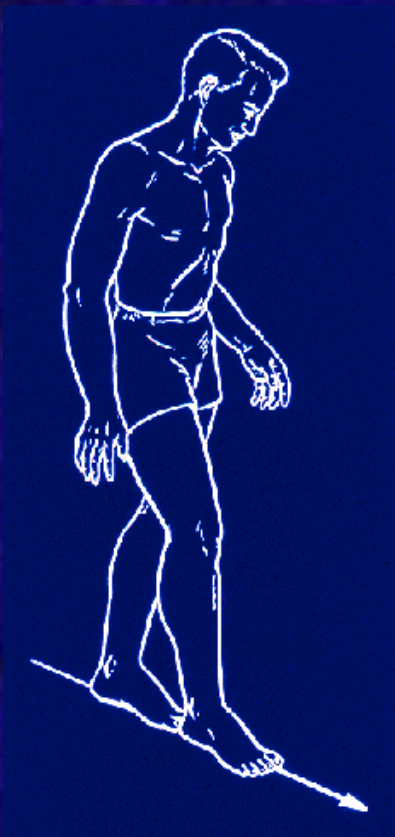
- Ability to maintain upright position with feet together and eyes open
- Sway/fall when eyes closed
- Indicates impaired proprioception or vestibular dysfunction

Coordination

- Control, precision, rhythm, synergy of movement
- Test at rest and with action in trunk and limbs
  - Finger-nose-finger
  - Rapid alternating movements
  - Heel-knee-shin
  - Finger or toe tapping

Gait

- Posture of body and limbs
- Length, speed, and rhythm of steps
- Symmetry and base of gait
- Steadiness
- Arm swing
- Turns
- Test with normal gait, toe walking, heel walking, tandem walking



Meningeal signs

- Neck mobility—look for nuchal rigidity (neck stiffness)

Recommended resource: