

Neurological Examination

Summary

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Target audience

medical students, health
care students & doctors
in Africa

Aim

To demonstrate how to
carry out a neurological
examination

Cranial Nerves

examine in the seated position

Olfactory (**First**) CN

Testing Smell

Testing Smell

loss of smell? *if there is*

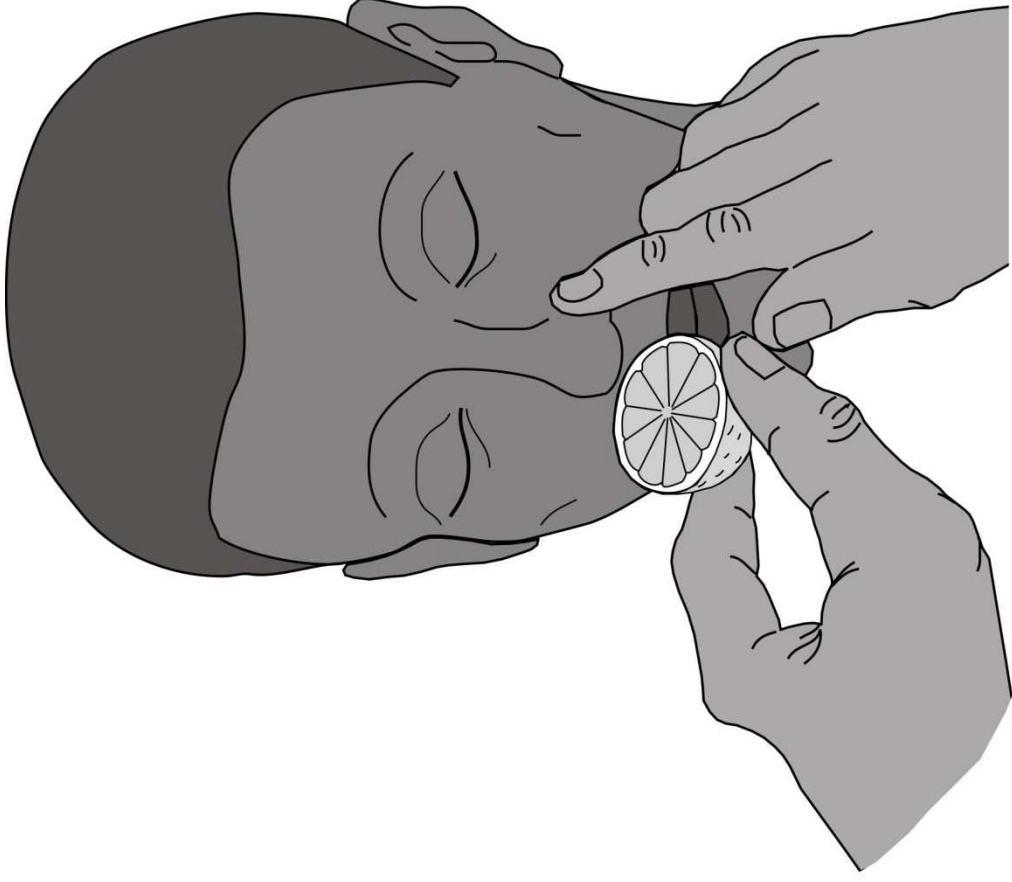
sniff to show that the nose is open

close eyes

block one nostril by applying a finger

identify up to 4 familiar smells eg

orange/lemon, soap, cloves & coffee



Testing smell
Olfactory nerve

Optic (**Second**) CN

Testing: **Visual Acuity**

Testing: **Visual Fields**

Doing: **Fundoscopy**

Visual Acuity

testing how well you see

can you see okay?

do you use glasses? *If so wear them*

stand 6 meters from **Snellen Chart (SC)**

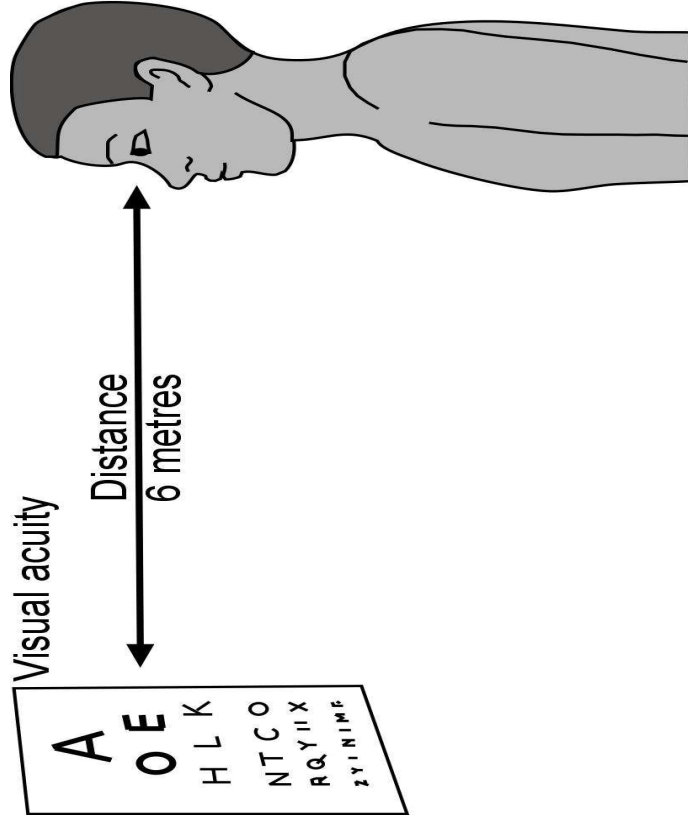
cover each eye & identify letters on **smallest** line
completely visible

Line = distance of person with normal vision can
see at eg 6, 12, 18, 24, 36

VA recorded as 6/5, 6/6--6/24-- CF/HM/PL

if **SC not available use** hand chart/newspaper

to test colour vision **use** *Ishihara plates*



The Snellen chart

Visual Fields

see in all directions

Confrontation

Field perimetry

Visual Fields Confrontation

look **at my nose**

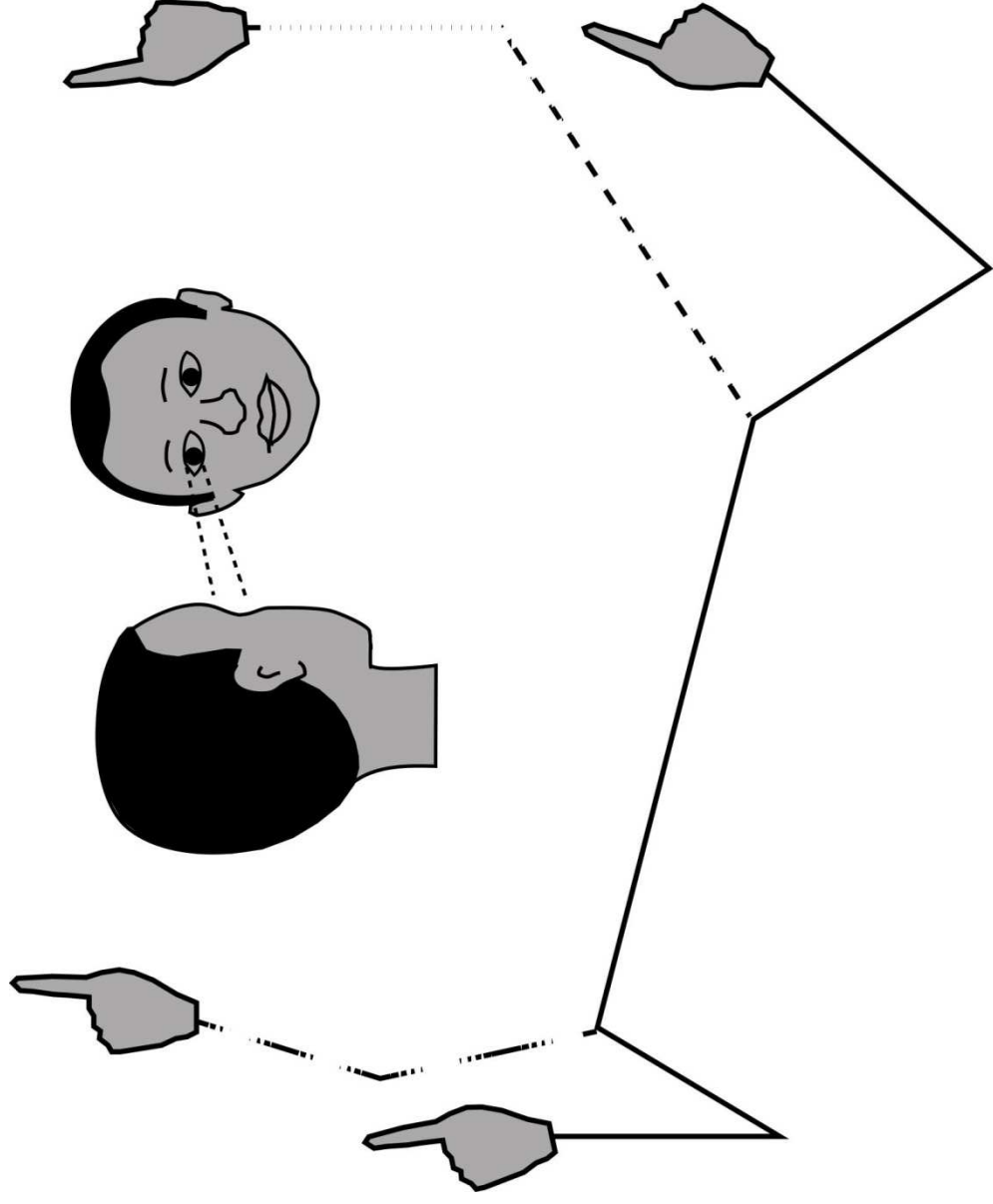
hold both hands **upright** $\frac{1}{2}$ meter apart &
30 cms **above horizontal**

move **finger tip**

ask pt to **identify movement**

repeat **for other side & 30 cms below**
horizontal

examine each eye **individually if indicated**



Testing for visual field defects by confrontation

Visual Fields Perimetry

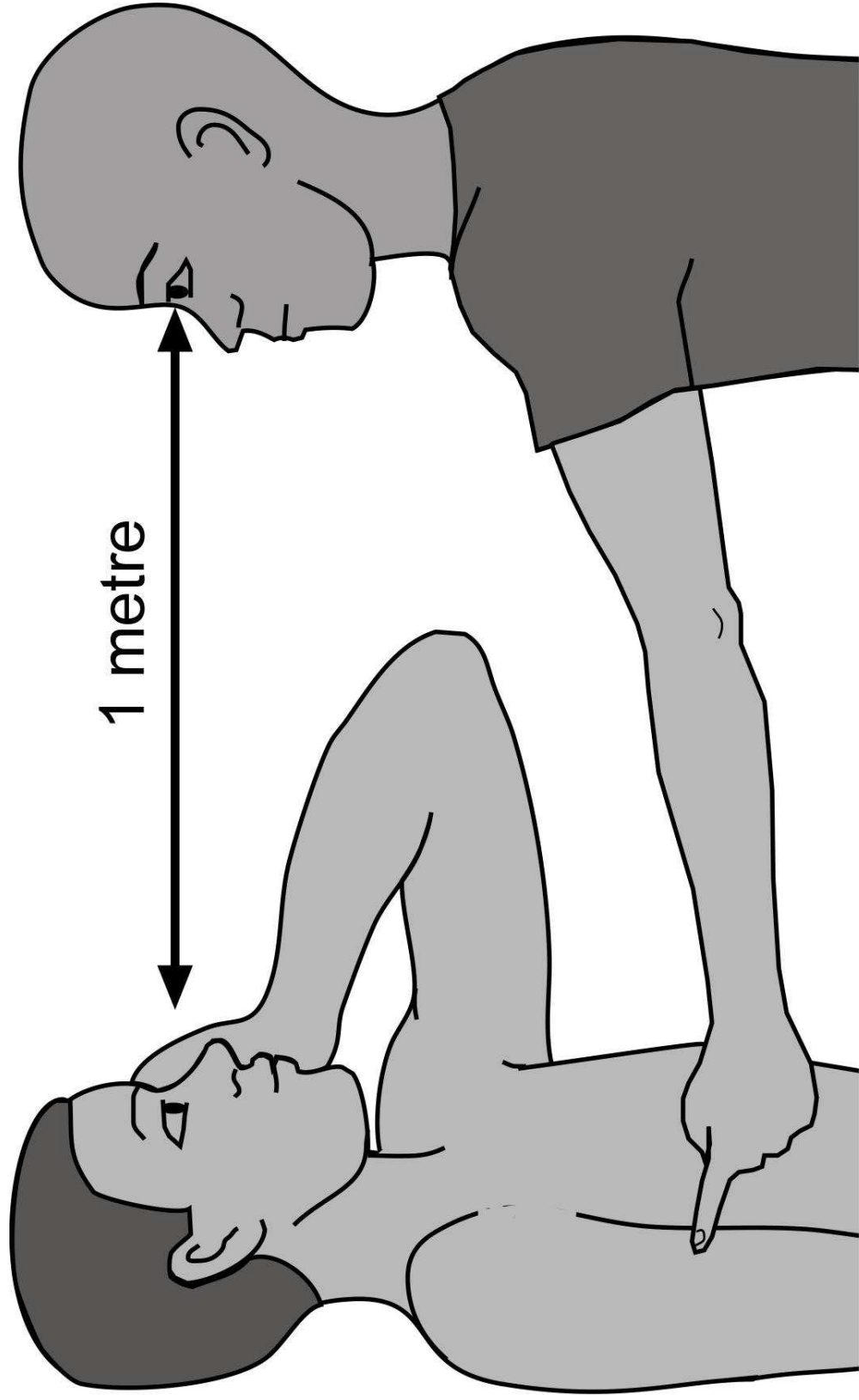
use **finger tip** *or white pin*

start behind **pts** visual field

come **forward** **diagonally** @ 45 degree
angle in **NE to SW** direction

ask pt *to* indicate **when** he sees movement

repeat in all (*four*) quadrants

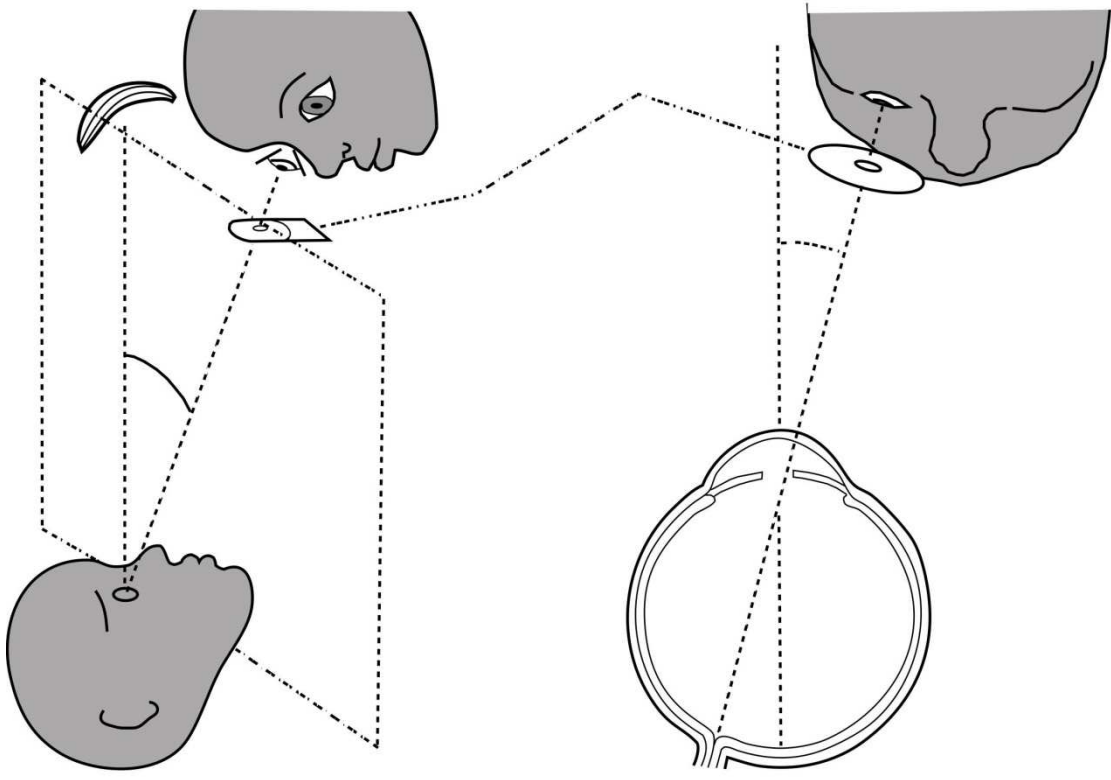


Testing visual fields by confrontation

Fundoscopy

Using the ophthalmoscope

- check **light is bright** & **focus is at 0**
- ask **pt to fixate** **ie** look **straight ahead**
- hold **ophthcope** in **right hand** & **30 cm away** & **15-20 degrees lateral** & **level** to fixation point
- aim at **back head** & **keep out** of line of sight
- see **red reflex** & move **slowly** to **1-2 cm** from **pts right eye**
- keep **ophthcope** & line fixation in **same plane**
- adjust **lens** & identify **blood vessels** & **disc**
- repeat in **other eye**



Examining the eye with an ophthalmoscope

Pupillary reflexes (Rx)

Light Rx

Consensual Rx

Accommodation Rx

Consensual Response

Pupillary reactions

ask patient to look in distance

shine bright light on bridge of nose

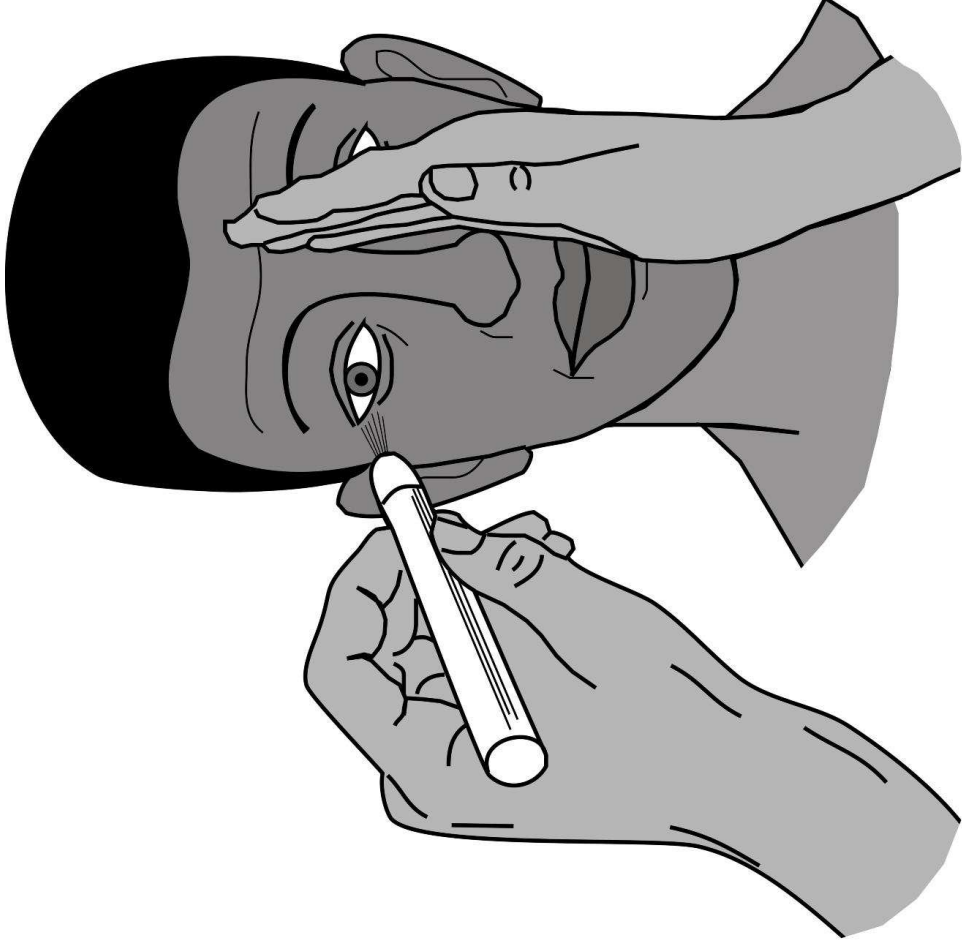
inspect pupils for PERLA (pupils equal, react to light & accommodation)

Light Rx: *bring the light from side or behind*

inspect pupil for constriction

Consensual Rx: *repeat & look in other eye*

Accommodation Rx: *look in distance & at my finger*



Testing the light reflex
Optic nerve

Testing eye movements

Oculomotor **(Third)** CN

Trochlear **(Fourth)** CN

Abducens **(Sixth)** CN

Eye Movements

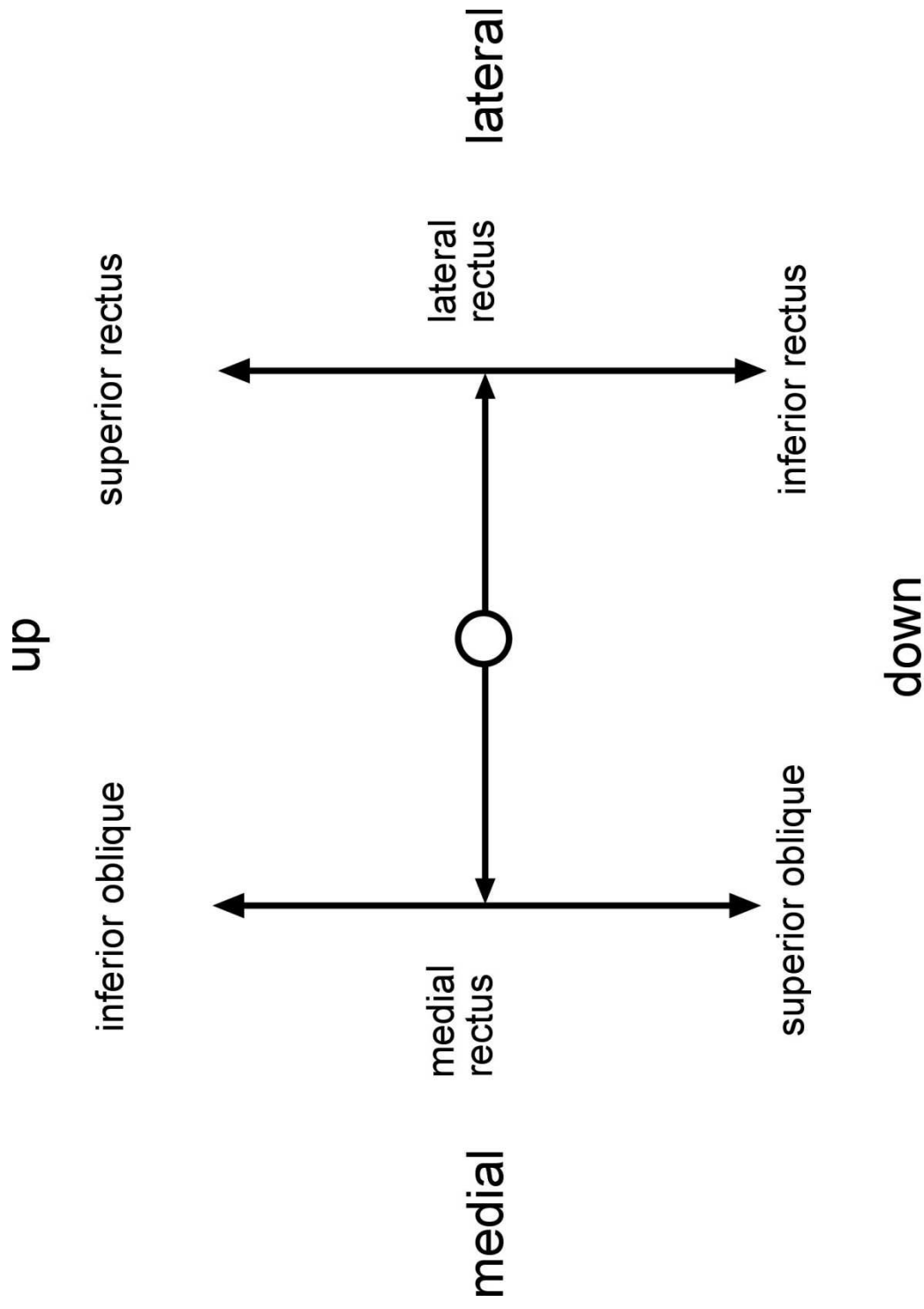
inspect & ask re double vision

please look right, left, up & down

make a cross and/or H sign in/air with finger

follow my finger with your eyes

if weakness *present*: test movements in each eye separately



Muscles involved in eye movements

Trigeminal (**Fifth**) CN

Testing facial sensation

Testing facial power *ie*
mastication

Testing facial sensation & jaw power

Sensation:

ask if numbness, loss of feeling on face

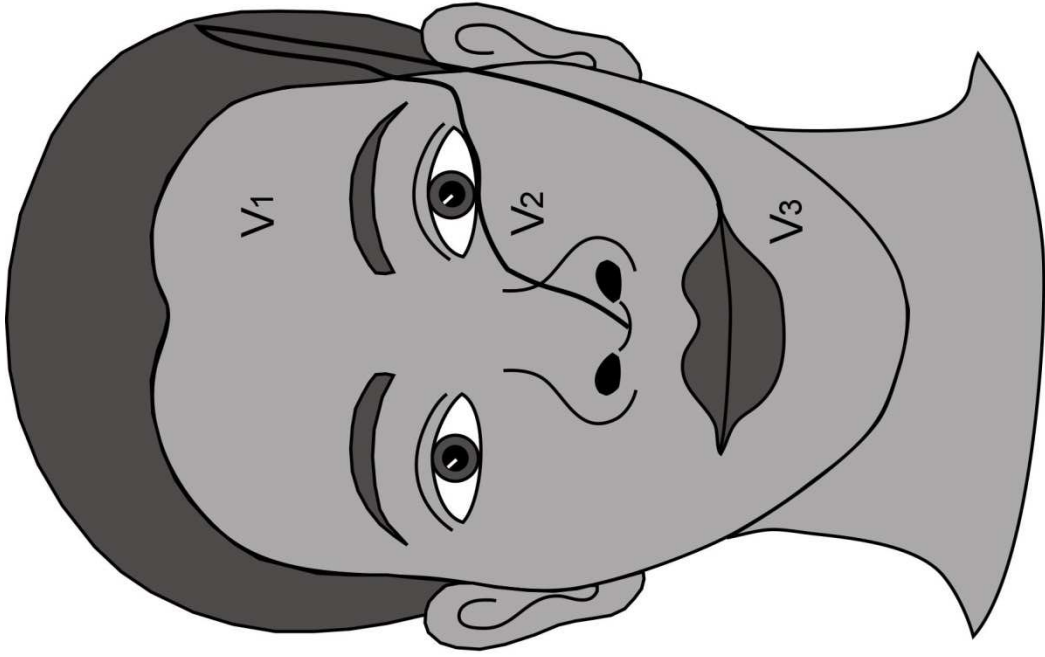
touch each side once at V1, V2 & V3

compare right & left

Power:

open & close mouth against resistance

Jaw Jerk: tap chin with patella hammer



Facial sensation: left side ophthalmic (V_1), maxillary (V_2) and mandibular (V_3) divisions of the trigeminal nerve

Corneal Reflex

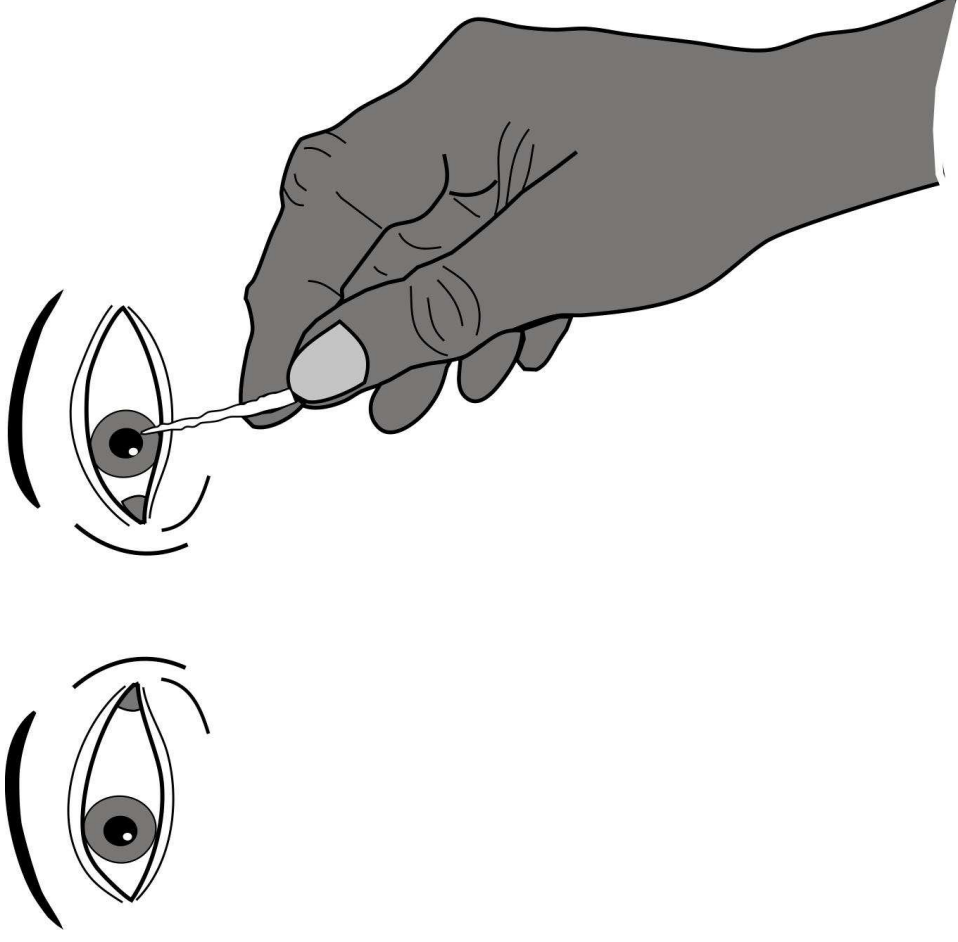
hold the lower lid down

ask pt to look up

use a wisp of cotton wool

touch the cornea from below

observe blinking in both eyes



Corneal reflex (V and VII)
Touch cornea from below with wisp of cotton wool

Facial Nerve (**Seventh**) CN

Testing facial expression

Testing taste

Testing facial expression & taste

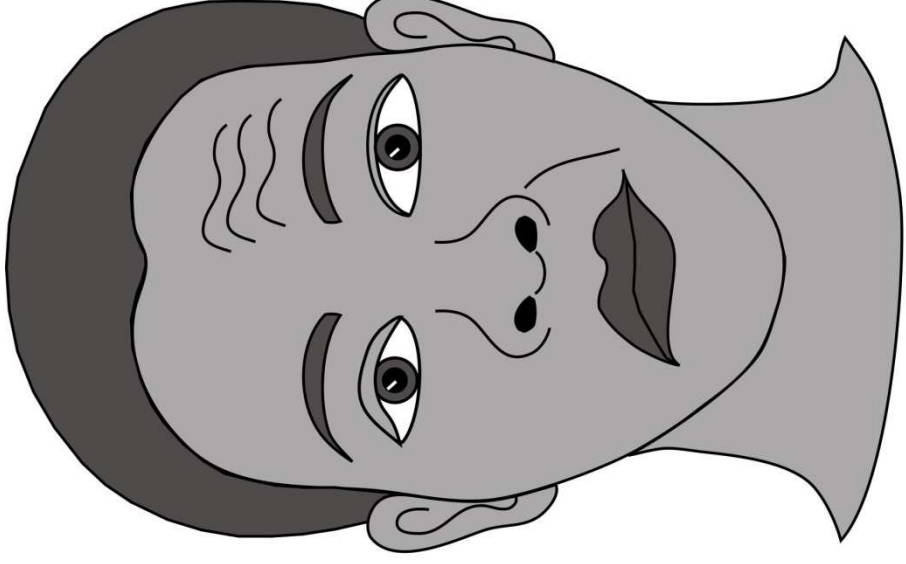
Expression: inspect the face

look up

close eyes

smile

Taste: apply salt & sugar to tip
tongue & identify the taste

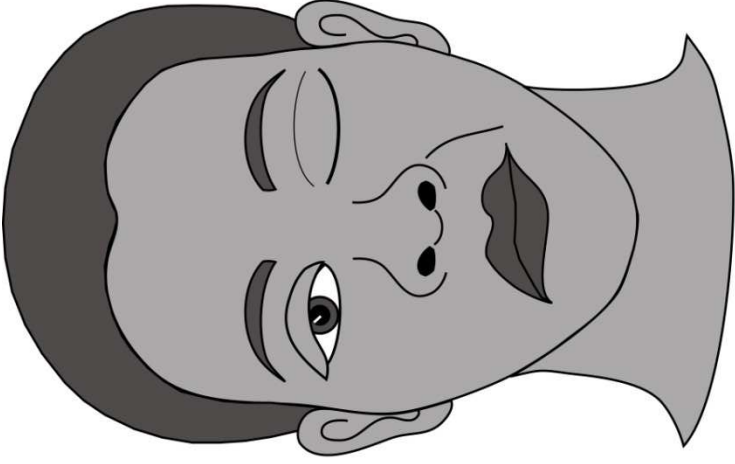


Facial nerve palsy right lower motor neurone lesion

Loss of wrinkling of forehead

Loss of nasolabial fold

Drooping of the mouth



Facial nerve palsy right sided lower motor neurone lesion
(during eye closure)

- Failure to close the eye
- Loss of nasolabial fold
- Drooping of the mouth.

Acoustic Nerve (Eight) CN

Cochlear & Vestibular

Testing: hearing

Testing: balance

Vestibular Nerve

Examining balance

(Not illustrated here see textbook "Neurology in Africa")

Hallpike's manoeuvre

Caloric testing

Cochlear Nerve

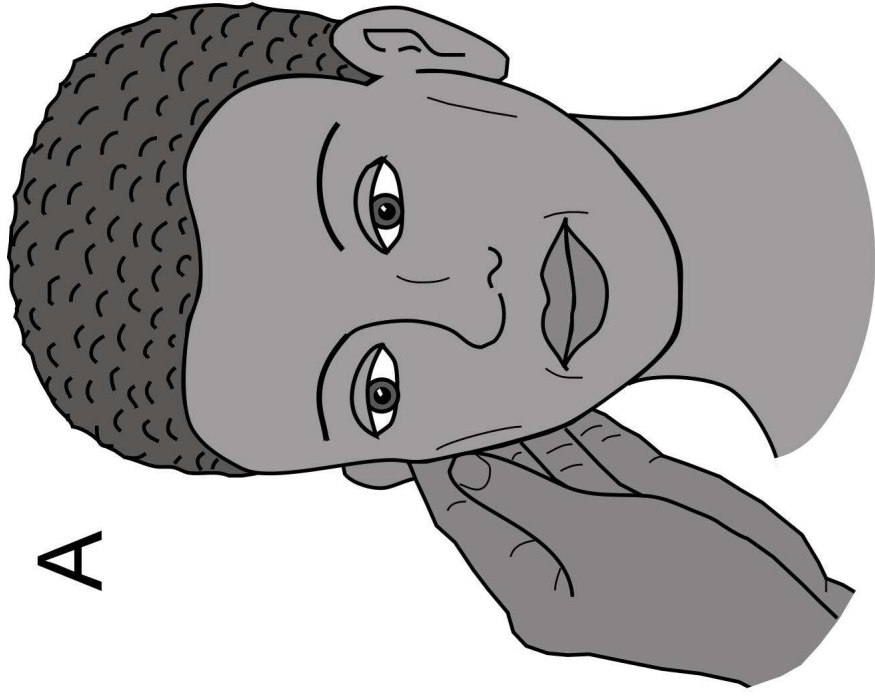
Examining for deafness

can you hear **normally?** *if not*

test hearing by rubbing fingers outside one ear & blocking other ear

from approx one meter behind pt ***whisper,***
if still can't hear speak and/or shout

if deaf do Rinne & Weber test



A



B

Testing for hearing
Auditory nerve

Tuning Fork Tests

Rinne test

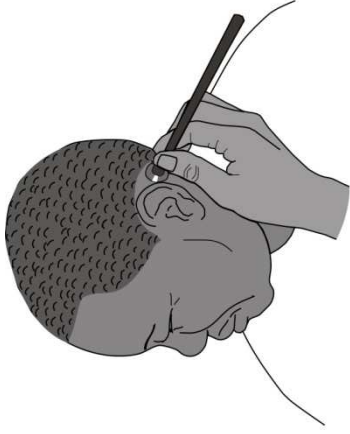
place beating tuning fork on mastoid bone

when hearing stops **place** next ear canal

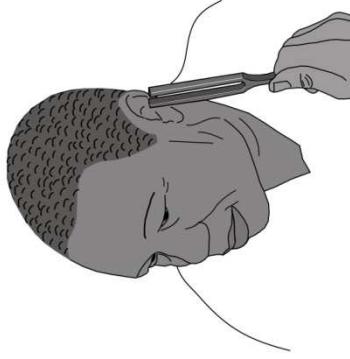
(normal: *air conduction > bone conduction*)

if pt can't hear: deafness is conductive

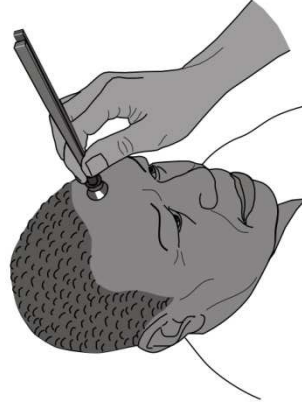
if pt can hear: deafness is sensorineural



A



B



C

Testing the type of deafness
The Rinne test A+B
The Weber test C

Weber test

place base of beating tuning fork on middle of forehead

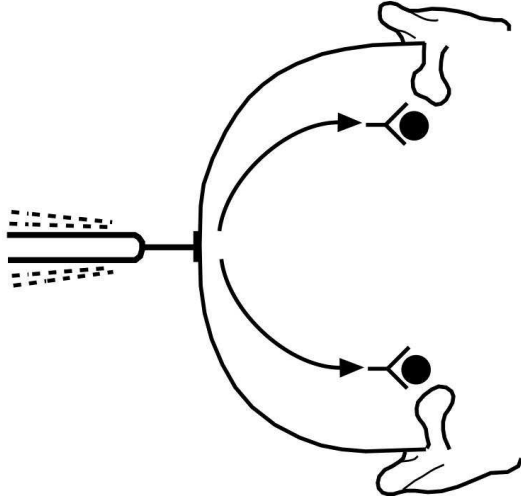
ask in which ear sound is loudest

normally heard equally in both ears

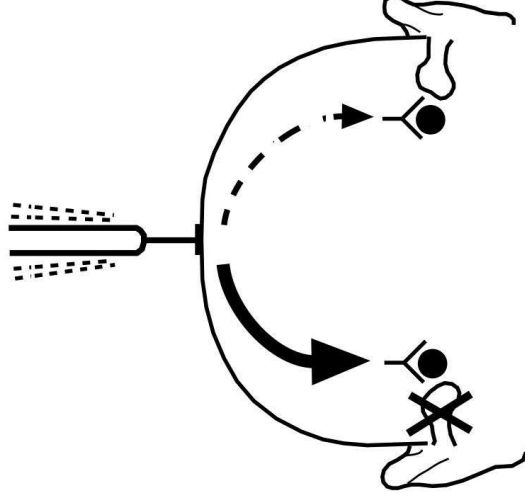
if heard best in *deaf ear* then deafness is ***conductive*** in that ear

if heard best in *good ear* then deafness is ***sensorineural*** in deaf ear

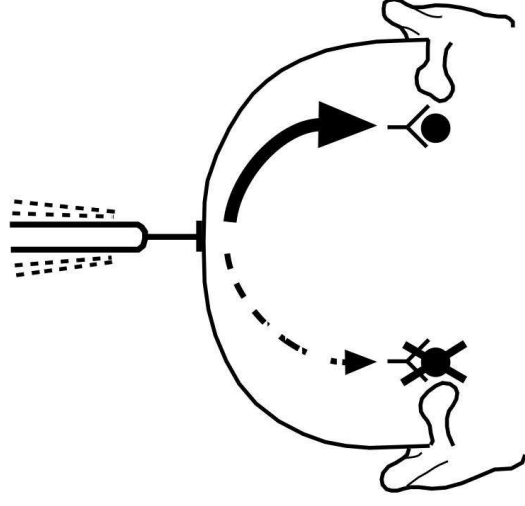
Weber test



normal



conductive
hearing loss



sensorineural
hearing loss

Glossopharyngeal (Ninth) CN & Vagus (Tenth) CN

Testing the gag reflex

Testing Gag Reflex

say “aah”

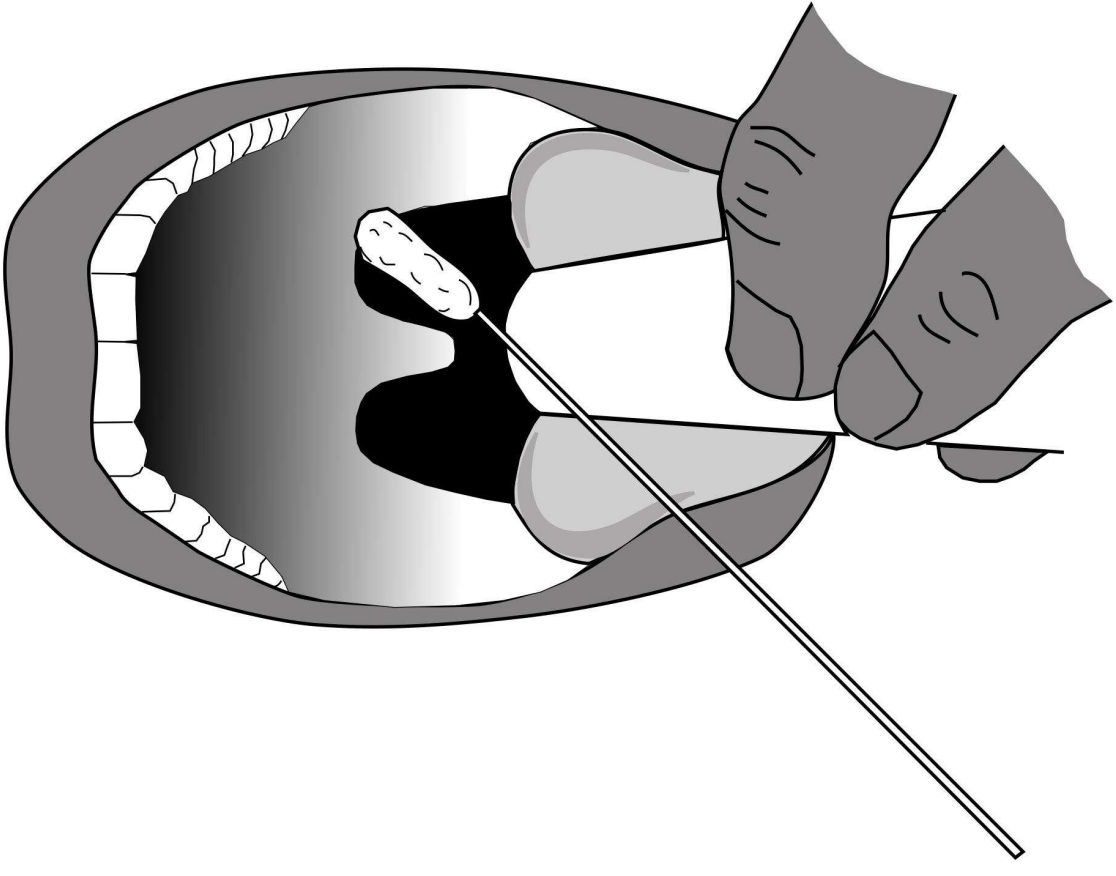
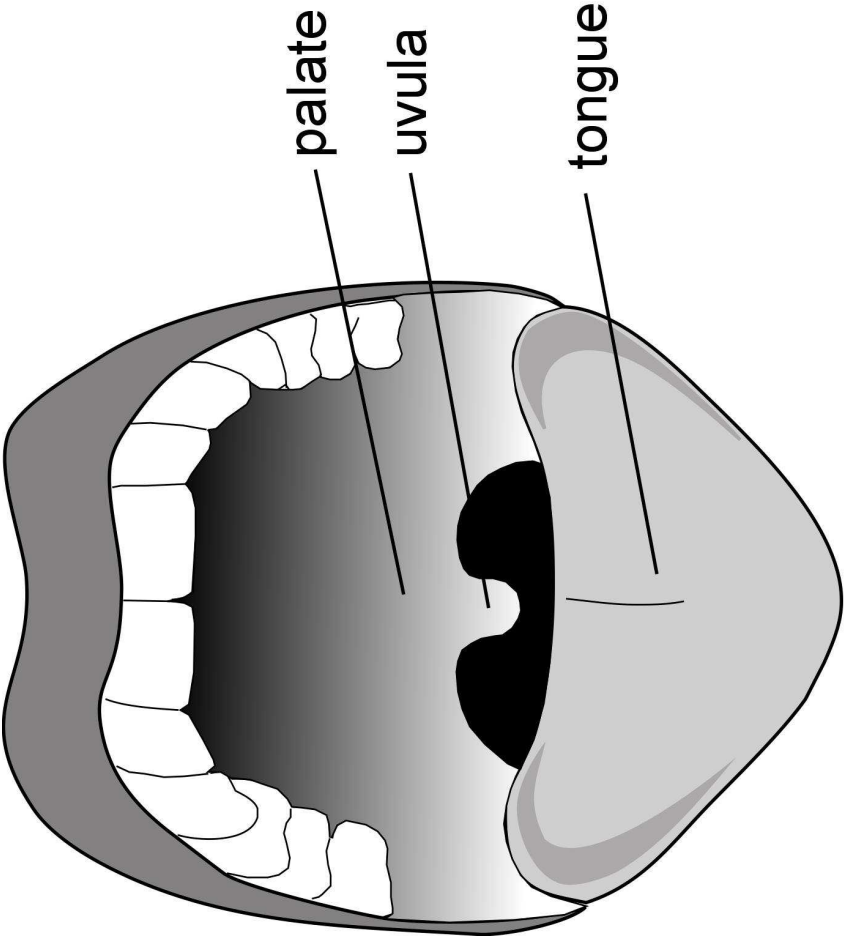
inspect uvula

touch soft palate with tongue

depressor on both sides

ask if feeling is the same

on both sides



Testing the gag reflex
glossopharyngeal and vagus nerves

Accessory (**Eleventh**) CN

Testing head turning
& shoulder elevation

Sternomastoids

Testing head turning

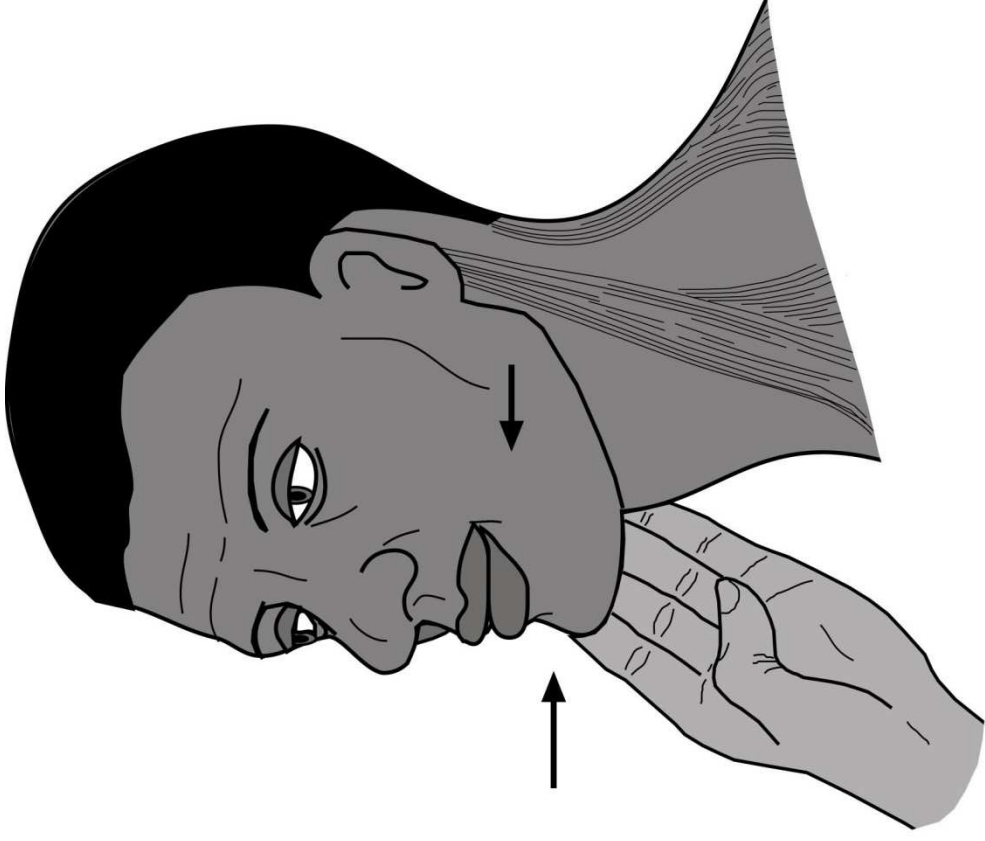
inspect for wasting

please turn head to left

place hand on side opposite

movement & resist it

repeat on the other side



Testing the sternomastoid

Accessory nerve

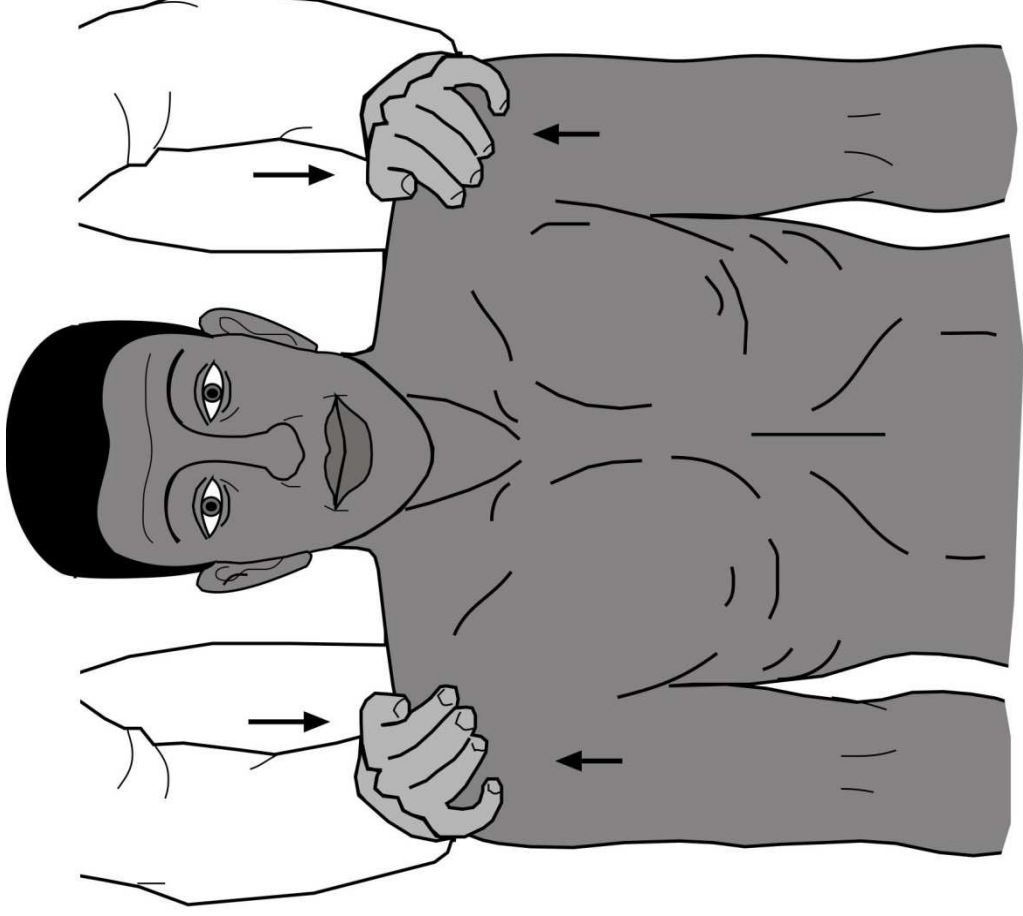
Trapezius

Testing shoulder elevation

inspect trapezius

elevate *or* **shrug** shoulders

resist elevation of shoulders



Testing the trapezius
Accessory nerve

Hypoglossal (Twelfth) CN

Testing tongue movements

Testing tongue movements

look at tongue at rest

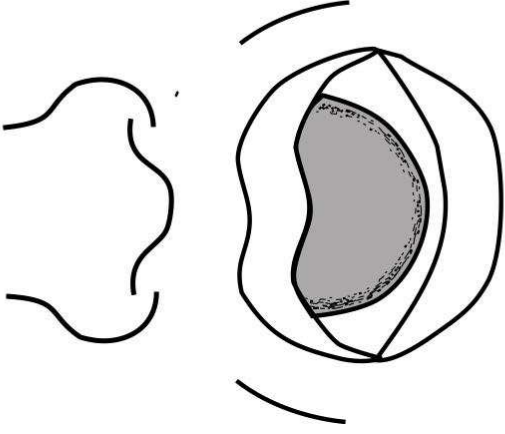
put tongue out & **look** at it

push tongue in & out rapidly

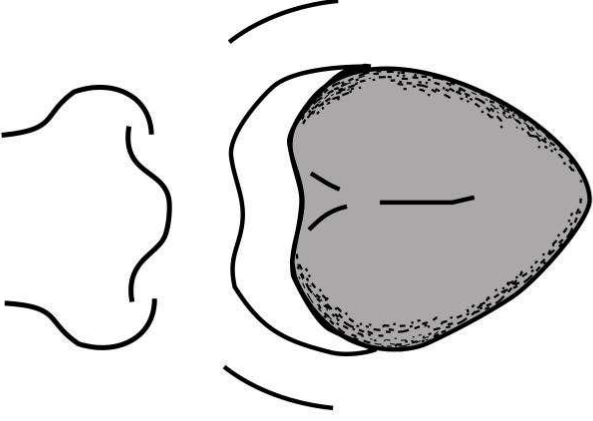
push tongue against inside
cheek

feel tongue through cheek

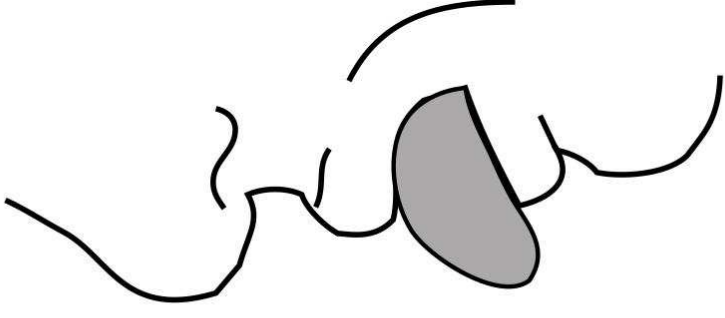
A



B



C



Testing the tongue

Hypoglossal nerve

Limbs: Upper

examine in the seated position

Examination of Limbs

Upper

Inspection

Tone

Power

Co-ordination

Reflexes

Sensation

Examination of Limbs (*upper*)

Inspection

expose arms & forearms

inspect in sitting position

look for obvious:

deformities

wasting

fasciculations

posture

skin

Tone

Examination of Limbs (*upper*)

Tone

relax the patient

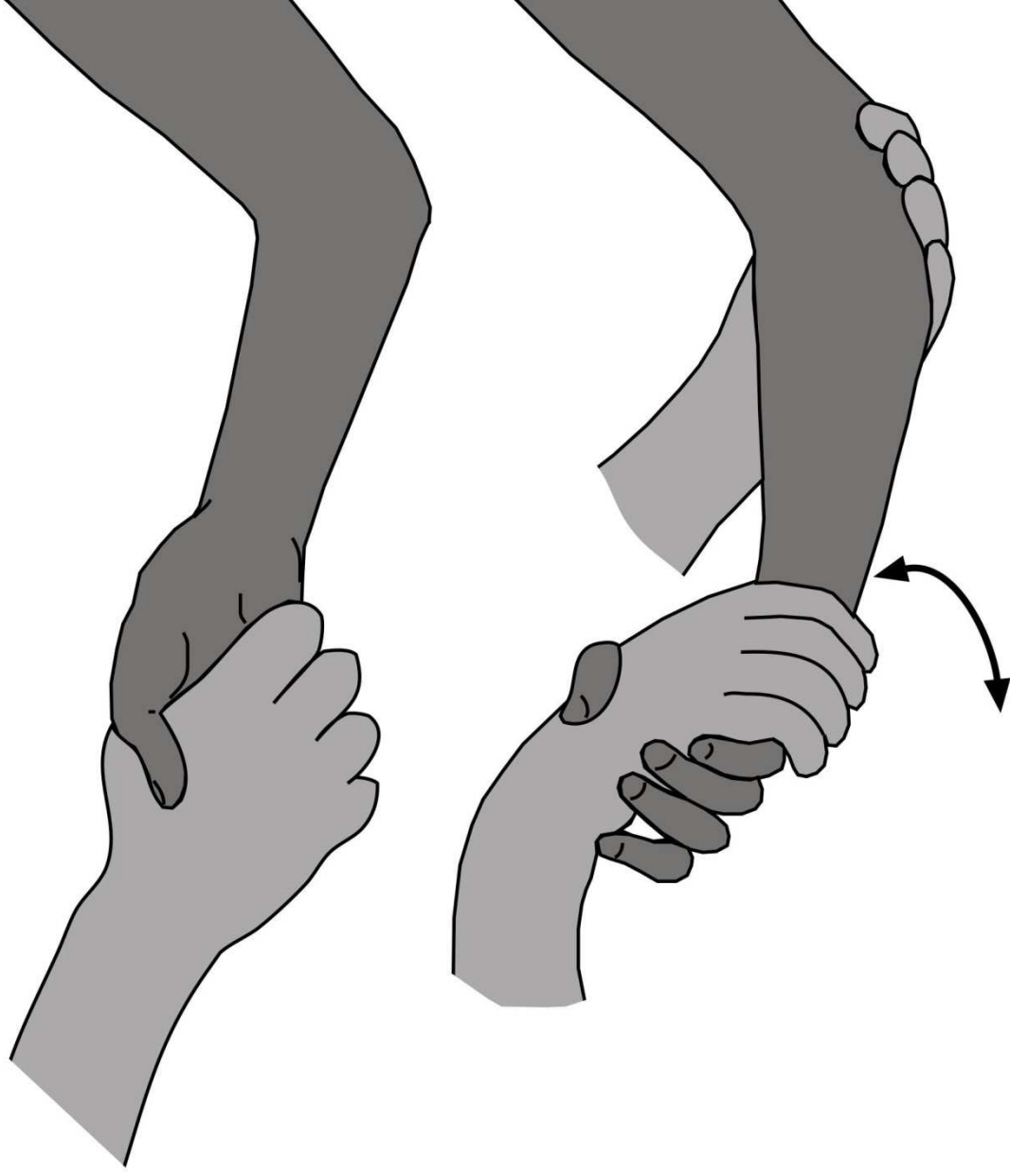
examine tone at elbow & wrist

move limbs passively through full
range of movement

look at pts face

feel for degree of resistance

compare both sides



Testing tone
Roll the wrist

Power

Examination of Limbs (*upper*)

Power

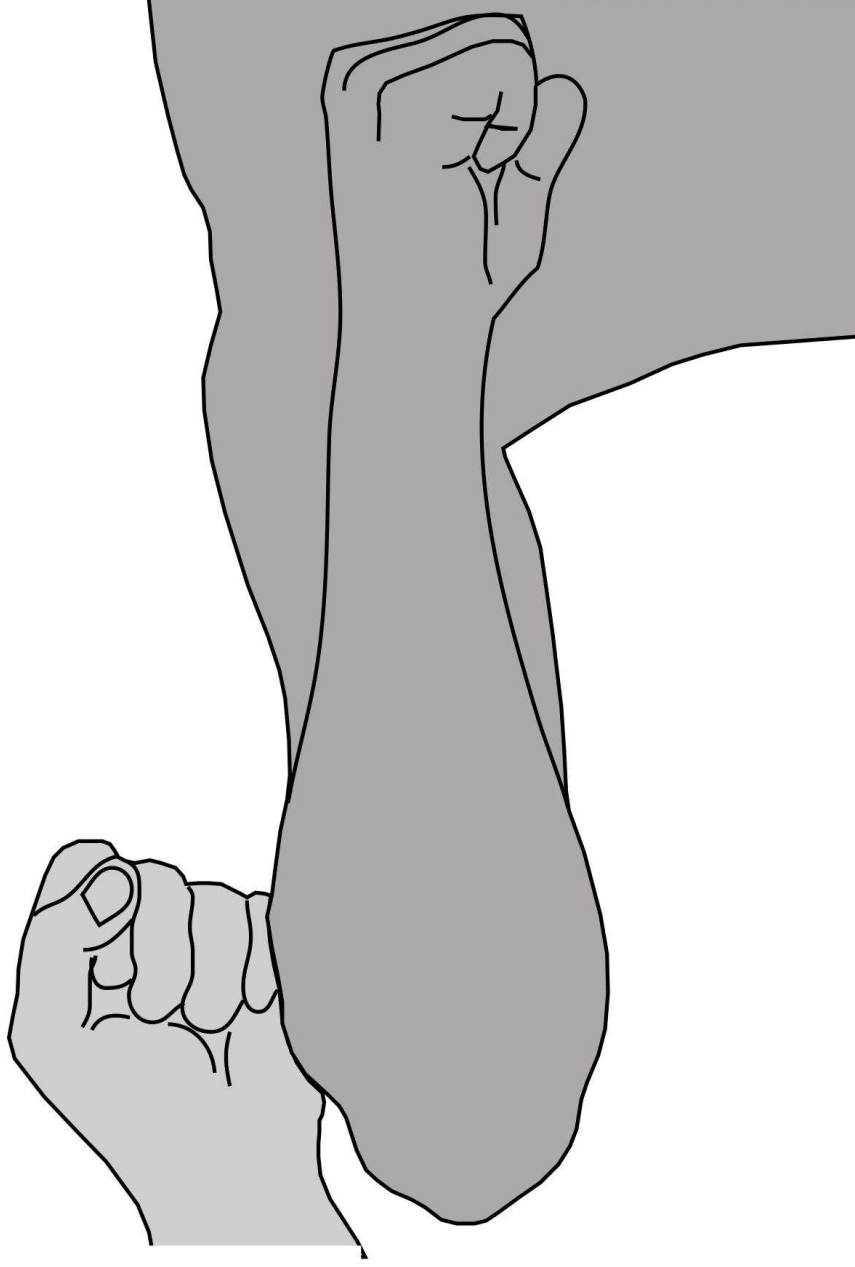
move limbs actively in proximal to distal direction

resist movements *passively*

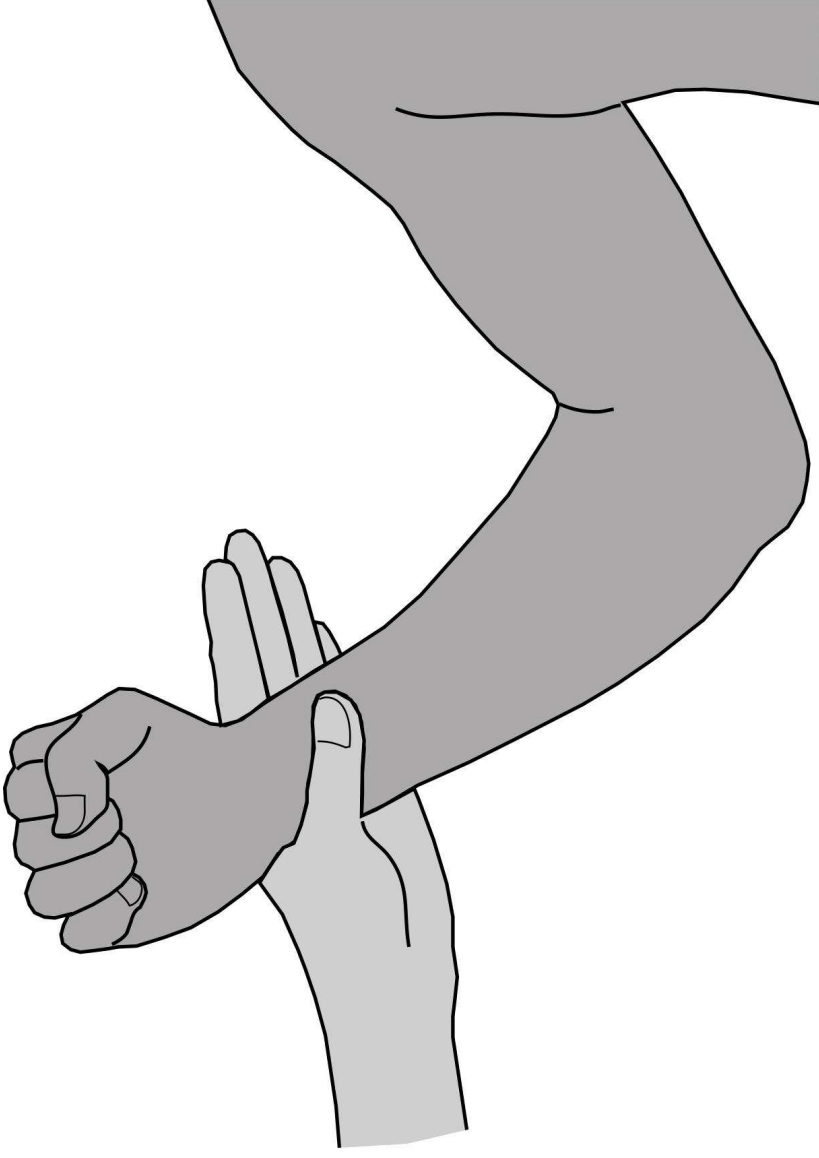
routine exam: test one proximal & one distal muscle group

test for mild weakness: hold hands outstretched in supine position:

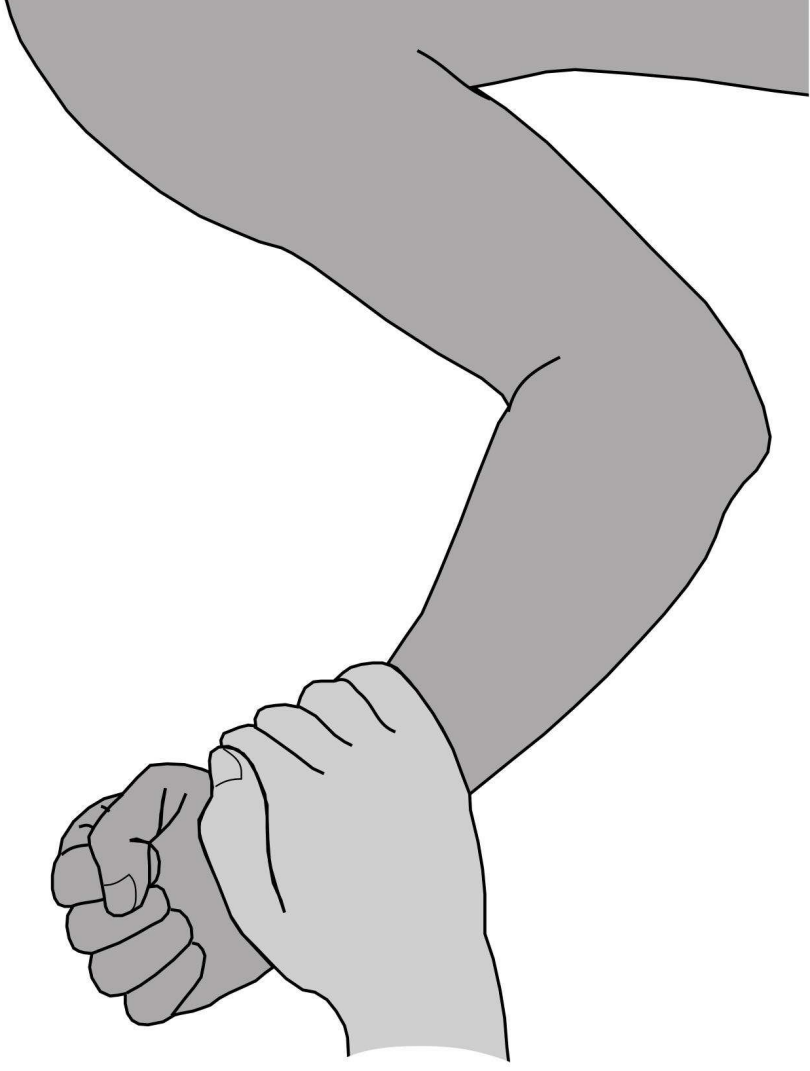
watch for pronation & drift downwards



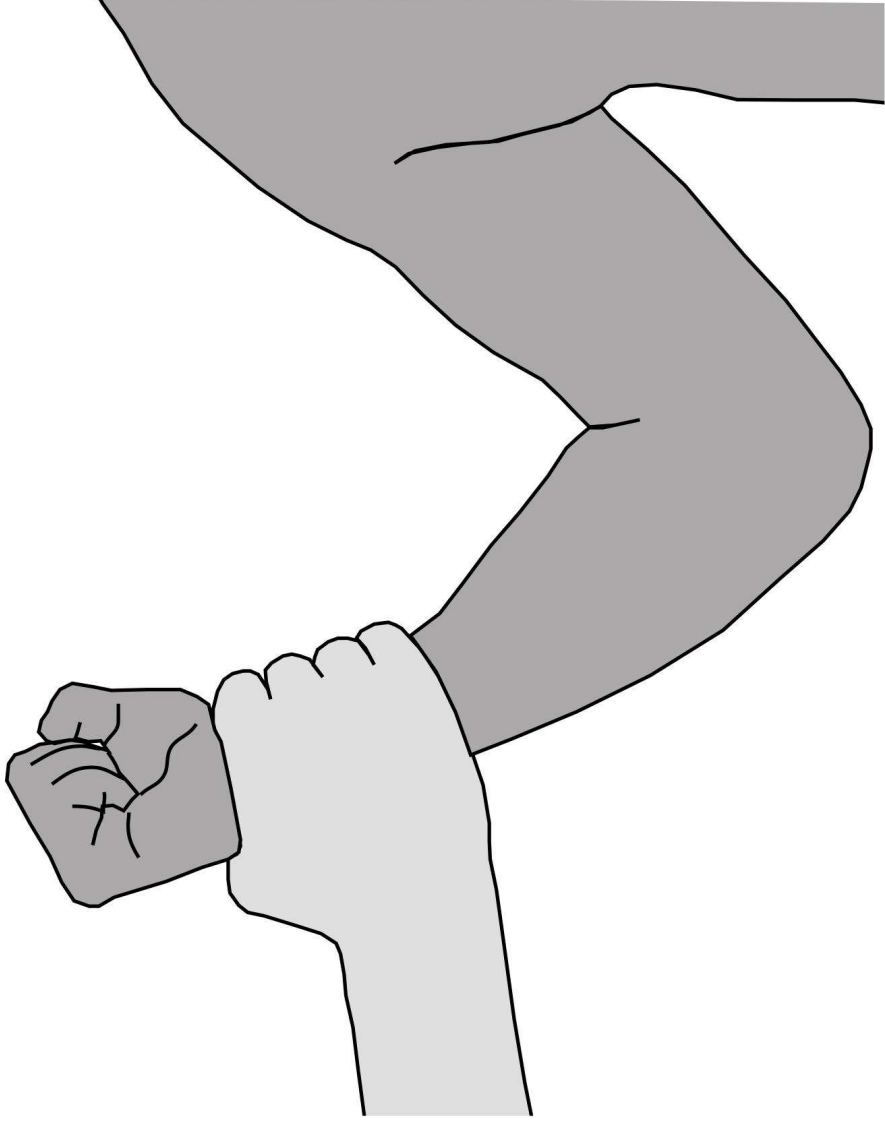
Shoulder abduction
Deltoid
Axillary nerve
C5



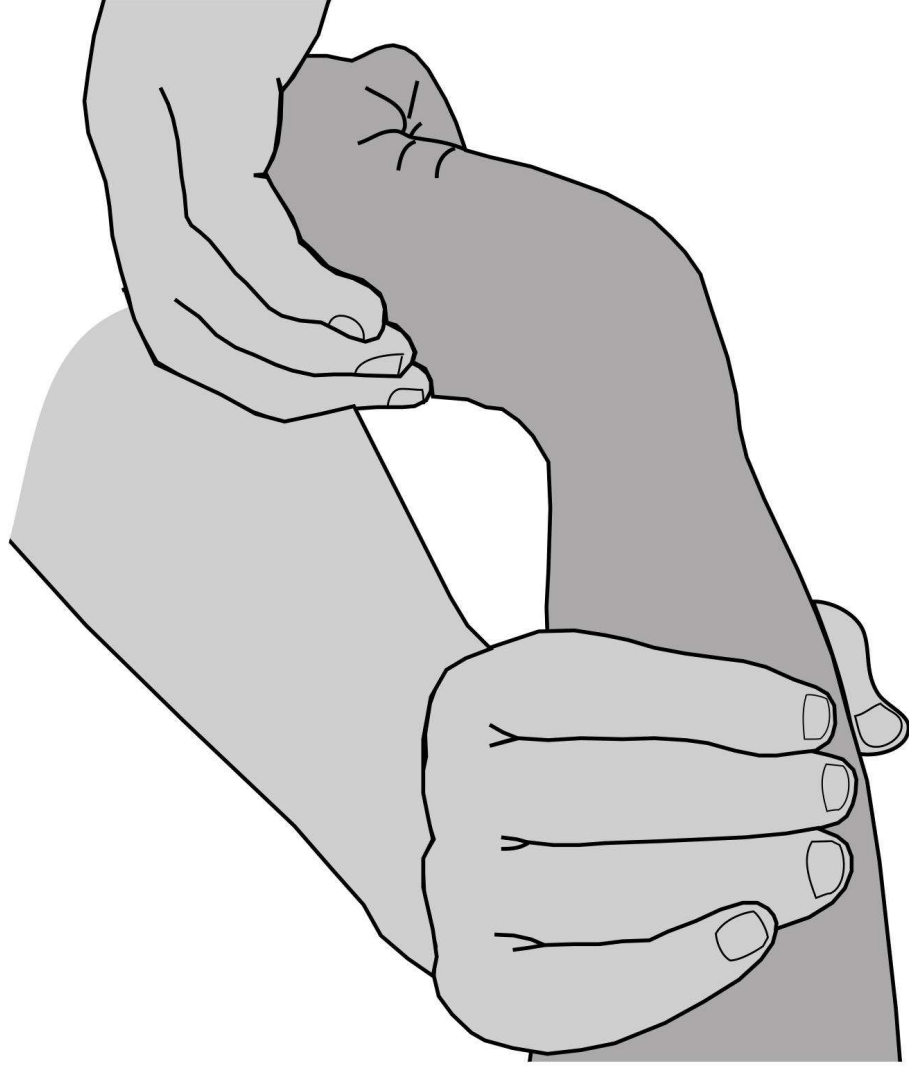
Elbow extension
Triceps
Radial nerve
C7



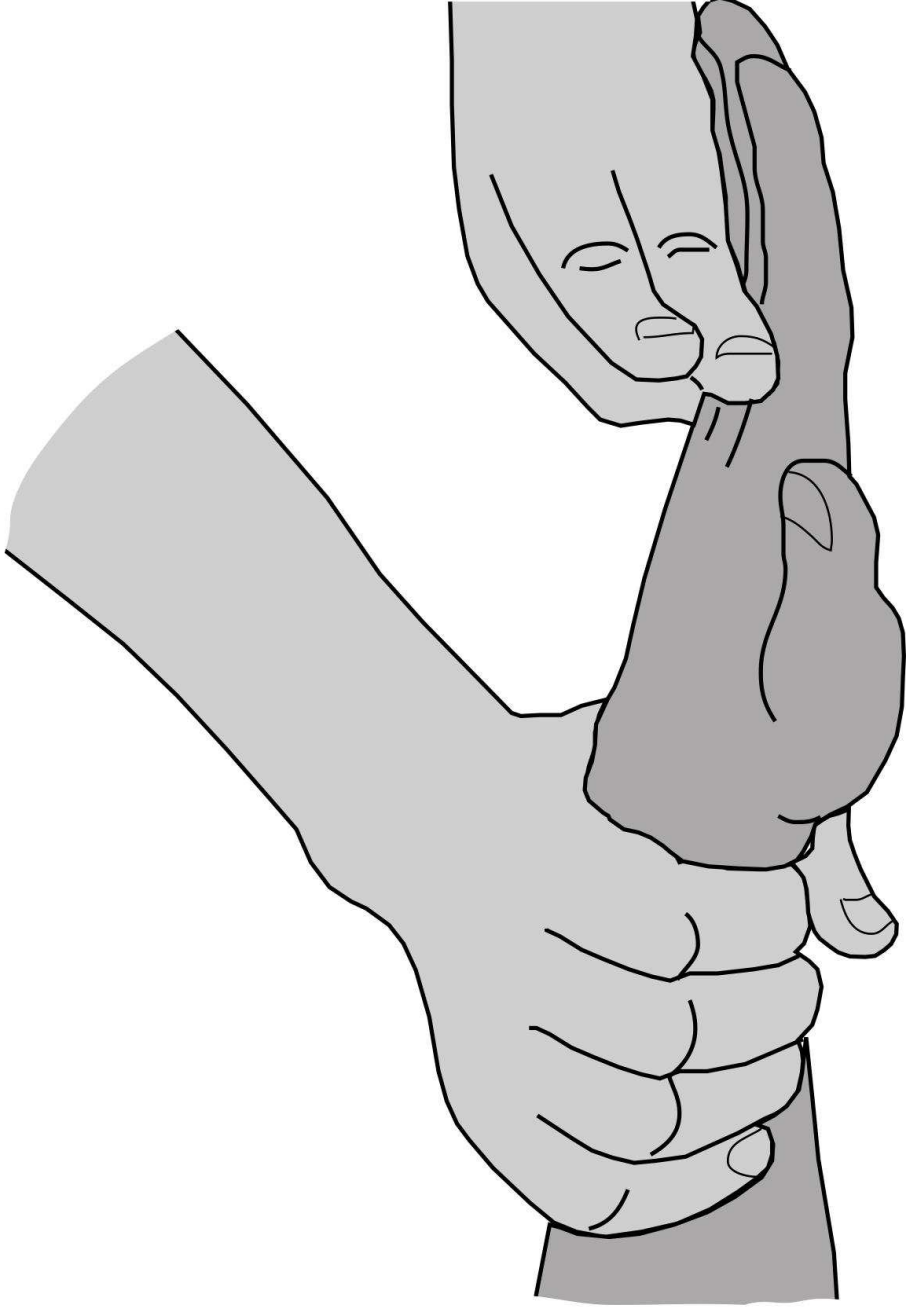
Elbow flexion (forearm midpronated)
Brachioradialis
Radial nerve
C₆



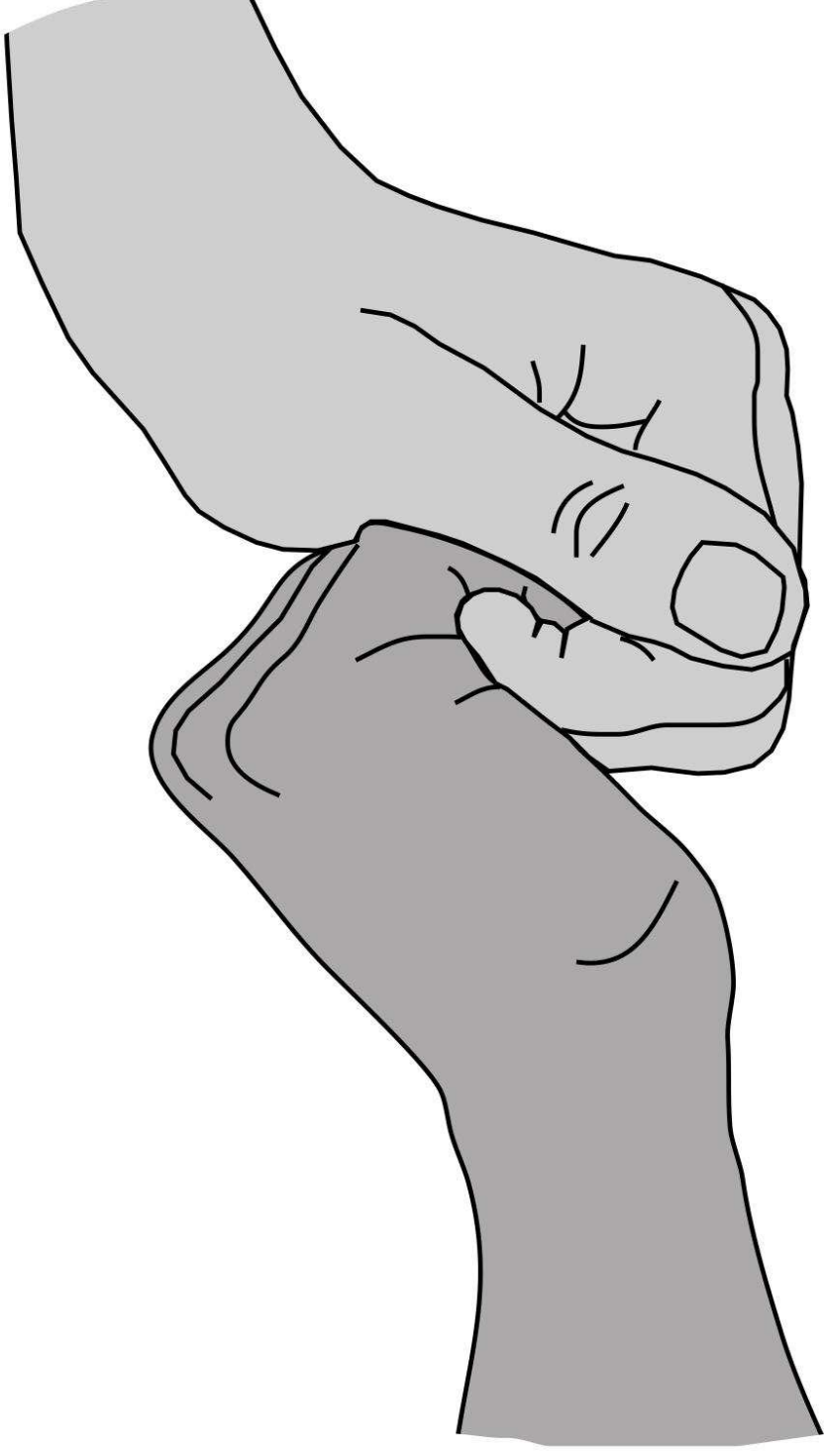
Elbow flexion
Biceps
Musculocutaneous nerve
C 5 C6



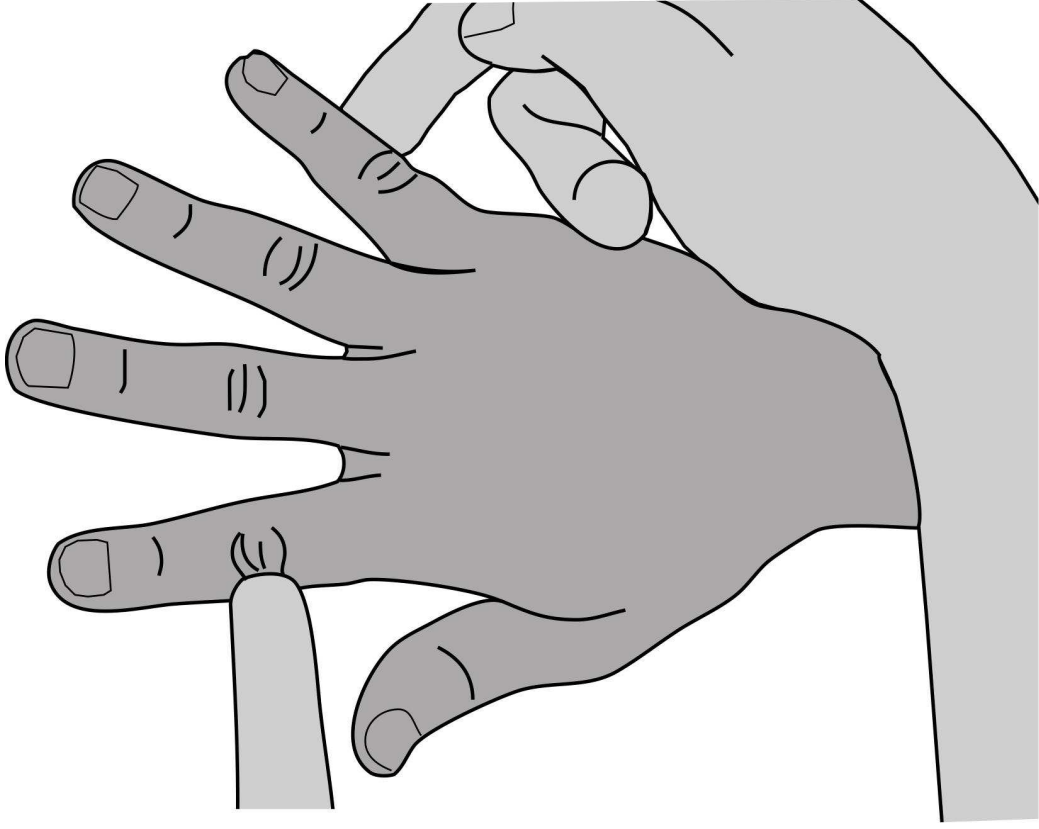
Wrist extension
Extensor radialis
Radial nerve
C7



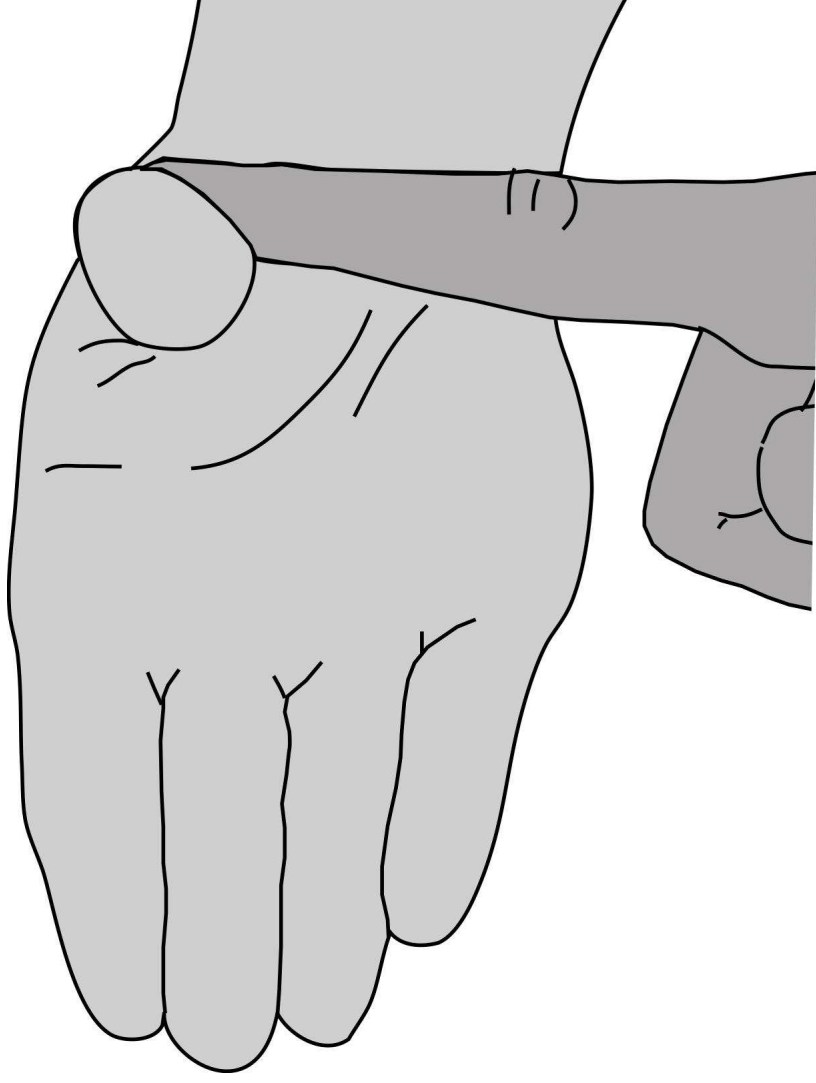
Finger extension
Extensor digitorum
Radial nerve
C7



Finger flexion
Flexor digitorum
Median and ulnar nerve
C8



Finger abduction
Dorsal interossei
Ulnar nerve
T1



Thumb abduction
Abductor pollicis brevis
Median nerve
T1

Co-ordination

Co-ordination

Finger-nose **test**

Finger-nose-finger **test**

Examination of Limbs (*upper*)

finger-nose test

relax pt

hold arm outstretched fully

horizontally with eyes open

touch *tip* of nose with *tip* of
finger

repeat on other side

Examination of Limbs (*upper*)

finger-nose-finger test

relax pt

hold your finger @ arms length
in front of pt

ask pt to touch *your finger-his-*
nose & your finger

watch for accuracy

repeat on other side



Testing co-ordination

The finger-nose test

Reflexes

Examination of Limbs (*upper*)

Reflexes (sitting position)

ensure pt is relaxed

flex arm to 90 degrees

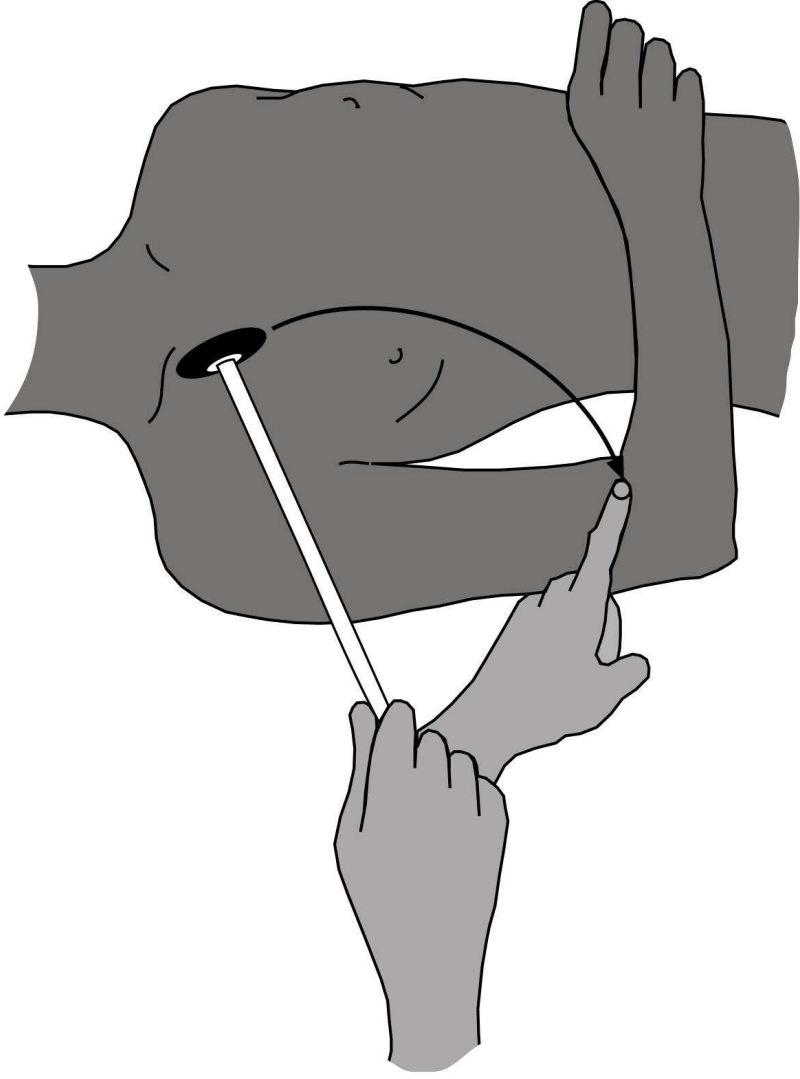
place finger over tendon

tap: *biceps, triceps & supinator*

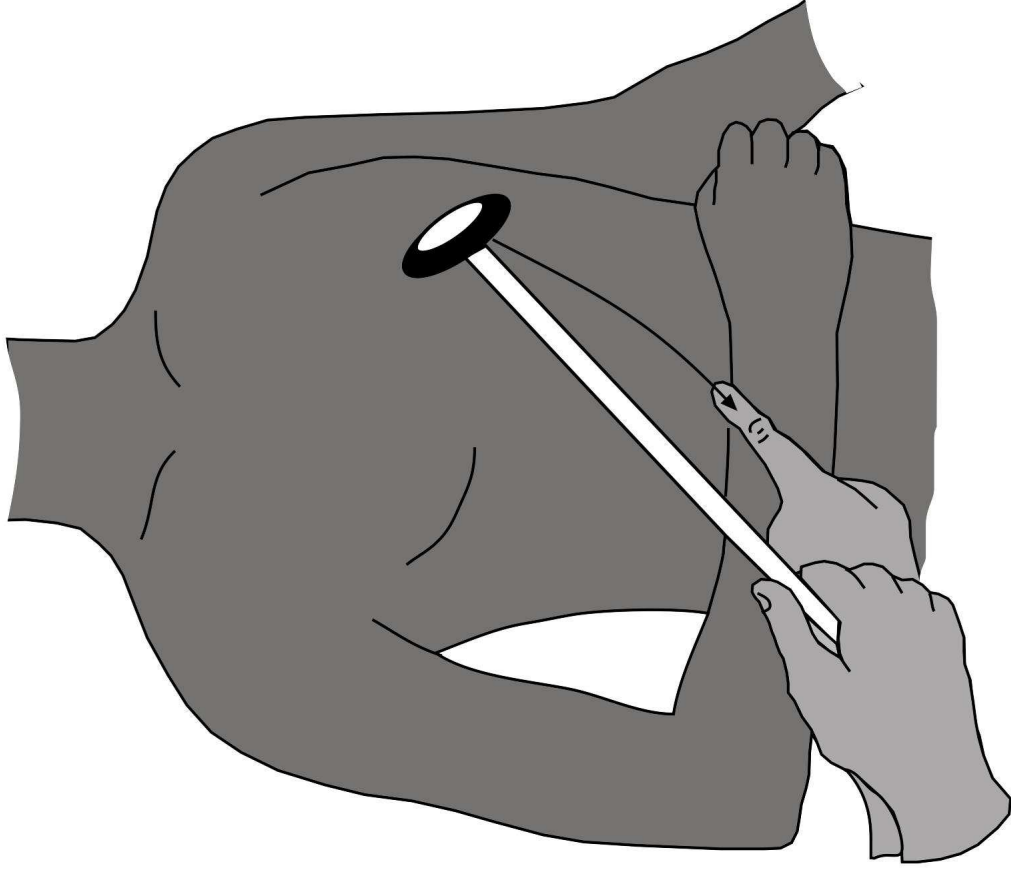
(not more than twice)

look for muscle contraction *or its* action

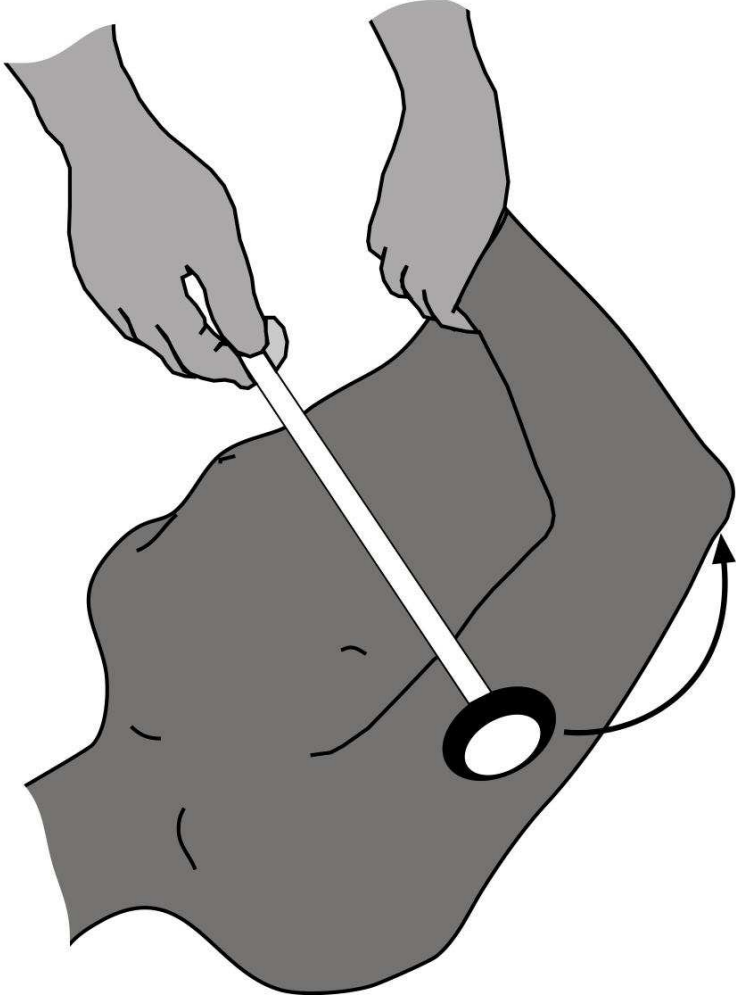
if Rx is absent get pt to reinforce



**The biceps reflex
C5, C6**



**The supinator reflex
C5, 6**



The triceps reflex
C7

Sensation

Examination of Limbs (*upper*)

Sensation (light touch)

requires co-operation pt & examiner

tell the patient what to expect

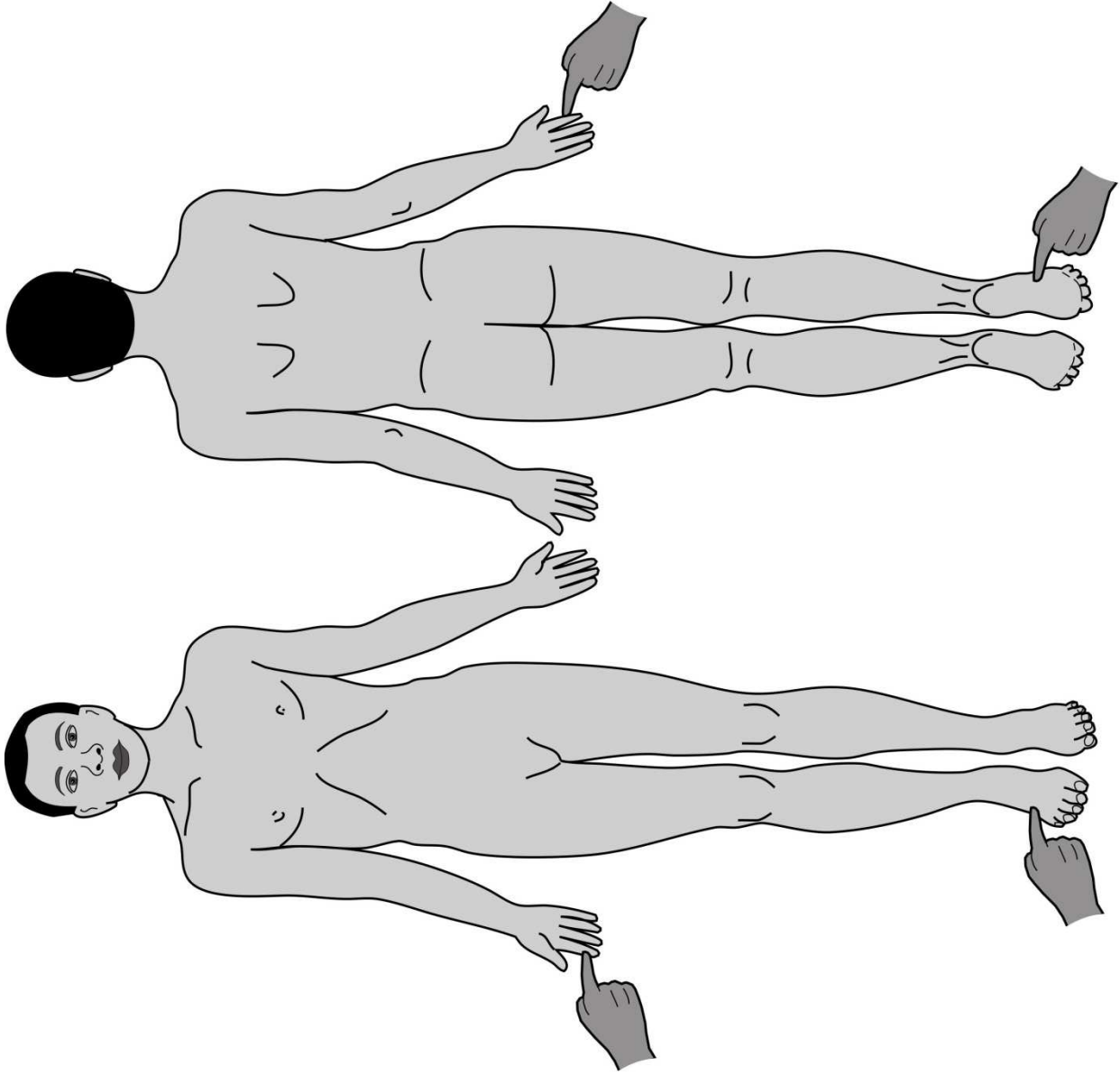
use wisp of cotton wool or finger tip

demonstrate on non affected area *eg face*

close eyes say *yes* each time feels stimulus

start distally & touch site *once*

go from abnormal to normal area



Testing superficial sensation light touch

Examination of Limbs (*upper*)

Sensation (Joint position)

requires *co-operation* of pt & examiner

grip *finger tip* **sides** & tell pt what to expect

show up & down movement at distal
interphalangeal joint with *eyes open*

repeat asking pt to identify **correctly** the
direction of movement with *eyes closed*

Examination of Limbs (*upper*)

Sensation (Vibration)

requires co-operation of pt & examiner

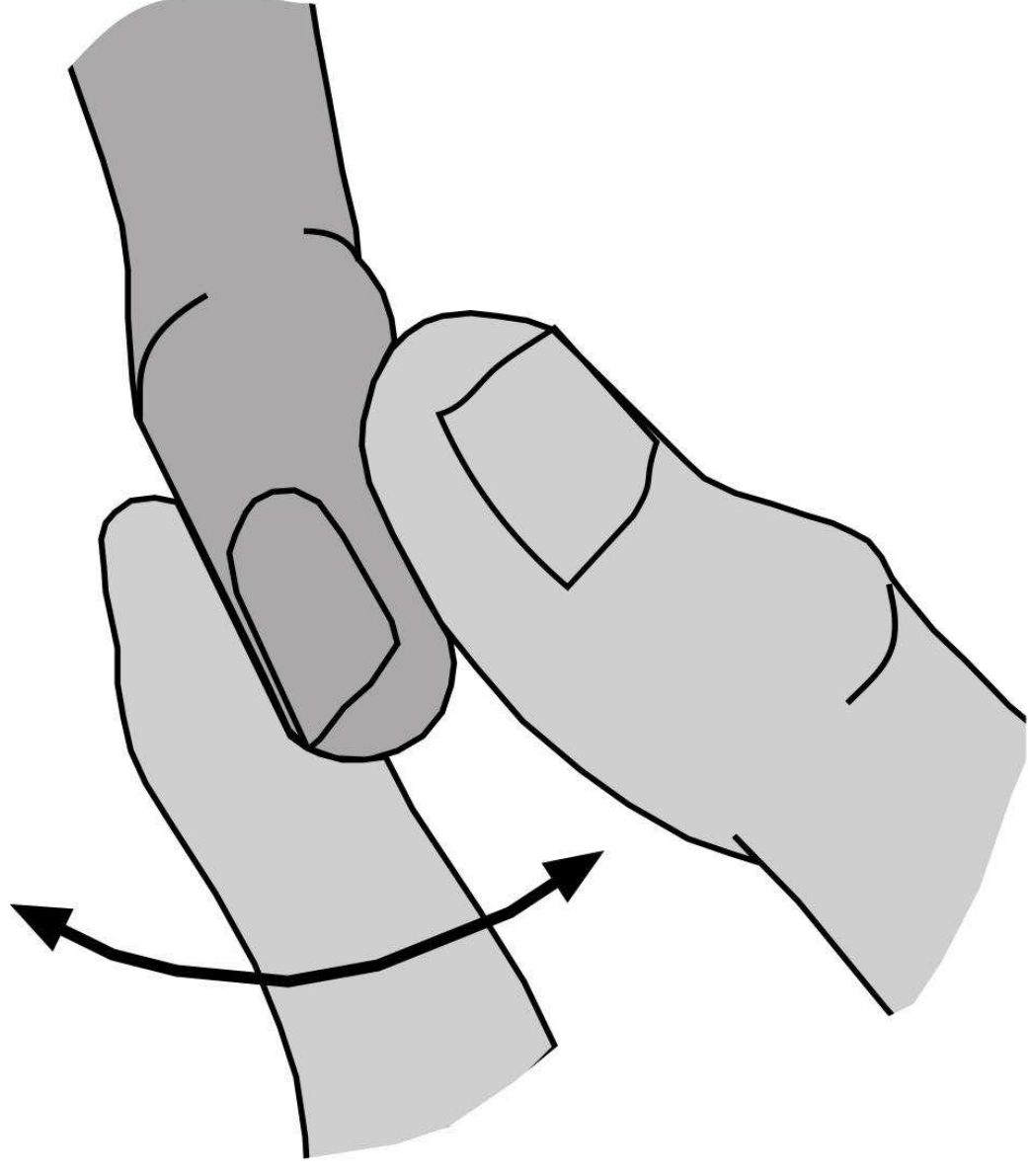
tell the patient what to expect

demonstrate the normal on non affected
area eg collar bone

place beating tuning fork on *distal*
metacarpo-phalangeal joint pt eyes closed

pt **identify** each time vibration *starts/stops*

proceed proximally until vibration is *intact*



Testing joint position in the finger

Limbs: Lower

examine in the lying position

Examination of Limbs (Lower)

Inspection

Tone

Power

Co-ordination

Reflexes

Sensation

Examination of Limbs (*lower*)

Inspection

expose *thighs, legs & feet*

look for:

deformities & posture

wasting & fasciculations

skin

Tone

Examination of Limbs (*lower*)

Tone

relax *patient*

examine *tone at knee & ankle*

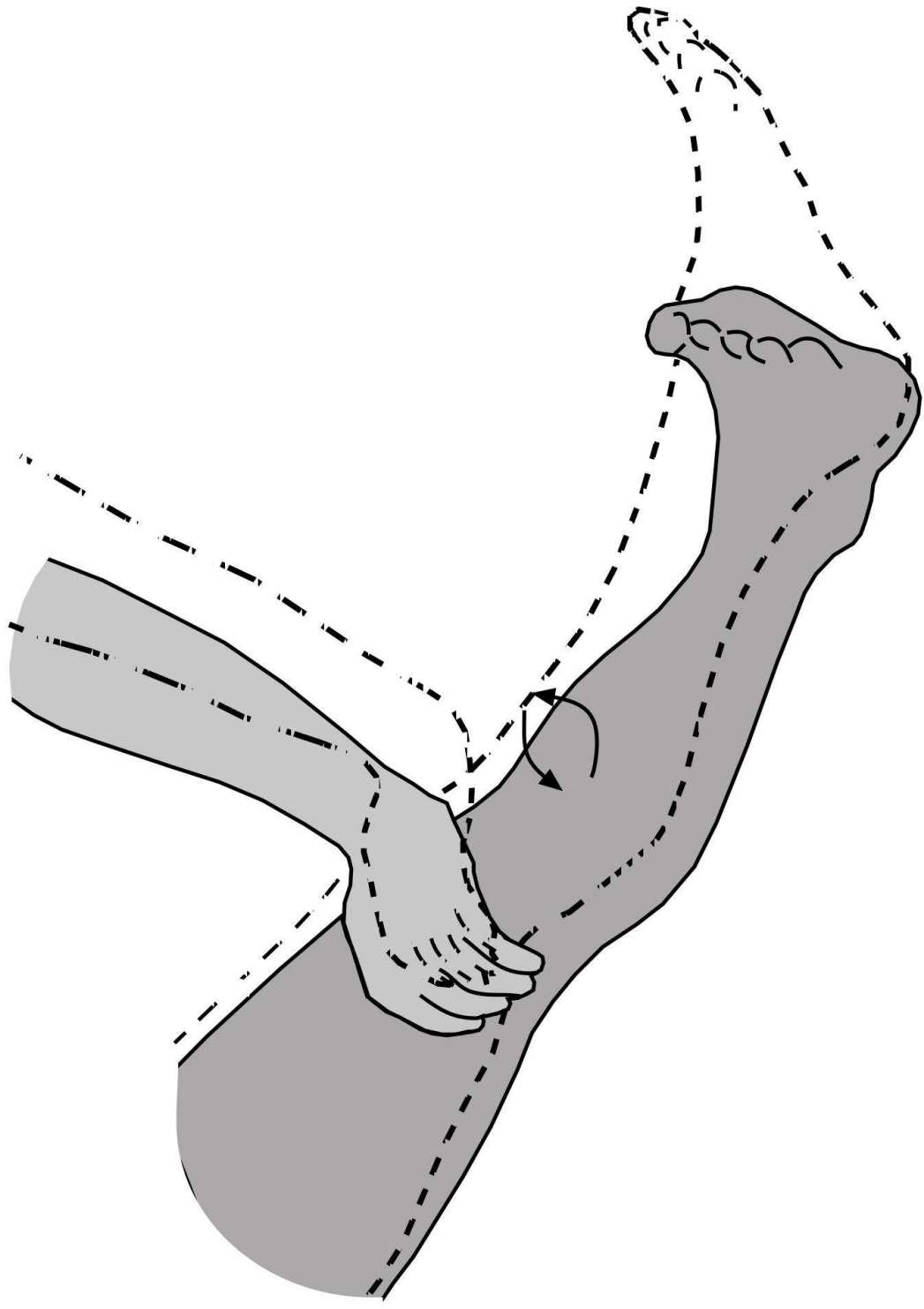
move *limbs passively through full range of movement*

look *at pts face while doing it*

feel *for degree of resistance*

compare *both sides*

test *for clonus at ankle & then knee*



Testing tone
Roll the knee

Power

Examination of Limbs (*lower*)

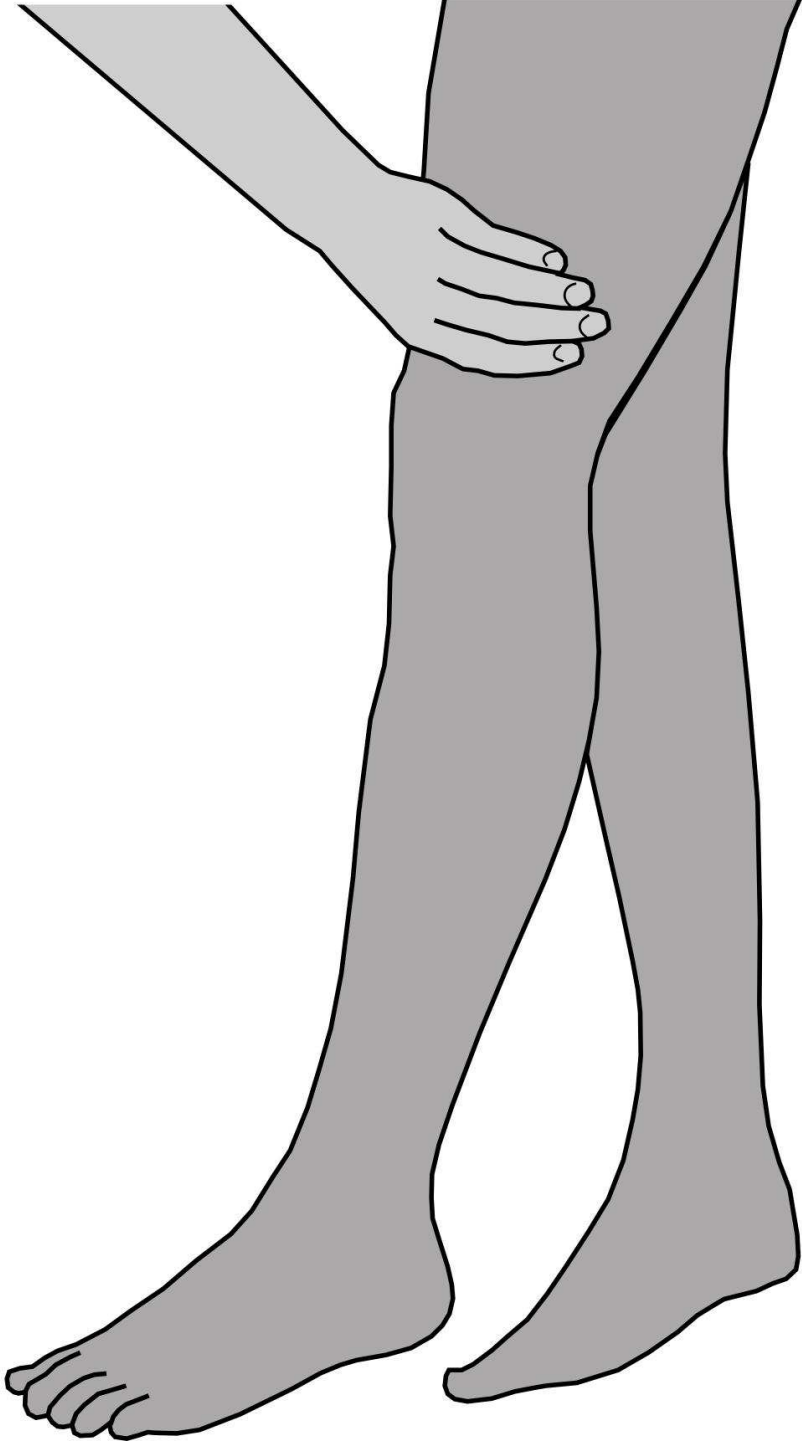
Power

move limb actively

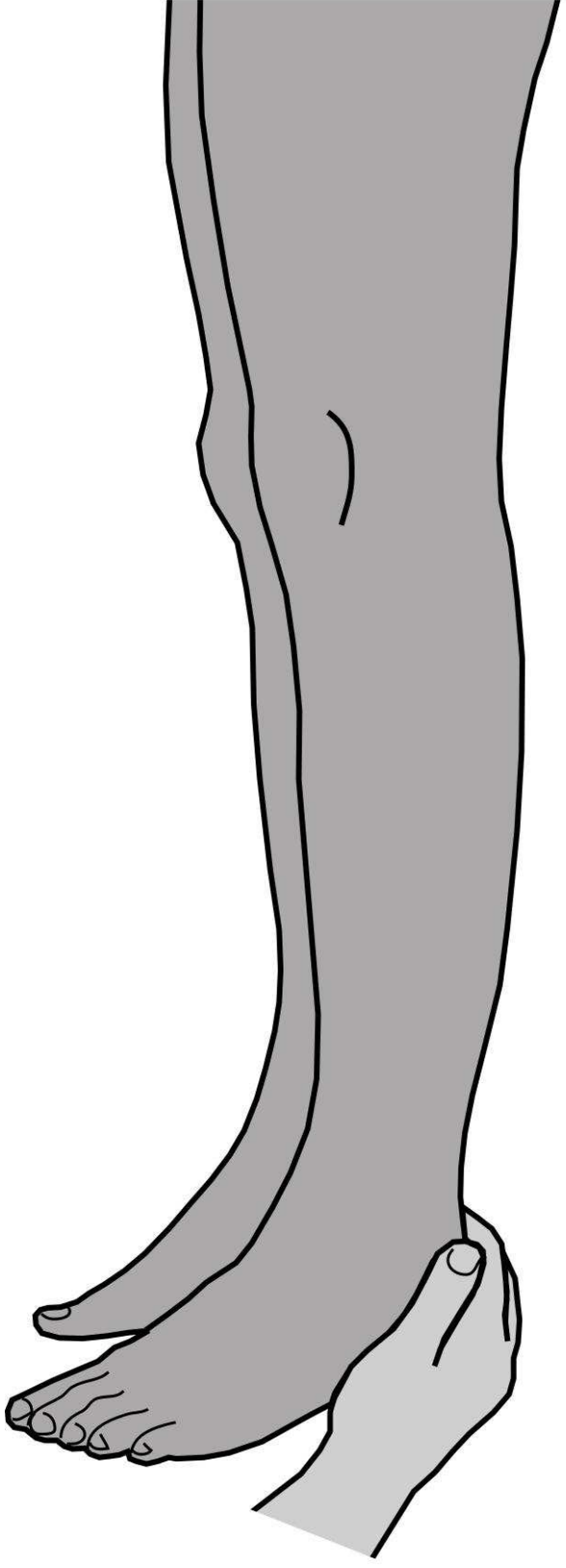
start proximally & proceed distally

resist movements *passively*

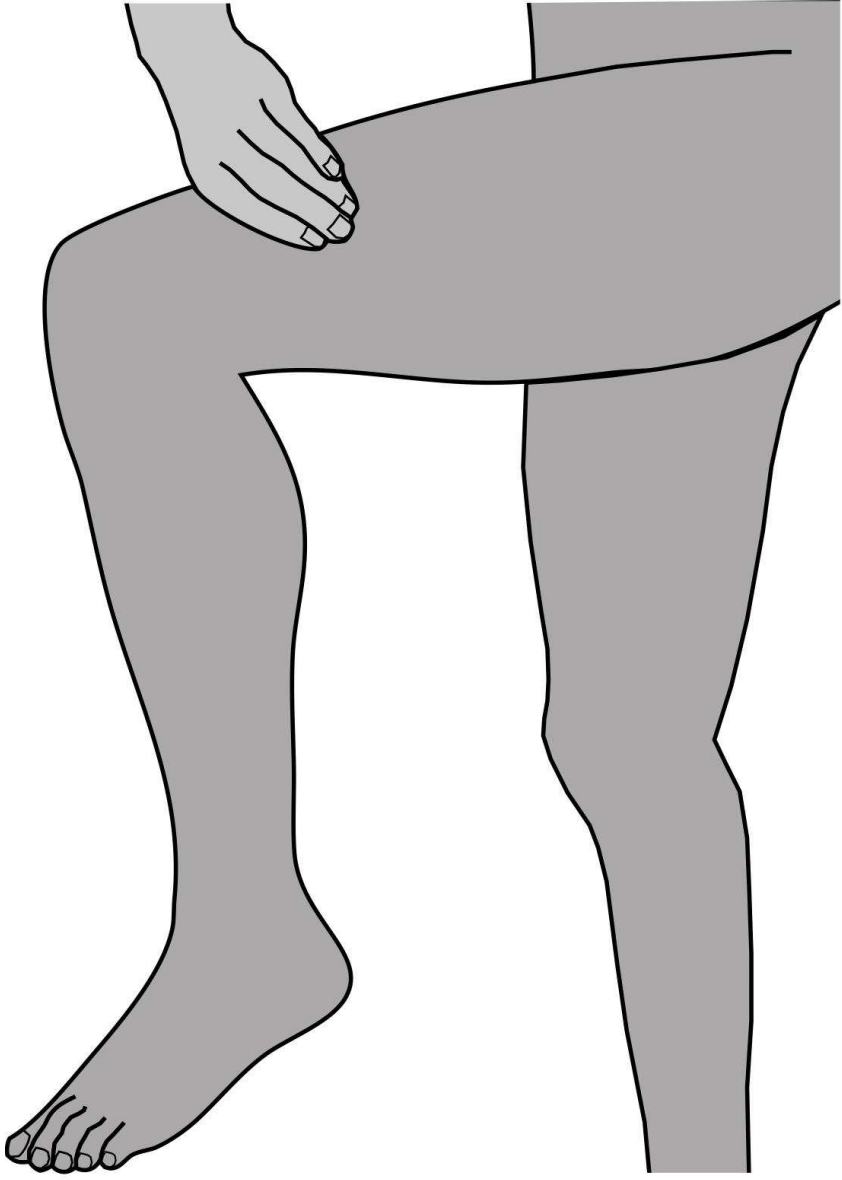
in a routine exam: test just one
proximal & one distal group



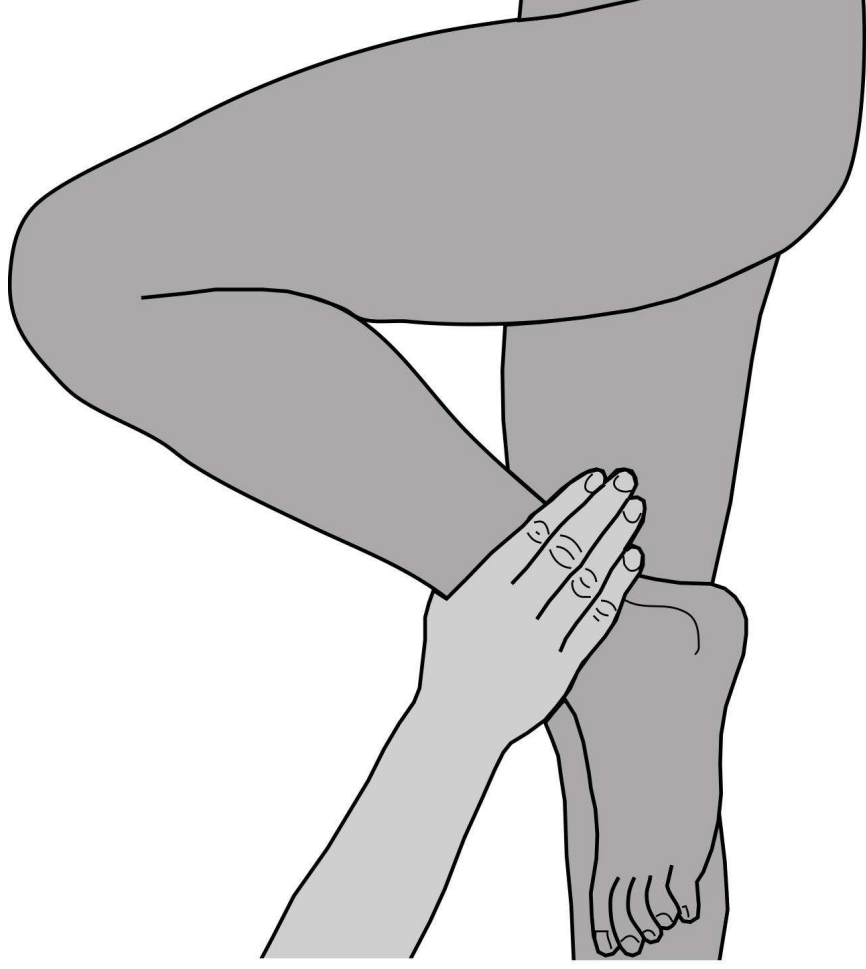
Hip flexion
Quadriceps femoris
Femoral nerve
L³ L⁴



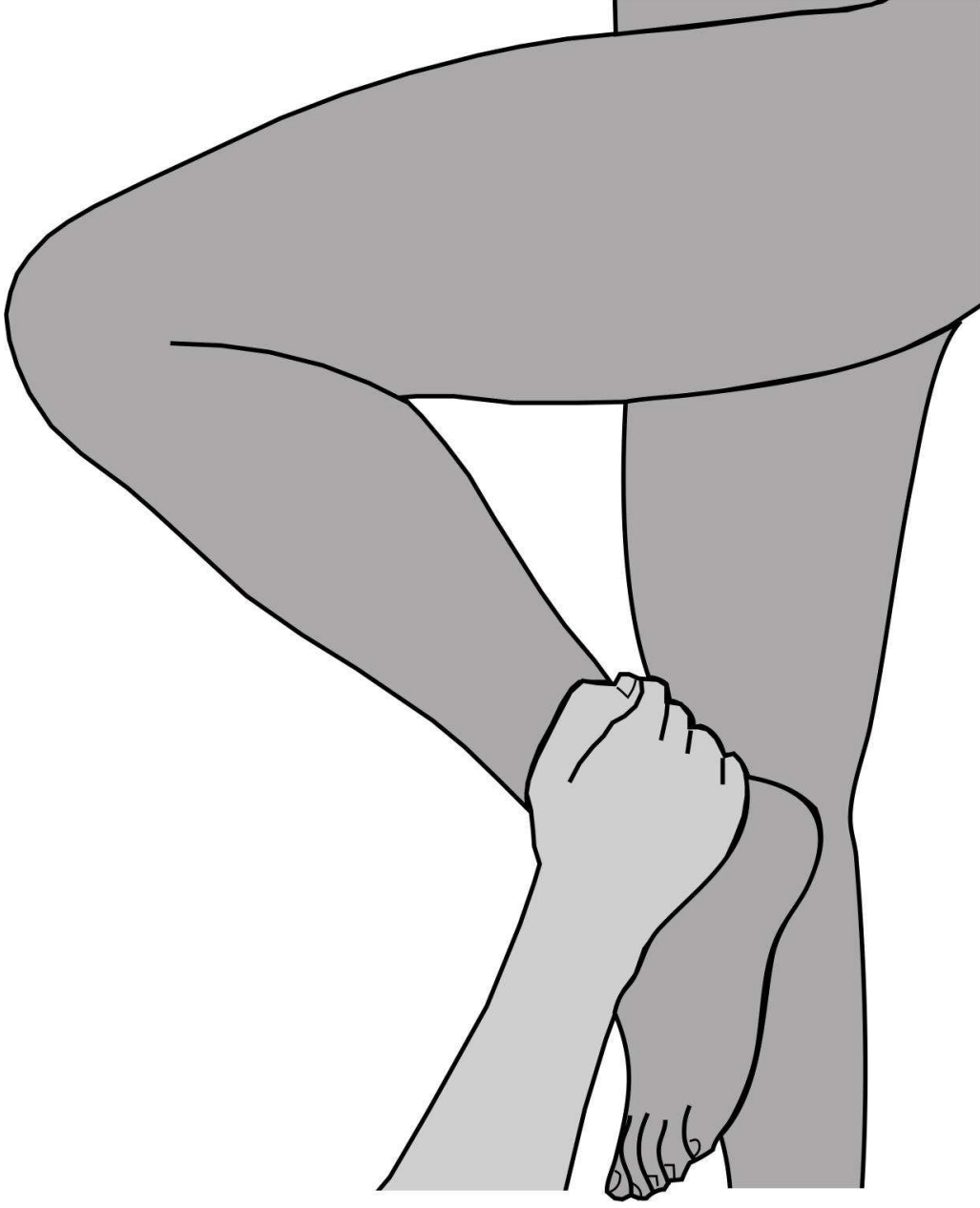
Hip extension
Gluteus maximus
Sciatic nerve
L⁵ S¹



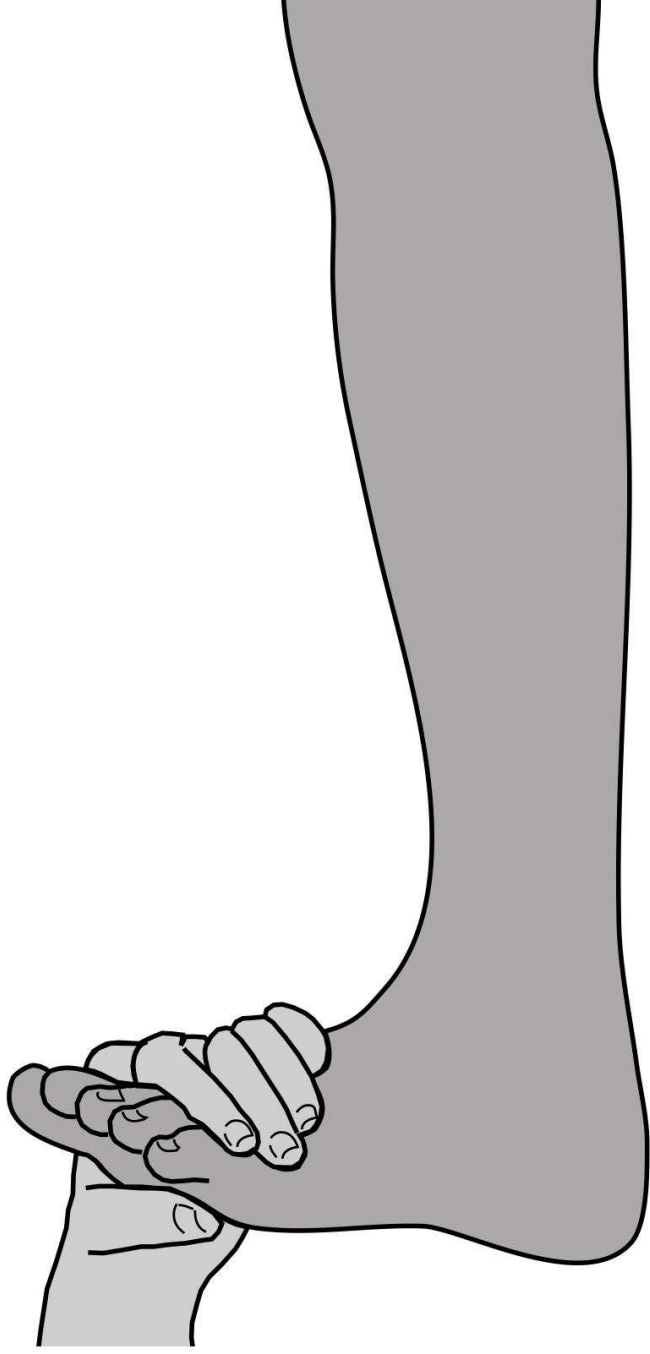
Hip flexion
Iliopsoas
Lumbar plexus and femoral nerve
L₁ L₂



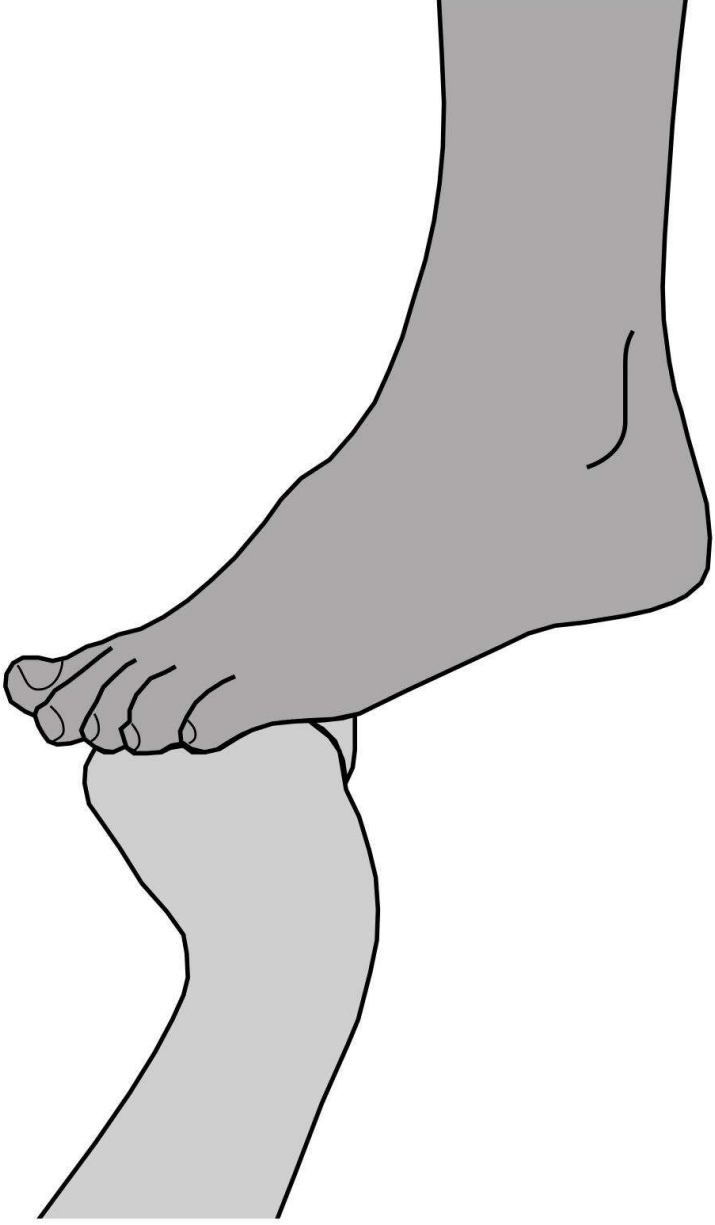
Knee extension
Quadriceps femoris
Femoral nerve
L³ L⁴



Knee flexion
Hamstrings
Sciatic nerve
L⁵ S¹



Ankle dorsiflexion
Tibialis anterior
Common peroneal nerve
L4. L5



Plantar flexion
Gastrocnemius and soleus
Sciatic nerve
S1 S2

Co-ordination

Examination of Limbs (*lower*)

Co-ordination

ensure **pt relaxed**

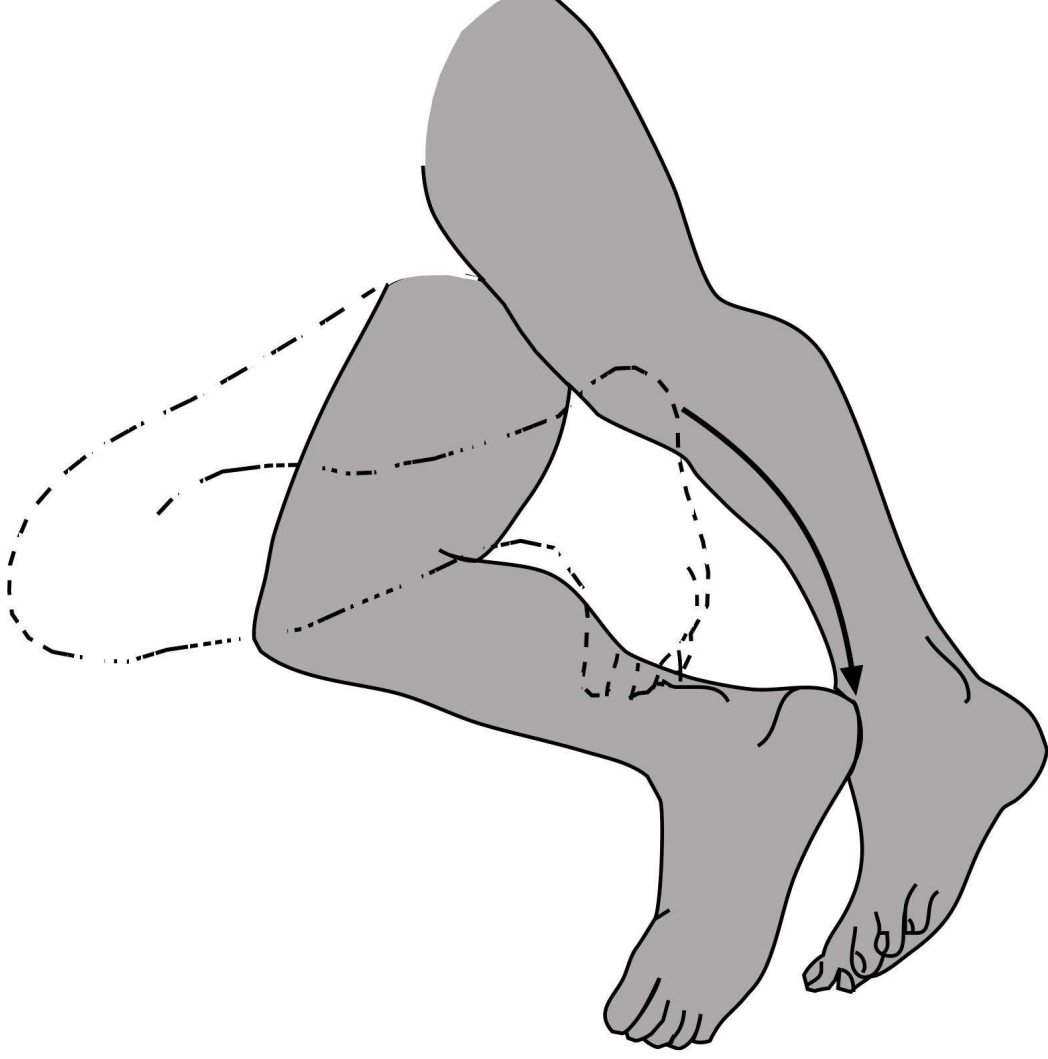
heel-shin test

hold **foot** *up in the air*

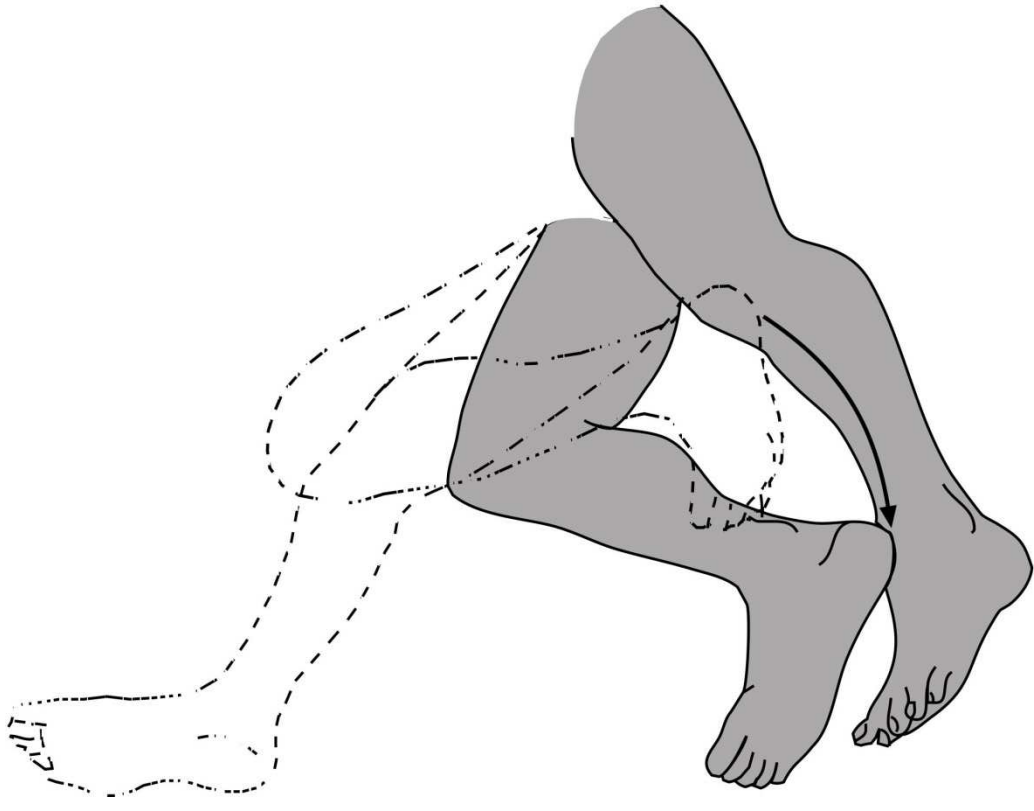
place *heel on the knee*

run **the** *heel down the* **shin**

look for any *inco-ordination*



Testing co-ordination
The heel-shin test



Testing co-ordination

The heel-shin test

Reflexes

Examination of Limbs (*lower*)

Reflexes

ensure **pt is relaxed**

flex knees & ankles to 90 degrees

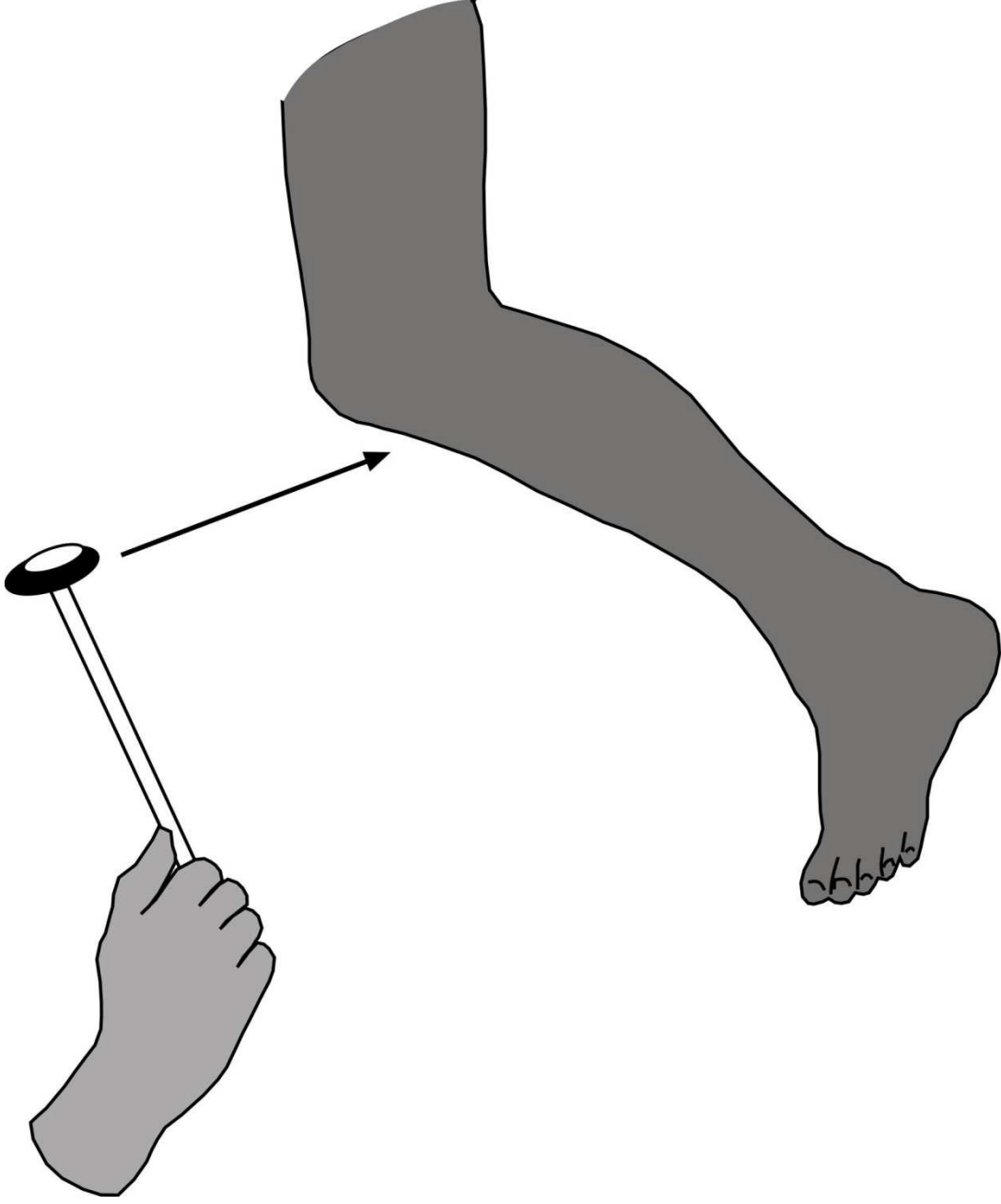
tap the quadriceps & achilles tendons

not more than twice

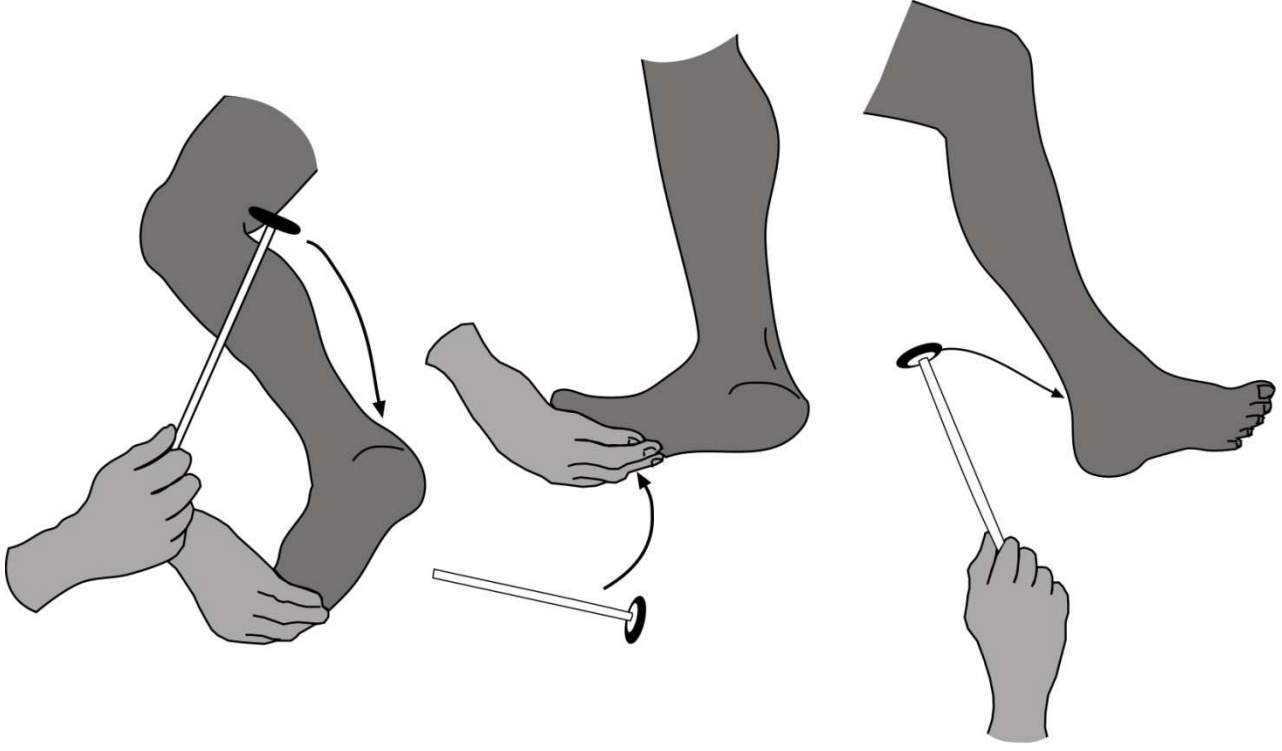
look for muscle contraction or action

if rx is absent carry out reinforcement

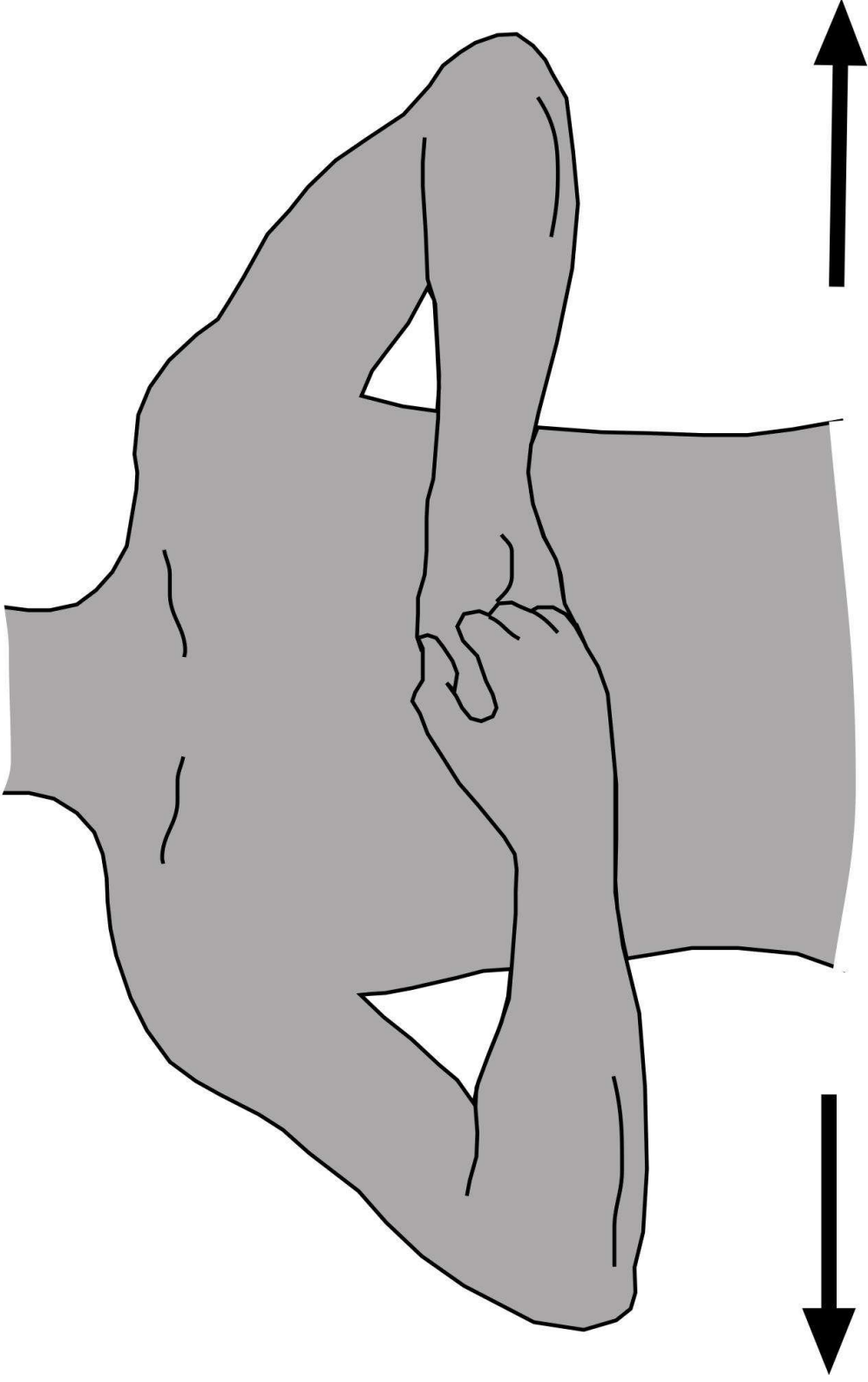
do the plantar reflex



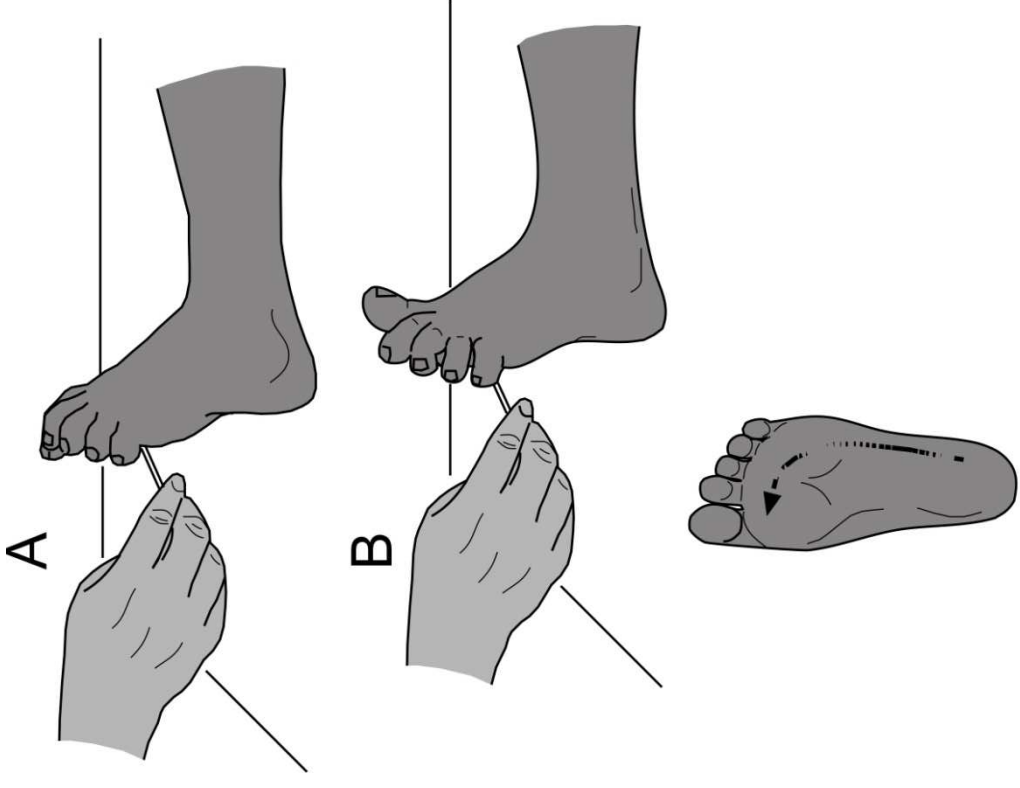
The knee reflex
L3, 4



The ankle reflex
S1

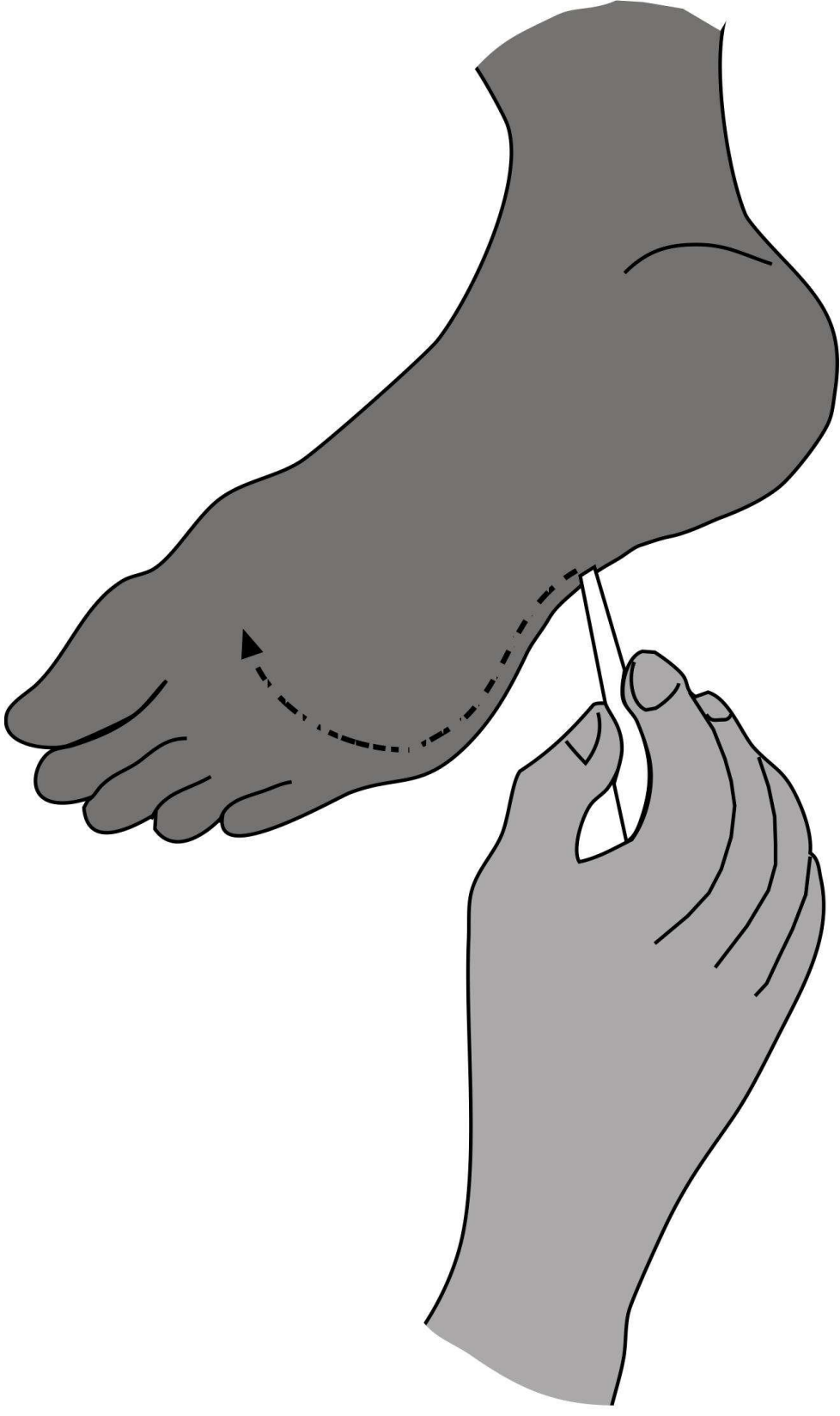


Reinforcement



Testing the plantar response

- A Normal
- B Upgoing plantar response or Babinski sign



Testing the plantar response

Sensation

Examination of Limbs (*lower*)

Sensation (light touch)

requires co-operation of pt & examiner

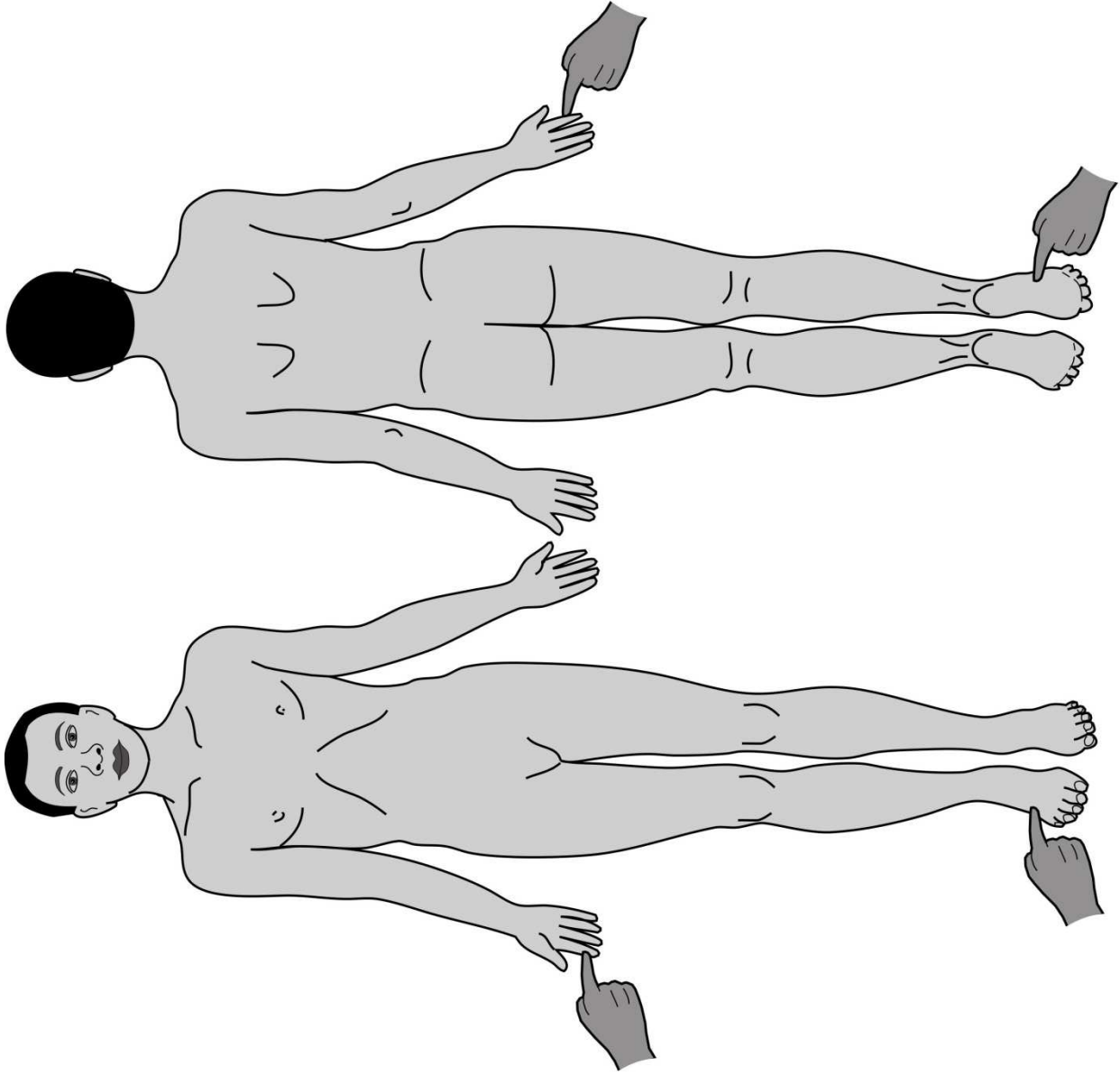
tell the patient what to expect

use wisp of cotton wool *or* finger tip

demonstrate on non affected area eg face

tell pt to say yes each time feel stimulus
(*eyes closed*)

start distally (*on feet*) & **touch** site once
going from abnormal to normal area



Testing superficial sensation light touch

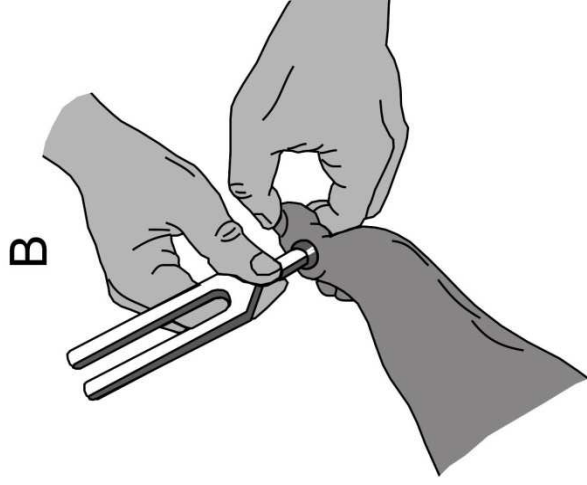
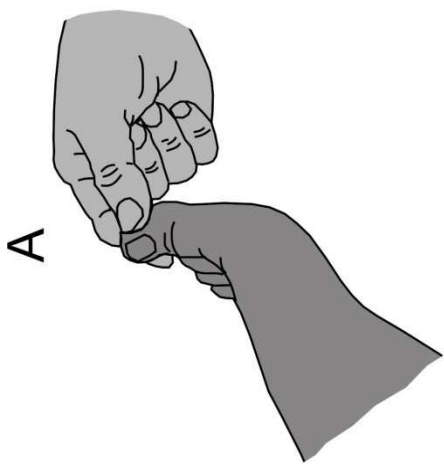
Examination of Limbs (*lower*) **Sensation** (Joint position)

requires co-operation pt & examiner

grip *toe* & **tell** the patient what to expect

show *up & down* movement at distal
tarsophalangeal joint with *eyes open*

repeat asking pt to identify correctly the
direction of movement with eyes closed



Testing deep sensation

A Joint position sense

B Vibration sense

Examination of Limbs (*lower*)

Sensation (Vibration)

requires co-operation pt & examiner

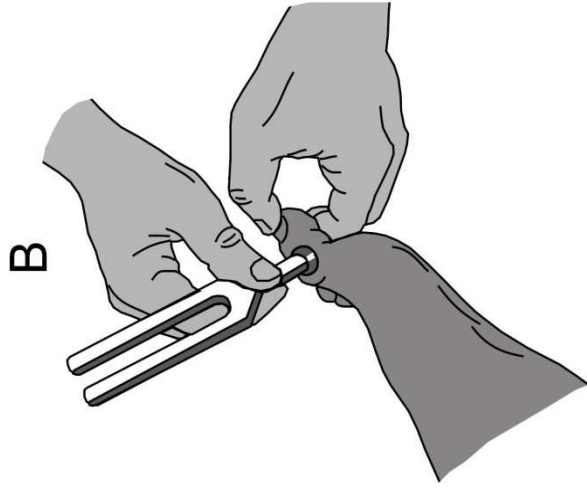
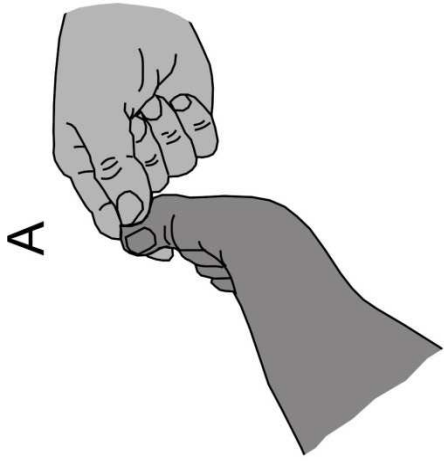
tell the patient what to expect

demonstrate the normal on non affected
area eg collar bone

place beating tuning fork on *distal*
metatarso-phalangeal joint (eyes closed)

identify each time vibration starts & stops

proceed proximally until vibration intact



Testing deep sensation

- A Joint position sense
- B Vibration sense

Gait

Gait

Romberg's **test**

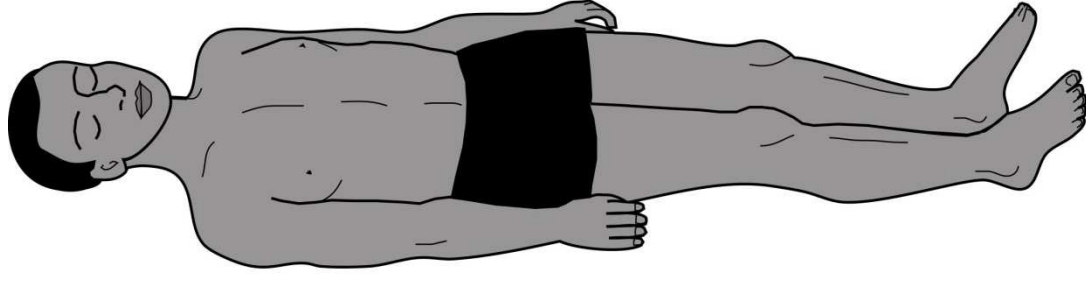
Walking

Gait

Romberg's test

stand **with** *heels together & toes
apart & eyes closed*

observe **for** *swaying or falling*



Testing joint position sense
The Romberg test
(eyes closed)

Gait

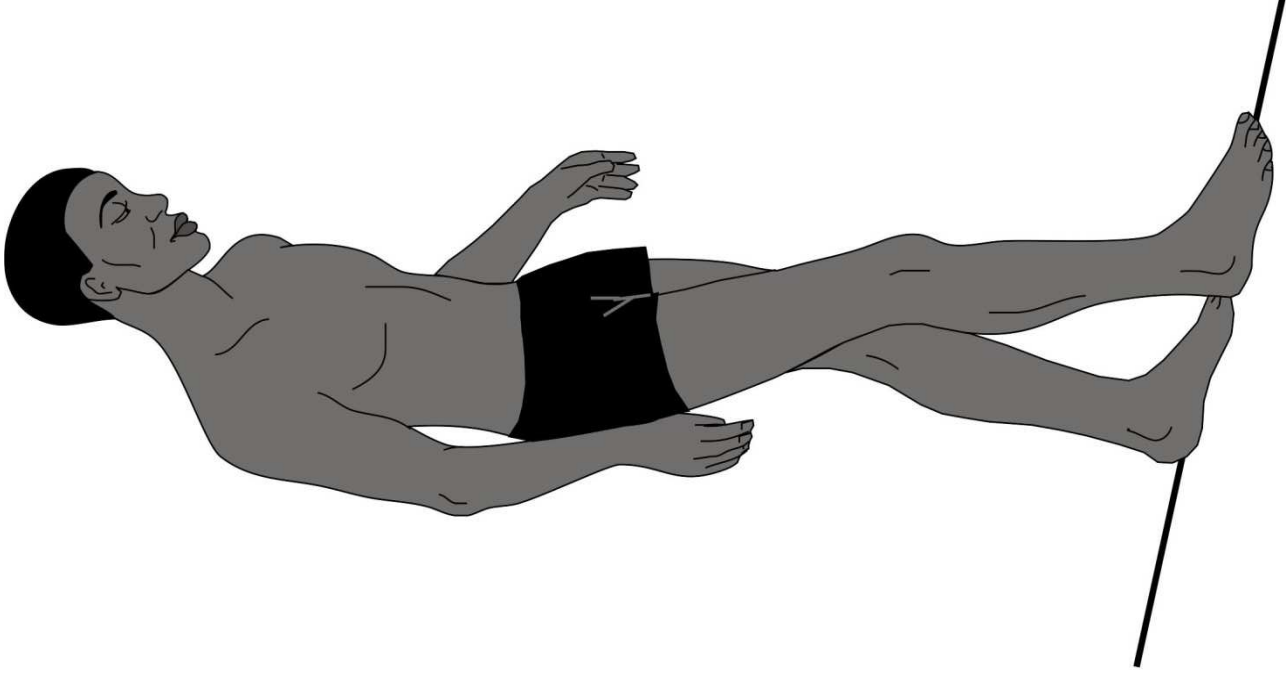
Testing Walking

ask pt to walk *normally* with *arms by sides*

observe *for unsteadiness & abnormal gait, arm swing, turning, symmetry*

if ataxia *still suspected* repeat

- *walking a straight line*
- *one foot placed in front of the other*
- *arms held aloft in front & looking straight ahead*



Testing gait