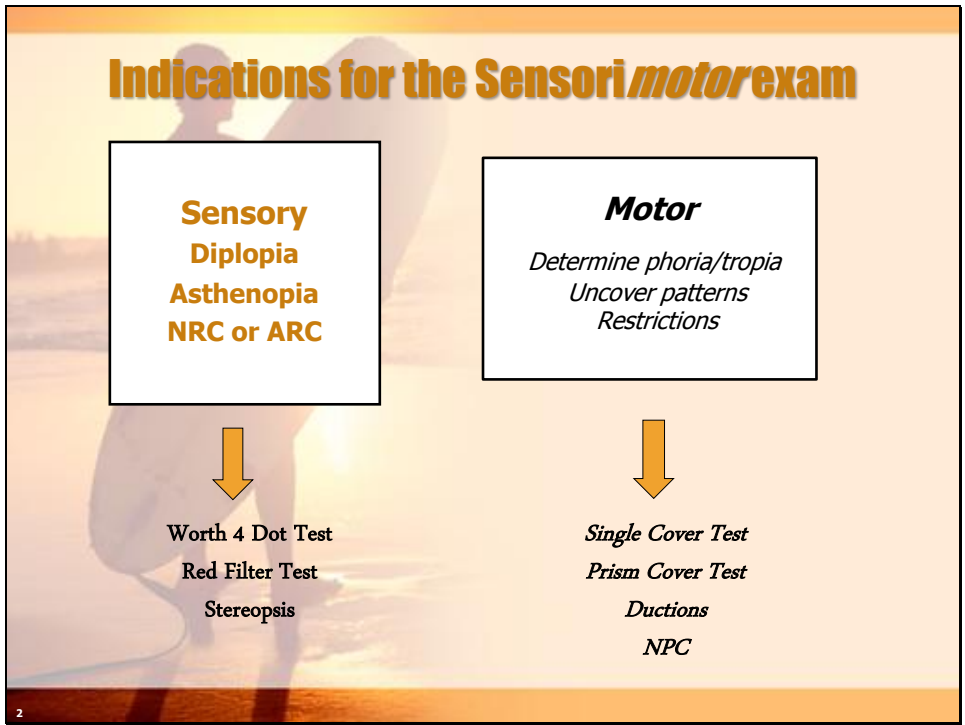




The Sensorimotor Exam

Shelley Klein, CO
Tufts Medical Center
Boston, MA
sklein1@tuftsmedicalcenter.org

1



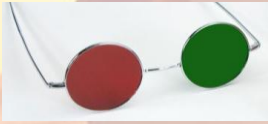
Indications for the Sensori *motore* exam

Sensory Diplopia Asthenopia NRC or ARC ↓ Worth 4 Dot Test Red Filter Test Stereopsis	Motor <i>Determine phoria/tropia</i> <i>Uncover patterns</i> <i>Restrictions</i> ↓ <i>Single Cover Test</i> <i>Prism Cover Test</i> <i>Ductions</i> <i>NPC</i>
---	--

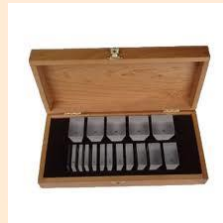
2

Start with the Single Cover Test....

Then sensory, Worth 4 Dot Test



Then motor, Prism and Cover Test



Start with SCT (at a minimum in primary position @ D and N) – it's important to know what you're starting with:

- Is there a phoria or tropia present?
- Is it intermittent?
- Is there a fixation preference?

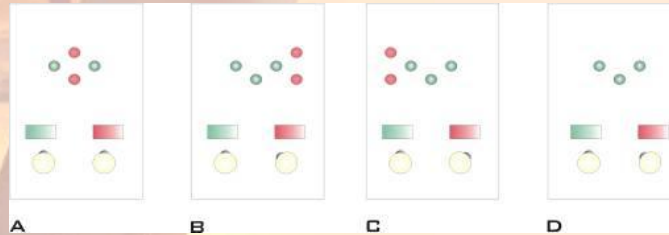
Then proceed to sensory testing

- In your office this should include stereopsis
- Here we'll review the W4DT

Finish with the motor part of the exam

- In your office this should include versions, ductions and NPC
- Here we'll cover the Prism and Cover Test

Worth 4 Dot Test or Red Filter Test used to determine fusion, diplopia or suppression



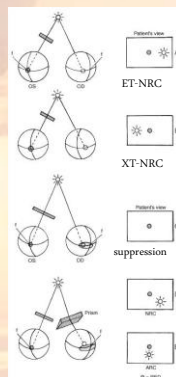
- A. Fusion
- B. Uncrossed diplopia (ET with NRC)
- C. Crossed diplopia (XT with NRC)
- D. Suppression OD

4

NRC or ARC

NRC

**Visual direction of
each fovea and
corresponding
retinal elements
are the same**
**If tropic may be
either diplopic
or suppressing**



ARC

- Retinal elements that are physiologically non-corresponding have acquired a common visual direction.
- Sensory adaptation to avoid diplopia

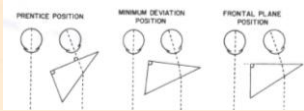
5

The Prism and Cover Test

Neutralization of deviation with prisms by optically moving the image onto the fovea

Factors affecting prism and cover measurements

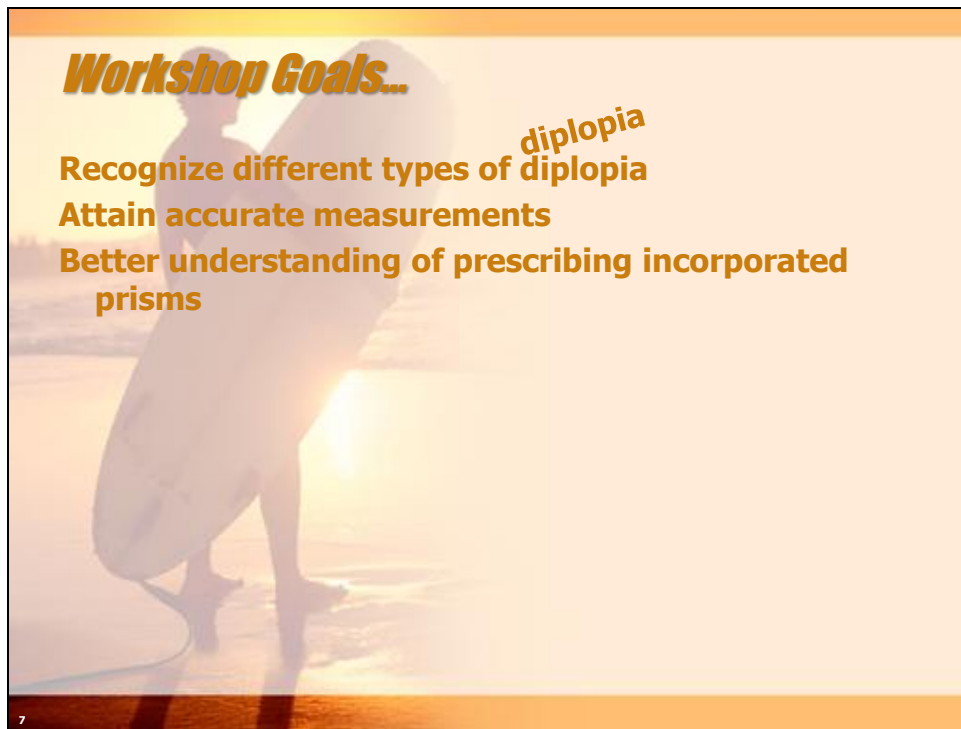
- Hold prisms in frontal plane position
- High refractive errors
- Stacking prisms
- Primary and Secondary deviations
 - 1° Fix with non-paretic eye / prisms over paretic eye = Smaller deviation
 - 2° Fix with paretic eye / prisms over non-paretic eye = Larger deviation
- Angle Kappa – angle that forms between the visual and pupillary axes
 - Positive angle simulates an XT
 - Negative angle simulates an ET



6

The Prism and Cover Test: *important pearls to remember...*

- Use an accommodative fixation target – don't block pt's view with your head!
 - @ Distance – you may need to measure in the 9 diagnostic positions (IV th NP)
 - @ Near – usually primary and downgaze is sufficient
- Dissociate maximally – pt's have strong compensatory innervation to keep their eyes aligned.
- Don't hurry/repeat APCT a few times.
- For diagnostic purposes, measure 25 to 30 degrees from primary position, you may not uncover a paresis or restriction if you don't expand the binocular field to it's outer limits.
- Some examiners like to measure till there is a reversal of the redress, personal preference
- Sometimes it's difficult to be certain of the end point of neutralizing the turn because of a rebound saccade. Do your best estimation.
- Positioning of the prism is very important – make certain to hold the prism straight, so you won't induce a vertical if you're measuring a purely horizontal deviation and vice versa for a vertical deviation. Explain Frontal Plane Position.
- Refractive errors > 5D
- Stacking prisms > 20 pd, better to split between 2 eyes, OK to stack vert/hor prism <20pd otherwise, re: splitting.
- Primary and Secondary Deviation – more likely to be seen with a new onset palsy, when monitoring the progression of the palsy from OV to OV, be consistent with your measurements.
- Be aware of an Angle Kappa – things may not be what they look like!
 - Up to 5 degrees of Positive Angle Kappa is physiologic in emmetropes.
- Sometimes you can't or it's difficult to do APCT – you may need to do a Krimsky
 - Poor fixation in a blind eye
 - Nystagmus



Prescribing Incorporated or Fresnel prisms:

Goal is to give the least amount of prism that will accomplish steady fusion.

Prism Pearls:

- Pt's typically do not move their eyes laterally more than 10-12 degrees
- If pt has bifocals, make sure what you're prescribing to rid the diplopia at the distance is acceptable at near and vice versa. You may need to prescribe separate glasses.
- If turn is comitant, I will usually start with half of the measured amount in primary position and will go up gradually if steady fusion is not accomplished
- Split the prism 50:50, unless there is a marked gaze deficit then you may need to prescribe asymmetrically or put it all on one side.
- Try to keep prescribed incorporated prism amount to 6 pd or less in each lens. I find going higher vertically is not as much a problem as horizontally.
- AR coating (or a slight tint) is beneficial
- Prism is very helpful in pt's with IV and VI NP. This is not the case with III NP pts. Typically, measurements are too incomitant, may be able to correct the exo but even this is very difficult. You might have better luck if it's an isolated vertical muscle supplied by the III rd nerve.
- Much of this is trial and error but patients are sincerely appreciative.

- With CN palsy pts: if there's a compensatory head position that accomplishes fusion be certain not to overcorrect that favored gaze with prisms. Pt's will not thank you!

Example: Pt with an AHP to the left for a Left VI th NP measuring

@ Dist: $8E(T) \leftarrow 20LET \rightarrow 40LET$ @ Near: $15E(T)'$

RE: Check pt's fusional convergence amplitudes in RIGHT gaze (where ET is only 8pd). If they can easily fuse 20 pd BO, then I would start with the 20 BO for diplopia relief using a Fresnel).

- With Divergence Insufficiency pts – OK to prescribe a greater amount of BO prism than what is measured in primary position. They have excellent convergence amplitudes straight ahead but a very small "single binocular field" because of the greater ET in lateral gazes. Check them at near if they're in bifocals.

Example: If the measurements are $12ET \leftarrow 4E \rightarrow 12ET$

I would prescribe 5 BO OU (total of 10 BO) may even want to give the full 6 BO OU.

- With Convergence Insufficiency pts –
Always offer eye exercises, especially if their NPC is decreased. They really work!
Prescribe separate reading glasses with BI prism split 50:50.

Example: If near measurement is $18X(T)'$ start with half, (9BI) have patient read with it. If happy prescribe 4.5 BI OU, if not strong enough, go up slowly till pt is comfortable.

Useful Articles:

- Thompson, JT, Guyton, DL. Ophthalmic Prisms. *Ophthalmology*. March 1983; Vol. 90, Number 3
- Kushner, BJ. Recently Acquired Diplopia in Adults with Longstanding Strabismus. *Arch Ophthalmology*. Dec. 2001; Vol. 119