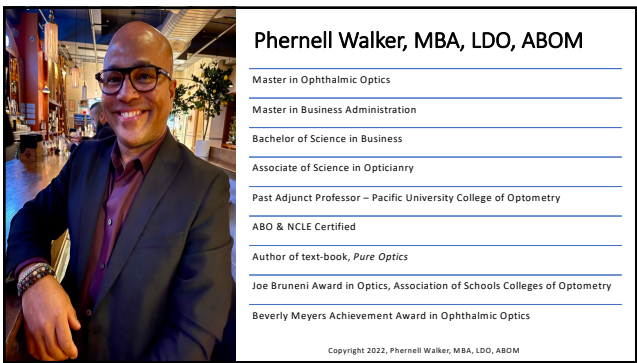
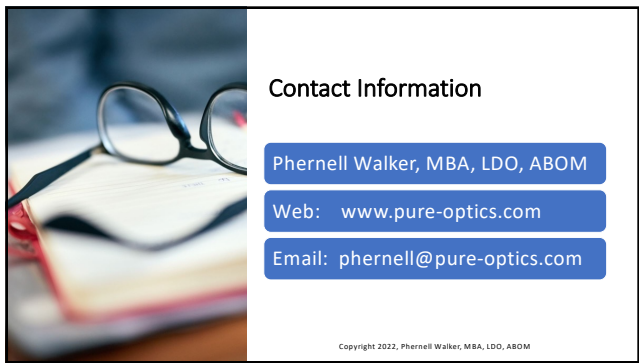


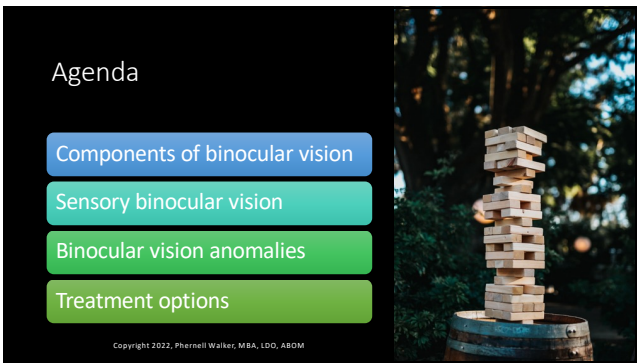
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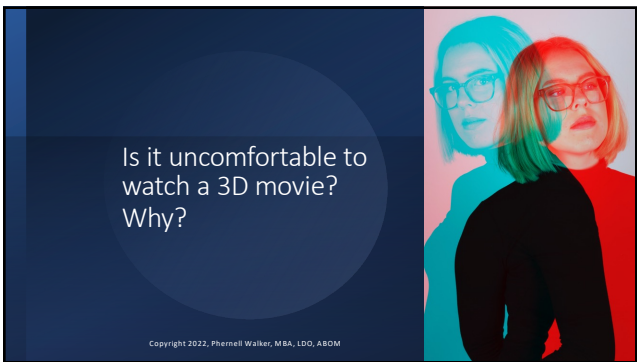
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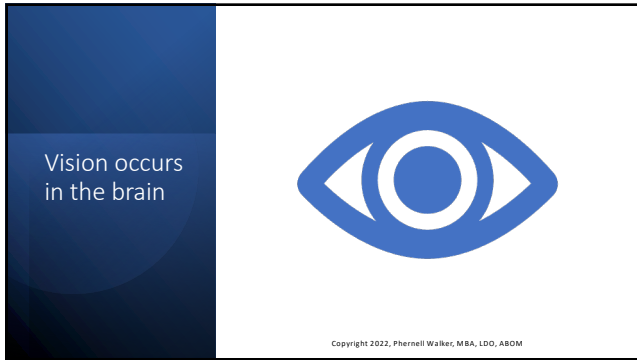
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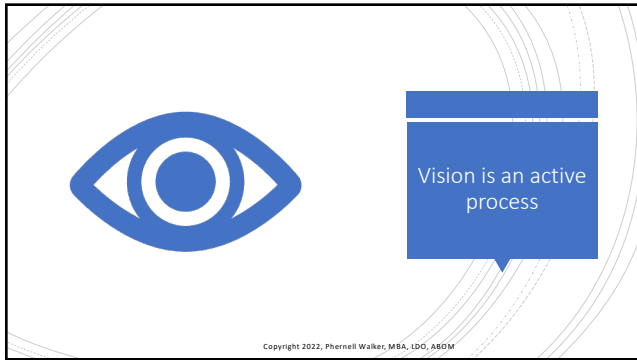
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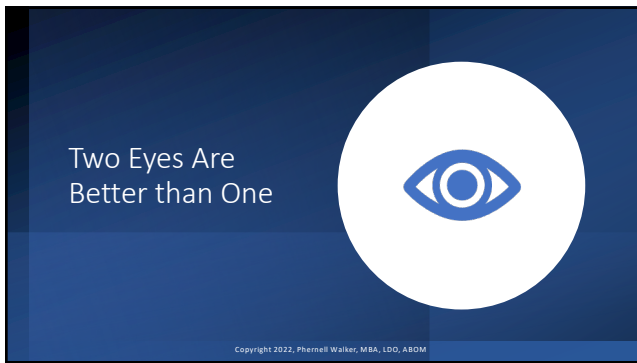
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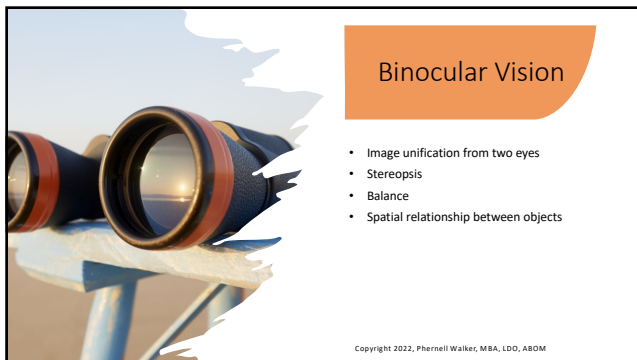
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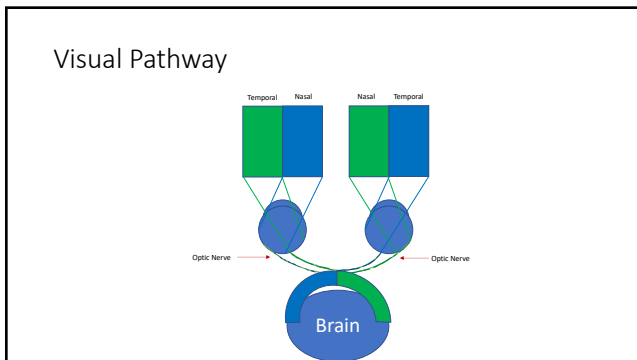
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Visual Field

- Total area your eyes perceive while fixed on a central target
- Normal visual field
- 90 degrees temporally to central fixation
- 50 degrees superiorly and nasally
- 60 degrees inferiorly

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BV Assessment

- Accommodation
- Convergence
- Depth perception (3D)
- Fusion
- Ocular motility
- Ocular posture
- Review conditions that affect binocular vision
- Spatial awareness / planning

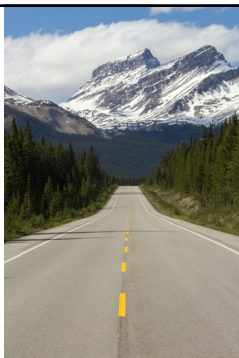


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Binocular Vision Assessment

- Stereopsis
- Tracking
- Working memory Vergence
- Visual acuity
- Visual-motor integration
- Visual perception
- Visual processing speed
- Working memory



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Ocular Motor Pathways



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Saccades



Fast conjugate eye movements looking back & forth between two objects.
Eye movement aligns the image on fovea centralis to obtain best VA.

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Saccades



Normal – “Patient showed accurate saccades with age-appropriate head movement during saccade assessment”



Abnormal - “Patient showed undershoots on 4 of 5 trials with excessive head movement for a person of this age.”

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Pursuits

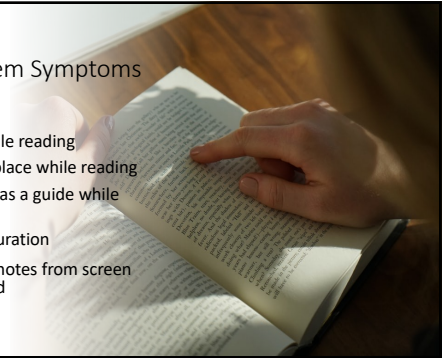
Visual tracking (i.e., pursuits) - the ability to efficiently move the eyes from left to right (or right to left, up and down, and circular motions) or focusing on an object as it moves across a person's visual field.



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Pursuit Problem Symptoms

- Skipping lines while reading
- Frequent loss of place while reading
- Using your finger as a guide while reading
- Short attention duration
- Difficulty writing notes from screen or dry erase board



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Documenting Pursuits



Good Performance - Patient showed smooth tracking without loss of fixation and minimal head and body movement during tracking assessment.



Poor Performance – Patient showed jerky tracking, with 6 losses of fixation and excessive head movement during tracking assessment.

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Pursuits
Practice Makes Perfect

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Vergence

Normal Vergence

Eyes are able to converge directly on a target.

Convergence Excess

Eyes converge too much and align before in front of a target.

Convergence Inefficiency

Eyes lack converge and align behind a target.

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Normal Vergence



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Convergence Excess



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Convergence Inefficiency



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Eye Teaming

Eye Teaming (aka Vergence) -
The strength and flexibility of
the eye teaming system
should be evaluated.

Deficits in eye teaming will
result in double vision,
eyestrain, fatigue, headaches,
or dizziness.

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Vergence
Practice Makes Perfect

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Vestibulo-ocular reflex

Balance in motion.

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Binocular Vision Anomalies

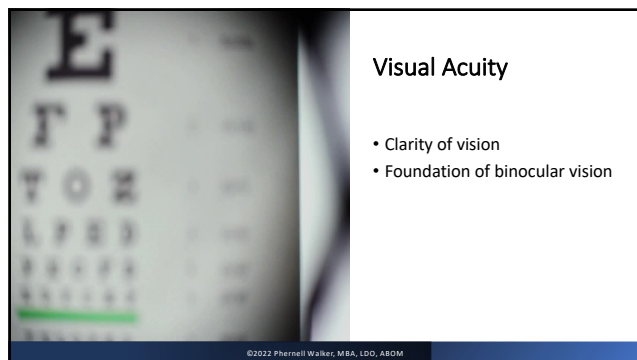


Non-strabismic binocular
vision anomalies

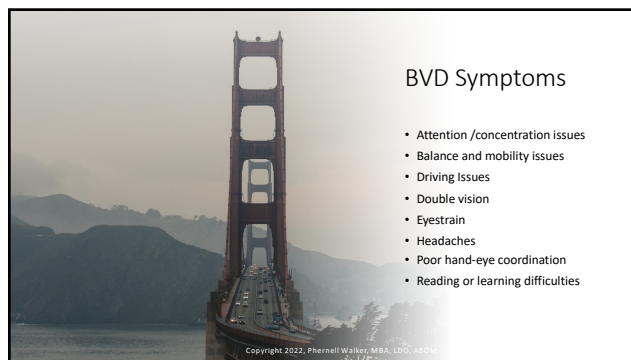


Convergence insufficiency
& Convergence Excess

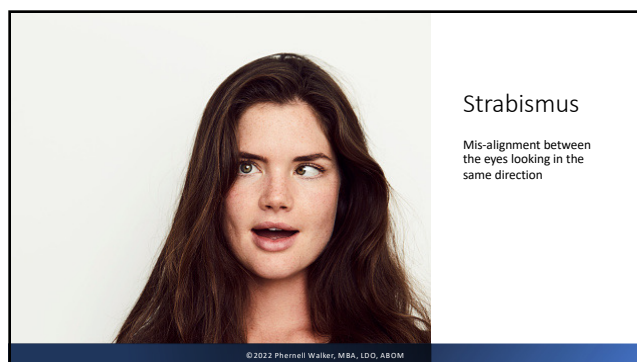
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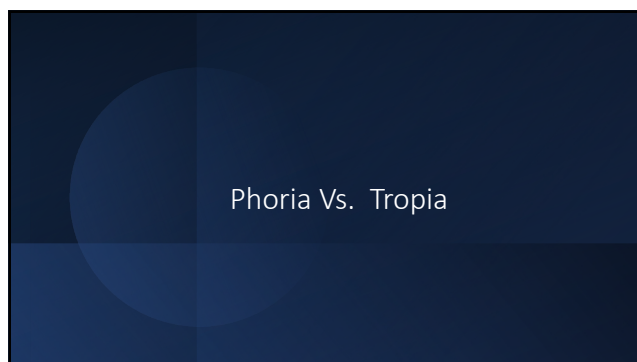
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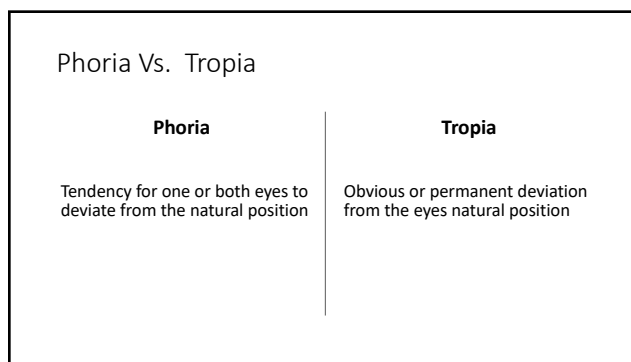
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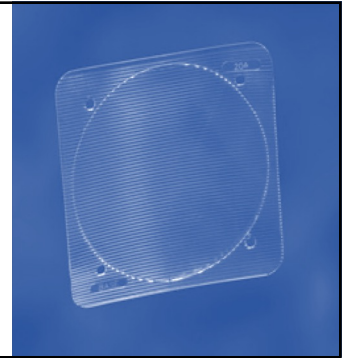
Treatment Options

- Spectacle lenses with prescribed Adverse Prism
- Spectacle lenses with prescribed Therapeutic Prism
- Vision Therapy (VT)

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Treatment Options

- Temporary Testing Prism



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Adverse Prism



Prescribed prism – apex over weak rectus muscle



Moving the image in the opposite direction of the eye

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Therapeutic Prism



Prescribed prism – base over weak rectus muscle



Moving the image in the direction of the eye

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Vision Therapy Indicated

- Amblyopia
- Strabismus
- Double Vision
- Depth Perception
- Convergence Insufficiency
- Eyestrain/Stress-induced Vision Issues
- Neurological Ailments
 - traumatic brain injuries, strokes, multiple sclerosis, cerebral palsy, whiplash and developmental delays
- Eye teaming
- Accommodative dysfunction
- Oculomotor dysfunction

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Cranial Nerves

CN II - vision

CN III - eye motility

CN IV - superior oblique eye muscle

CN VI - lateral rectus eye muscle

CN VII - facial and lacrimal gland



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Vision Therapy Indicated

Traumatic Brain Injury (TBI) stroke, automobile accidents, concussions, whiplash, post neurosurgical (e.g., tumor excision, aneurism repair)

80% of TBI patients suffer vision issues


We can use prism to widen a patient's field of view

1.00 diopter is equal to 0.573 degrees

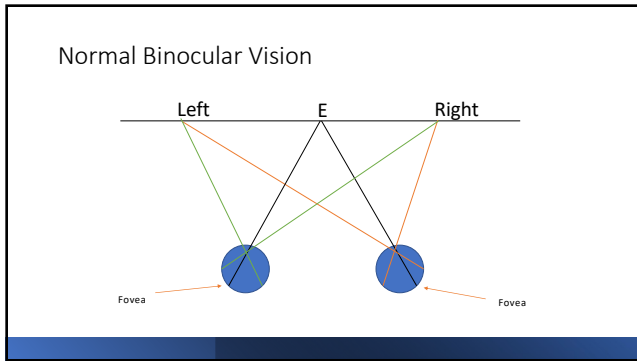
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Diplopia

- stereopsis
- walking
- balance
- reading
- visual field loss




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Prism Power

- Bilateral prism** - splitting prism between both eyes
- Convergence (ESO)** - bilateral Base Out (B.O.)
- Divergence (EXO)** - bilateral Base In (B.I.)
- Right (Hyper)**
 - OD lens = Base Down (B.D.)
 - OS lens = Base Up (B.U.)
- Left (Hyper)**
 - OD lens = Base Up (B.U.)
 - OS lens = Base Down (B.D.)



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Prism Therapy

Divergence - bilateral Base In (B.I.)

- Advantage - promotes bifocal stimulation
- Disadvantage - reduces (P.F.R.) prism fusional vergence amplitude

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Prism Therapy

Fusional Convergence amplitudes - focus on a accommodative target at near while holding a base out prism bar in front of one eye

Increasing the prism power gradually while maintaining a single image looking through Base Out Prism (B.O.)

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Accommodative Dysfunction

The strength, flexibility, and accuracy of the eye focusing system should be evaluated

Deficits in accommodation will result in blurry vision during near work, blurry vision when transitioning from near to distance tasks (such as copying notes from the board in school), and eye strain or fatigue

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BVD Anisometropia

Power difference of $> \pm 1.50$ D between the right and left eye in any meridian

OD: -2.25 -0.50 x 090
OS: -0.50 -0.75 x 090

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BVD Antimetropia

- Form of anisometropia
- Opposite refractive errors between eyes
- Patient is both hyperopic and myopic
- Opposite signs on the Rx

OD: +1.25 -0.50 x 090
OS: -0.75 -0.75 x 090

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Verify by Flat Transposition

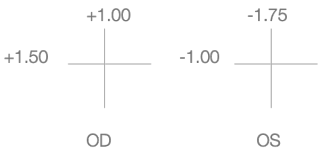
OD: -1.00 +2.50 x 165 OD: +1.50 -2.50 x 075
OS: -1.75 +1.50 x 015 OS: -0.25 -1.50 x 105

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Anisometropia in Multifocal

OD: +1.50 -0.50 x 180
OS: -1.00 -0.75 x 180
Add: +2.75
PD: 32/34



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Discovery

OD: -2.25 -1.50 x 135

OS: -1.00 -2.00 x 090

Add: +2.75

PD: 35/34

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Slab-off | Bicentric Grinding

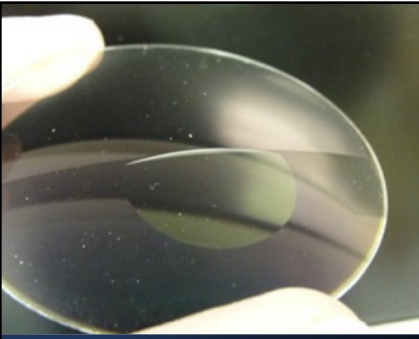
Slab-off - the use of prism in the reading portion of a lens to balance unequal prism in the 090th meridian between the OD and OS lenses.

Slab-off Methods:

- Traditional Slab-off
- Reverse Slab-off

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Slab Off

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Traditional Slab-off

Imbalance = > 1.50 D x 090th Meridian

Lens Selection = Weakest Plus Power

Lens Selection = Stronger Minus Power

Ground (Surfaced) = Base Up Prism x 090th Meridian

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Reverse Slab-off

Imbalance = > 1.50 D x 090th Meridian

Lens Selection = Strongest Plus Power

Lens Selection = Weaker Minus Power

Ground (Surfaced) = Base Down Prism x 090th Meridian

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Solution

How much slab-off should you prescribe?

OD: -2.25 -1.50 x 135

OS: -1.00 - 2.00 x 090 Add: +2.50 OU

Ft. 28

PD: 35/34

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Refractive vs. Axial Aniseikonia

- Refractive - result of refractive anisometropia
- Axial - result of axial anisometropia

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Solutions

- Keratometry or Topography
 - Delta K difference indicates refractive anisometropia
 - Solution = Contact lenses
- Biometry ("A Scan")
 - Significant delta between OD & OS axial length
 - Solution = Iseikonic spectacles vs. contact lenses

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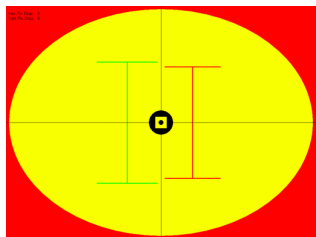
Subjective Tests

- Space eikonometer
- Synoptopore
- Computer simulation (most popular)
- Test Book - S. Awaya (second most popular)
- Maddox rod two pen light test

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Computer Simulation



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S. Awaya



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Synoptophore



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Types of Aniseikonia


Physiological Aniseikonia

Anomalous Aniseikonia


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Physiological Aniseikonia



Normal function of visual system



Helps determine object position and stereopsis

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Aniseikonia Candidates

Individual tolerance for magnification differential threshold

Anisometropia prescriptions can significantly cause aniseikonic symptoms

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Common Symptoms

Headaches 67%	Asthenopia (fatigue, burning, tearing, pain, pulling) 67%	Photophobia 27%	Reading difficulty 23%
Nausea 15%	Motility (diplopia) 11%	Nervousness 11%	Vertigo and dizziness 7%
General fatigue 7%	Distorted space perception 6%	Binocular Vision Dysfunction (driving issues) 40%	

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Oculomotor Dysfunction

Eye tracking

Quality of your eye movements is related to the neural connections to the brain as well as the integrity of the eye muscles themselves.

Eye movements - used to determination of a central nervous system dysfunction (i.e; tumors, inflammation, or neurologic conditions)

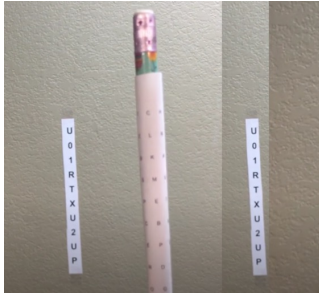
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Convergence Insufficiency Pencil Push-Up Treatment

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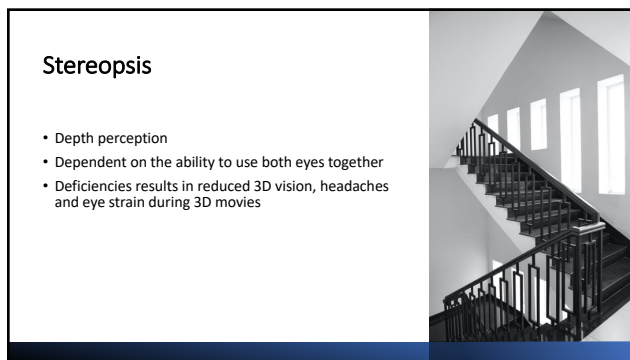
Pencil Push-Up Treatment



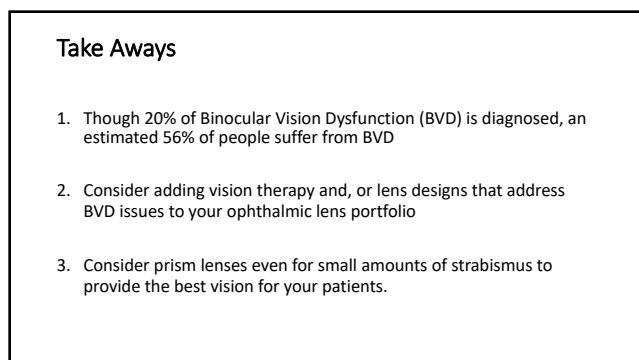
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