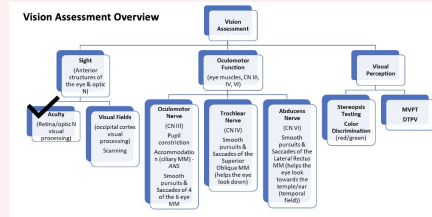


### Vision Assessment Overview



### Vision Assessment Overview

Binocular Coordination requires effective...	Smooth pursuits/tracking Saccades Convergence Divergence Stereopsis/Spatial localization Focal and Ambient Visual Processing- Physiological diplopia
Binocular Dysfunctions due to BI may results in...	Inadequate gaze stabilization and bifocal fusion Diplopia Suppression (brains response to diplopia) Vergence Insufficiencies (usually convergence) Accommodative Insufficiency (CN III) Visual fatigue due to poor oculomotor control- My eye is starting to sting

## Eye Alignment: Phoria

Natural positioning of the eye (everyone has phoria)

Tendency is to aim in front (esophoria) or behind (exophoria) the point of focus (convergence)

Fusion is intact

Depth perception may be intact

Measured by prism diopters

Produce subtle symptoms difficulty concentrating; frontal or temporal headaches; sleepiness or stinging of eyes after reading

## Eye Alignment: Strabismus or Tropia

Visible turn of one eye (constant, intermittent, alternating between both eyes) Esotropia: One eye turns in; Exotropia: One eye turns out; Hypertropia: One eye turns up relative to other eye

Fusion (binocular vision) and depth perception (stereopsis) are not present

## Strabismus or Tropia



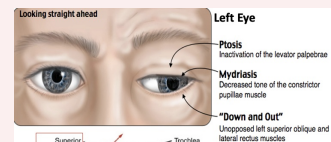
Hypertropia  
Hypotropia  
Esotropia

## Oculomotor N. Palsy

### Paralysis of the SR, MR, IR, IO

Symptoms Diplopia; Extraocular weakness resulting in exotropia; Convergence insufficiency; Ptosis-upper eyelid droops; Photosensitivity (if ciliary ganglion affected); Accommodation insufficiency (if ciliary ganglion affected)

## Oculomotor N. Palsy

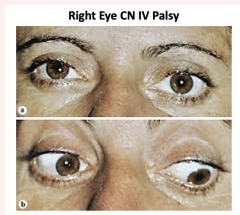


### Trochlear N. Palsy (CN IV)

Superior Oblique M. paralysis of the contralateral eye

**Symptoms** Trauma may result in binocular paralysis; Unable to efficiently complete torsion in (adduction) and down (depression); Hypertropia; Diplopia; Bielschowsky's Head Tilt Test-affected eye with become more hypertropic with head tilt to affected side; eye gaze appears normal with head tilt to non-affected eye side

### Trochlear N. Palsy (CN IV)



### Abducens N. Palsy (CN VI)

Lateral Rectus M. paralysis

#### Symptoms

Unable to move eye into abduction or laterally toward temporal field of the ipsilateral eye	Diplopia with temporal gaze
Divergence Insufficiency	Esotropic

### Abducens N. Palsy (CN VI)



### Oculomotor Control Testing (Voluntary)

Smooth pursuits/-tracking	Patient should follow target with eyes in a "T" then "X" pattern
---------------------------	--

### Oculomotor Control Testing (Voluntary) (cont)

Saccades	Instruct patient to shift gaze between two targets using eyes only. Move the two targets clockwise, keeping each target on opposite sides of the clock, e.g. 3 & 9, 1 & 7, etc.
Convergence	Pencil push up; Brock String
Divergence	Brock String

### Brock String

Used to train convergence and divergence  
improves fusion of the eyes and increase peripheral awareness (physiological diplopia)  
Can be fatiguing for individuals with diplopia or impaired visual processing  
Can be challenging to understand for individual with cognitive of memory impairments  
Can measure point of convergence and recovery into divergence with yard stick to assess progress and for goal writing - (point of convergence norm is 6-10cm from nose)

### Diplopia

Long-term effects result in central vision suppression	peripheral vision remains intact
--	----------------------------------

#### Symptoms/signs

Cover or close one eye OR favor one eye over the other	Under/over reaching objects
Double vision	Under/over reaching objects
Avoid near activities	Exhibit head tilt or turning during activities

### Oculomotor Interventions

Restoration	Adaptation
SEE Exercises	Pacing Programs (Functional Activity Logs)
Brock String	Binasal Occlusion
Field Expansion (central peripheral awareness)	Prisms
Accommodative Flippers	
Computer-based activities	



### Computer Based Vision Therapy

#### PROS

Great for people with good attention for sustained period of time and decent cognition (e.g., mild TBI)

Advanced vision therapy option for higher level goals such as driving or return to work

Great for individual who like objective measurements and goals

Great for "gamers"

#### CONS

Can be very fatiguing

Photosensitivity

May be challenging for more severe BI

#### Seizure contraindications

Ex: Sanet Vision Integrator, VisionBuilder, Bernell, Youtube

### Functional Therapeutic Activities

*Activities may be done in clinic or given as therapeutic home programs:*

- Speed Typing Tests (several resources online)
- Structured Internet Searches (i.e. locating a current event article, read it, and write or type a brief summary)
- Car Scans (i.e. locating street signs, speed limit, etc. with or without moving head)
- Reading a bed time story to your kiddos
- Scanning and clipping grocery store coupons
- Grocery shopping (i.e. establish a grocery list of 5 items and increase by 2 items each trip)
- Send email to therapist every Friday of new activities to add or replace on "functional activity log" for the next week

### Don't Over Do it!

**Goal:** reduce onset of symptoms of visual fatigue and other symptoms by participating in short spurts over a longer period of time versus long spurts over a short period of time

**Establish a baseline:** determine length of time an activity occurred resulting in onset of symptoms

**Establish the most effective strategy** for reducing symptoms (i.e. meditation, laying down in a dark and quiet environment, covering eyes with palm of hands with slight application of pressure)

### Don't Over Do it! (cont)

**Establish a "Pacing" Plan:** terminating or pausing an activity prior to onset of symptoms; then resuming activity after symptoms subside

### Understanding Yoked Prisms

Deviates an images toward its apex

Eye must also turn toward the apex of the prism in order to remain aligned with the image

EX: if one eye has a tendency to turn away from an object due to a muscle imbalance, prism can be prescribed to shift the image in the same direction

allows the eye to rotate to a more comfortable position, while still remaining aligned with the image

### Pacing Programs

Many individuals with Mild TBI push themselves beyond a point of recovery, which often can leave them "helpless" for hours or even days

Create a "**functional activities log**" or "**pacing program**"

- Tracking specific activities that are perceived triggers for onset of symptoms (i.e. computer or screen-time, reading, scanning for grocery items, eating in a crowded restaurant, riding as a passenger in the car, etc.)

### Peripheral Central Awareness Activities

Increasing awareness of **physiological diplopia and peripheral fields**

### How do prisms help?

Shifting the image allows for increased comfort improving eye fusion increases of expands peripheral awareness improving visual field loss and ambient visual processing

Diplopia may be eliminated

Alters the persons perception of reality improving midline shifts

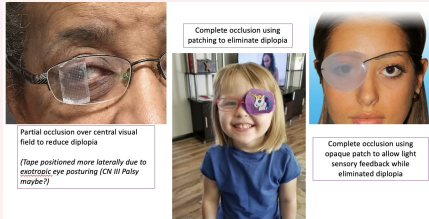
Typically used in conjunction with vision therapy and functional activities

Can treat visual dysfunctions while eliminating need for patching an eye (monocular vision)

Should only be completed with recommendations supplied by neuro-optometrist



### Occlusion Strategies Images



### Field Expansion (Peripheral Central Awareness)

Goal is to strengthen the peripheral field awareness (ambient processing) while engaging in central vision activities resulting in **field expansion**

This strategy improves **gaze stabilization** which improves reading skills, identifying obstacles quickly and efficiently, and improve anticipatory response time to reduce risk of falling

Must have adequate attention, arousal, and cognitive function to successfully use this strategy

### Other Occlusion Strategies

#### Central Taping Occlusion

- Occluding central vision to reduce diplopia

**Pros:** Benefits allowing peripheral vision processing to remain exposed to sensory feedback

**Cons:** May be visually distracting for patients who have additional cognitive/perceptual dysfunctions

#### Patching

- Complete occlusion of non-dominant eye

- Ideally alternating patch to eliminate risk of suppression

- Alternating schedules are dependent of patient's tolerance (phoria vs tropia)

**Pros:** allows for immediate relief of double vision

**Cons:** Utilizing monocular vision only can result in suppression due to no sensory feedback in non-used or affected eye

### Why try binasal occlusion?

Binasal Occlusion is a non-invasive method and is easy to apply in patients with mTBI and motion sensitivity

Reduces the symptoms caused by increased motion sensitivity and double vision

Provides immediate and sustainable effects by reducing stress with visual processing

May enhance performance during activities of daily living, hobbies, and work related activities



By **prinsam98**

[cheatography.com/prinsam98/](https://cheatography.com/prinsam98/)

Published 27th June, 2022.

Last updated 27th June, 2022.

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### Type of Visual Field Testing

Kinetic Confrontation (behind person)

Confrontation Field Testing (in front of person)

### Functional Observations of Visual Field Deficits

Collides or comes very close to obstacles on one side in an unfamiliar environment

Stares straight ahead at the floor immediately in front of them

Consistently stares to one side

Uses finger to "trail" wall to guide self

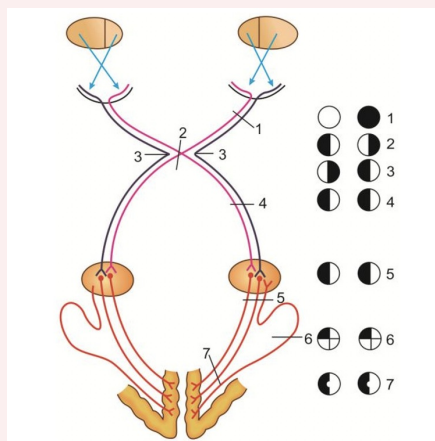
Refuses to take the lead when ambulating, preferring to walk behind others

Anxious or uncertain in crowded areas

Stops walking when approaching or passing by another moving person or object

Complains of feeling off balance particularly to one side

### Visual Pathway Lesions



### Visual Pathway Lesions: loss of visual fields

1. Right Eye Anopsia/Blindness

2. Bitemporal heteronymous hemianopsia

3. Binasal heteronymous hemianopsia

4 & 5. Contralateral homonymous hemianopsia

6. Contralateral upper quadrant anopsia

7. Contralateral homonymous hemianopsia with macular sparing

### Diminished or Lost Visual Field Strategies

**Increase awareness to affected visual field through adaptation**

- Visual scanning to affected side requiring head turning to scan surroundings

- Visual aides or markers to ensure the individual know how far to scan

- Position self on the side of affected visual field when looking far away (i.e. during a presentation, movie theater, etc.)

- Have someone walk on the side of the affected visual field

**Prism lens may help with visual field expansion as prescribed by neuro-optometrist**

**Central peripheral Expansion?**



### Spatial Localization

Judgement of space and distance- **Stereopsis** (depth perception)

**Functional observations that can impact safety**      **Can be affected by...**

- Difficulty negotiating steps, stairs, or curbs or safely navigating around environmental obstacles

- Changes in acuity

- Pouring hot coffee without spilling or reaching for skillet handle on stove top without burning self

- Contrast sensitivity

- Not stopping soon enough at a red light/stop sign or difficulty determining distance of exit/street sign resulting in last minute turning or missing exit

- Poor integration of focal and ambient visual processing systems

- Divergence and/or convergence insufficiencies (binocular vision dysfunctions)

### Visual Perceptual Activities

#### Functional Activities

#### Therapy activities

Dressing with or without AE

Parquetry

Applying make-up

Puzzles

Grocery shopping

Tangrams

Organizing spice rack and or pantry

Mazes

Organizing groceries to put away

"Where's Waldo?"

Sorting and organizing dishes from the dishwasher

Graphing

Sorting and folding laundry

Line or design completion

Setting the table

Any activity involving constructional praxis (e.g., 3-D building tasks)

Organizing medications

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Navigating Apps on phone or web browsers

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### Stereopsis Testing

**OT TESTING**

Finger to nose test

**OPTOMETRIST TESTING**

The Randot Stereotest

### Visual Perceptual Testing

MVPT-4

DTVP-A

### Visual Perceptual Strategies

**Environment**

**Person**

**Occupation**

Organization

Scanning strategies

Task Analysis

External Cues (e.g. Increasing Contrast)

Cognitive strategies

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Oculomotor Exercises

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By **prinsam98**

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