VISION THERAPY FOR CONVERGENCE AND ACCOMMODATIVE INSUFFICIENCY IN POST-CONCUSSION SYNDROME

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Concussions

A type of traumatic brain injury (TBI) caused by a sudden blow to the head.

Mostly seen in:

- Sports
- Motor vehicle accidents
- Home accidents

Post-concussion Syndrome

- Shearing of axons
- Large spectrum of symptoms

Most common visual symptoms of post-concussion syndrome include:

- Blurry Vision
- Headaches
- Diplopia
- Eye fatigue
- Balance
- Light sensitivity
- Difficulty with prolonged near tasks

Post-Concussion Syndrome

Most common vision disorders:

- Convergence Insufficiency (CI)
  - Dysfunction in vergence (fusional & accommodative)
- Accommodative Insufficiency (AI)
  - Dysfunction in accommodation & near reflex triad

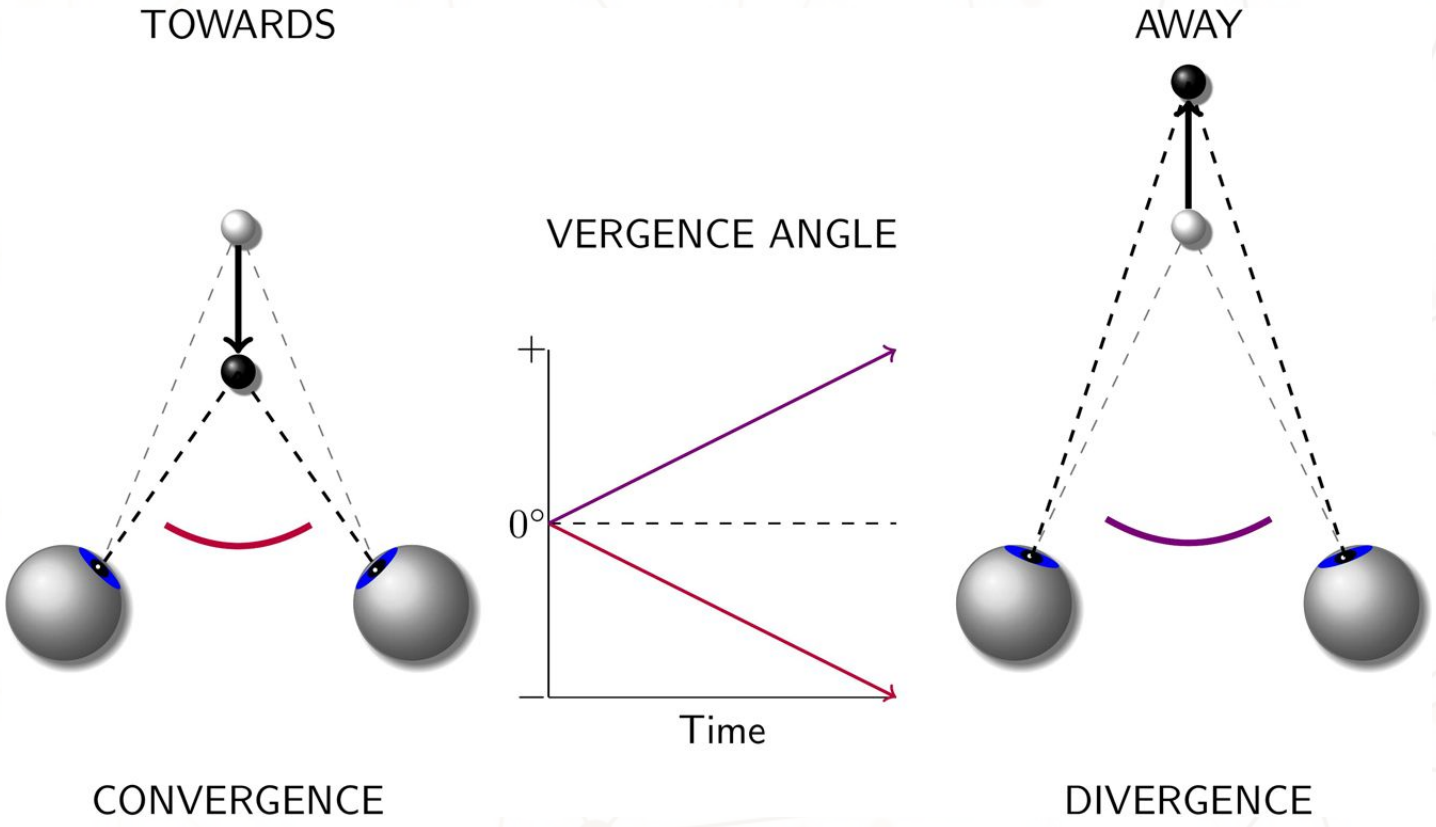
Treatment includes:

- Vision therapy/neuro-optometric rehabilitation

FUSIONAL & ACCOMMODATIVE VERGENCE

Fusional Vergence

Goal: Stay Single &
Avoid Double Vision



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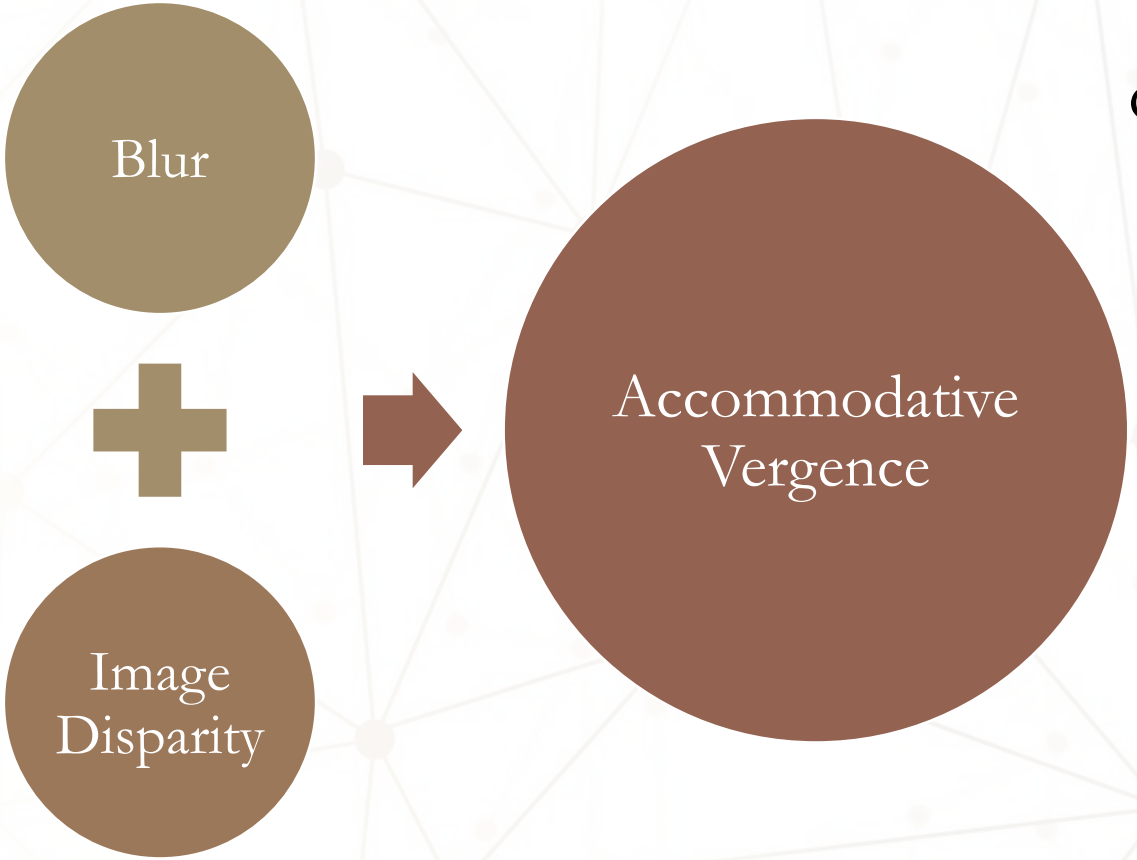
Accommodative Vergence

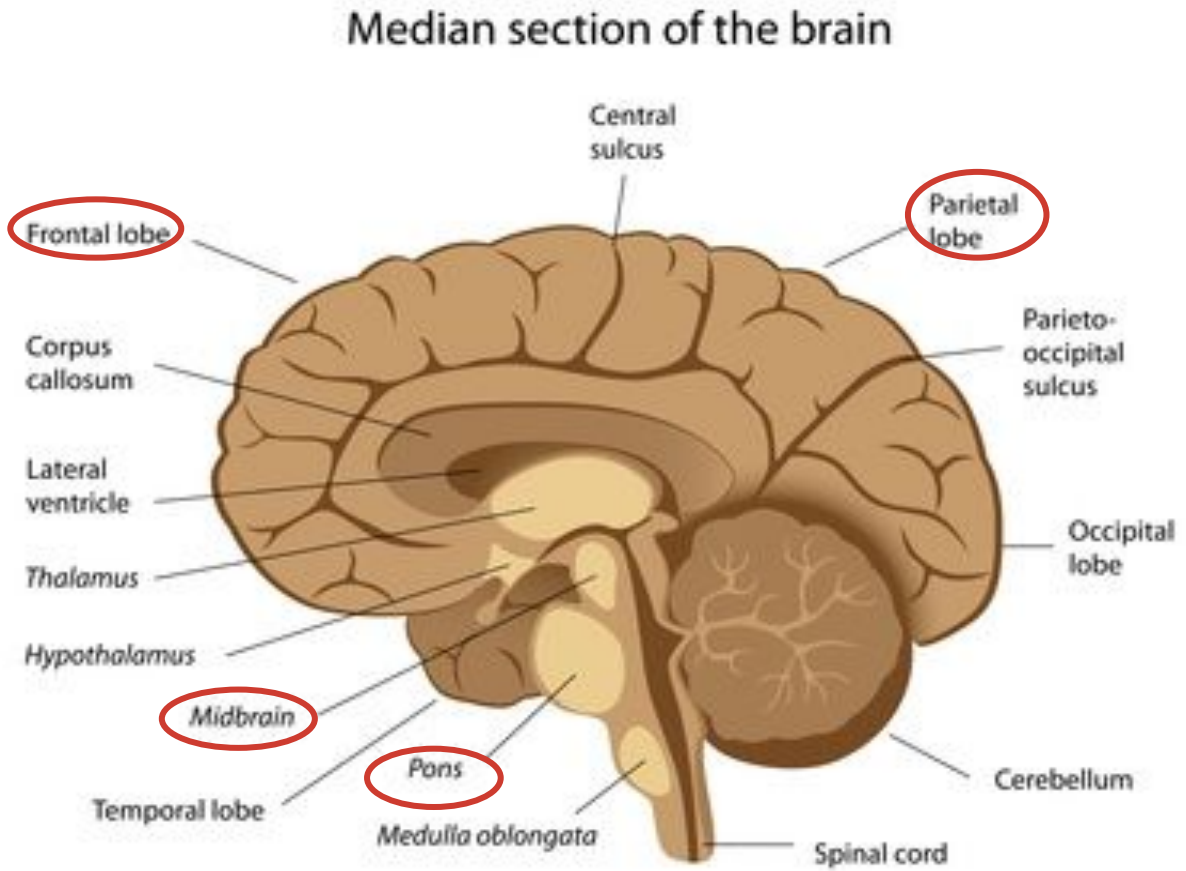


Goal: Stay Single & In Focus!

Fusional & Accommodative Vergence

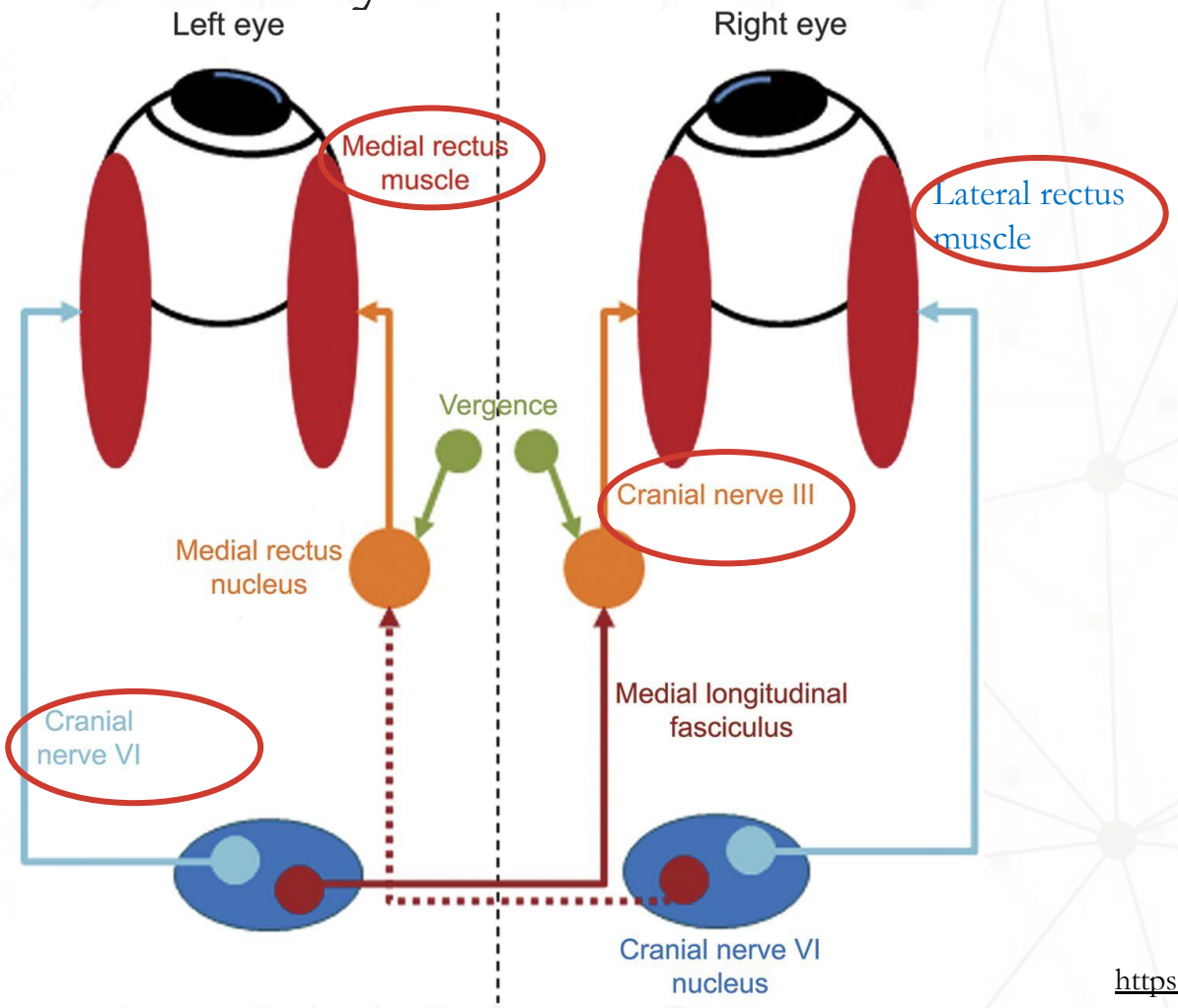
Areas of the Brain Involved:

- Midbrain
- Pons
- Parietal Lobe
- Frontal Eye Fields



https://www.generon.ie/read/neurosciences-17/human-normal-adult-brain-1325.html

Vergence Pathway



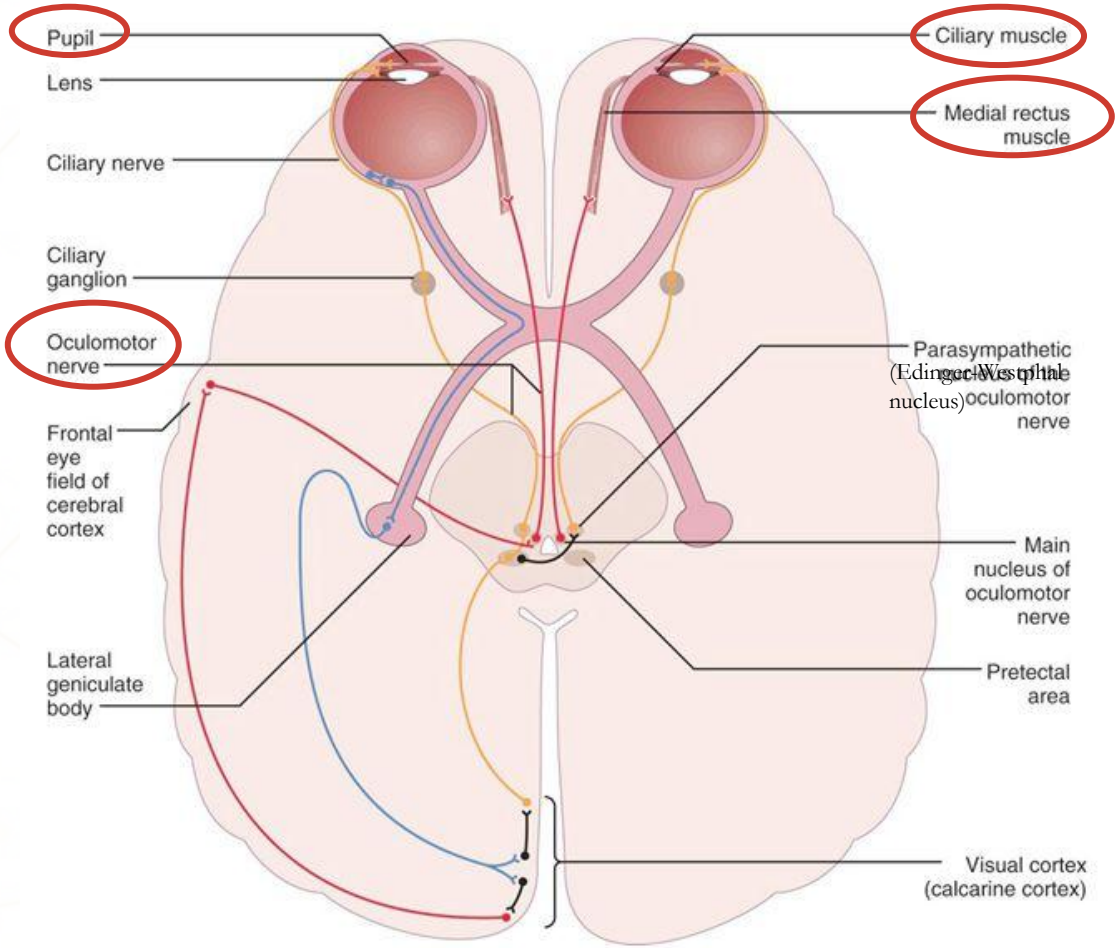
https://n.neurology.org/content/87/11/e117

THE OCULOMOTOR NERVE & NEAR TRIAD

Oculomotor Nerve

- Innervates:
  - Superior Rectus
  - Medial Rectus
  - Inferior Rectus
  - Inferior Oblique
  - Upper eyelid
- Involved In:
  - Near Triad
  - Pupil Reflex

Near Reflex Triad



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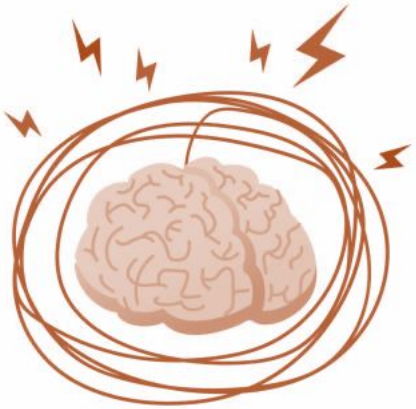
CONVERGENCE INSUFFICIENCY & ACCOMMODATIVE INSUFFICIENCY

Convergence Insufficiency (CI)

Difficulty with eye-teaming

- Near point convergence of greater than 6 cm
- Exophoria of at least 4 prism diopters greater at near than at distance
- Reduced positive fusional vergence at near.
- Symptoms:
  - Losing place when reading
  - Eyestrain
  - Headaches
  - Double Vision
  - Blurry vision at near

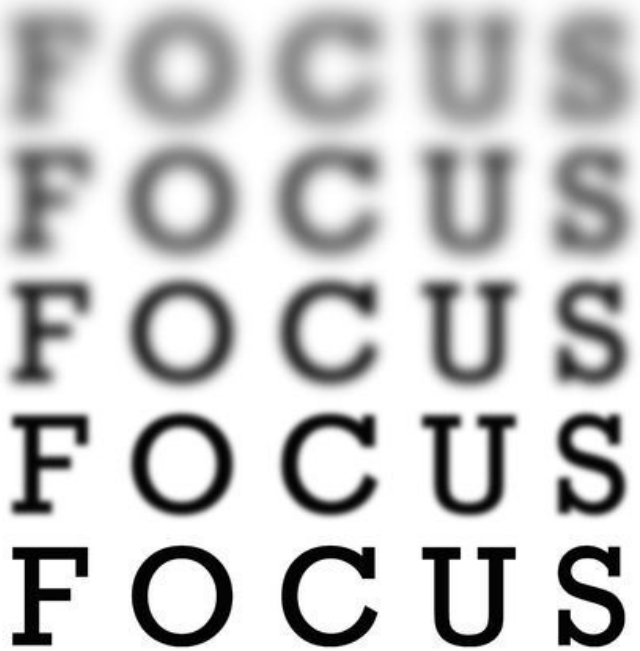
Double Vision



Accommodative Insufficiency (AI)

Reduced amplitude of accommodation based on age and difficulty with minus lenses.

- Symptoms:
  - Eye fatigue
  - Headaches
  - Blurry vision at near
  - Difficulty concentrating



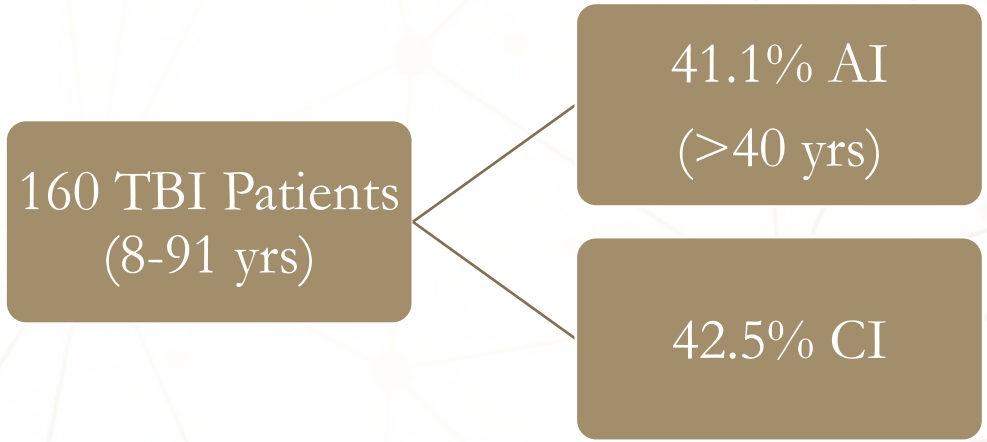
RETROSPECTIVE STUDIES

Occurrence of oculomotor dysfunctions in acquired brain injury: A retrospective analysis

Kenneth J. Ciuffreda, O.D., Ph.D., Neera Kapoor, O.D., M.S., Daniella Rutner, O.D., M.S., Irwin B. Suchoff, O.D., D.O.S., M.E. Han, O.D., and Shoshana Craig, O.D.

State University of New York State College of Optometry, Raymond J. Greenwald Rehabilitation Center, New York, New York.

- 220 CVA and TBI patient charts identified
- Looked at 5 areas of oculomotor dysfunctions

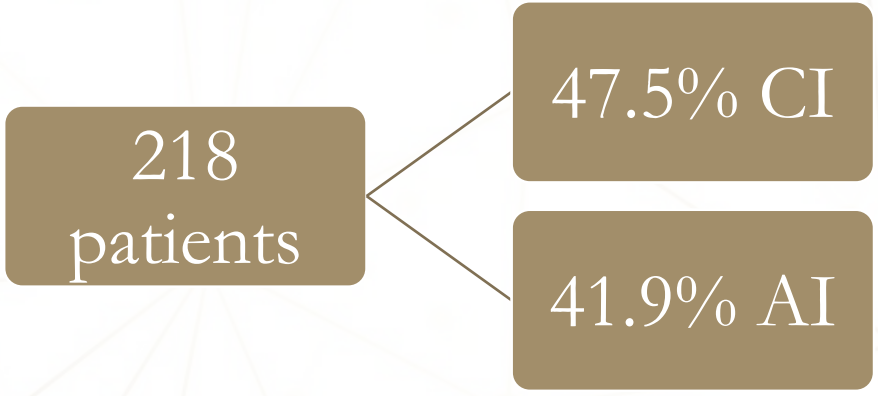


- Takeaways:
  - CI and AI were the most diagnosed for patients with TBI
  - Important to identify vision dysfunctions for proper treatment, including vision therapy

Vision Therapy for Post-Concussion Vision Disorders

Michael Gallaway*, Mitchell Scheiman†, and G. Lynn Mitchell‡

- Looked at occurrence and efficacy of vision therapy for vision problems that occur after a concussion



OVT & HVT (54.3%)

- CI
  - 85% success
  - 15% improved
- AI
  - 33% success
  - 67% improved

- Takeaways:
  - Most common vision disorders: CI and AI
  - Proper clinical testing is needed
  - Vision Therapy can be effective
  - Prospective studies needed

IN OFFICE & HOME VISION THERAPY

CI & AI Post-TBI:
Creating a Successful Vision Therapy Program

- Integration of convergence, accommodation, saccades, visual planning and balance activities
  - Engage peripheral vision
- Patient must be motivated
- Identify patient's goals
- Combination of In-Office Therapy and Home Therapy
  - Prisms, therapeutic lenses, vectograms, tranaglyphs, Virtual Reality (VR) and Eye Tracking software
- Monocular bi-ocular and binocular activities
- Evaluate progress regularly

SAMPLE ACTIVITIES

Split Spirangle Polaroid (+/- Lenses)

Objective

◦Accommodative Rock at near

Materials

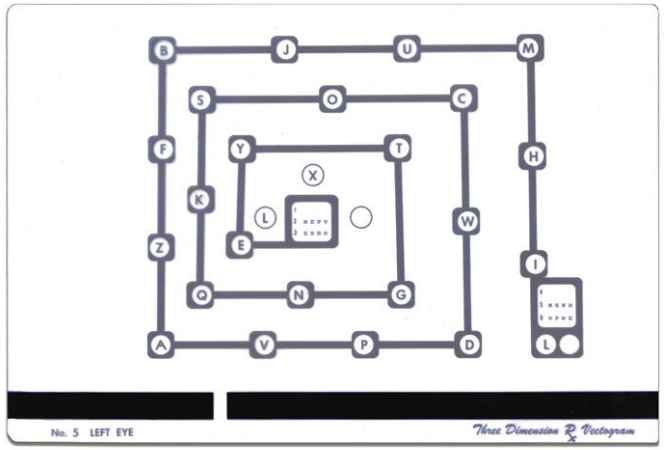
◦Fusion Slide Holder

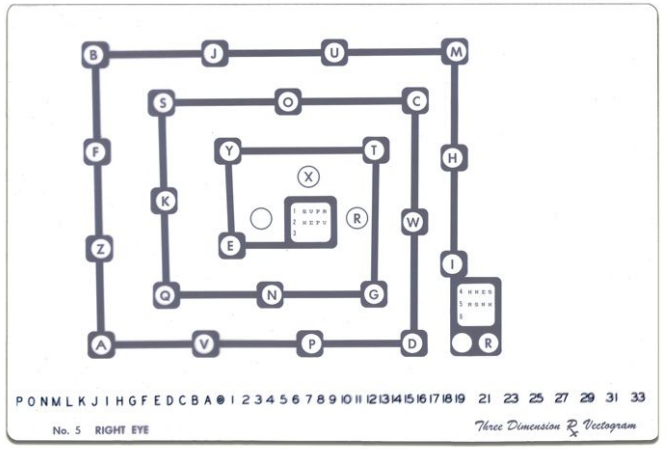
◦Spirangle Vectogram

◦Polarized 3D Glasses

◦Loose plus lens, and loose minus lens (that is 2x the amount of the plus lens)

◦List of words





https://www.bernell.com/product/SOV5/Vision_Therapy_BestSellers

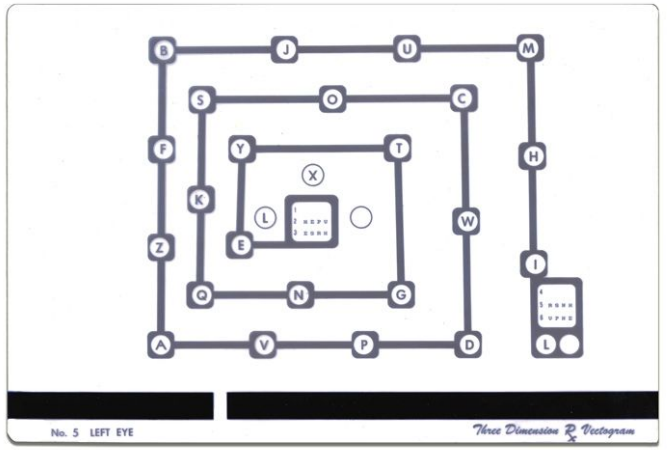
Split Spirangle Polaroid (+/- Lenses)

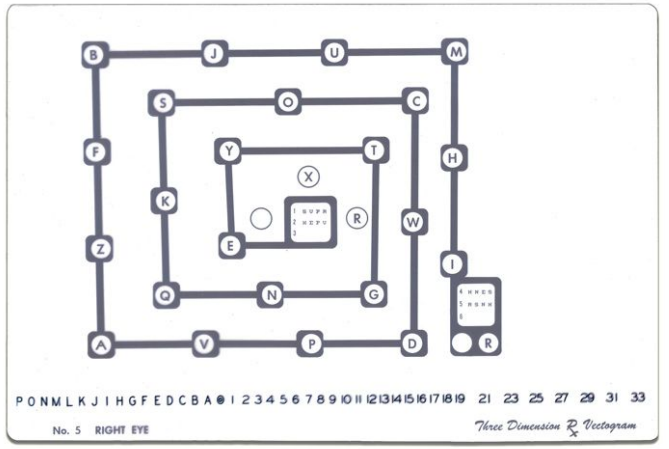
Procedure

1. Vertically align spirangle vectogram slides.
2. Attach a plus lens to one eye and a minus lens to the other eye of the polarized 3D glasses.
3. Instruct patient to spell the words on the list, alternating between the top and the bottom slide for each letter.
4. Switch the lenses and spell words from a new list.

Observations

Patient should see letters clearly on each slide.





https://www.bernell.com/product/SOV5/Vision_Therapy_BestSellers

Infinity Walk

Objective

◦To engage vestibular, peripheral vision, vergence and accommodation at distance

Materials

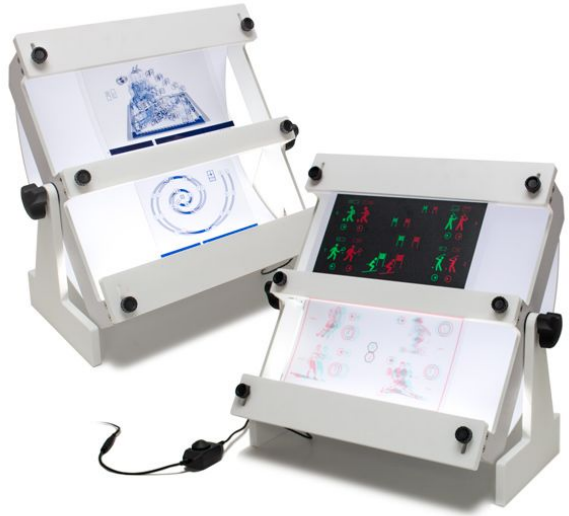
◦2 Stools

◦Fixation Target

◦Large Hart Chart for Distance

◦Bean Bags

◦Metronome



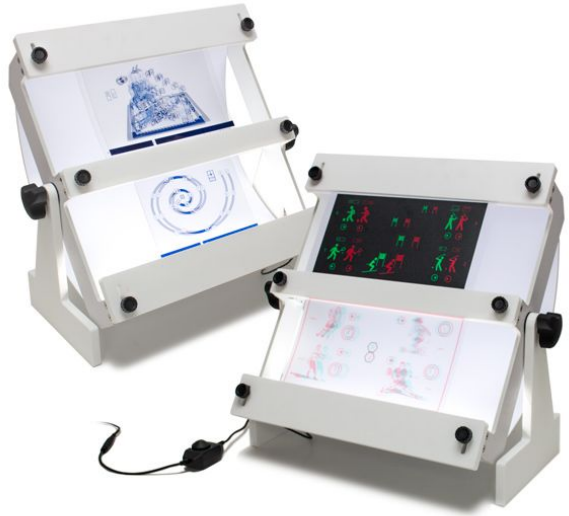
Infinity Walk

Procedure

1. On the wall post a fixation target and set two stools about 3 ft apart.
2. Level 1: Weave in and out of the two stools in an infinity shape while keeping eyes on the target posted on the wall.
3. Level 2: Large distance Hart Chart as target.
4. Level 3: Patient throws bean bags into buckets as they read the chart an walk.
5. Level 4: Target can be either a Tranaglyph or a Vectogram.
6. A metronome can be added at all levels to provide auditory stimulation.

Observations

1. Patient should engage their peripheral vision.
2. Any instance where the target becomes double.
3. Patient's body movements.



Rotating Pegboard

Objective

- Tracking, vestibular, and suppression

Materials

- Pegboard with Red/Green Shapes and Letters-

Clockwise/Counterclockwise 11rpm

- Pegs

Rotating Pegboard

Procedure

1. Level 1: As pegboard rotates, patient will find a hole and hover peg over the hole. Follow the hole for two rotations and stick the peg inside the hole after the second rotation.
2. Level 2: Add red-green glasses. Patient will follow and peg over the red and green holes.
3. Level 3: Add 30 BI Prisms with lenses on top. Plus and minus lenses can be added on top of each eye. Track the different shapes and letters on the board.
4. Level 4: Add a target (ex: Hart Chart, Line Count, Groffman Maze, etc.).

Observations

1. Patient should work on control as they track each item on the pegboard.
2. Look for signs of suppression for the red/green glasses.
3. Encourage the need to see two pegboards with BI prisms.

The Future

Vision therapy:

- Meets patients where they are in their journey
- Provides rehabilitation to equip post-concussion patients with the tools to reclaim these lost skills.
- Needs prospective research
  - Treatment
  - Effectiveness
  - Long term success

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THANK YOU!