An aerial, top-down view of a dense forest of evergreen trees covered in a thick layer of snow. The trees are scattered across a light-colored, snow-covered ground, creating a complex, textured pattern. The lighting is soft, highlighting the intricate details of the snow on the branches and the ground.

# The Role of Vision Therapy in Brain Injury Recovery

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# Disclosures

**The speaker has no financial interest in the subject matter of this presentation and is not representing any optometric community with this presentation.**

**The informational content of this presentation is intended to educate the audience on the visual aspects of their patients and by no means should substitute for comprehensive optometric vision care.**

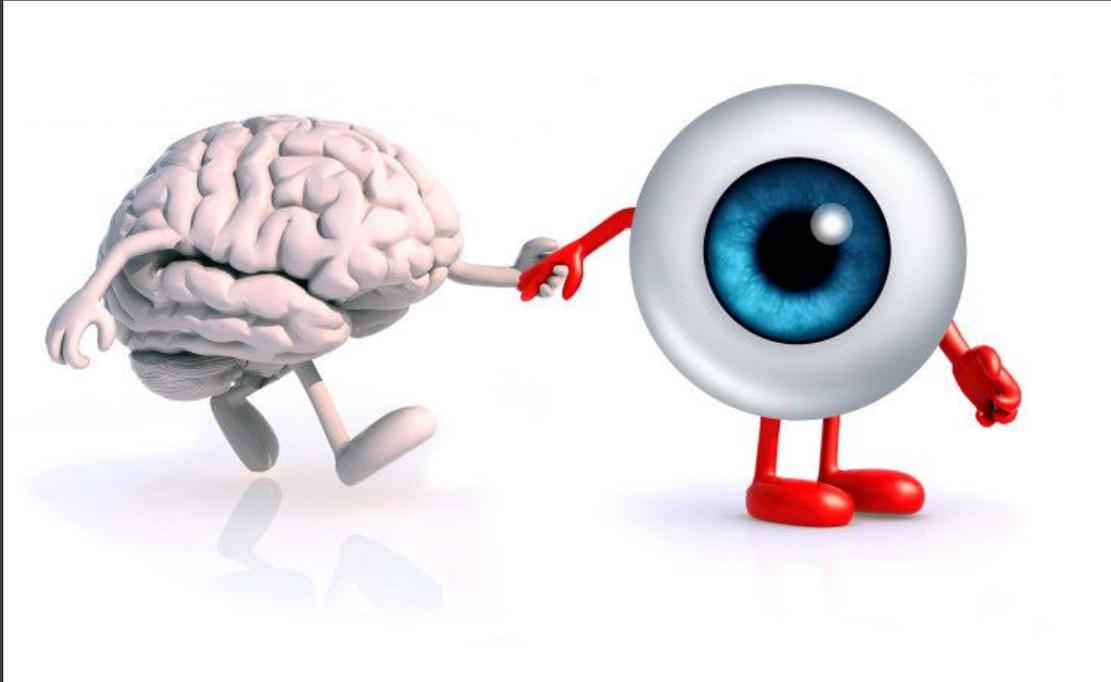
# What is a Behavioral Optometrist?

- ◎ **Behavioral Optometry**, also known as functional optometry, is an expanded area of optometric practice that uses a holistic approach to the treatment of vision and vision information processing problems. It incorporates various vision rehabilitation methods and has been characterized as a complementary alternative medicine practice.
- ◎ I work in the remediation of visual difficulties in children and adults, as well as visual rehabilitation for traumatic brain injury and stroke patients.

# Why do I work with these patients?



# What is Vision?



“A dynamic, interactive process of motor and sensory function mediated by the eyes for the purpose of simultaneous organization of **posture, movement, spatial orientation, manipulation of the environment** and to its highest degree of perception and thought.” *Dr. Padula*

- ⦿ There is neuroplasticity that allows us to change and re-map visual neural pathways.

# Learning Objectives

1. Common Visual Signs and Symptoms following a Brain Injury
1. Vision Syndromes associated with Brain Injury
1. Common treatment options for these visual deficits
1. What is Vision therapy?

# Visual signs and symptoms following a Brain Injury

- Blurred vision
- Ocular motor dysfunction (OMD)
  - Visual Hallucination (perceiving motion in patterns)
- Double vision
- Visual field loss
- Headaches with or without increased focus
- Reduced hand eye coordination
- Sensitivity to light and glare
- Reduced ability to converge and maintain convergence

# What happens when vision is not addressed?

- Vision problems start to affect other systems.
  - Ambulation- Balance or navigating different environments
  - Cognitive ability
  - Inability to function in different social situations
  - Uncontrolled reflexes
  - Emotional imbalances
  - Occupational limitations



# How Common Are Vision Problems After ABI? (Greenwald et al 2012)



- Research has documented 50-90% of individuals with ABI demonstrated visual dysfunction.
- 90% of TBI patients experience 1 or more oculomotor dysfunctions
- 40% of TBI have visual dysfunctions that persist > 3 months

# WHAT DO BINOCULAR VISION PROBLEMS LOOK LIKE TO THOSE SUFFERING?

There once was a little girl who could not read very well. She complained that the print was blurry and moving. She could not keep her place on the page. She went to her optometrist to get help. Her optometrist recommended vision therapy and told the girl that there was a solution to her vision problems. The girl began vision therapy and saw drastic improvements in her reading, writing, and most of all how she saw the world. The vision therapy made a huge difference in her life!

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# Now you try:

The consumption of soft drinks by American youth is increasing. National dietary surveys show that carbonated soft drink consumption more than doubled in youths aged 6 to 17 from about 5 ounces per day in 1977-78 to 12 ounces in 1994-98, the most recent years for which national data is available. Adolescent boys' soft drink consumption more than tripled during those years.

There are at least two negative results to this soft drink explosion. First, the use of soft drinks is likely related to the rise in childhood obesity. A variety of studies suggest that we don't eat fewer calories from other sources when we increase calories from beverages. If a child drinks 9 to 10 ounces of a soft drink, that's equivalent to almost 120 calories.

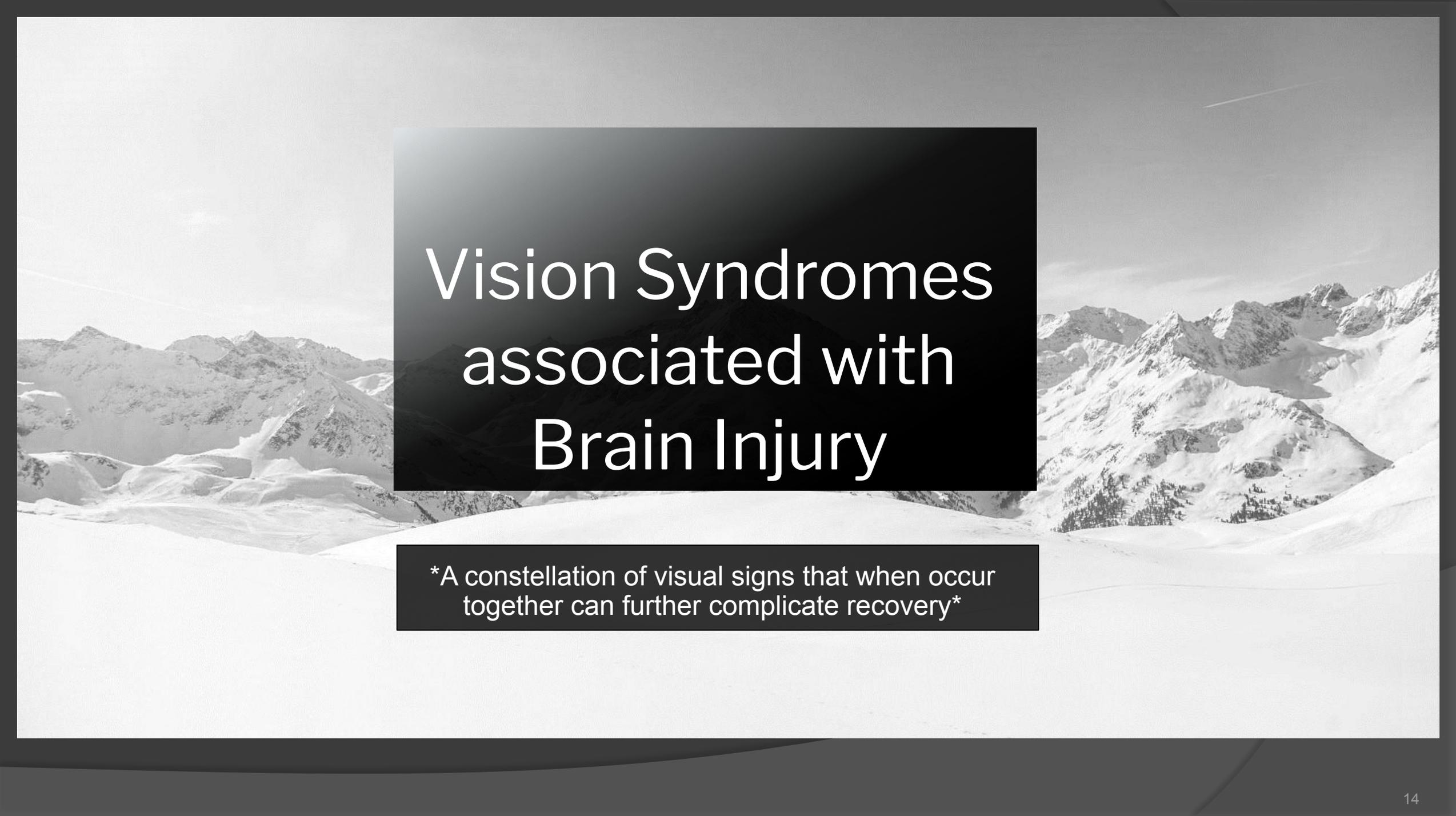
# Focusing Problem:

Failing to clean off your desk before lunch not only raises the risk of salad dressing spilling onto your work, but it could also increase your chances of getting sick. A new report shows that close to half of Americans don't clean their desks before eating at them, and a third don't wash their hands, which may foster the spread of infectious diseases like colds and flu.

Due to a shortage of the flu vaccine this year, health officials have urged the public to take measures to reduce their risk, and researchers say improving at-work hygiene and hand washing habits could have a major impact in reducing sick days. "Desks, phones, door knobs, conference tables, fax machines and other common workplace areas can be breeding grounds for bacteria-spreading germs," says Brian Sansoni, spokesman for the Soap and Detergent Association, in a news release.

# Saccadic Dysfunction/Oculomotility disorder

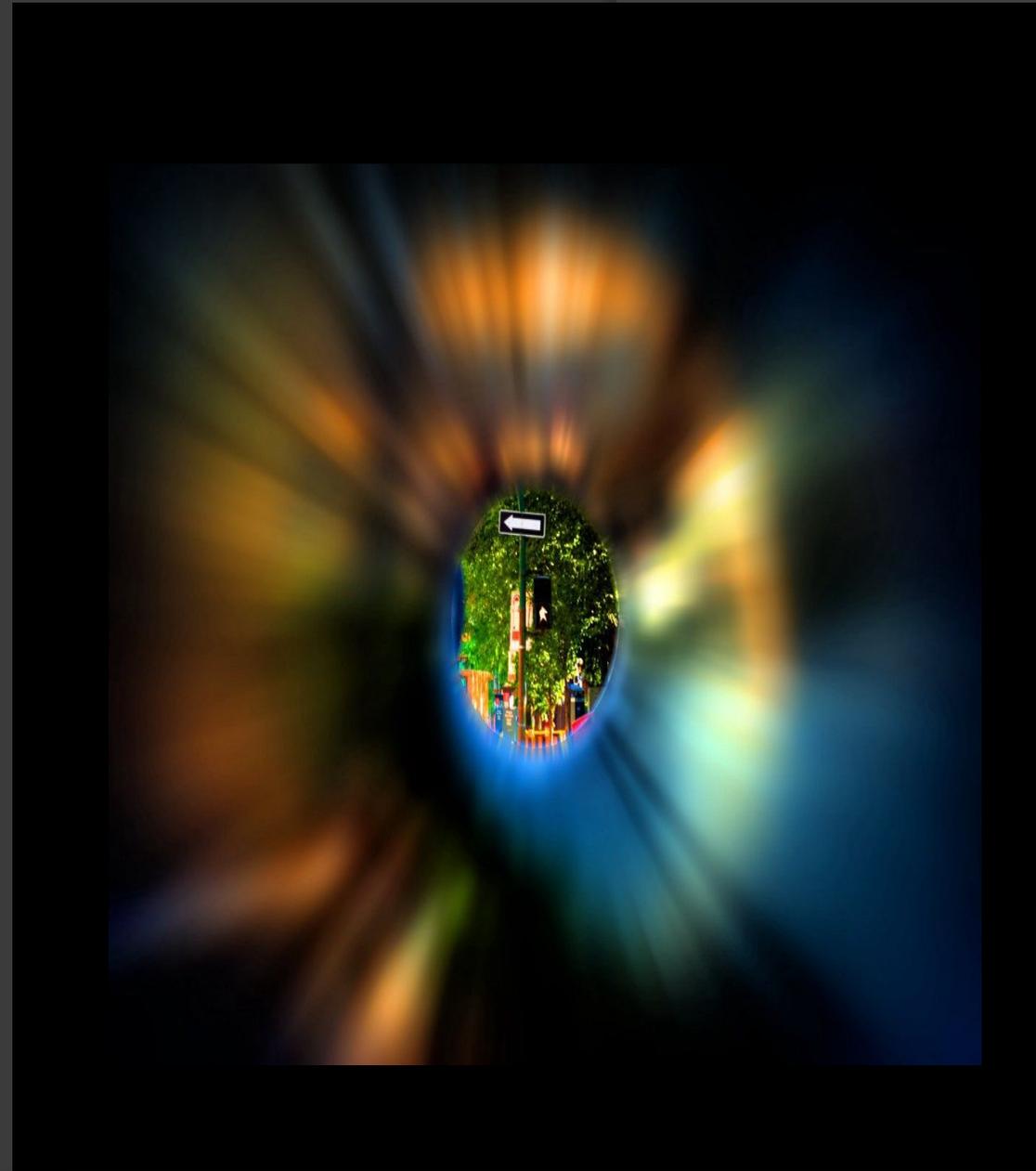
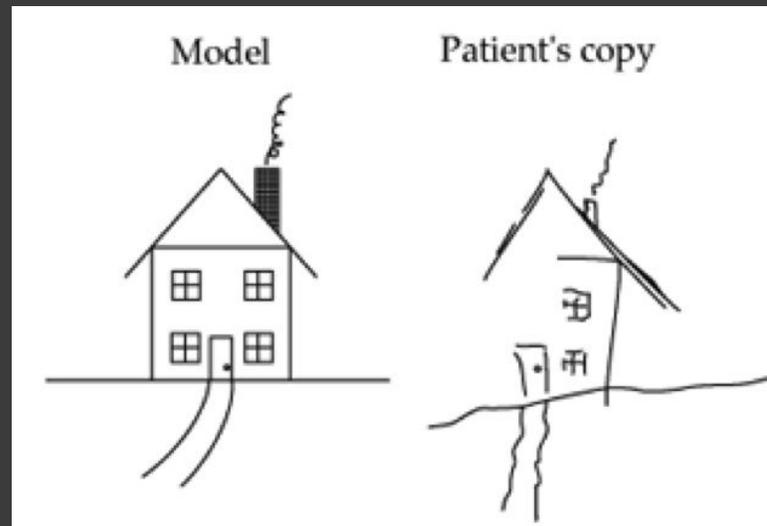
Henry looked to the right. He looked to the left. He looked up, and he looked down. Where had Frog gone? Henry did not like being alone in the forest. "Frog, where are you?" Henry called. "Please come back!"



# Vision Syndromes associated with Brain Injury

\*A constellation of visual signs that when occur  
together can further complicate recovery\*

- Post-Trauma Vision Syndrome
- Visual Mid-line Shift Syndrome
- Visual Spatial Neglect



# The most intricate part of your vision not your sight:



- Two systems of vision...
  - C3PO- Focal
    - Emotional reactive, stuck, does not move, knows a lot of information.
  - R2D2- Ambient
    - Proactive, hides quickly and pops up with solutions, moves oddly well for size and shape.

# Post-Trauma Vision Syndrome

- Syndrome that occurs when the ambient system does not work with the focal system.
- The patient is stuck with their focal system on full blast without the structure/context of the ambient system.
- The balance between vision and motor is compromised.
- Movement becomes conscious and isolates function



## What does this syndrome look like?

- Not grounded, very poor spatial awareness or control
- Hold on to walls when they walk
- Come in with sunglasses, baseball cap, very sensitive to light, sound, and motion
- Oftentimes they have been suffering for an extended period of time, which suggests this is an embedded syndrome.

# Post-Trauma Vision Syndrome

- What does it feel like?
- - Typically have searched out multiple modalities for treatment without success.
  - Depressed and often misdiagnosed with a psychological disorder, most commonly conversion disorder.
  - They often think that no one believes them.
  - If their symptoms have been there for a while, it can be an embedded syndrome in which they can develop spastic motor responses.



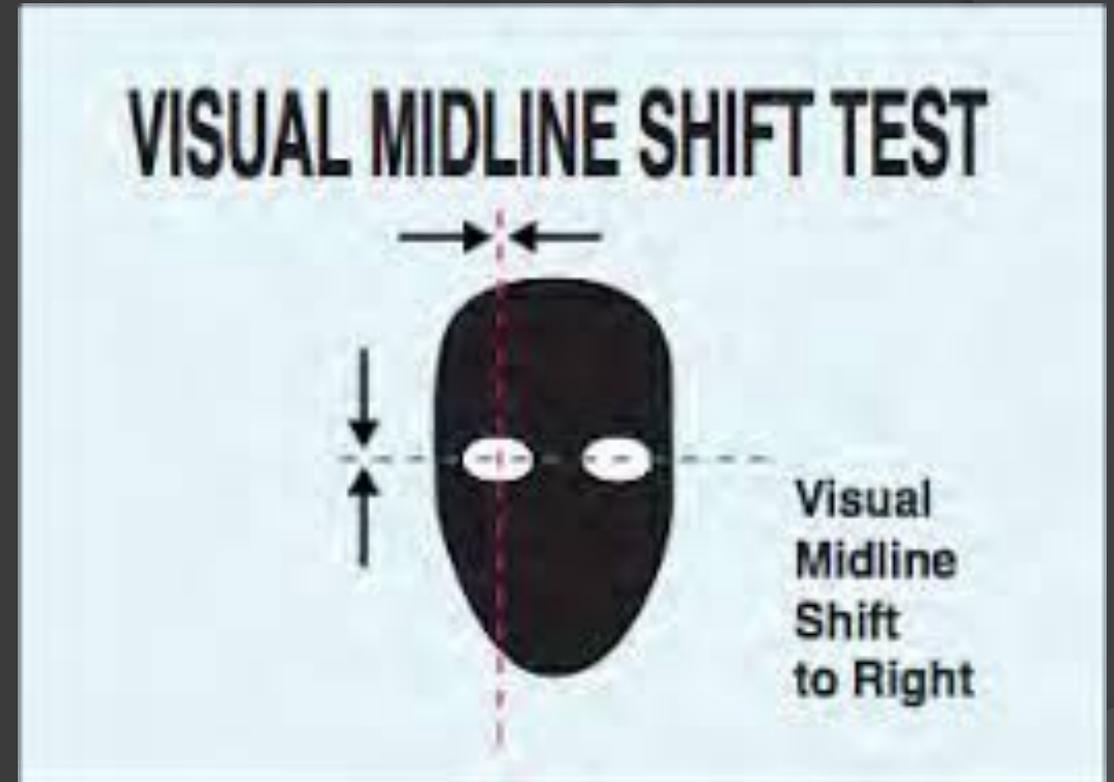
# Vision therapy/Neuro-cognitive vision rehabilitation

- Goal:
  - Re-map those neural-visual pathways to be more successful.
  - Comfortable and efficient vision
  - Ease in ability to attend and use eyes for information collection.
  - Balance in posture, focus, and attention.

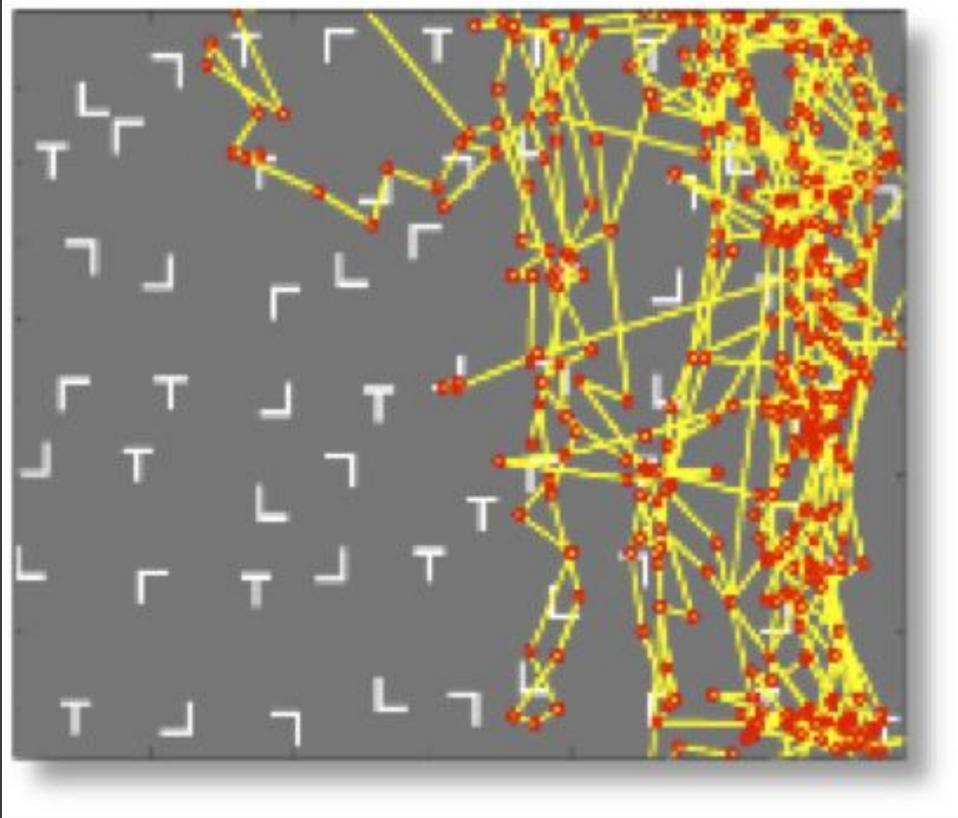


# Visual Midline Shift

- Where you think the center of his body to be.
- “The body will resolve this mismatch by leaning either toward the affected side, (uncompensated state) or away from the affected side (compensated state).” (W. Padula)
- This can be experienced as an altered posture or altered way you move through space.
- Lean and drift during ambulation correlates statistically with shift in visual midline.



# Visual-Spatial Neglect



- Failure to orient and respond to visual information presented in space contra-lateral to the side of the lesion.

1. Comprehensive 21 point vision examination
  1. Correct spectacle prescription
  2. Vision Therapy / Light Therapy
  3. Bi-nasal occlusion
  4. Prism prescription

# Common Treatment Options

For Visual Signs, Symptoms,  
and Syndromes

# What is a comprehensive 21 point vision examination?

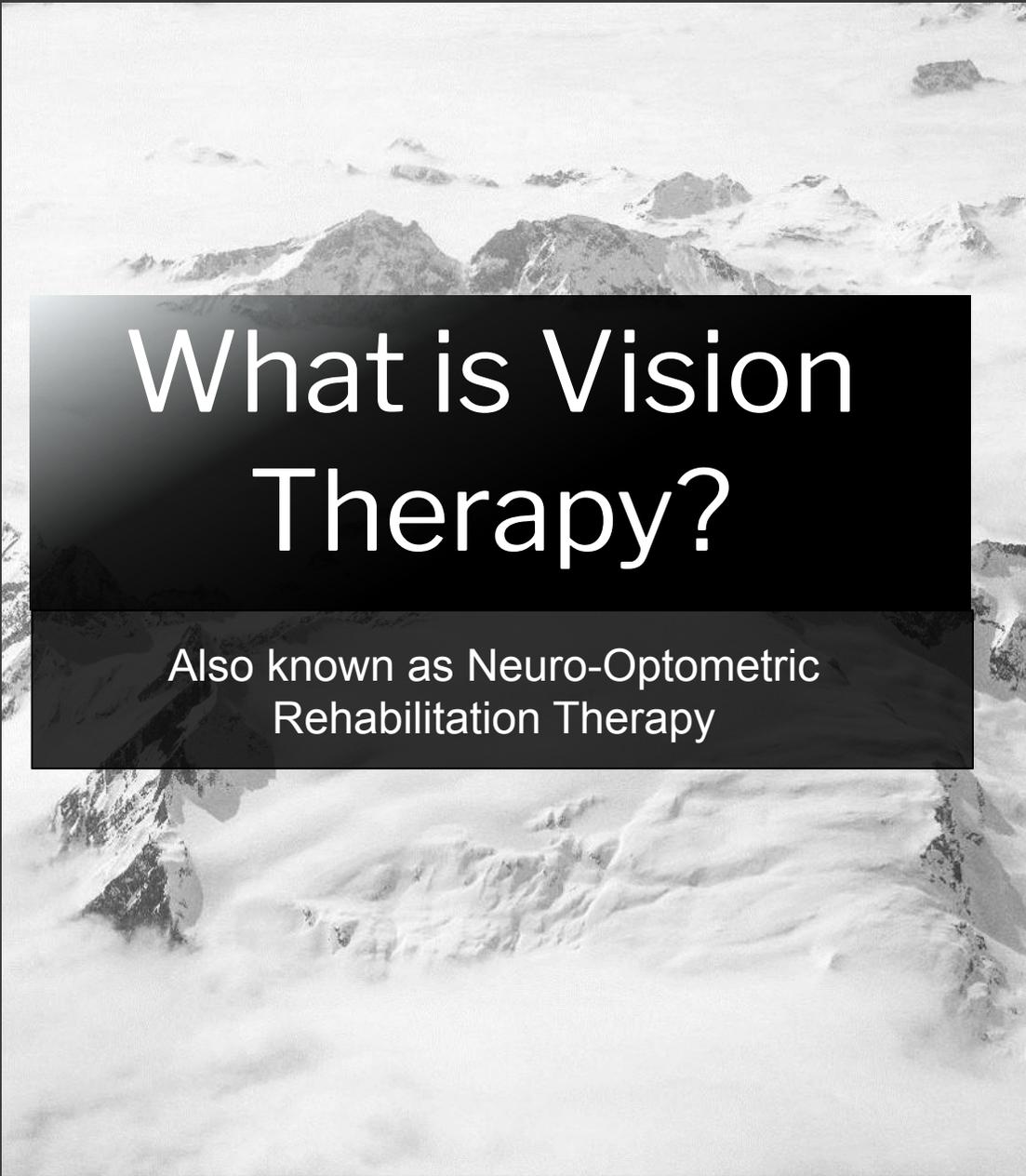
- Complete 21 point refraction which includes eye alignment, focusing assessment, convergence ability, and spectacle correction. This testing also includes assessment of depth perception, suppression, and ocular motor skills.
- Dilated fundus examination, an in-depth visual field evaluation, and a functional motion field test.
- The patient may be prescribed spectacle correction with or without bi-nasal occlusion, prisms or tints.
- Individualized treatment plan of vision therapy.
  - Typically 8 sessions of 45 minutes of therapy are recommended with spacing from weekly, bi-monthly, or monthly depending on the tolerance of the patient.
  - After that is completed a progress evaluation to re-measure any areas of concern elicited at the initial evaluation.

-Evaluate the VEP findings with Base In and Bi-nasal, to see which has a larger amplitude at p100.

-Using an OKN stimulus, I trial Bi-nasal occlusion, Base In prism, Base down prism to see what is going to decrease the patients sensitivity to the visual motion.

-Trial in office with and without ambulation if possible.

## Binasal Occlusion and Prism



# What is Vision Therapy?

Also known as Neuro-Optometric  
Rehabilitation Therapy

- A Behavioral Optometrist specifically trained to work with Brain Injury patients can help improve the flow and processing of information between the eyes and the brain.
- Vision therapy can be practical and effective. The optometrist prescribes a treatment regimen incorporating lenses, prisms, low vision aides and specific activities designed to improve control of a person's visual system and increase vision efficiency.



- There are many types of vision exercises that are employed to strengthen basic visual skills, perceptual visual skills, focal and peripheral integration, as well as visual cognitive skills.
- Just like many occupational therapist and physical therapist, those who work in vision therapy have a large tool bag of exercises and ideas we use to improve a patients signs and symptoms.
- Several recent studies/articles prove that vision therapy can improve a patients visual skills by 85% or better.

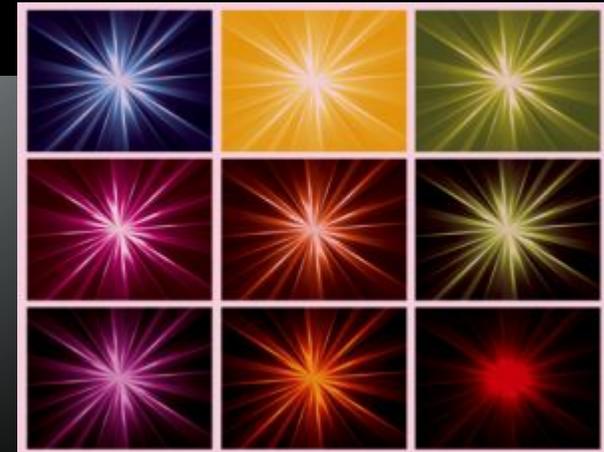
- **Vision therapy Protocols for common visual syndromes associated with TBI/ABI**

**3 parts of a session**

1. Stimulate peripheral motion and try interventions to improve tolerance

2. Peripheral activity without motion that they can control, to open up their periphery.

3. Hand eye coordination task to drive motor planning.



A black and white photograph of a snowy winter landscape. The scene is filled with falling snow, creating a soft, hazy atmosphere. In the foreground, several evergreen trees are covered in a thick layer of snow. The background shows a dense forest of similar trees, also heavily laden with snow. The overall mood is serene and quiet.

Neuro-Optometric Rehabilitation therapy  
can help patients through the “snow  
storm” of visual difficulties and teach them  
to appreciate the world around them,  
again.

# Questions?



# References

- Christenson GN1, Winkelstein AM. Visual skills of athletes versus nonathletes: development of a sports vision testing battery. *J Am Optom Assoc.* 1988 Sep;59(9):666-75.
- <http://www.ucalgary.ca/pip369/mod4/spatial/testingsensitivity>
- The King–Devick test is a valid and reliable tool for assessing sport-related concussion in Australian football: A prospective cohort study. *Journal of Science and Medicine in Sport* · March 2018
- Subotic, A., Ting, W., & Cusimano, M. Characteristics of the King-Devick test in the assessment of concussed patients in the subacute and later stages after injury. *PLOS.* August, 31, 2017
- K.M. Galetta, MS, J. Barrett, M. Allen, OD, F. Madda, MD, D. Delicata, MD, A.T. Tennant, EdD, C.C. Branas, PhD, M.G. Maguire, PhD, L.V. Messner, OD, S. Devick, OD, S.L. Galetta, MD, and L.J. Balcer, MD, MSCE. The King-Devick test as a determinant of head trauma and concussion in boxers and MMA fighters. *Neurology.* 2011 Apr 26; 76(17): 1456–1462. Published online 2011 Feb 2. doi: 10.1212/WNL.0b013e31821184c9
- Christina L. Master, MD, CAQSM1,2, Mitchell Scheiman, OD3 , Michael Gallaway, OD3 , Arlene Goodman, MD, CAQSM4 , Roni L. Robinson, RN, MSN, CRNP1 , Stephen R. Master, MD, PhD5 , and Matthew F. Grady, MD, CAQSM1,2 Vision Diagnoses Are Common After Concussion in Adolescents
- de Faria JML, Katsumi O, Arai M, *et al* Objective measurement of contrast sensitivity function using contrast sweep visual evoked responses. *British Journal of Ophthalmology* 1998;82:168-173.
- Ciuffreda et al. (2014). Proposed Objective Visual System Biomarkers for Mild Traumatic Brain Injury (mTBI). *Military Medicine.* 179.
- Craig et al. (2008). Profile of selective aspects of visually-symptomatic individuals with acquired brain injury. A retrospective study. *Journal of Behavioral Optometry.* 19(1).
- Curtis, S. (2018). Association of functional color field changes with imbalance, spatial misjudgment, and nausea in the treatment of post-concussion syndrome patients. *Journal of Optometric Phototherapy.*
- Kapoor (2002). Vision disturbances following traumatic brain injury. *Current treatment options in neurology.* (4) 271-280.
- Gallaway M<sup>1</sup>, Scheiman M, Mitchell GL. (2017). *Optom Vis Sci.* Jan;94(1):68-73. doi: 10.1097/OPX.0000000000000935. Vision Therapy for Post-Concussion Vision Disorders.
- Groce, A., & Bansal, S. (2016). Optometric Management of Sports-related Post-concussion Visual Symptoms in Teenagers with Vision Therapy: A Case Series. *Florida Vision Development & Rehabilitation* Volume 2, Issue 1

Thank You for  
your time and  
attention

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