



NEUROVision
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How many fingers do you see?

Vision and Brain Injury



Why

“I have had the experience of Post Trauma Vision Syndrome symptoms. I was unable to focus; my brain felt in a fog. I was dizzy, nauseous and exhausted. My eyes were out of sync with my head movements. When I moved my head, my eyes and vision would lag behind. I couldn’t read or watch TV. Lights were painfully bright. My vision would blur in and out. Being in a car was agonizing. Watching things moving around me was nauseating. I struggled to find somewhere to look that didn’t make me feel sick or anxious.

Over the years I have had many people come through my practice with a collection of symptoms similar to these. Many of these people have been suffering like this for years after a head injury, finding it increasingly difficult to cope and manage. Many people are not aware of having had a head injury yet have all the same symptoms. Many have been searching for solutions and have come up empty over and over again. Many people don’t realize what they are experiencing has a real physical cause, that they’re not imagining it. And they don’t realize that it’s often because something is out of synch with their visual process in the brain that never fully recovered.

When I can do something to make someone’s life easier; when people tell me they feel noticeably better; when I help them be able to read again and re-engage in their life, I know this is worth while. And that is why I do this.”

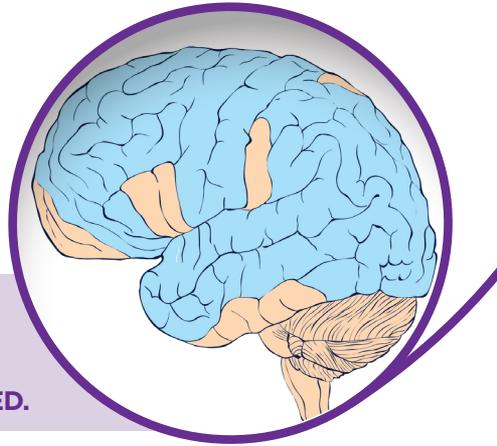
– Dr. Coralee Mueller, Optometrist in Vision Development

VISION HAPPENS IN THE BRAIN

You see with your brain through your eyes.

- 35 different brain areas are primarily involved with vision.
- 16 brain areas just to move your eyes from point A to point B.

We have visual brains. More area of the brain is involved in processing vision than all of the other senses COMBINED.



POST TRAUMA VISION SYNDROME

Post Trauma Vision Syndrome is a disruption of the visual process in the brain after an injury or trauma, resulting in problems seeing.

Causes of Post Trauma Vision Syndrome

- acquired brain injury
- closed head trauma
- concussion/mild traumatic brain injury
- whiplash
- stroke

You don't need a head injury to have a brain injury.

The visual process is neurological. Vision and coordination of binocularity happens in the brain. When there is a closed head trauma the disruptions that affect the neurons and axons in the brain can affect the visual process as seen in Post Trauma Vision Syndrome. The neurological conditions manifest in the ocular and visual symptoms.

20% of people with concussions will not have recovered after 3 weeks without intervention.

Start rehabilitation between 10 days and 3 weeks.

Common

- headaches
- eye pain
- double vision
- dizziness
- nausea
- light sensitivity

Symptoms

- problems focusing
- trouble reading
- visual fatigue and overwhelm
- poor balance
- problems with perceived movement and motion



Common Conditions

1. Convergence insufficiency

(the brain points the eyes out instead of inward when looking close up)

Reduced convergence at near point is a common finding after concussion. It is found to be associated with neurocognitive impairment. It is found to cause visual discomfort which is reflected in a higher convergence insufficiency symptom score. It also causes vision mediated functional difficulties like slowed reading and compromised attention, which can impair work performance.

2. Oculo motor dysfunction

(the brain doesn't move the eyes smoothly or accurately when looking around or when reading)

This can be a saccadic dysfunction which is a breakdown in the brain's ability to control the eyes to make a saccadic eye movement from one place to another. This can also be a pursuit dysfunction where the brain loses the ability to make a smooth eye movement to follow an object as it moves.

3. Vergence dysfunction

(the brain doesn't coordinate the eyes together properly when moving between far and close range)

This happens when the brain doesn't move the eye muscles freely inward and outward to reposition the eyes to look at different distances. Vision can appear blurred and double at varied times, making it difficult to read or focus.

4. Accommodative dysfunction

(the brain doesn't focus vision clearly when looking close or when shifting between far and close)

This can cause near or far vision to blur in and out and can take a prolonged time for vision to focus.

5. Visual midline shift

(perceived vertical midline position is misaligned with the physical midline position of the body, resulting in Vertical Midline Shift Syndrome – VMSS)

This indicates a mismatch and lack of communication between central and peripheral processing systems. Visual midline can be shifted left or right, up or down. When shifted, it can cause a person to posture their body weight to either side, front or back. The common symptoms of VMSS frequently include diplopia (double vision), perceived movement of print or stationary objects, headaches, and photophobia (light sensitivity). It can also affect balance and walking.

6. Ambient Visual Disturbance, Central/peripheral processing dysfunction

(the brain is not using information from centre and side vision together)

The central visual system, also known as the focal system, is processed in the ventral processing stream of the brain. The peripheral system, also known as the ambient system, is processed in the dorsal processing stream of the brain. Many of the binocular vision problems following a concussion are caused by a dysfunction in the ambient visual process – which is part of the neural sensorimotor feedback loop – rather than an oculomotor disturbance. Cortical binocular integration is influenced by dysfunction in ambient visual process.

7. Visual perception dysfunction

(the brain is not interpreting visual information accurately)

This happens when the brain is not making sense of the signals from the visual system. This can result in confusion and not understanding the world properly.

Thanks to neuroplasticity, the brain can change itself at any age. We are able to repair the damage and promote recovery from Post Trauma Vision Syndrome. Using Optometric Vision Therapy and Neurological Reorganization, there is hope to regain function and resume active life.

References

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Dr. Coralee Mueller is an Optometrist in Vision Development. She is the founder of NeuroVision Therapy Clinic and practices through Behavioural and Neuro-Optometric assessment. She is a Fellow with the College of Optometrists in Vision Development, Board Certified in Rehabilitative Optometric Vision Therapy and a Certified NR Practitioner. She is a Clinical Associate with the Optometric Extension Program Foundation, the Neuro-Optometric Rehabilitation Association, and a member of Canadian Optometrists in Vision Therapy and Rehabilitation.



Dr. Mueller completed her Doctor of Optometry with Honours from the University of Waterloo in 2001. In 1997, she graduated from the University of Western Ontario with an Honours Bachelor of Science double major in Physiology and Psychology, with Distinction. Throughout her university career she was involved in vision research and received numerous awards for academic achievement and research.

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