

As Many as 50% of Patients with a Neurological Injury or Impairment Suffer from Changes to Vision

Vision is more than just 20/20 eyesight. It is a complex, learned and developed set of functions that involve a multitude of skills. Research estimates that 80-85% of our perception, learning, cognition and activities are mediated through vision.

Visual processing involves the eye and the brain. Visual processing can become impaired in patients with neurological impairment or injury. The flow of information between the eye and the brain is often jumbled after a brain injury. As many as 50% of patients with a neurological injury or impairment suffer from changes to vision and many of these patients go undiagnosed.

Examples of conditions that warrant a Neuro-Optometric evaluation include:

- Traumatic or acquired brain injury
- Stroke
- Multiple Sclerosis
- Cerebral Palsy
- Brain tumor

Many individuals who suffer from a traumatic or acquired brain injury experience visual complications including problems with binocular vision, oculomotor skills, spatial localization, concentration, and visual motor tasks. These individuals often have “normal” results at a basic eye examination because visual processing problems are not always as obvious as eyesight problems. A patient may have 20/20 eyesight but can still be suffering from a visual processing problem.

Hidden visual processing problems can cause rehabilitation to take longer or be less successful if they are not recognized and treated.

Post Trauma Vision Syndrome:

Following a neurological event, vision imbalances can occur between the focal

(central) visual process and the ambient (peripheral) visual process. This can affect balance, posture, reading, attention, concentration, and cognitive function in general.

Symptoms of Post Trauma

Vision Syndrome include:

- blurred vision
- double vision
- light sensitivity
- disorientation in crowded places
- reading problems such as movement of print on the page or poor reading comprehension
- poor spatial judgement
- impaired depth perception
- loss of peripheral vision
- poor visual memory
- headaches with visual tasks
- limited concentration or attention

Neuro-Optometric rehabilitation optometrists can diagnose and treat visual processing problems that appear after brain injury. They work closely with a rehabilitation team such as occupational, physical, and speech therapists so that visual problems do not limit success in recovering from a brain injury.

The Neuro-Optometric evaluation includes:

- Extensive history
- Complete refractive evaluation
- Complete ocular health evaluation
- Oculomotor skills
- Eye teaming skills
- Accommodation function
- Visual spatial testing and visual midline testing

Neuro-Optometric Rehabilitation is an individualized treatment regimen for patients of all ages who have experienced neurological insults. A Neuro-Optometric Rehabilitation treatment plan improves specific acquired visual dysfunction determined by standardized diagnostic criteria.



Treatment regimens may include:

- eyeglasses or contact lenses to improve eyesight
- bifocal eyeglasses for better focus, flexibility and reading
- special lenses to expand peripheral awareness
- specialized filters or prism to eliminate double vision
- prism lenses to improve spatial orientation
- prescribed vision therapy activities.

Visual Problems Resulting from Brain Injury and Stroke

Although there are many visual problems that arise from brain injury and stroke, three are more devastating and impairing than the rest. These are visual field loss, intractable double vision, and visual/balance disorders.

Visual Field Loss

With a visual field loss the patient is blind to a certain area of their field of vision. This places the person at increased risk of further injury and harm from bumping into objects, being struck by approaching objects, and falls.

A two-fold approach is used to treat visual field loss. Visual rehabilitation activities are prescribed by the doctor and administered by a therapist to teach scanning into the area of field loss.

Special visual field awareness prism lenses can also be used in treating visual field loss. As the patient scans into the prism, the optics are shifted so as to perceptually gain about 15 to 20 degrees of visual field recognition. These are used as spotting devices to determine if there is an object in the periphery that deserves further visual attention. When such an object is spotted, the patient turns their head to view it in detail with their intact central vision.

Double Vision (Diplopia)

Double vision (diplopia) is a serious and intolerable condition that can be caused by strabismus, cranial nerve palsy, or decompensated binocular skills in patients with brain injury, stroke and other neurologically compromising conditions. Prisms, lenses and/or vision therapy can oftentimes help the patient achieve fusion (alignment of the eyes) and alleviate the double vision while using both of the eyes together.

Patching has also frequently been used to eliminate the double vision. Although patching is effective in eliminating double vision, it causes a reduction of the peripheral field of vision and it also causes a loss of depth perception. These limitations can directly cause problems in eye hand coordination, depth judgments, orientation, balance, mobility, and activities of daily living such as playing sports, driving, climbing stairs, crossing the street, threading a needle etc.

Visual Balance Disorders

Visual balance disorders can be caused by a Visual Midline Shift Syndrome (VMSS), oculo-motor dysfunction, nystagmus, and disruptions of central and peripheral visual processing. Visual Midline Shift Syndrome is a condition that affects balance, posture, orientation and mobility can occur following TBI and stroke. In VMSS, a persons' visual perception of the world will appear compressed in one portion and expanded in another. Their perception of the world will appear slanted, or tipped, and walls may

appear bowed and distorted. Balance is disrupted when attempts are made to orient to that perception of the visual world.

The treatment will depend on the visual diagnosis and etiology. Lenses, prisms and visual rehabilitation activities are used in the remediation of these disorders.

Diopsys

The Diopsys® NOVA-VEP Vision Testing System helps eye care professionals detect vision defects, including glaucoma and other neuro-visual disorders. The Diopsys® NOVA-VEP Vision Testing System is a painless, non-invasive vision test that objectively measures the function of the entire visual pathway from the eyes to the visual center of the brain. The Diopsys® NOVA device does this by using a technology called Visual Evoked Potential (VEP). VEP has been demonstrated to aid in the diagnosis and treatment of many disorders including amblyopia, brain injury, stroke, glaucoma, multiple sclerosis, and other vision-related issues. The purpose of this series of tests is to provide comprehensive diagnostic information to better plan your treatment and monitor the results.

Visual evoked potential (VEP) directly measures the electrical activity in the vision system. When light from an image enters our eye, it is converted into electricity at the retina and travels through the optic nerve and other pathways to the part of our brain that processes vision, the visual cortex. The VEP technology in the Diopsys® NOVA device helps us determine how your eyes communicate with your brain in a way that no other instrument or vision test can.

By using Visual Evoked Potential technology, we can measure the entire vision system, from the front of the eye to the visual cortex of the brain, without the patient having to say a word.

The doctor will review the profile of your eye-brain signals to help diagnose visual pathway disorders as well as to help determine how your treatment is progressing.

The Diopsys® NOVA-ERG Vision Testing System is an office-based pattern electroretinography (pERG) module – a part of the Diopsys® NOVA suite of tests. The pERG is an evoked potential test that measures the function of the retina. Patients view a screen with a reversing horizontal grating pattern to elicit a pERG response. Pattern electroretinography helps doctors gain objective information about the performance of the inner retinal cells of the eye, especially in an area of the retina called the macula. This information can help optometrists and ophthalmologists diagnose and monitor vision disorders like glaucoma, macular degeneration and diabetic maculopathies.

The optometrist's job is to stabilize and reorient the visual system to help increase outcomes in other areas of rehabilitation. In order to help the patient recover to his or her fullest potential, it is important for PTs, OTs and ODs to work together to treat any visual dysfunction that exists.

For more information about Neuro-Optometric Rehabilitation, contact:
Dr. Kellen Pathroff
Eye Center of the Dakotas
701-224-0661
FAX: 701-224-0663
e-mail: kpathroff@od.sco.edu

*Eye Center
of the Dakotas*

1221 W. Divide Ave.
Bismarck, ND 58501
701-224-0661
FAX: 701-224-0663
eyecenterofthedakotas.com
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