



NEUROVision
CLINIC
CONCUSSION REHAB
PERFORMANCE ENHANCEMENT



Assessments & Therapy



"In grade three when we started reading from chapter books, I started having difficulty. I would see the words would swim on the page. I couldn't tell where I was looking on the page. I would skip lines and lose my place. My head would ache, I'd feel dizzy and nauseous. I thought this was normal. I thought that this was what reading was like for everyone, so I never mentioned it to anyone, but I decided to avoid reading from then on. When I was forced to read, I was noticeably slow and had trouble with fluency and comprehension. I also started having trouble paying attention in class. I had no idea what was being taught, or what I was supposed to be learning. I felt completely lost, unfocused, and distracted by everything. I found many ways to compensate, which I had to keep reinventing as situations would change.

I never could figure out how people read fluently. I tried every different possible thing I could think of. It would never cease to amaze me to witness people actually reading fluently. I couldn't imagine how that was possible. In University it became quickly apparent to me that I had two options: find a way to get through all the textbooks, or flunk out. My compensating strategies kicked into high gear, and although it would take me 8 to 10 hours to get through a chapter, I found a way. At this point, I started seeing double, and the words would blur in and out of focus. This was my first realization that I had a vision problem, even though I have 20/20 vision. It inspired me to go to Optometry School, and subsequently for a Fellowship with the College of Optometrists in Vision Development.

I know what it feels like to not feel smart because you don't read fluently and have poor spelling. I know what it feels like to be the last one picked for the gym class soft ball team because you're uncoordinated and miss the ball. I know what it feels like to struggle because your visual process is letting you down. I know there are solutions to these visual dysfunctions that can provide an opportunity for a better and easier way; an opportunity for greater possibility. And that is why I do this."

– Dr. Coralee Mueller, Optometrist

OUR PERSPECTIVE

At Neurovision we assess vision from a developmental and behavioral perspective. We look for aspects of how the visual process can affect behavior. We also look at how well a person has learned to use their visual process.

We provide in depth functional vision assessment in:

- vision development
- vision & learning
- special needs
- crossed & “lazy eyes” (strabismus & amblyopia)
- brain injury/concussion

These Assessments are very lengthy and extensive, going beyond a general eye exam in:

- eye muscle coordination
- eye-strain
- focus change
- visual attention
- central & peripheral visual function
- visual perception
- vision & balance.

Someone with deficits in these areas will not uncommonly pass a general eye exam, including binocular vision testing in a general exam.

You need more than 20/20 eye sight to:

- ride a bike
- pick up a glass of water
- catch a ball
- read a book
- basically anything you do with your eyes open

Having 20/20 vision does not mean perfect vision. It means average expected eyesight.

The purpose of vision:

- derive meaning & direct action
- two eyes in the front of our head connect to the brain for binocular vision
- gives us superior ability to locate where things are around us and know how far or close they are to us.



We see with our brains not our eyes. Eyes are the brain's window to look through. Comparing the visual system to a computer system: the eyes are the hardware, the brain is the software. We assess both the hardware and the software.

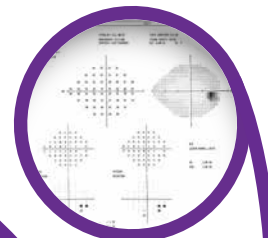
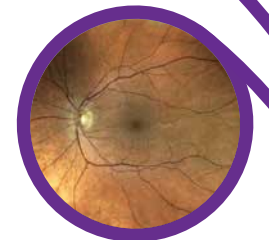
Ensure Healthy Eyes:

The Hardware

- It is of paramount importance to ensure that the eyes and eye muscles are healthy, free of disease and structurally intact.
- We use one of the most technologically advanced imaging systems.
- Detect sight-threatening conditions through retina photography combined with fundus autofluorescence to look deeper into the underlying tissues.

The Software

- A large portion of the brain is involved in the visual process which are the programs in the brain that allow us to see and use our vision efficiently.
- We check for structural damage or disease along the visual pathway in the brain by way of visual field assessment.
- The visual process involves:
 - the ability to make a clear image at distance and near
 - coordinating the eyes to move smoothly together
 - steady focus
 - moving the eyes to focus across various distances
 - knowing where you are in space, synchronized vision and balance
 - identifying objects
 - locating where things are
 - creating an accurate motor output (eye-body & eye-hand coordination)
 - visually directed motion.



VISION AND LEARNING

Do you know someone with a learning disability, or someone who seems like they should be performing better in school than they are based on their expected ability? Do you know someone who avoids reading, or who gets headaches or eye aches when reading? Reading requires a tremendous amount of visual skill that not everyone has learned or developed regardless of intelligence. These skills can also be lost due to a head injury or concussion.

a child who sees like this has 20/20 vision

LEARNING RELATED VISION PROBLEMS: when there is a learning disability there is often a concurrent deficit in visual skill that acts as a further impediment to learning. Also, a child does not need to have a learning disability to have learning related vision problems. If a child is having trouble reading or avoids reading regardless of whether or not they are performing at grade level, there is a possibility they are struggling with dysfunction in their visual skill. Our visual examination for learning related vision problems is designed to assess the functional aspects of the visual process as it relates to academics such as: learning, reading, math, writing, and classroom performance.

a child who sees like this has 20/20 vision

SKILLS ASSESSMENT INCLUDE:

- fixation
- tracking
- visual perception
- visual reversals
- near vision strain
- focus change
- vision & reading
- central-peripheral visual integration
- sensory & motor fusion
- visual motor integration

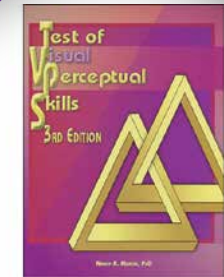
When the visual system is straining to look up close it is usually a losing battle to try and prolong the activity. Eyestrain is a major underlying element for visual skill dysfunction.

a child who sees like this has 20/20 vision

OCULOMOTOR DYSFUNCTION & ATTENTION: fixation and tracking are terms that can be used to describe different aspects of the saccadic and pursuit eye movement systems:

- pursuits – following visual information smoothly
- saccades – shift the eyes and attention exactly from one target to another.

The control of shifting visual focus correlates directly with shifting and controlling visual attention. For proper visual skill, the fixation needs to be steady, controlled, on target, with both eyes aligned at the same point in space. It also needs to be moved smoothly or shifted accurately.



VISUAL PERCEPTION ASSESSMENT

Standardized Testing using the Test of Visual Perceptual Skill (TVPS) 3rd edition:

- visual discrimination
- spatial relations
- figure ground
- visual closure
- visual memory
- form constancy
- sequential memory

These are the aspects of our visual process that allow us to interpret, understand and make sense of what we see.

Visual Reversal: often manifests in reversing letters and numbers or confusing letters such as b's and d's.

- related to laterality and directionality
- internal sense of left and right sides in the body and projecting left and right into space

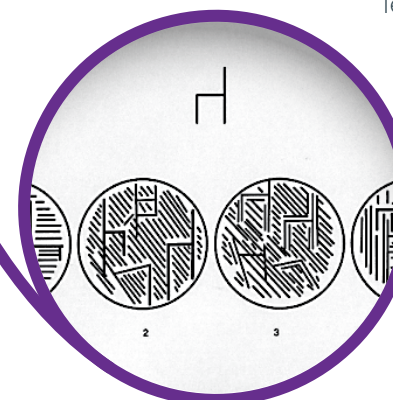
Visagraph Eye Tracker:

- objectively measure and assess the eye movement coordination while reading
- to see how someone is using their eyes when reading

- grade level equivalent score

which is based on normative data

As our visual skill improves so does our eye movement coordination while reading. This is seen as increased reading speed and fluency.



STRABISMUS AND AMBLYOPIA

STRABISMUS & AMBLYOPIA DEFINED: When a visual dysfunction occurs such that an eye turns in or out it is called strabismus. Amblyopia refers to reduced vision through an otherwise healthy eye. These have a profound effect on depth perception and three-dimensional vision. When someone has amblyopia, there is a much greater risk of losing vision in the dominant eye, so it is important to address.



UNDERSTANDING STRABISMUS IN THE BRAIN: We understand that the software in the brain controls the eye muscles that position and align the eyes. We check to see if the muscles have any physical restrictions or limitations. When the eye muscles are in tact (no hardware damage), we understand that the reason for the eye turn is in the brain, and that the brain is telling the eye to be in a turned position. In my model of vision, the eye turn is a symptom of an underlying problem where the brain is actively using one eye to shut off the other one. This is called suppression. The brain is attempting to reduce visual confusion from inability to integrate the right and left eye information together.

TREATING STRABISMUS & AMBLYOPIA: When we assess a person with strabismus and/or amblyopia, we are looking at it from the perspective of addressing the underlying suppression, and looking for ways to encourage both eyes to engage in seeing together. When giving a prescription lens for these conditions, we know that the lens strength that allows both eyes to cooperate better is not necessarily the lens strength that gives the sharpest vision in each eye. We also expect that the lens strength that gives better binocular cooperation will ultimately allow the potential for better vision including clarity in each eye. Traditional patching an eye doesn't allow for development of using both eyes together. Based on neuroscience, we opt for newer patching alternatives that have shown benefits to building binocular vision through antisuppression.



TRAUMATIC BRAIN INJURY

POST TRAUMA VISION SYNDROME: If you've ever known someone who's had a concussion, you may have noticed that they typically have vision problems afterward along with other symptoms such as headache and dizziness. They might see double, have difficulty focusing, lose track of lines when trying to read, or have trouble looking at objects that are in motion. This is because the visual system is often significantly affected by concussion. Eye muscle coordination and visual processing skills are likely to be compromised when the brain is hurt in concussion because so much of the brain is used for vision and eye control. This is usually not related to the ability to see 20/20.

IMPARED FUNCTION: When there is a direct blow to the head, or whiplash, often there is functional damage to the visual process in the brain. Not uncommonly, there is no structural damage to the eye or brain so all structural tests appear normal. However, there can be profound functional loss that won't necessarily be detected in a general assessment. Also, there can be a sudden mismatch induced between the vision and balance systems.

ASSESSMENT INCLUDES:

- near and far visual focus
- focus change
- fixation-tracking (saccades-pursuits)
- visual midline shift
- visual perception
- central-peripheral integration
- vestibular-ocular connection



TREATMENT POSSIBILITIES FOR VISUAL SKILL DYSFUNCTION



Glasses or Contact lenses

As Optometrists in Vision Development with a behavioral perspective, we recognize the power of lenses to encourage natural development and improve performance by reducing eyestrain and visual stress. We will also use the more commonly known lenses to compensate for nearsightedness, farsightedness, and astigmatism as needed, however we focus on lenses that have therapeutic or

rehabilitative value. These lenses go by different names such as therapeutic, performance, or focus change lenses.

PRISM: a therapeutic or rehabilitative lens prescription may also include prism in a variety of sorts,

- to relieve eyestrain
- improve fixation
- increase central-peripheral integration
- realign a visual midline shift

TINTS: for indoor or outdoor use and/or sunglasses can also be prescribed. When light sensitivity is an issue tints can be important for symptomatic relief. Sun protection also is prescribed for promotion of eye health.

Office Based Vision Therapy

We are not born knowing how to see and how to use our visual system.

NEUROPLASTICITY: because vision is a learned process that develops, we can re-create this at anytime. Because the brain is completely neuroplastic it can change itself at any age. Vision therapy works through neuroplasticity, which is a re-writing of the software. This is done by arranging visual conditions and activities such that the task is novel but related to a visual skill used in daily life. We make changes in the brain through the visual process and the visual process improves. As the visual process improves, we see changes in the affected behavior accordingly.



Referral

When a software problem has developed as a visual skill dysfunction, it does not correct itself. One does not out grow the problem on its' own. This is because everyday the conditions for using the skill are the same, so the same software code will continue to be used. They may find new and inventive ways of compensating which will not serve them long term or give them the efficiency they could be capable of. Dysfunctional skills grow at a slower rate than normal so with time the gap widens compared with peers.

THERAPY PROGRAMS: Since vision develops in infancy in conjunction with our primitive reflexes and sensory-motor systems. Our vision therapy program involves this necessary motor and reflex work to build the foundations for visual skill to emerge. Programs are prescribed by the doctor and individualized for each person's unique needs using a standard curriculum as a framework. The length of time it takes to develop a visual system will vary from person to person depending on the degree of the dysfunction and the degree of flexibility to accept change in the system. Some people will reach the desired results in 6 months, while others can take years especially if there is a head injury involved.

Our vision therapy sessions are done in the office one hour, once a week, one-to-one with the therapist. There can be 10 to 20 minutes of home exercises to complete during the week to support the office based program. Progress checks are scheduled with the doctor every 8 to 12 weeks of therapy. After our first progress check we can make better predictions for the individual as to how long their therapy would be expected to last. This is once we see how quickly they are progressing compared with their entry level. The doctor will only continue to prescribe therapy as long as the individual and the doctor both agree that the goals are being met in therapy.

Throughout our testing process, should we find any eye health, neurological, or surgical concerns that require the care of a medical doctor, we will set up a referral to the appropriate GP, neurologist, or ophthalmologist accordingly.

Similarly, we believe that we are part of a multi-disciplinary team of professionals that will work on various different aspects of the rehabilitative process. As such, we will co-manage as needed with other professions such as: occupational therapy, physical therapy, psychology, speech and language pathology, audiology, massage therapy, chiropractic, cranio-sacral therapy, neurological reorganization therapy, and osteopathy.

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Neurodevelopmental Movement Consultant

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