

Vision is one of our most important senses. 70% percent of all sensory processing in the entire body is directly affected by information coming from our eyes. The input we receive from our eyes travels throughout both sides of our brain, interpreting the information we see to make sense of it. A few of the reasons we use our vision include: guiding motor function and movement, providing feedback to improve postural awareness, helping us to orient our body in space, and helping us identify right vs. left side. Visual processing is the act of delivering information to the brain for the purposes of attention, concentration, and cognitive processing, allowing us to successfully and safely participate in tasks such as reading, writing, cooking, and driving.

Following a brain injury it is important to address vision and visual processing dysfunction to reduce complications, maximize the rehabilitation process, and support each person with a brain injury in their goals to return to independent functioning.

How Vision works:

- Vision is produced by input entering two eyes.
- Each eye is controlled by a network of 6 muscles, with each muscle controlled by a different nerve in the brain (cranial nerves) to produce a specific eye movement. These muscles allow the eye to move up, down, left, right, and to rotate toward and away from the nose.
- When the muscles of each eye work together to coordinate the movement of both eyes, the eyes will be aligned, move in all directions, and produce a single image.

Types of vision deficits

Double vision

When the muscles are not working due to weakness or injury, many deficits can result in either or both eyes. These include:

- Misalignment
- Decreased movement and coordination
- Decreased speed of movements

Strabismus

A type of eye movement dysfunction that interferes with vision since it prevents both eyes to appropriately align with each other. Usually caused by result of trauma or increased pressure in the brain.

- Misalignment of the eye can cause:
 - The eye turns in, out, or up.
 - The direction of the eye turn depends on which nerve in the brain has been affected.

Convergence

Issues related to an eye's ability to convergence and divergence is also known as an accommodative dysfunction which is very common after brain injury or stroke.

Nystagmus

A type of eye movement dysfunction that can occur following a brain injury referred to as Nystagmus. The cause of nystagmus can at times be unknown and difficult to treat.

- It appears as an involuntary, rhythmical, and repeated movement of one or both eyes in a circular or horizontal pattern. It can occur in any or all fields of gaze (ie. When looking up, down, to the left or right).
- There are different types of nystagmus that can result following a head injury, including:
 - Related to vision loss - *Sensory nystagmus*
 - Related to the control of muscle function- *Motor nystagmus*
 - Related to inner ear problems- *Vestibular nystagmus*
 - Medication can also cause nystagmus

Visual Acuity

The measure of the eye's ability to see small detail clearly, both near and far, is called *visual acuity*.

- It is recorded with a number on top (which is the testing distance) and a number on bottom (the distance that the letters/symbols are being viewed).
 - 20/20 vision is a term to express normal visual acuity, measured at a distance of 20 feet. This means that an individual can see clearly at 20 feet what should normally be seen at 20 feet.
 - For example, if an individual has 20/100 vision, it means that the individual must be as close as 20 feet to see what a person with 20/20 vision can see at 100 feet.
 - Decreased visual acuity often results in blurriness, or blurred vision.

Visual Fields

The eye's visual field is the space you see when you're looking out in to the world. An individual can be looking at an object, but can also see the space around the object's surroundings, known as the *peripheral field*.

- There are four visual fields for each eye:
 - Superior (up)
 - Inferior (down)
 - Temporal (by the ear)
 - Nasal (by the nose)