

*Difficulty With Vision Following
an Acquired Brain Injury*



By Michelle Rosen, OTR/L

Just for Fun!

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Why Is Vision Important to Rehabilitation After a Brain Injury?

- “Vision is our most far-reaching sensory system. It is the sensory system that takes us out into our environment; the first to alert us to danger (seeing a threatening storm approach) and the first to alert us to pleasure (seeing your children playing in the yard as you drive up)” (Pedretti, 1996, p. 194).
- Impact on learning/relearning during rehabilitation
- Often overlooked in rehabilitation process

What Is Good Vision?



- 3 parts to vision
 - (1) Acuity and visual fields
 - How clearly we see
 - Field of vision (our movie screen)
 - (2) Gross ocular skills
 - Eye-teaming
 - Eye alignment
 - Coordination and movement
 - Accuracy, speed, smoothness, and mobility

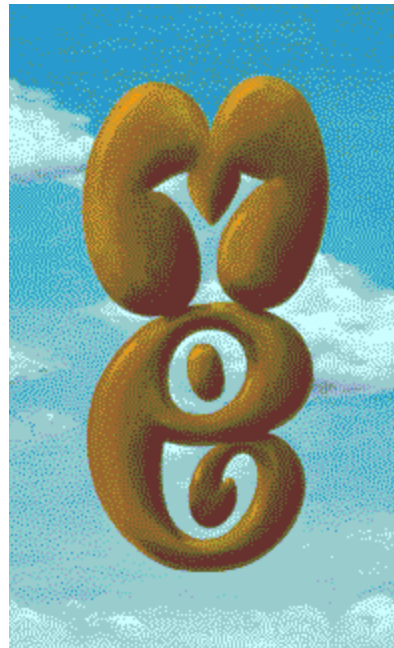
What Is Good Vision?

cont. 'd



- (3) Perception – processing what we see
 - Categories & Types of Perceptual Skills:
 - Visual discrimination
 - Visual form constancy
 - Visual figure-ground
 - Visual closure
 - Visual memory & visual sequential memory
 - Visual spatial relationships
 - Visual perceptual processing speed
 - Visualization

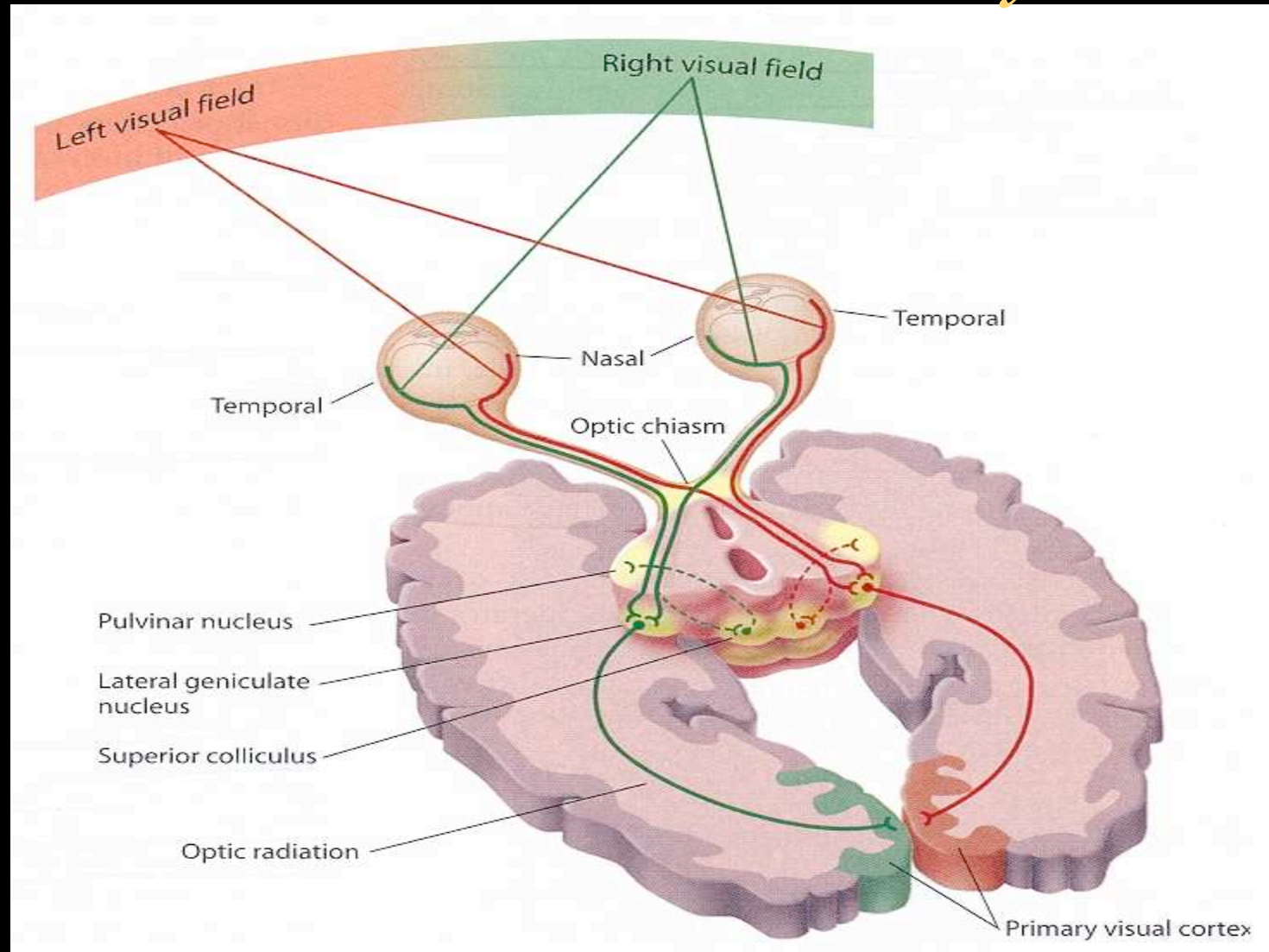
What do you see?



Basic Neuroanatomy and Physiology of Vision

- Basics of the visual pathway and visual processing:
 - Images come into the eye
 - Received by the retina
 - Transmitted to optic nerves
 - Continues along the visual pathway
 - Some of the fibers from the optic nerves split off and travel down to the brainstem nuclei (Ranpura, n.d., p. 2, “The Anatomy of Vision”)
 - Most continue to the occipital lobe, which is the primary visual cortex.

The Visual Pathway



(Images for Psychology, n.d.)

Basic Neuroanatomy and Physiology of Vision cont.'d

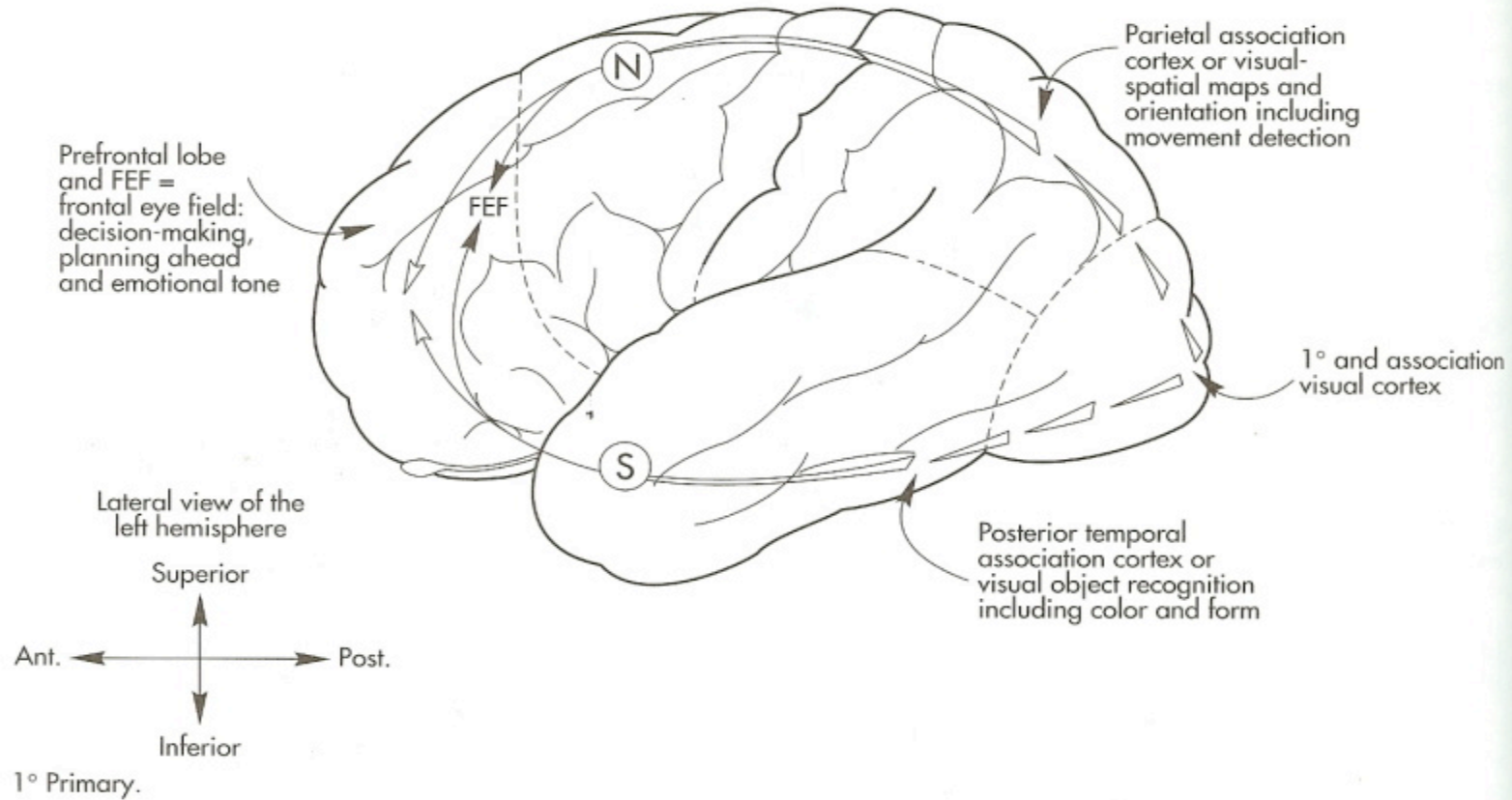
- From the visual cortex to the prefrontal cortex
 - Visual information continues it's journey from the occipital lobe to the prefrontal lobe via two routes (Pedretti, 1996)
 - Northern/Superior route – through parietal lobe
 - Southern/inferior route – through temporal lobe

PARALLEL-DISTRIBUTED PROCESSING OF THE VISUAL SYSTEM

Two parallel routes carry visual information from the occipital lobe to the prefrontal lobe and frontal eye field (FEF). Fibers from these two routes distribute to many areas along each route (not illustrated) before terminating in the prefrontal cortex and FEF as illustrated.

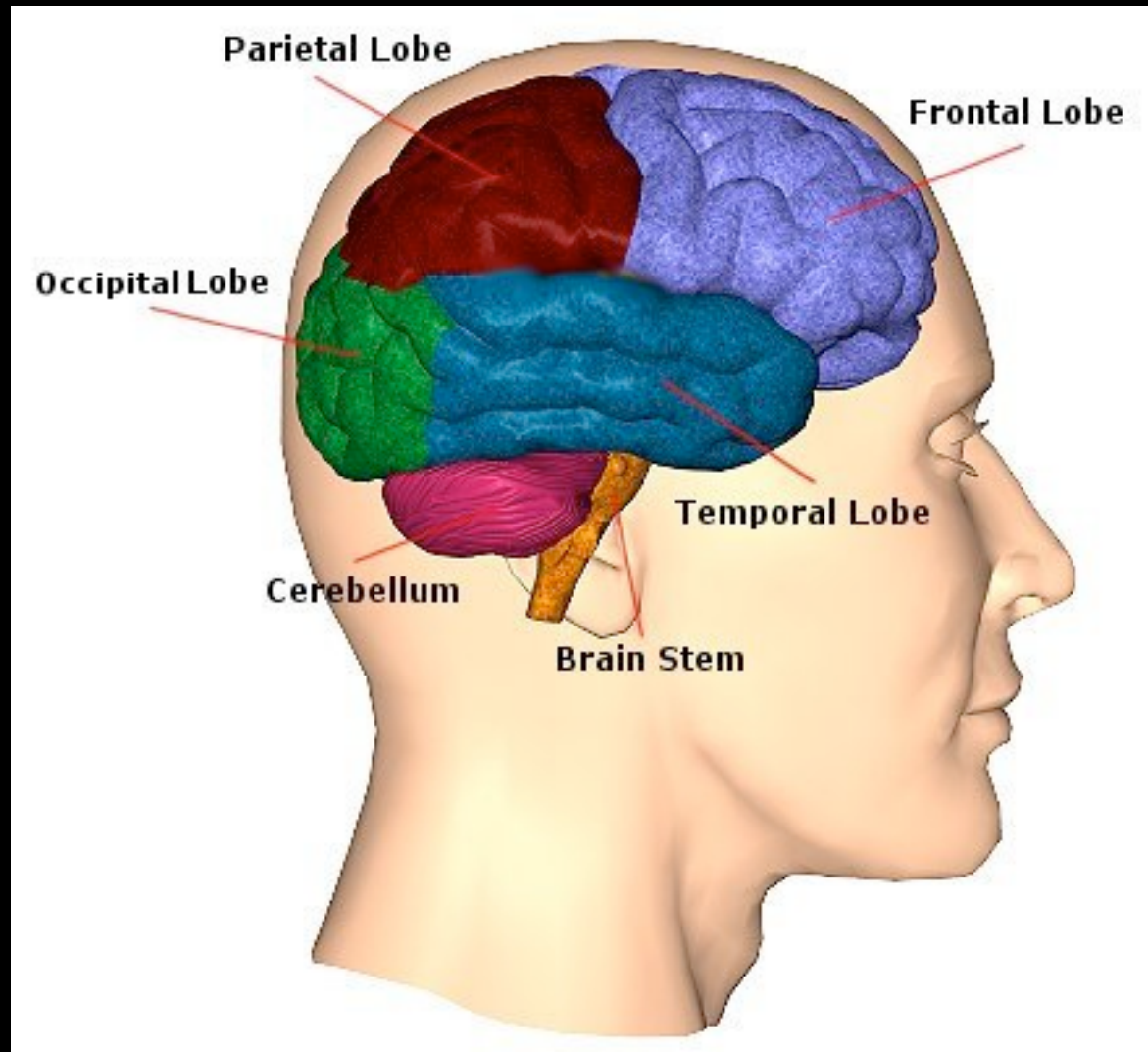
(N) = "Northern" or superior route via parietal and frontal lobes.

(S) = "Southern" or inferior route via temporal and frontal lobes.



(Pedretti, 1996, p. 196)

Lobes of the Brain



(Lehr, n.d., p. 1, “Brain Functions and Map”)

Visual Pathways in the Brain

cont. 'd



- Info from recent NORA conference:
 - To date, researchers have described approximately 305 intra-cortical pathways linking to vision
 - 32 different cortical areas implicated in visual function
 - 25 of these are regarded as either predominantly or exclusively involved in visual function, and 7 are considered visual-association areas.
 - Also, the brainstem, cerebellum have many connections with the visual system
 - As many as 50% of those with a neurological injuries suffer from visual changes (and this study looked at only certain aspects)

Functions of Lobes and Their Connection With Vision

- Frontal lobe
 - Learning, Attention and body movement
- Parietal lobe
 - One of the lobes where visual information is given meaning (Scheiman, 2002)
 - Visual attention
 - Visual perception
 - Receives and interprets sensory information. Also location of sensory cortex
 - When damaged: difficulty with reading, drawing, and eye/hand coordination

Functions of Lobes and Their Connection With Vision



- Temporal lobe
 - One of the lobes where visual information is given meaning (Scheiman, 2002)
 - Some visual perceptions
 - When damaged: difficulty with recognizing faces, and focused attention to what we see and hear

Functions of Lobes and Their Connection With Vision



- Occipital lobe
 - Primary visual cortex
 - When damaged: visual field cuts, identifying colors, recognizing words, drawn objects, and difficulty with perception of movement. May also have visual hallucinations or illusions.

Functions of Lobes and Their Connection With Vision



- **Brainstem**
 - Balance
 - Cranial nerves associated with eye muscles & movement, blinking & pupil reflex
 - When damaged: may have dizziness and/or nausea, difficulty with balance, restrictions in eye movements
- **Cerebellum**
 - Coordination of movement
 - When damaged: disturbance in visual motor coordination

Functions of the Left Hemisphere

- “the dominant hemisphere in almost all right-handed people and in about 65% of left-handed people” (Scheiman, 2002, p. 14)
- “responsible for processing visual information such as letters and words” (Scheiman, 2002, p. 14)
- Scans and attends only to the right visual field

Functions of the Right Hemisphere

- “more global and takes a general view of the environment” (Scheiman, 2002, p. 14)
- “responsible for nonverbal behavior and spatial relationships...depth, color, and shape discrimination” (Scheiman, 2002, p. 14)
- Scans and attends to the right and left visual field.
- You may see unilateral spatial inattention with damage to this hemisphere

Just for Fun!

Read out loud the text inside the triangle below.



Functional Implications of Visual Difficulties

- Common statements:
 - “I don’t like riding in a car anymore”
 - “I hate shopping at WalMart – it’s too overwhelming”
 - “I don’t go anywhere without my sunglasses”
 - “My glasses don’t work anymore”
 - “I can’t read like I used to”
 - “My headache gets worse when I...”

Signs and Symptoms

- Symptoms can include, but are not limited to:
 - Headaches
 - Light and glare sensitivity
 - Dizziness
 - Seeing double or Vision is blurred
 - Poor tolerance or attention for visual tasks
 - Eyestrain or aching eyes
 - Difficulty reading (fatigue, poor comprehension, skipping lines/words)
 - Feeling overwhelmed visually or trouble finding items in a store

Signs and Symptoms cont. 'd

- Difficulty with visual motor accuracy
- Objects appear to move
- Staring
- Difficulty with balance, coordination, or posture
- Difficulty with perceptual skills
- See also www.nora.cc for a list of symptoms (information available under “patients”)
- Even if your symptoms have decreased there may still be a problem.
 - Compensating and concept of Cumulative Burden

Post Trauma Vision Syndrome

- Many of the symptoms listed previously are very common with this diagnosis.
- Post trauma vision syndrome appears to be very common with mild head injuries and post concussion syndrome.
- Disturbance in the “where is it” and “what is it” process and balance (Mosheim, 2005)
 - Effects: (Padula, 2000)
 - Disturbance in ambient and focal processing
 - Loss of stability and grounding from the ambient system
 - Impacts eye movements and organization of spatial information

Post Trauma Vision Syndrome *cont. 'd*



- PTVS as described by William Padula (2000) in *Neuro-Optometric Rehabilitation*:
 - Characteristics:
 - Exotropia or High Exophoria
 - Accommodative Dysfunction
 - Convergence Insufficiency
 - Low Blink Rate
 - Spatial Disorientation
 - Poor Fixations and Pursuits
 - Unstable Ambient Vision

Signs & Symptoms of Difficulty With Visual Perception



- Difficulty with:
 - Dressing
 - Putting things together (e.g. puzzles & assembly)
 - Visualizing
 - Slow speed for taking in visual information
 - Following visual directions
 - Remembering where items were last seen
 - Noticing differences or similarities (e.g. two different kinds of chili with the same brand name)

Signs & Symptoms of Difficulty With Visual Perception cont.'d

- Difficulty with:
 - Identifying or recognizing an item when it is turned, smaller, bigger, or only part of it is visible
 - Seeing items when they are hidden in a busy background (e.g. grocery store)
 - Remembering phone numbers or difficulty with reading comprehension
 - Difficulty accurately judging size or distance (e.g. parking car, putting food away in correct size container)

Just for Fun!

**Count every
" F " in
the following text:**

**FINISHED FILES ARE THE RESULT OF YEARS
OF SCIENTIFIC STUDY COMBINED WITH
THE EXPERIENCE OF YEARS...**

What to Do?



- Vision screening with OT
- Referral to a specialized optometrist:
- 3 Questions to ask in finding an optometrist
 - 1) Are they knowledgeable about Post Trauma Vision Syndrome
 - 2) Are they familiar with Visual Midline Shift
 - 3) Do they do vision therapy and/or knowledgeable in this area
- Tips: ask for the full evaluation and give them a heads-up on your medical history/diagnosis
- New lens prescription, prisms
- Vision therapy with a specialized OT

Vision Therapy



- Some Tips on Vision Rehab:
 - Similar to other systems in your body, the visual system can be trained and rehabilitated.
 - Vision therapy should be in collaboration with an optometrist knowledgeable in vision rehab
 - Vision therapy can be a powerful tool for improving functional performance and may decrease severity of headaches.

Things You Can Do at Home

- Nintendo Flash Focus
- Mazes
- Puzzles (word puzzles and picture puzzles)
- Sudoku (number and color)
- What's Different Pictures
- Hidden Pictures
- Practice visualizing
- Scanning games for riding in the car
- Important notes:
 - if you have a problem with eye alignment and eye teaming you need to see an optometrist
 - These perceptual activities may require teaching strategies first

Helpful Web Links

- Neuro Optometric Rehabilitation Association (NORA)
 - <http://www.nora.cc>
- Centre for Neuro Skills, TBI Resource Guide
 - <http://www.neuroskills.com>
- Brain Injury Resource Guide
 - <http://www.headinjury.com>
- Helen Irlen & Irlen Institute
 - Helpful information on colored overlays and filters to help with reading difficulties and light sensitivities
 - <http://irlen.com>

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