Vision and Stroke: A Rehabilitation Approach

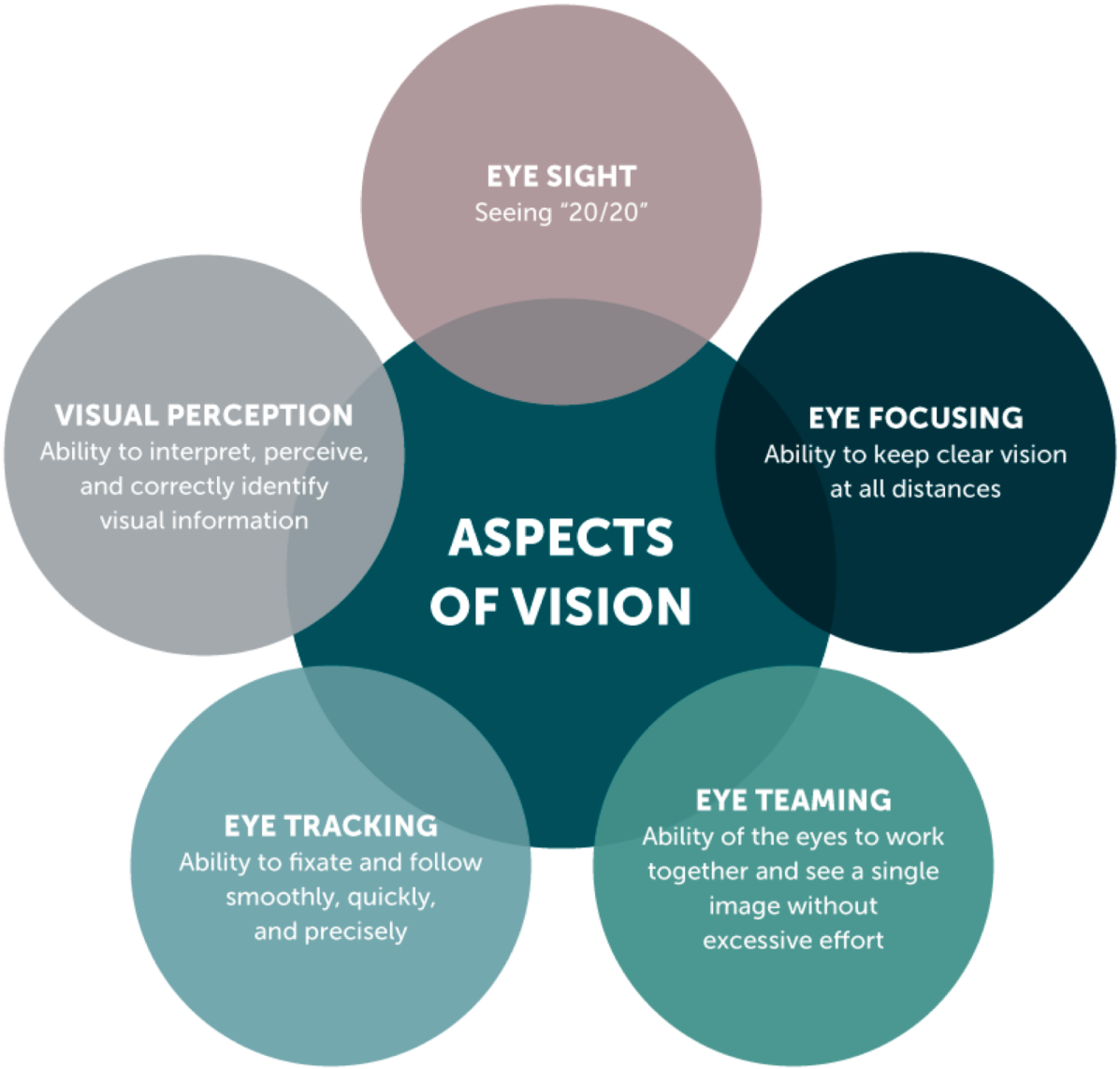
Dr. Zoé Briggs, OD, FAAO, FCOVD
Board Certified Optometrist in Vision Therapy

Napanee Family Eyecare

Course Objectives

- Define the visual process and fundamental visual skills
- Become familiar with common visual deficits following a stroke
- Understand treatment options for visual deficits
- Learn about specialized lenses, filters & prisms, and vision rehabilitation
- Learn how to recognize if vision is impacting your patients recovery
- How to refer for neuro-optometric testing and treatment

What is Vision?



What is Vision?

Visual Process involves two systems:

1. Focal System:
   - Central
   - Attention, Concentration, Details and Colour
2. Ambient System:
   - Peripheral
   - Movement, Balance, Posture, Orientation, Visual Midline
   - Guides the focal system through a continuous feed-back loop

What is Vision?

- Brainstem
  - 50% of the cranial nerves affect vision
  - Direct: II, III, IV, VI
  - Indirect: V, VII
- Cortex
  - Occipital Lobe (primary visual cortex)
  - Parietal Lobe (spatial inattention, perception)
  - Temporal Lobe (spatial organization, object recognition)
  - Frontal Lobe (initiates voluntary saccades and pursuits)

Vision and Stroke

- Visual Field Loss
- Visual Neglect
- Binocular Vision Dysfunction
- Oculomotor Disorder (Eye Tracking)
- Visual Mid-line Shift
- Visual-Vestibular Dysfunction
- Visual Perception Disorder
- Higher order deficits
- Post Trauma Vision Syndrome

Visual Field Loss

- Different visual field defect depending on which area of the brain is impacted (see image)

Visual Neglect (Spatial Inattention)

1. Cancellation task
2. Line bisection task
3. Copying and drawing task

Binocular Vision Dysfunction

- Convergence Insufficiency
  - Inability to converge eyes at near
  - Double vision or eyestrain with reading
  - Commonly found with Post Trauma Vision Syndrome
- Strabismus (eye turn)
- Vertical Deviation
- Cranial nerve palsy (III, V, VI)
  - Innervates Extra-Ocular Muscles

Visual Mid-line Shift

- Commonly occurs in patients with visual field deficits
  - Patients demonstrate postural and balance deficits
  - May state the floor looks tilted, or that they frequently bump into doorways or objects
  - Walls/floor appear to move or shift

Visual-Vestibular Dysfunction

- Vision integrates with balance through the Vestibular Ocular Reflex (VOR)
- VOR: Maintains stable, bifoveal retinal images during head and body movements
- Involves CN III and VI communicating with CN VIII
- Associated symptoms:
  - Increased disequilibrium and sensitivity to visually stimulating environments (grocery stores, malls, libraries)
  - Dizziness/Nausea/Disequilibrium/Vertigo with visual tasks (reading, TV, ambulation, computer)
  - Oscillopsia

Oculomotor Disorder (Eye Tracking)

- Involves:
  - Pursuits: Smooth eye movements
  - Saccades: Rapid burst eye movements
  - Fixation: Maintenance of gaze
- Symptoms:
  - Difficulties with reading
    - Loss of place, skipping lines or words, print appears to move/jump on the page
  - Difficulties with scanning and searching

Visual Perception & Visual Information Processing

- **Visual Discrimination:** ability to differentiate between objects and forms
- **Visual Memory:** ability to store visual details in short-term memory, such as recalling a phone number
- **Spatial Relationships:** ability to determine one form or part of a form that is turned in a different direction than the others
- **Form Constancy:** ability to see a form and find it among other forms, although it is sized differently or rotated
- **Sequential Memory:** ability to remember a series of forms and find it among other forms
- **Visual Figure-Ground:** ability to perceive a form and find it hidden in a conglomerated ground of matter
- **Visual Closure:** ability to fill in the missing details into an incomplete shape

Higher Order Dysfunction

- Light sensitivity
  - Sunlight
  - Indoor lighting
  - Screen intolerance
  - Fluorescent lighting
- Reading deficits
  - Integration of focal and ambient visual systems

Post Trauma Vision Syndrome

- Blur
- Slow, inaccurate reading
- Eyestrain / Fatigue
- Diplopia
- Difficulty in visually-stimulating environments
- Light sensitivity
- Visual field defects / Neglect
- Dizzy / Nausea / Vertigo

Neuro-Optometrist's Role

Diagnose and treat visual conditions to enhance visual function in:	
Multidisciplinary rehabilitation program	Activities of daily living

Optometric treatment:			
Lenses and Prisms	Filters	Occlusion	Vision Rehabilitation

Vision Treatment

Lenses:

- Modifications in glasses prescription
- Separate distance glasses and reading glasses

Filers:

- Tints
  - FL41 – Rose tint
  - Light blue or Omega (purple) – Calming
  - Blue light blocking anti-reflective coating
- Occlusion
  - Bi-Nasal Occlusion, Spot Occlusion, Monocular Occlusion

Prisms:

- Yoked Prisms
  - Change the patient's perception of visual space to modify weight transfer and improve posture and balance
- Compensatory Prisms
  - Compensate for eye turn

Vision Treatment

Neuro-Optometric Rehabilitation:

- Individualized treatment regimen for patients with visual deficits as a direct result of physical disabilities, traumatic brain injuries, and other neurological insults.
- A process for the rehabilitation of visual, perceptual, and motor disorders.
- Typically 30-45 minutes sessions, once weekly, with progress assessment every 8-10 weeks

Vision Rehabilitation Areas:

- Focusing
- Teaming
- Scanning Strategies
- Tracking
- Visual-Vestibular Dysfunction
- Visual Midline

How to refer for neuro-optometric assessment

- Optometrist trained in neuro-optometric rehabilitation
  - Fellowship with College of Optometrists in Vision Development (FCOVD)

    www.covd.org
  - Fellowship with Neuro-Optometrist Rehabilitation Association

    www.noravisionrehab.org
  - Vision Therapy Canada member

    www.visiontherapycanada.com

Vision and Movement in clients with Stroke

Wendy Sarsons, PT
Registered Physiotherapist
Action Potential Rehabilitation

Movement and Vision

- Vision leads movement
- Visual system and motor system develop together and are integrated
- Faulty postural control and balance impact negatively on efficiency of visual system
- Faulty visual system impacts negatively on the efficiency of balance and movement

Posture / Visual Relationship

Association between:

- Convergence / Near
- Flexion / Adduction / Down
- Exhalation

Association between:

- Divergence / Far
- Extension / Abduction / Up
- Inhalation

Post Trauma Vision Syndrome

Caused by neurological event / disease process

- Brain injury (ABI) including concussion
- Parkinson's Disease
- Multiple Sclerosis
- Cerebral Palsy
- Stroke (CVA)

Post Trauma Vision Syndrome

Insult to neurological system may impact:

1. Extraocular muscles controlling eye movement
2. Ocular system that regulates focusing
3. Cortical processing of visual information

Post Trauma Vision Syndrome

Results in “Focal Binding”

- Compensatory over-use of focal visual system for spatial orientation
- Focus on detail rather than switching between detail and peripheral information

  (eg. snowflake)

Focal Binding

- Get stuck and can't release visual fixation

  Eg. picking fluff off clothes
- Limited peripheral / spatial awareness
- Movement becomes conscious and restricted

Focal Binding Test

- Hold 2 small objects 6” apart, 16” away
- Ask client to look back and forth slowly between the 2 objects w/o moving head
- Then ask client to quickly look back and forth between the 2 objects
- Should be able to do 5 saccades (switch visual fixation 5x’s) without getting ‘stuck’

(Courtesy of Dr. William Padula OD)

Binasal Occlusion

- Interrupts focal binding
- Increases attention to periphery
- Reduces visual stress + overstimulation

Binasal Occlusion

- Use as little tape as needed
- Tape can be vertical or angled into nose
- Can use existing glasses or just frames
- If possible, ask client to read something
- If possible, have client walk with glasses on
- Have them reach laterally or rotate in sitting
- If there is change with binasal occlusion, need further assessment of visual system!

Visual Midline Shift Syndrome

- Most common with CVA or ABI, but possible with other neurological conditions (MS, CP)
- Ambient visual process changes its orientation to the perception of midline
- Mismatch of information between ambient visual and kinesthetic, proprioceptive and vestibular systems

Visual Midline Shift Syndrome

- Perceived visual midline is usually shifted towards the unaffected side
- Shifting of visual midline away from affected side reinforces hemiparesis +/or hemianopsia
- May have midline shift anterior / posterior as well as laterally
- Associated symptoms: floor/walls may appear tilted or appear to shift/move

Visual Midline Shift Syndrome

Pencil Test

- Hold pencil vertically in front of client (approx. 40cm or 16” in front)
- Move pencil horizontally
- Ask them when pencil in front of their nose
- Patient is instructed to track the pencil, without moving their head
- Therapist is placed off to the side for testing, not in front of patient

Visual / Vestibular Issues

- Visual / vestibular systems are very closely integrated functionally
- Dysfunction in one system can appear to be or cause dysfunction in other
- Need specialized training to be able to differentially diagnose specific issues

Recognize Visual / Vestibular Issues

How do we know if our client has visual issues?

We need to suspect that EVERY neuro client may have visual issues that could be reinforcing or contributing to their postural imbalance

Recognize Visual / Vestibular Issues

- Visual complaints – BIVSS (Brain Injury Vision Symptom Survey)
- Difficulty changing direction
- Difficulty with patterned flooring
- Clients with Neglect
- Clients with Pusher Syndrome
- Lack of change despite perceived physical ability or inability to maintain changes, especially regarding orientation to midline

Screening for Visual Issues

1. Do eyes lead movement?
2. Closed eyes – what changes?
3. Pencil test for midline shift
4. Binasal occlusion (does posture / movement or function change?)
5. Focal Binding test

What to Do?

- Refer to PT with specific training in visual and vestibular issues
- Suggest assessment by Neuro Optometrist
- Combine movement and vision in exercises

Continuing Education Courses

Vision and Movement

Dr. William Padula OD www.padulainstitute.com

- 3 online courses, great exercises

Concussion

Shannon McGuire PT St Joseph's Health Care

- 2 day workshops

Vestibular Rehab

Bernard Tonks PT www.vestibular-rehab.com

ACTION POTENTIAL REHABILITATION

Physiotherapy – Home and Clinic