



## **Visual Development & Rehabilitation Following Traumatic or Acquired Brain Injury**

**Michelle May, OD, FCOVD**

# Content Overview



- **Behavioral Optometry**
- **Vision and Brain Injury**
- **Interconnectedness of Vision with Other Systems**
- **Treatment of Vision Dysfunction in Brain Injury**
- **Case studies**

# Who Am I?

- Michelle May, OD, FCOVD
- Maryland Native
- UMBC class of 2006 (go Retrievers!)
  - Vision therapist in Bethesda
- Southern College of Optometry
  - Memphis, TN - class of 2010
  - COVD president & national liaison
- Residency in Vision Therapy
  - with Leonard Press (Fair Lawn, NJ)
- Fellow of the College of Optometrists in Vision Development (COVD)
- [Advanced Family Vision Care](#) (Gambrills, MD)

# What is an Optometrist?

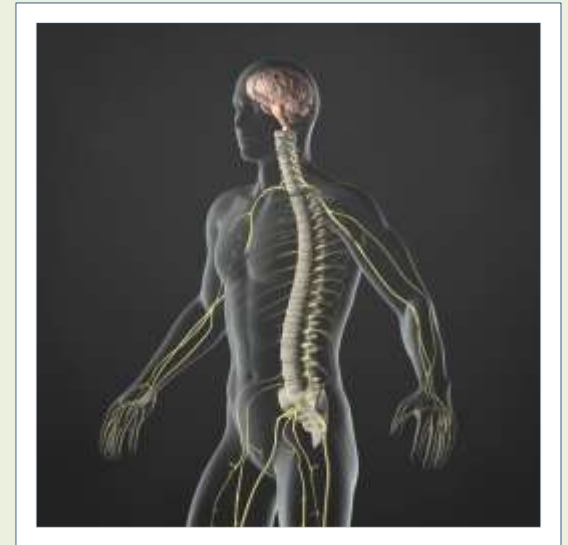


- **Diagnose and treat diseases and disorders of the eye and visual system**
  - Medications
  - low vision rehabilitation
  - vision therapy
  - spectacle lenses
  - contact lenses

- **Optometrist v. Ophthalmologist v. Optician**

# Behavioral Optometry

- A mode of practice based upon the core principle that vision **is a learned process** and can be developed or enhanced at any age.
- Education has continued beyond the basic Doctor of Optometry (O.D.) degree
  - Emphasizes the use of lenses, prisms, and vision therapy to enhance visual capabilities, reduce visual stress, and rehabilitate vision problems



Behavioral Optometrists consider **visual function and its integration with other senses and the body as a whole**

# What is Vision?

## Vision vs. Eyesight

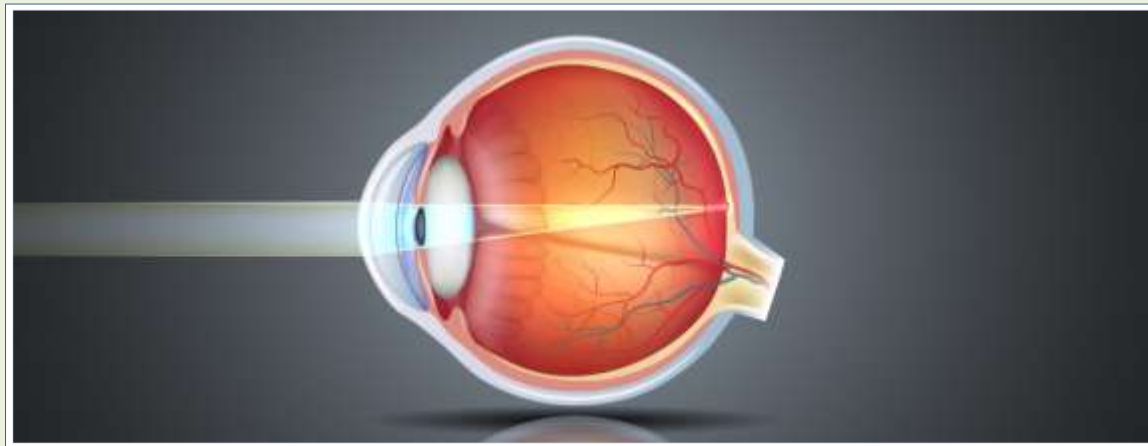


- **Vision** - The dominant sense with three areas of function
  - Visual pathway integrity
  - Visual skills
  - Visual information processing

Brain injury can affect all areas of visual function

# Vision

70 % of all sensory processing in the entire body is directly affected by information coming from the eyes



## **Ambient - Peripheral**

Derives information from the visual system plus information from other senses

**VS.**

## **Focal - Central**

Responds to stationary small targets, detail, and color

# How Does Brain Injury Affect Vision?



- Blurred vision and/or problems with focusing
- Sensitivity to light (esp fluorescent), glare sensitivity
- Reading difficulties; words appear to move
- Decreased reading comprehension
- Attention and concentration difficulty
- Problems with memory
- Eye Turns (strabismus) with or without double vision
- Headaches with visual tasks
- Inability to maintain visual contact
- Difficulties with eye movements
  - ocular pursuits (eye tracking ability)
  - saccades (shifting gaze quickly from one point to the other)
  - binocular vision (eye alignment, eye teaming)
    - Convergence insufficiency
- Visual field loss



# Convergence Insufficiency

- Very common side effect of brain injury



- Contributes to many symptoms listed previously
  - Difficulty with reading & comprehension
  - Headaches
  - Balance problems
  - Judgment of space
- [CITT Study](#)

# Visual Field Loss

- Common and easy to miss following brain injury
  - True visual field loss vs. visual-spatial neglect



Paris as seen with full visual fields



Paris as seen with [bitemporal hemianopsia](http://en.wikipedia.org/wiki/Bitemporal_hemianopsia)

# Brain Injury and Vision

As many as **50%** of those with neurological injury **will suffer from changes in the visual system; many are undiagnosed**



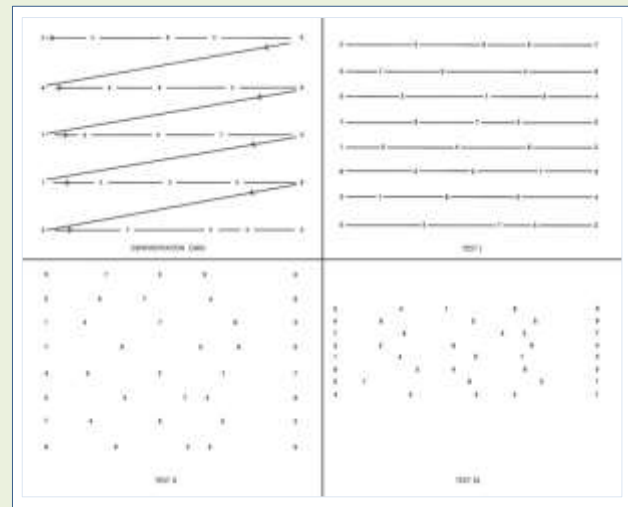
- Disruption of neural pathways
- Structural damage
  - Brainstem
  - Cortex
  - Cerebellum

# Brain Injury and Vision

- Visual problems resulting from TBI/ABI are often overlooked
  - Too often, these problems are undiagnosed and untreated and can affect recovery
- There are various treatments or combinations of treatments to address residual vision problems
  - Vision Therapy
  - Corrective lenses and/or prism lenses

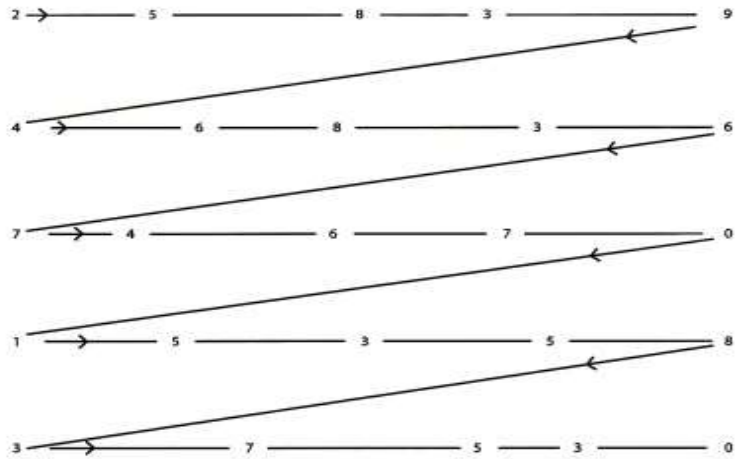
# Vision and Concussion

- Visual problems have been found **to correlate so well with head injury** that an eye movement test is now being used to screen on the sidelines for concussion
- **The King-Devick Test**
  - saccadic eye movements
  - Mayo Clinic

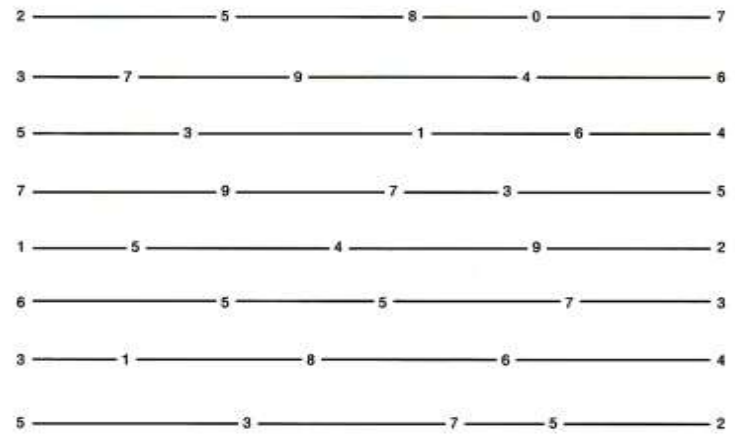


<http://kingdevicktest.com/for-concussions/research-and-publications/>

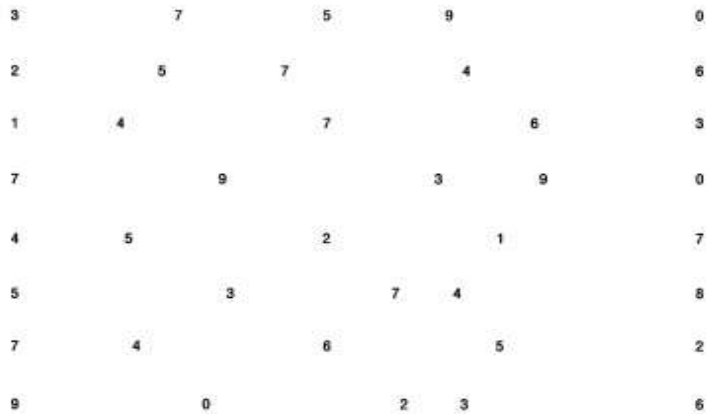
# The King-Devick Test



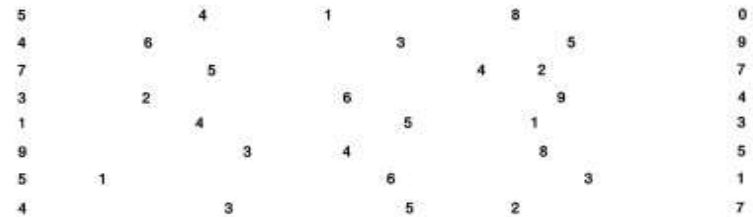
DEMONSTRATION CARD



TEST I



TEST II



TEST III

# Vision & Vestibular

- **3** main contributors to **balance**

Vestibular + Vision + Proprioceptive

- Dysfunction in any of the three necessitates an over-reliance on the others to maintain postural control
  - There are close neurological links between the visual and vestibular systems
  - When there are balance problems, **both should be addressed**
    - Vestibular rehab & Vision Therapy



# Vision and Vestibular

- Vestibular-Ocular Reflex (VOR)
  - activated when there is head movement, body movements or if the individual leans to one side

Brain Trauma is the second most common cause of vestibular damage

- Tumor is #1
- Symptoms: loss of balance, dizziness, hearing loss, vision problems, and Bell's Palsy
- Dizziness vs. vertigo



# What is Vision Therapy?



## Vision Therapy

- Optometric Vision Therapy is a form of **neuro-muscular re-education**. It is:
  - A progressive program of procedures;
  - Performed under doctor supervision;
  - Individualized to fit the visual needs of each patient.
- Procedures are prescribed to:
  - **develop, improve, or restore** fundamental visual skills and abilities;
  - Improve visual comfort, ease, and efficiency;
  - Change how visual information is processed or interpreted.

# What is Vision Therapy?

- Research has demonstrated that vision therapy can be an effective treatment option for:
  - Ocular motility dysfunctions (eye movement disorders)
  - Non-strabismic binocular disorders (inefficient eye teaming)



- [Strabismus](#) (misalignment of the eyes)
- [Amblyopia](#) (poorly developed vision)
- Accommodative disorders (focusing problems)
- Visual information processing disorders, including visual-motor integration and integration with other sensory modalities

# What Vision Therapy is NOT

- *NOT* Just “eye exercises”
  - Extraocular muscles are already incredibly strong
- *NOT* Orthoptics
  - Concerned with cosmesis more than function
- *NOT* Experimental or unproven
  - There are many studies that document the efficacy of vision therapy
  - Taught in every Optometry School
  - Residency Programs
  - Fellowship Programs
- *NOT* New, has been around for over 100 years!
- *NOT* A cure for dyslexia and/or learning disorders

# Vision Rehabilitation Treatment

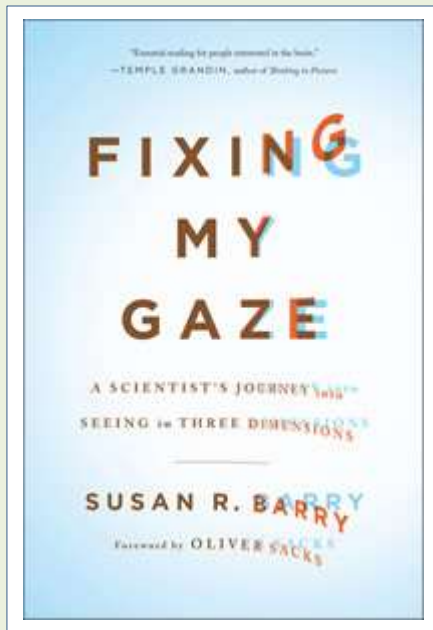
- Specialized Testing
- Personalized treatment plan
- Weekly in-office therapy sessions
  - “home therapy” between sessions
- Monthly progress evaluations
- Post therapy progress evaluation



# Am I Too Old to Benefit From Vision Rehabilitation?

- No!
- NEUROPLASTICITY in popular media

Dr. Sue Barry



<http://www.stereosue.com>

Cavin Balaster  
“Cavin Bounce”



In 2011, Cavin survived  
a two-story fall

[www.cavinbounce.com](http://www.cavinbounce.com)

# How You Can Help

## ■ Symptom Checklist

1. go through the [checklist](#) with your patients
2. if they are experiencing 3 or more symptoms on the list, there is a good chance they can benefit from vision therapy

- Download checklists: [here](#)

## ■ Consider quality of life



### Symptom Checklist

- Double vision
- Blurred vision at near
- Headaches associated with near work
- Burning, stinging, watery eyes
- Words run together when reading
- Vision worse at the end of the day
- Dizziness or nausea associated with near work
- Head movement when reading
- Skipping or repeating lines when reading
- Head tilt or closing one eye when reading
- Avoidance of reading and near work
- Omitting small words when reading
- Writing uphill or downhill
- Misaligning digits in columns of numbers
- Reading comprehension declining over time
- Holding reading material too close
- Poor eye-hand coordination/poor handwriting
- Trouble keeping attention on reading
- Confuses left and right
- Does not judge distance accurately
- Reverses letters and/or numbers when reading or writing

# Post-Trauma Eye Exams

Anyone suffering a brain injury should have a comprehensive **dilated eye exam** and a **visual field test**

- Evaluates ocular and visual pathway integrity
  - Critical: if there have been changes in clarity or if there is double vision
- To find a developmental optometrist:
  - [www.covd.org](http://www.covd.org)
  - [www.oepf.org](http://www.oepf.org)
  - [www.nora.cc](http://www.nora.cc)

# Case Study #1

- GV – 65yo WM, work accident
- Strabismus detected on post-trauma eye exam
  - Alternating exotropia with double vision
- With weekly therapy, eye turn and double vision resolved within 6 months
  - Was prescribed 8 months of therapy
- Maintenance therapy



# Case Study #2

- JW – 25yo WM, sports concussion
- Headaches, difficulty adjusting focus between near and far, double vision, difficulty reading
- 6 months in-office therapy resolved all symptoms with no recurrence

# Case Study #3

- RD, 23yo BF, car accident with severe brain trauma
- Some permanent nerve damage, some loss of function
  - Difficulty reading, blur at distance and near, extraocular muscle restriction
- Combination of lenses and therapy
- 8 months of therapy with maintenance post-therapy
  - Improved clarity, balance & reading ability

# Contact Me

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# Scholarly Articles Used to Develop this Presentation

- Alvarez, Tara, et al. **“Vision Therapy in Adults with Convergence Insufficiency: Clinical and Functional Magnetic Resonance Imaging Measures.”** *Optom Vis Sci.* Dec. 2010; 87(12): E985–1002. doi:10.1097/OPX.0b013e3181fef1aa.
- Ciuffreda, KJ. **“The scientific basis for and efficacy of optometric vision therapy in nonstrabismic accommodative and vergence disorders.”** *Optometry* Dec. 2002; 73(12):735-762.
- Ciuffreda, KJ, Kapoor, N. **“Oculomotor dysfunctions, their remediation, and reading-related problems in mild traumatic brain injury.”** *Journal of Behavioral Optometry* 2007; 18(3):72-77.
- Ciuffreda, KJ, Ludlam, DP. **“Clinical Oculomotor Training in Traumatic Brain Injury.”** *Optometry & Vision Development.* 2009; 40(1):16-23.
- Cockerham, Glenn, et al. **“Eye and visual function in traumatic brain injury.”** *Journal of Rehabilitation Research & Development* 2009;46(6):811-818.
- Scheiman, Mitchell, et al. **“Randomized Clinical Trial of Treatments for Symptomatic Convergence Insufficiency in Children.”** *Archives of Ophthalmology* Oct. 2008: 1336-349.

# Online Resources

- [www.covd.org](http://www.covd.org)
- [www.oepf.org](http://www.oepf.org)
- [www.nora.cc](http://www.nora.cc)
- [www.aoa.org](http://www.aoa.org)
- *Fixing My Gaze* – Sue Barry
  - Available on [www.amazon.com](http://www.amazon.com)
- [www.cavinbounce.com](http://www.cavinbounce.com)
- [www.visiontherapy.org](http://www.visiontherapy.org)
- [www.braininjuries.org](http://www.braininjuries.org)

# Questions?

