Low Tech Strategies for Teaching Communication to Children with Cortical Visual Impairments

Presenters:
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Pat Satterfield, Center for AT Excellence

March 20, 2014
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Thursday, May 8, 2014
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- March 20: Low Tech Strategies for Teaching Communication to Children with Cortical Visual Impairments
- March 26: AT for Aging In Place
- April 3: The Write Apps for Note Taking

IDEAS Conference:
- June 2: Epworth by the Sea, St. Simons Island

At Online Exchange

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IDEAS Conference
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• Pre-conference June 2 & 3
• Conference June 3 - 6, 2014
• Exhibit Hall – Thursday June 5
• Proposal Deadline March 21
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At the end of today’s webinar, we ask that you please take a moment to complete our survey:

https://www.research.net/s/TFLwebinar
Cortical Visual Impairments
March 20, 2014
Presentation overview

• Anatomy of the Eye
• Visual Pathway
• Cortical Visual Impairment
  Common Causes
  Differences
• Visual Perception
• Presentation of CVI
• Considerations
• Partner assisted scanning
• Resources
The human eye is a highly complex organ system.
The Eye ball

- The eye ball lies in the orbit, a bony cavity in the skull.

- The eye ball consists of the eye layers, the lens and the chambers.
The Retina

• The retina is an essential eye layer. Light waves striking the retina within certain wave lengths are transformed into electrical signals and transmitted to the brain via the optic nerve (cranial nerve II) and the so called “visual pathway”.

• These signals are then processed in the brain and converted to a picture.
The Choroid

- The choroid contains blood vessels that supply the retina.
The Lens

• The lens plays a major role in the accommodation of the eye, the focusing of close and distant vision.
• Through contraction and relaxation of the ciliary muscles the lens changes its shape adjusting the refraction of light.
The Sclera

- The sclera represents the white of the eye.
- It is covered by the conjunctiva, a transparent mucous membrane which is important for the distribution of the tear film during the eye blink.
The Cornea

- The cornea protects the eye to some extent.
- It is part of the optical system and mainly responsible for the refraction of light.
- Deformation of the cornea may lead to visual disorders.
The Iris

• The term iris is Greek for “rainbow”.
• This “pinhole” reaches around the pupil and changes its diameter through contraction.
• The iris regulates the eye’s adaptation to light and dark.
The Vitreous body

• The vitreous body is also part of the refractive apparatus. It is a jelly-like material filling the space behind the lens and has a similar refractive index as the cornea.
The Aqueous Humor

- The anterior and posterior eye chambers are filled with aqueous humor which flows from the posterior to the anterior eye chamber.
- Due to the aqueous humor’s ability of refracting the light it is considered as part of the optical system.
The Optic Nerve

- The Optic Nerve is the second of the Twelve Cranial Nerves.
- It consists of both afferent and efferent visual sensory fibers.
The Oculomotor Nerve

- The Oculomotor Nerve is the third of the Twelve Cranial Nerves.
- It consists of both afferent and efferent visual sensory fibers.
Oculomotor System

• Eye movements are controlled by different eye muscles which all originate from the orbit.
The visual pathway

The processing of visual information—the receipt of visual stimuli through the eyes, its interpretation by various brain centers, and its translation into visual images—has been estimated to involve as much as 40 percent of the brain.
The Visual Pathway

- The Visual Pathway is known as the pathway of the **Optic Nerve**.

- There is a left and right visual field in each eye.
Anatomy of Visual Pathways

• Occipital lobe: sight, visual memory
• Temporal lobe: visual object recognition (size, shape, texture), color vision, face recognition
Anatomy of Visual Pathways

Frontal lobe: voluntary eye movements, saccadic eye movement
Anatomy of Visual Pathways

- Parietal lobe: visual spatial orientation, movement detection, body image, mental mapping of environment
Anatomy of Visual Pathways

- Brain stem: cranial nerves (oculomotor)
- Cerebellum: coordinating skilled movement of ocular muscles
Visual Pathway Pathology

• Damage to the visual pathway can result in various visual field cuts.
• The site of damage determines the visual field loss.
• The damage has the same outcome for both afferent and efferent fibres.
Visual Pathway Pathology

(A) If one eye or one optic nerve is damaged, vision is lost only on the affected side.

(B) If the visual pathways after the optic chiasm (toward the back of the head) are damaged, part of the visual field in both eyes (on the same side as the damage) is lost. This disorder, called hemianopia, may result from a stroke or tumor that damages one side of the brain.

(C) If the optic chiasm is damaged, the outer part of the visual field in both eyes is lost.

= Visual field lost
Common Terminology

- Cortical Visual Impairment (CVI)
- Cerebral Visual Impairment (CVI)
- Cortical blindness
What is cortical visual impairment?

Definition for Medical Purposes:
Cortical visual impairment (CVI) may be defined as bilaterally diminished visual acuity caused by damage to the occipital lobes and or to the geniculostriate visual pathway. CVI is almost invariably associated with an inefficient, disturbed visual sense because of the widespread brain disturbance.
What is cortical visual impairment?

• Definition for **Educational** Purposes:
  Cortical visual impairment (CVI) is a neurological disorder, which results in unique visual responses to people, educational materials, and to the environment. When students with these visual/behavioral **characteristics** are shown to have loss of acuity or judged by their performance to be visually impaired, they are considered to have CVI.
Common causes of CVI

• Hypoxic ischemic encephalopathy
• Traumatic brain injury
• Epilepsy
• Metabolic disorders
• Cardiac arrest
• CNS developmental defects
• Meningitis/Encephalitis
Cortical Visual Impairment

Results in:

• Visual challenges caused by damage to the brain.

• Abnormal visual responses that cannot be attributed to the eyes themselves.

• The visual systems of the brain inconsistently interpreting or understanding what the eyes see.

• Visual impairment
How is it different than a typical visual impairment

<table>
<thead>
<tr>
<th>Neurological/physical</th>
<th>Cortical Impairment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homonymous hemianopsia is a visual field defect (blind area) that affects the same half of each eye, either on the right or left side caused by lesions</td>
<td>Normal or minimally abnormal eye exam</td>
</tr>
<tr>
<td></td>
<td>Difficulty with visual novelty</td>
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<td></td>
<td>Visually attends in near space only</td>
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</tbody>
</table>
How is it different than a typical visual impairment

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</tr>
</thead>
<tbody>
<tr>
<td>• Absolute Scotoma is a non-seeing, blind area within the visual field which may occur due to damage of the visual pathways, or to the retina.</td>
<td>• Difficulties with complexity/crowding</td>
</tr>
<tr>
<td></td>
<td>• Non-purposeful gaze/light gazing behaviors</td>
</tr>
<tr>
<td></td>
<td>• Distinct color preference</td>
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</tbody>
</table>
### How is it different than a typical visual impairment

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<th>Cortical Impairment</th>
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<tbody>
<tr>
<td>• Visual Neglect is the inability or impaired perception of visual information</td>
<td>• Absent or atypical visual reflexive responses</td>
</tr>
<tr>
<td>• Strabismus is a misalignment of the eyes where they do not point in the same direction</td>
<td>• Atypical visual motor behaviors</td>
</tr>
<tr>
<td></td>
<td>• Inefficient, highly variable visual sense</td>
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### How is it different than a typical visual impairment

#### Neurological/Physical

- Visual Agnosia is the inability to recognize common objects because of specific brain problems, regardless of visual acuity.

#### Cortical Impairment

- Visual field deficits
- Visual latency
- Attraction to movement, especially rapid movements.
How do we perceive visually

• Visual perception is a function of our eyes and brain.
• We see images as a whole rather than in parts.
• However, images can be broken down into their visual elements: line, shape, texture, and color.
Visual Perception

- These elements are to images as grammar is to language.
- Together they allow our eyes to see images and our brain to recognize them.
Who is at risk

- Children and Adults with:
  - Asphyxia
  - Brain maldevelopment
  - Head injury
  - Infection
Questions?
Presentation of CVI and Treatment

By: Mickey Rosner
Children’s Healthcare of Atlanta

Presentation of undiagnosed CVI

- In therapy the child’s vision may appear to fluctuate
- The child may be reported as seeing fine (nothing wrong with their eyes per the doctor)
- The child frequently doesn’t look at what they are touching or the find it with their hands before looking.
- Latency of visual gaze
- Some of these kids will turn their head when trying to look at something
- May not be able to coordinate vision with another sensory modality
- Child typically has additional neurological difficulties such as premature birth, seizures, CP, etc.
Considerations for enhanced vision input

Symbol selection

Clear uncluttered pictures with strong lines and borders and contrasting colors

Hard to perceive differences

Easy to perceive differences

- [Image of symbols comparing yes and no with contrasting colors]
Easy to see

One apple up on top!

Two apples up on top!

Look, you.
I can do it, too.

and a big scary green face!

But...
Considerations for enhanced vision in therapy for children with CVI continued

• **Familiarity** - the more familiar a picture is the more they will visually regard it and attach meaning to it.
Considerations for enhanced vision in therapy for children with CVI continued

• **Movement** - often attracts visual gaze
Considerations for enhanced vision in therapy for children with CVI continued

• Closer images rather than far away - children with CVI often see better closer up than farther away.
Considerations for enhanced vision in therapy for children with CVI continued

- **Light** – use of a light to attract vision or to maximize input can be used.

- When **fatigued**, vision is often the first to shut down.
Strategies to try in therapy

• Highlight cues with a flashlight
  • **Attention getting**- moving a light in front of the visual field to attract visual gaze.
  • **General vicinity**-shining a light on the object or picture in the area you want the person to look.
  • **Direct input**- hold a light on a particular location to cue a child as to the correct item to choose.

• Pay attention to visual fields. Watch to see how they are looking or receiving input.

• Bring pictures close and then move back to attract visual gaze.

• Give plenty of quiet time and wait for visual latency
More Strategies

• **Computer play**—many children may not be able to look and listen at the same time. It is not uncommon for children with CVI to activate a switch to interact with the computer and then look away when the sound is playing. After several interactions they typically will begin to slowly look at the computer as the activity becomes more familiar. Remember the more familiar something becomes the more they will visually regard it.
Strategies continued

• Color coding to enhance visual input and symbol recognition
Strategies continued

Toy selection

• Many of these children gravitate towards toys that provide lights and sounds.

Picture presentation and selection

• Try using a solid background such as a black Velcro board.
• Pictures that you use should represent vocabulary that is highly motivational and occurs frequently throughout the day.
• Pictures of people should be up close and uncluttered

Don’t forget

• Constantly analyze and watch what they are doing.
• Try different images to see what they are more able to look at.
What to do when reaching to make a choice is difficult.....

• Many of these kids have difficulty with direct access.
• Many will require indirect access. Try developing partner assisted scanning as a starting point for those children.
  1. Frequently we use a form of partner assisted scanning with these children from a very early age.
  2. Partner assisted scanning involves the child and the communication partner
  3. The partner lists options that a child may want to communicate
  4. The child communicates when the partner has said what it is they want.
Partner Assisted Scanning

• The reason we do partner assisted scanning is to move the behavioral response to a more formal switch based response.

• This can be done using a big Mack or other voice output communication device.

• We are providing choices and then encourage a motor output (switch hit) when you get to the message of choice.

• The partner can help guide the changes where as a device can’t read body language and can’t help guide a child to a specific response.
Partner assisted scanning: Getting Started

• Begin in a **quiet environment**. Often children who need to develop this skill have a great deal of difficulty listening in a noisy environment.
Partner assisted scanning: Getting Started

• Pre-record an appropriate message such as "that is what I want" or "let's play that". Use whatever language will be familiar to the child.

• Put the single shot message on a step by step or big Mack
Partner assisted scanning: Getting Started

• Make sure the activity is familiar.

• If you are starting with an activity that is unfamiliar, then take a few minutes to play with it so that the child has a frame of reference before being expected to make a request.
Partner Assisted Scanning: Getting Started

• **Tell** the child what the choices are going to be. "We can play with a ball, bubbles, or read a book".

• This is the most concrete linguistically, when you actually name the items to choose between.

• Another example would be, "Do you want to watch Cinderella, or Land Before Time?".
Partner Assisted Scanning: Getting Started

• If you can **pair a message with a visual choice** then do so; this really helps reduce the cognitive load.

• Provide the child with the appropriate choices (usually 2-3).

• Make sure to allow enough time for a response (sometimes 5 -7 seconds) before going on. Give 3 times before determining that no response was made.

• Some children will need to **start with two choices**
Partner Assisted Scanning: Trouble shooting

What to do if they don’t respond

- You may need to provide the choice "I don't want to do any of these" or "I want something else". Especially if you believe that they want something that is different than what you presented.
Partner assisted scanning: Trouble shooting

• **Show** them how to activate the single shot voice output system to communicate a response. May need to hold their hand over the switch so that the slightest movement activates the switch.
Partner assisted scanning: Trouble shooting

• If they make **no response** then ask them again and watch their body for a reaction.

• When they show any positive sign to a choice then show them how to activate a switch to communicate a response.

• Immediately reinforce the choice. Always let a child know when you have understood what they are trying to say. Go back and let them know this is how you tell me with the device. (for instance, I see you smiling, I think you want to play piano. Let me show you how to say it this way”

Partner assisted scanning: Confirming

- If a child is capable of providing a confirmation like a smile or vocal yes response.
- Then after they choose you may wish to ask them, "You choose to make a picture, that is what we are going to do, OK".
- Encourage a response.
- If they smile or use some other type of body language you should acknowledge this as a confirmation. Always let them know why you are reinforcing something.
The Ultimate Goal of Partner assisted scanning

• Once a child can make a reliable choice going from a general to specific using a switch to respond they can easily transfer this skill to a formal communication device using scanning.

• Using two switch step scanning is good as a method of access when scanning for kids who have more than one access method. This gives them much more control in the scanning process.
  • One switch for no and the other for yes or move and then select.
Feedback for kids who can reach but vision is not reliable at all

- Tactile feedback may help in understanding, especially if you are using a single switch for everything. Keep it simple and familiar.
- The referent should never be the reward.

Texas school for the blind has a list of tactile symbols [http://www.tsbvi.edu/tactile-symbols#EMOTIONS](http://www.tsbvi.edu/tactile-symbols#EMOTIONS)

- Provide visual input, but don’t rely on it.
Food for thought

• When something is gone they don’t know where it is, so words like bye and all done might be confusing for them.

• If you recognize they need help with understanding where their body is in space, use hand over hand or elbow assist to help them get started when establishing some simple gestures.
Questions?
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Resources for children with CVI

- **American Association of the Deaf-Blind (AADB)**
  AADB is a national consumer organization of, by, and for deaf-blind Americans and their supporters. “Deaf-blind” includes all types and degrees of dual vision and hearing loss. AADB’s mission is to ensure that all deaf-blind persons achieve their maximum potential through increased independence, productivity, and integration into the community. For more information please visit [www.aadb.org](http://www.aadb.org) or call (301) 495-4402 (TTY) or (301) 495-4403 (Voice).

- **American Foundation for the Blind**
  For nearly a century AFB has been expanding possibilities for people with vision loss by setting trends and devising innovative initiatives. For more information please visit [www.afb.org](http://www.afb.org) or call (404) 525-2303.

- **Georgia Council of the Blind**
  The Georgia Council of the Blind is a non-profit consumer organization affiliated with the American Council of the Blind. The Council strives to elevate the social, economic, and cultural levels of the blind. For more information please visit [www.georgiacounciloftheblind.org](http://www.georgiacounciloftheblind.org) or call 1 (877)-667-6815.
Resources for children with CVI

• Georgia Lions Lighthouse
The mission of the Lighthouse is to foster sight conservation and restoration, and hearing conservation, with a particular emphasis on youth. For more information please visit http://lionslighthouse.org or call (404) 325-3630 or 1 (800) 718-SITE (7483).

• Guide Dog Foundation for the Blind
Since 1946, the Guide Dog Foundation for the Blind, Inc. has provided guide dogs free of charge to blind people who seek enhanced mobility and independence. For more information please visit www.guidedog.org.

• Guiding Eyes for the Blind
Guiding Eyes for the Blind is dedicated to enriching the lives of blind and visually impaired men and women by providing them with the freedom to travel safely, thereby assuring greater independence, dignity and new horizons of opportunity. For more information please visit www.guidingeyes.org.

• Hadley School for the Blind
The Hadley School for the Blind is the largest worldwide distance educator of blind and visually impaired people, their families and blindness service professionals. For more information please visit: www.hadley.edu
Resources for children with CVI

• **Center for the Visually Impaired**
  Located in Atlanta, the mission of the Center for the Visually Impaired is to offer comprehensive services to promote independence with dignity and the preservation of self worth for individuals of all ages who are blind or visually impaired. For more information please visit [http://www.cviatlanta.org](http://www.cviatlanta.org) or call (404) 875-9011.

• **Recording for the Blind and Dyslexic (RFB&D)**
  Recording for the Blind & Dyslexic®, a national nonprofit, volunteer organization, has been the leading accessible audiobook library for students with disabilities such as visual impairment or dyslexia that make reading standard print difficult or impossible for the last 60 years. With titles available in every subject area and grade level, RFB&D’s digitally recorded audio textbooks on CD and downloadable audio textbooks help students challenged by the printed page. For more information Please visit [www.rfbd.org](http://www.rfbd.org).
Resources for children with CVI

• **National Eye Institute (NEI)**
  The NEI conducts and supports research that helps prevent and treat eye diseases and other disorders of vision. For more information please visit [www.nei.nih.gov](http://www.nei.nih.gov) or call (301) 496-5248.

• **National Federation of the Blind of Georgia, Inc.**
  The National Federation of the Blind of Georgia, Inc. (NFBGA), is a 501-C(3) non-profit volunteer organization of blind people improving the quality of life for all who are blind. Members of the NFBGA possess the knowledge, skills and life experience that work toward making a positive difference in the future of all blind adults and children. For more information please visit [www.nfbga.org](http://www.nfbga.org) or call (404) 371-1000 (Voice) or 1(866) 316-3242.
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