HOW DOES CORTICAL VISUAL IMPAIRMENT IMPACT ACCESS?

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Access to Independence

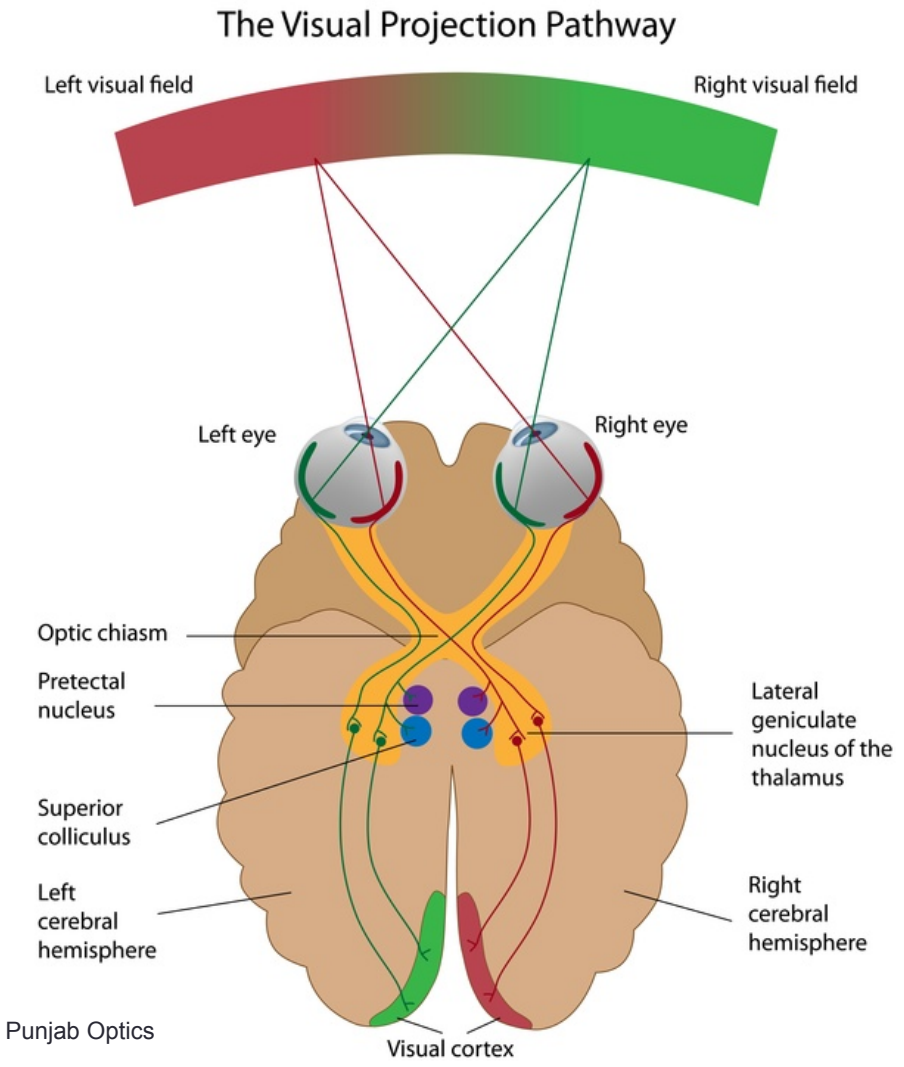
What are we covering?

- The impact of Cortical Visual Impairment on Access to Assistive Technology
  - What is Cortical Visual Impairment?
  - How does CVI impact the student's ability to access AT?
  - What interventions will help?
  - Case Studies

CP Daily Living

Vision

- Vision is complex!
- The visual system is part of the Central Nervous System (CNS)
- The lens focuses an image onto the retina
  - Light sensitive membrane on the back of the eye
- The focused image is then sent to the brain via the optic nerves
- The brain interprets or processes the visual information



Visual Acuity

- Visual acuity is primarily focus of images and has to do with the eye itself
- Acuity Deficits
  - Myopia (near sightedness) – image focuses in front of the retina
  - Hyperopia (far sightedness) – image focuses behind the retina
  - Astigmatism – images are not sharply focused on the retina due to the shape of the cornea

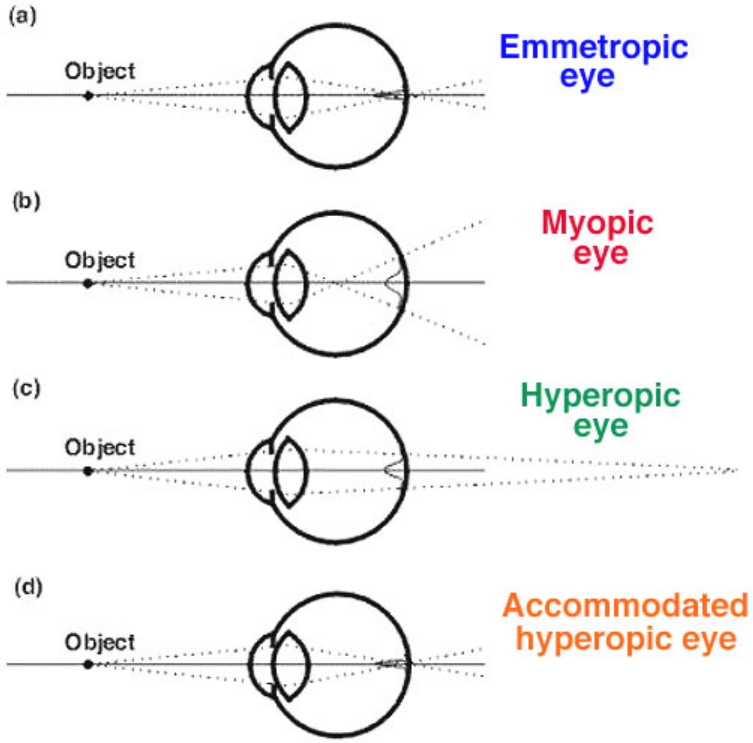


Figure 17. Point spread function at the back of the eye with different refractive errors.

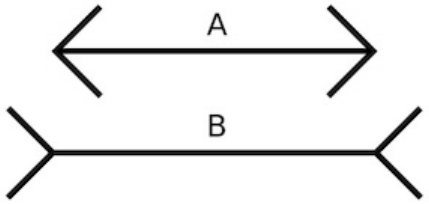
Webvision

Oculomotor Function

- Fixate – quickly and accurate locate a target
- Pursuit – visually follow a moving object
- Saccades – efficiently move eyes to fixate on objects from point to point (i.e. reading)

Getty Images

Visual Perceptual Skills

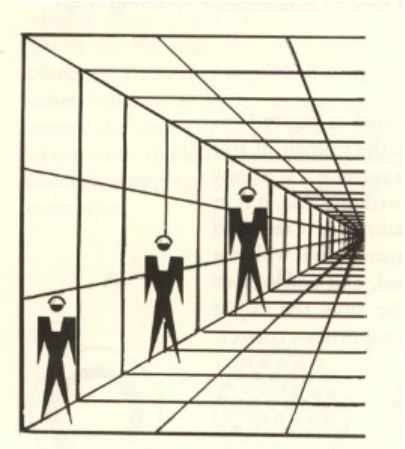


Study.com

- Form Constancy
  - Ability to recognize and label objects even in different contexts
- Visual Discrimination
  - Being able to discriminate between items, even similar items
- Visual Closure
  - Being able to correctly perceive something, even when partly hidden
- Visual Memory
  - Being able to remember what something looked like
- Visual Sequential Memory
  - Being able to visually remember a sequence of letters or numbers

Visual Perceptual Skills

- Depth perception
  - The ability to determine where you are in space in relation to other objects
  - i.e. the ability to determine how tall that curb is before you take a step
- Figure Ground Perception
  - Finding an object (i.e. a spoon) in a field (i.e. a silverware drawer)



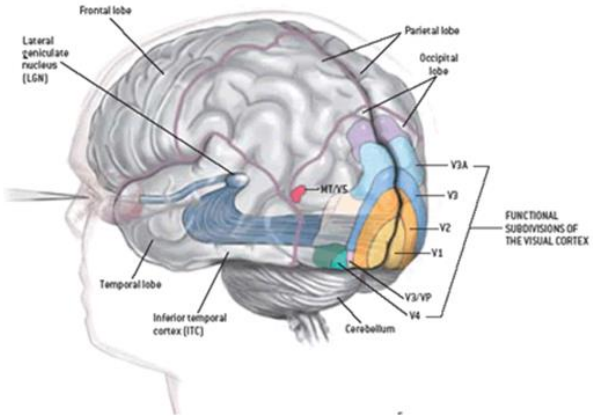
Jim Mather

Vision and Function

- Vision impacts our ability to move throughout the environment
- Vision impacts our posture

What is Cortical Visual Impairment?

- Cortical Visual Impairment or CVI
- Sometimes called Cerebral Visual Impairment
- Neurological problem in the visual processing center and visual pathways of the brain
- Not from a physiological problem with the eye
- The eye sees an image, sends it to the brain, but the information is not processed properly due to abnormal brain function



Texas School for the Blind and Visually Impaired

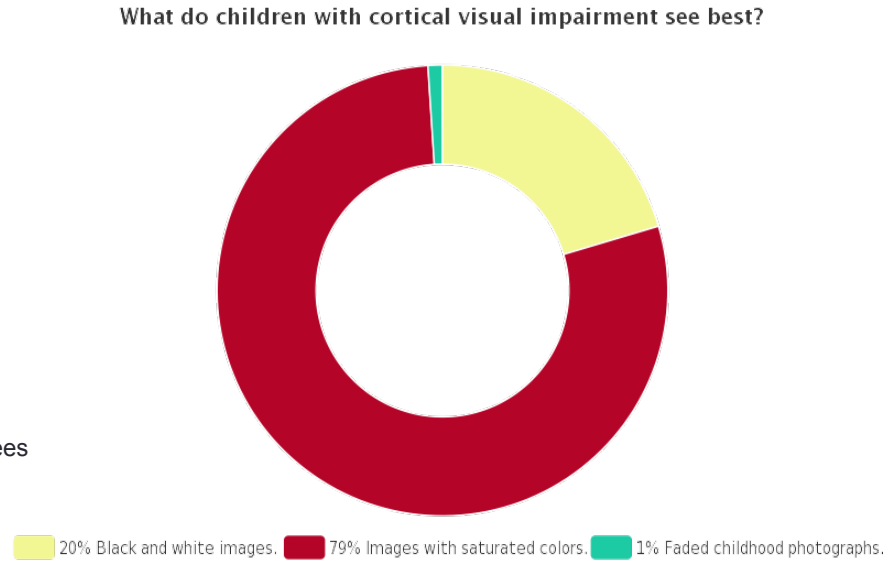
What Causes CVI?

- CVI is caused by a lack of oxygen, injury or infection of the areas involved
- Common in clients with
  - Cerebral palsy
  - Hydrocephalus
  - Brain injury
  - Meningitis

How Does CVI Impact Vision?

- Difficulty sustaining focus on an object
- Difficulty filtering out peripheral visual information
- Certain colors and contrasts may be easier to see
- Vision may fluctuate throughout the day
- Vision may improve over time
- Visual responses are often delayed

Little Bear Sees



Specific Traits

- Child will often glance at objects repeatedly, rather than sustain visual contact
- Child may assume asymmetrical head positions and vary head position to improve their ability to see an object
  - These positions are rarely constant
  - Client may hold head forward and look at objects out of the sides of their eyes

How is CVI diagnosed?

- Specialized optometrist
  - Behavioral optometrist
  - Developmental optometrist
  - Neurological optometrist
- Testing is possible even on young children and children who are non-verbal
- Need to find a specialist in your area?
  - Neuro-Optometric Rehabilitation Association
  - Noravisionrehab.org

NORA
NEURO-OPTOMETRIC
REHABILITATION ASSOCIATION

Can CVI be Treated?

- CVI cannot be corrected with corrective lenses or surgery
- Vision therapy, by a specially trained clinician, may be helpful
- Accommodations are also helpful
- CVI can improve over time

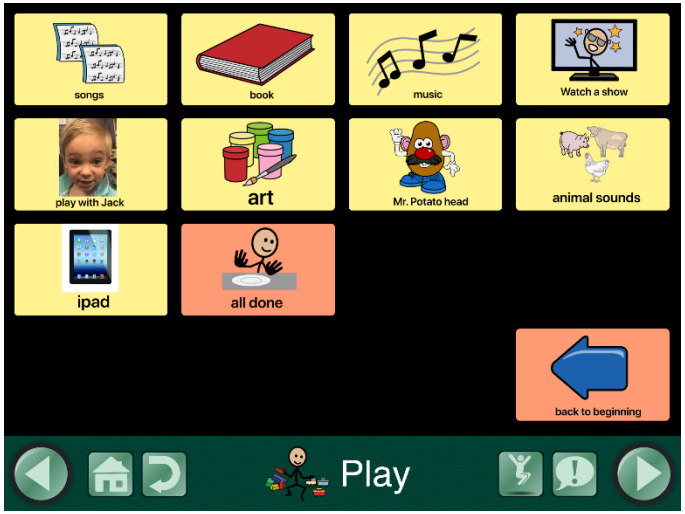
Glassesusa.com

Let's get Practical!

- Think of a client you are working with
- As we move through the webinar, think of strategies that may be helpful

How does CVI Impact Access to AT?

- In general, the client may have difficulty seeing a display
- Specifically, the client may have difficulty:
  - Sustaining focus on an area of the display
  - Visual perceptual skills may be impacted as the brain is not getting sufficient information for these skills to develop and work properly
    - Form Constancy
    - Visual Discrimination
    - Visual Closure
    - Visual Memory
    - Visual Sequential Memory

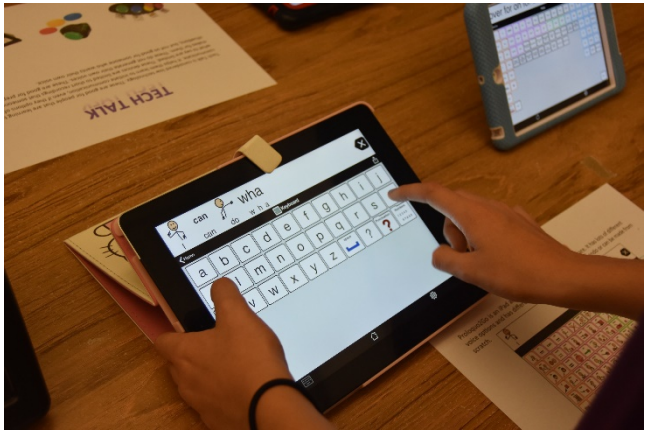


CVI and AAC

- The child with CVI will have difficulty:
  - Sustaining visual contact with the display
    - May see the device better if it is positioned to the side, allowing peripheral vision to be used
  - Visually tracking between selections to make a choice
  - Discriminating between icons
    - Not enough visual information
  - Returning to the same location – visual memory

CVI and AAC Access

- Access Methods
- Direct Access is often not possible, as the client has to:
  - visually track between possible choices
  - Visually discriminate between possible choices
  - sustain gaze while reaching out to activate that location



AAC Awareness

CVI and AAC Access

- Access Methods
- Eye Gaze Access is often not possible, as the client has to:
  - visually track between possible choices
  - Visually discriminate between possible choices
  - sustain gaze to activate that location

Scope

CVI and AAC Access

- Access Methods
- Standard Switch Access is often not possible, as the client has to:
  - Visually track between possible choices
  - Visually discriminate between possible choices
  - Track scanning to reach desired location

CVI and AAC Access

Noun Project

- Access Methods
- Auditory Switch Scanning is typically possible
  - The client does not need to see the display at all
  - The client listens to auditory cues
- Tips:
  - Very important to build vocabulary carefully so that the client knows where everything is
  - I generally place the device in front of the client
    - We don’t know how much they see and this helps the client to use the vision they have
    - Vision may improve

Questions?

Case Study

- Colton
- Initially seen at 2 years, 6 months
- Medical diagnoses:
  - Periventricular leukomalacia (PVL)
  - Mosaic duplication of chromosome 15
  - CVI
  - Seizures
- Identical twin, born at 34 weeks
  - 3 months in NICU, after discharge stopped breathing and required resuscitation.

Colton

- Colton was referred by his EI caseworker for an AAC evaluation
- Referral to Occupational Therapist for positioning and access to SGD

Colton

- Positioning
- Colton has very low tone, particularly in his trunk
- He had an adaptive stroller, but this seating did not provide adequate support
- He also used a Special Tomato adaptive seat
- In both of these systems, Colton sat in a posterior pelvic tilt and kyphotic trunk, leading to neck hyperextension
  - A blanket was rolled and placed behind his neck to improve support and a diaper was placed at his right trunk to limit leaning in that direction

Colton

- Colton was evaluated for a new seating system
- Colton did well in an ASO (Aspen Seating Orthosis) to provide the intimate contact required for postural support and alignment, stability, and pressure distribution

Colton

- Access
- Colton had been using his right hand to activate a switch, but he was unable to do so independently
  - He also used his ATNR to drive his hand toward the switch, pulling his eyes away from the AAC technology
- He does not have adequate motor skills for Direct access
- His vision is too impaired for Eye Gaze access at this point
- He required auditory scanning
- I needed to find a spot where he could independently access a switch…

Parent Perspective

Colton

- Even in the Special Tomato, Colton was able to access a switch by the left side of his head
  - The Jellybean has a nice clear click for feedback and placing this by his cheek allows him to see and feel it
  - Later, he may do fine with the switch placed further back on his head
  - The right side of his head was not a good option as he tends to lean to this side and release would be more difficult
  - He began accurately scanning in a very short time!

Colton

- Colton’s switch and a private speaker are now embedded in his head support

Colton

- Mobility
- We would like to explore power mobility for Colton in the future when he is more medically stable
- Vision – many children with visual impairments can drive a power wheelchair, sometimes with supervision.
  - Developmental benefits

Initial assistive technology

- Family's iPad with borrowed ChatWrap case
- GOTalk NOW Plus communication application
  - Selected because of auditory scanning capabilities, affordability, and ease of programming
- Switch mount and switch funded through insurance
- Switch interface funded using EI dollars

GoTalk NOW

AAC and Vision

- Colton listens to his choices through auditory scanning
- He sometimes looks at his device, as well
- We don’t know how much he sees, but this is helping his vision

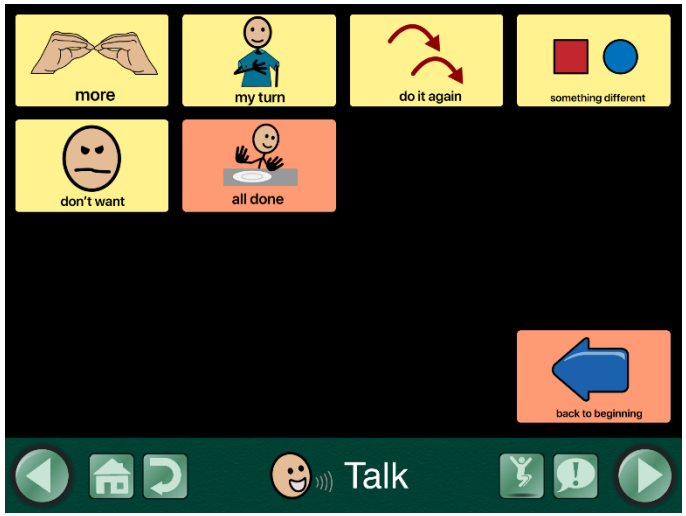
Current communication

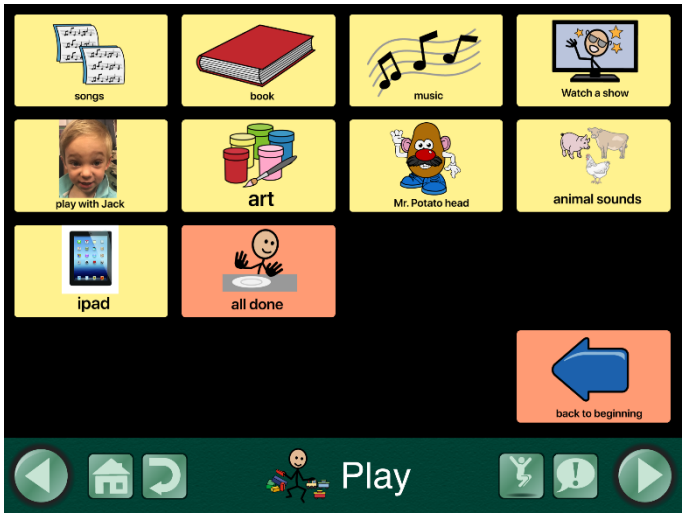
- His communication helps his to participate within his family
- In numerous environments

Current communication

- Video

Examples of vocabulary pages





Questions?

Case Study

- Brady
- Age: now 10 years old
- Diagnoses:
  - cerebral palsy
  - Movement disorder
  - **CVI**
  - Medically fragile
  - Scoliosis

Referral

- Brady was being seen by a speech language pathologist at The Children's Hospital in Denver
- She referred Brady for an access evaluation, as he was having difficulty progressing due to little to no access
- Brady was 7 years old and in 1st grade.
- He was receiving OT and PT
- He had been evaluated by the augmentative communication team at age 4 and more recently by the school AT team

Current Positioning

- Brady was seated in a custom molded seating system (Aspen seating orthosis) set on top of a Panda seating system. He was positioned well, though his neck was hyperextended.
- He had a dependent mobility base, a Snug Seat Tiger and a hi-low base.

Evaluation: Positioning

- Identified problems:
  - Lack of stability at the head
  - Scapular protraction and shoulder rounding, pulling the head forward
  - Elbow flexion pattern, leading to ROM loss
  - No support at feet for stability

Positioning Recommendations

- Stealth headrest with occipital pad, suboccipital pad, and lateral supports

Positioning recommendations

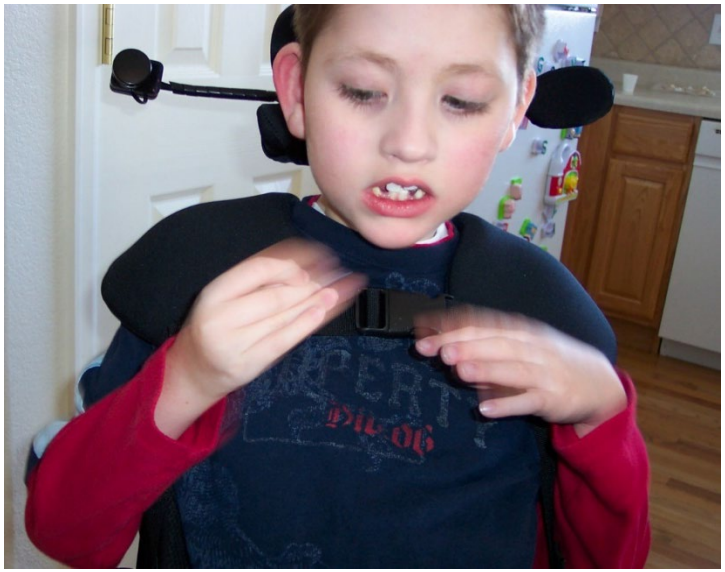
- Shoulder pads to retract scapulas and extend upper trunk to improve head position for access.

Positioning Recommendations

- Ankle Huggers to increase overall stability and reduce tremoring

Current Access

- Brady was using a Big Mack with his right hand. He required assistance to reach and press this switch surface. His movement patterns pull his hands up to his face.



Evaluation: Access

- Brady did not display adequate motor control for direct access
- Brady's vision was quite impaired (CVI), so he required auditory scanning which works best using a single switch
- With increased stability at the head and feet, as well as a bit more upper trunk retraction and extension, Brady could use a switch by either side of his head.

Access Recommendations

- Brady demonstrated his best control at the right side of his head, so an AbleNet Spec switch was placed on the headrest in this location. It can be swung away when the SGD is not being used.
- A speaker was placed on the left side for private listening of auditory cues and to provide a lateral “template”

Evaluation: Application

- I wanted to get a sense of Brady's communication potential, even though an SLP was not present.
- Partner assisted scanning: Brady demonstrated the ability to make multiple choices using this new switch site

Application Recommendations

- Recommended return to TCH AAC program for another evaluation with new positioning and access.
- Eventually, a new SGD was recommended to meet his communication needs.

Changes over the years…

- Positioning:
  - moved to MWC which was more stable and has more growth
  - Ankle huggers to shoeholders
  - Shoulder pads to shoulder straps

Changes over the years…

- Communication:
  - Brady moved from a PRC SpringBoard to an ECO and now an Accent 800
  - He is trying to spell
  - He generates unique sentences
  - He can use the SGD to control the TV and DVD player
  - He is beginning to send messages to a word processing program on the computer

Brady now… Video

Questions?

Take Home Message

- Cortical Visual Impairment can impact a child's ability to access AT
- Each child is unique and evaluation will provide more information and direct intervention
- Auditory input is critical

Let's get Practical!

- Remember that client you were thinking of?
- Did you think of any useful strategies to try?
- Write them down, give them a try and let me know how it works!

Activity Idea

- Grab a communication device with some basic vocabulary on it
- Set it up for switch access and auditory scanning
- Try and navigate through the vocabulary without looking at the display

Thank You!

Contact Information

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