UNDERSTANDING CORTICAL VISION IMPAIRMENT (CVI) AND STRATEGIES TO MAXIMIZE THE LEARNING ENVIRONMENTS

Julie Durando, Ed.D.
Project Director, Virginia Project for Children and Young Adults with Deaf-Blindness
Partnership for People with Disabilities, Virginia Commonwealth University
Phone: 804-828-8252 Email: jdurando@vcu.edu
http://www.vcu.edu/partnership/vadbproject/

OVERVIEW

- How CVI differs from ocular impairments
- The 10 characteristics of CVI
- How these characteristics relate to our brain’s processing of sensory information
- Strategies to improve the learning environment
- Video simulations and video examples of the visual behaviors will illustrate main concepts

VIRGINIA PROJECT FOR CHILDREN AND YOUNG ADULTS WITH DEAF-BLINDNESS

- Goal: To support families, teachers, and service providers in their efforts to improve outcomes for children and youth who experience both vision and hearing loss.

- Services: Consultation (technical assistance or TA), training, information disseminations (lending library), collaboration, and maintain Virginia’s Deaf-Blind Child Count (Census)
WHAT IS THE CRITERIA FOR DEAF-BLINDNESS?

- Myth: Deaf-Blind always implies total absence of hearing and vision
- The term deaf-blind includes individuals who have a wide range of hearing and vision loss.  
  - Vision and hearing loss may differ in severity and cause.
- In reality, each child who is deaf-blind is very different and unique.

TO QUALIFY AS DEAF-BLIND FOR THE CENSUS

- The individual must be less than 22 years of age and meet at least one condition in both of the following areas:
  - Hearing
    - Documented auditory impairment of at least 15 dB
    - Documented Central Auditory Processing Disorder (CAPD)
    - A documented syndrome, disease, or disorder associated with hearing loss
  - Vision
    - Documented visual impairment of 20/70 or worse after correction (with glasses or contacts) in better eye
    - A loss in visual field
    - Documented syndrome, disease or disorder associated with vision loss
    - Diagnosis of cortical visual impairment from an ophthalmologist and/or neurologist

THE VISUAL SYSTEM
Simply stated, cortical visual impairment (CVI) occurs when the eyes work fine but the part of the brain that interprets signals from the eyes does not.

For educational definition see:
http://www.aph.org/cvi
DEBUNKING MYTHS: TRUTHS ABOUT CVI

- Visual functioning fluctuations are not random, but based on the environmental factors
- We are continuing to learn more about CVI
- Treatment is education, not medical
- CVI may range from mild to severe
- Unlike ocular disorders, CVI can improve as neural pathways develop
- Interventions should be adjusted for severity

CVI RANGE

- Functional Vision Assessment for individuals with CVI
- Considers: Medical Diagnosis, Parent Interview, Observation, Assessment of 10 Characteristics
- Scores a range 1-10; 10 indicates complete “resolution”
- Use can determine if CVI is mild, moderate, or severe
  - Phase 1: (Severe 0-3) building stable visual function
  - Phase 2: (Moderate 4-7) integrating vision with function
  - Phase 3: (Mild 8-10) resolution of CVI characteristics

BASIC CONCEPTS

- Given appropriate accommodations, most children with CVI improve their use of vision*
- As children improve, they are said to “resolve” the CVI characteristics
- Intervention goals depend on severity of CVI
  - Phase 1: (Severe) building stable visual function
  - Phase 2: (Moderate) combine vision with function
  - Phase 3: (Mild) using vision for most tasks
- Consider characteristics as they apply to the environment and the target

LIGHT GAZING

- Staring at lights or light sources
- Tip: Position lights behind student
  - We accidentally set up light gazing by how we position children
- Tip: Use book light with objects

RESOLUTION OF LIGHT GAZING/NON PURPOSEFUL GAZE

<table>
<thead>
<tr>
<th>Strong Characteristic</th>
<th>Nearly Resolved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overly attentive to lights or possibly ceiling fans</td>
<td>Less attracted to lights – can be redirected to other targets</td>
</tr>
</tbody>
</table>

VISUAL REFLEXIVE RESPONSES

- Blinking is not addressed through instruction
- Assessment only
  - Blink to touch
  - Blink to visual threat
**Resolution of Visual Reflexive Responses**

<table>
<thead>
<tr>
<th>Strong Characteristic</th>
<th>Nearly Resolved</th>
</tr>
</thead>
<tbody>
<tr>
<td>No blink in response to touch and/or visual threat</td>
<td>Blink response to touch consistently present. Visual threat response intermittently present</td>
</tr>
<tr>
<td>Blinks in response to touch but response may be latent</td>
<td>Visual threat response consistently present (both near 90% resolved)</td>
</tr>
<tr>
<td>Blink response to touch consistently present. Visual threat response intermittently present</td>
<td>Visual reflexes always present, resolved</td>
</tr>
</tbody>
</table>

**Difficulty with Visual Novelty**

- Children prefer familiar items
- Children with CVI actually look away from or ignore novel objects
- Tip: use familiar objects and preferred colors to help introduce new objects
- Again, we often take for granted how quickly our brain recognizes the familiar even with limited information

**Color Preference**

- Usually strong color preference—a color that attracts and holds attention (example: red)
  - The CVI child looks only at items that are red in color.
- Apply color to objects you want the child to look at
  - Red rattle, red cup...
- We may take for granted how much brain processing is involved in color perception
**Resolution of Color**

<table>
<thead>
<tr>
<th>Strong Characteristic</th>
<th>Nearly Resolved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objects viewed are generally single color</td>
<td>Has a “favorite” color</td>
</tr>
<tr>
<td>Objects may have 2-3 colors</td>
<td>More colors, familiar patterns regarded</td>
</tr>
<tr>
<td>No color or pattern preference</td>
<td></td>
</tr>
</tbody>
</table>

**Movement**

- Movement can attract and sustain visual attention
  - Movement activates vision
- Vision develops in brain peripherally to centrally
- Objects with shiny or reflective properties can imitate movement

**Resolution of Movement**

<table>
<thead>
<tr>
<th>Strong Characteristic</th>
<th>Nearly Resolved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objects viewed generally have movement or reflective properties</td>
<td>More consistent localization, brief fixations on movement &amp; reflective materials</td>
</tr>
<tr>
<td>Movement continues to be an important factor to initiate visual attention</td>
<td>Movement not required for attention at near</td>
</tr>
<tr>
<td>Typical responses to moving targets</td>
<td></td>
</tr>
</tbody>
</table>
VISUAL LATENCY

- Delayed responses between the time the object is presented and when the child looks
- Need to wait long enough for the child to perceive the object
  - Wait without giving additional prompts
  - Wait without moving the target to a new location (don’t try to follow gaze, let the gaze come back)

RESOLUTION OF LATENCY

<table>
<thead>
<tr>
<th>Strong Characteristic</th>
<th>Nearly Resolved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prolonged periods of visual latency</td>
<td>Latency slightly decreases after periods of consistent viewing</td>
</tr>
<tr>
<td>Latency present only when student is tired, stressed, or over stimulated</td>
<td>Latency rarely present</td>
</tr>
<tr>
<td>Latency resolved</td>
<td></td>
</tr>
</tbody>
</table>

COMPLEXITY

- Types of complexity include:
  - surface
  - viewing array
  - sensory environment - i.e. background noise, crowded rooms
- Complexity of target, for example faces, are very complex
  - Example: Able to visually locate red slinky against a black background; however, unable to locate if placed on a Where’s Waldo background
**Faces and Complexity**
- Faces are dynamic and complex
- Familiar faces at close range will likely be regarded first
- Parents often report their child with CVI seems to look through them or ignore their face altogether
- This should not be confused with autism

**Resolution of Complexity (Target)**

<table>
<thead>
<tr>
<th>Strong Characteristic</th>
<th>Nearly Resolved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visually regards simple objects</td>
<td>Views simple books or other 2-dimensional materials. Typical visual-social responses.</td>
</tr>
<tr>
<td>Visually fixates on simple objects</td>
<td>Views simple books/symbols. Smiles at/regards familiar and new faces.</td>
</tr>
<tr>
<td>Familiar faces when no voice competes</td>
<td></td>
</tr>
</tbody>
</table>

**Resolution of Complexity (Environment)**

<table>
<thead>
<tr>
<th>Strong Characteristic</th>
<th>Nearly Resolved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Responds only in strictly controlled env.</td>
<td>Only the most complex visual environments affect visual response</td>
</tr>
<tr>
<td>Visually fixates when env. is controlled</td>
<td></td>
</tr>
<tr>
<td>Student tolerates low levels of familiar background noise</td>
<td></td>
</tr>
<tr>
<td>Student attends to toys with music</td>
<td></td>
</tr>
</tbody>
</table>
Reduce Clutter

- One toy vs. Many toys
- A few pieces vs. all at once
- Toy/object on solid background vs. Toy/object on patterned background

Visual Field Preferences
- Place where child best uses vision is visual field preference
- Regulated by the brain
- Visual responses in lateral fields first—lower field usually last to improve
- Interior fields affected by brain injury
- Often appear to look through people
- Central viewing may develop over time

Absence of Visually Guided Reach/Visual Motor
- A child will look at an object, look away, and then reach
- Not the same as ATNR or motor latency
- Can help by keeping background simple and environment quiet
- Don’t try to move object to the vision
RESOLUTION OF VISUAL MOTOR

<table>
<thead>
<tr>
<th>Strong Characteristic</th>
<th>Nearly Resolved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Look &amp; touch occur as separate functions. Large and/or moving targets</td>
<td>Look and touch consistently</td>
</tr>
<tr>
<td>Look &amp; touch on smaller objects that are familiar, lighted, or reflective</td>
<td>Visually guided reach with familiar objects or “favorite” color</td>
</tr>
<tr>
<td>Look and touch occur in rapid sequence but not always together</td>
<td>Look and touch</td>
</tr>
</tbody>
</table>

DISTANCE VIEWING
- Often problematic for children in early phases
- Difficulty because CVI child cannot perceive the object at a distance because of the visual complexity of the environment
  - Child brings the object closer to his face to reduce visual complexity
- In phase, typically only responds within 18-24 inches of his or her face

IS BIGGER BETTER?
- Enlarging reduces ability to see the “big picture”
- Although some students need enlargement, it shouldn’t be assumed that a child who holds things close up needs enlargement
- Child may be reducing clutter
- Clutter, novelty, and context are important
- You will be shown a series of cropped, enlarged portions of one picture. Can you figure out the bigger picture?
  - Picture placement on slide is relative to position in bigger picture
**Resolution Distance Viewing**

<table>
<thead>
<tr>
<th>Strong Characteristic</th>
<th>Nearly Resolved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visually attends in near space only</td>
<td>Visual attention extends beyond near space, up to 4-6 feet</td>
</tr>
<tr>
<td>Occasional visual attention on familiar, moving or large targets at 2-3 feet</td>
<td>Visual attention extends to 10 feet with targets that produce movement</td>
</tr>
<tr>
<td>Visual attention extends beyond 10 feet</td>
<td></td>
</tr>
</tbody>
</table>

**Thinking About Intervention Strategies**

- Unlike ocular disorders, CVI can improve as neural pathways develop
  - Example: learning to visually read braille
    - Prior to thinking about learning braille - ignore
    - At first introduction – appears random
    - Learning alphabet – with focus, understand cell by cell
    - Fluent reading – making meaning effortlessly
  - Similarly, the brain must learn to see.

**Learning to Look (Phase 1): Building Visual Behavior**

Students generally require:
- Single color objects
- Objects of preferred color
- Objects that produce movement or are shiny
- Objects presented against a simple background
- Objects that are familiar

- Roman-Lantzy, 2005
IDEAS FOR CHILDREN LEARNING TO LOOK

- Create small area in classroom with reduced noise, supportive seating, and controllable light
- Use black sheet, black matte finished poster board, sweater, etc. to block out visually distracting stimuli
- Dim lights and use book light or flash light to draw attention to targets

INTEGRATING VISION WITH FUNCTION (PHASE 2)

- Students generally require a reduction of visual and auditory environment
- Be cautious about interpreting student’s visual attention as successful visual processing
  - In other words, looking ≠ seeing all details
- Multisensory ≠ all senses all at one time

**Students should be at least a ‘7’ on the CVI Range before asking them to discriminate 2-D objects**
-Roman-Lantzy, 2005
MOVING FROM OBJECTS TO PICTURES
- Requires careful planning and consideration of individual needs
- Present familiar object with corresponding photograph
- Present photograph with drawing/picture
- Be cautious of complexity of picture

LOOKING TO LEARN (PHASE 3)
- Try a cubicle if the environment is too distracting
- Reduction of information when presented in 2 dimension**
  - Use slant boards, occluders, or window cards to eliminate excess detail
  - Highlight or outline critical features of symbols or pictures

REVIEW
When it comes to CVI think

not contrast.
**REVIEW**

True or False?

When a child is first learning to look, it is best to use different toys each day so she doesn’t get bored looking at the same thing.

**REVIEW**

True or False?

You should not write goals to help the child develop blink reflexes.

**REVIEW**

If a child looks away from the target you should:

a. Move the target where they are looking
   or
b. Keep the target in the same place and wait quietly
Children with CVI tend to bring targets closer to reduce ____________

Children with CVI may not look at your face or seem to look “through” your face due to which characteristic?

How can color be helpful in complex targets?
**SPEAKING OF SNOW**

- Like snowflakes all brains are unique; each child will learn to look based on what his own brain takes from each experience.
- Each of the characteristics may resolve uniquely for each child.
- The most important strategy is to observe the child and continually adapt accommodations.

**RESOURCES**

- DB-Link Special Topics
- West Virginia Department of Education On-Line CVI Training
- American Printing House CVI Information