Assistive Technology Outcomes and Benefits
Volume 14, Spring 2020, pp. 111-128
 ISSN 1938-7261
Available online: www.atia.org/atob

Emergent Literacy for Students with Cortical Vision Impairment: Self-Directed Reading

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Abstract

Students with Cortical Vision Impairment (CVI) struggle with literacy, including basic foundational knowledge. These students need comprehensive emergent literacy instruction which includes opportunities for self-directed reading. Self-directed reading simply implies giving students opportunities to choose a book and then explore it independently. In order to entice students to want to read, professionals need to have a wide assortment of personally meaningful and motivating books which are visually and physically accessible. This article will provide an overview of CVI, with very specific implications and suggestions for self-directed reading, along with a discussion of using PowerPoint to make books that are customized to meet students' vision needs.

Keywords: cortical visual impairment, emergent literacy, self-directed reading.

Target Audience and Relevance

This article is intended for use by professionals and families who are supporting learners with significant physical, communication, and sensory impairments. Our intention is to guide conversations across professional boundaries and encourage a multimodal collaborative approach. Our primary focus is on students who are identified or demonstrate characteristics of cortical visual impairments. The challenges with literacy learning may at first glance appear insurmountable for some of these students. Some well-intentioned interventionists have even gone so far as to re-define literacy in terms of symbolic representation of messages using objects or photos rather than the letters of the alphabet. In this article, we will define literacy as the ability to interact with text (letters of the alphabet) to produce (write) and understand (read) words. We will target emergent reading activities that can be self-selected and self-directed, as one element of comprehensive literacy instruction. Referencing the degree of impact from different visual characteristics can focus collaborative planning and specific ideas for finding and creating reading electronic materials. This article also includes specific ways that PowerPoint tools can address needs for using light, color, movement, and reduced complexity, to address common challenges associated with visual latency, visual field preferences, and absence of visually guided reach.

Introduction

Students with Cortical Vision Impairment (CVI) pose a daunting challenge to the professionals who are working to build students' vision, communication, and literacy skills. Each professional brings his/her domain-specific expertise to the team, and may be looking at the student from a different perspective with different goals. It is essential that professionals share and integrate their expertise to design robust language and literacy instruction that is accessible and personally meaningful for these students. In this article, we will discuss ways in which robust emergent literacy learning can occur while also addressing students' visual, expressive communication, and auditory processing needs in ways that don't limit literacy learning. Some students may be overwhelmed by auditory information when attempting to engage visually, and by visual information when trying to listen to auditory signals. These are the students who we see putting their heads down when somebody reads to them, during shared reading. This may also occur during self-selected reading time. In some cases, they are compensating for a lack of ability to integrate vision and hearing, and basically "tuning out vision" is how they behave when listening hard (Dutton, 2015; Tietjen, 2019). We also need to be aware of auditory processing challenges and modifications that are necessary to provide meaningful literacy experiences for students who have combined vision and hearing loss (CVHL). In this article, we will discuss ways in which robust emergent literacy learning can occur while also addressing students' visual and complex communication needs (CCN) in ways that don't limit literacy learning.

Providing Appropriate Literacy Instructions

It is important for professionals to understand literacy development in order to design the most appropriate literacy instruction. The term emergent literacy describes the process of beginning, exploratory reading, and writing experiences of children before they learn to conventionally read and write (Teale & Sulzby, 1986). Emergent literacy is not about sight words, phonics instruction, spelling words,

or taking comprehension tests—those are all conventional literacy skills. Instead, emergent literacy refers to the foundational experiences that prepare children for conventional instruction. It has been well documented that without a solid emergent literacy foundation, students will have difficulties with later conventional literacy learning. Professionals working with students with CVI need to understand the distinction between emergent literacy and conventional literacy in order to determine the most appropriate instruction. Although it is necessary to build a foundational knowledge base, emergent literacy is often poorly understood or not recognized as being important for students with CVI, particularly when these students have limited verbal language.

Emergent literacy starts at an early age, as infants, toddlers, and young children actively engage in a wealth of rich social interactions around print. Young children see print, experiment with print, and watch others use print. They are given opportunities to explore a wide range of books which they mouth, rip, flip, fan, hold upside down and pretend to read. Similarly, they are given a range of writing tools which they mouth, throw, and use to scribble. Children's early understandings and attempts are random, inconsistent, and fluctuate from day to day. Their attempts consist of culturally acceptable and expected errors which are celebrated. It is an implicit belief that students make errors and learn to problem solve as part of literacy development. Most importantly, emergent literacy is not readiness based; instead, it is based on the belief that all children are ready for literacy from a very early age—regardless of their level of understanding. Emergent literacy is a necessary base for all students—including those with CVI and limited expressive language capabilities.

The emergent literacy experiences of students with complex communication needs and cortical vision impairment are clearly different due to their verbal, visual, and physical challenges. They have clear gaps in their foundational knowledge and need comprehensive emergent literacy instruction. Erickson (2017) recommends the following daily activities for learners who are at the emergent literacy level: Shared Reading, Alphabet and Phonological Awareness, Independent Writing with the Whole Alphabet, Predictable Chart Writing, and Self-Directed Reading. While each of these areas is essential, self-directed reading is particularly challenging for students with CVI due to the high visual demands in books. Self-directed reading simply implies giving students opportunities to choose a book that they can explore independently. In order to entice students to want to read, professionals need to have a wide assortment of personally meaningful and motivating books which are visually and physically accessible. To provide solutions, this article will provide an in-depth discussion of CVI, CVI characteristics, implications, and suggestions for self-directed reading. Using PowerPoint to visually customize books will also be described.

Overview of Cortical Vision Impairment

Cortical Visual Impairment (CVI) is not an oculomotor issue but rather a manifestation of neurological impairment that impacts the processing of visual information. Roman (2018) has created a diagnostic framework for CVI along with guidelines for interventions and services that follow a strict set of medical and educational criteria. The framework defines how and why a student with CVI is demonstrating limitations in functional vision in order to be eligible for vision services from a teacher of the visually

impaired (TVI). Lueck and Dutton (2015), with a different view, use the term Cerebral Vision Impairment to describe these students. In the textbook titled, Vision and the Brain: Understanding Cerebral Visual Impairment in Children, Lueck and Dutton (2015) describe the notion of a social-linguistic-conceptual framework. This framework describes a broader spectrum of brain processing that goes beyond the cerebral cortex to include areas of the primitive brain that involve reflexes and balance. The framework is based on the importance of fostering social interactions with the student to create personally meaningful experiences which ground visual learning. Although the terms Cortical Vision Impairment and Cerebral Visual Impairment are not interchangeable, for the purposes of this article, we will use CVI to refer to visual processing challenges that impact the potential for a child to interact in meaningful ways with educational materials and conversational partners.

In the past decade, knowledge about CVI has grown rapidly (Roman-Lantzy, 2018; Lueck & Dutton, 2015). CVI is frequently undiagnosed or unrecognized due to other manifestations of brain damage that result in multiple physical/cognitive impairments. There are also cases where the CVI is less severe and a student may be misdiagnosed as having autism, learning disabilities, or behavioral challenges.

Characteristics of Cortical Vision Impairment

According to Roman-Lantzy (2018), there are 10 characteristics of CVI that are measured by the CVI Range. The CVI Characteristics provide information about visual functioning and overall degree of impact in the following 10 areas: color preference, need for movement, visual latency, visual field preferences, difficulty with visual complexity, light gazing, difficulty with distance viewing, atypical visual reflexes, difficulty with visual novelty, and absence of visually guided reaching. Each of the characteristics can seriously restrict literacy learning. In order for students to build their literacy knowledge, professionals need to design literacy instruction in a manner that does not rely solely on students' vision. Overreliance on students' vision will restrict students' literacy development. There needs to be a balance between using literacy opportunities to teach students to use their vision versus accommodations for their vision so that students can go deeper with their literacy knowledge without having to be restricted by their vision. For the scope of this article, implications as well as solutions for self-directed reading will be shared. It is important to understand these so that the appropriate interventions can be designed. The Within-CVI Characteristics Assessment Method (Rating II) assesses the degree to which each of the 10 characteristics is interfering with a student's functional vision (scale of impact). Understanding students' Within Characteristics scores can help design literacy instruction. Based on students' degree of functioning within each characteristic, students are classified into a phase distinguished by levels of severity. Roman-Lantzy (2018, CVI Assessment) describes three phases of severity of CVI in her Score I on the CVI Range (across characteristics). Understanding the severity of visual impact has been used to offer differentiated interventions (Roman-Lantzy, 2019, Advanced Principles). See Table 1 for the description of the visual characteristics and progress monitoring for self-selected reading.

Table 1: Visual Characteristics and Progress Monitoring for Self-Directed Reading

Characteristic	Characteristic Severely Impacts Visual Function	Characteristic has a Moderate Impact on Visual Function	Characteristic Mildly Impacts Visual Function
Color preference	• Use audio books and printed books with favorite color tape as binding. • Visual books may use highly familiar single color objects on a black background.	• Provide books with a limited number of vivid, fluorescent colors. • Add color around the shape of 2D and 3D items in preferred color, including book elements (textbox, page turning arrows). • Experience/Memory books may also include tactile enhancements using preferred color.	• Provide books with images using in a variety of colors. • Continue with use of specific colors to guide looking at elements in the book (e.g., textbox, page turning arrows). • Ask for student input (preferred colors) when outlining shapes or text.
Need for movement	• Avoid reading in areas where shadows are cast by window blinds or near overhead fans. • Offer reading time while swinging or bouncing.	• Find a quiet space for reading that avoids distractions of movement in the background. • Use movement in to draw visual attention to book elements (text or textbox, page turning, moving or shiny image/item on the page).	• Continue to monitor visual distractions of movement in the background.
Visual latency	• To give students time to look at every page, adapt books with a switch that turns the page, that they can activate on their own time. • Continue to offer switch-adapted books even when the student turns the page quickly. Time to explore the effect is part of the learning process and may proceed looking.	• Be mindful of the effects of fatigue or over-stimulation when scheduling time for reading. • Don't expect the student to visually attend quickly when focusing on an auditory task (such as listening to the story being read). • When selecting a book, give students time to look at choices.	• Higher scores indicate latency is not a factor very often, and they can look at pictures (or text) in a book after the page is turned. • Visual elements on the page may need to be consistently placed or highlighted by color to remind students to visually shift focus to various areas of the page.
Visual field preferences	• Monitor field preferences when positioning a book, the person reading (or giving book choices), and the student.	• Avoid placing books or tablets flat on a table or lap tray due to lower visual field challenges.	• Students with CP almost never achieve a perfect score on this indicator due to challenges with lower visual field processing.

Characteristic	Characteristic Severely Impacts Visual Function	Characteristic has a Moderate Impact on Visual Function	Characteristic Mildly Impacts Visual Function
Difficulties with visual complexities	• Monitor visual complexity as it relates to objects, array, sensory environment, and faces. • Focus visual attention for choosing a book using a single-colored near object with no competing sensory inputs (including overhead lights).	• Offer electronic books with backlighting to improve visual processing. • Reduce competing sensory input as much as possible. • Be mindful that facial expressions are difficult to visually discriminate.	• Easy, familiar books are visually accessible even in busy environments. • Novel or more complex books should still be presented with limited competing sensory input.
Need for light	• Avoid reading in areas with possible targets for visual fixation (bright lights, fans, shiny reflective surfaces).	• Light can be used as a tool to engage/direct vision by presenting book choices on a light box or electronic stories on a back-lit tablet.	• Visual recognition or discrimination may be enhanced by backlighting, making repeated readings of the same book increasingly more enjoyable.
Difficulty with distance viewing	• Position books and book choices at a distance of less than 18 inches.	• Recognize that students may visually attend to large items as far away as 10 feet, especially if they are moving. • This is not sufficient vision to read independently when positioned in front of a large screen with a group of students.	• Higher scores indicate that distance is not a problem for this individual, as is rare for students with CVI. We should assume that reading books should take place using near vision when possible and without distractions of objects that are moving in the distance.
Difficulty with visual novelty	• Offer books with highly predictable auditory patterns, and/or predictable visual cues associated with moving to the next page.	• Include books with photos of familiar objects place in novel situations. • Use sentence frames to provide a stable context with only one visually different element on each page.	• Visual curiosity is an element of the drive to explore new books.
Absence of visually guided reach	• Don't position a switch that turns the page of a book in a location that would require the student to look for it. • Rather than asking a student to reach for the book he/she is choosing, list the books and ask for a head nod or a vocalization as confirmation.	• Facilitate reaching to choose a book by adding bright or shiny enhancements. • Add reflective tape to the edge of the tablet to facilitate looking and reaching for the bottom edge of the screen to swipe right to left.	• Problems with visually guided reach may be minimized when we use eye gaze selection on a tablet or computer to click on an arrow that turns the page or a hot spot that speaks a message.

Characteristic	Characteristic Severely Impacts Visual Function	Characteristic has a Moderate Impact on Visual Function	Characteristic Mildly Impacts Visual Function
Atypical visual reflex	• Lowest score means the student doesn't blink in response to a quick poke at the area just between the eyes at the bridge of the nose (or other visual threat)	• Middle scores indicate the blink response to visual threat is inconsistent.	• Most students with CVI have an abnormal blink reflex. It is not something we target for educational interventions.

Note 1: Original Score Guide for Cortical Visual Impairment (CVI) Range Score II (Roman-Lantzy, 2018) is based on a 5-point rather than a 3-point scale.
0 = Full effect of the characteristic is present
0.25 = Behavior on this characteristic has begun to change or improve
0.5 = The characteristics is affecting visual functioning approximately half the time
0.75 = Occasional effect of the characteristic; response is nearly like that of individuals the same age
1 = Resolving, approaching typical, or response is the same as others of the same age

Note 2: Self-Directed Reading as defined by Erickson (2017) for students with severe disabilities is a recommended daily activity involving time selecting a book and interacting with the book.

Severe Impact from CVI Characteristics: Building of Visual Behaviors

Please note that although a CVI Range score may place a student in Phase I, it is important to carefully consider which of the CVI Characteristics is most critical for developing instructional accommodations and methods. Roman-Lantzy (2018, 2019) describes students in this phase as having difficulty using their vision to simply look at things.

Scoring guide according to Roman-Lantzy (2018), CVI Range Score II:

- 0 = Full effect of the characteristic is present
- .25 = Behavior on this characteristic has begun to change or improve

Lower scores in these areas may indicate that the student:

1. attends best to a single, preferred color and may not be able to visually engage with more complex materials. (Color preference)
2. attends primarily to movement, including being distracted by a ceiling fan. (Need for movement)
3. takes a long time to look at an item, every time it is presented. (Visual latency)
4. struggles with lateral visual fields, affecting where we might position a book (Visual field preferences)
5. can only focus visual attention on a single-colored near object when there are no competing sensory inputs, including lights overhead or from windows. (Difficulties with visual complexities — evaluated as it relates to objects, array, sensory environment, and faces)
6. attends to sources of light to the point of visual fixation and has trouble looking away from bright lights. (Need for light)
7. demonstrates best viewing is at a distance of less than 18 inches. (Difficulty with distance viewing)
8. prefers to look at items that are familiar and is not curious about new things. (Difficulty with visual novelty)

9. looks, looks away, and then reaches for an item, using separate rather than integrated actions. (Absence of visually guided reach)
10. doesn't blink in response to a quick poke at the area just between the eyes at the bridge of the nose, or other visual threat. (Atypical visual reflexes)

These are students who present as obviously severely visually impaired. If they appear to be looking at all, it seems like they are unfocused and looking "through" rather than "at" something. During reading activities, the student may not attend to the pages of a book or the person who is reading to them. In busy, loud classrooms, these students may appear unengaged or uninterested, and may tune out. Document changes in visual behaviors over time, as impact of CVI characteristics may decrease. CVI interventions may focus on teaching students to simply look at materials and people. Professionals using interventions to promote improved visual function typically present a familiar item that is brightly colored with a single color and placed on a black background devoid of complexity. Throughout the day, these students will need additional interventions to build joint attention through other channels, such as touch and movement. Students with this degree of severity have been observed to engage visually with objects that are in motion, or when they themselves are moving. Students with vision impairments and other multiple impairments are delayed not only in visually guided reach, but also with reaching for (and localizing to) a sound. Being able to reach for an object by sound (integrating/organizing motor experience) may be an indicator of readiness for independent/autonomous mobility (Fazzi, Molinaro, & Hartmann, 2015). Sensory-motor interventions may also incorporate rhythm and predictable sounds in order to build the students' abilities to localize and reach for an item by sound rather than sight. We need to plan for access to self-directed book reading opportunities that may be engaging/motivating to these students based on sounds or rhythm. See Table 2 for more ideas about self-directed reading as it relates to PowerPoint tools we can use to address CVI characteristics.

Table 2: Visual Characteristics and PowerPoint Tools for Self-Directed Reading

Characteristic	Characteristic Severely Impacts Visual Function	Characteristic has a Moderate Impact on Visual Function	Characteristic Mildly Impacts Visual Function
Color preference	• Slide Backgrounds black • Insert Photo with Transparent Background (Instant Alpha)	• Insert Photo • Use Glow	• Use Glow formatting • Insert Shapes with an opening in the middle • Insert Sound recording to the slide
Need for movement	• Transitions • Animations	• Order Animations • Time Animations	• Order Animations • Transition (page curl)
Visual latency	• Settings = Loop • Transitions on click	• Transitions on click • Animation Timing (sequential, pauses) • Links	• Transitions • Animations Timing (simultaneous)

Characteristic	Characteristic Severely Impacts Visual Function	Characteristic has a Moderate Impact on Visual Function	Characteristic Mildly Impacts Visual Function
Difficulties with visual complexities	• Insert Sound recording for each page • Setting = Loops • Animation to bring in a textbox as object • Timing Order after the inserted sound is played	• Adjust Brightness • Insert Photos with limited visual information • Delete image backgrounds (Instant Alpha or Transparent Background)	• Use Transparent formatting (Instant Alpha) of Objects
Difficulty with visual novelty	• Insert only one Sound (recording) per page	• Insert Photos of • Make Photo Background Transparent (Instant Alpha) • Duplicate PPT shows to create multiple versions of a similar story	• Use Transparent Background (shape) and Color • Draw or Markup photos • Insert Images of line drawings (symbols)
Absence of visually guided reach	• Use iPad Recipe "Turn Pages" for switch control	• Insert Shape of page turning arrow • Use Glow formatting to highlight edges • Animation Order bring in the page turning arrow only on click and after any recordings	• Consider use of eye gaze selection

Note 1: Original Score Guide for Cortical Visual Impairment (CVI) Range Score II (Roman-Lantzy, 2018) is based on a 5-point rather than a 3-point scale.
0 = Full effect of the characteristic is present
0.25 = Behavior on this characteristic has begun to change or improve
0.5 = The characteristics is affecting visual functioning approximately half the time
0.75 = Occasional effect of the characteristic; response is nearly like that of individuals the same age
1 = Resolving, approaching typical, or response is the same as others of the same age

Note 2: Self-Directed Reading as defined by Erickson (2017) for students with severe disabilities is a recommended daily activity involving time selecting a book and interacting with the book.

Meet Aaron. Aaron was born with cerebral palsy and it was clear immediately that he had trouble focusing his vision. Due to high spasticity, he wasn't able to walk or use his hands to pick things up. But he was very interested in toys with buttons and sounds and lights. He does not attend visually to photos or symbols, and has even damaged communication devices with dynamic screens in his efforts to avoid looking at the screen. During free time at home and in preschool, elementary, and high school, he was happiest rolling on the floor and interacting with musical toys. He graduated high school last year and his joy in interacting with musical instruments persists. During his school years he learned to activate switch-adapted computer games and stories. He really enjoyed music therapy and would happily listen to stories about different musical instruments, various types of songs, and musicians. He was also amused by books with silly sound effects, alliteration, and rhyming words. He would laugh, smile, put his head down to listen and reach out to activate a switch to turn the page, using a big whole arm slapping motion. In high school it was discovered that placing the device behind him helped him to focus on listening without being distracted by the light from the screen. Visual characteristics of light fixation and difficulties with visual complexity were affecting his ability to use a dynamic screen communication device. In his Adult Day Program his team discovered his joyful response when somebody gave a dramatic reading

accompanied by chanting and rhythm. As part of his ongoing private speech therapy services, we are continuing to adapt audio books for him, using the Pictello app on his iPad and his mom's phone (see Figures 1 and 2 for screen captures). He enjoys hearing different voices read the same story. He wears a speaker on his wrist to listen to stories and music.

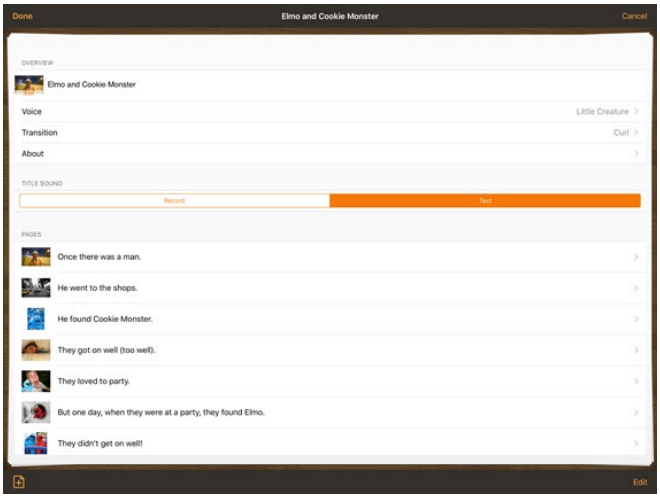

Figure 1: Elmo and Cookie Monster

This iPad screen capture shows thumbnails and page text for a story downloaded into the Pictello app, which has an option for the Little Creature voice. A link for more information about the Pictello app can be found here.

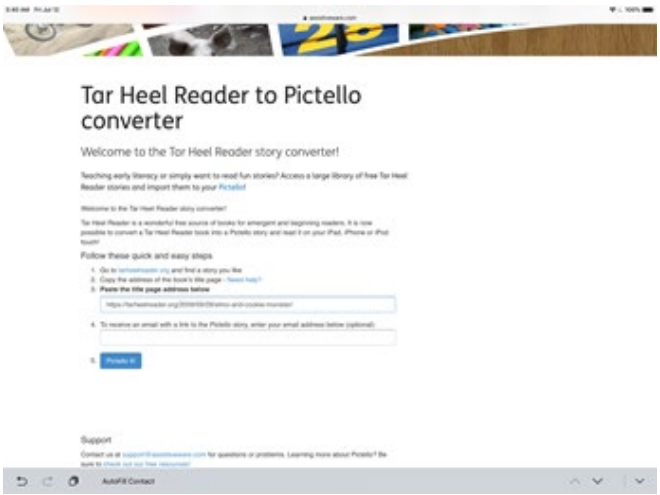

Figure 2: Tar Heel Reader to Pictello Convertor

This screen capture depicts how to convert Tar Heel Reader stories to the Pictello app. The link to this site can be found here.

Moderate Impact of CVI Characteristics: Integration of Vision and Function

Students at this phase are learning to integrate vision with function. Higher scores on some of the rating scales indicates that the characteristics of CVI are not as debilitating as they are for students with lower scores. Recognizing the impact of visual latency as a CVI characteristic can be critical for reading books with these students. They may also need to figure out how to position themselves to address visual field neglect or preferences. We can make a significant difference in their ability to gain meaning from a book they choose to read (at the pace the student chooses to read it).

Scoring guide according to Roman-Lantzy (2018), CVI Range Score II:

- .25 = Behavior on this characteristic has begun to change or improve
- 5 = The characteristic is affecting visual functioning approximately half the time
- .75 = Occasional effect of the characteristic; response is nearly like that of individuals the same age

Lower scores in these areas may indicate that the student:

1. can attend to more than one color, though bright fluorescent colors may be most engaging, and may benefit from highlighting visual features of both 2D and 3D items in a preferred color. (Color preference)
2. can be visually distracted by movements 8 to 10 feet away. But we can also use movement to bring their attention to a particular area where they can focus on a specific item, such as elements on the page of a book. (Need for movement)
3. takes increasingly less time to look at something once it is familiar, but takes more time again when the person is fatigued, over-stimulated, or just after a seizure. (Visual latency)
4. can visually fixate on items in more fields, though lower visual field function may remain atypical. (Visual field preferences)
5. can attend to more details or more items at once, though competing sensory input is still visually distracting and using backlighting can engage vision. (Difficulties with visual complexities)
6. engages visually when light is used as a tool to direct vision, such as through use of a light box or back-lit tablet. (Need for light)
7. visually attends to items as far away as 10 feet, especially if they are moving, such as recognizing a person who is moving in the distance. (Difficulties with distance viewing)
8. demonstrates increasing visual curiosity, built from experiences with objects. Visual curiosity does not occur spontaneously with 2D images. (Difficulty with visual novelty)
9. looks and reaches in a more integrated manner, sometimes facilitated by use of bright or shiny/moving objects. (Absence of visually guided reach)
10. blinks in response to a visual threat inconsistently. (Atypical visual reflexes)

Giving a student time to figure out when they are ready to turn the page is part of advocating for personal choice. We cannot know how long a student needs to look at a page before it starts to make sense. We can do our best, however, to make modifications to the schedule and the environment to give the student all the time he/she may need. Tietjen (2019) cautions us to carefully consider the complexity of the reading task and the environment. Many students with cerebral palsy and CVI experience difficulty visually processing information presented in the lower visual field, impacting not only their mobility, but also their ability to look at a book placed flat on their lap tray. Students who are learning to integrate vision with function may also be learning visually guided movements, like reaching for a book while looking. We should not be discouraged if students are not looking when given choices, since at these levels of visual functioning, students may still be learning to do this. If the book piques their interest, we may open a window into what it takes for him/her to make the effort to overcome challenges that had

been getting in the way of interacting with materials or people in more integrated and functional ways. Assessing CVI characteristics of complexity may be important in understanding how social relationships and joint attention can be impacted, since these students have difficulty visually processing faces and facial expressions. Since they cannot see other people smiling or frowning, they may not be emulating this behavior. See Table 2 for more ideas related to self-directed reading.

Meet Ben. He is six years old and is being raised by his grandmother due to his mother's challenges with drug addiction. When he was younger, his favorite color was yellow, but he visually attends to a variety of colors now and will use colors to talk about simple images in board books. He loves it when his grandmother reads to him. She makes sure the lights are low and gives him time to look at the pages, sometimes using a flashlight to draw his attention to something on the page. He will use his eye gaze communication system to ask her to read to him. Color is used on his communication displays to reinforce navigational branching. He has a page programmed with a number of his favorite stories and will also use the alphabet page in an attempt to request a new story by giving some letter cues. He likes listening to dramatic stories with repeated lines and predictable, controlled text. He is learning to activate some online stories with eye gaze control of his device. The button to start the stories is in a predictable place to be familiar enough to address his difficulties with visual complexity and challenges with visual novelty. Sometimes he looks at the screen, but more often he leans his head down and quietly listens.

Milder Impact from CVI Characteristics: Developing Visual Curiosity

A thorough understanding of the CVI characteristics is necessary in order to determine how to improve or address visual functioning of students with milder (Phase III) CVI. Some of these students are not identified as having CVI until they try to read on their own (Dutton, 2015). They may seem clumsy due to problems with visual-motor integration. They may seem grumpy or oppositional because they don't respond consistently to facial expressions or body movements of other people. Students who can speak may self-report that they can't read or don't like reading to themselves. More than likely, reading is seen as a difficult task because the items on the page are too visually complex. In order to help these students find books they like, we may be able to provide some continuity and consistency through the use of predictability and salient feature instruction.

Scoring guide according to Roman-Lantzy (2018), CVI Range Score II:

- .75 = Occasional effect of the characteristic; response is nearly like that of individuals the same age
- 1 = Resolving, approaching typical, or response is the same as others of the same age

Higher scores in these areas may indicate that the student:

1. does not require a specific color for visual engagement. (Color preference)
2. doesn't need movement to elicit visual engagement, but may still be distracted by movements in the distance while trying to look at the pages of a book. (Need for movement)

3. can look at a target when presented, and latency is not a factor very often. (Visual latency)
4. can visually fixate in most/all visual fields. Students with CP almost never achieve a perfect score on this indicator due to challenges with lower visual field processing. (Visual field preferences)
5. can attend to complex visual arrays even in environments with competing sensory in-put. (Difficulties with visual complexity)
6. may be able to visually recognize or discriminate better with backlighting, and may not have as many difficulties with visual fixations unless the person is tired, hungry, or immediately following a seizure. (Need for light)
7. doesn't have difficulty seeing at a distance, though a perfect score for students with CVI is rare. We should assume that reading books should take place using near vision when possible and without distractions of objects that are moving in the distance. (Difficulties with distance viewing)
8. is able to use vision to learn about new things. (Difficulty with visual novelty)
9. with motor impairments can visually attend to a target item as they are reaching for it. Problems with visually guided reach may be minimized when we use eye gaze selection on a tablet or computer. (Absence of visually guided reach)
10. has more typical blink reflexes, though all students with CVI tend to have atypical visual reflexes. It is not something we target for educational interventions. (Atypical visual reflexes)

Meet Cyntyhia. She has cerebral palsy and uses a dynamic screen communication device, an Accent from PRC-Saltillo, that she accesses through the same switches in her headrest that she uses to drive her wheelchair. She has some trouble with lower visual fields, and can be distracted by movements in the distance, making driving independently in noisy or crowded places an unrealistic goal. She also has some trouble visually recognizing obstacles in new environments. But she can safely navigate her home because it is familiar and her switch activations have become automatic after years of practice. When she was younger, her mother put pictures from stories on her bedroom ceiling for her to read to herself by advancing a slide projector with her switches. In high school, her speech therapist and vision specialist designed books for her to read with visually and conceptually salient features of the icons in her communication device. She directs her tutors and family members to read and review her schedule with her, one of the highlights of her day. As a young adult, she uses her switches to read back text documents sentence by sentence using her communication device, and follows a script to tutor a group of students who are learning to activate messages on their own communication systems.

Implications

The challenges with literacy learning may at first glance appear insurmountable for some of our students. Some well-intentioned interventionists have even gone so far as to re-define literacy in terms of symbolic representation of messages using objects or photos rather than the letters of the alphabet. In this article, however, we will continue to define literacy as the ability to interact with text (letters of the alphabet) to produce (write) and understand (read) words. The examples above highlight how each student has unique needs, but each can have daily opportunities for access to self-selected reading opportunities. Table 2 provides specific PowerPoint tools that may be used to support these students.

Creating Your Own Books Using PowerPoint

PowerPoint is an ideal solution for making books for students with CVI to be used during self-directed reading. PowerPoint is a readily available and highly flexible tool that can be used to visually customize books. PowerPoint has multiple features and tools which can be used to address the different CVI characteristics, such as adding color as an anchor, adding movement, highlighting salient features of texts and pictures, making onscreen occluders to reduce clutter, and adding audio recordings of salient feature descriptions. With specific knowledge of their students' CVI needs, professionals can select the most appropriate PowerPoint options for adapting books. Those who are looking for a collection of accessible books and ideas that can be downloaded into PowerPoint will find thousands of options on the Tar Heel Reader website here. Images from this website can be found in Figures 1 and 2.

When visual characteristic severely impacts visual function, consider these recommendations.

1. Use Black Color for Slide Backgrounds on all slides (see Figures 3 and 4 for examples). Books for building vision should use one item in a single color with a Transparent Background (see Figure 4).
2. Use Transitions between slides as a way to draw visual attention with movement. Use Animations to draw visual attention to a moving element on the slide.
3. Use Settings to make the slideshow Loop without exiting. Transitions and Timing support page-turning with individualized sensory feedback following a swipe or switch activation.
4. Create auditory-only books, using Insert Sound to add a recording for each page. Make sure that the PowerPoint loops when finished, and options to turn forward and backwards are included. Some students may notice a text box as an image if the complexity is reduced. Animation can be used to bring in a text box, Timing Order after the inserted sound is played.
5. Focus on auditory-only books. Insert only one Sound (recording) per page. Create memory books that are personally meaningful, possibly including the one item this student is willing to visually engage with. Consider printing the books so they can be read by other partners. Outline printed books in preferred color, possibly using reflective tape.
6. As a student starts to use vision more, his/her ability to reach and touch are not yet integrated. Students who are most severely affected tend to look, look away, and then reach for an item. While listening to a PowerPoint story, consider positioning a switch that turns the page in a place where the student would not need to look for it (e.g., behind his/her head, on a chest strap, or under his/her foot). Use iPad Recipe "Turn Pages" for switch control.

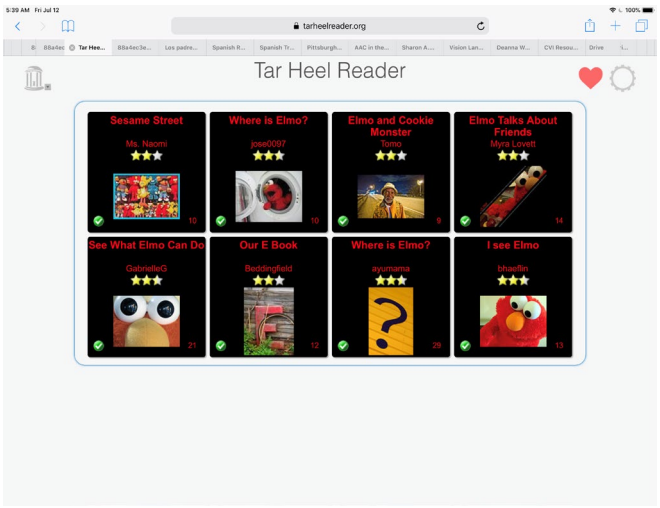

Figure 3: Tar Heel Reader Elmo Stories

Image depicts the thumbnails representing a collection of eight favorite Tar Heel Reader stories about Elmo with the background color set to black. Link to this page can be found here.

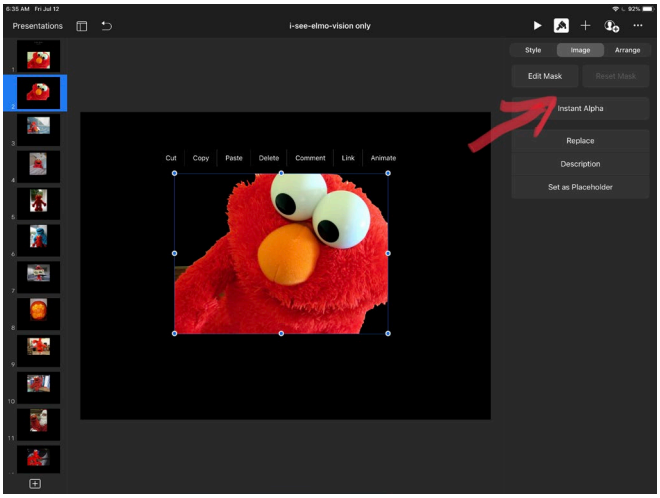

Figure 4: Elmo Vision Only Book

Image depicts a PowerPoint slide with a single image of Elmo, using black text and transparent background. A link to the full story can be found here.

When visual characteristics moderately impact visual function, consider these recommendations.

1. Insert Photo of a familiar brightly colored object. Use Glow for words and/or objects in slides to color around the items in preferred color (See Figure 5).
2. Order Animations to draw visual attention and control pacing of movements on the screen.
3. Transitions and Timing support page-turning with individualized sensory feedback following a swipe or switch activation. Create a PowerPoint launcher that Links other stories or websites. (This requires clicking, not just swiping.)
4. Beware of distractions from competing sensory input. Consider how the backlight from a tablet engages vision, and adjust Brightness according to individual needs. Insert Photos with limited visual information. Delete backgrounds of objects with Transparent formatting.

5. Build visual curiosity starting with preferred or everyday objects and then Insert Photos of these objects using Transparent Background formatting. Create multiple versions of a similar story. Use familiar or repeatable lines as the context for learning to look when a page or a line is changed.
6. Students who have more functional vision may look and reach for items on a tablet/iPad when the item is shiny or moving. Consider Inserting a page-turning arrow Object in a preferred color with Glow formatting to draw attention. Use Animations to bring in the page-turning arrow only after the student has had an opportunity to visually attend to the image on the page and the text (or the audio recording). For students with physical challenges who cannot touch the page on a tablet, consider using this as a cue to touch the switch or use eye gaze dwell selection (mouse click) to activate the action on the page-turning arrow Object.

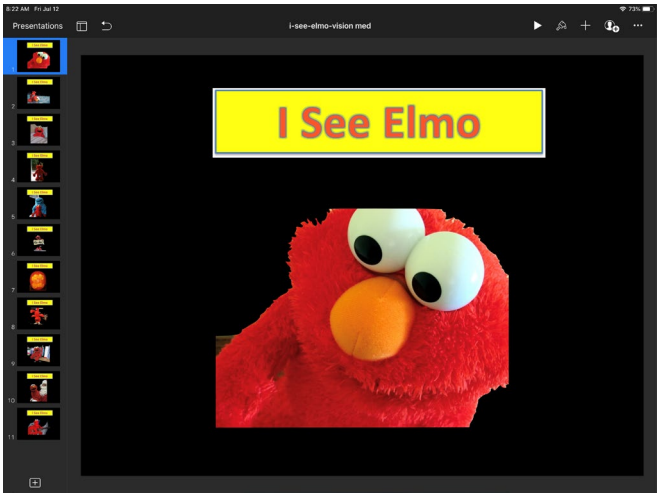

Figure 5: Elmo Animated

This version of the story uses an animated textbox example with glow coloring of the text. A link to the full story can be found here.

When visual characteristics mildly impact visual function, consider these recommendations.

1. Use Glow formatting (with preferred color) on more complex images to build language of joint attention based on color concepts.
2. Insert Shapes (using preferred colors) as occluders to block out distracting portions of an image. Choose a circle or square with an opening in the middle. Use language to talk about what is inside and outside the shape during shared reading time (or Insert Sound recording to the slide). As indicated for more moderate levels of visual impairment, problems using visually guided reach may be minimized when we use eye gaze selection on a tablet or computer. Order Animations to draw visual attention to a new concept, with the focus on building language around the movements themselves. Use Transitions with movement to draw visual attention to page-turning.
3. If latency is not an issue, then Transitions and Animations can either occur in order after previous or after click.
4. Consider how background information may be unnecessarily distracting (visual or auditory). Use Transparent formatting of Objects as needed.
5. Use Transparent Background (shape) and Color formatting of objects as necessary to draw

attention to visual characteristics of new items that are related to familiar items. Consider using Markup of photos in another program/application before inserting. Insert Images of line drawings (symbols) to build familiarity with multiple representations of high frequency words.

6. As indicated for more moderate levels of visual impairment, problems using visually guided reach may be minimized when we use eye gaze selection on a tablet or computer.

Outcomes and Benefits

All students benefit from systematic daily emergent literacy intervention, regardless of their disabilities. Using the CVI characteristics to guide discussion provides teams with a framework for appropriate accommodations to maximize potential growth in reading abilities. The degree of educational impact from CVI characteristics can be systematically reviewed. The recommended PowerPoint tools can be used over and over again as a template to create a multitude of books and stories that are relevant and personally meaningful. Some animations that add an element of engagement for other students have potential to interfere with learning of a particular student based on their CVI. With PowerPoint, timing of auditory and visual elements can be ordered and manipulated. Once these students realize that they are in control of the rate of animations and transitions in a PowerPoint show, they can truly experience self-directed reading.

Declarations

This content is solely the responsibility of the author(s) and does not necessarily represent the official views of ATIA. No financial disclosures and no non-financial disclosures were reported by the author(s) of this paper.

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