**Promising Practices:**

**Considerations for the Accessibility of Sign Language**

**for Individuals with CVI**

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***Promising Practices***

*-As it relates to this presentation*

*-Many current educational practices around CVI are considered promising*

*practices.*

*-The information in this presentation is based on my own professional*

*experiences as well as quotes from individuals living with CVI.*

*-Promising practices are being linked to research findings to the greatest*

*extent possible.*

***Presentation Goals***

*-To socialize an evolving concept.*

*-To encourage thoughtful, individualized, and methodical evaluation of sign*

*language accessibility for students with CVI.*

*-To emphasize that there is no one size fits all for any student with CVI.*

*-Different means of communication access will occur, receptively and*

*expressively!*

*-Highlight experiences of those living with CVI.*

***In Air Sign & Tactile Sign***

*In Air Sign - The receiver watches the signs produced by their*

*communication partner.*

*Tactile Sign - The receiver places their hands on top of the hands of their*

*communication partner.*

***CVI/Deafblindness***

*-Hereditary Syndromes:*

*-CHARGE Syndrome (23% at Perkins)*

*-Cornelia deLange Syndrome (7% at Perkins*

*-Down Syndrome (7% at Perkins)*

*-Cytomegalovirus (CMV)*

*-Hydrocephaly*

*-Microcephaly*

*-Asphyxia*

*-Head Injury*

*-Meningitis*

*-Complications from prematurity*

***Deafblindness***

*-We know that…*

*-Learners who are deafblind may have:*

*-Residual use of either vision or hearing*

*-No residual use of vision or hearing*

*-Additional needs which may impact physical development, cognitive*

*development, and communication*

*-Less access and engagement*

*-Reduced incidental learning*

***When it Comes to Sign & CVI…***

*-If a child has any residual vision, in air sign tends to be implemented.*

*-For children with CVI, visual attention and visual recognition abilities can be*

*deceiving and are often misunderstood.*

*-There may be prioritization of visual means of access due to the focus on*

*Vision and the assumption that vision will improve.*

*-Others wait based on the recommendation of “wait and see.”*

***The CVI Perspective***

*“The first time I met another adult with CVI, we spent eight hours straight – yes,*

*eight consecutive hours – swapping techniques that we had both used to pass as*

*sighted.*

*Not tips on how to see things better. We both agreed that, even during our*

*strongest visual years, trying to use our eyesight had always been exhausting,*

*confusing, frightening, and straight up traumatic. We swapped tips on how we*

*used our other senses so that we could fool people into thinking we were seeing*

*things.”*

***"The neural network of a CVI brain is “fundamentally different.”***

***– Dr. Lotfi Merabet, Neuroscientist/CVI Researcher -***

***If learning is not happening…***

*-Is the information perceivable?*

*-If the input is not perceivable, a memory cannot be formed that can*

*then be used for future recognition (CVIScotland, 2022).*

*-If it’s perceivable, is it also sustainable? Most efficient means of input?*

***The Visual Brain***

***A (very) Basic Overview***

*Primary Visual Cortex*

*Primary visual cortex (in the occipital lobe) is responsible for early visual processing, “the sketch”:*

*V1: first point of processing of the image from the retina. Passes information to each area*

*V2: plays a role in binocularity, understanding complex patterns, and object orientation*

*V3: plays a role in form, orientation, motion, and depth perception*

*V4: plays a role in understanding color,motion, and spatial vision*

*V5: plays a role in understanding motion*

***Interconnectivity: Dorsal and Ventral Streams***

*Dorsal stream:*

*-Where” and “how”*

*-Supports the behavioral goals of action control and the*

*understanding of spatial relationships (Atkinson & Braddick,*

*2011).*

*Ventral stream:*

*-“Who” and “what”*

*-Processes information for the recognition of objects and faces*

*-These systems work together and not in isolation.*

***Visual-Spatial Processing***

*Overview*

*-Visual-spatial processing relies on the integration of many areas and*

*systems in the brain.*

*-Spatial perception and visually guided actions are equally represented in the*

*dorsal stream, developing relations to several areas of the cortex such as*

*frontal, temporal, and limbic lobes.*

***Ventral Stream & Incidental Access***

*-Processes complex objects (ex. body parts, patterns, places, objects, words,*

*and faces), even when their position, angle, or size changes. This ability is*

*called form constancy.*

*-Individuals with CVI may not recognize something because:*

*-It’s not seen well (perceivability)*

*-It’s not known (experience)*

*-Unclear and no prior experience (global impact of limited incidental*

*learning).*

***Dorsal & Ventral Streams***

*Examples:*

*-Dorsal Stream Dysfunction:*

*-Impacted spatial perception*

*-Impaired motion perception*

*-Impacted visually-guided reach*

*-Trouble walking around obstacles*

*-Challenges with visual clutter*

*-Ventral Stream Dysfunction:*

*-Difficulty identifying an interpreting objects and faces*

*-Impaired depth perception*

*-Challenges with route-finding*

***Sign Language is…***

*-A visual, iconic language. Signs often look like the words that they represent.*

*-A primarily visuospatial language, being produced manually and perceived*

*visually rather than being produced orally and being perceived auditorily.*

*-Relies heavily on the the analysis of hand motion.*

***Visual Accessibility***

Sign Language & CVI

**Areas of Assessment**

-Visual Attention

-Visual Recognition

-Response Interval

-Appearance of the Eyes

-Movement of the Eyes

-Visual Curiosity

-Form Accessibility

-Visual Fields

-Visual Guidance of the Upper Limbs

-Visual Guidance of the Lower Limbs

-Impact of Motion/Motion Perception

-Sensory Integration/Impact on Vision

-Impact of Color

-Impact of Light

-Impact of Clutter

-Access to People

**Answers are only as good as the**

**questions asked**

-Understanding the student’s communicative intents and reliable responses

is essential. Partnerships and relationship building is critical.

-What are you looking for in assessment? How will you analyze findings?

-File review (vision care, FVE/LMA, related services, education etc.)

-Interviews (multiple team members and parents)

-Observations (across environments, tasks, people)

-Direct Assessment (1:1 with the student)

**Accessing Sign Language**

What is the student’s:

-Visual field?

-Acuity?

-Contrast sensitivity?

-Ocular motility?

-Alignment?

-General ocular health?

Can the student:

-Fixate and follow?

-Scan?

Are there concerns around:

-Photophobia

-Degenerative conditions?

(Is there a concern for, or diagnosis of, CVI?)

**Co-existing ocular impairments**

-Refractive Error - 30%

-Nystagmus - 11%

-Reduced Contrast Sensitivity - 23%

-Strabismus - 28%

-Coloboma - 8%

**General Goals in Assessment**

-What signs are being perceived receptively?

-Which factors are supporting these

abilities?

-Which factors are causing difficulties?

-What signs are being produced expressively?

Are they:

-Traditional?

-Approximations?

-Modified?

-Having body to body contact?

-Do motor impairments explain any difficulties?

-What are the trends?

**Visual Attention & CVI**

-Damage along the occipital parietal frontal pathway (dorsal stream) can cause difficulty with visuospatial attention, sustained attention, selective attention, and visual search.

-It’s not only about where to look, but where not to look.

(Dutton and Zihl, 2015; Merabet, 2021)

“It’s about knowing what is where.”

- Lotfi Merabet -

**Understanding Attention & CVI**

Dr. Nicola McDowell

“People also have a tendency to dress in bright, bold colors, that would draw

my attention like a moth to a flame and distract me from focusing on

navigating safely through the minefield ahead.”

[Cluttered fridge] “I had no systematic search technique, as I felt like I

couldn't control my eyes. They had a mind of their own and would decide to

look at whatever they wanted to and because of the abundance of food to

look at, I seemed to have no control over their movements at all.”

**Visual Attention**

Awareness followed by Attention

Visual attention is an important prerequisite.

Example considerations:

-Is visual attention extremely brief or maintained?

-Is there an ocular reason for decreased visual attention?

-Can they shift and scan?

-Is the student with CVI able to visually attend (under many circumstances)?

-Does the student establish attention in a non-visual form?

**5 Basic Elements of Sign Language**

1. Handshape

2. Movement

3. Palm Orientation

4. Location

5. Non-manual markers

-Users are constantly manipulating and perceiving signs created in space to

communicate complex concepts.

**Handshape**

-Refers to the configuration of the hand(s).

Digital Images: Gallaudet Handshape Starter, 2022

**Palm Orientation**

-Refers to the direction that the

palm faces (up, down, left, right,

outward, inward).

-Signs may have the same

handshape, but different palm

orientation; this changes the

meaning.

**Handshape & Palm Orientation**

Consideration for CVI access:

-Ability to consistently demonstrate hand position and fine detail recognition

-Ability to identify fine details due to impaired contrast sensitivity

-Ability to recognize signs from different viewing perspectives (form constancy)

-Dependency on compensatory strategies (i.e. auditory, context, visual cues)

-Tendency to demonstrate confusion between similar handshapes

**Movement**

-Movement, the changing the location in the physical space during sign

production, impacts the meaning of signs (same hand shape, same palm

orientation, same location, different movement).

-Signs change meaning based on direction (ex: in versus out). Direction

provides information about subject and object of sentence (ex: give or ask).

**Impact of Motion & CVI**

“On average, individuals with CVI require nearly three times the motion

coherence signals in order to reliably detect the direction of movement of the

optic flow stimulus.” Pamir, Z. et al (2021).

“Children with CVI may manifest motion perception deficits attributed to

dorsal stream dysfunction, including abnormalities in detection of optic flow

and global or biologically relevant motion, as well as visuomotor integration

deficits leading to optic ataxia.” Atkinson (2017)

Individuals with CVI may experience dyskinetopsia (movement is processed

more slowly). (Chokron et al, 2021)

**Impact of Motion & CVI**

-Difficulty judging direction, speed, and an object’s relation to self (distance).

-Individuals with CVI may be more likely to alert to movement. There may be

an inability to visually disengage.

-Not all students with CVI need or prefer movement.

Example considerations:

-Reliance on motion over fine detail for recognition?

-Signs that are replicated with only gross motion approximations?

-Attention and recognition changes based on sign speed?

-Reliance on compensatory cues (ex: bathroom and context)?

**Signing Area**

-Signing occurs in front of the body, from top of the head

down to the waist, shoulder to shoulder.

-Signs may have the same handshape, palm orientation,

and movement, but vary in location; this changes the

meaning (for example, “mother” versus “father”).

**Signing Area & Visual Field**

-Effects of visual field deficits may include impaired visual motor

coordination and may impact social interaction; there may be focal deficits.

-Visuospatial neglect/simultanagnosia, or visual inattention, is the difficulty

of detecting or acting upon visual stimuli on one side of space.

-Visual field can additionally be impacted by contrast sensitivity, ocular motor

challenges, visual motor difficulties, visual clutter, competing sensory stimuli,

visual fatigue, and motion in the environment.

**Simultanagnosia**

Dr. Nicola McDowell, New Environments

“…….I can see multiple things at one time, I can't possibly have

simultanagnosia. But in this new unfamiliar environment, that is exactly what

is happening. Every time I leave the house, I am only seeing one interesting

thing in the environment at a time. One day a familiar name on a road sign,

another day a cool looking house, you see how this is going. But because I

am only seeing these things in isolation, I couldn't possibly tell you

where they are in relation to each other.”

**Fatigue & Clutter**

“When I’m rested and happy, I see clearly

except for the visual field loss. My acuity is

fine. But, when I have visual fatigue, it’s like

looking through a straw. I have an extremely

limited visual field. It gets all fuzzy. Usually,

when I’m not fatigued, it’s like looking through

an empty toilet paper roll.”

- Dagbjört, CVI.Now.org

**Types of Signs**

-One-handed (dominant hand)

Example word: king

-Two-handed (symmetrical)

Example word: more

-Two-handed (non-symmetrical)

Example word: help

**Contact Points**

-Signs will also:

-Make physical contact with the body (points on

hands, face, torso, arms, face).

-Occur without physical contact with other points on

the body (open air).

**Spatial Skills & Sign**

-Spatial skills is an umbrella term that includes spatial visualization, spatial

orientation, and mental rotation.

-When learning sign language, the learner sees a sign, flips the sign up to

180 in order to properly produce it with their own hands.

-The signer must consider the signer’s perspective, rotate the

movements, and map them onto their own body.

**CVI**

*-Area of Possible Implication*

-People with CVI often have visual impairment associated with dysfunction of the parietal lobe (part of the dorsal stream).

-This may potentially impact an individual’s ability to:

-To perform mental rotation, as this occurs bilaterally in the parietal cortex

-Evaluate the relative spatial positions of objects in a a visual scene

-Differentiate between the right and left sides of space (right left

confusion - associated with parietal lobe dysfunction)

**Some Considerations**

*Identify Trends*

-Confuse handshape, position, and relative motion of the signs?

-Is there a difference in accuracy between body contact point signs and those

without?

-Is there adaptation of signs to increase body contact?

-Different levels of accuracy with one handed, two-hand

asymmetrical/symmetrical?

**Non-Manual**

*Facial Expressions & Body Language*

-Expressions and signals from the face (e.g., eyebrows, nose, eyes, and

lips), shoulders (e.g., raising), head (e.g., tilts, nods, and shakes), and body

(e.g., tilting) that convey meaning in addition to the use of the hands (Ham,

2020).

-Facial expressions represent tone, emotion, and intent in a visual form

-The body is used to convey past, present, and future

-Varying speed and incorporation of facial expressions are employed to

convey meaning

**Access to People**

-Prosopagnosia is a neurological disorder resulting in impaired facial recognition

(including oneself).

-Prosopagnosia resulting from occipitotemporal damage is associated with right

or bilateral damage of the fusiform and/or occipital face areas (Barton et al,

2021). There are individuals who have prosopagnosia without evidence of brain

injury.

-Superior temporal sulcus (STS): processes changeable aspects of faces

(such as facial expressions, direction of eyegaze, expression, lip

movements, or lip-reading).

**Access to People**

-Impaired perception of faces can be accompanied by impaired biological-motion

perception (Lange et al, 2009).

-The ability to perceive the movement of a living creature; refers to our ability to make

inferences about identity and actions of another human based on visual perception

(Wang et al., 2016). Recognizing stereotypic movements of humans (imagine

someone walking).

-Biological motion can involve hand, eye, lip, or whole-body movements, which,

together with faces, constitute crucial ingredients of social cognition and interaction.

**Case Study Examples**

**Jenny & Mark**

**Case Study**

**Introducing Jenny**

Age: 17 years old

Vision: CVI + optic atrophy

Hearing: Deaf

*CVI Assessment Results*

-Eccentric viewing

-Requires close viewing

-Clutter interference

-Impaired motion perception

-Impacted visual fields (inf, sup, right)

-Increased response interval

-Impacted facial recognition

-Reliant on compensatory cues

**Sign Language Observations**

-Reliant on context, gestures, prompting, and color cue.

-Rarely responded to a sole signed directive.

-Not observed to fixate and shift visual attention to fast moving sign language.

-Less responsive to signs that moved into her lower visual field

-Reliant on peripheral movement (multiple prompts alongside gestural cues)

-Expressive sign = gross approximations and produced with general movement.

-OT reported that fine motor abilities do not fully explain deficits

**Case Study**

**Introducing Mark**

Age: 8 years

Vision: CVI, eso., NLP right,

Hearing: unilateral, severe to

profound

**CVI Assessment Results**

-Reduced visual attention

-Impacted right periphery, inferior field

-Clutter impacts attention & recognition

-Impaired motion perception

-Impacted hand-eye coordination

-Fluctuations in vision based on environment, instruction, and materials.

**Sign Dictionary**

*Expressive Signs (40 reviewed)*

-Traditional

-Open palm and/or Contact:

-Bye

-Please

-Thank you

-Mom/Dad

-Happy

Modified:

+ Contact to In Air

-All done (right hand over left wrist, pull

outwards)

-Want (open right palm, thumb in to chest)

-Music (open palm down on left arm, movement

back and forth)

+ Gross Movement, - Fine Detail

-Bathroom (wrist shaking)

-Yes (O/E hand shaking)

-Help (two C hands, locked on thumbs, up down

**Evolving Concept**

Let’s keep the conversation going!

-While our understanding of CVI continues to evolve, the issue of accessibility is well understood.

-There is no “one size fits all” approach, but instead, an umbrella of approaches that support comprehensive, individualized assessment.

-We need to be careful observers, who ask the right questions, and who put personal bias aside (to the best of our bility) so that access to learning is maintained.

**Thank you!**

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