

Cortical Vision Impairment (CVI)

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Overview

- What is CVI?
- How vision works
- Ocular vs cortical vision impairment
- Causes and diagnosis of CVI
- Characteristics of CVI
- CVI Range
- Interventions and educational considerations
- Myths
- Resources

CVI and Vision



What is CVI?

- CVI is a term used to describe a vision impairment that occurs due to damage in the brain
- It is a condition in which the eye works but the part of the brain which interprets the signals provided by the eye does not



How vision works



Neurological system



Ocular impairment v CVI

- Ocular impairment:
 - The individual has difficulty obtaining a good visual image, but can process and interpret the image accurately when provided with enough information
- CVI:
 - The individual may see a visual image, but is unable to accurately interpret it



Causes of CVI

- Asphyxia
- Perinatal hypoxic-ischemic encephalopathy
- Intraventricular haemorrhage
- Periventricular leukomalacia
- Cerebral vascular accident/Cerebral artery infarction
- Infection
- Structural abnormalities
- Metabolic conditions
- Acquired CVI



Diagnosis

- A diagnosis of CVI is given when the following three criteria are met:
 - A normal or near normal eye exam that cannot explain the individual's impaired vision
 - A history or presence of neurological problems
 - The presence of behavioural responses to visual stimuli that are unique to CVI (characteristics)



Characteristics of CVI



10 Characteristics of CVI

- Colour preference
- Need for movement
- Visual latency
- Visual field preference
- Difficulty with visual complexity
- Need for light
- Difficulty with distance viewing
- Atypical visual reflexes
- Difficulty with visual novelty
- Absence of visually guided reach



Colour preference

- Individuals with CVI often have a strong preference for a particular colour
- Objects often need to be a single colour
- Often red or yellow, but not always





Need for movement

- Majority of children with CVI have a tendency to visually attend more to objects with properties of movement, rather than stationary objects
- Sometimes this can manifest through the child moving, rather than the object
- May be necessary to provide movement to visually stimulate to get visual attention









Visual latency

- Refers to the response time from when a visual target is presented to when visual attention occurs
- Generally more delayed in individuals in lower phase than in higher phase of CVI Range
- May be dependent on fatigue and/or illness, as well as target object





Visual field preferences

- Individuals often have a field preference where they have "best use of vision".
- Often peripheral



Difficulty with visual complexity

- Four dimensions:
 - Complexity of patterns
 - Complexity of visual array
 - Complexity of the sensory environment
 - Complexity of human faces



Complexity of patterns

Single coloured

Muilti-coloured



Complexity of patterns cont.

Single coloured

Muilti-coloured





Complexity of visual array



Complexity of visual array - background

Plain background



Pattered background



Complexity of visual array - clutter

I solated object

Complex array





Complexity of sensory environment



Need for light

- Possibly an unusual attraction to light
- May be natural or artificial light







Difficulty with distance viewing

- Closely linked to the characteristic of complexity
- May present as being near-sighted







Absent or atypical reflexes

- Two innate responses that serve to protect the eyes:
 - Visual blink reflex
 - Visual threat reflex
- Frequently absent or delayed in individuals with CVI



Difficulty with visual novelty

- Many individuals with CVI often do not respond in the same way as their typically sighted peers in response to new or novel objects
- Preference for familiar or known objects



Absence of visually guided reach

- Simultaneous look and reach
- "Look, look away, reach"
- "Find, touch, look"
- Two separate events



Coexisting ocular conditions

- Need to be mindful of coexisting ocular conditions, as these may mask effects of CVI characteristics
 - High myopia or hyperopia, optic nerve disorders, cataracts visual complexity
 - Myopia distance viewing may be impacted
 - Hemianopia, severe retinopathy of prematurity, glaucoma, retinal disease – field preferences



Phases, resolution and assessment


Phases

- Three phases of CVI
 - Phase I
 - Building visual behavior primarily a dorsal stream function
 - The 'where'
 - Phase II
 - Integrating vision with function primarily a ventral stream function
 - The 'what'
 - Phase III
 - Refinement of remaining characteristics



Typical refinement of visual behaviours

- Earlier:
 - Need for light
 - Atypical blink reflex
- Then:
 - Colour preference
 - Visual latency
 - Difficulty with visual novelty
 - Atypical reflex to visual threat
 - Need for movement



Typical refinement of visual behaviours cont.

- Later
 - Visual field preference
 - Absence of visually guided reach
 - Difficulty with visual complexity
 - Difficulty with distance viewing



Assessment

- CVI Range
 - Interview
 - Observations
 - Direct assessment
- Two components
 - Rating 1
 - Rating II



Interventions

- Dependent on individual
- Considerations:
 - Phase
 - Coexisting ocular impairments
- Ideas and activities will be provided to you by a qualified person



Example of Interventions Phase I Student

Objective	Literacy and Numeracy	Mealtime	Free Time	Communication/Switching		
Colour	Use orange on a black background.	Use an orange spoon or orange material wrapped around the spoon.	Place familiar orange objects on Student A' tray and wheelchair, or on the floor when he is out of his chair.	Highlight targets with orange.		
Movement	Move targets slightly to get Student A' visual attention.	Move the spoon slightly to get Student A attention. Use reflective materials around the spoon to provide an element of movement.	 Provide objects with movement /reflective properties. 	Move objects slightly to get Student A' visual attention. Place reflective material on switches.		
Visual latency	 Provide wait time for Student A to look – as much as 60 seconds. 	 Provide wait time for Student A to look – as much as 60 seconds. 	 Provide wait time for Student A to look – as much as 60 seconds. 	 Provide wait time for Student A to look – a much as 60 seconds. 		
Visual fields	Present material in Student A' left or left of centre visual fields. Present targets top and bottom with spacing in between.	Present the spoon in Student A' left or left of centre visual fields.	Provide targets in Student A' left or left of centre visual fields.	Present targets in Student A' left or left of centre visual fields. Present targets top and bottom with spacing in between.		
Complexity	 Present largets on a plain black background. Provide only one or two targets at a time with spacing between. Avoid talking to Student A when asking him to use his vision. Reduce/eliminate external stimuli such as noise or high light levels. 	 Reduce/eliminate external stimuli such as noise or high light levels. 	 Provide only one or two targets at a time with spacing between. Provide a black background for targets. Reduce/eliminate external stimuli such as Avoid talking to Student A when asking him to use his vision. 	 Offer one or two choices at a time against plain black background. Block out extraneous images or highlight with g carage target. Reduce/eliminate external stimuli such as noise or high light levists. Avoid talking to Student A when asking hi to use his vision. The use of a out-out with orange reflective material around the edges (c). Schw X con square) may help direct Student A' attention. 		
Need for light	 Position Student A with light source behind him. The use of a light box with appropriate visual targets (familiar cance objects) may help initiate and sustain Student A' visual attention. 	 Position Student A with light source behind him. The use of a torchlight directed at a target (e.g. spoon or cup) may help initiate and sustain Student A visual attention. 	Position Student A with light source behind him. The use of a light box with appropriate visual targets familiar orange objects may help initiate and sustain Student A' visual attention.	 Position Student A with light source behind him. The use of a torchlight directed at a target may help initiate and sustain Student A' visual attention. The use of a cut-out with orange reflective material around the edges (e.g. 5cm x 5cn square) may help direct Student A' attention. 		
Distance viewing	Present targets within 30cm of Student A.		Present targets within 30cm of Student A.	Present targets within 30cm of Student A.		
Visual reflexes	This is a CVI characteristic and behaviour that cannot be accommodated for and cannot be taught.					
Visual novelty			Use familiar orange objects with shiny/reflective properties. Introduce new objects that match Student A' CVI requirements.			
Visually guided reach			 Place familiar objects that are orange on Student A' tray, wheelchair, or surrounding area. Use an orange shiny ribbon or shiny balloon around his wrist – as he moves his arm, he may see the ribbon or balloon move and watch it. 			

Example of Interventions Phase II Student

Examples of Embedding CVI Strategies in Student B's Day							
Objective	Arrival, Dismissal and MOVE	Literacy and Numeracy	Free Time	Mealtime Management	Communication/PODD		
Colour	Highlight landmarks with red.	Use red on a black background.	Place familiar red items near Student B.	Use a red cup, bowl, or spoon. Wrap a red ribbon around targets of different colours.	 Highlight targets with red. 		
Movement		 Move targets slightly to get Student B's visual attention if required. 	Provide objects with movement /reflective properties.	 Move objects slightly to get Student B's visual attention if required. 			
Visual latency		Provide wait time for Student B to look – as much as 30 seconds.	 Provide wait time for Student B to look – as much as 30 seconds. 	 Provide wait time for Student B to look – as much as 30 seconds. 	 Provide wait time for Student B to look – as much as sixty seconds. 		
Visual fields		Present material in Student B's left visual field.	 Provide highly motivating or familiar targets in Student B's right visual field. 	Present targets in Student B's left visual field.	Present the PODD to Student B's left visual field.		
Complexity	Select route to/from class with reduced complexity	 Present largels on a plain black background. Present no more than three largets at a time, fewer when participating in learning, with spaces in between. Discuss sainer (teatures of letters and numbers. Avoid talking to Student B when asking her to use her vision. Reduze/eitmiate external stimuli such as noise or high light levels. 	 Reduce complexity of logs with multisensory input (e.g. have lights and music) to encourage looking. Have no more than three familiag: motivating objects together to encourage Student B to look to select. Discuss Sailent features of objects. Reduce/eliminate external stimuli such as noise or high light levels. 	Offer one or two choices at a time against a plain black background, or on a red plate, using labelling. Discuss sailent features of objects. Reduce/eliminate external stimuli such as noise or high light levels. Introduce symbols in isolation of familiar targets (e.g. banana, sandwich).	Use block out cards or an occluder to reduce the number of targets and direct Student B's visual attention. Introduce symbols in isolation of familiar targets (e.g. car, banana, sandwich). Highlight salient features.		
Need for light		Ensure light source is behind Student B. The use of a light box with appropriate visual targets (e.g. red letters/numbers on an iPad) may help gain Student B's visual attention.	Ensure light source is behind Student B. The use of a light box with appropriate visual targets (three-dimensional in the first instance) may help gain Student B's visual attention.	Ensure light source is behind Student B.	 Direct Student B's visual attention to targets with a light from behind. 		
Distance viewing		Present targets within 30cm of Student B.	Present familiar and motivating targets at near, then gradually move them further away to practise distance viewing.	Present targets within 30cm of Student B.	Present targets within 30cm of Student B.		
Visual reflexes	This is a CVI characteristic and behaviour that cannot be accommodated for and cannot be taught.						
Visual novelty		Present new learning material in isolation.	 Introduce targets that are similar to known objects. 		 Introduce target symbols in isolation to support Student B to develop discrimination. 		
Visually guided reach			Encourage Student B to look at objects before reaching, then orgin utility helding.	 Encourage Student B to look at objects before reaching, then again unlike helding. 	 Encourage Student B to look at objects before reaching. 		

Example of Interventions Phase III Student

		Examples of Embedding CVI Strategies in Student C's Day								
	Objective	Classroom Positioning	Literacy and Numeracy	Physical Education	Art					
	Colour	Highlight targets at distance with yellow	Highlight salient features in yellow For example, tightly bubble new words or numeracy symbols Use colour (yellow) to underline lines of print	Use yellow lines/ropes/field markers	Highlight edges of work with yellow					
	Movement	Move distance objects if required	 Movement may be required for distance 	 Provide movement or use a reflective material for distance targets 	 Movement may be required or distance 					
	Visual latency	Provide wait time if required	Provide wait time if required	Provide wait time if required	Provide wait time of required					
	Visual fields	Position Student C to the centre or right in the classroom for learning Small group time can allow Student C to practise use of her right visual field	 Allow Student C to position her work to her left Student C may benefit from a guide on the right and bottom of her work to know where to work to 	Position Student C to the right of the group	Position Student C to the centre or right of the classroom					
	Complexity	Ensure the environment between Student C and the learning (teacher, whiteboard, etc) is reduced of clutter Use colour highlighting if required Reduce/eliminate external stimuli such as noise or high light levels if required	Remove extraneous visual information where required Increase line spacing where required Identify salient features of Student C's work Student C may require more detailed images Reduce/eliminate external stimuli such as noise or high light levels if required	 Reduce/eliminate external stimuli such as noise or high light levels if required 	 Use a contrasting background to the medium used, e.g. black or yellow background or white paper 					
	Need for light	Ensure light source is behind Student C The use of an iPad or tablet may reduce visual fatigue for complex tasks	Ensure light source is behind Student C The use of an iPad or tablet may reduce visual fatigue for complex tasks	Ensure light source is behind Student C Use reflective objects for distance Glare may present an issue for Student C	Ensure light source is behind Student C					
	Distance viewing	Position Student C to the front of the classroom for learning	Present novel targets (learning) within 5m of Student C	Present novel targets (learning) within 5m of Student C	Present novel targets (learning) within 5m of Student C					
	Visual reflexes	This is a CVI characteristic and behaviour that cannot be accommodated for and cannot be taught.								
	Visual novelty	Direct attention to new objects in the classroom		Describe new equipment used using salient features	Use salient features where required					
	Visually guided reach		Highlight lines where Student C is to write	Encourage Student C to look at the target before acting	Encourage Student C to look before reaching					

Educational and environmental considerations



Supporting development of colour preference

- Use objects in the preferred colour
- Highlight features of text in preferred colour
- New objects should have a component of the preferred colour
- If introducing a new colour, consider using a light box to draw visual attention









Supporting development of visual complexity

- Reduce background stimuli (e.g. turn off music or whiteboard) when encouraging the use of vision
- Use plain black backgrounds for objects
- Avoid visual clutter













Supporting development of visual novelty

 Provide novel objects that are similar to familiar or known objects





General support

- High contrast visuals
- Highly saturated colours
- Adequate physical support
- Be aware of other stimuli in the classroom
- Avoid talking and presenting visuals simultaneously



Test time ③

























Myths



Black and white is always the best colour combination



FALSE!



Black and white is always the best colour combination - answer

Highly contrasting saturated colours are often best. In a survey conducted on children with CI from 6 months of age through to 15 years of age from 2002-2007, it was determined that 55% of these children were reported to have a preference for red, followed by 34% for yellow, and 11% for green, pink, blue or no colour preference.



Vision constantly changes


NOT TRUE!



Vision constantly changes

- It's more likely that there is an environmental factor as to why the vision appears to fluctuate
- Consider external stimuli such as noise, touch or smell; positioning of objects; current state of the individual



CVI is not a true vision impairment



INCORRECT!



CVI is not a true vision impairment

• Vision is more than just using the eyes – it is also the ability to make sense of the images the brain receives



Video

 "How I See", sourced from <u>http://www.youtube.com/watch?v=NoPMX5IqT6A</u>

Web Resources and iPad apps

- Information:
 - <u>www.littlebearsees.org</u>
 - <u>www.wonderbaby.org</u>
- Salient features:
 - <u>https://cvicollaborative.wixsite.com/salientfeatures</u>
- <u>Word bubbling:</u>
 - <u>https://roman-word-bubbling.appspot.com</u>
- Background removal:
 - <u>https://www.remove.bg</u>



iPad apps

- YouDoodle+
- Little Bear Sees
- Big Bang Patterns
- Big Bang Pictures
- Sparkabilities



Books

- Roman-Lantzy, Christine (2018). Cortical visual impairment: An approach to assessment and intervention (2nd Ed.). New York: AFB Press.
- Tallent, A., Tallent, A., & Bush, F. (2012). Little bear sees: How children with cortical visual impairment can learn to see. Little Bear Sees Publishing.



Books cont.

 Roman-Lantzy, Christine (2007). Cortical visual impairment: An approach to assessment and intervention. New York: AFB Press.



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