PCVIS
Pediatric Cortical Visual Impairment Society

What is CVI?

Cortical Visual Impairment

Cortical Visual Impairment (CVI) has become the leading cause of visual impairment in children in developed countries because of advances in medical care, treatment, and newborn survival rates.[1,2,3] The number of children with CVI is increasing, elevating it to a public health crisis of high significance. Approximately 30-40% of children with visual impairments have CVI.[4] The National Institutes of Health website cites a CVI prevalence of 10.5% of all children with developmental disabilities.[5]

A child has CVI when:

1. The child's visual loss cannot be fully explained by an eye exam.
2. There is a history of a neurological issue even if brain-imaging studies appear normal.
3. The child demonstrates a set of unique visual and behavioral characteristics identified in medical and educational research.[6]

How is CVI different? An Expectation of Improvement.

There are fundamental differences between cortical visual impairment and ocular visual impairment. Because CVI is a brain-based visual impairment, the problem is with the visual processing centers and visual pathways of the brain, not the eye.[7] The brain has the ability to change, known as neuroplasticity, and develop new neuronal connections in spite of damage to visual processing centers and pathways.

By building connections in the brain with appropriate intentional interventions, a child with CVI can improve their functional vision and access to their visual world. CVI disrupts the ability to process and interpret the visual world. The world appears as a "kaleidoscope of meaningless color and pattern."[8] Providing the child with access to the visual world can unlock his her learning and social potential.

How Is CVI Diagnosed?

Cortical visual impairment is typically diagnosed by a medical doctor, usually an ophthalmologist or neurologist and in some states, an optometrist. The child should have a full eye examination. While some children with CVI will have a co-existing ocular condition, this condition will not fully explain their visual loss.

Children with CVI have history of a neurological issue due to a medical cause such as, but not limited to, perinatal hypoxia, prematurity, hydrocephalus or genetic disorders. Brain-imaging studies may or may not indicate the neurological issue. Children with CVI will exhibit some or all of the unique visual and behavioral characteristics as described in the CVI Range.[9] A child must be six months old to receive an official CVI diagnosis. After diagnosis, a Teacher of the Visually Impaired (TVI) and Orientation & Mobility Specialist (O&M) help execute and plan appropriate interventions and adaptations to increase functional vision. There are no medical interventions for CVI.

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2 Hatton, D.D. et al. (2007). Babies Count: the national registry for children with visual impairments, birth to 3 years. JAAPOS, 11: 351-5.
3 Matsuba, C.A., Jan, J.E.. (2006). Long-term outcome of children with cortical visual impairment. Dev Med Child Neurol, 48: 508-12.
4 Junge, J. S. (2018). Quantifying Visual Functions in Children with Cerebral Visual Impairment (CVI). UC Berkeley. ProQuest ID: Junge_berkeley_0028E_18330. Merritt ID: ark:/13030/m54798jx. Retrieved from https://escholarship.org/uc/item/7fc6p09t
5 Swaminathan, M. (2011). Cortical visual impairment in children A new challenge for the future? Oman Journal of Ophthalmology, 4(1), 1 2. http: doi.org 10.4103 0974-620X.77654
6 Roman, C., Baker-Nobles, L., Dutton, G.N., et al. (2010). Statement on Cortical Visual Impairment. JVIB, 104:69-72.
7 Jan, J.E., Groenveld, M. (January 1993). Visual Behaviors and Adaptations Associated With Cortical and Ocular Impairment in Children. Journal of Visual Impairment and Blindness, 87(4).
8,9 Roman-Lantzy, C. (2018). Cortical Visual Impairment: An Approach to Assessment and Intervention. 2nd ed., New York, NY: AFB Press.

For more information, visit PCVIS at www.pcvis.vision.

The Pediatric Cortical Visual Impairment Society, a multi-disciplinary group of doctors, medical professionals, researchers, educators and parents, was created to further advocacy for children with CVI, heighten public awareness, and promote research and other activities that lead to improvement in vision care for children with CVI. PCVIS is a 501(c)(3) nonprofit organization.

The CVI Range© Assessment

The CVI Range© is the only educational tool to assess the degree of impact on the visual functioning of a child with CVI. Developed by Christine Roman-Lantzy, PhD, specifically for those with CVI, the CVI Range© evaluates the overall extent to which the visual and behavioral characteristics associated with CVI, referred to as the 10 Characteristics of CVI, interfere with the child's use of vision and the degree to which each of the characteristics affects the child. (85-92) The term "Range" indicates that functional vision of a child with CVI is measured on a continuum, and that the functional vision can be improved with systematic and tailored interventions. (83)

Traditional assessments (ocular, educational and psychological) fail to accurately gauge the ability and understanding possessed by a child with CVI. However, through the use of an intentional, systematic approach and methodology, guided by a child's CVI Range© score, children with CVI, across varying levels of abilities, can learn to understand the world around them and achieve academically, thrive socially, and acquire independent life skills.

The 10 Characteristics of Cortical Visual Impairment (CVI)

Color Preference

The child may have a strong attraction to visual targets of a particular color. Even when not a single, preferred color, the use of color is critically important. Vibrant or highly saturated color alerts and maintains visual attention to a target.

Need For Movement

The child may be attracted to objects that have properties of movement over those that remain stationary, including shiny, reflective surfaces that create the illusion of movement.

Visual Latency

The child's visual responses may be slow or frequently delayed, which may include a delay in recognition or interpretation. However, if sufficient wait time is permitted, the child may eventually turn in the direction of the target and localize (turn toward) or fixate (eye-to-object contact) on the object.

Visual Field Preference

The child may ignore information presented in certain areas of their visual field, or they may turn their heads to view objects from a particular portion of their field of view. Visual field preferences are present in almost all children who have CVI.

Need for Light

The child may exhibit unusual attraction to or need for light, and may spend prolonged periods of time gazing at primary sources of light, whether natural light or artificial light.

Difficulty with Distance Viewing

Many children with CVI who have difficulty with distance viewing behave as though they were highly nearsighted. The child may position his or her face within inches of a visual target and have great difficulty recognizing even familiar or large targets when they are presented beyond the immediate vicinity. This characteristic is closely linked to the characteristics of difficulty with complexity of array.

Difficulty With Visual Novelty

Children with CVI seem to prefer to visually regard targets that they have viewed over and over and, conversely, appear to ignore objects or other targets that are new.

Atypical Visual Reflex Responses

Many children with CVI tend to have atypical responses with regard to two innate reflexes that serve to protect the eyes from potential harm: the visual blink reflex and the visual threat response. Assessment is of reflexes but they are not part of an intervention protocol or program as they are not directly influenced by instruction.

Absence of Visually Guided Reach

Many children with CVI are unable to look and reach simultaneously. Some may localize or fixate on a target, turn away, and then reach in the direction of the target.

Difficulties With Visual Complexity

Visual complexity encompasses four interrelated aspects:

- **Complexity of patterns on the surface of objects**
  Children with CVI in general appear to have the most consistent visual responses to objects with simple patterns or color on their surfaces.
- **Complexity of visual array**
  Most children with CVI have ocular abilities that allow the reception of visual information. Often, however, visual information may be "seen" but cannot be sorted, interpreted or understood.
- **Complexity of sensory environment**
  Visual attention can occur only when there are no distractions from other sensory stimuli. Many with CVI may be unable to establish or maintain visual attention when there is "competition" from other sensory inputs.
- **Complexity of visual elements of human faces**
  Children with CVI often demonstrate unusual regard of faces. Eye-to-eye contact is generally absent. As functional vision increases, the child with CVI may begin to discriminate faces in a slow and predictable way.

Roman-Lantzy, C. (2018) Cortical Visual Impairment: An Approach to Assessment and Intervention. 2nd ed. New York, NY: AFB Press.

Roman-Lantzy, C. (2019) Cortical Visual Impairment: Advanced Principles. Louisville, KY: APH Press.