

*The 2nd International Researchers Conference on
Deafblindness
23-27 November 2019, Saint Petersburg, Russia*



CEREBRAL VISUAL IMPAIRMENT

NEUROLOGICAL FOUNDATIONS AND IMPLICATIONS FOR
LEARNING

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NEUROLOGICAL BACKGROUND

CEREBRAL VISUAL IMPAIRMENT (CVI)

- NOT ocular based visual impairment
- visual impairment that occurs due to brain injury
- caused by damage of visual processing structures and visual pathways
- the incidence of CVI is on the rise worldwide!

HOW CVI IS IDENTIFIED IN CLINICAL SETTING?

1. Normal eye exam or an eye exam that reveals an eye condition that cannot explain the individual's profound lack of functional vision;
2. A medical history that includes neurological problems associated with a diagnosis of CVI;
3. The presence of **unique visual and behavioral characteristics of CVI**

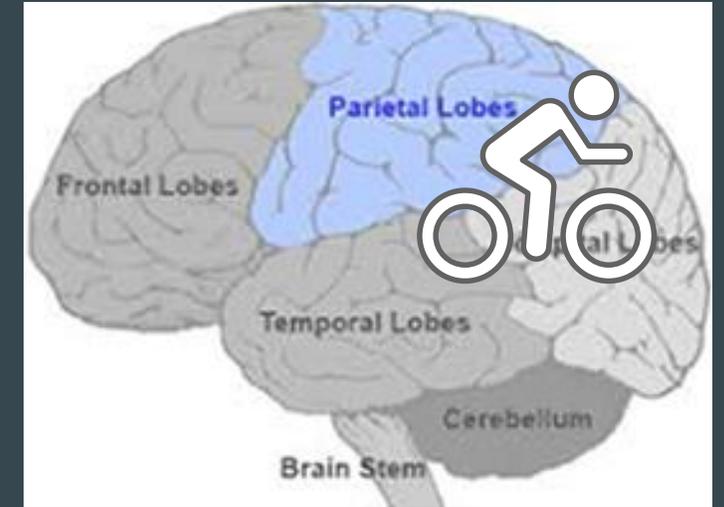
STILL A CHALLENGE

WHAT DO WE SEE IN CLINICAL PICTURE?

- decreased visual acuity, visual field deficits, reduced contrast sensitivity...
- higher-order visual processing deficits
- other neurodevelopment delays

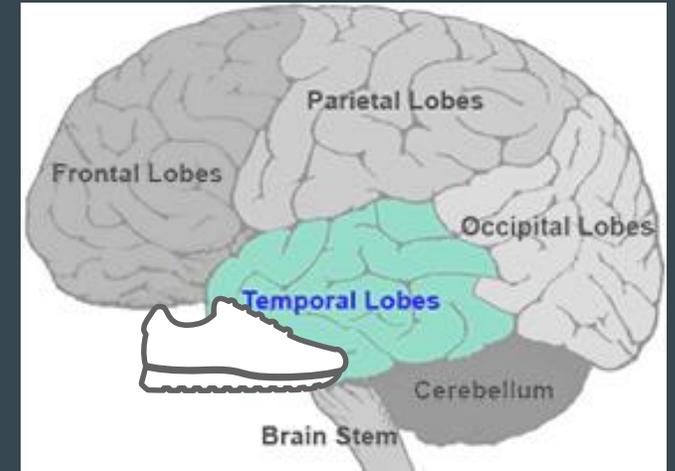
DORSAL STREAM DYSFUNCTION

- connecting the OCCIPITAL to PARIETAL cortices and terminating within FRONTAL areas
- SPATIAL AND MOTION processing
- deficits in VISUAL ATTENTION
- difficulties with VISUO-MOTOR INTEGRATION
- VISUAL GUIDANCE OF MOVEMENT?

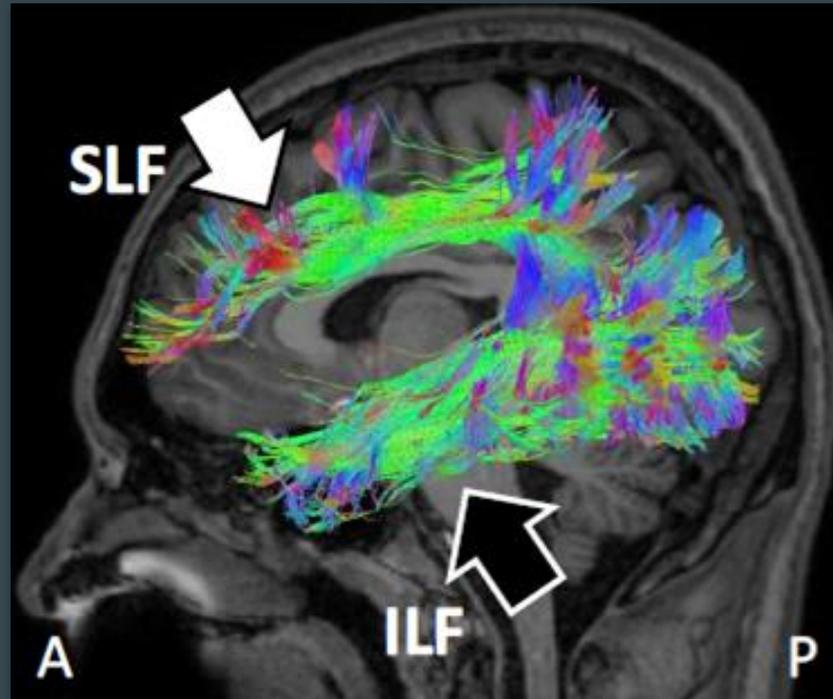


VENTRAL STREAM DYSFUNCTION

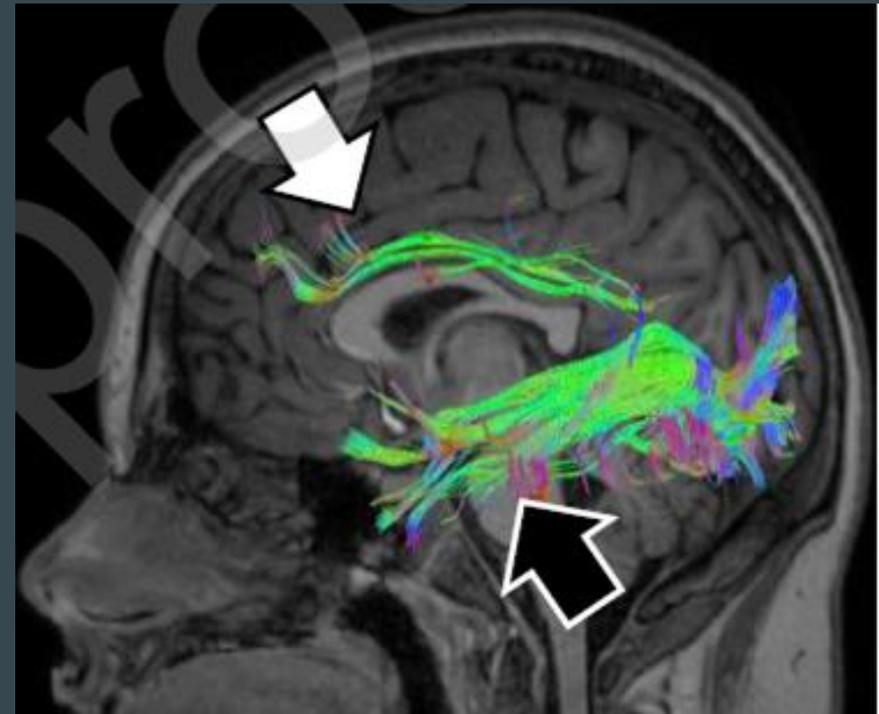
- connecting the OCCIPITAL to INFERIOR TEMPORAL cortex
- deficits related to OBJECT IDENTIFICATION
- deficits in recognizing FACES and SHAPES



WHAT HAPPENS IN THE BRAIN?



HOW **TYPICAL** BRAIN PROCESS VISUAL INFORMATIONS



HOW **BRAIN WITH CVI** PROCESS VISUAL INFORMATIONS

WE OBSERVE IMPAIRMENTS IN...



CVI 10 unique visual and behavioral characteristics

Color preference and attraction to color

- attracted to color, sometimes a particular color - attract and hold attention
- vibrant or highly saturated color (red, yellow or other)

both dorsal and ventral stream characteristic

Attraction to movement

- to initiate or sustain visual attention
- either the viewer or the object needs to be moving (or reflective surfaces)

dorsal stream characteristic

Visual latency

- responses and looking at objects are delayed
- medication can impact response time

Visual field preferences

- areas within peripheral fields where targets are able to be seen and are not able to be seen
- lower visual field dysfunction is common (O&M)

dorsal stream characteristic

Difficulties with visual complexity

- a) complexity of the pattern on the surface of an object
- b) complexity of the visual array
- c) complexity of the sensory environment
- d) complexity of the visual element of human faces

ventral stream characteristic

Need for light

- attracted to primary sources of light

dorsal stream ch.

Need for light

- needs to be paired with a target to see it

Difficulty with distance viewing

- cannot isolate targets beyond certain distance

ventral stream characteristic

Difficulty with visual novelty

- increased visual attention is paid to targets that are familiar (lack of visual curiosity)

ventral stream characteristic

Absence of visually guided reach

- the ability to look at and to touch an object at the same time is not displayed
- looking and touching are performed separately

dorsal and ventral stream
characteristic

Assessment → intervention

1. Functional visual assessment has a standardized protocol
2. Interventions must emerge from assessed needs
3. Environments must be adapted (visual and auditory complexity, embedded into daily routine)

Children involved in an intervention based on FV assessment regularly show significant improvement in visual functioning

Intervention: Phases of CVI

Looking

Phase I

Child is beginning to use vision for looking at objects. It is important to teach children specific characteristics of objects such as color, shape and size.

Minimal visual responses (prefers light).

Child can only see without visual distraction, in carefully controlled learning environment.

Function

Phase II

Child is learning to use his vision to do something. This can include looking and reaching for an object.

Visual responses are more consistent, use his vision during functional tasks.

Needs environmental adaptations but they can visually attend under mild competing visual and auditory stimuli.

Resolution

Phase III

Specific characteristics are less pronounced and child is better in using his vision in daily life.

Begin to visually inspect objects.

Child can see withing non-adapted, typical home or school environment.



CVI FRIENDLY ENVIRONMENT

Accommodations and adaptations

PHASE I

MATERIALS

Using 3D objects
Single coloured objects
(preferred colour)
Large objects
Use of familiar objects
Single item presentation
Using reflective, shiny materials

STRATEGIES

Reducing background complexity:
visual, auditory, position
Giving enough time
Good positioning
Use of light
Preferential seating
Placing in best visual field

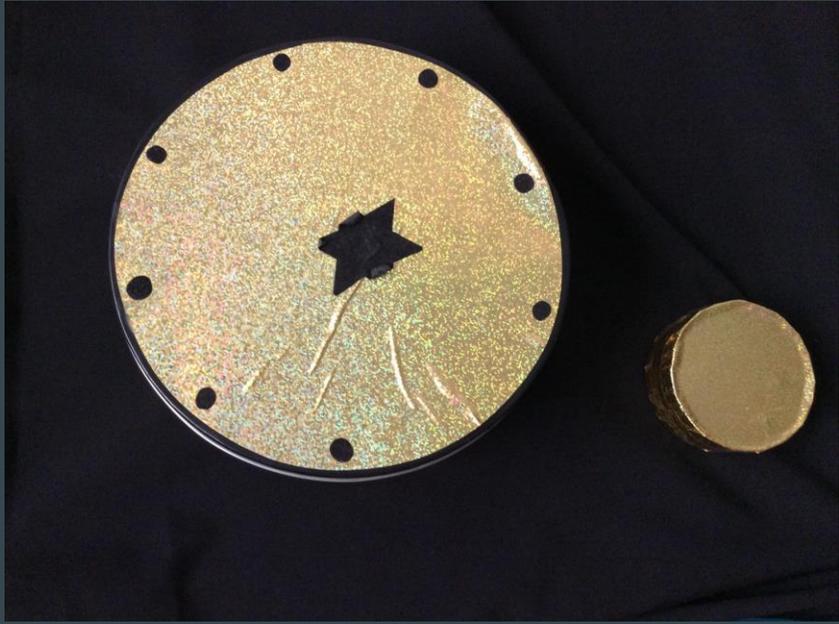
OBJECTS





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USE OF MOVEMENT

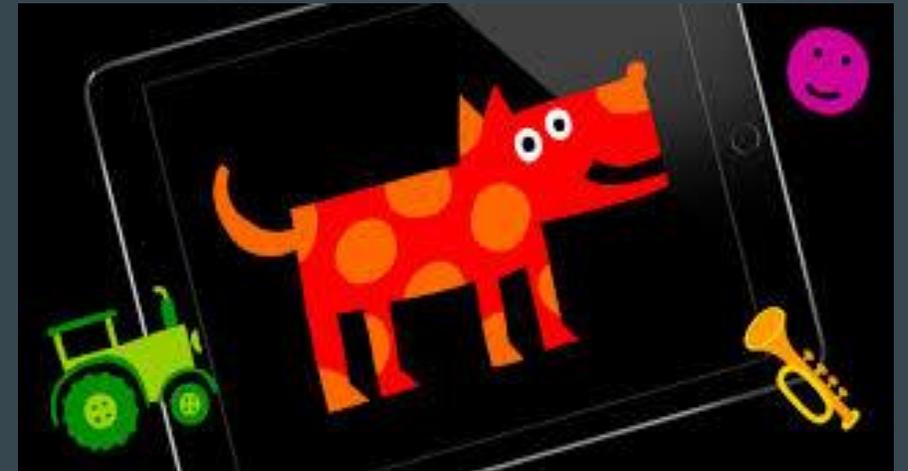


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USE OF LIGHT



USING IPAD



PLACING IN BEST VISUAL FIELD



REDUCING VISUAL COMPLEXITY





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PHASE II

MATERIALS

Multicoloured objects

Highlighting colour

Highlight place to reach

Familiar items when introducing something new

Embedded symbols

STRATEGIES

Using movement to gain attention

Allowing enough time

Predictable book with salient features

Backlight light

Large print

OBJECTS





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PHASE III

MATERIALS

Moving to 2D materials

Salient features

Use of large prints

STRATEGIES

Backlighting technology

Use of covers and line keepers





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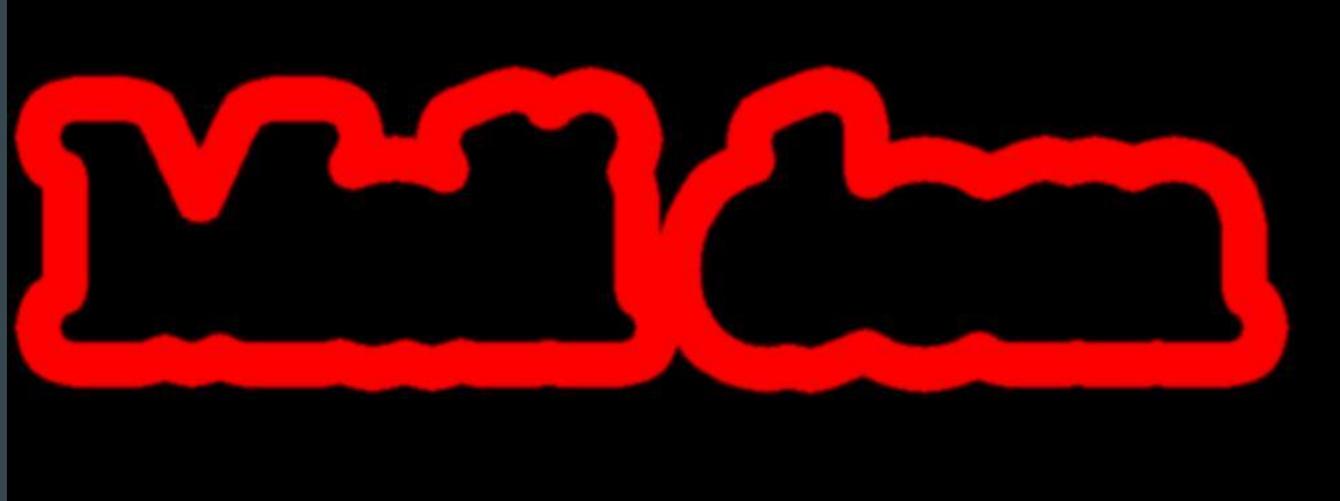
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BEHAVIOURAL CHARACTERISTIC

- DORSAL STREAM DYSFUNCTION

- Absence of visually guided reach
- Color preferences
- Attraction to color
- Attraction to movements
- Need for light
- Visual field preferences

- VENTRAL STREAM DYSFUNCTION

- Absence of visually guided reach
- Color preferences
- Attraction to color
- Difficulty with visual novelty
- Difficulty with distance viewing
- Difficulty with visual complexity