Evaluating and Prescribing for Children with Challenges

Dr. Cathy Stern, OD, FCVO, FCSO, FNORA

POA Clinical Catch-All
March 3, 2019

Course Learning Objectives
1. Learn methods of evaluation when conventional tests may not work.
3. Appreciate communication approaches for children with challenges.
4. Be able to communicate vision for understanding and action vs. sight.

No financial disclosures
While we will cover aspects of care unique to certain conditions or diagnoses, the patients used here generally carry a primary diagnosis of cerebral palsy.

Introduction to Cerebral Palsy

- Cerebral Palsy (CP) is a non-progressive disorder of movement and posture which results from brain injury
- Prematurity is the number one risk factor in North America (less than 32 weeks gestation)
- Low birth weight <5.7lbs
- 15% of cases are caused by maternal infection, CVA, hypoxia or identified birth trauma
  
  Most cases of CP have no identified cause

25-80% have additional impairments including:

- Intraventricular Hemorrhage (IVH)
- Periventricular Leukomalacia (PVL)
- Seizure disorder, 30% (especially with hemiplegia)
- Cognitive impairment – MR, LD
- Visual and auditory perception/processing
- Speech and language impairment (80%)
- Sensory processing such as stereognosis (can’t identify an object by touch alone)
Other associated disorders include:
- Stunted growth, 25%
- GI and feeding problems, 50%
- Abnormal brain CT – 70% of those with spastic CP

Major Risk factors for CP include:
- prematurity and/or low birth weight
- intrauterine infection
- multiple births

CP is associated with a high prevalence of:
- Decreased Visual Acuity (up to 75%)
- Oculomotor Dysfunction
- Accommodative Insufficiency/Infacility
  poor focus flexibility
- Significant Refractive Condition
- Visual Perceptual Dysfunction
  eye-hand and spatial misperception
- Cerebral Vision Impairment (CVI)

Classification of Cerebral Palsy

SPASTIC (60%)
- Increased tone in muscle groups
- Muscles often tense or contracted
- Jerky movements
- Movements are slow and inaccurate
- Scissor gait or toe walking
- Upper motor neuron lesion, damage to corticospinal/pyramidal tract
ATHETOID (20%)
• Involuntary extraneous motor activity, dyskinetic
• Uncoordinated, uncontrollable movement
• Often accompanied by hearing loss
• Wide based gait and poor fine motor ability
• Damage to the extrapyramidal motor system and to the basal ganglia

ATAXIC (10%)
• Poor balance, high stepping gait
• Gross and fine motor coordination impaired
• Cerebellar lesion
• Nystagmus is common

MIXED TYPES
example: spastic athetoid CP
• Tight muscle tone with involuntary reflexive movement
• Generally more severe with a poorer prognosis for motor and cognitive development
Body Topography
parts of the body affected

HEMIPLEGIA (30-40%)
• One side of the body e.g spastic hemiplegia
• May be accompanied by hemianopia
• May be accompanied by speech delay

PARAPLEGIA (10-20%)
• Both legs

DIPLEGIA (10-20%)
• All limbs but legs worse than arms
• Generally both legs with some arm involvement
• Spasticity is most common – spastic diplegia
• With spastic diplegia: ankle-foot orthotics (AFO’s)

QUADRIPLAGIA (15-20%)
• All four extremities
• Spastic quadriplegia is the most severe form
Jean Ayers and sensory integration

Sensory integration is much more difficult to achieve without visual integration.

Our Role

Vision is one of the primary means for exploring our surroundings.

Deficits in sight, visual efficiency and visual processing lead to delayed social and cognitive development.

Motor development is impaired which also contributes to delayed development of visual efficiency and visual perceptual skill.

Tests of Visual Acuity

- Teller
- Lea (available for distance and near)
- Broken Wheel
- Snellen
- sVEP or flash VEP
- OKN
• Don’t forget NEAR acuity
• Tests don’t always agree e.g Teller vs VEP
• Do binocular before monocular

Tests of Visual Acuity
• Gratings overestimate acuity
• Poorer acuity correlates with greater motor/ cognitive challenges
• sVEP is poor for determining level of amblyopia in strabismic amblyopia
• Acuity may be underestimated if the test requires a high level of eye movement/control

Fixate, Follow, Focus, Fusion
the impact of visual skill
Oculomotor – pursuits and saccades
Accommodation – focus flexibility
Binocular vision skill – stamina and stability – strabismus in CP
Oculomotor and Binocular Function

- Pursuit and saccades
- NPC
- Cover Test
- Worth 4 dot
- Stereopsis
- Prism vergence
- +/-2.00 or MEM

Pursuits

Have the patient best supported and instruct them to follow a fixation target with their eyes. Hold the target approximately 16 inches from the patient and trace a circle with an 8 inch radius from primary gaze at least two times in a clockwise direction and two times in the counter-clockwise direction. Monitor and record the patient’s ability to complete each rotation, to maintain fixation of the target, and any head or body movements made during the testing.

Southern California College of Optometry (SCCO)
4+ Scoring System for Evaluating Ocular Motility

Pursuit ability: test binocularly
- 4+ Smooth and accurate
- 3+ One fixation loss
- 2+ Two fixation losses
- 1+ More than two fixation losses or any uncontrolled head movements
Saccades

Have the patient best supported. The procedure involves two targets. Hold the two fixation targets 16 inches from the patient with each target respectively positioned horizontally 4 inches from the right and left of the midline, and just below the lateral corner of the patient’s right or left eye. Have the patient fixate one target and then instruct them to quickly look at the other target. Repeat each cycle four more times.

Monitor and record any over- or under-shooting of fixation, the ability to complete the task, and any head or body movements.

Southern California College of Optometry (SCCO)

4+ Scoring System for Evaluating Ocular Motility

Saccadic ability: test binocularly - if deficient, test monocularly
- 4+ Smooth and accurate
- 3+ Some slight undershooting
- 2+ Gross undershooting or overshooting or increased latency
- 1+ Inability to do task or any uncontrolled head movement

Normal latency of initiating a saccade is 120 to 180 milliseconds

Near Point of Convergence Test

Have the child watch a small toy or a penlight as it is moved slowly toward her nose. The eyes should track inward together until the target is 3” from her nose.

As the toy/light is moved back away from her nose, she should be able to refixate with both eyes as the target gets to no more than 6” from her nose.

- Do both eyes move inward symmetrically?
- Does one eye turn outward (or inward) quickly?
- Are the eyes able to refixate the target quickly?
- Does the child report seeing double?
Worth 4-dot test

What the patient is seeing with red lens OD

Lang Stereo Test
Oculomotor and Binocular Function

- Significant Refractive condition 40-76%
- Oculomotor dysfunction 80-85%
- Unstable fixation 60% (half=nystagmus)
- Vergence anomalies 45%

- Strabismus 50-70%
- Esotropia 50%
- Exotropia 25-50%
- Amblyopia 25%
- Accommodative dysfunction 100%
- Visual perceptual (body schema, directionality) 78%

---

Oculomotor and Binocular Function

- Without strabismus about 90% have motor fusion (NPC, prism vergence) and sensory fusion (W4D, stereo).
- Up to 75% of patients cannot achieve sensory fusion. Be careful with divergence excess as sensory fusion at near is good.
- Patients without motor/sensory fusion prior to surgery do not gain fusion post surgery.

---

Functional Visual Field

- Visual field constriction without pathology
- Quick method of assessing functional field
- It’s significance to family, teacher, therapists
- It’s significance for classroom placement
- Communicating functional visual field loss
- Differs from spatial inattention (neglect)
Visual Perception

- Test of Visual Perceptual Skills (TVPS)
- Motor Free Visual Perceptual Test (MVPT)
- Developmental Test of Visual Perception (DTVP)
- Beery VMI (often do not have the hand control to do this test)

- Normative data not helpful
- Use for baseline of abilities

Color Vision Testing Made Easy
Contrast Sensitivity

- A contrast sensitivity test measures your ability to distinguish between finer and finer increments of light versus dark (contrast).

- Contrast sensitivity (CS) may almost be more important than visual acuity for low light situations or when the contrast difference between two objects or surfaces is reduced.

- When someone complains of not seeing well, CS may be more the issue than visual acuity. It can be a sign of early visual changes such as cataracts and glaucoma.

Vision and Low Vision Needs
- Spectacle Rx and/or bifocal considerations
- Compensatory prism and yoked prism
- Vision therapy (not for strabismus)
- Low Vision considerations – optical and non-optical

Environmental modifications for home/school
- lighting, posture, working distance

Effect of treatment on:
- communication
- feeding
- mobility or w/c travel,
- classroom, recreation

Spectacle Rx
- +/-
- Bifocal Rx
- Prism
- Yoked prism
- Bangerter foil for amblyopia/strabismus
Spectacle Rx

- Safety/sport eyewear
- Rx swim goggles for significant Rx
- Horizontal and vertical compensation
- Cable temples especially for W/C patients
- Strap/Croakie to improve fit/comfort

Congenital quad, 28wks, 3lbs, MR, seizure disorder
Rx: plano-5.00x180 OU
VA: distance 20/200sc to 20/70cc
near J16/2.5M sc to 20/25cc.
“I only wear my glasses in class, remember I can’t drive with them”
Important Visual Factors

- Visual Tracking - Fixation / Follow/ Locate
- Near Point of Convergence
- Binocular Eye Coordination
- Focus Flexibility
- Visual – Vestibular
  - head position, head moving, eyes moving,
  or head and eyes moving

*These skills lead to sustained visual attention over time and faster processing speed*

Loading and Unloading Tasks
Marsden Ball

Focus Flexibility

Accommodative (focus) Flexibility
- switching focus between near

Convergence Insufficiency (CI)

- Convergence Insufficiency is the inability to adequately aim and fixate your two eyes together at near (desk work, reading and computer tasks).
- This condition frequently causes eye strain and fatigue while reading.
- Other symptoms include intermittent double vision, distance blur after reading, and limited visual attention or concentration for near work.
- Some students with this condition avoid reading.
Common Symptoms of CI

- Eyestrain and fatigue with extended near work (reading, computer)
- Avoidance of reading or close work
- Short attention span
- Headaches during or after reading
- Blurred distance sight after reading

Body Lifts

1. One Body Part – major, such as head or arm
2. Two Body Parts – homolateral
3. Two Body Parts – contralateral

Sequence

Touch two and then three body parts, asking the child to lift and lower them in the sequence touched.
- sequential motor memory and motor planning

Ask the child to lift the body parts in reverse order in which they were touched

Always watch for “motoric stuttering” or lack of fluidity
Estimation
Stand across the room and hold a dowel parallel to the child. Ask him to tell you to raise or lower it until it is level with his waist. Repeat for knees and shoulders.

Variation - ask the child to judge at what level of his body a fixed object would intersect. For example, if there is a table across the room, can he tell if the table will be at his waist, above it, or below it when he reaches the table.

Cognitive Load
1. basic pursuit – follow the magic ball
2. now ask the child to repeat the task.
While they are following the target, have them to spell their name or do simple math problems - this is more representative of performance in the real world

Tools that Work
- Get to know the child
- Establish a relationship
- Think developmentally – let the child’s actions and results dictate your next step.
- Resist teaching – allow the child to explore and discover the solutions using experimentation and evaluation.
### Tools that Work

- Mistakes are not bad. Not recognizing an error or difference makes it a bad mistake.

- Children can learn to discriminate “same” and “not same” related to movement even before they understand directional labels.
  
  Laterality comes before Directionality
  Knowing it on yourself allows you to project it into space, now you can recognize the difference between “b” and “d”.

- Hold a child accountable for space and time.
- Motor planning should include the requirements for the framework in which space will occur and how time will pass.
- Make time matching as essential as space matching.

### Role of the Child’s Team

**How does my child see?**
**How does this child see for learning/reading, for navigating safely, for interacting with peers?**
**Will this child be successful with a communication board?**
**Where should s/he sit in the classroom?**
**What size print should s/he use?**
**When should s/he use eyeglasses?**
Communication with
Family, Teacher, Therapists, Physician

- How does the child see – acuity, visual field
- How and when to use eyewear
- Simple environmental modifications
- Classroom placement
- Best placement for TV, computer, assistive technology
- Consideration for mobility – walking, w/c
- Prognosis for gaining visual skill - independence, safety, learning, work and recreation

Other Considerations

- Is the child in a special school or educational program?
- What is his classroom like?
- Does s/he have any hobbies?
- For adults you need to ask about occupational needs and considerations? ADA

THANK YOU

Dr. Cathy Stern, OD, FCOVD, FCZO, FNORA
doctorstern@gmail.com