Vision:

Academic Challenges,

Classroom Behaviors, and

Evidence-Based Vision Screening Approaches

Introduction and Disclaimer

• 17 years in vision screening field

• Former Director/Lead Trainer – Vision Initiative for Children – West Virginia University Eye Institute

• Member – Advisory Committee to the National Center for Children’s Vision and Eye Health at Prevent Blindness

• Consultant – Vision Screening Committee, American Association for Pediatric Ophthalmology and Strabismus

• Current Education and Outreach Coordinator for the National Center for Children’s Vision and Eye Health at Prevent Blindness

• Current Director – Vision and Eye Health Initiatives at Good-Lite and School Health Corporation

• Not in sales . . . Focus is encourage age-appropriate, evidence-based, and best practice vision screening as part of a strong, 12-component, Vision Health System of Care
Info You Will Take Home …

4 Learning Objectives

- Describe 2 solutions to vision-related academic challenges.
- List 1 website for finding resources to support your vision and eye health program.
- List 2 classroom behaviors that may be related to vision.
- List 2 evidence-based approaches to vision screening and describe what each measures.

Current State of Children’s Vision in the U.S.

Vision disorders requiring treatment impact 1% to 6% of preschool-aged children and about 20% of school-aged children in the United States.¹

- Eye and vision disorders in children are a time-sensitive concern.
- If left undiagnosed and untreated, eye diseases and vision disorders in children can lead to permanent and irreversible vision loss and/or cause problems socially, academically, and developmentally.
- Nearly 94% of the vision problems leading to the impairment in preschool-aged children can be identified early during a vision screening resulting in earlier access to an eye care provider and improvement in vision.²
- Only 41% of children ages 5 years and younger are screened for vision problems.³

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7 Classroom Behaviors that May be Related to Vision Disorders

Behaviors are not always related to vision.

A vision disorder is something to consider when the behaviors occur.

Conduct vision screening to rule out vision as a casual factor.

Talking in class – Child said he talked because he was asking other students to help him read material on board.

Notably quiet in class – Child said she stopped looking at board... She couldn’t see material on board.

“Spacy” and in own world – Interrupt story time to come forward to see book pictures. “I can see that now!”

Difficulty sitting still – Up and moving in circle time or watching TV with brother. Loner and bored. Now sits and participates in group activities.


Screener and parent stories.

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Frustrated with “academic work” –
Before glasses, “things looked dusty”. Different child, happier, less frustrated.

Squinting during class activities –
“Mommy! There are numbers on that circle on the wall!”

Clumsiness until receiving glasses –
“I have realized through these screenings that vision can affect a child’s behavior, balance, and academic performance.”


Relationship between Vision and Reading/Literacy Scores

Comment to “Vision problems can harm kids’ development grades”

“I always thought I was just sitting too far from the blackboard to read the words and numbers the teachers were writing. It wasn’t until my 8th grade year (having repeated 6th grade) that I was vision tested. Geez, what a difference when I went back to school as a freshman in high school. I could read everything, and my learning was so much easier.”
5th grade – Cs & Ds. Consistently unruly in class. After VS & glasses, behaviors calmed almost immediately. 3 mo later – Bs & working on As. “You saved my nephew.”

2015 study – low-income, ages 3 through 5 yrs – found: Improvement in academic progress, confidence & behavior - increase in focus during lessons & classroom participation & interaction.

317 2nd & 3rd graders – 12 high-poverty schools – Baltimore City – Children with uncorrected hyperopia did not perform as well on reading assessments compared with children without hyperopia.

2015 study – ages 4 and 5 yrs with hyperopia (farsightedness ≥4.0 D) scored significantly worse on early literacy test than children with normal vision.

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Diopter defined

- “Diopter” refers to the strength of a prescription lens required to give a child the clearest vision possible. The higher the number, the stronger the prescription lens.

- A child requiring 4 diopeters of correction in prescription glasses, or contact lenses, would likely struggle with blurred vision, crossed eyes, or both, and would see much better with prescription glasses.
Early Identification & Treatment Make a Difference

- First grade reading ability found to be predictive of 11th grade reading outcomes, including:
  - Reading comprehension,
  - Vocabulary, and
  - General knowledge.

Academic Considerations for Vision

- Improved GPA (reading and math) - more likely for hyperopes than myopes
- Increased satisfaction with school
- Reduced stress
- Improved cognition, attention span, and focus
- Improved test scores
- Less task avoidance and need for discipline
- Less labeling- ADD or ADHD
- Earlier identification leads to improved outcomes

Academic Performance of Oyler School Students after Receiving Spectacle Correction. Thesis by Kimberly L. Renner; Graduate Program in Vision Science; The Ohio State University, 2017


What do previous slides tell you?

- Importance of:
  - Evidence-based vision screening,
  - Follow-up eye exams,
  - Receiving vision treatment plan and related devices/materials (i.e., glasses, patching); and
  - Following treatment plan for best vision now and in the future.
Such a simple solution . . .
Evidence-Based Vision Screening Approaches

What . . .?!?
No Snellen charts?

Cast of Characters

NCCVEH:
• National Center for Children’s Vision and Eye Health at Prevent Blindness
  • Optometry
  • Ophthalmology
  • Family Advocates
  • Nurses
  • Public Health Professionals
  • Educators

AAP:
• American Academy of Pediatrics
• American Association for Pediatric Ophthalmology and Strabismus
• American Academy of Ophthalmology
• American Association of Certified Orthoptists
2 Approaches to Vision Screening

1. Optotype-based screening
   - Tests of visual acuity using optotypes to measure visual acuity as interpreted by the brain
     - Quantifiable measurement of the sharpness or clearness of vision when identifying specific optotype sizes at a standardized distance

2. Instrument-based screening
   - Instruments do not measure visual acuity
   - Instruments analyze images of the eyes to provide information about amblyopia and reduced vision risk factors:
     - Estimates of significant refractive error (hyperopia, myopia, astigmatism)
     - Estimates of anisometropia
     - Estimates of eye misalignment (some, not all)

Threshold & Critical Line Screening

- Threshold screening
  - Move down chart until child cannot correctly identify majority of optotypes

- Critical line screening
  - Use only line child needs to pass according to child’s age

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“Not so great” charts . . .

**NOT** Recommended by NCCVEH and/or AAP

- “Sailboat”
- Allen Pictures
- Lighthouse or “House, Apple, Umbrella”
- Snellen
- Tumbling E
- Landolt C

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Why NOT Recommended?

- The use of validated and standardized optotypes and acuity charts is important for an accurate assessment of vision.
- Charts not standardized.
- Children may not know their letters.
- Requires discrimination of direction, which is not sufficiently developed in preschool-aged children.
- Not well validated in screening environment.


Importance of Appropriate Tools

- “Visual acuity scores can be significantly affected by the chart design.” (p. 1248)

- Excluding optotype size, “each visual acuity level on a test chart should present an essentially equivalent task”. (p. 740)
National and international distance visual acuity eye chart design recommendations

• **1980 - National Academy of Sciences-National Research Council (NAS-NRC)**

• **1984 - International Council of Ophthalmology (ICO)**

• **2003 - World Health Organization Prevention of Blindness & Deafness (WHO)**

• **2010 – American National Standards Institute, Inc.**

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**Similar recommendations across guidelines**

- Optotypes approximately equal in legibility
- Horizontal between-optotype spacing = 1 optotype width
- Vertical between-line spacing = height of next line down
- Geometric progression of optotype sizes of 0.1 log units (logMAR, ETDRS)
- 5 optotypes per line
- Optotypes black on white background with luminance between 80 cd/m² and 160 cd/m²

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**Tips:**
- Line outside optotypes
- 20/32 vs. 20/30
- 10 feet vs. 20 feet

Do the following eye charts fit national/international eye chart design guidelines? **NO**
Preferred Optotypes for Ages 3 to 7 Years

- NCCVEH
- AAP
- Recommend LEA SYMBOLS® and HOTV letters as optotypes


Preferred Optotype Format

NCCVEH national guidelines call for using single, LEA SYMBOLS® or HOTV letter optotypes surrounded with crowding bars for children ages 3, 4, and 5 years at 5 feet.

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• Card with 4 optotypes – use as matching game
• Individual cards may be placed on floor in front of child – ask child to step on card matching optotype to identify

Options: Critical Line Screening at 10 feet

Sight Line Kit


Also acceptable . . .

Preferred Optotypes for Ages 7 Years & Older

• AAP
  ▪ Recommends Sloan Letters

• American Academy of Ophthalmology
  ▪ Recommends Sloan Letters and numbers


Options - Kits From AAPOS
(American Association for Pediatric Ophthalmology and Strabismus)

- AAPOS Vision Screening Kit
- AAPOS Vision Screening Kit: Supplemental Screening Package

Screening Distance

- 5 or 10 feet from chart to child's eyes
- *New, standardized distance charts will be at 10 feet for children and adults*
- 10/xx on left side of chart with 20/xx on right side – report 20/xx
Occluders – Younger Children <10 Years

Unacceptable Occluders Ages 3, 4, and 5 years

- Hand
- Tissue
- Paper or plastic cup
- Cover paddle

Why unacceptable?

Children can easily peek

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Occluders – Aged 10 Years and Older


To Point or Not to Point . . . ?

- Pointing to each optotype to help children know where they are on the chart is permissible.

  - True or False?

    ✓

  - 1.8 “Line-by-line isolation or pointing may be used, but not letter by letter

No Pointing at Optotypes

• Holding pointer at optotype makes optotype easier to identify.

• Instead . . . briefly point under or over top of optotype and quickly remove pointer.

• If line has a box around optotypes, stay outside the box with pointer.

No Need to Read Each Optotype on Every Line

World Health Organization (2003) says:

• May be less tedious for children to read 1st optotype on left-side of chart until missing one and then moving up a line and reading entire line

Camparini et al. found:

• ETDRS-Fast (reading 1 letter per row until a mistake is made) yields accurate results compared with standard method of reading each optotype on every line.

• Also – significantly reduced test time

Referral Criteria

NCCVEH
- **Age 3 years:**
  - Majority of optotypes on **20/50 line**
- **Ages 4 and 5 years:**
  - Majority of optotypes on **20/40 line**
- **Ages 6 years and older:**
  - Majority of optotypes on **20/32 line**

AAP
- **Age 3 years:**
  - Majority of optotypes on **20/50 line**
- **Ages 4 years:**
  - Majority of optotypes on **20/40 line**
- **Ages 5 years and older:**
  - Majority of optotypes on **20/32 (or 20/30) line**
  - Or 2-line difference even in passing lines (i.e., 20/20 and 20/32)

Referral Criteria


Choices for Near Vision Screening

Can do critical line only with both eyes open or one eye at a time.
2 Approaches to Vision Screening

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2. **Instrument-based screening**
   - Instruments do not measure visual acuity
   - Instruments analyze images of the eyes to provide information about reduced vision and amblyopia risk factors:
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     - Estimates of anisometropia
     - Estimates of eye misalignment

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**Instrument-Based Screening**

- Use beginning at 12 months; better success at 18 months (AAP)
- Use instruments OR tests of visual acuity for children ages 3, 4, and 5 years (NCCVEH and AAP)
- Instruments at any age for 6 years and older if child or young adult cannot do test of visual acuity (AAP)

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Instrument-Based Screening

- If use instruments, no need to also do visual acuity screening unless you want to check both VA and refractive error.

- If cannot “capture” a pass or refer result... refer child for comprehensive eye exam.

Do not attempt to convert estimated refractive error to visual acuity value.

- Child could fail vision screening with instrument, but pass with conversion and miss opportunity for eye exam.

<table>
<thead>
<tr>
<th>Minus (-) Sphere</th>
<th>Plus (+) Sphere</th>
<th>Estimated Visual Acuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age: 0-11y</td>
<td>Age: 12-17y</td>
<td>Age: 18-20y</td>
</tr>
<tr>
<td>-0.5</td>
<td>+2.00</td>
<td>+1.25</td>
</tr>
<tr>
<td>-0.75</td>
<td>+3.00</td>
<td>+1.75</td>
</tr>
<tr>
<td>-1</td>
<td>+3.25</td>
<td>+2.50</td>
</tr>
<tr>
<td>-1.25</td>
<td>+3.75</td>
<td>+3.00</td>
</tr>
<tr>
<td>-1.5</td>
<td>+4.25</td>
<td>+3.50</td>
</tr>
<tr>
<td>-2.5</td>
<td>+4.75</td>
<td>+4.00</td>
</tr>
</tbody>
</table>

[1] Spherical results are based upon minus (-) cylinder conversion.

Instrument “Approved” by NCCVEH

Welch Allyn® Spot™ Vision Screener

Review and monitor this website for additional NCCVEH-approved instruments:
https://nationalcenter.preventblindness.org/instrument-based-vision-screening

Visual Acuity Testing Machines (such as Titmus, Optec, and Keystone View vision screens)

Visual acuity testing machines screen for near and distance visual acuity and can use a variety of letter or symbol slides. Some machines can test other visual functions. Such machines prevent observation of a child’s face and eyes during screening. Child cooperation can be a problem when screening young school-aged children. Insufficient data exist to support machines as preferred practice for school-aged children. If screens choose to use machines, Sloan Letters or LEA NUMBERS® are the preferred optotypes.

Prevent Blindness Position Statement on School-Aged Vision Screening and Eye Health Programs
https://nationalcenter.preventblindness.org/publications-and-presentations

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Vision Screening is . . .

• Part of a process...not a single event.

• 1 of 12 components of a strong vision health system of care.

Evaluating Your Vision Health Program

https://www.nasn.org/nasn-resources/practice-topics/vision-health

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An Eye on Vision
Five Questions About Vision Screening and Eye Health—Part 2


Year of Children’s Vision

- [http://nationalcenter.preventblindness.org/year-childrens-vision](http://nationalcenter.preventblindness.org/year-childrens-vision)
- Archived vision screening webinars in Resources

National Center for Children’s Vision & Eye Health

- [http://nationalcenter.preventblindness.org/](http://nationalcenter.preventblindness.org/)

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Prevent Blindness Position Statement on School-Aged Vision Screening and Eye Health Programs

Prevent Blindness recommends a continuum of eye care for children to include both vision screening and comprehensive eye examinations. All children, even those with no signs of trouble, should have their eyes checked at regular intervals. Any child who experiences vision problems or shows symptoms of eye trouble should receive a comprehensive eye examination by an optometrist or an ophthalmologist.

Prevent Blindness, other organizations, and school health personnel often perform vision screenings for children at schools and other settings. While vision screenings and eye examinations are complementary approaches to assessing the eye problems of a child, a screening is used to identify a child at risk for vision problems and does not replace a comprehensive examination performed by an eye doctor. Additionally, vision screenings provide a critical bridge from detection to eye care for families that may not regularly access health or eye care services, may need financial assistance to afford care, or those that may not fully understand the impact an undiagnosed and untreated vision problem might have on the rest of their child’s life. Prevent Blindness advocates for good vision for all throughout the life spectrum, and that all children are visually ready as they begin school and beyond.

This document is a position statement, not formal recommendations or protocols, and is meant to guide those charged with developing, implementing, and evaluating vision screening programs for school-aged students. The guidance provided in this document is meant to supplement, not replace, best practice guidelines issued by professional organizations, regulatory agencies, or other public health entities. School districts in all 50 states have the right to determine the level of service and funding for vision screening. Visibility, Healthy People, and B07, serve as national guides for vision screening and eye health programs for school-aged children.


Helpful info and statistics for grant proposal writing . . .


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NASN Vision and Eye Health Resource

(National Center for Children’s Vision and Eye Health and NASN partnership)

https://www.nasn.org/nasn-resources/practice-topics/vision-health

Call to Action

- Share academic and classroom behaviors info with teachers.
- Conduct evidence-based screening.
- Evaluate vision and eye health program.
- Help ensure follow-up to eye care when children do not pass vision screening.
- Your suggestions?
Thank you for your TIME and ATTENTION. . .

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