Vision Screening:
Evidence-Based 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

List 2 evidence-based approaches to vision screening and describe what each measures.

List 1 website for finding resources to support your vision and eye health program.

Name the number of components in a strong vision and eye health system of care.

Describe a way to evaluate your vision and eye health program.

Cast of Characters

NCCVEH:
• National Center for Children’s Vision and Eye Health at Prevent Blindness

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 black optotypes on a white background using 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)

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**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
“Not so great” charts . . .

NOT Recommended by NCCVEH and/or AAP

“Sailboat”
Allen Pictures

Lighthouse or “House, Apple, Umbrella”

Snellen

Tumbling E

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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)
  • www.icoph.org/dynamic/attachments/resources/icovisualacuity1984.pdf

• 2003 - World Health Organization Prevention of Blindness & Deafness (WHO)
  • Prevention of blindness and deafness. Consultation on development of standards for characterization of vision loss and visual functioning. Geneva: WHO;2003 (WHO/PBL/03.91).

• 2010 – American National Standards Institute, Inc.
  • ANSI Z80.21-1992 (R2004) Approved May 27, 2010

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 6.1 log units (logMAR, ETDRS)
5 optotypes per line
Optotypes black on white background with luminance between 80 cd/m² and 160 cd/m²

Similar recommendations across guidelines

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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?

Yes or No?

☑ 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

• 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


Also acceptable . . .

Preferred Optotypes for Ages 7 Years & Older

- AAP
  - Recommends Sloan Letters
- American Academy of Ophthalmology
  - Recommends Sloan Letters and LEA 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
- Arch of foot on line (NOT heels or toes to the line) or back of chair (with child’s back to back of chair)
Occluders – Younger Children <10 Years

Unacceptable

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

Why unacceptable?

Children can easily peek

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?

    - 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.

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**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

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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)

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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:
     - Estimates of significant refractive error (hyperopia, myopia, astigmatism)
     - Estimates of anisometropia
     - Estimates of eye misalignment


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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.

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### Conversion Chart: Refractive State to “estimated” Visual Acuity¹²

<table>
<thead>
<tr>
<th></th>
<th>Myopia (NearSighted)</th>
<th>Hyperopia (Farsighted)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ages: All</td>
<td>Ages: 3y to 15y</td>
</tr>
<tr>
<td>MINUS (-) SPHERE</td>
<td>20/90-40</td>
<td>+2.00</td>
</tr>
<tr>
<td>-0.75</td>
<td>20/75</td>
<td>+3.00</td>
</tr>
<tr>
<td>-1</td>
<td>20/60</td>
<td>+3.25</td>
</tr>
<tr>
<td>-1.25</td>
<td>20/70</td>
<td>+3.75</td>
</tr>
<tr>
<td>-1.5</td>
<td>20/100</td>
<td>+4.25</td>
</tr>
<tr>
<td>-2.5</td>
<td>20/200</td>
<td>+4.75</td>
</tr>
</tbody>
</table>

¹ Spherical results are based upon minus (-) cylinder conversion.
² Not recommended for conversion of screening results for children screened for amblyopic risk factors.

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Instruments “Approved” by NCCVEH

Welch Allyn®
Spot™ Vision Screener

Plusoptix
S12C Vision Screener

Welch Allyn®
SureSight™ Vision Screener

Disclaimer: These tools are examples of vision screening instruments for this age group. They are shown for the purpose of sales or promotion.

Ages 3, 4, and 5 years


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

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 screeners 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
Resources . . .


An Eye on Vision

Five Questions About Vision Screening and Eye Health


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 ophthalmologist or an optometrist.

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

Helpful info and statistics for grant proposal writing . . .

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

Prevent Blindness Children’s Vision Screening Certification Course

Info for Prevent Blindness nationally recognized vision screening certification you can do online at your own pace

http://nationalcenter.preventblindness.org/prevent-blindness-childrens-vision-screening-certification-course

800-331-2020 Nottingham@preventblindness.org

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Thank you for your TIME and attention . . .