Vision Screening: 
What?!? No Snellen or Sailboat Charts?

Presenter Disclosures

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The following personal financial relationships with commercial interests relevant to this presentation existed during the past 12 months:

No relationships to disclose
Presenter Disclosures

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The following personal financial relationships with commercial interests relevant to this presentation existed during the past 12 months:

In addition to working for the NCCVEH, also employed by Good-Lite and School Health Corporation as vision screening education consultant – NOT IN SALES.

Today’s Presentation

- Learn about 2 evidence-based approaches to vision screening and describe what each measures
- Appropriate use of an optotype-based eye chart
- Appropriate ages for optotype-based and instrument-based vision screening
- Q & A
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 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)
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"
- "House, Apple, Umbrella"
- Snellen
- Lighthouse
- Tumbling E
- Landolt C

**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.

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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.**
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

Similar recommendations across guidelines

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

Design guidelines = “ETDRS” or “logMAR” chart
Do the following eye charts fit national/international eye chart design guidelines?

Yes or 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

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

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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

Occlusion:

Children likely to peek when given responsibility for covering their eyes during vision screening.
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

Occluders – Ages 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**

- Isolating an optotype with a pointer, or masking all optotypes but one on a line, can lead to under-referrals or missing children who should be referred because the optotype is easier for the child 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_

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

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 cleanness of vision when identifying black optotypes on a white background using specific optotype sizes at a prescribed and standardized distance

2. Instrument-based screening
   Instruments do not measure visual acuity

   Instruments analyze digital 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

• 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)


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.

**Conversion Chart: Refractive State to “estimated” Visual Acuity**[^1][^2]

<table>
<thead>
<tr>
<th>Minus (-) Sphere</th>
<th>Estimated Visual Acuity</th>
<th>Hyperopia</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Age: All</td>
<td>Age: 5y to 10y</td>
</tr>
<tr>
<td>-0.5</td>
<td>20/20-40</td>
<td>+2.00</td>
</tr>
<tr>
<td>-0.75</td>
<td>20/50</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.


*Not Recommended for conversion of screening results for children screened for amblyopic risk factors*
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. These are not shown for the purpose of sales or promotion.

TABLE 2.
Distance visual acuity testing for vision screening of children aged 36 to younger than 72 months.

<table>
<thead>
<tr>
<th>optotype</th>
<th>Best practice</th>
<th>Acceptable practice</th>
<th>Unacceptable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coptest</td>
<td>Single surrounded HOTV letters or LEA Symbols</td>
<td>Rectangular crowding bar surrounding a single line* of HOTV letters or LEA Symbols</td>
<td>Snellen, Allen figures, E, Landolt C, Lightbox, Kindergarten Eye Chart</td>
</tr>
<tr>
<td>Test distance:</td>
<td>5 ft (1.5 m)</td>
<td>10 ft (3 m)</td>
<td>20 ft (6 m)</td>
</tr>
<tr>
<td>Monocular visual acuity</td>
<td>Name or match correctly 3 or 4 out of 4 small symbols (size 4) or 20/30 for 4- and 5-year-olds</td>
<td>Binocular testing</td>
<td></td>
</tr>
<tr>
<td>Illumination</td>
<td>200 candelas per square meter</td>
<td>Glare on test cards or computer screen</td>
<td></td>
</tr>
<tr>
<td>Occlusion</td>
<td>Adhesive patch or opaque paper tape</td>
<td>Specialized occluder glasses</td>
<td></td>
</tr>
<tr>
<td>Examples of currently available commercial products</td>
<td>VIP Screener, single surrounded optotypes (Good-Lite)</td>
<td>Sloan Single surrounded (Precision Vision)</td>
<td></td>
</tr>
</tbody>
</table>

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

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 screensers 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
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


Year of Children’s Vision

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

- Archived vision screenings webinars in Resources

![Year of Children's Vision](image)

National Center for Children’s Vision & Eye Health

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

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 screenings 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 vision 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
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

Thank you!

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