



AT PREVENT BLINDNESS

Characteristics of Tests of Recognition Visual Acuity for Screening the Vision of Children Ages 3 Through 5 Years (36 to <72 Months)

The most commonly measured type of visual acuity, recognition visual acuity, is defined as the ability to identify certain optotypes (letters, numbers, or figures) at a specified distance. Following are characteristics of tests of recognition visual acuity based on recommendations from the National Expert Panel to the National Center for Children's Vision and Eye Health at Prevent Blindness. Tests of recognition visual acuity whose design meets best practice* (preferred) or acceptable practice** recommendations should be used for screening vision in the targeted age range. **Anyone using tests based on "unacceptable" characteristics should move toward using tools based on best practices as soon as possible.**

Optotypes considered "Best-practice*"

At this point, these are the only two optotypes that meet the standards of **best practice**. Other optotypes may be included in the future depending on demonstration of evidence-based research.

1. Single-surround LEA Symbols
2. Single-surround HOTV Symbols

Unacceptable optotypes

Following are examples of commonly used charts that are NOT acceptable. Refer to Appendix A for a more comprehensive list and images of optotype-based tests that are NOT acceptable at any test distance for this age group.

- Sailboats
- Birthday cakes
- Allen Pictures
- Tumbling E's
- Landolt Cs
- Flying crows
- Sjögren hands chart
- Wright figures©
- Charts with houses, apples, and umbrellas
- Broken Wheel
- Snellen letters

**A designation of "Best Practice" for a vision screening tool indicates that it has high-quality published performance data in the targeted age range and is commercially available with the appropriate Food and Drug Administration designation.*

***A designation of "Acceptable Practice" for a vision screening tool indicates that there is not as much high-quality, published performance data available in the targeted age range as the "Best Practice" designation, however the available data and expert experience indicate that the instrument will perform well.*

Appropriate presentation of optotypes

1. High-contrast black optotypes on a white background.
2. Must have “crowding bars or box”.
 - a. Single optotype with crowding bars on all four sides (considered “best practice**”).
 - b. Line of optotypes surrounded by a box on all four sides presented in a flip book format (considered “acceptable practice**”).

Do NOT use single optotypes without black bars on all four sides.

Screening environment preparation

Screening location: Conduct the screening in a quiet, semi-private area with minimal distractions to help the child focus on the task.

Test distance: 5 feet (1.5 m) is considered **best practice***

10 feet (3 m) is considered **acceptable practice****

The test distance is the distance between the chart and the child’s eyes.

NOTE: You must measure the test distance exactly; estimating or guessing is NOT acceptable.

Acceptable lighting conditions

- Ensure even lighting and no glare on the test plates.
- Keep screening away from windows, which can cause glare.
- Illumination with a light box using LED lights behind the optotypes is ideal.
- If using an electronic tablet* to present optotypes, be certain to hold the tablet perpendicular to line of sight of the child to avoid glare.

* Only use iPad v3 or above with the Retina High Resolution display. The older versions of iPad have a lower screen resolution and will not display the optotypes correctly.

Screening Procedure

Provide a **matching card**: The child does not need to verbally identify an optotype to demonstrate the ability to see it. Pointing to the correct symbol on a matching card is a valid response. Use of the matching card is not required, but will improve screening outcomes in most preschool children. If using LEA Symbols, accept the name the child gives to the optotype.

If using a single-surrounded optotype, or a line of optotypes with a crowding box, do NOT use a finger or pointer to point directly at each optotype. Instead, you should point beside the full line only. If you need to help a child understand where they should be looking, you can briefly point above or below the surround bar, and then quickly remove the finger/pointer.

Note: Pointing at an optotype or “breaking the box” makes the optotype easier for the child to identify and you may obtain an inaccurate measure.

IMPORTANT

Test each eye separately, covering first the left eye with a recommended occluder. Children with one eye that sees poorly will automatically try to “peek” and use their better eye to see the chart.

Note: Children who demonstrate they are uncomfortable with occlusion of a particular eye, but are comfortable with occlusion of the other eye should receive an automatic referral for a comprehensive eye examination by an optometrist or ophthalmologist.

Recommended occluders

Occluders appropriate for this age-group include:

- Adhesive patches*



- 2-inch wide hypoallergenic surgical tape*
- Specially constructed occluder glasses, such as Good-Lite frosted occluder glasses**



Unacceptable occluders include:

- Hands (child or adult)
- Tissues
- Cups (including paper and plastic)
- Cover paddles

Screening Results

Child must be able to correctly identify (verbally or with matching) at least 3 of 4 (or 4 of 5, depending on the testing format) with both the right **and** the left eye.

Passing Line by age:

3 years: 20/50

4 and 5 years: 20/40

6+ years: 20/32

Note: Research indicates that children who cannot successfully complete vision screening tests are **twice** as likely to have a vision disorder as children who pass vision screening.

(Vision in Preschoolers Study Group. (2007). Children unable to perform screening tests in Vision in Preschoolers Study: Proportion with ocular conditions and impact on measure of test accuracy. Investigative Ophthalmology & Visual Science, 48(1), 83-87.)

If a child **refuses** to participate in a complete screening:

- Result = unable or untestable.
- Child should be **rescreened**.
 - The same day if possible.
 - No later than 6 months.

When rescreening, start from the beginning of the screening process as though the child has never been screened.

If a child **refuses** to participate in the vision screening **AND** rescreening cannot be conducted for *any* reason, the unable child must be referred for a comprehensive eye examination.

VALID VISION SCREENING

If the child does not pass vision screening, records must indicate that a child has an appointment with an optometrist or ophthalmologist for the screening to be considered successfully completed. Performance measures should be established for screening programs to ensure completion of this step.

Certain children should bypass vision screening and, instead, go directly to an optometrist or ophthalmologist for a comprehensive eye examination. These children include those with:

- a. Parents who suspect eye or vision problems.
- b. Ongoing treatment by an optometrist or ophthalmologist.
- c. A first-degree relative with a vision disorder, such as amblyopia or strabismus.
- d. Hearing impairment.
- e. Motor abnormalities, such as cerebral palsy.
- f. Down syndrome.
- g. Cognitive impairment.
- h. Speech/language delays.
- i. Autism spectrum disorders.
- j. Born prematurely.
- k. Systemic disease or medications known to cause eye disorders.

Additional unacceptable practices

The following practices are not acceptable for children ages 36 to <72 months:

- Red reflex testing for media opacity detection (i.e., penlight test) conducted by individuals who are not health care personnel professionally trained to perform and interpret the tests.
- 20-foot testing distance.
- Near cards.
- Screening with both eyes open.
- Vision testing machines that optically simulate distance vision, such as those used at motor vehicle testing facilities.

Devices for instrument-based screening

The following devices are considered “Best” or “Acceptable” practice if individuals want to conduct instrument-based screening with children ages 36 to <72 months.




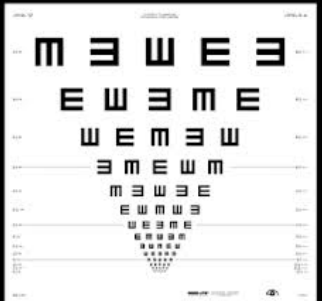
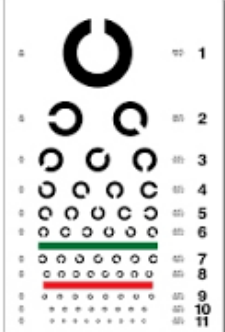
Screeners are not required to use both.

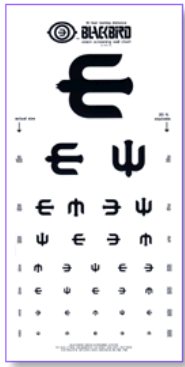


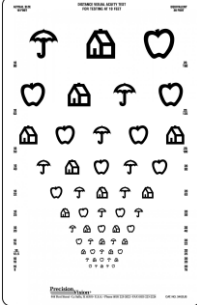

- Welch Allyn SureSight® Vision Screener - Version 2.25 (*Best Practice*)
- Righton Retinomax – (*Best Practice*)
- Welch Allyn Spot™ Vision Screener - (*Acceptable Practice*)
- Plusoptix - (*Acceptable Practice*)

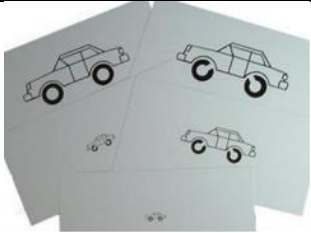

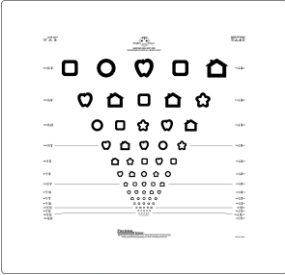



Note: When the Plusoptix and Spot devices are used outside of an eye care setting, consultation with a pediatric eye care professional regarding the

best cut-offs to use for the particular patient population to be screened is advised until evidence-based refractive error criteria are determined.

Appendix A: List of optotype-based tests that are NOT acceptable at any distance for children aged 36 to <72 months*

Chart Name	Image
Sailboat (Kindergarten Chart)	
Birthday cake (Allen Pictures)	
Allen Pictures as single, isolated optotypes	
Tumbling E	
Landolt C	

<p>Flying crows (Blackbird Wall Chart)</p>	
<p>Sjögren Hand Chart</p>	
<p>Wright figures©</p>	
<p>“House, Apple, Umbrella” (Lighthouse symbols)</p>	
<p>Snellen “E” Chart</p>	

Broken Wheel Test	
Optotypes in Color	
Patti Pics Visual Acuity Chart	
Titmus Vision Screening Machine	
Optec® Vision Screeners	
Keystone Vision Screener	

The tests of visual acuity illustrated in Appendix A are not acceptable for children aged 36 to <72 months for one or more of the following reasons:

(1) They do not adhere to national and international guidelines for standardized eye chart design;

(2) They meet the design standards but the optotypes require orientation and directional cognitive skills that are not yet developed in this targeted age group,

(3) The optotypes are not equal in discriminability when compared with the international reference Landolt C, or

(4) Some of the pictures have a cultural bias and others are outdated, making the pictures not readily recognizable by all children.

National and International Eye Chart Design Guidelines:

1. Optotypes should be of approximate equal legibility.
2. Each line on an eye chart should have the same number of optotypes.
3. The horizontal spacing between optotypes should be equal to the width of the optotypes on a line.
4. The vertical spacing between lines should be the height of the optotypes in the next line down.
5. The size of optotypes should progress geometrically up or down the chart by 0.1 log units between rows (20/32 vs. 20/30).
6. Optotypes should be black on a white background under good lighting conditions (luminance between 80 cd/m² and 160 cd/m²).

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Elkind, D. C. (1961). Children's conceptions of right and left: Piaget replication study IV. *The Journal of Genetic Psychology*, 99, 269-276.

International Council of Ophthalmology. (1984). Visual acuity measurement standard. Retrieved from <http://www.icoph.org/dynamic/attachments/resources/icovisualacuity1984.pdf>

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