



P. Kay Nottingham Chaplin, Ed.D.

- Director – Vision & Eye Health Initiatives – Good-Lite
- Vision Screening Consultant – School Health Corporation
- Member – Advisory Committee to the National Center for Children’s Vision and Eye Health at Prevent Blindness

Disclaimer

- Current Director – Vision and Eye Health Initiatives at Good-Lite and School Health Corporation
- Will see “great” and “really awful” eye charts manufactured by The Good-Lite Company and marketed through Good-Lite and School Health Corporation, but focus is not to push product from the podium
 - Focus is to use power of podium to encourage appropriate and evidence-based vision screening as part of a strong vision health system of care



Learning Objectives

1. Describe 3 components of a standardized eye chart for optotype-based screening.
2. Describe 3 steps to consider when using devices for instrument-based screening.

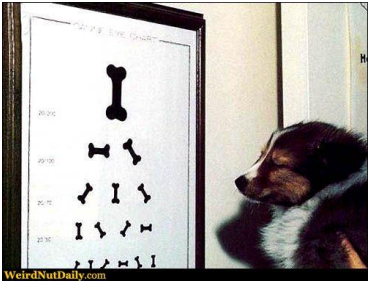


2 Types of Vision Screening

- Two types of vision screening:
 - Optotype-based
 - Instrument-based
 - Or combination
- Optotype = name of picture, symbol, letter to identify
- Optotype-based screening measures visual acuity
- Instrument-based screening measures for presence of amblyopia risk factors:
 - Significant refractive error
 - Asymmetry of refractive error
 - Misalignment of eyes
 - Presence of cataract



Optotype-Based Screening - (a.k.a. Test of Visual Acuity)



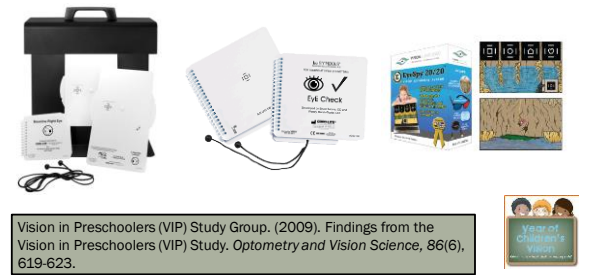
Threshold vs. Critical Line for Optotype-Based Screening

- 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



Single, Surrounded LEA Symbol

- Research supports using single, LEA Symbols optotypes surrounded with bars at 5 feet for children aged 3 to 5 years



Vision in Preschoolers (VIP) Study Group. (2009). Findings from the Vision in Preschoolers (VIP) Study. *Optometry and Vision Science*, 86(6), 619-623.

Importance of Appropriate Test of Visual Acuity

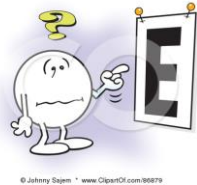
- “Visual acuity scores can be significantly affected by the chart design.” (p. 1248)
 - Bailey, I.L. (2012). Perspective: Visual acuity – Keeping it clear. *Optometry and Vision Science*, 89(9), 1247-1248.
- Excluding optotype size, “each visual acuity level on a test chart should present an essentially equivalent task”. (p. 740)
 - Bailey, I. L., & Lovie, J. E. (1976). New design principles for visual acuity letter charts. *American Journal of Optometry & Physiological Optics*, 53(11), 740-745.



- Many of you use threshold eye charts as a test of visual acuity– this session will focus on threshold eye charts



- Standardized eye charts meeting national and international eye chart design guidelines offer this equivalent test task.
- Many commonly used eye charts do not.
- If you use an eye chart for optotype-based screening, how do you know if the chart is standardized?

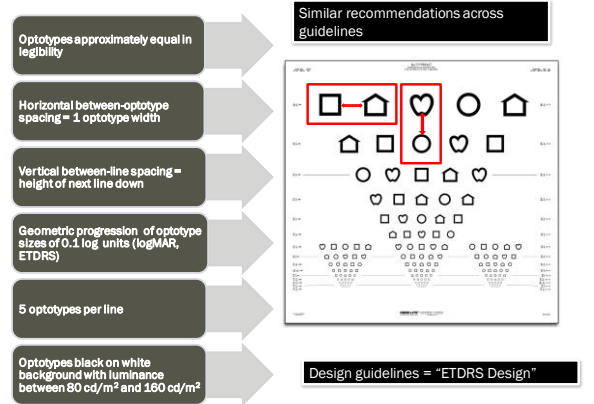


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National and International Distance Visual Acuity Eye Chart Recommendations

- 1980 - National Academy of Sciences-National Research Council (NAS-NRC)**
 - Recommended Standard Procedures for the Clinical Measurement and Specification of Visual Acuity
- Committee on Vision. (1980).** Recommended standard procedures for the clinical measurement and specification of visual acuity. Report of working group 39. Assembly of Behavioral and Social Sciences, National Research Council, National Academy of Sciences, Washington, DC. *Advances in Ophthalmology*, 41:103-148.
- 1984 - International Council of Ophthalmology (ICO)**
 - Visual acuity measurement standard.
 - www.icoph.org/dynamic/attachments/resources/icovisualacuity1984.pdf
- 2003 - World Health Organization Prevention of Blindness & Deafness (WHO)**
 - Consultation on Development of Standards for Characterization of Vision Loss and Visual Functioning
 - 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
 - Performance standard for the optical design of optotypes used in clinical visual acuity measurement systems



Tips:

- Line outside optotypes = inverted pyramid, NOT rectangle
- 20/32 vs. 20/30
- 10 feet vs. 20 feet

YES

NO

Challenges With 5 Common Eye Charts

Snellen Letters

Kindergarten Test Chart

Tumbling E

Allen Pictures

Lighthouse or "House, Apple, Umbrella"

Year of Children's Vision

2 Challenges With "Snellen Charts"

Do not meet national/international eye chart design guidelines

Are not standardized

Some optotypes are easier to guess than others

Kaiser, P. K. (2009). Prospective evaluation of visual acuity assessment: A comparison of Snellen versus ETDRS charts in clinical practice (An AOS thesis). *Transactions of the American Ophthalmological Society*, 107, 311-324.

"Sailboat" Chart Lacks Scientific Evidence

Does not meet national/international eye chart design guidelines

Optotypes of different sizes on same line

NEVER on recommended list of eye charts from American Academy of Pediatrics

Chart's history and developer unknown

No supporting research to validate

2 Challenges With Tumbling E

Children's orientation and direction challenges with directional optotypes

Ability to guess optotype at threshold

Emerging cognitive skill

Up/down emerges before left/right

Usually in place by ages 8 or 10 years

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

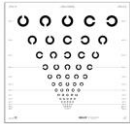
Hyvärinen, L., Näsänen, R., & Laurinen, P. (1980). New visual acuity test for pre-school children. *Acta Ophthalmologica (Copenhagen)*, 58(4), 507-11.

"Because of the difficulty in inducing children and stupid illiterates to name the position of the Snellen E, or to hold its duplicate in the hand in the same direction as the character on the chart, the author constructed a set of test-type for illiterates in 1886"...

Ewing, A. E. (1920). Test objects for the illiterate. *American Journal of Ophthalmology*, 3, 5-22.

3 Challenges With Allen Pictures

- 1. Asking young children to make a “whole” picture from “parts”
- 2. Cultural bias
- 3. Calibrated against Snellen 30-ft E, not Landolt C (international standard)



Lighthouse Chart

- Optotypes easy to guess
- Poor visual acuity results when compared with international Landolt C standard

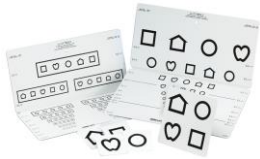


- Not on list of charts recommended by:
 - American Academy of Pediatrics
 - American Association of Certified Orthoptists
 - American Association for Pediatric Ophthalmology and Strabismus
 - American Academy of Ophthalmology

Candy, T. R., Mishoulam, S. R., Nosofsky, R. M., & Dobson, V. (2011). Adult discrimination performance for pediatric acuity test optotypes. *Investigative Ophthalmology & Visual Science*, 52(7), 4307-4313.
Eye examination in infants, children, and young adults by pediatricians. (2003). *Pediatrics*, 111(4), 902-907.

Preferred Optotypes for Pediatric Eye Charts

LEA Symbols

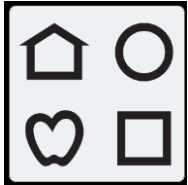


HOTV



LEA Symbols

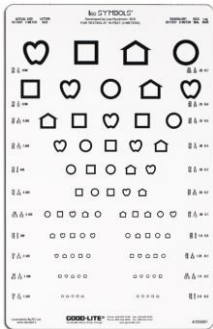
- Only pediatric eye chart with optotypes that blur equally at threshold
- Culturally neutral
- Children call optotypes what they want
 - i.e., Square may be an iPad
 - Circle may be hula-hoop



Beware of . . .



“Linear-Spaced” Eye Charts



- 100% spacing between optotypes (1 optotype-width)
- Unequal spacing BETWEEN lines



“Wide-Spaced” Eye Charts



- Between-optotype spacing >100%
- Unequal spacing BETWEEN lines
- Basically contains lines of single optotypes



No Single Optotypes or Flashcards Without Surround Bars for Typically Developing Children

- Visual acuity results, on average, 3 lines worse on charts with lines vs. single, non-crowded optotypes
- For example, 20/32 with single, isolated optotype and 20/80 with line chart



Youngson, R. M. (1975). Anomaly in visual acuity testing in children. *British Journal of Ophthalmology*, 59(3), 168-170.

Hilton, A. F., & Stanley, J. C. (1972). Pitfalls in testing children's vision by the Sheridan Gardiner single optotype method. *British Journal of Ophthalmology*, 56(2), 135-139.

A Historical Review of Distance Vision Screening Eye Charts

What to Toss, What to Keep, and What to Replace

A. Kay Nottingham Chaplin, Ed.D., West Virginia
Geoffrey E. Bradford, MD, West Virginia

Distance vision screening (DVS) is a critical component of early vision screening programs, as it is the only screening procedure that can be performed in a variety of settings, including schools, community centers, and public health departments. The purpose of this review is to provide a historical perspective on DVS, from its origins in the early 20th century to the present day. The review will focus on the evolution of DVS charts, the development of screening procedures, and the current state of the field. The review will also discuss the challenges of DVS and provide recommendations for the future.

Nottingham Chaplin, P. K., & Bradford, G. E. (2011). A historical review of distance vision screening eye charts: What to toss, what to keep, and what to replace. *NASN School Nurse*, 26(4), 221-228. <http://nas.sagepub.com/content/26/4/221.abs+trac>

Instrument-Based Screening



Instrument-Based Vision Screening

- Instruments
 - Require no child response or interaction
- Machines, such as Titmus
 - Not considered an instrument
 - Use slides or cards
 - Require child response or interaction



Neely, D. E. (2013). The eyes have it: Advances in vision screening should lead to early diagnosis, treatment of preventable blindness in children. *AAP News*, 34(5), 14-15.



Current Recommendations

Child Ages for Optotypes and Instruments		
AGE	OPTOTYPE	INSTRUMENT
Preverbal children		X
Preliterate children		X
6 months to 3 years		X
3 to 5 years	X	X
>5 years	X	

Miller, J. M., Lessin, H. R., American Academy of Pediatrics Section on Ophthalmology, Committee on Practice and Ambulatory Medicine, American Academy of Ophthalmology, American Association for Pediatric Ophthalmology and Strabismus, & American Association of Certified Orthoptists. (2012). Instrument-based pediatric vision screening policy statement. *Pediatrics*, 130(5), 983-986. Retrieved from <http://pediatrics.aappublications.org/content/130/5/983.full.pdf+html>



Current Recommendations

- Children aged 3 to 5 years:
 - Instrument-based screening has not been shown to be superior or inferior to optotype-based screening.

Schmidt, P., Maguire, M., Dobson, V., Quinn, G., Ciner, E., Cyert, L., . . . Vision in Preschoolers Study Group. (2004). Comparison of preschool vision screening tests as administered by licensed eye care professionals in the Vision in Preschoolers Study. *Ophthalmology*, 111(4), 637-650. Retrieved from <http://download.journals.elsevierhealth.com/pdfs/journals/0161-6420/PIIS0161642004001629.pdf>

Instrument-Based Screening

- Most experts believe cannot convert instrument measurement to visual acuity
- If use instruments, have test of visual acuity as back-up
 - Forgot to charge battery
 - Device malfunctions
 - Cannot achieve a reading
- Head Start children in Vision in Preschoolers Study
 - Could “nearly always” participate in instrument-based screening if unable to participate in optotype-based screening, and vice versa

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. Retrieved from <http://www.iovs.org/content/48/1/83.full.pdf+html>

- ✓ Welch Allyn SureSight
 - ✓ Calibrated every 18 months
 - ✓ Set in child mode
 - ✓ Set in “minus” calibration until you can upgrade to recent software
 - ✓ Upgrade software to Version 2.25
- ✓ PediaVision Spot
 - ✓ Updated with most recent software
 - ✓ Discuss referral criteria with local eye care professional
- ✓ Plusoptix S09, S12R, or S12C
 - ✓ Updated with most recent software
 - ✓ Discuss referral criteria with local eye care professional



Thank You for Your Time and Attention!!!!



P. Kay Nottingham Chaplin, Ed.D.
kay@good-lite.com 304-376-9988

