Visual Acuity

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What you will learn today

• History
• Parameters
• Optotypes
• Checking acuity
• Pre-verbal acuity
• Techniques
• Pitfalls
• Pearls

I think it’s an ancient eye exam chart.
Forefathers

Francisco Cornelius Donders (1818-1889)

Herman Snellen Sr (1834-1908)
A little bit of History...

1862  Snellen devises a standardized measurement tool to check vision

1867  Monoyer introduces the decimal notation for acuity measurements

1888  Landolt proposed the broken ring symbol (Landolt Cs)

1959  Louise Sloan designs a set on non-serif letters for the acuity chart

1976  Bailey and Lovie design a new acuity chart with proportional spacing and 5 letters (logMAR)

1982  National Eye Institute combines Sloan and Bailey-Lovie to produce the ETDRS chart
A little more history…

• Donder was the brains behind creating the visual acuity measurement

• While writing his book, *Refraction and Accommodation*, he realized the need to have a standard for “sharpness of vision”

• Donder defined the “standard eye” to be able to recognize letters that are 5 inches high

• He used this “standard eye” to compare his patient’s vision, which would give the visual acuity
The Chart...

• Donder asked his good friend, Herman Snellen to devise a measurement tool for him

• Snellen first used abstract shapes, but finally decided that letters were best
Parameters

- 20 feet or 6 meters is considered standard when assessing distance vision
- Requires very little accommodation
- Reported as a fraction
- Illumination in room should not be less than \( \frac{1}{5} \)th of the illumination of the chart
- Most use computer systems
  - M&S System
  - Acuity Pro
The Fraction....

20/200

Numerator (20) is the distance the patient is from the object

Denominator is the distance a “normal” eye can see

Emmetrope can see the letter at 200 feet

Optically handicapped can see at 20 feet
20/200
Optotypes

• Special characters designed specifically for visual acuity measurement
• Calibrated to the “standard eye”
• Optotypes in a basic row on all charts subtend 5’ of arc and their detail 1’ of arc from the testing distance
• Standard distance 20 feet or 6 meters
Landolt Broken Ring

- aka Landolt C
- Ring that has a gap
- The patient identifies where the gap is located as the size of the C and the gap are reduced
- Standard optotype for acuity measurement in most European countries
- Stroke width is the same as the width of the space, 1/5 of the diameter
Tumbling E

• Useful for children
• Useful for people who may not know the language
LogMAR

- Logarithm of the Minimum Angle of Resolution
- Letters progress in a geometric progression
- Fixed 5 letters on each line
- Space between lines change in proportion keeping contour interaction constant
- Used mostly in research settings
- 20/20 or (6/6) = LogMAR 0.00
- 6/60 or 20/200 = LogMar 1.0
Lea Symbols

• Designed for children who do not know their alphabet or numbers

• Developed by Leä Hyvarinen, MD, PhD in 1976 while serving her as a fellow at the Wilmer Eye Institute

• 4 Optotypes: apple, pentagon, square, circle

• Easily recognizable by preschool age patients
Allen Pictures

- Drawn to Snellen specifications
- Standardized against adults with known visual acuities
- Easily recognized pictures for children who do not know their alphabet
- Crowding bars can be added to detect amblyopia
HOTV

- Designed for children who do not know the full alphabet but can say or match 4 letters
- Similar to Snellen chart
- Snellen specifications
Sloan Letters

- Block letters
- Thickness of the lines equals the thickness of the white spaces
- Height and width is 5 times the thickness of the line
To Crowd or Not to Crowd

• Contour Interaction Bars
  - Crowding Bars
• Pediatric visual acuity
• Vision acuity can be overestimated if measured with single optotypes
• Amblyopia
Monocular Acuity

Either eye can be tested first

- Amblyopic eye
- Consistent

Occlusion

- Use patch, or tape
- Hold the occluder yourself
Acuity Testing

• Snellen chart is best
• Age appropriate test
  ❖ Pictures
  ❖ Matching
  ❖ Letters
• Shorten testing distance if necessary
Pre-Verbal Acuity

- Rely on objective techniques
- Observation & good history
- Babies under the age of 3
- Developmentally delayed
- Malingerers

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In the beginning...

Get a good history

- Do the parents think their child can see?
- Do they follow faces? Toys? Bottles?
- Do they notice crossing/drift ing?
- Systemic/Developmental?
- Any family history of eye problems?
Tests

- Fix & Follow
  - Face
  - Lighted toy
  - Monocular/Binocular
- Central Steady Maintain
  - Light Reflex Central
  - Nystagmus
  - Maintain with 12BD
ESOTROPIA

- Eye crossing?
- Does patient use that eye?
- Can patient abduct the right eye?
- Amblyopia?
Head posture

- Why?
- What happens when you tilt the head in the opposite direction?
- Do parents notice head position?
- Has it always been there?
- Old photos?
Ptosis

Normal Pupil? Vision OK?

Why are they being seen? Wake them up

Sleeping
Tests

Preferential Looking Tests
Teller Cards

Evoked Potential (VEP)
Electrodes placed occipital lobe
Pitfalls

**Children!!**

- Parents
- Cooperation
- Siblings
- Attention Span
- ADHD
- Autistic
Misunderstood Milestones

• Most children will only be able to identify 1 color by the age of 3
  ❖ No treatment for color vision problems

• Letter reversal is normal for a child to do up until 4th-5th grade
  ❖ Work with school, on task training

• Vision problems will NOT cause debilitating headaches
  ❖ At most dull ache that resolves with break
Take Away Pearls

• Know your tests!
• Explain why you are doing what you are doing
• Give the child time to calm down
• Take breaks
Take Away Pearls

- Take control of the room
- Gently lay down rules
  - Hands on lap
  - Sit up nice and tall
  - Use your listening skills
- Talk directly to child
- Get down to child’s level
Let Out Your Inner Child!

Works Cited


