جامعة المستقبل

كلية التقنيات الصحية والطبية

قسم تقنيات البصريات

Second Stage 2025-2026

REFRACTIVE ERRORS 3

Lecture Title

Visual Acuity Test for Child

Lecture Number: 8 / course 1

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OPTOMETRIST

Visual Acuity Test for Child

Scientists have agreed to measure visual acuity by means of certain signs, drawn in a scientific way based on visual and physiological facts and arranged within plates graded in size from largest to smallest, and the most famous of these charts used are:

1- **Number chart**

2- **Letter chart**

3- **Symbol chart**

4- **Snellen chart**

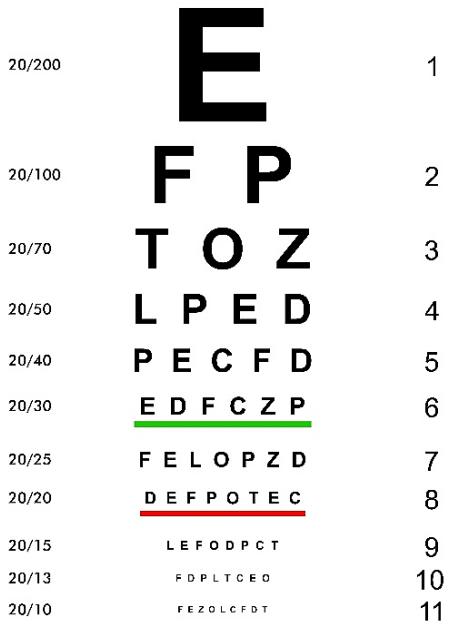
5- **Hand chart**

6- **Landolt chart**

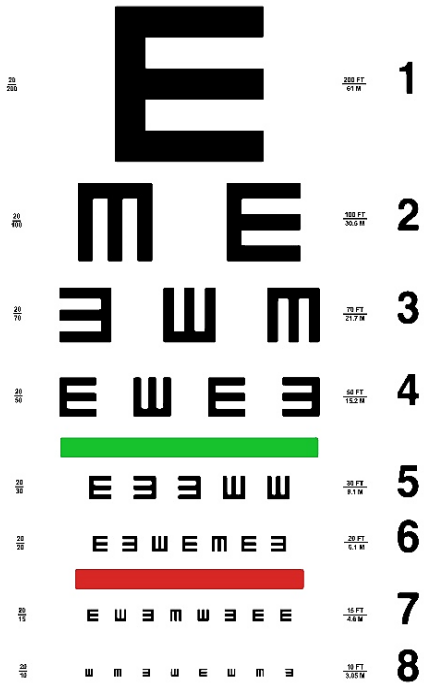
The most important charts used to check visual acuity are:

1. Snellen chart: An eye test chart used by an optometrist to measure visual acuity. The scheme is named after the Dutch ophthalmologist Hermann Snellen who created the chart in 1862. The chart consists of two types: -

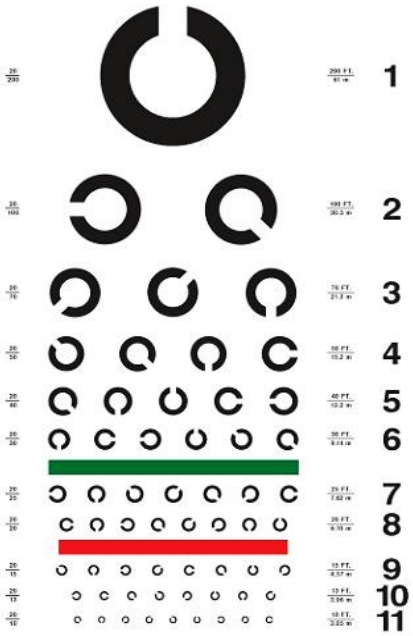
a) Snellen-alphabet chart: It consists of a list of rows of English letters, scaled from top to bottom, as shown in the figure below.



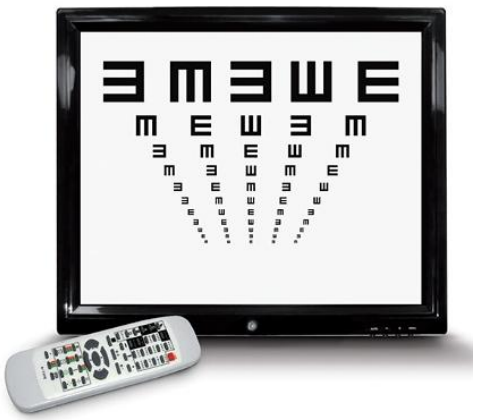
b) Snellen-tumbling E chart: It is a chart of rows of English letter E that gradually decrease in size from top to bottom. This chart is useful for patients who are unable to read English letters. As in the figure below.



2. Landolt Chart: It is a chart named after the Swiss doctor Landolt in 1899. It is known as the Landolt ring. It is a chart that includes rows of incomplete circles with different direction of opening, which gradually decreases in diameter from top to bottom, as in the figure below.



- **These charts are used to examine the distance vision test, where they are placed at a distance of 6 meters from the person whose vision is to be tested (so that the light rays that enter the eye are parallel enough to cancel the accommodation), and they can be placed at a distance of 3 meters with the help of a mirror that reflects the image of the chart (double distance).**
- **A device called the LCD Acuity Chart panel screen has also been designed that contains different types of charts, used for various tests whose display is controlled through a remote control, and its features include flexibility in choosing the working distance, diversity of panels and tests, as shown in the figure below.**



Visual Development and Normal VA by Age

Age	Approx. Snellen Equivalent	Clinical Description
Birth	6/120 – 6/240	Blurry vision; recognizes light and large faces.
4 months	6/60	Begins fixation and following movement.
6 months	6/36	Binocular vision developing; recognizes familiar faces.
1 year	6/18	Improved clarity; explores environment visually.
2 years	6/9 – 6/6	Nearly adult-like pattern recognition.
5–6 years	6/6 (20/20)	Visual maturity achieved.

Pediatric Visual Acuity Testing Methods

Because young children cannot read letters or reliably identify them, eye care providers use alternative **optotypes** and techniques to measure their acuity. The aim is to get a quantitative idea of the child's vision in an age-appropriate way:

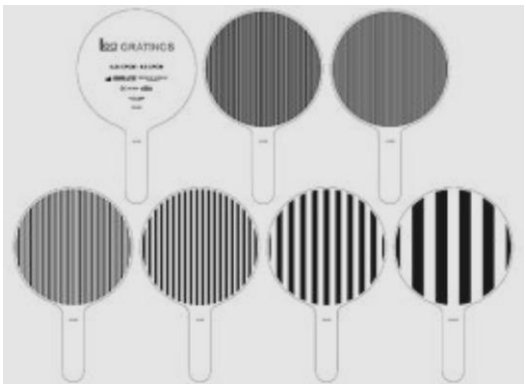
Age-Appropriate Testing Methods

A. Infants (0–12 Months)

1. Preferential Looking Tests (Infants):

- Tools: Teller Acuity Cards, LEA Gratings.
- Method: Infant shown a striped card vs blank card — preference for stripes indicates recognition.
- Purpose: Estimate grating acuity in non-verbal infants.
- Advantage: Objective behavioral method; repeatable and reliable

For example, if an infant shows preference for a 1 cycle/degree grating but not 2 cycles/degree, the acuity might be in that ballpark (say 20/600 in Snellen terms). These tests often yield results in terms of grating acuity (which may slightly overestimate Snellen acuity, but they are useful for tracking development.

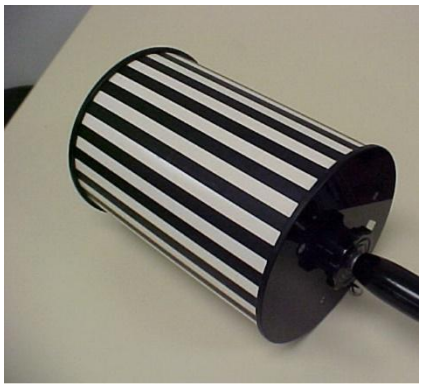


2. Visual Evoked Potential (VEP)

- Objective neurophysiological test measuring visual cortex responses to a checkerboard or pattern stimulus.
- Determines smallest visible pattern eliciting a cortical response → correlates with estimated VA.
- Useful in neurologically impaired or unresponsive infants.

3. Optokinetic Nystagmus (OKN)

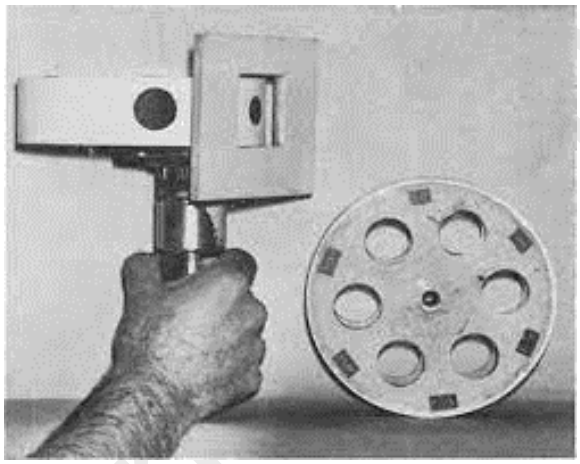
- Observation of reflexive eye movements when a striped drum or pattern moves before the eyes.
- Presence of alternating nystagmus indicates ability to resolve stripes (and thus visual function).



B. Toddlers (1–3 Years)

1. Catford Drum Test

- It is an objective method to evaluate the objective visual acuity
- Rotating drum with dots of decreasing size on white background.
- The test is carried at a distance of 60 cm, and the child is instructed to watch the dot
- Observing nystagmus or tracking movements as dots rotate.
- Smallest resolvable dot = VA endpoint (converted to Snellen equivalent).
- Useful for non-verbal or uncooperative toddlers.



2. Worth Ivory Ball Test

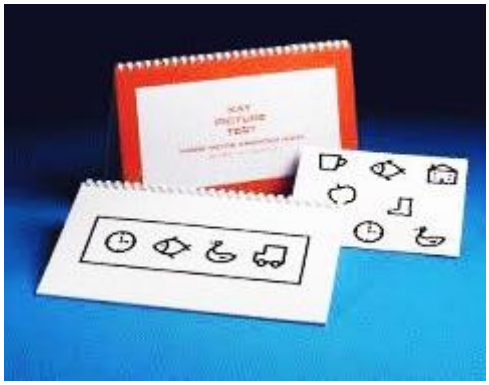
- Five ivory balls (0.5–2.5 inches).
- Child covers one eye and retrieves balls thrown on the floor at 6 m — smallest ball seen defines VA.

3. Boeck Candy Bead Test

- Colorful beads of different diameters shown at 40 cm.
- Child picks up visible beads → near VA roughly estimated.

4. Cardiff Acuity Test

- Cards with simple pictures (house, car, duck, train) placed top or bottom of the card.
- Examiner observes eye movement toward the image → gives a **quantitative VA** (6/6 to 6/60 range) at 1 meter viewing distance.
- Ideal for children aged **1–3 years**.

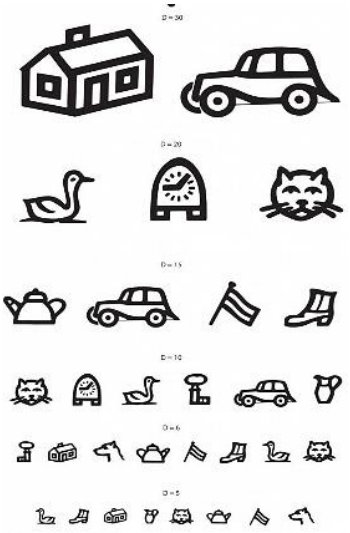


C. Preschoolers (3–5 Years)

1. Picture Charts

- Modified Snellen-type charts with **recognizable images**.
- Example: **Lea Symbols Chart** (house, apple, ring, square) – standardized and widely used worldwide.

- Other examples: **Kay Pictures**, **Allen Picture Chart**.

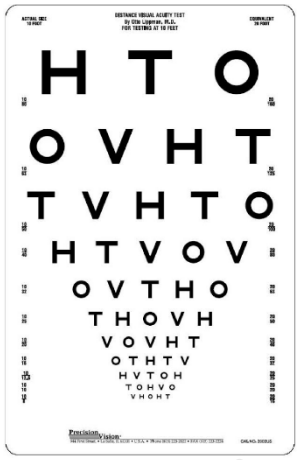


2. Sheridan–Gardiner Test

- Matching test:
  - ✓ Child holds a small card with optotypes.
  - ✓ Examiner shows symbols from 6 m, and child points to matching symbol.
- Advantage: Requires minimal verbal response; suitable from ~3 years.

3. HOTV Test

- Uses letters H, O, T, V – easy shapes for recognition.
- Often used on LCD screens; works on matching principle similar to Sheridan–Gardiner.



D. School-Age Children (≥6 Years)

1. Snellen Chart (Alphabet or Tumbling E)

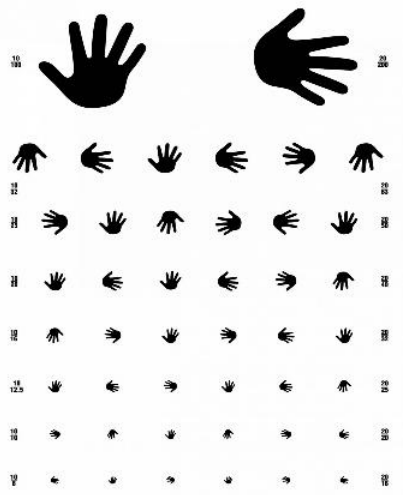
- Standard for school screening and clinic use.
- Distance: 6 meters (20 ft).
- Child reads down until unable to correctly identify half the letters in a line.
- Record as **6/x (or 20/x)** notation.

2. Landolt C Chart

- Used when literacy is limited or for standardized research measurements.

3. Hand or "E" Direction Test

- Fun alternative for younger school-aged children; simple orientation matching.



Testing Environment and Procedures

- **Distance:** Standard 6 m (may use mirror systems if space is limited).
- **Lighting:** Adequate, glare-free, and uniform.
- **Positioning:** Eye level with chart; child seated comfortably.
- **Procedure:**
  1. Record medical and visual history.
  2. Test each eye separately, then both together.
  3. Begin with large optotypes → progress to smaller.
  4. Encourage verbally; make it engaging.
  5. Note hesitations, squinting, or eye preference.
  6. For non-readers, use matching or pointing techniques.
- **Recording:**
  - ✓ Express in Snellen (6/6) or logMAR format.
  - ✓ Indicate whether tested with correction (cc) or without correction (sc).

Interpretation of Results

- Compare obtained VA with age-expected norms.
- Discrepancy ≥2 lines between eyes indicates possible amblyopia or refractive difference.
- In infants/toddlers, grating or behavioral acuity must be interpreted relative to developmental stage.
- Re-test or refer if:
  - ✓ Poor fixation or inconsistent response.
  - ✓ Asymmetrical behavior between eyes.
  - ✓ Lack of improvement with pinhole or refraction.

Challenges and Best Practices

- **Attention span**: Keep sessions short, interactive, and playful.
- **Language/communication**: Use gestures, pictures, or matching cards.

- **Fear or shyness**: Build rapport before testing; use parent involvement.
- **Fatigue**: Test the better eye first or schedule morning sessions.
- **Reinforcement**: Praise or use small rewards for cooperation.
- Avoid **memorization** by rotating or masking chart lines.

HOME WORK

1. Define visual acuity (VA) and explain why it is considered a *subjective* test in clinical practice.
2. List the six main types of visual acuity charts mentioned in the lecture and describe the scientific principle behind their graded size arrangement.
3. Differentiate between the Snellen alphabet chart and the Snellen tumbling E chart. When would each type be preferred in clinical use?
4. Explain how the Landolt C chart works and state one major advantage of using it over letter-based charts.
5. Why is the testing distance for visual acuity standardized at 6 meters (or 20 feet)? What optical principle does this distance achieve?
6. Describe the function of an LCD Acuity Chart panel. How does it improve accuracy and flexibility in modern visual testing?
7. Summarize the normal visual development milestones from birth to 6 years of age. At what age is visual maturity typically achieved?
8. Describe the principle behind the Preferential Looking Test (Teller Acuity Cards). How does the examiner interpret a baby's visual preference?
9. Explain how the Catford Drum Test provides an objective measurement of visual acuity. Why is it useful in non-verbal children?
10. List three practical challenges in testing visual acuity in young children and suggest one strategy to overcome each challenge.