



# VISUAL ACUITY IN CHILDREN: DEFINITION AND ASSESSMENT

جامعة ساوة

كلية التقنيات الصحية والطبية

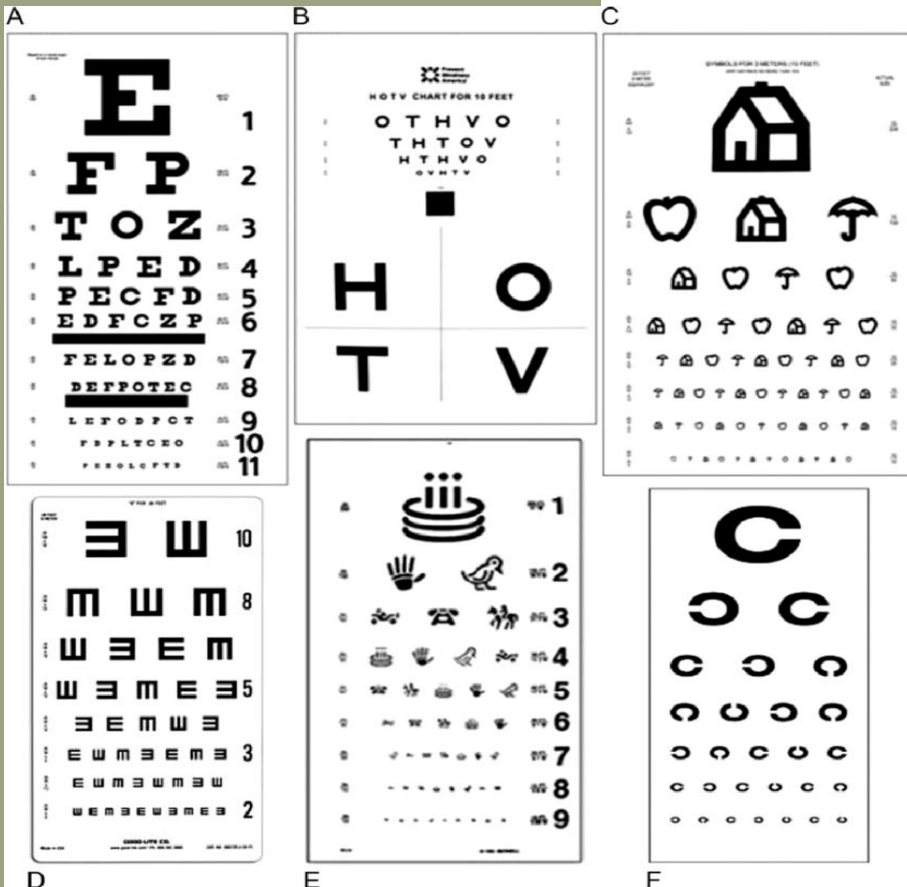
قسم تقنيات البصريات

المرحلة الرابعة

الفصل الأول

طب عيون أطفال

## DEFINITION OF VISUAL ACUITY (VA)



- ❑ VA is the eye **resolving** power
- ❑ Or the ability to **distinguish** **fine** details
- ❑ Specifically: it is the ability to perceive **two separate** points as **distinct** entities
- ❑ Clinically: it represents the **smallest optotype** a patient can correctly identify at a **particular distance**
- ❑ An **optotype** is any **standardized symbol, letter, number, or picture**

# COMPONENTS OF VISUAL ACUITY

- ❑ VA consists of three main abilities
  1. **Detection** Acuity: simply detecting the presence of a target
  2. **Resolution** Acuity: distinguishing two separate features as distinct entities, like stripes
  3. **Recognition** Acuity: involves not only resolution but also the identification of a familiar shape or letter by naming or pointing
- ❑ Pediatric testing progresses from measuring detection/resolution to recognizing standard optotypes.



Figure 1. The task of detection involves stating whether the spot or line is present. (a) Bright test object on a dark background. (b) Dark test object on a bright background.

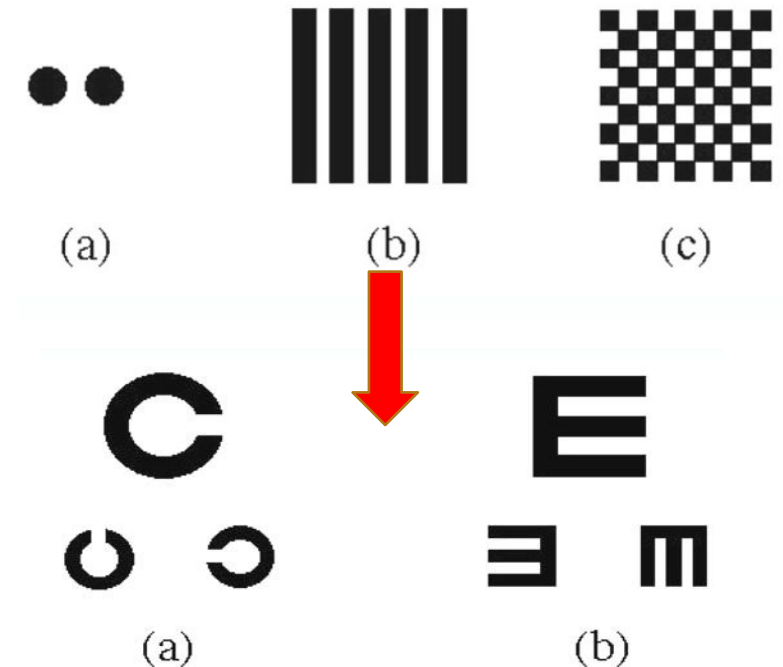
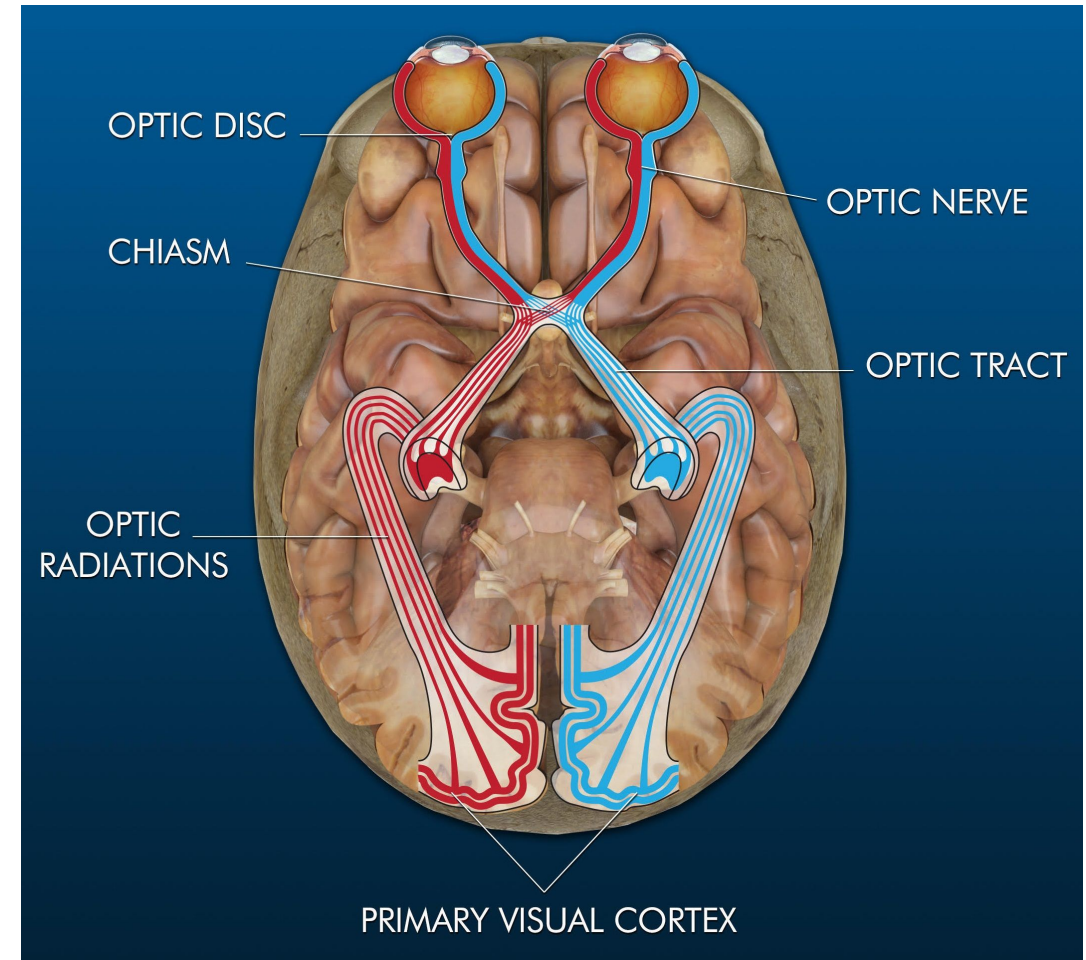


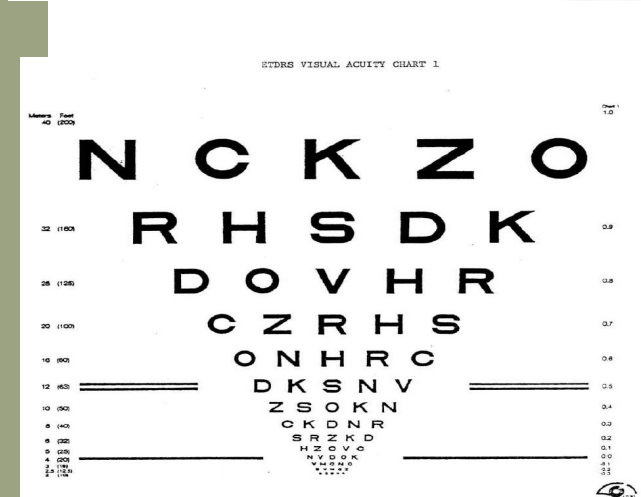
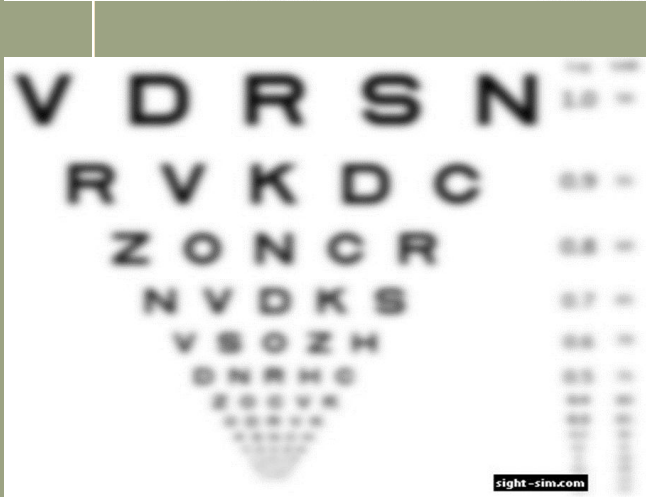
Figure 2. (a) Landolt C. (b) Illiterate E.

# IMPORTANCE IN PEDIATRIC CARE

- ❑ Accurate VA measurement is the primary indicator of a healthy visual pathway development
- ❑ abnormal VA is the cardinal sign of an underlying pathology or refractive error.
- ❑ Failure to detect poor VA early can lead to Amblyopia
- ❑ Early intervention prevents lifelong deficits in monocular and binocular vision.



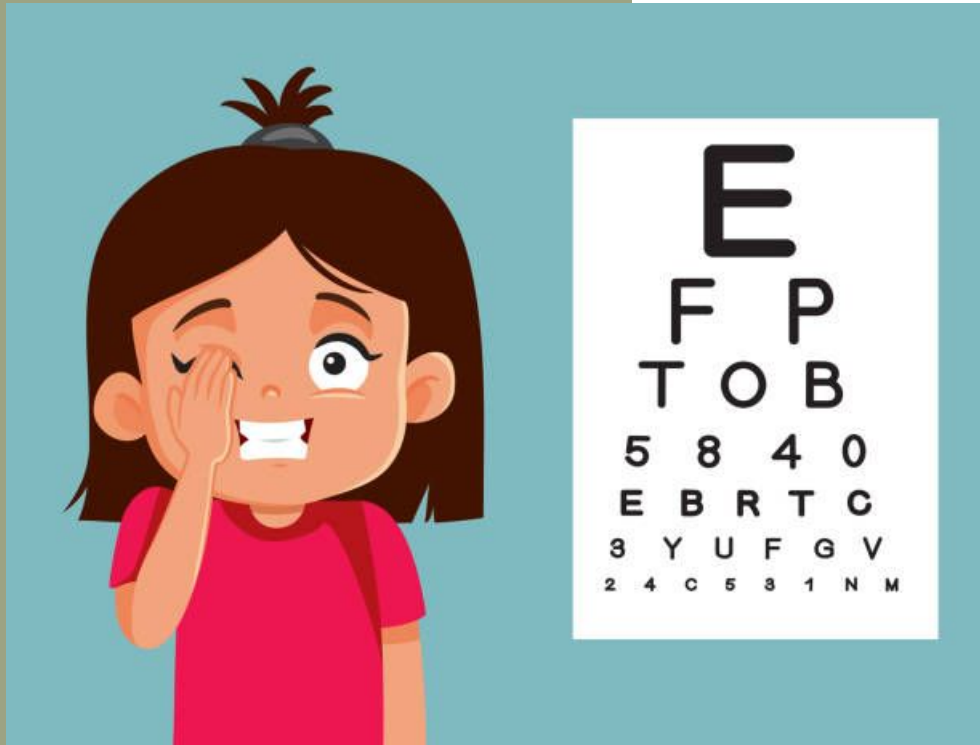
# NORMAL VA DEVELOPMENT MILESTONES



- ❑ Visual function matures rapidly postnatally, especially in the first year.
- ❑ At birth, estimated VA is poor, 6/120 (20/400), based on detection ability.
- ❑ By 4 months, it improves to 6/60
- ❑ By 6 months, VA improves to approximately 6/36 (20/120).
- ❑ By 3-5 years, most children achieve 6/9 (20/30) or better.
- ❑ 5. Adult 6/6 (20/20) VA is usually reached by 6 years of age.



# GENERAL ASSESSMENT PRINCIPLES



- ☐ VA must be assessed **monocularly** to uncover **unilateral** deficits and **amblyopia**
- ☐ Start with the "good" eye first, or the eye the child **prefers** to use
- ☐ The testing technique must be **age-appropriate**
- ☐ Best Corrected Visual Acuity **BCVA** should be **estimated**
- ☐ Testing **distance**, room **illumination**, and patient **cooperation** must all be optimized

# AGE-APPROPRIATE TEST SELECTION

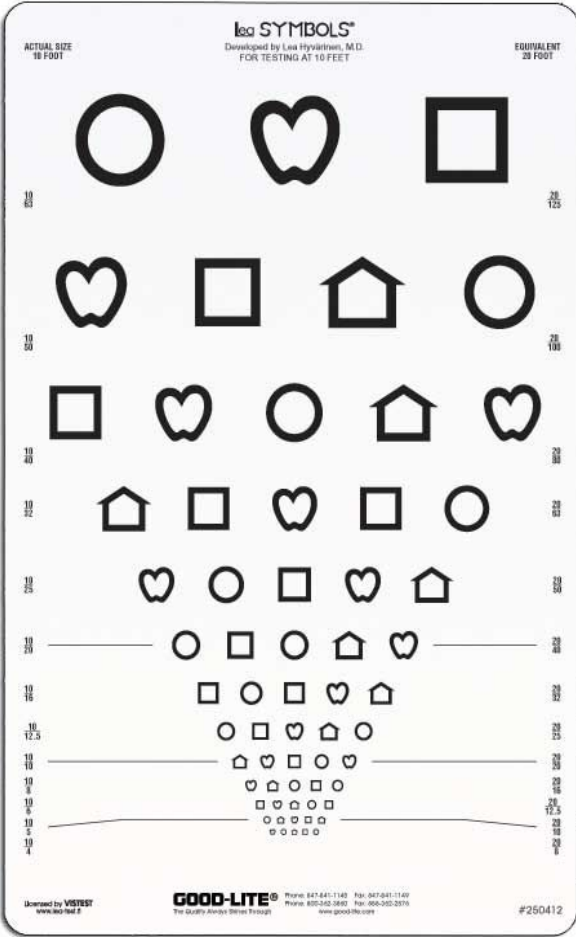


- The most fundamental principle is selecting an age and cognitive level appropriate exam
- Infants (0-1 year) require objective observational or resolution-based tests
- Toddlers (1-3 years) often require qualitative observation and observational quantitative tests can be used
- Preschoolers (3-5 years) transition to recognition with symbols (Lea or HOTV) or directional targets
- School-Aged Children (5+ years) are assessed using standard letter charts (ETDRS or Snellen).

LEA GRATING TEST  
(RESOLUTION BASED  
TESTS)



LEA SYMBOLS  
TEST

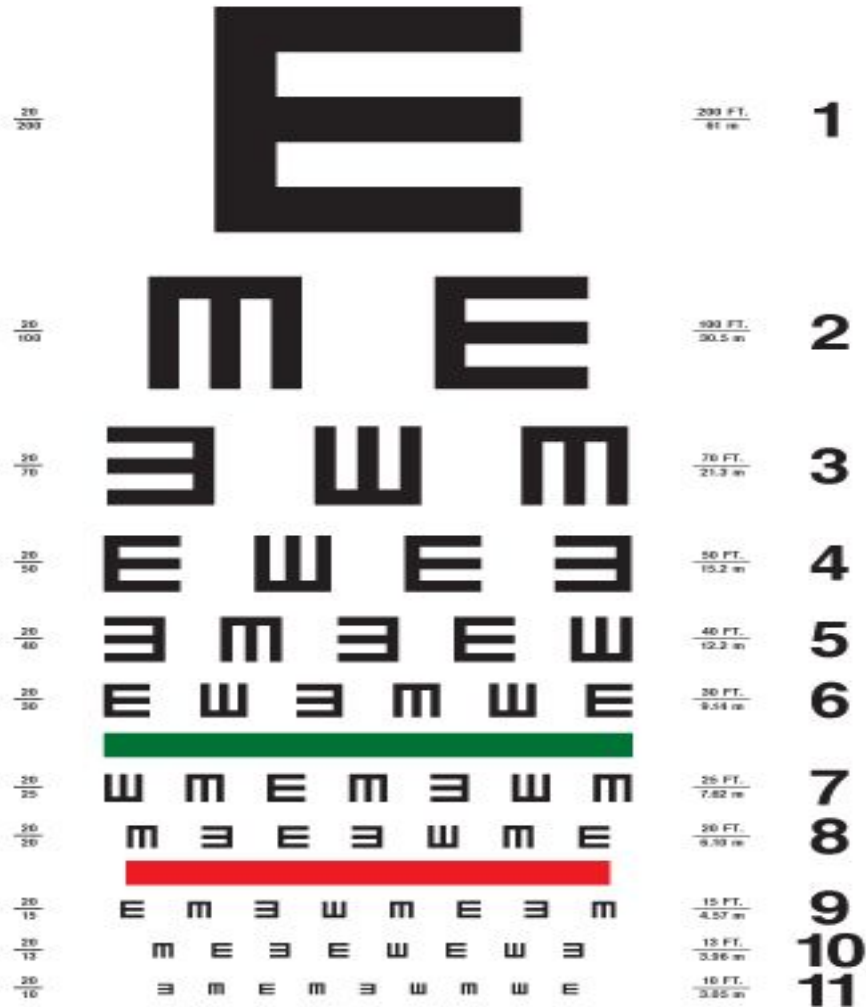


HOTV CHART

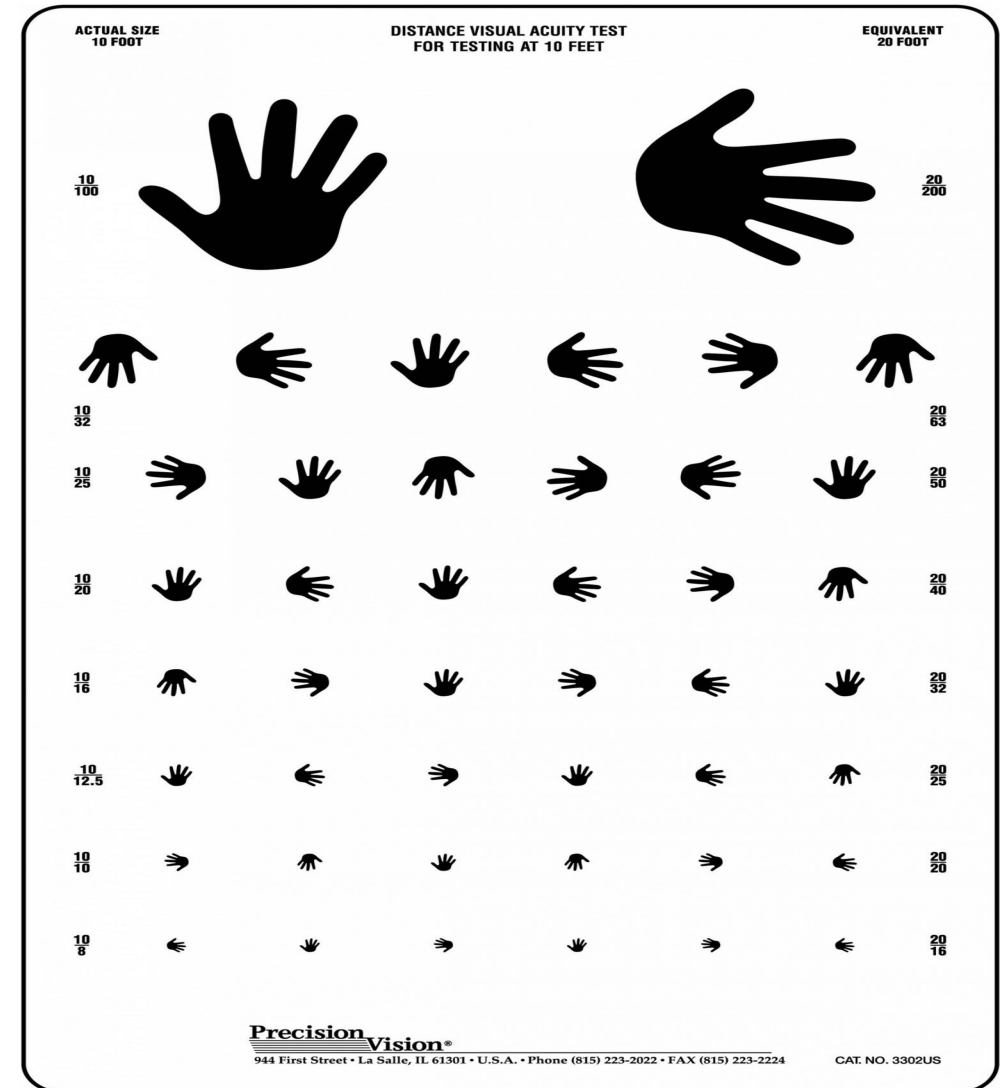




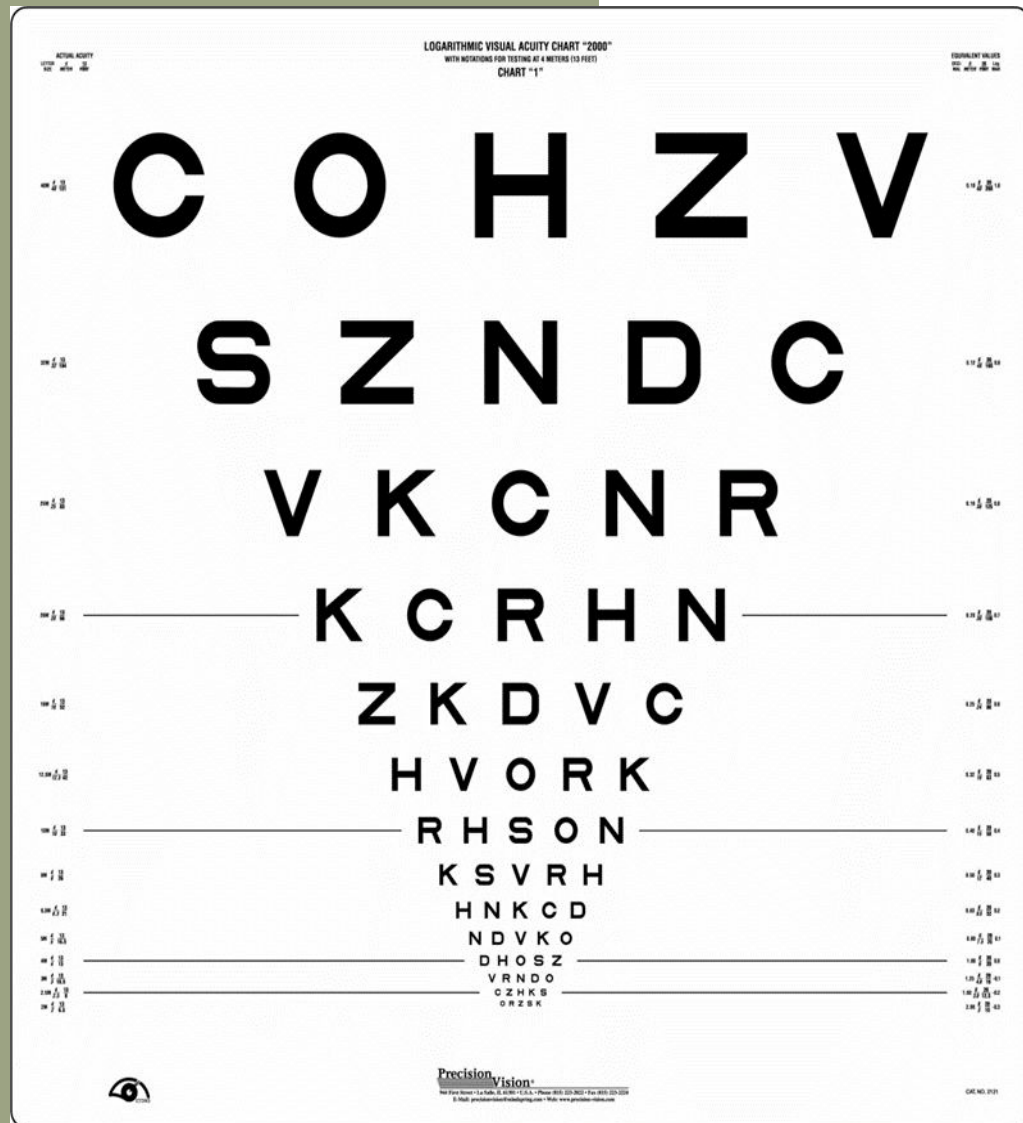
# TUMBLING E CHART (DIRECTIONAL CHART)



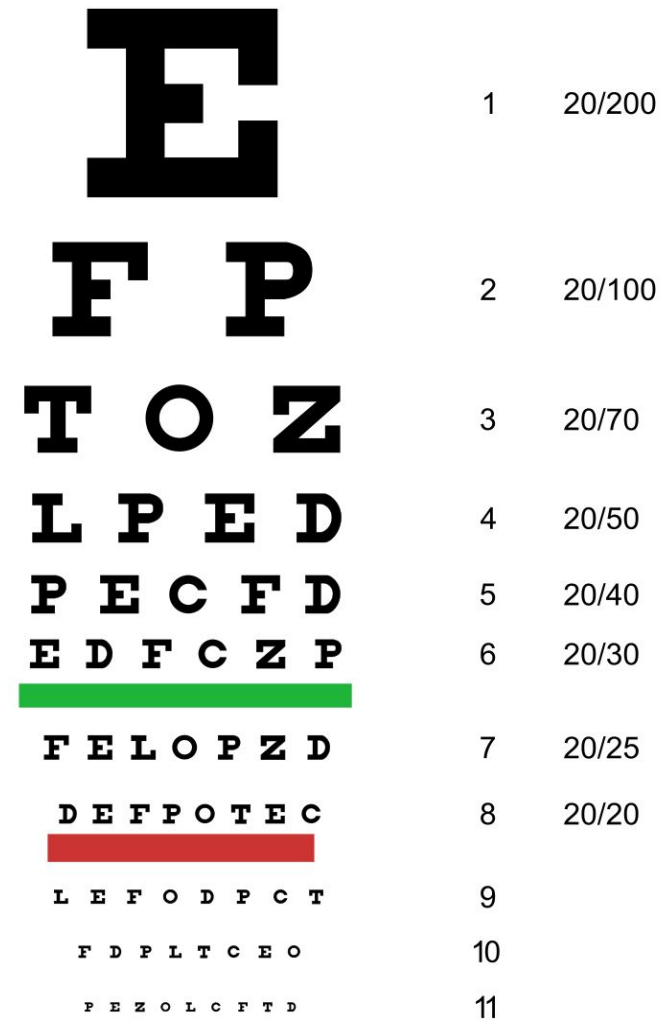
# SJOGREN HAND CHART (DIRECTIONAL CHART)



# ETDRS CHART



# SNELLEN CHART



# SUBJECTIVE VS. OBJECTIVE MODALITIES

## Subjective tests

- ❑ require a conscious response like: naming, matching, or pointing
- ❑ an example: symbol or letter charts
- ❑ They measure Recognition Acuity, the final visual product

## Objective tests

- ❑ measure physiological responses
- ❑ they eliminate the need for patient communication
- ❑ An example: Visual Evoked Potential (VEP)
- ❑ used when the patient is non-verbal, non-compliant, or has cognitive impairment.

# QUALITATIVE VS. QUANTITATIVE MEASURES



## Quantitative VA testing:

- ❑ provides a precise numerical value (e.g. 6/6)

## Qualitative VA testing

- ❑ provides a descriptive estimate of vision
- ❑ Used when precise quantification is impossible
- ❑ Examples include: CSM (Central, Steady, Maintained) fixation and Light Perception (LP)
- ❑ necessary for infants or patients with severe vision loss below the chart limits

# MAXIMIZING COOPERATION AND RELIABILITY



- ❑ Build quick rapport using positive and patient-centered language
- ❑ Use a matching card to pre-teach optotypes to young children
- ❑ Test the better-seeing eye first to build the child's confidence
- ❑ Pace the test to match the child's attention and fatigue level
- ❑ If VA results are inconsistent or due to guessing, they are unreliable and need retesting.



# TEST ENVIRONMENT FOR YOUNGER CHILDREN



- ❑ Lighting must be controlled for accurate contrast in resolution tests, or to be suitable for test type
- ❑ Minimize physical distance to keep the child's attention
- ❑ The room should feel safe to reduce anxiety and aid cooperation
- ❑ Ensure the child is comfortable (e.g., in a parent's lap)
- ❑ The examiner must clearly observe the child's fixation and involuntary eye movements during objective testing.

# TEST ENVIRONMENT FOR OLDER CHILDREN



- ❑ The test distance must be precisely set (e.g. 6 m or 20 ft)
- ❑ Chart illumination must meet standardized clinical guidelines
- ❑ The chart should be positioned at the child's seated eye level
- ❑ Minimize or eliminate all distractions from the testing area
- ❑ Use a calm, professional tone to encourage maximum cooperation.

## KEY REFERENCES AND SOURCES

1. American Academy of Ophthalmology (AAO)
2. American Optometric Association (AOA): Clinical practice guidelines for comprehensive pediatric eye and vision examinations
3. National Eye Institute (NEI) / ETDRS Study
4. Pediatric Ophthalmology Textbooks
5. Psychophysics of Vision Research: Literature on Preferential Looking (PL) and Visual Evoked Potentials (VEP) used in infant acuity testing.