Visual Acuity

Visual Acuity Measurement Requires:
- Detection of the object
- Resolving the object into component parts
- Transmitting the information to the brain
- Matching against existing memory shapes
- Communication of recognition

What Does 20/20 Mean?
Numerator = # of feet away from viewed object
Denominator = # of feet a person with “normal’ vision could see the object

Acuity Charts
Rows of different size letters
Each subtending the same visual angle at a specified distance up to 20 feet

The Snellen Chart
Developed 1863 by Professor Snellen, accepted as standard

The Snellen Chart: Disadvantages
- Some letters are easier to recognize (ex: L is easier than E)
- Patients must be literate; modifications include the Landolt rings and the Tumbling E chart
- Different numbers of letters on each line and nonproportional spacing between letters

Bailey-Lovie Chart
Early Treatment Diabetic Retinopathy Study (ETDRS)
Progressive linear assessment of acuity, has become the standard for clinical research
- Each row has 5 letters
- Read at 4 meters
- Acuity of 1.0 = 20/200
- Acuity of 0.3 = 20/40
- Acuity of 0.0 = 20/20

Converting Meters to Feet
- Divide denominator by 3
- 6/6 (6/3=2) so 6/6=20/20
- 6/9 (9/3=3) so 6/9=20/30

Converting Feet to Meters
- Multiply denominator by 3
- 20/20 (2 x 3=6) so 20/20=6/6
- 20/30 (3 x 3=9) so 20/30=6/9

Partially Sighted
Best corrected visual acuity of 20/60 or worse in the better eye

Legal Blindness
Best corrected eye is 20/200 or less or field of vision in the better eye is less than 20°

Low Vision Charts
- If below 20/400:
- Move closer to chart and record appropriately
- Count fingers (CF)
Visual Acuity

- Hand movement (HM)
- Light Perception (LP)
- Light Projection (LProj)
- Indirect Ophthalmoscope (LP By IO)
- No Light Perception (NLP)

**Contrast Sensitivity**
In the “real world” the eye responds to levels of luminance of a target and its background. Snellen acuity charting does not reflect how the individual can visually function when driving at night, reading in poor light or in direct sunlight.

**Contrast Sensitivity Testing**
- Sine wave gratings
- Electronically on a television screen
- Graphically on a chart

**Infants**
- Fix & Follow (F&F)
- Central, Steady, Maintained (CSM)

**Preferential viewing**
The child is shown 2 cards: one with a grating, one without. If the child can distinguish the grating, he is looking at it preferentially because it is more interesting.

**Visual Evoked Potential (VEP)**

**Preschool Children**
- Allen Picture Cards
- HOTV

**Patients with Amblyopia**
- Watch carefully for peeking
- Test amblyopic eye first
- Crowding Phenomenon: single optotype

**Patients with Nystagmus**
Do not occlude
Use a high plus lens to fog the eye not being checked.

**Assessing Color Vision**
The human eye can detect 10 million color hues, but cannot see ultraviolet or infrared light.

**Conditions**
- Trichromatism
- Dichromatism,
- Monochromatism

**Etiology: Genetic**
- Color Deficiency is most commonly inherited by mutations on the X chromosome

**Etiology: Acquired**

**Color Vision Testing**
- Demonstration Plate (#1)
- Test Plates

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The Stroop Effect
Why? The words themselves have a strong influence over your ability to say the color. The interference between the different information (what the words say and the color of the words) your brain receives causes a problem. There are two theories that may explain the Stroop effect:
- Speed of Processing Theory: the interference occurs because words are read faster than colors are named.
- Selective Attention Theory: the interference occurs because naming colors requires more attention than reading words.

Amsler Grid
Tests the central 20 degrees (macula)
Each square subtends an angle of 10
- Macular Degeneration
- Diabetic Retinopathy

Amsler Grid Instructions
- Cover one eye, and then focus on the dot in the center.
- Do any of the lines look wavy, blurred or distorted?
- Are there any missing areas or dark areas in the grid?
- Can you see all corners and sides of the grid?

Inward bending lines—micropsia
Outward bending lines—macropsia

Stereo Testing
Perform before Vision Testing
- House fly test for gross stereopsis (3500 seconds of arc)
- Graded circle test (800 to 40 seconds of arc)
- Animal testing for young children (400 to 100 seconds of arc)

3D movies
Questions to ask:
Is the 3-D viewing experience not as vivid as it is for others watching the same picture?
Do you experience eyestrain or headaches during or after viewing?
Do you feel nauseous or dizzy during or after viewing?
Are you more comfortable viewing 2-D TV or movies instead of 3-D TV/movies?
Is it difficult for your eyes to adjust back to normal after watching 3-D TV/movies?