E-ETDRS Test Protocol

The EVA runs a visual acuity testing program called E-ETDRS (Electronic Early Treatment of Diabetic Retinopathy). The program has been developed to provide a visual acuity letter score that is comparable to the ETDRS chart testing score.

During development of the E-ETDRS protocol, a study was conducted in which high validity and test-retest reliability were demonstrated (Moke PS, Turpin AH, Beck RW et al. A computerized method of visual acuity testing: adaptation of the amblyopia treatment study visual acuity testing protocol. Am J Ophthalmol 2001; 132:903-14).

Overview

The E-ETDRS Visual Acuity Testing Protocol consists of an initial screening phase to obtain an approximation of the visual acuity threshold and then a testing phase to obtain the visual acuity score. The protocol is summarized below. The complete algorithm is depicted in the figure that follows. Letters are displayed with surround bars one full letter width from the letter.

<table>
<thead>
<tr>
<th>The E-ETDRS testing protocol:</th>
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<tbody>
<tr>
<td><strong>Screening phase:</strong> With single letter presentations, determines smallest logMAR level at which a letter is correctly identified.</td>
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<tr>
<td><strong>Testing phase:</strong> Starts testing letters by intermixing letter sizes of screening phase score and one level smaller.</td>
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<td><strong>Test progress:</strong> If a letter is missed at a level, one level larger is added to the testing mix; if a letter is correct at a level, one level smaller is added to the testing mix.</td>
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<tr>
<td><strong>Acuity determination:</strong> Tests 5 letters at each level until smallest level with 5/5 correct and the smallest level with 0/5 correct are determined.</td>
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Example:

*IN THE FOLLOWING EXAMPLE, C = CORRECT AND M = MISSED*

**Screening:** 20/400c, 20/200c, 20/100c, 20/50c, 20/25m, 20/40m, 20/50c  
Score = 20/50

**Test progress**
1. Start by intermixing 20/50 and 20/40 letters: 20/50c, 20/40m, 20/50c, 20/40m, 20/50m  
2. Because a 20/50 letter was missed, add 20/63 to the letter mix (so now have letters of 20/40, 20/50, and 20/63 intermixed): 20/63c, 20/50c, 20/40c  
3. Because 20/40 was correct, add 20/32 to the letter mix (mix is now 20/32, 20/40, 20/50, and 20/63): 20/32m, 20/63c, 20/63c, 20/50m  
4. Five letters at 20/50 have been tested, so it drops out of the mix (mix is now 20/32, 20/40, and 20/63): 20/63c, 20/40c, 20/32m, 20/40m  
5. Five letters at 20/40 have been tested, so it drops out of the mix (mix is now 20/32 and 20/63): 20/32m, 20/32m, 20/63c  
6. Five letters at 20/63 have been tested, so it drops out of the mix (mix is now 20/32 only): 20/32m  
7. Five letters at 20/32 have been tested; there are no letters left in the mix so test is over

**Test summary**

- 20/63 5/5 correct
- 20/50 3/5 correct
- 20/40 2/5 correct
- 20/32 0/5 correct

**Letter Score:** 10 (number of letters correctly identified) + 55 (5 times the number of lines above (larger than) 20/63 and through 20/800) = 65

**Snellen Notation** (approximate Snellen from letter to LogMAR conversion): 20/50
Electronic ETDRS (EETDRS) Visual Acuity Testing Protocol Algorithm

Screening Phase

In each step, one letter is shown at each logMAR level.

1. Show 20/400 letter
   - Correct: Show letters in 3-level steps (e.g. 20/200, 20/100, 20/50, 20/25, 20/12) until either a miss or 20/12 correct
   - Incorrect: Show letter at each successively smaller level until either a miss or 20/400 correct

2. Letter missed
   - Show letter 2 levels up from missed level (i.e. level smaller than last correct level)
   - Incorrect: Show letter at each successive larger level until correct response or 20/800 is shown
   - Correct: Screening score is last correct level or 20/800 if last letter shown is 20/800

Threshold Phase

1. To start, the letter pool consists of letters from 2 levels*: the level of the screening phase score and one level smaller.
2. Each letter presentation is randomly selected from the active pool of letters with the stipulation that the first letter and every third letter must be from the largest level in the active letter pool.
3. A level remains in the active pool until 5 letters are tested at the level.
4. A new level is added to the active letter pool when:
   a. A letter from the largest level in the pool is missed: one level larger is added to the letter pool†
   b. A letter from the smallest level in the pool is correct: one level smaller is added to the letter pool‡
5. Testing continues until an upper logMAR level with 5 of 5 letters correct and a lower logMAR level with 0 of 5 letters correct are determined and 5 letters are tested on all levels in between the upper and lower logMAR levels.§
6. Visual acuity score is the number of letters correctly identified during threshold testing, plus 5 letters for each logMAR line above the upper logMAR level through 20/800.

The screening phase uses the letters V, R, K and D. The threshold phase uses the same 5 letters from the Sloan letter set that appear on the original ETDRS charts for right and left eyes.

*Unless screening score was 20/12, in which case letter pool consists of only 20/12 level letters.
†Unless 20/800 letter is missed.
‡Unless 20/10 is correct.
§If 20/10 becomes part of the active letter pool, it will be the lower logMAR level.