Feedback improves measured visual acuity in adults

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**Purpose**

Visual acuity (VA) is used in clinical practice for both screening and measuring visual function. Many factors need to be standardized to obtain valid and repeatable VA measures including the testing environment, presentation method, termination rules and patient motivation.

**Aims:**

To quantify the effects of providing feedback during clinical measures of visual acuity.
- can we tell a patient that they incorrectly identified a letter?
- can we tell a patient what the letter was that they incorrectly identified?
- is any effect of feedback on VA measurement repeatable?

**Methods**

**Experiment 1: Sloan Letters**

Single, crowded Sloan letters (ETDRS and HOTV sets) were presented on the Electronic Visual Acuity (EVA) system (Figure 1) to 14 visually-normal adults. Three different levels of feedback were given: (1) No Feedback, (2) Minimal Feedback - whether the response was correct or incorrect, and (3) Maximum Feedback - correction of incorrect responses. Measurements were conducted using both Method of Descending Limits (DL) and Staircase psychophysical methods. Measurements were also performed on each participant on two different occasions to assess the effect of feedback on test-retest repeatability.

**Experiment 2: Landolt C Optotypes**

The experiment was repeated using single, crowded Landolt C optotypes presented to 20 visually-normal adults. Measurements were conducted using a Staircase method and were performed on each participant on two different occasions to assess the effect of feedback on test-retest repeatability.

**Results**

**Sloan Letters: Effect of Feedback**

Overall, no significant difference in measured VA was found between the No Feedback and Minimal Feedback conditions (0.00 logMAR, p = 0.463). Measured VA was significantly better when Maximum Feedback was provided compared with No and Minimal Feedback (0.04 logMAR and 0.05 logMAR respectively; p < 0.0001).

No statistically significant differences in VA were found by measurement method (staircase vs descending limits).

**Landolt C: Effect of Feedback and Session**

No significant difference in measured VA was found by Feedback condition (2-way ANOVA, p = 0.096) within either the first or second measurement sessions. However when comparing between sessions, a significant difference in overall VA was found (p = 0.007). Post-hoc analysis demonstrated that significant differences exist between Sessions 1 and 2 for Minimal Feedback (0.05 logMAR, p = 0.023) and Maximum Feedback (0.05 logMAR, p = 0.047), but not for No Feedback (0.01 logMAR, p = 0.912) conditions. In contrast to the Sloan letter presentations, it appears that any learning effect of feedback occurred at the second visit for Landolt C optotypes.

**Conclusions**

Correcting responses when participants are first exposed to Sloan letters results in a small but statistically significant improvement in measured VA of approximately half a line. This is not true for a rotationally symmetric target such as the Landolt C.

Participants measured VA improved significantly between Session 1 and Session 2 for both Sloan and Landolt C optotypes.

To ensure repeatable VA measures, particularly in new patients, consistent levels of feedback should always be provided.