

## **Performance, usability and comparison of three and four alternate forced choice versions of the handheld Radial Shape Discrimination test**

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**Purpose:** The handheld Radial Shape Discrimination (hRSD) test (Wang et al, 2013) is now widely used to detect macular pathologies, and is being used for self-monitoring by patients. Recently a 4 alternate forced choice (4AFC) version was introduced in addition to the 3 alternate forced choice (3AFC) version used in previous studies. We investigated the performance of both versions of the test.

**Methods:** We recruited 98 healthy participants (59 F; median age: 33y; range 18-72y); 6 eyes with ocular pathologies were excluded. Tests (near and distance visual acuity, VA; Contrast Sensitivity, CS; Amsler grid, AG) were conducted with participants' habitual visual correction. Slit lamp biomicroscopy and undilated funduscopy examinations were performed. Threshold results for the 3- and 4AFC hRSD tests, presented on an Apple Ipad Touch, were recorded as a LogMAR value with the time taken for each test. The test order (3AFCvs4AFC) was counterbalanced across participants and they also completed a 5 question usability survey.

**Results:** For all eyes with a normal undilated funduscopy examination, median (IQR) distance VA was -0.08 (0.18), near VA was -0.08 (0.16) and CS 1.65 (0.0). The 3AFC and 4AFC hRSD median (IQR) thresholds were -0.84 (0.15) and -0.82 (0.13) respectively (Wilcoxon signed ranks paired test;  $Z=1.923$ ,  $p=0.054$ ; NS); across participants the thresholds were significantly correlated (Spearman's  $\rho=0.468$ ,  $p<0.001$ ). There was no significant difference in test time (median (IQR); 3AFC: 172.5s (56s); 4AFC: 184.5s (56s);  $Z=1.229$ ,  $p=0.22$ ). Age was weakly correlated with the 3AFC thresholds ( $\rho=0.181$ ;  $p=0.01$ ) but not with 4AFC thresholds ( $\rho=0.121$ ; 0.10). 187/190 eyes reported a normal Amsler grid. From the survey, the majority of participants understood how to use the test, found it easy to use, felt it did not take too long and felt confident using it. While 41% of participants expressed no preference between versions of the hRSD test, 34% found the 3AFC version easier to use, 25% found the 4AFC hRSD easier to use.

**Conclusions:** The 3 and 4AFC versions of the hRSD test had comparable performance; there were no statistically significant differences in threshold or test time. Across the participants neither version was clearly preferred. Given the underlying psychometric advantages of a 4AFC task, this version should be used as standard.

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