

OPERATIONAL BASED VISUAL ASSESSMENT (OBVA) CONE CONTRAST TEST HIGH DEFINITION (CCT-HD) RESEARCH AND DEVELOPMENT

EVALUATION VISUELLE OPÉRATIONNELLE (OBVA) CONE CONTRASTE TEST HAUTE DÉFINITION (CCT-HD) RECHERCHE ET DÉVELOPPEMENT

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Introduction: The United States Air Force (USAF) introduced a computer-based color vision test in 2011-the Rabin cone contrast test (RCCT), to replace pseudoisochromatic plate (PIP). The RCCT measures contrast thresholds with stimuli stimulating a single cone type of a color vision normal (CVN) observer, reliably screens and classifies the type of color deficiency. However, the RCCT has limited contrast levels and imposes a ceiling effect, with most (CVN) individuals scoring a maximum value of 100. To further refine color vision testing, OBVA developed a new CCT-HD color test with improved accuracy, reliability and is a paradigm shift in color vision testing.

Methods: Approximately 1,500 USAF pilot candidates were tested using the CCT-HD and RCCT during medical screening. The test was administered either binocularly or monocularly and some participants repeated the test to examine test-retest reliability. Color deficiency was assessed based on RCCT monocularly criteria (log contrast threshold for L- or M-cone tests > -1.65).

Results: Mean CVN individuals' binocular L- and M-cone log contrast sensitivities were approximately -2.21 and -2.15, respectively. CVN mean monocular L- and M-cone log contrast sensitivities were approximately -2.08 and -2.02, respectively. Among the USAF pilot candidates tested, approximately 3.9% were classified as deutans, and approximately 0.7% as protans. Test-retest reliability of the CCT-HD was good (M-cone $R^2 = 0.87$).

Conclusion: The CCT-HD accurately and reliably tests both congenital and acquired color deficiency, eliminating the annual requirement in the USAF for the former and delaying the latter testing until age indicated. The improved accuracy and reliability of the CCT-HD provides the capability to establish distribution thresholds of CVN individuals, not previously possible with the RCCT. Subtle color changes can now be researched. The improved precision of the CCT-HD tests the full range of color capabilities to examine potential impact on operationally-relevant performance.