Tests for color vision deficiency: Is it time to revise the standards?

Dear Sir,

As members of the state’s medical board, the authors wish to share some of the difficulties encountered while testing candidates for color vision deficiency (CVD). Though many methods for color vision testing are available, there is no consensus on the ideal method, with different countries using different tests. In India, the Ishihara charts are the most widely used, with additional use of Edridge-Green lantern in civil services and Martin lantern in armed forces.[1,2]

The Ishihara test is quick and easy and is an excellent screening tool to detect those with red-green CVD. However, it has a limited ability to classify CVD and determine its severity.

Organizations that require the correct recognition of colored signals (principally transport groups such as the Civil Aviation Authority, Railways, Maritime, and Naval and Air force) depend on a standard lantern test which imitates actual signal systems simulating the workplace. Lanterns do not specifically screen for color defects. It is surprising that even now, the general design of lanterns has not changed very much since their creation in 1891. With the exception of the Farnsworth lantern used in the USA, there are scarce studies on the validation and reliability of lanterns.

The panel tests, including the Farnsworth Panel D-15 and Farnsworth–Munsell 100-hue tests, are much more accurate in classifying color deficiency. Farnsworth Panel D-15 Test is considerably quicker and more convenient test for routine clinical use. Though not very sensitive, its speed and accuracy make it useful. The relative insensitivity can also be an asset in judging the practical significance of mild degrees of color deficiency. For example, individuals who fail the Ishihara plates but pass the D-15 panel will probably not have color discrimination problems under most circumstances and in most jobs.[3] Nagels anomaloscopes is considered the gold standard for color vision testing in clinical research, however, it is an expensive instrument requiring an experienced examiner’s skills.

Color vision is graded into higher and lower grade depending on the size of the aperture in the Edridge-Green lantern (1.3 mm vs. 13 mm),[1] with the technical services category of Indian civil services, which includes police services requiring higher grade of color vision. The United States police service no longer implements a color vision standard though monochromats are barred.[4] Those who fail initial color vision screening by pseudoisochromatic plates should be further evaluated by anomaloscope or D-15 test to include anomalous trichromats who are the most numerous among the CVD persons.

In an ongoing study, 500 candidates who appeared in the divisional medical board were studied.

Ishihara chart was used for initial screening of all candidates with further use of Edridge-Green lantern for candidates found to have CVD and selected for jobs requiring high grade of color vision. Sixty candidates (13%) were found to have CVD; 39 of those were selected for jobs requiring accurate color perception. None of the candidates found to have CVD on testing by Ishihara chart could pass the lantern test. Only 21 candidates found to have CVD were previously aware of their deficiency.

Since color judgment is an integral part of work in various occupations, a screening test to establish color vision should be undertaken while giving career’s advice. An early diagnosis of CVD might allow for early modifications in educational and other activities. Furthermore, there is a need to supplement the existing color vision tests for various services in India, with more objective, diagnostic tests such as the D-15, maintaining standard illumination. Use of color enhancing
appliances (X-chrome and chromagen contact lenses) should be ruled out. Computer-based programs are needed so that easily reproducible and acceptable methods of testing are developed.

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