

THOUGHTS AND RECOMMENDATIONS ON COLOR VISION TESTING

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The FALANT (Farnsworth Lantern) has been the definitive color vision test for the U.S. Navy since 1954. Only 5 – 6% of males fail this test as compared to the 8% that fail the pseudoisochromatic plates (PIPs). Thus, it salvages a few individuals with a mild color vision deficiency that in Farnsworth's own words, "Are not dangerous to Naval Service."

For a number of years the FALANT was unavailable for purchase. In the past few years it has become available again, but at a very steep price, around \$5,000. It is available from two different manufacturers, MacBeth Corporation (producer of the original lantern) and Stereo Optical Corporation. Of the two, I prefer the MacBeth version. In the Stereo Optical version, a motor slowly moves the slides and an astute subject, who has the order memorized, can easily hear the motor moving the slides and thus determine which slide is about to be presented. In the MacBeth version, the slides are rotated by hand and can be easily spun so fast that the subject cannot count them and determine which slide is being presented.

Many Naval communities require testing of color vision by the FALANT, while some will allow PIPs to be used. If the PIPs are used, the subject must score 12 or more correct in a series of 14 plates. This is considered "normal" color vision and is recorded as a "pass." There is currently a proposal being put forward to allow PIP testing for all communities. The important questions being asked are which PIPs should be used and what are some of the special considerations in administering them.

It is desirable to accurately predict FALANT success when using the PIPs, since the FALANT is still the definitive test. In the early 1990's, Dr. Penny Walter and I tested both the Ishihara and Dvorine series of PIPs along with the FALANT. Both of these PIPs will accurately predict FALANT success. (See Military Medicine, December, 1992). If the subject scores "normal" on those PIPs, he/she will pass the FALANT. In the years since that study, I have tested thousands of subjects using the Ishihara series and have yet to find someone who scores "normal" on the PIPs and then fails the FALANT.

For clinical testing I recommend the 24-plate edition of the Ishihara PIPs. To get a 14 plate series, one should use plates 2 – 15. (Plate 1 is the demonstration plate and should be presented to all subjects – but is not scored, plates 16 and 17 are used to differentiate protans and deutans, while plates 18 – 24 are used for illiterates). The plates should be placed in a random order so as to counter any memorization efforts by the subject. The only tricky part of these plates is the proper scoring of the camouflaged plates (numbers 14 and 15). Each of these plates has a corresponding sister plate, plate 10 for plate 14, and plate 9 for plate 15. If the camouflaged plate is seen easier than the sister plate, the camouflaged plate is scored as an error. If the sister plate is more easily seen, then the camouflaged plate is scored as correct. To facilitate scoring, I place the camouflaged plate and its sister plate adjacent to each other.

Proper illumination is also required for PIP testing. Ideally, a MacBeth Easel should be used. This provides a color temperature of about 6740°K. In the absence of a MacBeth lamp, a daylight fluorescent bulb may be used. Do not use an unfiltered incandescent bulb, as this will help deutans pass the test. Richmond Corporation sells a

True Daylight Illumination Lamp (about \$150.00) which is similar to a MacBeth Lamp. They also sell Daylight Glasses (about \$35.00) which are used with an incandescent bulb to change the color temperature to about that of a MacBeth Lamp. While these items are desirable, I don't think they are absolutely essential for clinical use. For experiments in a laboratory setting, however, they would be required.

Richmond also sells a 15 plate PIP series (originally produced by American Optical). This series is currently in many military facilities. I do not recommend this series since many of the plates are very difficult to distinguish, even for persons who have normal color vision as determined by an anomaloscope. Richmond has also re-introduced the H-R-R (Hardy – Rand – Rittler) series of PIPs. The original H-R-R series (c. 1955) was excellent, but the new Richmond version leaves something to be desired and I cannot recommend it at this time. (I tested about 20 subjects and found numerous inconsistencies). I plan on doing further testing of it this summer.

When testing with a FALANT, a test distance of 8 feet is essential. Also, "average" room lighting is required. If a subject fails the test, wait at least five minutes, re-administer the instructions, and test again. Often the reason for a failure is the subject is confused on the instructions. Many times they don't really understand that there are three colors from which to choose, even though you told them that when giving the instructions. (They will only give "red" or "green" responses even though they clearly see a "white" light). Sometimes they don't understand that both lights can be the same color, so when presented with a green/green combination, they will call it green/white.

One final thought. There is a company, ColorMax, which is marketing color vision enhancement glasses. Basically, these are glasses with a special coating applied to them that acts like an X-Chrome contact lens. That is, they filter out certain wavelengths allowing a color deficient individual to "see" the figures in the PIPs based on brightness differences and not on wavelength differences. They can "pass" the test, but can't tell what the colors really are. The coating looks similar to an anti-reflection coating. Another company, Colorsoft Laboratories, plans on introducing precision tinted soft contact lenses for the same purpose - enhancing color vision performance. It may be difficult to spot the tint in these lenses when they are on someone's eyes. In light of these new products, I highly recommend that subjects who require corrective lenses be allowed to use only clear spectacles when taking color vision tests. You should have a lensometer, phoropter, and a trial lens set nearby.

By the way, if anyone should find a subject that scores "normal" on the Ishihara series and then fails the FALANT (after you've done a retest), please call me as I would like to try and test that person myself. Feel free to call me on any other color vision issues, too. My DSN number is 792-5568, ext. 49. The commercial number is: (847)688-5568.