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Short Communication

When Vision Science becomes Vision Theology

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What makes Science valuable to society is that it takes observable facts and correlates them with explanations which in turn can be used as tools for increasing human productivity, wealth, and security. However, when Science ignores the need for explanations, the observable facts become problematic.

Quantifying visual processes and acuity has been an historic challenge. Ancient standards ranged from the ability to identify the separation of two adjacent stars to the ability to see a mustard seed. In 1862 Dr. Herman Snellen developed, and copyrighted, visual targets using European-style letters. Prior to Snellen's chart, Optometrist and Ophthalmologists would use their own charts which could include words to read or simply showed pictures in varying sizes of items such as a flower, wagon, or house. That Snellen test became a major breakthrough in providing a more precise assessment of refractive errors.

When the industrial revolution was in full swing during the late 1800s and early 1900s, proper vision was becoming vital to operating machinery. Literacy was becoming an essential part of technology, a key to personal and cultural economic growth, and Snellens standardized test became invaluable to doctors and patients.

The Snellen test codified the intriguing relationship of the letter sizes having a logarithmic increase height versus diopters of blur as the viewing distance increased, resulting in the LogMAR concept as conceived by Drs. Ian Bailey and Jan Lovie in 1976. The Landolt C, and the LogMAR valuation, became the Academic standard for acuity versus the classic Snellen test as the emmetrope Clinical benchmark. This was codified by the Visual Functions Committee in 1984 as the Visual Acuity Measurement Standard during the CONSILIUM OPHTHALMOLOGICUM UNIVERSALE.

In recognition of the potential advances of technology, the Consilium's final paragraph stated.

XIV.1. A standard is meant to be a stable entity, yet all points are not established by experimental certainty, deficiencies are periodically revealed and need correction, new developments in tests are occurring, etc. Thus, a standard may be an evolving document and needs to be re-viewed periodically and should not be regarded as immutable.

However, what the Eye Care Profession seems to have not recognized is that just because you can measure something does not mean that the measurements are actually valid or that you understand the source of those values. It also fails to realize that the Landolt C and the Snellen letters are NOT interchangeable as to acuity measurement.

In 2009 the innovative and revolutionary Dyop (pronounced di-op) test was discovered using a uniformly spinning segmented ring to provide a strobic visual stimulus to the fovea. That binary strobic stimulus allowed for modulating variables such as the ring diameter (angular arc width), ring stroke width, rotation speed, gap/segment contrast, and gap/segment colors. The optimum strobic pixelized refresh rate of the photoreceptors creates an indicator for visual acuity and the parameters for determining refractions.

Because Dyop acuity and refractive measurement is not dependent upon cultural cognition of letters, a Dyop can also be used for infants and non-literate or non-verbal individuals as a more accurate measure of acuity. Unlike static optotypes, which get increasingly blurry as they get smaller or further away, a spinning/rotating Dyop has a significantly sharper threshold as to the acuity endpoint based upon the angular arc width and viewing distance. The typical circular Dyop segmented ring typically comprises 8 black and 8 white equally sized, alternating segments on a neutral gray background, and spinning at 40 rotations per minute.

Curiously enough the relation of the Dyop angular arc width and associated diopters of blue was linear rather than the traditional logarithmic curve of Snellen optotypes. This led to the realization that the optimum Dyop gap had a 0.54 arcminute squared versus the standardized Snellen gap area of 1.0 arcminutes squared.

This further led to the realization that the increased precision (up to 6x), increased consistency (up to 8x), and increased efficiency (up to 3x) of using a Dyop versus Snellen letters is due to the basic gap of Snellen testing being too large as well as inconsistent and irregular. As to the Theology of Snellen testing, using letter-based cognition as a substitute for Resolution Acuity ignores the physiological fact that the photoreceptors see light and colors rather than seeing black due to the absence of black-sensing photoreceptors.

This also led to the realization that the inclusion of color-sensitive cone photoreceptors in the fovea was not random but rather was what facilitated acuity and accommodation. As the lens refracts light, the L/M/S colors are bent at differentiated focal depths in relation to the fovea. The response to having Green focused ON the fovea, with Blue focused in FRONT of the fovea, and Red focused BEHIND the fovea is what triggers the rapid adjustment of the focal depth of the lens.

With the still increasing global need for better vision, a current limit to improved acuity testing is from the lack of understanding as to why Black and White optotypes are so relatively inaccurate and inconsistent. Eye care practitioners fail to utilize the fact that acuity is a foveal color perception process. Color contrast sensitivity by a Dyop is far more precise and informative as to how we see. Using the built-in Dyop contrast sensitivity matrix will entice Eye Care Professionals and Vision Scientists to study Dyop contrast and realize that it is best done in color.

The simplicity of Dyop use (without cultural or age barriers) and the potential of color therapies from improved color diagnostics, should allow the increased use of Dyop acuity and refraction testing to lead to better global acuity. The continued use of Snellen as a global standard rather than using a Dyop for acuity and refractions likely reflects the conditioning from years of that continued use of Snellen which has now become more of a reflection of Vision Theology rather than of Vision Science.