DYSLEXIA AND COLOR PERCEPTION

Sandra Stark
Principal CEO at Stark-Griffin Dyslexia Academy
Johannesburg Area, South Africa 96

Abstract

Background: Acuity and accommodation result from a matrix response of the L (red), M (green), and S (blue) cone photoreceptors and the relative refractive focal depths of those specific colors. A Dyop® (or dynamic optotype) is a spinning segmented ring visual target which uses the strobic detection of the spinning gaps/segments of the ring to measure visual function. Dyop gap/segment color/contrast permutations have distinctive, and corresponding, acuity endpoints.

Methods: One hundred and eighty-eight patients, ranging from 4 years to 44 years in age, were examined as part of **Stark-Griffin Dyslexia Academy** to compare their color/contrast acuity endpoint perception of a spinning **Green-on-White Dyop** versus a spinning **Blue-on-Black Dyop** and the possible diagnosis of types of dyslexia. The patients were presented, as part of the Chart2020 vision test platform, a display which has an identical diameter spinning **Green-on-White Dyop** and spinning **Blue-on-Black Dyop** with sufficient arc width diameter such that both Dyop rings were detected as spinning. Those Dyop rings were then identically reduced in arc width diameter until spinning of each of the identical diameter colored rings was not detected. The smallest diameter ring where spinning was detected for each of the color/contrast combinations (corresponding to the acuity endpoint metric value) was recorded as its color acuity endpoint.

Results: Of the 188 patients, 166 (88% of the total) were formally diagnosed with dyslexia, and 22 patients **(12% of the total)** were diagnosed as **not** having dyslexia. Of the166 patients diagnosed with dyslexia, 151patients (86% of that group) detected the spinning **Blue-on-Black Dyop** while 9 patients (5% of that group) preferentially detected the spinning **Green-on-White Dyop**. Of the 22 patients **(12% of the total)** diagnosed as **not** having dyslexia, 12 patients (55% of that group) preferentially detected the spinning **Green-on-White Dyop** while 9 patients (41% of that group) detected the spinning **Blue-on-Black Dyop**. Of the 22 patients diagnosed as NOT having dyslexia, one was diagnosed as a “cognitively challenged,” one was diagnosed as a “slow reader” (albeit NOT dyslexic) and one was diagnosed as having ADHD. There was an additional group of 16 patients (9% of the total) where there was no **Green-on-White Dyop** versus **Blue-on-Black Dyop** preference. Of the group with no color preference, 1 patient (5% of that group) was diagnosed as not having dyslexia, and 15 patients (95% of that group) were diagnosed with dyslexia. Of the 151 patients with a definitive color response and diagnosed dyslexia, 142 (94%) had a preferential detection of the spinning Blue-on-Black Dyop. Of the 21 patients with a definitive color response and diagnosed as not having dyslexia, 12 (57%) preferentially detect the spinning Green-on-White Dyop. While this is only a preliminary study, the association of the preferential detection of the spinning Blue-on-Black Dyop with the 94% association with diagnosed dyslexia definitely deserves further evaluation.

Conclusions: This is a preliminary evaluation of the disparity of color perception versus diagnosed symptoms of dyslexia. There was a very strong positive correlation ($r \leq 0.9$) between color perception and diagnosed symptoms of dyslexia. The findings suggest that symptoms presented by dyslexics could be better understood or analyzed by their color perception.

Keywords: Color perception, Visual acuity, Dyslexia, Dyop acuity chart.