Cornell University

December 5, 2016

Neuroscience Research on Irlen Syndrome at Cornell University

From the Desk of Professor Adam Anderson

Director of the Affect and Cognition Lab at Cornell University, Ithaca, New York, USA

Disorders of reading have been thought to be of primarily phonological origin. However, visual neuroscience has uncovered systematic disturbances in the visual brain in the reading impaired, supporting a prominent role of visual processing deficits. It has been shown that differential processing along three main visual neural pathways: magnocellular, parvocellular and koniocellular, contributes to reading impairments. Each of these pathways has specific wavelength (color) sensitivity, but in combination support all visual processing, beyond the perception of color. As such, changing the background color of visual inputs influences the relative balance between these pathways for visual processing. We and others have shown that such color manipulations enhance and/or suppress the different pathways to influence vision, both in simple tasks, e.g., judging orientations, to complex ones, e.g., reading emotion from faces. Our functional Magnetic Resonance Imaging work at Cornell is following up on these findings to examine how the primary visual cortex relays information along these three visual channels to other regions of the brain to support normal and disordered reading.

According to this research, each individual may have altered dysfunction within and across visual channels. As such, unique color filters would be needed to restore normal balance and integration. Based on imbalances in the three pathways we observe in those diagnosed with Irlen Syndrome, we make predictions on what wavelength filters would be most likely to restore normal integration across channels. We then test how use of specific wavelength Irlen filters restore normal visual responses across the three pathways and their relation to visual performance, including reading. More than a simple outcome, like reading speed, we test a specific neural model of dysfunction of the visual pathways involved in reading and its relation to many aspects of vision, reading facility and comprehension, and associated behaviors (e.g., eye scanning) which contribute to a larger syndrome of visual stress and reading difficulty.

Sincerely,

Adam Anderson, PhD
Director, Affect and Cognition Lab
Associate Professor
Cornell University, Ithaca, NY