

September 2018

RE: IRLLEN SYNDROME AND THE IRLLEN METHOD

Irlen Syndrome is a disorder that many people are not familiar with, and as such, it often goes unidentified and untreated, leaving children to struggle well into adulthood. This document is intended to provide a thorough background of the disorder and its treatment, offer a current and up-to-date analysis of the scientific research that has been conducted on the disorder and the efficacy of treatment over the last 30 years, and explain the impact that this disorder can have on not just school success, but future job and life success, if left unidentified and untreated. Within this document, you will find the following:

- A definition of Irlen Syndrome and the areas of functioning it can impact
- An explanation of the Irlen Method of Colored Overlay and Spectral Filters used to treat the disorder
- A review of some of the most current and relevant scientific research, as well as highlights from key educational pilot studies and reports presented to school districts around the world that have chosen to implement Irlen Screening methods and Colored Overlays

Defining Irlen Syndrome

Irlen Syndrome (sometimes referred to in the literature as Meares-Irlen Syndrome, Scotopic Sensitivity Syndrome, or Visual Stress) is a problem with the brain, not the eye. It is a perceptual processing disorder, not a visual problem, a finding that the most current brain imaging research supports. In simplistic terms, when an individual suffers from Irlen Syndrome, their brain has difficulty or an inability processing certain wavelengths of light. In this way, light (especially bright and fluorescent lighting) becomes a stressor on the brain. This stress causes certain parts of the brain (e.g., the visual cortex) to become overactive. It is this over-activity and inability to effectively process visual stimuli that creates a variety of visual, physical, cognitive, emotional, and neurological symptoms.

As one might expect, symptoms of Irlen Syndrome include difficulty with reading and comprehension, issues with stability and clarity of print, and difficulty with high contrast (black print on white paper, patterns). But because Irlen Syndrome involves the brain's inability to process all visual information it receives, and the stress on the brain can have a cascading effect throughout the entire body, it affects much more than just reading. Irlen Syndrome can also result in significant physical symptoms, such as headaches, migraines, nausea, fatigue and anxiety, as well as difficulties with math computation, handwriting, copying, reading music, depth perception, sports performance, listening, attention and concentration.

Irlen Syndrome is not identified by current educational, psychological, ophthalmological, or medical tests. In fact, many individuals with Irlen Syndrome go unidentified well into adulthood, simply being told they are dumb, stupid, or lazy because all the tests show there is nothing wrong with them. When left untreated, Irlen Syndrome can lead to school failure, unrealized adult potential, and, research suggests, even a path into the criminal justice system.

Who Is Affected?

Irlen Syndrome affects 12-14% of the general population, approximately 50% of individuals with reading difficulties, dyslexia, and learning disabilities, and about 30% of those with ADHD and autism. These children are misidentified and not getting the help they need. It is a pervasive problem that affects students of all

academic levels from the learning disabled and struggling student to the gifted student.

What Causes Irlen Syndrome?

As is the case with many educational and psychological disabilities (including dyslexia and autism), a definitive cause for Irlen Syndrome has yet to be determined. While there is a strong hereditary component, Irlen Syndrome can also be acquired through brain injury or illness. There are presently two theories that try to explain the visual processing deficits associated with Irlen Syndrome: the transient visual subsystem deficit and the cortical hyperexcitability theories. The first suggests that there are issues with the magnocellular pathway that brings information to the primary visual cortex, conveying information about motion. The second proposes that there is a lack of inhibition in the orientation columns in the visual cortex, and this lack of inhibition causes excitation to spread throughout the visual system resulting in difficulty in processing visual information. In either case, it is suggested that color can improve perceptual processing for individuals experiencing difficulties.

The Treatment: Colored Overlays and Precision-Tinted Spectral Filters

In 1983, while working under a federal research grant at the California State University of Long Beach, Helen Irlen discovered that filtering the visual information before reaching the brain through the use of either colored overlays or spectral filters (worn as glasses), could allow the brain to correctly process the visual information it received. In doing so, these colored overlays and spectral filters could eliminate symptoms associated with Irlen Syndrome and improve reading fluency, accuracy, and comprehension, improving grades and test scores. As such, at its outset, the Irlen Method was designed to address problems associated with reading difficulties. Colored overlays in particular are effective primarily for addressing issues related to reading. In a classroom setting, colored overlays are an easy, inexpensive, and non-invasive intervention that can complement any other program of remediation and reading instruction. Issues that go beyond reading, including writing, math computation, copying, listening, depth perception, attention and concentration issues and headaches and stomachaches, often respond better to the use of spectral filters, which can be worn as glasses to filter light from the entire visual field.

Irlen Colored Overlays and Irlen Spectral Filters are used by millions of children and adults in more than 45 countries around the world. Colored overlays and/or colored filters are recognized as a standard accommodation for standardized testing in many states in America, including California, Arkansas, Florida, Oklahoma, Nevada, Massachusetts, New Mexico, and Washington. The SAT, LSAT, ACT, Learning Ally, Illinois Department of Rehabilitation, Indiana Office of Vocational Rehabilitation, Michigan Rehabilitation Services, Texas Commission for the Blind, Nevada Vocational Rehabilitation Services, and Wisconsin Vocational Rehabilitation all officially recognize Irlen Syndrome. In Australia, the following are a sampling of agencies which have officially recognized Irlen Syndrome: Department of Employment, Education & Training, Departments of Army, Navy, and Air Force, Board of Studies – NSW, Board of Secondary Education – WA, Department of Children’s Services – WA, Commonwealth Employment Service (CES), Department of Rehabilitation, Geelong Medical Fund, and Technical and Further Education (TAFE).

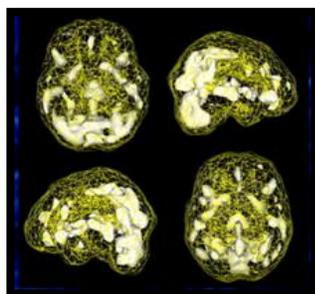
Summary of the Scientific Research

There is currently a body of research related to Irlen Syndrome, Colored Overlays and Colored Filters that spans more than 30 years. The Irlen Method and the efficacy of colored overlays and colored lenses has been the subject of over 200 research studies encompassing the disciplines of education, psychology, and medicine. To

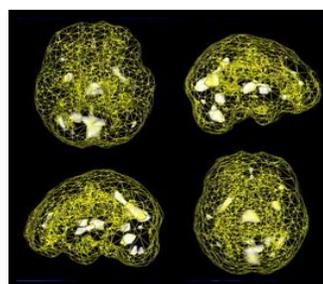
date, more than 100 of these studies supporting the use of colored overlays and lenses to treat the perceptual processing difficulties associated with Irlen Syndrome are published in peer-reviewed academic and scientific journals, including the Journal of Learning Disabilities, Australian Journal of Special Education, Perceptual and Motor Skills, Australian Journal of Learning Disabilities, Journal of Clinical & Experimental Neuropsychology, Journal of Research in Reading, Behavioral Optometry, and Ophthalmological and Behavioral Optics, among others. This research has established a hereditary component of the disorder (Loew & Watson, 2012; Robinson, Foreman, & Dear, 2000; Robinson, Foreman, Dear & Sparkes, 2004), a number of biochemical markers for problems associated with Irlen Syndrome (Robinson, Roberts, McGregor, Dunstan, & Butt, 1999; Robinson, McGregor, Roberts, Dunstan & Butt, 2001; Sparkes, Robinson, Dunstan, & Roberts, 2003), and differences between both the anatomy and functioning of brains of individuals with Irlen Syndrome (Chouinard, Zhou, Hrybousky, Kim, & Commine, 2012; Huang, Zong, Wilkins, Jenkins, Bozoki, & Cao, 2011; Lewine, Davis, Provencal, Edgar, & Orrison, 1997; Riddell, Wilkins, & Hainline, 2006; Yellen & Schweller, 2009). The research has repeatedly documented efficacy of both colored overlays and spectral filters, as measured by improvements in a variety of reading skills (Bouldoukian, Wilkins, & Evans, 2002; Nobel, Orton, Irlen & Robinson, 2004; Park, Kim, Cho, Joo, 2012; Robinson & Foreman, 1999; Tyrrell, Holland, Dennis, & Wilkins, 1995; Williams, LeCluyse, & Rock Fauchoux, 1992; Wilkins, Evans, Brown, Busby, Wingfield, Jeanes & Bald, 1994), reduction in physical symptoms that include headaches, migraines, eye strain, fatigue, and light sensitivity (Barbolini, Lazzarini, Pini, Steiner, Del Cecchio, Migaldi, & Cavallini, 2009; Bulmer, 1994; Chronicle & Wilkins, 1991; Huang et al., 2011; Wilkins & Wilkinson, 1991), and improved functioning and success in both academia and the workplace (Bulmer, 1994; Irlen & Robinson, 1996; Robinson & Conway, 1994; Robinson & Conway, 2000; Whiting & Robinson, 1988; Whiting, Robinson, & Parrot, 1994).

Notably, the most current research on Irlen Syndrome and the use of color utilizes advanced brain-mapping technology to show actual changes and normalization of brain functioning that is not achieved through ophthalmological treatments (plain lenses, prisms, or vision therapy). Researchers have utilized functional magnetic resonance imaging (fMRI), visual evoked responses (VER), and single photon emission computed tomography (SPECT) scans to objectively document the profound effects of visual sensory overload on the brain and the normalization of brain activity when individually-prescribed, precision-tinted colored filters are worn. In one study by Amen and colleagues, comparing the brains of 42 people with Irlen syndrome to 200 age-matched individuals without any evidence of Irlen syndrome, SPECT scans showed increased activity in the brain's emotional and visual processing centers and decreased activity in the cerebellum (an area that helps to integrate coordination and new information).

WITHOUT IRLLEN SPECTRAL FILTERS
Overactive Brain



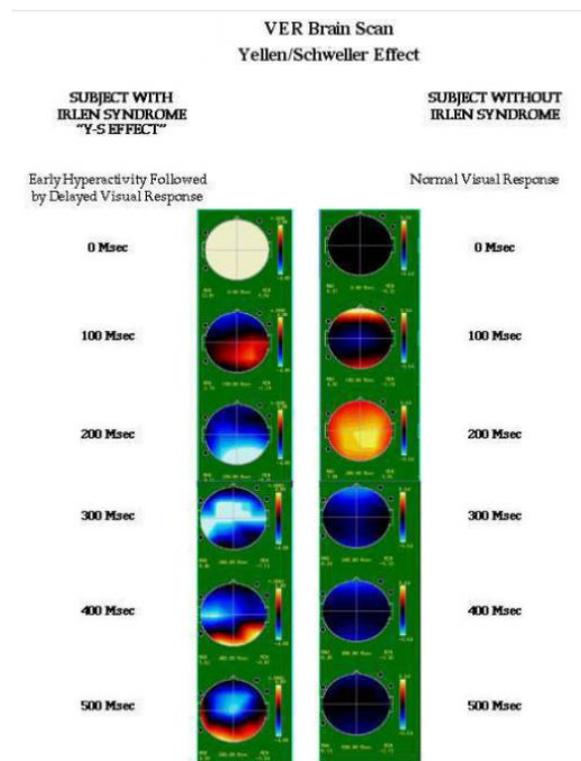
WITH IRLLEN SPECTRAL FILTERS
Calm Brain with Normal Function



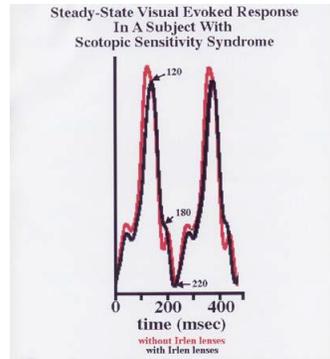
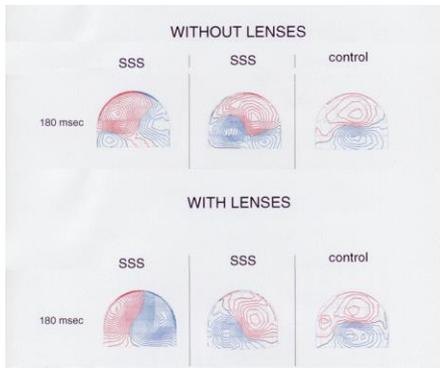
SPECT scans courtesy of the Amen Clinic

Kim et al. (2015) investigated patterns of functional magnetic resonance imaging (fMRI) activation during sentence reading before and after wearing color-tinted lenses. The results showed the reading speed of patients improved more than 20% while wearing the selected lenses. This is the first study to use brain imaging as a direct correlate to reading performance, showing that changes in brain function with precision-tinted colored lenses correspond directly to positive improvements in reading performance.

Yellen and Schweller (2009) utilized state-of-the-art Visual Evoked Responses (VER), a portion of their comprehensive neuroelectrical evaluation of patients called the DESA®, and discovered that individuals with Irlen Syndrome have early hyper reactivity to visual stimuli somewhere between 30-60 milliseconds, and it is 3-9 standard deviations above normal (the Yellen-Schweller Effect). Irlen Spectral Filters reduce the standard deviation abnormalities of the Yellen-Schweller Effect, lessening of the delay of the brain coming back “online” and allowing it to clear sooner.



Lewine et al. (1997) utilized magnetoencephalography (MEG) to characterize visual responses in conditions with and without lenses. In all cases, the evoked magnetic signal reflected a complicated pattern of bilateral activation of multiple cortical generators. A major difference in with and without lens conditions was seen between 170 and 200 msec post-stimulus. The data suggest that the colored Irlen lenses provide for normalization and crystallization of visual information processing in individuals with Irlen Syndrome.



Lewine (1997)

Chouinard et al. (2011) compared the neurological characteristics of a person with Irlen Syndrome with control subjects who were participating in a language. The descriptive results indicated that there are numerous significant differences in many areas of the brain cortex between the control subjects and the individual with Irlen Syndrome, providing evidence of a neurobiological foundation to Irlen Syndrome.

Huang et al. (2011) used fMRI to investigate differences between individuals suffering visual stress and controls in relation to migraine and to determine the effectiveness of precision-tinted colored filters for individuals suffering from visual stress. The research showed a normalization of cortical activation and spatial frequency tuning in the migraineurs by precision tinted filters that suggests a neurological basis for the therapeutic effect of these lenses in reducing visual cortical hyperactivation in migraine.

Highlights From School District Reports and Pilot Studies

In addition to current brain research, and a history of educational research published in scientific journals that documents the benefits of Irlen Colored Overlays and Spectral Filters for adults and children from a variety of populations, there have been a large number of informal educational reports submitted to administrators and decision-making personnel in school districts around the world that document the impact of implementing Irlen Testing and Colored Overlays within the school system. Below we detail highlights from a few key reports. As expected, these reports and the data they present are not subject to the scrutiny of the scientific journal review process, but these results have been used to make budgetary, staffing, and curriculum decisions within the school district and highlight real results from real schools around the world. In all cases, students using colored overlays showed significant improvements, and recommendations were to continue using colored overlays within the schools. Below are selections pulled directly from these reports.

2014 District-Wide Irlen Screening in Bay St. Louis/Waveland Schools, Mississippi, USA. In 2014, the Bay St. Louis/Waveland School District embarked on a pilot study implementing Irlen Screening and Colored Overlays with 3rd graders. It was one of many interventions the district decided to implement as a way of combating the 3rd Grade Gate, a newly instituted policy that requires all third graders to be reading at or above grade level by the end of the third grade in order to progress to 4th grade. Based on past data, the district estimated that more than 25% of their third graders would not qualify to progress to 4th grade and would need to be held back. Certified Irlen Screeners screened all 3rd grade students at one school, and students identified as having Irlen Syndrome were placed in either a test (N=42) or control group (N=43). Children in the test group were given their prescribed Irlen Colored Overlay to use in class for three months, while the control group did not receive a colored overlay. All children's reading performance was tested at the beginning of the year, and then again after the 3-month intervention period using the NWEA standardized assessment given to all

children in the district in the fall, winter, and spring. **Results: After 3 months, an additional 19% of students in the test group met the national norm in the winter (increasing from 51% to 70% passage rate after using their Irlen Colored Overlays for 3 months).** In contrast, there was no increase in the percent of the control group meeting the state norm on the NWEA from fall to winter (48% fall/44% winter). Based on the results of this pilot study, the Bay St. Louis/Waveland School District approved district-wide (grades K-12) screening for Irlen Syndrome in 2016.

2006 Pilot Project: Stoddard Elementary School, Anaheim City School District, California, USA. All 4th, 5th, and 6th graders in the school were screened for Irlen Syndrome. Twenty-five percent of students tested were determined to have Irlen Syndrome and were given their preferred Irlen Colored Overlay to use both at school and at home. Students who were given overlays were able to use them on the California State Test (STAR).

Results: Test scores for the school went up by 25%. The biggest gain for the overlay students was at the Proficient Level (grade level). Of the students scoring Proficient in 2005, 54% of the students using overlays moved up to the “advanced” (above grade level), while only 17% of the group not using overlays moved up to “advanced” on the 2006 tests.

2000 Boyd School, Colorado, USA. All staff at Boyd School were trained in the Irlen Method to identify and refer students for Irlen Testing. Of the total population of 207 third graders, 10% were identified as having Irlen Syndrome and were given Irlen Colored Overlays to use. 50% of the students using Colored Overlays made significant gains in reading. The students were pre/post tested using the following assessment tools: North West Education Assessment, Colorado Student Assessment Program, Quantitative Reading Inventory-II, and an individually administered 45-minute reading performance assessment. **Results: A definite correlation was shown between identification of Irlen Syndrome, consistent use of colored overlays, and advancement in reading.** Many students showed gains of over two grade levels.

1999 Pioneer Valley Pilot Project, Massachusetts, USA. A study funded by the Massachusetts State Legislature and the Massachusetts Department of Education was conducted to test the effectiveness of using colored overlays as an intervention for increasing reading performance for students identified with Irlen Syndrome. All 4th graders (172 children) in the South Hadley School District were screened for Irlen Syndrome. Twenty-seven percent were identified as having moderate to severe symptoms and tested to determine their appropriate colored overlay. Of this group, 30 met the additional criteria of having a minimum of a second grade word attack skills and lacked multiple layers of problems. Fifteen of the students were receiving special education services. All 30 students were pre/post tested using the Rosner Test of Auditory Analysis Skills, the Woodcock-Johnson Tests of Achievement Form B, and the Gray Oral Reading Test-3 Form A & B. Post testing was done two weeks after and again three months after the children were given their correct colored overlays. **Results: 100% of the students demonstrated statistically significant improvement in accuracy and/or comprehension.** Mean increases were 2.6 years in accuracy and 2.3 years in comprehension. 83% of students reading below grade level increased their scores by 9 months to 4.1 years in accuracy. 97% of students gained at least one year in one key reading skill: rate, accuracy, comprehension or passage fluency. 90% of students gained one year in two key reading skills. 73% of students gained at least one year in three key reading skills. 67% of students improved at least one year in all four reading skill areas tested.

1994 The effect of Irlen colored overlays on improving student reading achievement. Report to District 25 Queens: New York City, Board of Board of Administration Studies, New York, USA. The students of reading teachers and resource room teachers in three elementary and three junior high schools were screened. One hundred fifty-one students who showed evidence of reading strain or difficulty on a pre-assessment questionnaire participated in the study. Fifty-five of those students used the Irlen colored overlay on the 1993 standardized citywide reading test. **Results: There was a significant difference in gain scores from 1992 to 1993 for those who used the overlays.** Those students who used the overlays also reported greater ease when reading. Staff with the same reading strain of difficulty problems who had suffered from “reading related”

headaches no longer had headaches when they used the overlays or filters (tinted lenses).

1990 An Intervention for Students with Low Reading Achievement: A Report for the New York City Schools, New York, USA. Twenty-six students identified as having Irlen Syndrome were randomly assigned to either the experimental or control group. The experimental group was given and used their selected Colored Overlay for 4 months in their reading remediation class, when reading at home, and when reading in class. The control group only received 4 months of reading remediation. All students were pre/post tested using the GORT-R (Gray Oral Reading Test) and two subtests of the WRMT-R (Woodcock Reading Mastery Tests) word identification and passage comprehension. **Results: The use of colored overlays increased reading achievement in comprehension, speed and error efficiency on both the GORT-R reading test and WRMT-R reading achievement subtests.** All results were statistically significant. Students in the control group who were not given a colored overlay did not show any growth in comprehension, speed or efficiency, even with an intensive reading intervention program.

1995 Special Needs Students in Kent, England. Twenty special needs students with moderate to severe Irlen Syndrome were divided into 3 groups: given correct Irlen Spectral Filters, given correct Irlen Colored Overlay, given a clear overlay. A group of special needs students who did not have Irlen Syndrome were used as a control group and given a clear overlay. All students were administered the revised British version of the Neale Analysis of Reading Comprehension and Accuracy. Forms A and B were used for pre/post testing which was done less than a month apart to eliminate any possibility that growth could be attributed to instruction. **Results: showed statistically significant improvements in reading comprehension and accuracy for only those students using the correct Irlen Spectral Filters and Irlen Colored Overlays.** All students were monitored after completion of the project, and all students identified as having Irlen Syndrome continue to use their Irlen Spectral Filters or Irlen Colored Overlay. Some of the students have now been able to be removed from special education and placed in regular education, saving the education authority money.

1991-1992 Diocese of Palm Beach Pilot Study, Palm Beach, Florida, USA. Students in two elementary schools and one high school were chosen for the study. Students were pre-screened for Irlen Syndrome, and identified students were individually tested and prescribed a colored overlay. Pre/post testing was done two weeks apart using the Woodcock Reading Mastery Test in the elementary schools and the Skim-Scan Subtests of the Stanford Diagnostic Reading Comprehension Test in the high school. **Results: in the high school there was a mean average improvement in score of 19 percentiles in two weeks. Results in the elementary schools showed a mean average improvement of 11+ months within two weeks.**

1992 Las Cruces Public Schools, New Mexico, USA. Thirty-nine learning disabled students were screened for Irlen Syndrome. Twenty-Two were identified as having Irlen Syndrome and were given their preferred Irlen Colored Overlay to use. Students were pre/post tested using the Woodcock Johnson Psycho-educational Battery – Revised (achievement and reading subtests). Students were divided into three groups depending on whether they had used their overlays most of the time, occasionally, or never. **Results: the more the students used their overlays, the greater the gain in reading, with those using their overlays most of the time showing gains of 1 year and 2 months.** As a result of the project, demand for Irlen Screening increased across the district, with most of the educational diagnosticians in the district ultimately getting trained to administer the pre-assessment and incorporating it into their standard evaluation process.

In Conclusion

Irlen Syndrome is a real condition, with severe consequences if left undiagnosed. Sadly, the disorder is poorly understood, and regularly left untreated, or mistaken for other problems. Ironically, it is quick and easy to screen for, diagnose, and treat with non-invasive, inexpensive colored overlay and spectral filter technology.

Relief and improvement are immediate, thereby allowing students to take full advantage of standard instruction and remediation offered to them. More information about Irlen Syndrome and the Irlen Method can be found at www.irlen.com.

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