



Australasian Association of Irlen Consultants Inc.

President: Dr G. Robinson, Special Education Centre,
University of Newcastle, Callaghan, 2308
Secretary: Mrs B. Freney, PO Box 733, Buderim, QLD, 4556;
Phone: (07) 5445 2458

December 2004

Basic Research into the Irlen Method

The Irlen method is another way of looking at a subset of individuals who, in reality may not be dyslexic nor ADHD, nor have specific learning disabilities, but who may manifest symptoms similar to those displayed by individuals with those disorders. These individuals may or may not have fundamental difficulties in language processing at the level of the phoneme, but they do have difficulty with a subset of perceptual and processing skills that prevent the easy and efficient use of reading skills, thus interfering overall with learning and attention. When incidence data has been collected on this type of processing deficit, it consistently appears as one layer of difficulty in large numbers of people identified with reading, attention or learning difficulties, with estimates of incidence in the general population of 12% to 20% (Evans, Patel, Wilkins, Lightstone, Eperjesi, Speedwell et al., 1999; Jeanes, Busby, Martin, Lewis, Stevenson, Pointon et al., 1997; Scott, McWhinnie, Taylor, Stevenson, Irons, Lewis et al., 2002). It may not be the only difficulty or major problem, but reducing or eliminating this layer can be very beneficial to the educational process of the individual, allowing them to benefit more from other programs or therapies, and reducing their overall level of difficulty.

Diagnosis and treatment with Irlen Filters has been reviewed by the USA Medical Board, and has been determined as not the practice of medicine, and has also been reviewed by various USA Boards of Optometry and been found to be not the practice of optometry. Binocular and accommodative anomalies may occur in conjunction with the syndrome, but are not considered to be the underlying physiological basis of the condition (Evans, Patel, Wilkins, Lightstone, Eperjesi, Speedwell et al., 1999; Evans, Wilkins, Brown, Busby, Wingfield, Jeanes, & Bald, 1996; Evans, Wilkins, Busby, & Jeanes, 1996; Scott, McWhinnie, Taylor, Stevenson, Irons, Lewis et al., 2002; Simmers, Gray, & Wilkins, 2001). The problem is not a medical condition. It is not pathological, nor a disease. It is not, as far as is known, a visual problem due to any abnormality of the eye. As a perceptual problem, it is similar to other processing problems (visual and auditory) which are diagnosed by psycho-educational testing and treated within the educational system.

In USA, there are over 4 000 schools that have implemented the Irlen method. Over 100,000 people have been provided with Irlen Filters; Arizona has passed a bill designating funding for a pilot project and within two years making Irlen screening mandatory in all schools in that state; California has funded a pilot project for the diagnosis and treatment of inmates at Mule Creek Prison, and Alabama has recognised Scotopic Sensitivity as a learning disability. In the United Kingdom, the Medical Research Council has funded extensive research into the Irlen method and coloured filters at Cambridge University and now at Essex University.

Research projects are ongoing around the world, and I have attached a selection for your perusal. Some of these concern Irlen filters, others are investigating the principle of colour filtering. In a recent survey, it was possible to identify 63 studies

involving coloured overlays, coloured computer monitors or coloured lenses. Many of these would be considered to have adequate experimental controls and many were published in peer reviewed journals, conscious of guarding their reputation by not accepting papers with serious methodological flaws. Of the 63 studies reviewed, only 6 produced fully negative results, with 42 finding positive results for particular reading skills, 4 having mixed results and 11 finding improvements in accommodation facility, eye movements while reading, and reduced headaches/migraine. A number of these studies have used placebo controls (Bouldoukian, Wilkins, & Evans, 2002; Jeanes, Busby, Martin, Lewis, Stevenson, Pointon et al., 1997; Robinson & Foreman, 1999; Wilkins, Evans, Brown, Busby, Wingfield, Jeanes, & Bald, 1994; Wilkins & Lewis, 1999).

In addition, a credible scientific theory has been presented and discussed in the literature for some years. This theory relates to a deficit in the magnocellular visual neurological pathway. A recent review of research and series of studies relating to this theory has been published by Chase et al. (2003). The paper by Chase et al. reviews a number of studies which suggest that red light disrupts magnocellular tasks and that the use of blue filters (which filter red light) results in an improvement in reading performance.

In Australia, Associate Professor Greg Robinson from the Special Education Centre at the University of Newcastle has completed a placebo-controlled study of the use of Irlen Filters, and has published numerous other papers on the subject, including evidence of biochemical anomalies in people with Irlen Syndrome. Fundamental research is being conducted by Dr Jeff Lewine, Associate Professor of Radiology and Director of Functional Brain Imaging, University of Utah, and Professor G. Barbolini, Università Degli Studi Di Modena, Dipartimento Di Scienze Morfologiche E Medico, Italy. Brain research at the cellular level has provided new information regarding the operation of the visual pathways in dyslexics as opposed to normal readers, and provides a plausible explanation for the demonstrated effectiveness of Irlen filters whether in the form of lenses or acetate sheets. A single-subject study carried out in the US Naval Air Warfare Center Weapons Division purports to demonstrate, among other things, that the Irlen effect is real, and that varying the energy spectrum presented to the eye of this dyslexic individual was capable of altering visual and cognitive performance for better or worse, to a significant extent.

In light of the ongoing research and the results of clinical surveys, it seems important that this technology be widely available to individuals who suffer with learning disabilities, whose disabilities are not easily resolved by other methods, or for whom Irlen Syndrome may constitute one layer of the disability. While it does not assist all people with learning disabilities, it constitutes a relatively cheap, non-invasive and safe intervention that appears materially to assist a significant number of people with learning disabilities.

SYNOPSIS OF SOME RESEARCH PAPERS

In the United Kingdom, the main researchers have been Professor Arnold Wilkins of the MRC Applied Psychology Unit, Cambridge, and Dr Bruce Evans of the Institute of Optometry, London. While Arnold Wilkins is partly commercially involved with a colour diagnostic method, neither of the above researchers prescribes Irlen lenses.

A study by Wilkins et al. (1994) used a double masked, placebo controlled design with subjects

reporting significantly fewer symptoms when the correct coloured lenses were worn. The Wilkins et al. (1996) study found an immediate and significant increase in reading speed when using coloured overlays.

Evans et al. (1995) investigated the degree to which subjects with symptoms of Scotopic Sensitivity/Irlen Syndrome have undetected optometric problems. It was found their difficulties were primarily of a non-optometric nature and thus do not come within the field of optometry.

The Tyrrell, Holland, Dennis, and Wilkins (1995) study found children read significantly more slowly without a chosen coloured overlay than with it. These effects took 10 minutes of reading time to occur, which verifies the claims of a progressive distortion of print frequently reported by subjects. A later study demonstrated that improved speed of reading could not be attributed to placebo effects nor to optometric or orthoptic factors (Bouldoukian, Wilkins & Evans, 2002).

Another group of researchers centre on Florida with Mary Williams as a key person. This group of researchers does not have any commercial involvement in the use of colour, and have worked independently with colour, having no association with the Irlen technique. The attached study by Williams et al. (1992) found significant improvements in reading comprehension and reading accuracy when using coloured overlays and coloured computer monitors.

A third group of researchers centre on the University of New South Wales. They also have worked independently from Irlen and do not have a commercial involvement in the use of colour. The main researchers are Robert Elliott, Professor in the Education Faculty and Stephen Dain, Associate Professor in the Faculty of Optometry.

Other researchers at the University of New South Wales (Croyle, 1998) have found a significant improvement in a speeded classification task under certain coloured background conditions, which supports the concept of a deficit in the transient visual processing system as outlined in the Williams et al. (1992) article. If the deficit is identified as a visual-perceptual or visual processing problem, it does not lie within the field of optometry.

Our clinical research in Sydney (Whiting et al., 1994) has shown that individuals wearing Irlen lenses for six years indicate continuing improvements in a range of symptoms, from poor reading comprehension to headache.

Associate Professor Greg Robinson from the University of Newcastle is involved in dispensing Irlen lenses, but his research has been published in peer review journals that are conscious of the need for research to be methodologically sound.

A first paper (Robinson & Conway, 1994) found significant improvements in reading comprehension and rate of reading for a group of subjects using Irlen lenses when compared to a control group. Both groups had a similar degree of reading difficulty.

A second paper (Robinson, Foreman, & Dear, 2000) investigated the familial incidence of symptoms of Scotopic Sensitivity/Irlen Syndrome. It was found that for children who have symptoms, there was an 84% chance of at least one parent showing similar symptoms.

A third paper (Robinson, 1994) is a review of current evidence to that date, with the methodological flaws of both positive and negative studies discussed. The review should provide you a good overview of the range of research undertaken. The literature review in the Robinson, Foreman and Dear (2000) study would provide a more recent supplement to this.

A long-term placebo controlled double masked crossover study that was funded by the

Commonwealth Department of Human Services and Health has found three year gains in comprehension and two year gains in accuracy over the 20 months study period for 3 experimental groups, compared to a one year gain for the control group. (*Perceptual and Motor Skills*, March, 1999). Robinson has also found significant gains in comprehension and accuracy over a six-month period in a recent study that involved an experimental group and two control groups, one not using Irlen filters, and one whose application of Irlen filters was delayed three months. The comprehension and accuracy effects tended to plateau after three months, however. Self-esteem was also measured and improved significantly (Robinson & Conway, 2000, 5(1), 4-13).

Robinson and colleagues (Robinson, Roberts, McGregor, Dunstan, & Butt, 1999; Robinson, McGregor, Roberts, Dunstan, & Butt, 2001) have identified a number of biochemical markers for visual processing problems related to Irlen Syndrome. The Robinson et al. (1999) study found significant differences in a number of amino and organic acids, which suggested an alteration in protein and tissue metabolite turnover, which could be indicative of immune system dysfunction and the presence of infection, which in turn may influence the metabolism of fatty acids. The Robinson et al. (2001) study found a significant increase in long chain polyunsaturated acids and a reduction in the odd-chain saturated fatty acid C17:0 (heptadecanoic acid) between the low and high symptom Irlen Syndrome groups. A further study (Sparkes, Robinson, Dunstan, & Roberts, 2003) investigated both children and adults with symptoms of Irlen Syndrome. The Irlen Syndrome group had lower mean levels than the control group for most n-3 and n-6 essential fatty acids. Cholesterol levels were also decreased for the IS group and lower cholesterol levels can be a marker of infection, which in turn may influence the supply of fatty acids.

It is not appropriate, in this important area, to conduct a numbers war with the side having the greatest number of positive studies being declared the winner and the losing side having its research dismissed (as is constantly occurring in the debate about methods of teaching reading). In the interests of balance, I have included both positive and negative studies so that readers may judge, to some extent, for themselves, the merits of the case. However, the case for Irlen lenses has not been fairly stated in the past, and I have provided the above information in an attempt to rebalance the situation. In particular, I was concerned that among the many emerging methods, Irlen has been one of the few identified for negative comment, especially as there are many other areas that do not have the wide research support that this method is now receiving.

Regarding the probable anatomical mechanisms involved in the studies, the papers by Livingstone et al., (1991) and Lehmkuhle et al. (1993) appear to demonstrate the existence of a defective visual pathway in at least some dyslexic individuals, while the report from Lewine et al. from New Mexico (now Utah) indicates that a positive effect on neural organization can be observed in individuals wearing Irlen lenses when subject to magnetic source imaging.

This study at the University of Utah Centre for Advanced Medical Technologies (submitted for publication) has resulted in the following observations, among others:

"This study provides objective physiological evidence for a neurological correlate (and perhaps basis) of scotopic sensitivity syndrome. Specifically, subjects with SSS demonstrate disordered visual information processing when compared to control subjects." And again,

"Perhaps the most interesting aspect of the present study is the objective evidence for a physiological effect of Irlen lenses. The slowing of the early component of the evoked response probably reflects little more than the fact that the lenses reduce the luminance by a factor of 1.5-3 (depending on the particular set of lenses). The effect at 180 msec cannot be explained easily in the same manner. Rather, the data suggest a true alteration in visual information processing by the Irlen lenses. Interestingly, this effect does not seem to influence the 220 msec component.

This suggests that the 180 and 220 msec response components reflect parallel rather than sequential processing. . . . by providing objective evidence for the effect of lenses, it can now be reasonably argued that anecdotal reports of the effectiveness of Irlen lenses should not be dismissed out of hand.”

Assoc Professor Greg Robinson

President

(Dr) Paul R. Whiting

References

- Bouldoukian, J., Wilkins, A. J., & Evans, B. J. W. (2002). Randomised controlled trial of the effect of coloured overlays on the rate of reading of people with specific learning difficulties. *Ophthalmological and Physiological Optics*, 22, 55-60.
- Chase, C., Ashourzadeh, A., Kelly, C., Monfette, S., & Kinsey, K. (2003). Can the magnocellular pathway read? Evidence from studies of colour. *Vision Research*, 43, 1211-1222.
- Cotton, M. M. & Evans, K. M. (1990). An evaluation of the Irlen lenses as a treatment for specific reading disorders. *Australian Journal of Psychology*, 42(1), 1-12. (Greg Robinson replies to this article in the same issue: pp. 13-15.)
- Croyle, L. (1998). Rate of reading, visual processing, colour and contrast. *Australian Journal of learning Disabilities*, 3(3), 13-21.
- Evans, B. J. W., Busby, A., Jeanes, R., & Wilkins, A. J. (1995). Optometric correlates of Meares-Irlen syndrome: A matched group study. *Ophthalmological and Physiological Optics*, 15(5), 481-487.
- Evans, B. J. W., & Joseph, F. (2002). The effect of coloured filters on the rate of reading in an adult study population. *Ophthalmic and Physiological Optics*, 22, 525-535.
- Evans, B. J. W., Patel, R., & Wilkins A. J. (2002). Optometric function in visually sensitive migraine before and after treatment with tinted spectacles. *Ophthalmological and Physiological Optics*, 22, 130-142.
- Evans, B. J. W., Patel, R., Wilkins, A. J., Lightstone, A., Eperjesi, F., Speedwell, L., & Duffy, J. (1999). Review of the management of 323 consecutive patients seen in a specific learning difficulties clinic. *Ophthalmological and Physiological Optics*, 19(6), 454-466.
- Evans, B. J. W., Wilkins, A. J., Brown, J., Busby, A., Wingfield, A., Jeanes, R., & Bald, J. (1996). A preliminary investigation into the aetiology of Meares-Irlen syndrome. *Ophthalmic and Physiological Optics*, 16(4), 286-296.
- Evans, B. J. W., Wilkins, A. J., Busby, A., & Jeanes, R. (1996). Optometric characteristics of children with reading difficulties who report a benefit from coloured filters. In C. M. Dickinson, I. J., Murray, & D. Garden (Eds.), *John Dalton's colour legacy* (pp. 709-715). London: Taylor and Francis.
- Irvine, J. H., & Irvine, E. W. (1997). *Scotopic sensitivity syndrome in a single individual (A case study)*. China Lake, CA 93555-6001: Naval Air Warfare Weapons Division.

- Jeanes, R., Busby, A., Martin, J., Lewis, E., Stevenson, N., Poynton, D., & Wilkins, A. (1997). Prolonged use of coloured overlays for classroom reading. *British Journal of Psychology*, 88, 531-548.
- Jordan, D. R. (1972). *Dyslexia in the Classroom*. Chicago: Bell and Howell. Also in *Overcoming Dyslexia*, Pro Ed, 1989.
- Lehmkuhle, S., Garzia, R. P., Turner, L., Hash, T., & Baro, J. A. (1993). A defective visual pathway in children with reading disability. *New England Journal of Medicine*, 328(14), 989-996.
- Livingstone, M. S., Rosen, G. D., Drislane, F. W., & Galaburda, A. M. (1991). Physiological and anatomical evidence for a magnocellular defect in developmental dyslexia. *Proceedings of the National Academy of Science*, 88, 7943-7947.
- Lovegrove, W. (1984). Dyslexia and the vision factor. *Education News*, November, 15-18.
- Martin, F., Mackenzie, B., Lovegrove, W., & McNicol, D. (1993). Irlen lenses in the treatment of specific reading disability: An evaluation of outcomes and processes. *Australian Journal of Psychology*. 45(3), 141-150.
- Meares, O. (1980). Figure /ground brightness contrast, and reading disabilities. *Visible Language*, XIV, 1, 13-29.
- Menacker, S. J., Breton, M. E., Breton, M. L., Radcliffe, J., Gole, G. A. (1993). Do tinted lenses improve the reading performance of dyslexic children? *Archives of ophthalmology*, 111, 213-218.
- Noble, J., Orton, M., Irlen, S., & Robinson, G. L. (2004). A field study of the use of coloured overlays on reading achievement. *Australian Journal of Learning Disabilities*, 9(2), 14-26.
- Northway, N. (2003). Predicting the continued use of overlays in school children: A comparison of the Development Eye Movement test and the Rate of Reading test. *Ophthalmic and Physiological Optics*, 23(5), 457-463.
- Robinson, G. L. (1994). Coloured lenses and reading: A review of research into reading achievement, reading strategies and causal mechanisms. *Australasian Journal of Special Education*, 18, 3-14.
- Robinson, G. L. W., & Conway, R. N. F. (1990). The effects of Irlen coloured lenses on students' specific reading skills and their perception of ability: A 12-month validity study. *Journal of Learning Disabilities*, 23(10), 589-596.
- Robinson, G. L., & Conway, R. N. F. (1994). Irlen filters and reading strategies: Effect of coloured filters on reading achievement, specific reading strategies and perception of ability. *Perceptual and Motor Skills*, 79, 467-483.
- Robinson, G. L., & Conway, R. N. F. (2000). Irlen lenses and adults: A small-scale study of reading speed, accuracy, comprehension and self-image. *Australian Journal of Learning Disabilities*, 5(1), 4-13.
- Robinson, G. L., & Foreman, P. J. (1999). Scotopic Sensitivity/Irlen Syndrome and the use of coloured filters: A long-term placebo controlled and masked study of reading achievement and perception of ability. *Perceptual and Motor Skills*, 89, 83-113.

- Robinson, G. L., Foreman, P. J., & Dear, K. G. B. (2000). The familial incidence of Scotopic Sensitivity/Irlen Syndrome: comparison of referred and mass-screened groups. *Perceptual and Motor Skills*, *91*, 707-724.
- Robinson, G. L., McGregor, N. R., Roberts, T. K., Dunstan, R. H., & Butt, H. (2001). A biochemical analysis of people with chronic fatigue who have Irlen Syndrome: Speculation concerning immune system dysfunction. *Perceptual and Motor Skills*, *93*, 486-504.
- Robinson, G. L., Roberts, T. K., McGregor, N. R., Dunstan, R. H., & Butt, H. (1999). Understanding the causal mechanisms of visual processing problems: A possible biochemical basis for Irlen Syndrome? *Australian Journal of Learning Disabilities*, *4*(4), 21-29.
- Saint-John, L. M., & White, M. A. (1988). The effect of coloured transparencies on the reading performance of reading-disabled children. *Australian Journal of Psychology*, *40*(4), 403-411.
- Scott, L., McWhinnie, H., Taylor, L., Stevenson, N., Irons, P., Lewis, E., Evans, B., & Wilkins, A. (2002). Coloured overlays in schools: Orthoptic and optometric findings. *Ophthalmological and Physiological Optics*, *22*, 156-165.
- Simmers, A. J., Gray, L. S., & Wilkins, A. J. (2001). The influence of tinted lenses upon ocular accommodation. *Vision Research*, *41*, 1229-1238.
- Sparkes, D. L., Robinson, G. L., Dunstan, H., & Roberts, T. K. (2003). Plasma cholesterol levels and Irlen Syndrome: Preliminary study of 10- to 17-year-old students. *Perceptual and Motor Skills*, *97*, 743-752.
- SPELD (S.A.) Tinted Lenses Study Group (1989). Tinted lenses and dyslexics: A controlled study. *Australian and New Zealand Journal of Ophthalmology*, *17*(2), 137-141.
- Stanley, G. (1990). Rose coloured spectacles: A cure for dyslexia? *Australian Psychologist*, *25*(2), 65-71.
- Tyrrell, R., Holland, K., Dennis, D., & Wilkins, A. (1995). Coloured overlays, visual discomfort, visual search and classroom reading. *Research in Reading*, *18*, 10-23.
- Whiting, P. R. (1988). Improvements in reading and other skills using Irlen coloured lenses. *Australian Journal of Remedial Education*, *20*(1), 13-15.
- Whiting, P. R., & Robinson, G. L. W. (1988). Using Irlen coloured lenses for reading. *The Australian Educational and Developmental Psychologist*, *5*(2), 7-10.
- Whiting, P., Robinson, G. L., & Parrot, C. F. (1994). Irlen coloured filters for reading: A six year follow up. *Australian Journal of Remedial Education*, *26*(3), 13-19.
- Wilkins, A. J., Evans, B. J. W., Brown, J. A., Busby, A. E., Wingfield, A. E., Jeans, R. J., & Bald, J. (1994). Double-masked placebo-controlled trial of precision spectral filters in children who use coloured overlays. *Ophthalmological and Physiological Optics*, *14*, 365-370.
- Wilkins, A. J., Jeanes, R. J., Pumfrey, P. D., & Laskier, M. (1996). Rate of reading test: Its reliability and its validity in the assessment of the effects of coloured overlays. *Ophthalmological and Physiological Optics*, *16*(6), 491-497.

- Wilkins, A. J., & Lewis, E. (1999). Coloured overlays, text and texture. *Perception, 28*, 641-650.
- Wilkins, A. J., Patel, R., Adjamian, P., & Evans, B. J. W. (2002). Tinted spectacles and visually-sensitive migraine. *Cephalgia, 22*, 711-719.
- Williams, M. C., Lecluyse, K., & Rock-Faucheux, A. (1992). Effective interventions for reading disability. *Journal of the American Optometric Association, 63*(6), 411-416.
- Winter, S. (1987). Irlen lenses: An appraisal. *Australian Educational and Developmental Psychologist, 4*(2), 1-5.