1989

An evaluation of the effectiveness of Irlen photopic transmittance lenses in overcoming reading disabilities

Kaye Lowe
University of Wollongong

UNIVERSITY OF WOLLONGONG

COPYRIGHT WARNING

You may print or download ONE copy of this document for the purpose of your own research or study. The University does not authorise you to copy, communicate or otherwise make available electronically to any other person any copyright material contained on this site. You are reminded of the following:

This work is copyright. Apart from any use permitted under the Copyright Act 1968, no part of this work may be reproduced by any process, nor may any other exclusive right be exercised, without the permission of the author.

Copyright owners are entitled to take legal action against persons who infringe their copyright. A reproduction of material that is protected by copyright may be a copyright infringement. A court may impose penalties and award damages in relation to offences and infringements relating to copyright material. Higher penalties may apply, and higher damages may be awarded, for offences and infringements involving the conversion of material into digital or electronic form.

Recommended Citation

NOTE

This online version of the thesis may have different page formatting and pagination from the paper copy held in the University of Wollongong Library.

UNIVERSITY OF WOLLONGONG

COPYRIGHT WARNING

You may print or download ONE copy of this document for the purpose of your own research or study. The University does not authorise you to copy, communicate or otherwise make available electronically to any other person any copyright material contained on this site. You are reminded of the following:

Copyright owners are entitled to take legal action against persons who infringe their copyright. A reproduction of material that is protected by copyright may be a copyright infringement. A court may impose penalties and award damages in relation to offences and infringements relating to copyright material. Higher penalties may apply, and higher damages may be awarded, for offences and infringements involving the conversion of material into digital or electronic form.
An Evaluation of the Effectiveness of Irlen Photopic Transmittance Lenses in Overcoming Reading Disabilities

By

Kaye Lowe

A Dissertation submitted in Partial Fulfilment of the Requirements for the Degree of Master of Education (Honours) in the University of Wollongong

February, 1989
Acknowledgements

To Peter, Nathan, Brian, Frank, Gerry and Tracey:
I appreciate your invaluable support and encouragement.

To the subjects of this project who allowed me to intrude:
I appreciate your willingness to participate.

Kaye Lowe
# TABLE OF CONTENTS

## Volume ONE

### Chapter I.

- Introduction
- Background to Irlen Tinted Lenses and Scotopic Sensitivity Syndrome
- Background Events to Irlen Tinted Lenses in Australia
- Rationale of the Study

### Chapter II.

- Literature Review
- Introduction
- The Tinted Lens Therapy
- Visual Dysfunction and the Tinted Lens Therapy
- Physical Deficit Factors and the Tinted Lens Therapy
- The Reading Process - A Theoretical Framework
- Generalisations Identified in the Literature

### Chapter III

- Methodology
- The Nature of the Evaluation Project
- Evaluation of the Tinted Lens Therapy and the Naturalistic Inquiry Paradigm
- Methodological Data
  - Stages in the Data Collection
  - Methods of Data Collection
- The Sites
- Additional Information
- Data Analysis and Treatment
- Themes Emerging From Data
- Ensuring Credibility of Data
| Chapter IV | Case Studies Summary Stories | Page 95 |
| Chapter V  | Case Study Results           | Page 174 |
| Chapter VI | Results- Experimental Simulations | Page 224 |
| Chapter VII| Conclusion                   | Page 237 |
|            | Discussion of Results        | Page 237 |
|            | Grounded Theory and Interpretation of the Data Collected | Page 243 |
|            | Concluding Remarks           | Page 248 |

**Volume TWO**

**Appendix: See Note Below**

**Bibliography**

Because of the unusual nature of this project and the scarcity of readily available information a sizeable Appendix has been included.
CHAPTER I
INTRODUCTION

This project sets out to evaluate the effectiveness of the Irlen Photopic Transmittance Lenses (tinted lenses) as a therapy for reading disability.

Specifically, a case-study methodology was applied to sixteen subjects who had been prescribed tinted lenses. As well, experimental simulations were devised to examine the performance of these subjects in a variety of reading and writing contexts.
Background to the Irlen Tinted Lenses and Scotopic Sensitivity Syndrome.

Tinted lenses are prescribed for a condition known as Scotopic Sensitivity Syndrome.

Definition of Scotopic Sensitivity Syndrome.

This term came to prominence in 1983 when Mrs. Helen Irlen, psychologist and co-ordinator of the Adult Learning Disability Programme, California State University, addressed the 91st Psychological Convention and identified the syndrome as "a causative factor," "a previously unrecognised dysfunction of the eye that affects reading and depth perception." (Refer Appendix: Successful Treatment of Learning Disability)

In the Irlen literature Scotopic Sensitivity Syndrome is variously defined as:

(i) A distinct type of visual dyslexia,
(ii) A dysfunction which may be hereditary,
(iii) Sensitivity to brightness which can be related to light source, intensity and colour. (Refer Appendix: What is Scotopic Sensitivity Syndrome?)
Other Irlen practitioners describe it as follows:

Scotopic Sensitivity Syndrome is an inherited physical disability which appears to be a major contributing factor in at least sixty five per cent of cases of reading disability malfunction at the retinal level. (Robinson and Miles, 1987).

Information obtained from the Hobart Assessment Centre states that:

Basically, the retina is transmitting an interference signal to the brain from one of many colours contained in the white background. It appears that sensitivity to one of these colours in the 'white light spectrum' can interfere with the true perception of other images in the same visual field such as print.

Correctly changing the background colour makes the page appear 'normal' to the dyslexic person with Scotopic Sensitivity Syndrome; i.e., the particular colour which is disturbing the visual field of the individual is blocked out.

(Refer Appendix: About the New Discovery)
The Irlen literature claims that Scotopic Sensitivity Syndrome should not be confused with visual acuity and refractive errors; nor can it detected by opthamologists, opticians, developmental vision therapists or optometrists.

The Tinted Lens Therapy

The tinted lens therapy involves filtering out those sections of the light spectrum to which a person is uniquely sensitive. (Robinson, 1987). The Irlen procedure involves prescribing photopic transmittance lenses ("tinted lenses") to minimise visual distortions. Distortions are minimised through the use of thirty tinted lenses used in combination to make approximately one hundred and forty colour tint variants. (Refer Appendix: Visual Dyslexia).

Subjects are asked to select the colour which best eliminates distortions. These distortions relate to the:

... existence of impaired resolution in areas of haloing, shadowing or blurring of letters. Other distortions categorised were vibration and pulsation of letters, stretching of letters at the tops and bottoms, and unequal shading of letters. (Refer Appendix: Irlen 1983).
Other symptoms commonly reported to be characteristic of Scotopic Sensitivity Syndrome include slow reading rate, inefficient reading, poor concentration, difficulty in judging distances, eye strain or fatigue, headaches, and poor concentration. Murphy states that:

In addition, some individuals may also suffer from inhibition disorders which make thought, language, interpretation and even control of supposedly willful (sic) activity difficult. (Refer Appendix: Scotopic Sensitivity Syndrome: An Overview.)

Assessment Procedure

The procedure used to identify symptoms of Scotopic Sensitivity Syndrome involves two consultations. Prior to the initial consultation, clients are requested to undergo an independent optometric assessment, to ensure that any necessary refractive adjustments are made prior to the administration of the Irlen Differential Perceptual Schedule (I.D.P.S).

The initial consultation includes the administration of the I.D.P.S. which is the major instrument of the assessment procedure. It takes the form of a structured interview during which several visual tasks are performed.
The Irlen assessment technique examines the following:

**Photophobia; the ability to adjust to certain lighting conditions,**

**Visual Resolution; the ability to clearly recognise print without distortion,**

**Span of Focus; the ability to perceive groups of words at the same time (often linked to tunnel vision),**

**Sustained Focus; the ability to retain words in focus,**

**Depth Perception; and Eye Strain Symptoms.**

Questions relating to each of the above categories are cited in *A Needs Evaluation of Scotopic Sensitivity at a Tertiary Institution* (Pascoe, Hooley and Chalmers, 1987) and include:

*When you are tired, do you feel like the words could easily go blurry?* (I.D.P.S. General Indicators p. 1).

*When reading, does it take energy and effort to see the words?* (I.D.P.S. General Indicators p 1,2)

*Does the page seem too bright?*(Photophobia, p. 3).

*Does the white background compete with the letters for your attention?* (Photophobia, p.4).
Do you have trouble sight reading music because you cannot keep track of the notes? (I.D.P.S. General Indicators, p. 10 part IX, Alternative Near Point Activities, Q. 1 and Q. 2).

Do you inappropriately use punctuation marks in your essays? (I.D.P.S General Indicators, p. 11).

In relation to the questions asked in the I.D.P.S., Whiting claims that:

Since the successful administration of the I.D.P.S. is very dependent on the ability of clients to report their own experiences, it is considered desirable that no people under the age of ten years be included in the Study. (Refer Appendix: New Help for the Learning Disabled).

The second consultation determines the appropriate combination of lens tints. This procedure employs the use of both coloured papers and overlays.

While the exact mechanisms are not fully understood, it is believed that by selectively reducing specific wavelengths of light and letting in those rays which the eye can handle, the focus on the retina is slightly shifted to produce sharper, clearer, and more stable vision. (Refer Appendix: What is Scotopic Sensitivity Syndrome?)
Stated Outcomes

Whiting contends that:

...when the correct coloured filters are applied to individuals with Scotopic Sensitivity Syndrome as a major part of their learning disability, immediate and significant increases in ease of reading, rate of reading, reading comprehension and accuracy of reading are achieved. (Refer Appendix: New Help for Learning Disabled, p. 6).

He also states that the real results are achieved using plastic lenses in spectacles because then significant improvements in handwriting are possible.

...the optimum effect was obviously to be obtained by having the coloured filter interposed between the eye and the page at a place closer to the eye than to the page. In this way, improvement might be obtained while writing, as well as during reading. (Refer Appendix: SPELD News).

Murphy contends that as with any treatment, individuals should be re-evaluated periodically, because the tinted lenses are known to fade and the visual system could alter. O'Connor, whilst not stating the necessity of re-evaluation, recommends:
...intensive remedial help from a resource/remedial teacher to allow them (the clients) to realise their full potential and to "catch up"... do not expect magical results overnight. (Refer Appendix: Insight, p. 3).

In SPELD News (Refer Appendix) Whiting states that "When the spectacles have been tinted, a follow up visit is required (about three months later) just to check on the client's progress." Information contained in "What is Scotopic Sensitivity Syndrome?" states that "As with any treatment, it is imperative that individuals are re-evaluated on a continual basis."

However, in a newsletter to prospective clients, he claims that there is no follow-up normally necessary, "except to check that everything is going well."

Whiting asserts that the symptoms do not dissipate with age; "...that is, children will not 'grow out of it.'" Murphy contends that because Scotopic Sensitivity Syndrome is found in adults, Whiting's assertion has merit. Individuals, Murphy states, "develop coping strategies in order to compensate or overcome difficulties." (Refer Appendix: Scotopic Sensitivity Syndrome: An Overview).
Background Events to Irlen Tinted Lenses in Australia

When Channel Nine's "60 Minutes" programme screened a segment on Irlen Lenses in March, 1985, the Australian general public was exposed to Scotopic Sensitivity Syndrome for the first time. The programme referred to an experiment wherein a learning disabled boy (John) was sent to America by the programme to be prescribed tinted lenses. An outline of the experiment was contained in a substantial article in The Australian Women's Weekly (Refer Appendix) which appeared shortly after the screening of the television program. Whiting referred to this article as "...featuring an Australian boy and his mother, both of whose reading abilities have been improved by the use of the lenses." Small articles on the subject of tinted lenses have since appeared in the Local, National and International Press. (Refer Appendix).

It was in 1985 that Irlen visited Australia for a lecture tour sponsored by John S. Cheetham Pty Ltd, Education Consultants, Melbourne. Whilst in Australia, she conducted the training necessary to enable Dr. P. Whiting to perform screening procedures and tinted lens prescription. Dr. Whiting continues this work from the Evelyn McCloughan Children's Centre, Sydney. At the time of this Study there were seven
known assessment centres in Australia, located in Sydney, Newcastle, Tamworth, Canberra, Hobart, Mount Waverley, (Vic.) and Mandurah (W.A.)

Rationale of the Study

Specifically, there were three reasons why this research project was considered timely. The topic was held to be somewhat controversial, there was a lack of research data regarding the efficacy of the tinted lenses therapy in overcoming reading disability, and involved significant costs to those who sought the tinted lens therapy.

(i) The Controversial Nature of the Tinted Lens Therapy

There had been increased interest in the tinted lenses since the T.V. Program "60 Minutes" (T.C.N. 9, March, 1985) publicised them as being a new development in the United States. This new development promised to give hope to those with learning disabilities. (Refer Appendix: New Help for the Learning Disabled).

According to Whiting, "60 Minutes" announced that no other segment of the program had ever received a public response of similar dimensions. (Refer Appendix: SPELD News).
It seemed that the statements made by those prescribing the tinted lenses were most encouraging. As stated by Dr Whiting:

A conservative estimate of people with learning difficulties around the world is ten percent of the population. Of these, half might be helped through an appropriate 'tinted lens' programme... in other words, some 750,000 Australians. (Refer Appendix: The Australian Women's Weekly).

In the United States, Irlen claimed to have treated three thousand subjects in a four and a half year period at a small clinic attached to California State University. (Refer Appendix: How Difficult Can Reading Be?).

Claims of such note cannot be dismissed, particularly in light of the fact that even with the massive increase in theory-building and research within the last two decades, little consensus emerges in relation to what is truly effective. (Singer and Ruddell, 1976; Wilsher and Taylor, 1986).

An avenue of such promise deserves not to be overlooked, and as Whiting states "It is hoped that the development of the Irlen lens programme will enable a much larger number of people to lead more normal
lives, and certainly to be more successful in their reading." (Refer Appendix: How Difficult Can Reading Be?).

(ii) Lack of Research Data

Over five thousand books, journals and articles were searched in an attempt to identify references to Scotopic Sensitivity Syndrome or the Irlen Tinted Lens Therapy.

Search sources included ERIC, Psychological Abstracts, Australian Education Index, Medline, Exceptional Child Education Resources, Psycalart, and Dissertation Abstracts. No articles were found which referred directly to Scotopic Sensitivity Syndrome or to the use of tinted lenses. The search was widened to include truncated terms such as scotopic and retina combined with reading failure, reading disability, dyslexia and learning disabilities. No articles appeared in the Education Index, whilst thirteen appeared in psychological and medical abstracts as a result of this extended search. Of these articles, most referred to Scotopic Sensitivity in animals such as coyotes, ducks, monkeys and pigeons.
Zimmerman, a former practitioner with the Irlen Institute states "One of the major problems with tinted or coloured glasses is the lack of research in this field." (Rainbow Optics, 1988, p.15.)

Murphy, an Irlen practitioner in Hong Kong, states:

In fact, until Mrs. Irlen's original work, apparently no references specifically related colours to retinal and neurological activity with reduction in discomfort and increases in efficiency of reading. (Refer Appendix: Visual Dyslexia—Successful Treatment with Irlen Lenses. (Draft) p. 5).

The only article found that referred specifically to Scotopic Sensitivity Syndrome was: The Use of Coloured Overlays to Improve Visual Processing—A Preliminary Survey. (Robinson and Miles, 1987). This article reported the results of an experiment with coloured sheets of plastic in an effort to overcome reading disability. It concluded that:

The present investigation has indicated that, in the short term, coloured overlays can assist particular individuals to achieve some significant improvement in the visual processing of easy verbal material. Possibly the wearing of more
accurately prescribed coloured lenses would yield even greater short term gains. This view is not supported, however, by the failure to find differences in word identification, which is the task most similar to normal reading (although task difficulty could be a contributing factor in the failure to find differences on this task, as discussed previously.) (p. 70)

The lack of appropriate studies dealing with Scotopic Sensitivity Syndrome and the prescription of tinted lenses led to the compilation and inclusion in this study of a sizable appendix of information not readily available elsewhere.

The Irlen literature referred to the tinted lenses being prescribed in the United States, Australia, New Zealand, the United Kingdom, the Netherlands and Hong Kong. Information was sought from each of the seven Australian Irlen trained practitioners during the course of this study.
(iii). Costs Incurred

Evaluation was essential not only because of the number of people directly affected, but also because of the significant costs incurred by many of those involved. Clients pay a minimum of $A65.00 for each of the two screening sessions, as well as the cost of the tinted lenses themselves. In each case the lenses are custom tinted in the United States. (Refer Appendix: New Help for the Learning Disabled).

Costs are not only incurred in obtaining the tinted lenses themselves, but also in the often extensive searches made by parents in efforts to find the solution to reading disability. If the tinted lenses provide a means of addressing reading disability then the costs referred to by Whiting in the following quote need not be a consideration.

The Evelyn Mc Cloughan Children's Centre: 
...has seen children who have had eight, ten, or more years of continuous remedial instruction, which has cost the parents in excess of ten thousand dollars. The result is in most cases, a child who reads poorly, or with difficulty. (Refer Appendix: How Difficult Can Reading Be?).
Needless to say, despite the efforts and best intentions of others researching in the field of reading disability, the problem endures. Whiting agrees "There are lots of avenues of research, but they are not coming up with very good answers for a lot of people." (Refer Appendix: The Australian Women's Weekly). He also claims that the tinted lenses discovery is probably "...the most significant breakthrough in the understanding of learning difficulties."

This project attempts to illuminate the credibility of such claims.
CHAPTER II
LITERATURE REVIEW

Introduction

_It works out expensive, but I said I'd take the kids to the moon if it'd help. As a parent you are very vulnerable. I sometimes think they must say "here come the suckers again." I've spoken to so many people._ (Interview with a subject's parent, 1987).

These words reflect the anxiety often experienced by parents whose children suffer from reading disabilities. Not only parents, but professionals have grappled with the riddle of reading disability. Still, the causes of reading disability and the "cure" for it remain controversial and emotive issues.

Since the initial clinical descriptions at the turn of the century (Morgan, 1896; Hinshelwood, 1900), reading disability has generated controversy regarding both cause and treatment.
Like Joseph's coat, the history of reading research is a thing of many colours. It is not a single continuous stream of human endeavour but has at least four and perhaps as many as six independent threads, each with its own methods and each moving to the beat of a different drummer. (Venesky, 1970, p. 3)

The reading disability literature identifies a multiplicity of unusual and sometimes bizarre "treatments" or therapies, each claiming to be the solution to reading disability. However, as stated by Wilsher and Taylor (1986); and supported by Jorm (1983) and Singer and Ruddell (1970). "There is no currently accepted means of treatment which is clearly proven to be highly effective or fast." (Wilsher & Taylor, 1987, p. 437). Whiting agrees "No single line of research has, to this point, yielded results that provide substantial immediate benefits to the learning disabled." (Refer Appendix: New Help for the Learning Disabled, p. 3).

Concerned parents and professionals seek solutions only to be confronted by a collection of therapies ranging from covering one eye or the prescription of drugs, to the wearing of tinted lenses. Parents are often desperate to find the solution to the problem and consequently as Wilsher and Taylor
claim "this makes them easy prey for people touting easy answers." (p. 437). It seems that professionals cannot agree and parents are usually not in a position to evaluate the relative merits of such an array of therapies.

The mass of literature (often with inconclusive results) only adds to the confusion. In 1967, Eichenwald claimed that the previous seventy years had produced in excess of twenty thousand books, articles and papers on the subject. Many factors have been identified as having contributed to reading disability and just as many therapies have emerged. However, it is the trail that specifically relates reading disability to visual dysfunction that forms the organisational structure of this chapter. The justification for this organisational structure flows from statements made by both Irlen and Whiting.

Irlen claims that her research would: "redirect attention back to specific visual dysfunction as a major factor in dyslexia." (Refer Appendix: Irlen, 1983).

Whiting states that:

"Finally, these new observations bear on the question of the reading process itself, and the degree of visual information which is
necessary for success in reading. Where visual information is minimised, for some people reading becomes an impossibility. Only when we maximise the amount of visual information available to them does reading become fluent, and comprehension become easy." (Refer Appendix: How Difficult Can Reading Be? 1985, p. 6).

The organisational structure of this chapter is outlined in Figure 2.1 below.

Figure 2.1 is a schematic representation of the relationship that exists between the tinted lens therapy and the various components of the reading disability field. Subsequent to the literature
available on tinted lenses being reviewed, the tinted lens therapy is located within the context of visual dysfunction and reading disability. The reason for this is that Irlen’s own research (as stated previously) would "redirect attention back to specific visual dysfunction as a major factor in dyslexia."

Following this, the tinted lens therapy is located within the broader context of physical factors as they relate to reading disability. The reason for this is that the tinted lens therapy seeks to overcome a physical deficit; namely Scotopic Sensitivity Syndrome.

The chapter then demonstrates that the tinted lens therapy emerges from a specific theoretical standpoint; namely the "outside-in" explanation of how the reading process operates. In order to clarify the positions which this "outside-in" explanation adopts, it is compared to another theoretical standpoint; namely the "inside-out" explanation of the reading process.

Finally, the chapter locates the tinted lens therapy within the very broad context of reading disability itself, because there are certain generalisations and issues that need to be recognised as impacting on all resultant therapies.
Irlen's research recognises visual dysfunction as a major factor in dyslexia. She contends that whereas visual dysfunction in the past was limited to the "refractive error of the eye, muscle imbalance, and vergency and accommodative difficulties" Scotopic Sensitivity Syndrome occurs once the image is focused on the retina. The research indicates that individuals with Scotopic Sensitivity respond dysfunctionally to specific wave lengths of light. Full spectral light produces over stimulation of the retinal receptors and this dysfunction causes problems with seeing the print on the page clearly.

However, Lovegrove, claims that "...visual persistence differences mediated by spatial frequency that have been reported between good and poor readers are likely to be cortical and not retinal in origin." (W. J. Lovegrove, et al; 1980)

Whilst Irlen and others identify a retinal dysfunction as a contributory factor, others claim that no cause can be identified. Whiting states that: "No cause for Scotopic Sensitivity Syndrome is known. It is postulated that a retinal dysfunction is involved and that it is genetically determined." (Refer Appendix: New Help for the Learning Disabled, p. 4).
Murphy goes a step further in venturing that reading disability "resides on chromosome fifteen" or is acquired following "head trauma, viral encephalitis, stroke activity etc." (Refer Appendix: Scotopic Sensitivity Syndrome—An Overview, p. 1.)

Irlen (cited in Murphy) reported a remediation effect rate for those screened of between seventy to eighty percent. Whiting states that preliminary results of those screened at the Evelyn Mc Cloughlan Children's Centre indicated that fifty to seventy percent of the learning disabled referred to the Centre could be assisted by the tinted lenses. (Refer Appendix: How Difficult Can Reading Be?).

Murphy, in the article Scotopic Sensitivity Syndrome—An Overview claims that as many as fifty percent of individuals who have reading difficulties, have Scotopic Sensitivity Syndrome to some extent.

To add to the confusion, Miller (1984) carried out a study of sixty five subjects which investigated Scotopic Sensitivity Syndrome and reading disability. The study concluded that:

The preceding data and categorisation of results leads to the conclusion that Scotopic Sensitivity is a condition which is present in groups of both low reading ability and high reading ability adults. (p. 46).
It appears that there is no consensus on the percentage of people claimed to be helped by the tinted lens therapy.

Research by Wilsher and Taylor (1987) criticises the lack of scientific evidence supporting Irlen's claims. They state that there were no control groups in the experiments carried out by Irlen and Murphy (1986). "The proponents of these treatments did not control for motivation, attention, and Hawthorne effects..." (p. 444).

The available literature is also critical of the screening procedure advocated by the Irlen Institute.

Further research was done in the U.S. by Helen Irlen, during the years 1981 through 1985 in California. She went from coloured overlays to soft plastic lenses to get the necessary tint or colour to rectify visual dysfunctions associated with dyslexia. This method, known as "The Irlen Lenses" was somewhat successful in treating this dysfunction, but the assessment was complicated, unsatisfactory and expensive. All lenses had to be tinted in the U.S., necessitating a long wait between assessment and use. (Zimmerman, 1988).
The Irlen Literature does not refer to a minimum age limit below which the tinted lenses should not be prescribed. (Two of the subjects of this project were aged ten and eight years). The I.D.P.S. relies solely on the subjective response of those being interviewed. It is in regard to this that Whiting states in a proposal for a research project that:

"Since the successful administration of the I.D.P.S. is very dependent on the ability of clients to report their own experiences, it is considered desirable that no people under the age of ten years be included in the study."

Orlando (1973) is also critical of visual testing procedures. Measured visual skills often have little to do with reading achievement related tasks, they claim.

It is stated (O'Connor, Murphy, Whiting, and Irlen) that Scotopic Sensitivity Syndrome is genetically determined. According to Irlen "As such, one is born with the condition and it does not improve or deteriorate with time." (Refer Appendix: What is Scotopic Sensitivity Syndrome?).

O'Connor suggests that because Scotopic Sensitivity Syndrome is considered a genetic condition it is not uncommon for other members of the same family
to suffer from the same problem. Murphy explains that "Typically males suffer more from Scotopic Sensitivity Syndrome than their mothers or sisters, who appear to adapt well and are usually not diagnosed." (Visual Dyslexia—Successful Treatment with Irlen Lenses [Draft] p. 2).

Heredity is often recognised as an important factor in reading disability. (Hallgren, 1950; Walker and Cole, 1965; Michal-Smith, et al, 1970). However, other studies of unselected populations have failed to find significant evidence of familial reading disability. (Clark, 1970; de Hirsh, Jansky and Langford, 1966). Harris and Sipay offer an alternative explanation "When a boy grows up in a home with a father who has trouble with reading, imitation and emulation can play an unknown part in the degree to which the son's behaviour resembles that of his father." (p. 269).

Mazurkeiwicz, 1960, claims that male parents unconsciously lead their boys to reject reading as a feminine activity because the male parent fails to provide a positive model of this activity. The research also suggests that these factors can be overcome (Spache, 1960; Bond and Tinker, 1976), or at least compensated for.
Murphy recognises the impact of the tinted lenses on the elimination of emotional problems.

Rather, as the work of this author and that of Mrs. Irlen suggest, individuals who are aided with the lenses find emotional problems to abate. It is not uncommon to see such a change based on the knowledge that the lenses will be coming. (Refer Appendix: Visual Dyslexia: Successful Treatment with Irlen Lenses (Draft) p. 3).

Research by Grant, (1983) recognises the role of emotional problems as a causative factor of reading disability. "The student's failure to achieve literacy is located in the wider context of their failure to develop as confident human beings."

Furthermore:

Recent studies of reading disability point to the high incidence of emotional disturbance among children who fail to read. Whether the emotional disturbance is the cause, the effect, or a concomitant feature of the reading disability is not always clear. (Dahlberg, Rosewell and Chall, 1982 p. 211).
Irlen (1983) reports that "once the lenses have been prescribed, results are immediate and marked improvements in the above areas are obvious."

Whiting: "...the results are almost immediate and lasting—while the spectacles are worn." (Refer Appendix: SPELD News) "It is reported that improvement is sustained." (Refer Appendix: New Help for Learning Disabled).

Results of a study reported by O'Connor, Sofo, Kendell, and Olsen indicate that:

...Scotopic children given the correct coloured overlays did dramatically better than all other groups, gaining an average of 19 months in reading comprehension level in just one week. (Reading Disabilities and Use of Coloured Overlays, Abstract)

However, information obtained in May 1988, from the Hobart Assessment Centre included the following disclaimer:

Due to the complexities involved in reading and other learning related skills, Perceptual Development Corporation and those who represent...
its products make no claims that tinted lenses will automatically increase reading and other academic skills.

As stated previously, there is a dearth of research data. It appears therefore that the notion of "scotopic sensitivity syndrome" and the capacity or otherwise of Irlen lenses to address the problem have not been exposed to systematic, verifiable investigation. Wilsher and Taylor (1986) state: "There appears to be no other data reported and no statistical analysis reported." (p. 444).

Murphy agrees:

At this time, there is no method to evaluate the exact extent of relief found through use of tinted lenses. While Mrs. Irlen's subjects reported increases in reading ability and comprehension and the current research indicated dramatic results with reduction of visual distortions and excellent results in terms of error-rate reduction and increases in words read correctly, there is no way to evaluate against some measure of true innate ability or to evaluate subjective comments. (Refer Appendix: Visual Dyslexia-Successful Treatment With Irlen Lenses).
A study conducted by Miller (1984) concludes that "...scotopic sensitivity could be regarded as a syndrome rather than as a deficit which exists on a continuum throughout the adult reading population." (p. 47).

Furthermore, Lovegrove (1980) suggests that "...disabled readers should experience a general visual deficit on many integration tasks. Difficulties in reading should be only one manifestation of the problem." (p. 440).

The value of their research findings must remain open to doubt as long as independent verification opportunities remain elusive. The Irlen Institute and the licensors restrict the availability of information regarding the testing procedures and the methodology employed. To obtain a licence which gives access to the training, lens kit, training manuals, literature, forms and related material, requires an outlay of 1988 U.S. $6,000.

It appears that there are many shortcomings in the information available; not only is it scanty and often proffered without verification, but the claims which relate complex eye functions to reading disability are made by psychologists and special educators. Scotopic Sensitivity Syndrome is largely ignored by specialists in the Optics field.
No other option exists but to report on a set of materials and articles made available by those who prescribe the Irlen lenses. This data is "untested" because it is often based on unverifiable statements.

Visual Dysfunction and the Tinted Lens Therapy.

The tinted lens therapy is located within the context of visual dysfunction and is one of several therapies designed to eliminate visual processing or "visual perception" problems. According to the Irlen literature indicators that a problem exists are all visually oriented. Visual symptoms identified by Whiting, (Refer Appendix: How Difficult Can Reading Be?) include:

- They skip lines unintentionally.
- They skip words unintentionally.
- They repeat the same line.
- They exhibit eye-strain symptoms.

The field of visual difficulties has featured in the literature since as early as the 1800's when it was dominated by German and French opthamalogists and neurologists. A British opthamologist, W. Pringle-Morgan reported the first case of Reading Disability in 1895. From these foundations, visual perceptual deficits or lags in neurological or perceptual development have been recognised as the
primary cause of reading disability according to research by Park and Burri, 1943; Robinson, 1946; Eames, 1948; Bender, 1957; Rosen, 1965.

In the case of Scotopic Sensitivity Syndrome and the tinted lens therapy Irlen goes beyond previous conclusions.

In the past visual dysfunction has been limited to refractive errors of the eye, muscle imbalances and vergency and accommodative difficulties. This presentation explores dysfunction that occurs once the image has been focused on the retina called scotopic sensitivity. (Refer Appendix: Successful Treatment of Learning Difficulties.)

Contrary to this popularly held belief that visual perceptual skills appear to be related to reading achievement (Kavale, 1982), remedial programs based on such approaches (Examples include Kephart, Getman, Frostig) generally have not been shown to result in significant reading improvement when subjected to well controlled studies. (Goodman and Hammill, 1975; Hammill and Larsen, 1975; Keogh, 1974). Research by Keogh found that the inadequacies of research methodology made the available evidence inconclusive about the value of such programmes. Allington, (1983) points out that despite the
discouraging research results, teachers continue to believe in the efficacy of training deficits in visual perception to improve reading ability. The research results often do not account for motivation and attention effects attached to the remedy. (Wilsher and Taylor, 1986).

Those prescribing tinted lenses contend that in many cases the syndrome identified as Scotopic Sensitivity Syndrome adversely affects the recognition of symbols and hence reading ability. They suggest that eliminating the interference (caused by Scotopic Sensitivity) through the application of visual filters will, as a consequence, result in improved vision. This in turn will lead to improved reading ability. Irlen and others imply that recovery is almost instantaneous. According to the subjects of this case study the need for a "follow-up" consultation was rarely recommended.

On the other hand, Wilsher and Taylor (1987) state that "It has recently become apparent in the press (Sunday Times, 22.12.85) that some people believe that dyslexia can be ameliorated by the wearing of the tinted glasses. There is no scientific evidence to support this notion."

Monaghan (1980, p.98) states that "The first and most obvious lesson is that remediation must take place through channels other than the visual alone."
Some consistent trends in relation to Reading Disability and visual defects are identified in the Literature. These trends are:

1. There is a slightly greater percentage of visual defects among children with Reading disability as opposed to children with no Reading disability.

2. Children with visual defects as a group tend to read more poorly than children without visual dysfunction.

3. On the other hand, many children with visual defects learn to read as well as or better than children without visual defects.

Harris, (1976) states that "If poor vision is a child's only handicap the child may become a good reader in spite of it. Lovegrove (1980) reports "While it was possible to find substantial evidence indicating a visual deficit, there was also considerable data to say that this was not the case." (p.1).

Some children make good progress despite the visual deficiency. (Bond and Tinkler, 1980). It appears that most types of visual defects increase the
possibility of Reading disability. (Bond and Tinker, 1980) but none of the factors alone is sufficient to preclude reading success.

4. Visual defects are seldom the single causal factor in Reading Disability. (Spache, 1976; Bond and Tinker 1980; Harris and Sipay, 1976).

*Children sometimes learn to adjust to, or compensate for a defect and achieve normally. The very same dysfunction to some degree may seriously retard one child and have no apparent effect upon another one of similar age and ability.* (Spache, 1976).

A study conducted by Ellis and Miles (1978) demonstrated that "dyslexics" had no difficulty discriminating between nonsense figures irrespective of whether they were rotated or reversed. Subjects did have discrimination difficulty on the basis of the names of letters. The research concluded that dyslexics have no difficulty with visual perception, but do have difficulty with naming.

5. There are inconsistencies in the research findings. Research into the relationship between visual defects and reading disability is extensive. (Harris and Sipay, 1975). However, disputations have arisen as a result of this research, (Bedwell, Grant and
McKeown, 1980); (Bond, Miles, *et al.* 1980), and persist. (Weintraub, 1972). There are no consistent findings. (Kirk and Chalfant, 1984).

Inconsistencies include the following. The research findings of Eames, (1935), for example, concludes that farsightedness contributes to reading disability. Research by Stromberg, (1978)) draws the opposite conclusion.

Research by Taylor, (1937) and Young, (1963) suggests that certain types of refractive errors are closely associated with reading disability. They claim that binocular difficulties are common among disabled readers. In the case of the child with severe reading disabilities, Keeney and his co-authors (1968), contend that visual acuity, refractive errors, and minor binocular imbalances are not significant factors.

Critchley (1964) maintains that specific developmental dyslexia is a genetically determined constitutional disorder and is not visual in origin. Other workers support this view. (Goldberg, *et al.*, 1970). Wilhelm (1968) contends that the inability of disabled readers to fixate on visual tasks is not necessarily genetically determined but may be stress related.
Similarly, inconsistent research findings exist in relation to at least one of the Irlen assessment techniques. This procedure relates to "span of focus" as contributing to reading disability. Whiting explains it thus "All those conversant with reading theory, will know the importance of a broader span of focus for efficient reading. (Refer Appendix: How Difficult Can Reading Be?). However, a study conducted by Underwood (1982) entitled The Span of Letter Recognition of Good and Poor Readers concludes that there is "no evidence to suggest that skilled readers utilised letter information from a wider region of text than did less able readers."

When considering the tinted lens therapy in the context of visual factors, several cogent reasons exist for inconclusive results. Firstly, vision tests purporting to measure the same visual function do not yield precisely the same results. Secondly, most of the current tests are brief and thus unreliable, (Shubert and Walton, 1980). Thirdly, it appears that the visual development of different age groups is not comparable. (Spache, 1976). Fourthly, Lovegrove (1984) claims that previous researchers failed to find a visual defect, not because it did not exist, but because proper testing procedures were not used to detect or recognise the defects. This claim is supported by Rabin (1982).
Physical Deficit Factors and the Tinted Lens Therapy

If, as Irlen implies, Scotopic Sensitivity Syndrome is a major causative factor of dyslexia, it is reasonable (for the purposes of this project) to place the tinted lens therapy within the context of physical deficit factors as they relate to reading disability.

According to information from the Hobart Assessment Centre, Scotopic Sensitivity Syndrome is a physical deficit in which "...the retina is transmitting a interference signal to the brain from one of the many colours contained in the white background." Whiting asserts that "Scotopic sensitivity is an inherited physical disability..." (Refer Appendix: Insight).

Many therapies rely on the identification of a physical deficit factor as being the cause of reading disability. Such a factor could be visual, auditory, neurological, glandular, cerebellar vestibular, or a speech disorder. Generally, poor readers are classified according to the deficiency displayed. Researchers contend that by eliminating the deficit, reading success will be promoted. However, Reed (1968) claims that it is not possible to classify poor readers by different sets of deficiencies.
However, the majority of unitary deficit theories espoused prior to and during the 1960's failed either to explain the development of reading disability or to provide proven remedial approaches (Forness and Kavale, 1983). Kinsborne and Caplan (1979) describe such approaches as "irrational" and Cambourne and Rousch (1982) label them as "pseudomedical." As well, there is no agreement as to what constitutes "a reading disability." (Keogh, et al., 1982; Algozzine, et al., 1982; Tucker, et al, 1983).

Detailed studies of individual cases have demonstrated that no exact classification of all cases is possible. There exists considerable overlap between categories and disabled readers do not fit neatly into any one of them. (Naidoo, 1972; Vernon, 1977). Rarely does a single physical deficit alone cause reading disability. In fact, as stated by Woestehoff (1970) "Causation in reading disability is generally unknown although numerous unverified theories exist." (p.9).

Despite this, each of five disciplines identified in the Literature (Kirk, 1962; Lerner, 1971) formulates its own theoretical position regarding the nature and cause of reading disability, based on the identification of a unitary deficit. The disciplines are Medicine, Linguistics, Education, Psychology, and other disciplines which include Optometry, Genetics, Anthropology, Computer Science,
and Biochemistry. Consequently, the resultant therapies are as diverse as the disciplines themselves. For example, Medicine concentrates on the aetiology of the disability. Optometry concentrates on visual function alone. (The Irlen tinted lens therapy also concentrates on vision alone, but is a therapy largely ignored by mainstream optometrists.)

However, the research literature suggests that the factors affecting reading disability are indeed numerous and inter-related. Due to the exigencies of research, studies are rarely sufficiently extensive to include the interplay of forces or to adopt an interdisciplinary approach. Strong support for the notion that most cases of reading disability cannot be attributed to a single cause is offered by Robinson, (1946); Reed, (1968); Adams, (1969); Malmquist, (1971); Harris and Sipay (1975).

Also, for every contributing dysfunction identified in the literature there is evidence to support an opposing contention. In most instances the research findings remain inconclusive.
All therapies that profess to ameliorate reading disability relate closely to and evolve from theoretical understandings of the reading process. Although there are as many explanations as there are researchers, two fundamentally different explanations of the reading process can be identified. They are the "outside-in" and the "inside-out" explanations.

Both the "outside-in" explanation of the reading process and the Irlen tinted lens therapy operate from the notion that reading is fundamentally a visual process.

The visual screening procedures employed by the Irlen technique conform to the principles of the outside-in approach. Attention is given to the suitability of the subject for the tinted lenses, and attempts are made to recognise any visual impairments that may exist. Subjects are asked to participate in activities which include identifying figure-ground differentiation, visual form discrimination, figure-ground and brightness contrast. As well, detailed attention is given to individual letter symbols, words, and word parts.
The "Outside In" Explanation

The basic assumption underlying this explanation is that reading is defined as the accurate sequential recognition of isolated symbols. It can be best summarised in Figure 2.2 below.

Print → every letter → phoneme → blended → pronounced → meaning obtained and recognised

This explanation assumes that reading is basically a visual task and it is preoccupied with the accurate errorless reproduction of the text. (Gough, 1972; La BERGE and Samuels, 1974). Anything that impairs or interferes with this recognition hinders reading ability. (Snowling, 1980; Monroe, 1936; Hinshelwood, 1895; Fernald, 1943; Gilligham, 1936). Essential to reading success is the mastery of a set of hierarchic al subs skills. (Flesch, 1955; Austin and Morrison, 1963; Barton and Wilder, 1964).

Detailed attention is given to individual words and word parts. (Hegge, Kirk and Kirk, 1936; Spalding, 1962). Comprehension is not given high priority, but it is assumed to occur as a result of successful decoding. The Irlen literature supports
Perception in reading must precede comprehension." (Refer Appendix: Successful Treatment of Learning Disabilities)

In summary, the "outside-in" explanation focuses primarily on decoding the visual aspects of the text as the key to reading success. The tinted lens therapy is designed to eliminate any interference that may impair the visual recognition of written symbols.

The "Inside-Out" Explanation

An alternate theoretical framework - the "inside-out" explanation - is recognised in the literature. This explanation asserts that reading is only incidentally visual and recoding to sounds is only peripheral to deriving meaning of words. The inside-out explanation contends that the information a reader brings to the reading situation (including knowledge of the world, language and print) is used to anticipate what information lies on the page. This knowledge is as important as the visual display itself. The quest for meaning is paramount, rather than the correct recognition of fractionalised sounds. No hierarchy of subskills predominates. (Goodman, 1967; Smith, 1971).
The practices and therapies which build on this explanation are thus radically different from those employed by "outside-in" therapists.

A Discussion of the Explanations

The literature highlights a number of discrepancies between the two theoretical explanations.

"Inside-out" theorists contend that the "outside-in" explanation cannot accommodate the dynamics of skilled reading. The time necessary for a skilled reader to deal with text one letter at a time, or even syllable by syllable, amounts to a mathematical paradox according to the "inside-out" explanation. Speeds reached by fluent readers are difficult to account for in the outside-in explanation. (Miller, 1956; Kolers and Katzman, 1966; Cambourne, 1979).

Whereas the "outside-in" explanation contends that the pronunciation of words is a necessary pre-requisite of comprehension the "inside-out" explanation claims that it is necessary to establish meaning prior to pronunciation. The "inside-out" explanation holds that a reader must be aware of the contextual meaning before correct pronunciation is possible. Good readers access meaning prior to pronunciation. (Cambourne, 1973).
The "outside-in" explanation asserts that reading is no more than the visual recognition of symbols. Kolers, (1970) suggests that this is a narrow view of the reading process.

Despite the obvious complexity of the reading process, the great number of investigators have sought relatively simple, strictly causal explanations. By strictly causal, I mean such simplistic theses as reading is principally the activating conditional meanings, reading is principally a matter of discriminating the geometry of letters, and reading is a matter of translating graphemes into sounds. There have been few efforts since Huey's masterpiece in 1908 to deal with the whole phenomenon, to account for the variety of events that go into reading. (p. 90).

The "inside-out" explanation claims that it is not possible for the "outside-in" approach to explain why it is that good readers are able to contend with typing mistakes, or even with deleted words. Smith (1977, p. 386) states that contending with deleted words, and other typographical errors, is only possible because reading is not a matter of decoding but consists essentially of "bringing meaning to print."
The assertion that reading is more than a visual process is supported by the research of Kozin, Poritsky and Sotsky (1971). Their research demonstrates that poor readers have little difficulty identifying and learning to read Chinese characters even though they had failed to learn the basis of phonological recoding after two years of schooling. The subjects of the study were able to read Chinese characters after only a few hours of tutoring. This would seem to indicate that it is not merely the visual aspect of reading which prevents the subjects from being successful.

Similarly, studies conducted by Goodman and Burke (1973), Weber (1968), Clay (1972), and Rousch and Cambourne (1978) find that the substitutions made by fluent readers show little visual similarity to the words replaced within the text. However they did find that the substitutions made are both semantically and syntactically correct (Eg. pony for horse; later on for after). These inside-out theorists contend that if a reader relies solely on visual features, then substitutions such as gate for gale, bad for dad, should be expected. However this expectation is not borne out by the prevailing pattern of responses.

Another difference between the two explanations relates to how children learn to read. The "outside-in" explanation emphasises a structured,
hierarchical, subskills approach. The "inside-out" explanation would concur with research by Heilman (1972) which suggests that there are no principles which apply exclusively to remedial reading. Furthermore, research by Goodman (1973) and Clay (1972) indicates that learner-readers use or attempt to use the same cueing systems and processes as fluent readers, and poor readers simply do not have the same control over the processes involved.

A further difference relates to the ways in which evidence is gathered in support of both explanations. The "outside-in" evidence is based on controlled laboratory situations which are supposedly able to be duplicated empirically. However the kinds of subskills chosen to be graded by this exercise have no validity, according to Cambourne, (1973). To paraphrase Smith "laboratory data are interesting but they bear little or no resemblance to reading in the real world." The "inside-out" explanation gathers its evidence from the world of books, signs, menus, poetry or anything else that involves intention, need, selectivity, prediction and comprehension of whole interconnected chunks of meaning." (Smith, 1977).

The differences outlined above point to the fundamental difference between the two explanations: that is, the way in which reading itself is defined and understood. The two explanations result in diverse therapies.
Generalisations Identified in the Literature

At the outset, this chapter "mapped" the course it would take. It examined tinted lenses in the context of visual dysfunction, physical factors, and theoretical explanations of the reading process. This final section examines some of the generalisations which shape the whole field of reading disability and which in turn shape all resultant therapies. It is essential to emphasise the point that regardless of the theoretical standpoint adopted, shortcomings are evident. These can be summarised as follows:

The literature gives only a fragmented overview of the problem of reading disability and its causes. The results remain inconclusive. (Spache, 1976; Ekwall, 1983; Bond & Miles, 1976).

Gray's findings (1923) remain applicable. He reviewed the scientific research trends from their beginnings in the late 1800's to the late 1930's.

...but the progress achieved thus far is not without serious limitations. Unfortunately much of the scientific work relating to reading has been fragmentary in character... the investigator frequently attacks an isolated problem, completes his study of it and suggests that he will continue his research at some later time but often
fails to do so. In the second place, there is little or no co-ordination of effort among research workers in the field of reading. In the third place, many of the studies reported have been conducted without adequate controls... nevertheless, much of the evidence available is so significant that it serves as a valuable guide in reorganising and improving instruction in reading at all levels and in defining with greater clarity the function of reading in contemporary life. (Gray, p.892-3)

Scott's monograph of 1954, *A "Forest" View of Present Research in Reading* (Educational and Psychological Measurement, Vol. XIV, [pp. 208-214]), is critical of reading research conducted. He claims that it is voluminous, fragmentary and unrelated, oriented toward content methods and mechanics, and inconclusive and limited. He adds that "The most tantalising and stimulating characteristic of reading research findings is their inconclusiveness."

Inconclusiveness results from failure to define what is being examined. Very few researchers adequately define what is meant by reading and even fewer attempt to define accurately what they mean by a "reading disability." (Heilman, 1972; Kozol, 1980; Keogh, et al, 1982; Tucker, et al, 1983; Ysseldyke, et al, 1982). Similarly, researchers have used different
names for those who fail to learn to read. Are they "dyslexic", "reading disabled", "alexic", or "deprived"? "If one point seems to emerge, no-one... has yet been able to agree upon the standard definition of a literate man or woman." Kozol (1980, p. 54).

The history of reading disability is influenced by five broad disciplines as identified previously and the fact that each contributes in isolated and diverse ways adds to the fragmentation and inconclusiveness.

All of the above factors combine to create a picture of the field of reading disability that resembles a hazy, disjointed mosaic. The field of reading disability treatment is not a neat package of compartmentalised therapies, but rather presents itself as nebulous, ambiguous and in conflict with itself. The tinted lenses therapy is situated somewhere within this conglomeration. As well, the therapy has to contend with a range of unique factors which make the evaluation of its effectiveness as a remedial therapy difficult.
CHAPTER III
METHODOLOGY

The Nature of this Evaluation Project

The approach taken in the evaluation of the tinted lenses therapy was based on a model known as "Responsive Evaluation", pioneered by Stake (1975) and later extended and refined by Lincoln and Guba (1981). The focus of responsive evaluation is the experiences, feelings, beliefs, concerns, perceptions and understandings of the participants in the program being evaluated. Rather than the achievement of any predetermined goals or outcomes, it is the value of the therapy's worth to the participants which is used as the indicator of its success or failure. This is not to deny, however, the evaluator from obtaining insights into the degree to which the aims are achieved. In a responsive evaluation the evaluators are more concerned with the effects that the project being evaluated has
on those involved in it, (i.e. its "stakeholding audiences") than it is on the degree to which the attainment of the project's objectives can be measured.

The responsive evaluation in this case was both formal and informal. From the results of the responsive evaluation and the literature reviewed, principles emerged and were explored. Specific situations were contrived to test presuppositions using contrasting cases and intervention devices in the form of experimental simulations.

Initially data was collected which examined the tinted lenses program through the eyes of those who were involved in or affected by its use. The various understandings, interpretations and conceptions of those involved in the tinted lenses program were examined. Inevitably, each participant had diverse and unique reasons for seeking out the tinted lenses as well as each having a complex range of goals, expectations and purposes once the tinted lenses were obtained.

In order to carry out this evaluation it was necessary to become involved with the participants in a variety of contexts and to gather information by "responding" to them. Consequently, two layers of information were collected. Firstly, the interview data was collected. This involved talking to, observing and
collecting various "artifacts" or outcomes from a range of contexts. (Eg. school record cards, handwriting samples.) The second layer of information resulted from simulations designed to test and verify assumptions disclosed by the participants and the Irlen literature.

Naturalistic inquiry at its most simplistic level utilises the every day interactions between people, yet at the same time it is an extremely complex and rigorous process. It comprises focused observation, recording, analysis and checking for reliability through the extensive use of credibility measures. It is ethnographic in nature, yet focused by the inquiry question and therefore employs purposive sampling. The power of this process stems from the use of "human as instrument". The credibility measures employed in the naturalistic inquiry process ensure that maximum benefit is gained from use of "human-as-instrument" while at the same time limiting the adverse affects of inherent bias. The following statement reveals the complexities of the naturalistic inquiry method. (Lincoln and Guba, 1985, p. 187-189).

... naturalistic studies are virtually impossible to design in any definitive way before the study is actually undertaken. But naturalistic studies do have a characteristic pattern of flow or development... Naturalistic inquiry is always
carried out, logically enough in a natural setting, since context is so heavily implicated in meaning. Such a contextual inquiry demands a human instrument, one fully adaptive to the indeterminant situation that will be encountered. The human instrument builds upon his or her tacit knowledge, and uses methods that are appropriate to humanly implemented inquiry: interviews, observations, document analysis, unobtrusive clues, and the like. Once in the field the inquiry takes the form of successive iterations of four elements: purposive sampling, inductive analysis of the data obtained from the sample, development of grounded theory based on the inductive analysis, and projection of next steps in a constantly emergent design. The iterations are repeated as often as necessary until redundancy is achieved, the theory is stabilised and the emergent design fulfilled to the extent possible in view of time and resource constraints. Throughout the inquiry, but especially near the end the data and interpretations are continually checked with the respondents who have acted as sources, as well as with the counterpart individuals; differences in opinion are negotiated until the outcomes are agreed upon or minority opinions are well understood and reflected. The information is then used to develop a case report—a case study. The case study is primarily an interpretative instrument for an idiographic constual of what was found there. It may however,
be tentatively applied to other, similar contexts, if empirical comparison of the sites seems to warrant such an extension. The entire study is bounded by the nature of the research problem, the evaluator, or the policy option being investigated, (which are, however, themselves subject to revision and extension as the study proceeds.) Finally, its trustworthiness is tested by four naturalistic analogues to the conventional criteria of internal and external validity, reliability and objectivity, which are termed "credibility", "transferability", "dependability", and "confirmability", respectively. This testing begins early in the study and continues throughout, culminating in a critical review by a panel of local respondents."

Figure 3.1 below summarizes this flow.
Carried out within problem, evaluand or policy option determined boundaries.

All tested for Credibility Transferability Dependability Confirmability

**Figure 2.1 THE FLOW OF NATURALISTIC INQUIRY**
The Evaluation of the Tinted Lens Therapy and the Naturalistic Inquiry Paradigm

The methodology employed in this research followed the general pattern or "flow" described above. Data was collected from natural settings such as subjects' homes or classrooms. The focus was on people as subjects and on the interactions with these people through interviews.

The information obtained was useful when comparing the beliefs held by both those prescribing the tinted lenses and others involved, including subjects, parents and teachers.

Part of the project's design was to collect data over an extended timeframe. This enabled subjects to reflect upon their prior conversations and gave them the opportunity if needed to add to or vary their opinions as the project progressed. Contrastive information was also obtained using a visual discomfort test with eighteen "good readers." As a result, sixteen case studies were produced, and were supported by the group results of the simulated situations.
Methodological Data

Stages in the Data Collection

The study was divided into four distinct stages.

The semi-structured interview. This was the initial contact with the subjects and their informants. No time limit was set for these interviews but the duration was usually 2 to 2 1/2 hours.

The focused interview with subjects and the implementation of simulations. This occurred approximately one month after the initial interview was made.

Focused interviews with informants. These occurred after the initial interview and before the follow-up interview.

Follow-up interviews with subjects and informants. In most instances these occurred approximately twelve months after the initial contact was made and again approximately ten months later. All subjects or their informants were telephoned and data was obtained regarding the current status of the tinted lenses.
The purposes for each interview were determined by the outcomes of the data collected at the prior interview. It became clear where additional information was required, or where clarification was deemed to be necessary.

Refining the Focus of Interview and Observation Instruments

The questions asked at the initial interview were general and solicited a broad overview from the participants.

(i) How do you see yourself as a reader and a writer?

(ii) What do you remember about learning to read and write?

(iii) Did you think that the tinted lenses would help you? (Reasons).

(iv) If you feel that the tinted lenses have helped you, in what way have they done so?

(v) What can you remember about the screening procedure?
At the subsequent interviews the focus was increasingly refined and had as its purpose the verification of information given previously by the subjects.

Following these interviews simulations were carried out. The simulations enabled comparisons to be made between information given previously and the results obtained.

Methods of Data Collection

The main methods of data collection were qualitative in orientation. They are outlined in Figure 3.2 and are explained below.
Approximate Timespan

During months

0-3

Semi-structured interviews

Focused Interviews

By month 6

Simulations

Information verified

Parents

Teachers

Others

Figure 3.2

Visual Miscue Visual Discomfort Analysis and Discrimination Test Copying Exercise Visual Concentration Test Proof Reading Exercise

Contrastive Group (administered to 18 "good readers")

By month 12

Follow-up Interview

By month 18

Final Interview

Verification of information contained in case-studies

Additional Information

1. Interview with licenced Irlen practitioner

2. Interview with parent whose child was not prescribed the tinted lenses

3. Interview with the remedial teacher of the subject featured on "60 Minutes"

4. Written contact with Irlen practitioners in Australia
The Semi-Structured Interview

This type of interview probed for information from a range of broad areas (see questions listed above). The aim was to let the informant talk freely around these predetermined areas, and thus inform the interviewer of what was known, believed, felt and understood about each area. The interviewer was free to probe for clarification, follow up leads and comments which may have been of interest, and to seek expansion of answers whilst the informant was free to expand, clarify or to lead the discussion. The aim was to gather rich, high quality data which when coded would illuminate the focus of the study.

The Focused Interview

This type of interview was based on specific questions regarded as being essential to the study and had as its purpose the verification of information stated previously by the subjects. Typically these questions emerged from the interpretations made of the information which the semi-structured interviews provided. The aim was to obtain specific information. Both the interviewer and informant were less free to range over topics, although it was possible for one of
the specific questions to lead to some spontaneous probing by the interviewer.

Subjects Literacy Related Products

During the course of the focused and semi-structured interviews, a range of literacy products were collected and they included the following:

Handwriting Samples

Samples were collected from all subjects. Each subject was asked to "free-write" with the tinted lenses on. After three to five minutes (depending on how much was written) the subject was asked to remove the lenses and to continue writing. With most subjects this process was repeated.

Rationale: Handwriting in the Irlen literature is recognised as being affected by the wearing of tinted lenses. As Whiting states, the tinted lenses "...assist people with reading and writing, spelling and any visually intense activity." (Refer Appendix: Rose Coloured Glasses p. 3).
"...the optimum effect was obviously to be obtained by having the coloured filter interposed between the eye and the page at a place closer to the eye than the page. In this way, improvement might be obtained while writing, as well as during reading." (Refer Appendix: SPELD News, p.4).

Therefore, if handwriting is affected by the wearing of tinted lenses, then there should have been a noticeable difference in each subject’s performance when wearing and not wearing them.

Samples of Subjects Reading with Lenses On and Off

While all subjects read with tinted lenses on and off, two subjects were videotaped whilst doing so. The reading matter came from books that were being read currently by the subjects but the actual text (a series of pages) had not previously been read. Oral retellings were also conducted. Four other subjects were audiotaped under the same conditions.

Rationale: If the subjects’ perception of the text was altered by the wearing of tinted lenses there should have been noticeable differences in performance with the tinted lenses on and off. The Irlen literature identifies a number of features commonly experienced by persons with Scotopic Sensitivity Syndrome. These features include the following.
Murphy: "...loses place, reads slowly, hesitantly, possibly in a monotone, reads in stop-go rhythm, omits small words, reading skills and comprehension deteriorate as reading continues." (Refer Appendix: Scotopic Sensitivity Syndrome: An Overview).

Whiting: "...skip lines, reread lines, skip words confuse similar letters or words, read word by word and complain of eye strain or headaches." (Refer Appendix: Rose Coloured Glasses).

Robinson: "A large number of these people report a restriction in the span of words which they attend to. ...as span narrows, word recognition becomes difficult with endings being left off words, words reversed and longer words not being attempted."

It would be expected that the incidence of the above features would alter noticeably when subjects alternated the wearing of the tinted lenses. Irlen (1983) claims that "...results are immediate and improvements in the above areas are obvious."

The videotaped segments were viewed by a number of persons otherwise unconnected with the project, and their comments were sought.
**Artifacts**

Copies of past report cards and referrals from various doctors were collected when available. **Rationale:** These artifacts should have given an historical perspective of the nature and cause of the subjects' "problem". They also enabled comparisons of the subjects' progress to be made over a period of time.

**Simulation Procedures**

**Introduction**

These simulations were based on a series of hypotheses identified in the Irlen literature. The literature regarded these hypotheses as contributing factors to reading disability. Employing the simulations acted as a process of elimination. Each hypothesis was considered in turn and group results were collated. Simulations were designed with a second aim as well: to evaluate the authenticity of statements made during initial interviews by those wearing the tinted lenses. Not all subjects participated in all screening procedures. Figure 3.3 indicates simulation participation rates.
<table>
<thead>
<tr>
<th></th>
<th>Visual Discomfort Test</th>
<th>Proof Reading Exercise</th>
<th>Miscue Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANDREW</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>CHRIS</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Darryl</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>David</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Eva</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Fran</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Gordon</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Greg</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Lawrence</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Noel</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Peter</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Rory</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Teena</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Tim</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Tony</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Warren</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

Figure 3
<table>
<thead>
<tr>
<th>Discrimination Concentration Exercise</th>
<th>Copying Exercise</th>
</tr>
</thead>
<tbody>
<tr>
<td>X X X X X X X X X X X X X X X X X X</td>
<td>X X X X X X X X X X X X X X X X X X</td>
</tr>
<tr>
<td>X X X X X X X X X X X X X X X X X X</td>
<td>X X X X X X X X X X X X X X X X X X</td>
</tr>
<tr>
<td>X X X X X X X X X X X X X X X X X X</td>
<td>X X X X X X X X X X X X X X X X X X</td>
</tr>
</tbody>
</table>

An explanation of the six simulations used, and the rationale for each one, follows Figure 3.3.
Visual Discomfort Test

This test, designed by the Department of Psychology, University of Wollongong, involved a series of questions relating to vision and visual discomfort. The test consisted of three components.

(i) General information regarding visual discomfort.

(ii) The identification of situations in which vision was impaired, the symptoms incurred, and the degree to which discomfort was felt.

(iii) Examination of the types of distortions generated when looking at a series of ten black and white graduated line grid patterns. These patterns were similar to those used by Olive Meares, a clinician from New Zealand, whose interest in visual discomfort began in the early 1970's. Meares identified the problem in terms of figure/ground and brightness contrast. In the test designed by Wollongong University twelve different coloured plastic overlay sheets were used to identify whether visual discomfort could be reduced significantly, using coloured filters.

The results of this test were compared to those obtained from eighteen school children of ages ranging from seven to twelve years. At the time of the
test they also read self-selected texts. These children were selected by their class teachers on the basis of being exceptionally good readers.

Rationale: The Irlen literature lists a number of visual discomforts often associated with Scotopic Sensitivity Syndrome.

General characteristics. Finds lighting situations difficult. May read in light that seems dim... bothered by glare and generally light sensitive.

Complaints. Reading or light related headaches; eyes that feel itchy, burning, sandy, scratchy, dry; drowsiness when reading; words double, move, look funny, blurry, fuzzy, or even partially or completely disappear. (Refer Appendix: Scotopic Sensitivity Syndrome: An Overview).

These characteristics are examined in Sections (i) and (ii) of the Visual Discomfort Test.

Section (iii) refers to the use of "graduated line grid patterns" as indicators of Scotopic Sensitivity.
Murphy:

...this researcher believed there would be a relationship between lined gratings on a lighted background and persons found to have Scotopic Sensitivity Syndrome. The paradigm was quite simple:

*If reading is made difficult on a horizontal line because of colour; then horizontal lines on a highly lit white background containing all colours should be seen differently by the reading disabled."* (Refer Appendix: Visual Dyslexia. Successful Treatment with Irlen Lenses. Draft).

It was considered appropriate to compare the results of this test with those obtained from eighteen children (Year Two to Year Six) considered by their teachers to be "good readers".

Rationale: "Good readers" should have suffered less visual discomfort than those diagnosed with Scotopic Sensitivity Syndrome.
Proof Reading and Cloze Exercise

This test was designed to assess whether or not the subjects could identify "typing" errors when not wearing the tinted lenses for an assigned text. The subjects were instructed to read the text and identify (by circling) mistakes made in the text. Examples of typing errors included the following.

- Dark instead of Park
- Dig instead of big
- then instead of there
- cricket instead of cricket
- cat instead of at
- slipper instead of slippery
- aunty instead of army
- lsto instead of lots
- pole instead of people
- benches instead of beaches
- fe instead of be.

Sample of Text.

*There* in also the Opera Horse which has dig triangle roofs. There is also the Sydney Cricket Ground were they plays all types of football, cricket and soccer.
Letters were omitted, added, rearranged or substituted. Letters which were substituted were graphically similar to those replaced; "b" & "d", "u" & "n"; "f" & "b". The text was a photocopied black and white stencil. Secondly, using the same text, the subjects were asked to replace the "typing errors" with a word that made sense within the context.

Rationale: If subjects had difficulty seeing print clearly (i.e. without distortions) then it should have been expected that they would also have difficulty identifying visually similar typing "errors" in a previously unseen text. The simulation related to the distortions identified by those with Scotopic Sensitivity and referred to by Whiting:

The print appears to double, letters merge together, blur, or parts of the letter disappear altogether. The last mentioned phenomenon explains why such readers confuse "b" and "d", "n" and "h", "m" and "n", etc. (Refer Appendix: Using Coloured Lenses in the Treatment of Disabilities).
Miscue Analysis and Retelling

The subjects were asked to select a book which was being read currently. Before the subjects commenced reading they were asked informally to identify the sound and names of letters on a page of text. The subjects were instructed to begin reading from where they had previously finished. Whether or not subjects put on their tinted lenses (without instructions to do so) was noted immediately. The subjects commenced reading and the researcher kept a running record of all miscues made. A miscue referred to any variation of the text made by subjects when reading aloud. Miscues were noted without subjects being aware that this was being done. Subjects read alternate pages with tinted lenses on and off. The procedure was repeated a number of times depending on the difficulty of the book selected. This was followed by the subjects orally retelling what was read and understood.
Rationale: Two points were considered.

1. Subjects oral reading performance should vary when wearing and not wearing the tinted lenses. As stated previously: "Reported results are immediate and marked improvements... are obvious." (Irlen).

2. If reading disability is visually based then substitution miscues made should be similar visually.

Visual Discrimination Exercise

This test was designed to test the subjects ability to differentiate forms and symbols visually. It was based on substitution miscues made during the initial interview and followed up in the subsequent interview in the following manner.

Substitution miscues made were extracted and randomly included in a list of words which were graphophonically similar. If the subject initially read "went" for "want" then the list would appear thus:
"want want went want want want"

The subjects (when not wearing tinted lenses) were asked to identify the word which was different.

Rationale: If the reason that substitution miscues were made resulted from visual impairment, then it should have been expected that subjects would have difficulty discriminating the visual features of words found in the text and the substitutions made by them when both were juxtaposed.

Concentration on Visual Tasks Test

This test was designed to assess the ability of subjects to recall accurately prior visual experiences. Each subject was asked to view a unit of randomly selected letters for approximately six seconds. The letters were removed and the subject was then asked to identify the unit within a series of the same or similar letters in different combinations. Example: "cbmtv" was viewed first, then the subject was requested to identify it in the series "rtmbc tmvcb abmtv cbmtv". This was done when subjects were not wearing the tinted lenses.
Rationale: This test was designed to examine the relationship between the subjects' ability to concentrate on a visual task when not wearing tinted lenses and the claims of the Irlen literature in this regard.

Robinson states that tinted lenses "...allow the person more time to concentrate." (Refer Appendix: SPELD News).

Copying Exercise

This test had two sections. In the first, subjects were shown a random set of six letters. Upon removal of the set, they were asked to recall and write the letters. In the second section subjects were shown a combination of random letters resembling the construction of a simple sentence and were then asked to copy the combination below the place where the combination appeared in the sentence. Example: "Rve cmтоп rstv wxyms egfge." The subjects were asked to copy the text exactly as they saw it.

Rationale: This exercise was designed to find out what it was that subjects saw when looking at print when not wearing tinted lenses. Whiting states that "Many of them report that the words move about on the page, go blurry or fuzzy, swirl or such unusual things." (Refer
Appendix: Parents Letter. The following are examples of the way in which print supposedly would appear to Scotopic Sensitivity Syndrome sufferers, according to Whiting.

How Difficult can Reading Be? New Insight into Reading Problems (Whiting, 1985).

[Text continues on next page]
Irlen (1983) states that:

The subjects were checked to determine the existence of impaired resolution in areas of haloing, shadowing or blurring of letters. Other distortions categorised were: vibration and pulsation of letters, stretching of letters top and bottom, and unequal shading of the letters.

If these distortions occur it should be expected that they would be repeated in the copying exercise. (For example; letters being made taller, shorter, overlapping).

The Sites

The interviews took place in the subjects' homes and at mutually convenient times. All subjects resided within a forty kilometre radius of the City of Wollongong.

There were sixteen subjects; three females and thirteen males. The age range was from eight to fifty four years. (Refer Figure 3.4). All subjects
were referred to the study by word of mouth. It appeared that a network existed whereby one parent informed another or knew of a friend who had been prescribed tinted lenses. The majority of subjects attended Dr. O'Connor's clinic because of reduced waiting time ("six weeks" as suggested by the subjects, compared to "anything up to six months in Sydney."). The others (with the exception of David) attended the Evelyn McGloughan Children's Centre. David underwent similar screening procedures as those prescribed by Irlen as part of an evaluation project being undertaken at the Prince of Wales Children's Hospital.

<table>
<thead>
<tr>
<th>Name</th>
<th>Age</th>
<th>Sex</th>
<th>Time with Lenses</th>
<th>Grade/Occupation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andrew</td>
<td>12</td>
<td>M</td>
<td>3 Months</td>
<td></td>
</tr>
<tr>
<td>Chris</td>
<td>12</td>
<td>M</td>
<td>5 Months</td>
<td></td>
</tr>
<tr>
<td>Darryl</td>
<td>11</td>
<td>M</td>
<td>3 Months</td>
<td></td>
</tr>
<tr>
<td>David</td>
<td>14</td>
<td>M</td>
<td>2 Months</td>
<td></td>
</tr>
<tr>
<td>Eva</td>
<td>54</td>
<td>F</td>
<td>6 Weeks</td>
<td></td>
</tr>
<tr>
<td>Fran</td>
<td>10</td>
<td>F</td>
<td>2 Months</td>
<td></td>
</tr>
<tr>
<td>Gordon</td>
<td>42</td>
<td>M</td>
<td>6 Months</td>
<td></td>
</tr>
<tr>
<td>Greg</td>
<td>11</td>
<td>M</td>
<td>7 Months</td>
<td></td>
</tr>
<tr>
<td>Larence</td>
<td>11</td>
<td>M</td>
<td>1 Month</td>
<td></td>
</tr>
<tr>
<td>Noel</td>
<td>19</td>
<td>M</td>
<td>2 Months</td>
<td></td>
</tr>
<tr>
<td>Peter</td>
<td>12</td>
<td>M</td>
<td>1 Yr and 3 Months</td>
<td></td>
</tr>
<tr>
<td>Rory</td>
<td>8</td>
<td>M</td>
<td>2 Months</td>
<td></td>
</tr>
<tr>
<td>Teena</td>
<td>14</td>
<td>F</td>
<td>2 Years</td>
<td></td>
</tr>
<tr>
<td>Tim</td>
<td>14</td>
<td>M</td>
<td>1 Year</td>
<td></td>
</tr>
<tr>
<td>Tony</td>
<td>15</td>
<td>M</td>
<td>5 Months</td>
<td></td>
</tr>
<tr>
<td>Warren</td>
<td>17</td>
<td>M</td>
<td>1 Year</td>
<td></td>
</tr>
</tbody>
</table>

FIGURE 3.4

SUBJECTS
The only predetermined criterion for selection was that subjects be prescribed "tinted lenses" in order to overcome Scotopic Sensitivity Syndrome as identified by Irlen.

All except Eva believed that the tinted lenses would help alleviate their reading disabilities. The reasons Eva sought the tinted lenses are explained in the Case Studies Section. All respondents indicated that they were willing to participate in a series of interviews. Information was sought from parents, spouses and teachers.

These informants were able to offer confidential verification of the subjects' reading disability and report on the subjects' responses to the tinted lenses therapy. Where possible remedial teachers who worked with the subjects at the time of the study were also contacted. School record cards and work samples were also examined.

Additional Information

Additional information was obtained from a variety of sources which included the following.

(i) An interview with a licensed Irlen practitioner.
(ii) A telephone conversation with the remedial teacher of "John" interviewed on the "60 Minutes" program.

(iii) An interview with a parent of a child who sought the tinted lenses but was not prescribed them.

(iv) Telephone conversations: representative of the Optometric Association of Australia, an Opthamologist, an Optometrist.

Data Analysis and Treatment

This study generated a large and complex volume of data. Data ordering, reduction, synthesis and analysis had to occur for the purpose of theory building. Organisation and systems which facilitated such activities were required. There was continual data generation, reduction and analysis at each stage of the study.

To aid in data analysis, data was coded and assembled in columns according to different themes as these themes emerged. Data coding from the outset was an integral component of the methodology.
Core Data and Supportive Data

Core data was that which directly contributed to the focus question of the study. The following Figure is a schematic representation of the types of data collected and the relationships between them. The core data as illustrated in Part A of Figure 3.5 centred around the effectiveness of the tinted lenses as perceived by those wearing them and the opinions of those closely associated with the subjects. Another set of core data resulted from experimental simulations designed to examine the effectiveness of the tinted lenses according to predetermined hypotheses recognised in the Irlen literature and revealed by the subjects. All other data was considered to be "supportive" and was used to confirm or reinforce interpretations coming from the core data.
PART A
- Interviews
  - Informants
  - Subjects
- Themes that emerged
  - Individual summary story
  - Group Summary story

PART B
- Comparative group
  - Work samples
  - Simulations
- Group summary story

PART C
- CONCLUSION
  - Merging of data

Figure 3.5
Based on the statements made by the subjects and their informants sixteen individual summary stories were compiled. These individual summary stories enabled common themes to be identified and written up as group results.

The results of the simulations were presented as summary stories. (Part B. of Figure 3.5) The results of the simulations were completed on a group basis.

Both summary stories were then combined and in doing so a mass of qualitative information was drawn together (Part C. of Figure 3.5)
The Coding of Core Data

Interview Data

The information was collated and analysed, resulting in the emergence of common themes. In order to do this the following procedure was employed.

1. The verbatim accounts of interviews with subjects and their informants were read and reread. The sentence was then selected as the basic unit of data because it represented as nearly as possible a "packet" of information that could stand alone yet be comprehensible.

2. With successive readings of each interview account emergent themes were identified.

3. The themes themselves, the definition of themes, and the criteria for allocation of discrete data to a particular theme was tentative initially. Information was considered in the light of the definition and the definition had to be flexible enough to accommodate each new piece of information.
4. Once coding was completed the information was extracted into a single body of specific data and the definition became fixed.

5. The definition of each emergent theme was justified to other students and lecturers involved in similar study projects for criticism, evaluation and comment.

6. Individual case studies were written up according to the themes which emerged.

Themes Emerging from the Data

The following themes emerged and the data was categorised according to the following headings. Samples of statements classified under each heading are included.

1. Self Perception as a Reader.

Statements which referred to each subject's self-perceived view as a reader. For example: "I'm not very good at it" or "I've always been slow at it."
2. Perceptions of Schooling and School Experiences.

Statements which related to experiences at school or home particularly any significant incident that the subject recalled in relation to their perceived reading disability. Examples included: "Mrs. G... she asked me to read and I couldn't... everyone started laughing and I made up something else (another word) to go back there."

3. Hereditary Factors.

Statements which related to the existence of a reading disability within the subject's immediate or close family. For example: "None of my family's got it." and "We haven't anyone in our family that we know of that has a problem."

4. Parental Expectations.

Statements which revealed the parents' attitude towards the children as readers and learners. Examples included: "He can't stand reading. He's got the same problem I've got."; "She isn't a backward child. I find it most frustrating."; "He's never really been interested... never liked to colour in or draw."
5. Understanding of the Reading Process.

Statements which indicated the subjects interpretation of how the reading process worked. It also included statements which related to what it was that the subjects claimed to do when confronting unknown words, and what it was that they thought a "good reader" did in the same situation. For example:

"I ask Mary or John, because they are good readers."

"I ask my friends and teachers what the word means and what it is."

"I sound it out."

"In my head, I just skip it... well, I have a go at it... out loud I have a go. The teacher corrects me if it's wrong."

Examples of statements which indicated what the subjects thought "good readers" did included:

"She doesn't make mistakes out loud."

"They go and see the teacher. Sometimes the teacher doesn't know so then they have to go to the Library teacher."

"They sound it out and use syllable breaks."

Statements which compared the perceived differences in reading ability and vision both before and after regular use of the tinted lenses. For example: "I don't think the glasses have solved the problem. I think she has a problem with phonetics even with the glasses on." (Father)

"I felt I was stopping and starting before. Now I feel more fluent." (Subject)

"No significant changes. His problem has a lot to do with his attitude to his schoolwork." (Teacher)

7. Historical Background to the Problem.

Statements which related to the subjects' visual histories and included results of optometric consultations. As well visual performance at other daily tasks including sport, hobbies and interests, and other school subjects. For example:

"One optometrist said that he was short-sighted, another long-sighted and another eye specialist said that there was nothing wrong with him." (Father).

"Sydney eye specialist said that his eyes were much better than a lot of adults he had tested." (Father).

"He has been playing the piano for three years and completed his second grade examination." (Mother).
"He plays piano as well as tennis, hockey, golf, squash, and goes surfing. He has a good eye for things." (Mother)

"Maths... he's always been in the highest group." (Mother)

"He played competition cricket and was seeing and hitting the ball really well. Made me think there was nothing wrong with his eyes." (Father)

8. Performance at Irlen Screening.

Statements which revealed the types of questions asked and the screening procedures employed by those prescribing the tinted lenses. These statements also related to the subjects performance at the testing procedure. For example:

"C. was given the right signal to the whole message, I mean, if the doctor said "You're seeing lines" he would nod "Yeah". (Father)

"He assessed that she had a number of disabilities, but didn't go into any of them. Said to C. "Do you have trouble reading a whole lot of words... like a full line, and then... like... do they come together, blur, wave? Do they squash together, spread apart? Is there too much white on the page? Do they leave snake lines on the page?"" (Father)

Statements which indicated the reasons why the parent or subject sought tinted lenses. For example:

"The teacher at school suggested we try them. From Grade Two we've been chasing this problem and here she is in Grade Five. If she stayed at "F." school I don't think they would have identified what the problem was. We didn't get anywhere with the public system." (Father)

"As a parent you want to do the most you can for your child. I would have been prepared to go to America if it meant I could help in some way." (Mother)

Simulations

Results obtained from each of the experimental simulations were collated and a group summary story was compiled according to the headings indicated in Figure 3.2
Ensuring Credibility of the Data

Throughout the stages of data collection and analysis certain activities were undertaken to ensure that the findings and interpretations would have a high degree of credibility and trustworthiness. These activities were in line with the naturalistic paradigms analogues of reliability and validity as outlined by Lincoln and Guba (1985, pp. 289-331).

Specific credibility measures employed in this study included the following.

1. Structured or semi-structured interviews over an extended period of time at the subject's own home. The subjects were observed in their family setting.

2. Triangulation of information from a wide variety of sources not only guarded against bias in the inquiry and analysis stages, but also allowed the multiple value perspectives present to be accommodated. The nature of the triangulation processes employed is illustrated in Figure 3.6 below.
Case Study Interviews
What subjects think of themselves as literacy users
What they understand of the reading process
What they believe they do when reading
Why they perceive they need tinted lenses
Any changes since obtaining tinted lenses
Recollections of Irlen screening procedure

Final Interview
Confirmation of data
Any changes?

Follow up Interview
Any changes?

Informants
Parents
Why would tinted lenses help?
Why did they seek them?
Changes (if any)?
Recollections of screening procedure
Understanding of the reading process
Opinion of subject as reader/writer

Contrastive Group
Visual Discomfort Test administered to eighteen 'good readers'

TRIANGULATION

FOCUS: Evaluation of
the effectiveness of
the tinted lens therapy

Work Samples
Literacy products-
tinted lenses on and off
School reports
Audio and visual tapes
Viewed by others not involved in the project

Simulations
Does subjects literacy behaviour correspond with their account of it?
How does the subject process print?
Differences in performance on literacy tasks with tinted lenses on and off

Teachers
Child as literacy user?
If any reading problems, why?
Changes (if any)

Additional Information
Interviews
Licensed Irlen practitioner
Mother of subject not prescribed tinted lenses
Remedial reading teacher- '60 Minutes'
Correspondence - Irlen practitioners

Figure 3.6
An important aspect of the triangulation process was that all subjects and/or informants were given the opportunity to comment on their completed case studies. They were asked to verify the validity of the information obtained.

3. Peer debriefing, whereby other co-researchers combined to "test" the data ordering, constructions and interpretations was also used. This formed a credibility measure used to check for possible misinterpretations or bias on the part of the evaluator. Intensive peer debriefing occurred twice during the course of this study. In addition a monthly statement was made to the research group regarding the structure and the current status of the research project. The project was also presented and discussed at a colloquium held in November, 1988.

4. The recording of detailed descriptions of both the context and the participants (thick description) was a feature of evaluation. It served a number of purposes as listed below.

It described fully the evaluand and the circumstances in which the data was collected.
It identified meanings and values in context. It allowed anyone reading the evaluation report to make informed judgements concerning the tinted lenses based on the sound and precise presentation of the research findings.
CHAPTER IV

CASE STUDIES SUMMARY STORIES

In what follows, sixteen case studies are presented according to themes that emerged.

Teena

Teena was fourteen and the youngest of two girls. Of all subjects interviewed she had been wearing her tinted lenses for the longest period (2 years). In 1985 she was interviewed along with her parents on the second "60 Minutes" programme that featured the tinted lenses.

Teena regarded herself as a slow reader and claimed "I know I wasn't the worst in the world but I wasn't that good either." "I'd get nervous when the teacher asked me to read a paragraph. In tests, I'd do some questions over and over again" and at other times "I kept turning pages to show that I wasn't as dumb as I looked."

There was no history of reading disability in her immediate family but Teena's mother thought the syndrome "could be related to colour blindness which was in the family." Teena's father also wore tinted lenses. Her mother, (Mrs. G.) claimed that Teena did
have a learning problem and this she detected from an early age. "Before she started school her speech was a bit jumbled, . . . tended to reverse words, . . . run words together, stuttered at four."

Teena was young when she started school and "cried her way through Kindergarten." Her mother stated "even then she wanted kids to play with her, and even then I began to see the seeds of her feeling different."

From Kindergarten it appeared that Teena had been unhappy at school. She could recall in detail an incident in Year 2 where she had to read to the Assembly. "I remember in second class I'd written a story and had to read it in Assembly and I didn't know what to say or how to read it. It got pretty embarrassing . . . . I felt humiliated and kept feeling kids were whispering about me behind my back and what the teachers would be thinking". Those feelings of embarrassment continued and in Year 5 when Teena had to read to younger children she claimed that "it made me feel pretty lousy. Got embarrassing because I used to make up some of the sentences so she wouldn't notice."
Her mother described how unhappy Teena became so that by the end of Year Five she "was close to suicide...she was writing about her death and death was close to her thoughts at the time". Teena was removed from that class and went to a new school.

This concern led her mother to seek many solutions to the problem. She attended a Child Development Centre, ("they said don't worry about her...she's normal."); changed her diet, ("I was diagnosed as hypo (hypoglycemic) and along with that I put the girls on the same diet."); read up on dyslexia, ("I noticed Teena matched the checklist in the books."); joined SPELD, ("I mentioned it to the Doctor and he said she had MBD [minimal brain dysfunction] and he put me onto SPELD."); and as well she "hunted for psychological things" as well as "dabbled in naturopathy and chiropractice." (sic).

Teena also consulted a school counsellor who referred her to a paediatrician. In turn she was referred to an occupational therapist, speech therapist, and the Prince of Wales Learning Disability Clinic. (Mrs G. claimed: "The speech therapist thought I was having her on. I don't think she saw the problem as being huge enough. Therefore it wasn't significant."). She had also been on a trial of ritolin. She had seen an ophthalmologist and "he said
that "her eyes were normal." Another ophthalmologist confirmed previous diagnoses. He stated that "there was nothing wrong." Teena, "didn't seem to notice she had an eye problem" according to her mother.

Then the "60 Minutes" programme prompted a visit to Dr. Whiting.

Mrs. G. continued: "meanwhile the school kept telling me there was no problem and that it was home." Also her class teachers reacted negatively to Mrs. G's concerns. When Teena was in fourth class "I mentioned my concerns to Mrs. B. and I wanted her to look out for things and she got "anti" and quite angry when I suggested that Teena was too withdrawn. She said there was "nothing to worry about. She can read all right."

Mrs. G suspected that a reading problem existed because Teena "read well initially and put in expression. She worked hard with expression but after two sentences she lost the sense of what she was reading .... she kept going with "gobbly gook" and was exhausted by one or one and a half pages. It didn't make sense, she didn't seem to notice that what she was reading didn't make sense."
When asked what she did when confronting unknown words, Teena responded "I don't know... I suppose I try to spell it out in my head and do the best I can. Sometimes when I don't know it the teacher usually has to say it." Teena felt that she read very slowly and that good readers could read quickly. "At first it was when I tried glasses on I read faster. Less embarrassing. Lot easier. I found it more interesting to read". I am coping better with it but took a while. I am much better than I used to be. I am able to concentrate more." "I don't need to use my finger to follow the words."

Upon obtaining the tinted lenses, the most noticeable difference according to Teena, and verified by her father, was her increased confidence. "I felt much better, and more grown up. Didn't feel like a baby. Didn't feel dumb. Didn't bump into as many people. I used to be really clumsy". "Crossing the road was much better - I wasn't as nervous". "Getting on and off escalators was better once I got them".

Teena's reason for obtaining the tinted lenses was "because I looked at words and they'd go blurry and move about. Worse when I had ear infections. Words looked like alphabet soup turning slowly in a mix-master. Letters would jumble up and go red. Magazines would go red and really shiny. Looked like it was raising up and going down. Sometimes the
background looked greenish - blackish. Sometimes - not often - just when I got tired." She claimed to tire after reading a few paragraphs and that she was unaware that print looked differently. "Didn't know that that wasn't how you saw it."

At the initial screening at Dr. Whiting's clinic, "60 Minutes" were filming and Mr. G. claimed that "it's not that they give glasses to everyone that goes along. When "60 Minutes" was there this fellow went before us and was a bit of a dud. Then Dr. Whiting came back and said "quick, we've got one." Teena was so good. So quick to respond. Teena was so definite and so quick they were impressed."

However, it seemed that Mrs. G. was not dissatisfied with the tinted lenses but she was still listing other possible avenues to investigate. "So now I'm wondering if we track down allergies will she be able to concentrate more and also with her eyes - will there be a difference in the eye problem". "At this point I'm wondering if it's hyperglycaemia. One problem of it was eye sensitivity."

Mrs. G. continued: "We feel that she's had so much attention and that her behaviour was becoming attention seeking". It seemed as though her parents were convinced that the tinted lenses were helping her, and her school results had improved. "Still we've got
the evidence from school to say she'd improved two or two and a half years in reading age. We could tell that they helped her but didn't know how much they'd helped her with her school work.

At the initial interview Mrs. G. stated that: "Teena was asked back but in an indirect way— they didn't have the facilities for backup going yet. It seemed they didn't have them in operation at that stage. He said to keep in touch."

Chris

Chris was the middle child of three boys. Chris suggested that he could improve his reading and writing. "I think I can improve a lot— I'm not all that good." Reading was regarded as "hard" and when reading out aloud he claimed to feel "really nervous."

At the initial interview Chris had not received the tinted lenses, even though they had been prescribed. Therefore it was necessary to revisit Chris three months later.

There was no incidence of reading disability in Chris's family. As Chris's older brother had coped admirably at school, Chris's mother (Mrs. M.) found it
difficult to comprehend Chris's perceived reading disability. "My fifteen year old is very intelligent and all along the teachers have been telling me I've been comparing him. I haven't."

She had made many attempts to help him. "Up to third class, I'd help. He'd be in tears." From the time he was in Kindergarten, Mrs. M. stated that there was a problem. "He was never really interested - he never liked to colour in, draw... at the end of Kindergarten he didn't do all that much - wasn't interested - wouldn't look at books."

Chris recalled an incident in second class that he regarded as being significant. "I had to read this story. I think it was about when I went camping outside and there was a thunderstorm. I think I was alright. I might have been a little bit nervous." When asked if he still got nervous he nodded his head and replied "Yeah."

Mrs. M. also placed a lot of emphasis on Chris's pleasant personality, which she thought allowed him to "wrap people around his little finger." She suggested that his teachers should not have succumbed to his antics. "I think most of the time the teachers like his personality and give him a pat on the head
instead of pushing him more." Chris's teacher disagreed. "His attitude was good — genuinely a good worker."

Throughout the interview Mrs. M. referred to Chris's attitude. "... He went to a reading teacher and he was not at all happy with his reading nor his attitude. ... this year his teacher was concerned with his attitude. I agree with him that he has the intelligence but hasn't shown it with his work."

His mother encouraged Chris to "sound out words". His remedial reading teacher at school stated: "He tried to sound it out, puzzle over it and then say some nonsense word which looked and sounded similar. He would keep reading". The teacher also felt that Chris's reading problem was "not that bad but rather he tended to read books of difficult content. For example books that were set in medieval times, etc."

Chris claimed that the best reader he knew never made mistakes. "She's got lots of expression — doesn't make mistakes."

Chris was particularly good at sport. His mother claimed "He has a good eye for things — he plays tennis, hockey, squash, just about every sport except football." As far as maths was concerned "he's always been in the highest group." He had also completed the
second grade music examination after playing the piano for three years. Chris stated that during the screening procedure with Dr. O'Connor "the music not near the outer edge of the page disappeared out of the corner of my eye." However he said "when playing the piano it doesn't seem to make any difference." Chris did not wear his tinted lenses when playing the piano.

Prior to obtaining the tinted lenses Chris had never complained of any vision problems and he had been told by the optometrist that his eyesight was "perfectly O.K."

Chris had had remedial help at home for reading. He had also been tested by the school counsellor ("couldn't find any problems") and at "the speech centre."

Chris's parents saw the tinted lenses promoted on the "60 Minutes" programme in 1985 but only decided sometime later to follow up the matter with a visit to Dr. O'Connor's Canberra clinic. When tested there Chris recalled seeing a rainbow when looking at the print. "I've only really seen them once and that was when I was being tested ... just a normal rainbow that went down the page. When asked had he noticed this before he replied that he had not. He also commented that "the white sort of distracts me and there's ghostly lines - well usually seems to be. It's
white where the outskirts of the word and everywhere else. Sometimes in the paragraph it's all right and then a duller colour outside.

Since receiving his glasses Chris reported that his schoolwork "seemed to be getting easier." He said that the changes had occurred over a period of time. "Weren't really quick, but sort of all right, but not all that quick." He thought the changes occurred "maybe a month or so after getting the lenses - maybe two weeks."

Chris could see no improvement in his writing. "That's one thing that hasn't really improved." With reading he stated that he no longer felt that he "stopped and started" and now seemed more "fluent."

At the time Mrs. M. was a little less convinced. "Whether it was a physical thing or mental thing I don't know. I think it's just a wait and see."

Noel

Noel was a nineteen year old apprentice mechanic who lived with his parents and older brother. His brother succeeded at the Higher School Certificate
whereas Noel left school having completed his School Certificate. He had undertaken a mechanic's course and at the time of the initial interview was in the process of losing his apprenticeship. He lacked confidence in his reading ability and appeared to suffer an inferiority complex. When talking about people who could read, he said "suppose they think they're smarter than what I am. I think they are better in some ways."

His mother supported this feeling. "I think he feels he has been dealt a raw deal in life."

In relation to reading he stated that he lacked confidence and avoided it. "I wasn't very confident, I'd never sit down and read or try to read." He continued "once I get frustrated with it I won't go back to it for a while". At the time of the interview he felt that reading was for him a low priority. "I'm busy and I don't make much time for it", "I don't go out of my way to do it - like I go out of my way to surf or go for a drive."

There had been no reading problems diagnosed in the family prior to this. Dr. S. (a Sydney doctor) however had informed Noel's mother (Mrs. A.) that "he was born with a deficiency. Something there - that's not lubricating the brain".
His school reports indicated the following: "he talked and disturbed the rest of the class". "Noel must apply himself more" and "He'd do better if he concentrated." His mother said "Maybe it's true."

Noel agreed "I had trouble with reading and used to muck up and get sent out. I was always told I was a disruption to the class. I gave a fair bit of cheek and copped a lot of extra work". "I talked a lot, disturbed people, doodled a lot instead of doing work" and "I was always volunteering to do messages and I'd take the long way back."

A headmaster had told Mrs. A. that "he was a spoilt little boy and I was an overindulgent mother." His mother it seemed had accepted a lot of responsibility for Noel's learning difficulties. "Maybe over the years I've tried to do too much for him. In a way I don't think I've let him down," and "I don't demand anything from him. He'd rebel. I'd kid around and I don't think he likes authority." Noel agreed. "Being in the classroom was like being court martialled."

His mother expressed concern for his inability to persevere - "You never stuck with anything."
Noel stated that "I've never really made sense of reading." His only means of word attack was to "sound it out and if that doesn't work I throw the book down usually." When asked what he thought good readers might do he said "Jess dunno, try to see what's in front of them and read ahead and work it out by making sense of the sentence. People told me they sound it out and take it from there." His mother spent time listening to him read and often they "both ended up in tears." Her method of helping included having Noel write out the word ten times.

Noel attended an eye specialist ("eyesight normal"), has had remedial tuition and had been prescribed ritolin ("medication to help me concentrate."). Mrs. A. stated that "Dr. S said it was a deficit attention syndrome and we'll give him a tablet. He was taking three a day." Mrs. A. said that "the ritolin made Noel more confident, just like the tinted lenses did. But I think he went off the ritolin at the wrong time. If he'd stayed on it up until Year Ten I think he would have done much better."

When another of the subjects of this study (Mr. G.) recommended the tinted lenses Mrs. A. rang Dr. S. to seek his advice. "Dr. S. said 'Yeah! They sound like a good thing. If they don't work come back and I'll see if we can put him back on ritolin.'"
Noel had his driver’s licence, liked to draw, read only "hot rod magazines" and worked as an apprentice motor mechanic. "Mechanical side was good... I could handle that." At the time of his initial interview Noel was failing the theory part of his apprenticeship. Since the initial interview Noel had a new teacher and he claimed that "the teacher this year was making it more interesting."

Noel stated that it was now "easier to read and concentrate with the lenses" but at the second interview, when asked what changes if any he had noticed, he replied: "Not much has changed – maybe haven’t had them long enough." (At this time Noel had had the tinted lenses for two months). Mrs. A. was still convinced. "I think if he uses those glasses they will help."

Mrs. A. stated that: "At the time of the interview, Mrs. O'Connor said that because of Noel’s age, it was not necessary to come back for another appointment, or to have the glasses checked."
Peter

Peter was twelve years old. He was the eldest of three boys and had worn his tinted lenses for approximately fifteen months. He was dissatisfied with his reading, writing and spelling.

"I wasn't that good with my printing and running writing. My reading was fairly good - bit over average. I'm still not a really good speller. This year we have dictation - I'm satisfactory - a bit under if that."

Peter's younger brother was experiencing similar reading and writing problems. Mrs. C. thought that Peter's younger brother could possibly benefit from tinted lenses as well. Mrs. C. was an avid reader but Mr. C. claimed not to be a great reader - "I read mainly newspapers - wouldn't pick up a book." His father justified this. "I've got really good eyes ... top vision. Unfortunately it mustn't be hereditary. He (Peter) plays competition cricket. It didn't worry me too much because he played comp. cricket and he was seeing and hitting the ball really well."

Apparently Peter had few problems at school until approximately Year Five. His Mother (Mrs. C.) said that "Basically he's an ordinary kid. He had no learning problems. He was happy to go to school. Early
in the piece it was really good. We could get through most anything. It wasn't until Fifth or Sixth that he had a real personality change. He was frustrated. He was just — he felt defeated. He felt like as much as he tried he wasn't getting anywhere. I felt frustrated — I began to grieve for the poor kid." His mother attributed these changes to his teacher's attitude.

"He had Mrs. F. in Fifth Class and it just seemed to compound itself. Then Mrs. P. in Sixth Class. She seemed to take over from Mrs. F. Peter went a little bit worse. He got degrading marks in his books. She wasn't a nice teacher. I don't think she wanted to accept that Peter had problems. Prior to Fifth and Sixth they said he didn't really have a problem."

Peter insisted on repeating Year Six. "It was virtually his decision. Ninety percent his idea." Both his parents and teacher referred to a marked improvement in Peter's attitude. When asked what changes had been noticed since obtaining tinted lenses, his mother responded "A lot... I'd say there's been a lot of marked improvements — his attitude has changed. He's much more positive towards school. His grades are up and I don't know whether it's the glasses or a change in his attitude." Peter's parents recognised two
contributing factors to the improved grades; the fact that he repeated Year Six and had a male teacher for the first time.

Even though Peter had had the tinted lenses for fifteen months at the time of the initial interview, the changes in attitude and improved grades occurred only in the previous three months. "He got the glasses last February and he wasn't good. He had Mrs. P. He had lots of bad habits to get out of...."

When asked specifically about changes this year his mother stated "completely different. First Term he wasn't crash hot. His Second Term report was excellent. His teacher thinks it's a change of attitude rather than the glasses. As I said, I don't know." His father interjected "It's only been this Term and we put it down to his teacher - well, I do. The teacher gave him a kick start - pull your socks up or get nowhere." His teacher claimed that Peter needed reminding to put the glasses on and that "he doesn't wear them much at all. I think the novelty wore off last year." When asked what changes Peter had noticed himself, he commented that things had not changed much but that "I feel they make it a bit more comfortable when I see words but not that much."
Peter's only reading strategy was to sound out words. "I try and wait there. Try to get basic parts out of it and put it all together. Sound it out - not out aloud." When asked what strategies he thought good readers might use he said "I don't know. Not sure. I wouldn't have a clue." His mother confirmed this. "When he comes to a word he doesn't know, he tries to sound it out and break it up into syllables."

Peter had his eyes tested and the doctor said "Fine. No problems." Peter also had played the piano for three years prior to getting the tinted lenses. At the time of the screening procedure, he claimed (according to Mrs. C.) that "... the lines were running into each other. Bars of music were merging at the ends and he could not tell whether the notes were above, on or below the lines." When questioned about complaints prior to this she said he had not complained. "No, but he was having lots of trouble with music. We were hoping they would help." When asked if they did help she replied "No, we pushed him and his heart was never in it."

At the time of the initial interview, Peter did not wear his tinted lenses in Maths nor when he played competition cricket or tennis. "I need them
for close up work... not for copying off the board." Dr. O'Connor informed his parents that Peter "should wear them everywhere and anywhere."

During the screening procedure Dr. O'Connor praised Peter for his bookwork. His father felt embarrassed. "I considered them to be terrible. Dr. O'Connor looked at them and praised Peter for his standard of work... after I had ridiculed Peter the night before because it was bad. Dr. O'Connor's reasoning was that (a) the writing was on the line and (b) writing is a form of communication and some people write better than others. In the same way some people express themselves better than others. I felt terrible. Peter looked at me and I felt lousy."

Dr. O'Connor asked Peter what problems he had when reading from the page. Mrs. C. recalled that he replied: "The white spaces between the paragraphs prevent me from reading the words in the middle of the paragraph. He had not mentioned this before. Peter also rested his head in his hand when reading." His mother said that Peter often did this at home and she thought it was due to laziness. Dr. O'Connor explained "The reason was he was blocking the light coming in from the window. Mrs. C. explained that "That was the excuse Dr. O'Connor gave."
Peter's parents elaborated that at the screening procedure different coloured overlays were used. Mr. C. went on to explain "Dr. O'Connor placed a blue overlay over the page and his reading improved twenty five percent." On being asked what he read he stated "He reread what he had read beforehand. . . . The conclusion was the blue was filtering the white out and giving a more even page colour."

Mr. C. was impressed with the screening procedure. "I've had dealings with professional people and he's impressed me most with his thoroughness and keenness to find a solution. I think he really believes in the product." Peter's parents claimed to have seen the "60 Minutes" programme and at the time had decided "it got to the stage we knew something had to be done."

The teacher concluded that "It seems better for the parents to think that the problem was that Peter needed coloured glasses rather than see Peter himself as being the problem. I said "Whooppee!""

At the initial interview Mrs. C. claimed that "Doctor O'Connor said that he'd get back to us if he had any information for us. Just lately he did contact us for Peter to have a check-up to see if the lenses were still satisfactory."
Lawrence

Lawrence was twelve years old and an only child. He had been wearing the lenses for approximately one month. He did not think that he had a reading problem, nor did his teacher or mother. When asked why he thought he needed the tinted lenses he claimed: "I don't know — probably because of my reading." However, according to Mrs. R. (Mother) they sought tinted lenses to alleviate headaches and improve his handwriting. Mrs. R. said "He's always been a bad writer which worried me a little bit — but a reasonably good reader and reasonably good at his work." His school teacher verified this. "She was the sort of parent whose pretty concerned about his school work." Mrs. R's concerns included the fact that Lawrence "couldn't seem to write the letter "O" neatly. It has about six corners on it.... also he hates writing stories. He's never coloured in — never sat with pens and paper at all."

Lawrence regarded himself as an average reader but he felt that "sometimes with writing I could barely read it when I got it down quickly."

Whilst Lawrence did not have a reading problem he stated that he did not read at home and enjoyed reading only "when it was a good book." His mother verified this. "He'd rather be outside running around."
Neither parents or close relatives suffered from any reading problems. Mrs. R. claimed that "While we were there (Dr. O'Connor's office, Canberra), he (Dr. O'Connor) looked at my husband and said "I think it comes from you - the way your eyes are watering."

The influence of hereditary factors seemed non-existent to Mrs. R. She claimed that even though neither parent suffered from any reading problem - "they read very little."

Lawrence had been to many optometrists since a school nurse suggested that there could be something wrong with his eyesight. Each gave differing opinions, as Mrs. R. explained. "I made an appointment at D. (optometrist) and he said "No, there's nothing wrong with him." I went to see C. at Liverpool and he said that he needed glasses. His test was completely different. He said that Lawrence had tunnel vision and needed magnification. One said "Yes" and one said "No." So we decided to wait and see the specialist. She said, "Definitely no. Don't give him glasses. He doesn't need them." We went back to another specialist, an orthopist and he said "No. Come back in twelve months time."
According to Mrs. R., Dr. O'Connor stated that "Lawrence had tunnel vision." She continued: "I agreed with Dr. O'Connor and thought that it was best to give him coloured glasses with no magnification rather than glasses with magnification." Whilst this was the main reason for Mrs. R. obtaining tinted lenses for Lawrence, she also thought that they would help eliminate his headaches, bloodshot eyes, and assist his concentration.

Lawrence did not wear his lenses in Maths...
"My best subject - other day I was picked in the top ten percent of the State for maths. And I don't need to wear them for band practice where I need to read the music."

There was little change in Lawrence's performance once he received the tinted lenses, according to Mrs. R. "No, I can't say I've noticed a difference... and I haven't noticed any changes to his handwriting either." Lawrence claimed that after wearing the tinted lenses for a month he had not noticed any differences in his reading or writing. "No, I can't tell yet. I can read for longer periods without stopping to rub my eyes or blink." His teacher stated that "He doesn't wear them at all, especially now that he's moved to the front. Didn't have them on at all today. One day he had them in his bag and I said "Why haven't you got them on?" and he
said he didn’t have to wear them all the time." His teacher explained: "He’s got poor handwriting and there’s no improvement in handwriting ... can’t say that there was any significant improvement in any subject."

Mrs. R. did refer to a change in the way Lawrence read when tested at the screening procedure. However, this improvement related to extracts which Lawrence had previously read at least once before to Dr. O’Connor, and did not relate to previously unseen material. "You could definitely tell the difference with reading - flowed much better from one line to the next than if he didn’t have the lenses on."

Mrs. R. was informed by Dr. O’Connor that it was not necessary for a follow up consultation: "No - he (Dr. O’Connor) said there was no need to come back."

Darryl

Darryl was eleven years old with a brother aged nine years. Darryl had had the lenses for approximately three months at the time of the initial interview. Prior to the tinted lenses he regarded himself as being "a poor reader... hopeless." He also had a disdain for reading.
"I had trouble reading and others could read better than me. Like they'd read and it'd be like flowing and I'd stop at every word." Darryl could not identify a purpose for reading but stated that "It's important to get my reading better." When asked "Why?" he said: "I don't really know." His teacher agreed: "Darryl doesn't see a point to reading. He'll do in life what he wants to do."

His parents seemed genuinely concerned. His teacher felt that his mother used to "hassle" him: "I think Darryl has to be responsible for himself... you can't 'moddy coddle' him." His father admitted that "There was another factor... we've been overprotective."

Mr. M. claimed that he became disillusioned by the time Darryl was in Year Four. "Along the line my frustrations came out. My thought was "He's not trying." Probably was - just wasn't coping. He's still not up to scratch. It feels like you could put a bomb under him. There's something amiss here." Mrs. M. agreed: "He still has a tendency to live in a dream world."

Mrs. M. recollected that it was in Kindergarten when the problem first surfaced. "I realised Darryl had a problem because the teacher said she thought he'd been listening but he was only
dreaming. The report said he wasn't good in Kinder. By the end of Year One he was crying daily and it was then that the frustrations started to show up." Mrs. M. was concerned that she had nothing with which to compare Darryl's work. "We began to wonder what we had - when your child's backward at school."

Darryl's teacher attributed the reading problem to feelings of insecurity: "Deep down, I think he feels inadequate. This shows up in his diary... he was just there in the class, doesn't seem to have any bearing on anything."

Mr. M. was a reluctant reader and did not read until Year Four. Darryl's brother also experienced reading difficulties. Mrs. M. was an avid reader.

Darryl recalled in detail an incident in Year One when he had to read to his teacher Mrs. B. "I had this book with pictures of elephants. I didn't know where we were up to. Raymond showed me and I didn't know what the first word was. I read it and read it. I kept getting stuck. I'd stop and go, stop and go. I felt awful and didn't feel like reading after that."

When confronting an unknown word Darryl stated that: "I pronounce it and if it doesn't sound like a word I miss it out and go down and if there's a
word I just put it there in place of it." He suggested that the key to reading success was to concentrate more and that for him to improve would "take a lot of effort."

His teacher claimed that when Darryl confronted a word he didn’t know "He looked blank. He had no word attack skills. Owen (person sitting next to him) told him words he does know. Owen reads quite fluently."

Darryl stated that the tinted lenses enabled him to "learn easier. It’s a lot easier to read. You’d probably learn without them but it’d take longer than if you’ve got them on."

Darryl’s progress at school had been slow according to his teacher. "For a long time I didn’t think there was any progress. Over the last few weeks I found it hard to get Darryl to write anything ... he’d sit in the background and go unobserved. Last week he wrote in his diary ... I could read everything he wrote. I didn’t attribute any of this to his glasses. Maybe they’ve just given him some confidence.... There hasn’t been any massive improvement only marginal."
When asked what changes had occurred since obtaining the tinted lenses, Darryl replied: "Before I got the glasses, when I looked at a book it'd go blurry and I'd have to blink. It wasn't in straight sentences. It was in steps. Without them the words had circles around them too and the circles cut off some of the word. There's sort of creeks through them in between words and words come out at you - come off the page and I wouldn't see them. They'd disappear."

He claimed that there were no changes when looking at numbers but then reconsidered his response. "Numbers... (looked away) were not really different. Numbers?... Oh well... hundreds and thousands, yeah. They'd get rings and cut off bits and make them look different." When asked how he coped in Mathematics he replied: "Not that bad in Maths." Asked how he felt about Mathematics his response was: "Good - 'cause I wasn't really low." He did not wear his tinted lenses in Mathematics.

Other changes in the environment noticed by Darryl included: "The canoe was more of a banana shape before I got my glasses...now when I look at it a few times it looks normal. Oh, yeah!...the stripes on the door; sometimes they might disappear but not very often. If I'm looking at a pencil in front of me - it'd bend and go sideways at each end."
Mr. M. stated that Darryl had referred to "telegraph poles bending and disappearing, clothes lines disappearing and light cords disappearing."

On the other hand, Darryl was particularly good at fixing electrical appliances. He claimed: "It seems funny when I'm reading something and it goes wrong but when I'm fixing something, it doesn't." He also learned guitar and did not wear his tinted lenses when learning to read music. However, when Darryl read music at the Irlen screening procedure, his father reported that: "They tested him with music and he said that it bent up and came out of the page."

Mr. M. said that he had recognised discrepancies. "The discrepancies include things like he concentrates on things for hours... he fiddles with things... He seems to go into escapist things really. He does electrical things - pulls things to bits and puts them back together again. Got a hairdryer to work; fixed the car radio and blinkers before he got the glasses. This was the enigma - if he can do these things - this was what gave us hope."

There was also a lack of suitable reading material for Darryl to read. "Dr. O'Connor had no reading material that Darryl could read to him." Darryl identified "rivers and waterfalls running through the words and grey halos" during the screening...
procedure. Mrs. M. claimed that Darryl had not spoken previously to them about it. However, Darryl stated that, prior to going to Canberra, he had asked his friend: "Do you see tree roots running through the page?" This he relayed to his parents only after the consultation in Canberra.

Darryl's parents had sought many solutions to the perceived problem. These included:

1. His mother had "four visits weekly to the school" according to his teacher.

2. Interviews with the school counsellor who said that: "Darryl has no trouble with what he gets done."

3. Appointments with ear specialist, eye specialist, ("Results were perfect") and Government-sponsored Child Development Centre.

4. Remedial tuition.

5. Appointment with a paediatrician who suggested that it could have been attention deficit disorder. "...some kids are born without neurons and the child can't concentrate. He was then prescribed ritalin."
His parents recognised that "parents grasp at straws. Grasp for kids sake." They were also conscious of limited changes when asked "Have you noticed any improvement?" "No, not really. If anything, hesitancy to read was not there - seems to flow more."

Darryl appeared to be very defensive about his tinted lenses. When reading to his mother she asked him if he wanted to put his tinted lenses on. "He said, "You sound like that lady - you don't know what it was like when the words spin." He got all 'thingy' with me." Mrs. M. was also conscious of the comments her friends made when Darryl was absent from school regularly with tonsillitus, sore legs, "...So he could get out of sport." "My friend said to him: "You've got around your mother again." His friends would say "You're faking it again!"

Mr. M. stated that he was informed by Dr. O'Connor that: "I'd only be too willing for you to come back, or relate to me by correspondence." Mr. M. continued: "It appeared at that stage that it was experimental... like this programme was in its infancy and he'd only be too happy to have any feedback."
Greg

Greg, aged eleven, was the middle child of three and the only one with a reading problem.

An obvious physical feature was a large wart growing on his top eyelid down into his eye. He claimed that before the lenses he could see a "big spot on the page and all the rest was fuzzy - tops and bottoms were fuzzy." He lacked confidence in his ability to read: "...Terrible - no good as a reader.", but claimed that his writing was adequate. He had been wearing the tinted lenses for approximately seven months.

According to Greg's mother (Mrs. S), his elder brother was an excellent reader, whereas Greg experienced great difficulties. "He used to cry a lot and say he couldn't do it. He had a rough life this kid." There was no history of reading disability in the family, however Daniel's father said that he (Mr. S.) had a "comprehension problem, and even now I have to read things a couple of times."

Mrs. S. referred to the fact that Greg had missed a lot of school because he was an asthmatic, and suffered from ear problems (which included having a perforated ear drum, and a cyst). Greg had been tutored
for his reading and had been referred to the school counsellor who had said that "there was nothing wrong with his reading."

Mrs. S. claimed that Greg's problem first became evident in Kindergarten and Year One. "I didn't realise that in First and Kindergarten he wasn't doing as well. I found that she (teacher) told me what I wanted to hear rather than what was happening."

An incident that Greg recalled vividly occurred in Year Two when he had Mr. B. as his teacher. "We had Mr. B. ... I was sitting on the carpet and he got angry at someone at the back. He started spitting and yelling. ... It was terrible. It just went all over the place and on me." When asked: "What did Mr. B. think of your reading?", he replied: "Before I got the glasses he said it was pretty good." When asked: "Did you believe him?" his response was a definite "No!" He explained: "Mum says my reading was not too good and I should read better." It appeared that at the time Greg confronted conflict between the views of his mother who said that he wasn't a good reader and a teacher whom he disliked who said that he was a good reader.

Greg's reading strategies revolved around sounding out words and "Probably just from a book or the pictures... I dunno!" Mrs. S. confirmed this.
"We'd get really basic books and I'd get him to sound it out." There was a lot of anxiety attached to Greg's perceived reading disability. "Greg would read in the morning and after school - there were lots of tears. The amount of tears he shed! Sitting there, I'd get so angry. P and D and A and Z were all the same to him. He'd lose his place so many times."

Greg had been tested by an optometrist: "Nothing wrong." He had also been interviewed by the school counsellor who stated that: "There was nothing wrong with Greg's reading." He did not wear his tinted lenses when playing tennis, nor in craft work which he enjoyed. Greg regarded himself as being "good at number work." Mrs. S. confirmed this: "He could do his number work really well and I think that's what saved him a lot."

In relation to the perceived reading difficulty, Greg's headmaster suggested that the tinted lenses "were the only option left."

Dr. O'Connor was contacted. Mrs. S. explained Greg's symptoms as: "He reads in a zig zag fashion and his eyes are bloodshot and sore. ...He suffers from headaches." Mrs. S. went on to explain that: "The chap in ACT said: "Yeah, Greg sounds like me!"" At the
screening procedure conducted by Dr. O'Connor Greg claimed that "The notes 'swam'". Up until then Greg had been having recorder lessons.

Since obtaining the tinted lenses, Greg thought that his reading had improved. When asked why, his response was: "Sometimes Mum and other people say it's better." He only started enjoying reading "a few weeks" after he obtained the tinted lenses.

When visiting Greg approximately four months later it was noted that the wart had been removed from his top eyelid. This corresponded with getting the tinted lenses. When asked what changes he had noticed Greg stated that "The big spot had disappeared." Previously he had claimed that the print looked fine "only on the outside of the big spot. "...It was alright in the bit that I could see."

Greg also felt that his writing had improved. "I can read and write nicer. People can read my writing." Mrs. S. stated that since getting the tinted lenses "Greg didn't instantly read. I'd say it only just came now. I don't think he's super marvellous but I think he's doing well now."

After the screening procedure, Mrs. S. asked Dr. O'Connor what should happen "Now that Greg had his glasses." Mrs. S. reported that "Dr. O'Connor said that
"I had to go with these as long as he was happy with them." Mrs. S. then said that: "But I got a letter twelve months later to say that they had this new U.V. glass that they had since discovered, and that I should come back."

Rory

Rory was in Year Four and had worn the tinted lenses for two months. He lived with his father. He was the elder of his father's two children and the fourth of his mother's five children. Rory did not like reading and regarded it as "Being hard. When I went to school I couldn't read any books because they were all too hard. At the other school they only had hard books and I didn't even bother to look at them." Rory had a very low self esteem in relation to reading and writing. "I felt I was stupid then cause I couldn't read or write much. Everyone was overtaking me. I was way behind."

His father (Mr. X.) said that reading problems did not exist in the family: "None of my family's got it." However, Mr. X. was not interested in reading. "I won't read unless I have to and only if I'm really interested. I hate reading. There's really no reason for me to read." It appeared that Mr. X.
understood Rory's disinterest in reading. "Rory can't stand reading. He's got the same problem as I've got. I can see he is no different to me when I was a kid."

Rory changed schools when his father was dissatisfied with his progress at the state school. "I thought he might go better in the private system - not as many kids." Rory did not like his former school. As well as having only hard books, Rory reported that "They told our mums and dads to teach us. Mum and Dad couldn't teach me cause they had to go to work."

Rory recalled an incident in Year Two when he was asked to read and he "got everything wrong." "...It was embarrassing. Everyone started laughing." Rory looked worried when explaining this and said that it was a "really scary" experience. He continued: "I kept on shaking and I didn't like myself much then."

Rory's only means of word attack was to ask his friends "Because they're real good readers." He stated that good readers when confronted with words that they do not know "Would usually go and ask the teacher. Sometimes the teacher didn't know so then they'd have to go to the library teacher."

Rory had been to many optometrists and other eye specialists and received differing opinions. Mr. X. explained that: "One optometrist said he was short
sighted, another long sighted and another eye specialist said that there was nothing wrong." Finally Rory was tested by an eye specialist in Sydney. Mr. X: "He said his eyes were better than a lot of adults that he had tested." It seemed that Rory experienced few visual problems outside of the reading situation. He was involved with basketball, football and had won many trophies for BMX riding.

When diagnosed by Dr. O'Connor, it was inferred that Rory's eye problem affected his co-ordination. Mr. X. disagreed. "As far as his eyesight being mixed up with his co-ordination, I think he's (Dr. O'Connor) a bit wrong. He doesn't have any problems playing sport."

At the screening procedure, Rory was asked "a lot of questions" according to Mr. X. These questions included the following: "Do you have trouble reading a whole lot of words, like a full line, and then do they come together, blur, wave? Do they squash together, spread apart?"

Mr. X. stated that: "Before this guy was putting it in his mouth Rory was saying the same thing. Rory was given the right signal to the whole message. I mean if the Doc. said "You're seeing lines" he would
nood "Yeah!" At the screening procedure Rory did not have to read. He just had to stop the words from waving and going blurry."

Rory suffered from headaches when reading and watching television. This was the main reason for his seeking the tinted lenses. Rory's grandmother saw the "60 Minutes" program and out of concern for Rory and his perceived reading problem, she suggested that they go to the A.C.T. Rory's teacher supported this decision. Mr. X. reported that "It took three months to obtain the lenses from America and then the lenses had to be cut to fit the frames of his glasses. This was done by a local optometrist."

Since obtaining the tinted lenses Rory stated that his reading had improved. "Every time I look at words I almost know them off by heart. I know I've been getting better because I've been reading and there's no blurring or rivers or that." Mr. X. was hesitant: "He (Rory) doesn't seem a bad sort of guy. I don't know whether he's fair dinkum. Maybe these people that come up with these glasses could be a trick. I didn't know if he was leading me up the garden path or not but I've noticed Rory doesn't get as many headaches... Well, he's had only one... or that's the only one he's complained about - probably watching
too much T.V. or running around." Mr. X. also felt that "Rory's getting a little bit better in reading. He's reading things more."

The library teacher from his school stated that "there had been no significant change as a result of the lenses."

Rory was not asked to return for a follow-up visit. However, Mr. X. claimed that: "Mrs. O'Connor said that we had to go with these for as long as Rory was happy with them."

Fran

Fran was the third of five children and was in Year Five. She did not enjoy reading. She had a younger sister who was an avid reader. At the time of the initial interview she had only ordered the tinted lenses. The second interview took place five months later.

Fran regarded herself as being a "dumb reader" but said that "I sort of get better by the day." At the time of the interview her father interrupted with the comment "Rachael (younger sister) does more reading than you." Fran replied: "She enjoys
it. I don't. Some time later her father (Mr. B) stated: "I think Fran feels pressured by her younger sister."

Mr. B. seemed to think that Fran's problem resulted from her lack of phonic knowledge and her inability to use syllabification. "She doesn't seem to break words up into syllables." Her parents expressed concern: "She isn't a backward child. We find it most frustrating." Fran's parents were informed by the Year Two teacher that a problem existed. "Teacher called us in and she said that Fran was not reading and spelling like she should. The teachers were aware of the problem and I (father) felt that she was bright enough."

Fran showed signs of sadness when recalling memories of how she learned to read. "In Year One I didn't - ...just wasn't so bad until I sort of ... (looked away with sad expression) ... there were some people got better and some people got worse."

Fran admitted having to ask her friends and teachers the words that she could not recognise. When this was not possible she stated: "I sound it out and use syllable breaks. Spalding (a reading approach based on syllabification) helps me put in the breaks."
Fran suggested that good readers would do the same if "They knew Spalding and if they didn't, they'd work it out." She also thought that they would "sound it."

Mr. B. expressed concern about Fran's "guessing" of unknown words. Fran's teacher confirmed this. "She makes a guess at words she does not know. That's her main method of coping. I don't know if that's changed now that she can see the words clearly."

Fran was particularly skilful at "maths, handicrafts and needlework." Her music teacher had remarked that she was very musical; prior to her getting the tinted lenses.

When tested by Dr. Whiting, Fran was asked to read "little stories - three or four sentences and some had more." Fran stated that she "did a mistake and didn't realise it." Mr. B. elaborated "there was a word in the test with Dr. Whiting and without glasses she misread it. It had four letters. For example, on the paper it said "did" and she read "done" or something. It was amazing. She read it three times and got it wrong. With the glasses on she got it correct."
Dr. Whiting also suggested that Fran had a hearing problem. Mr. B. recalled Dr. Whiting explaining it thus: "She doesn't always hear exactly what's said. Therefore, she can't translate what she says... that is, the sounds into writing." Her teacher, who attended the interview with Fran's parents, explained the basis of this observation. "He (Dr. Whiting) asked her to read and then asked questions. Her answers weren't exactly what she read. I don't think that there's anything wrong." Mrs. B. agreed as she did not think Fran had any hearing difficulties.

Fran had also had her eyes tested by an optometrist prior to the visit to Dr. Whiting. The optometrist stated that "there were no problems." Fran had been interviewed and tested by the school counsellor as well as Porter Street. Her father claimed that "They didn't diagnose the problem. They didn't twig and it left us with frustrations."

Fran had also changed schools. Mr. B. reported thus: "From Second Class we've been chasing this problem and here she was in Fifth. If she had stayed at (F. school) I don't think they would have identified what the problem was. Fran didn't get anywhere with the public system."
One of the other subjects in this study attended the same school and it was on this recommendation that the school suggested the glasses be sought. "They (the school) picked up she had a problem — they already knew a girl with the same problem." The school also suggested the use of ritolin. "The school mentioned Dr. S. who prescribes ritolin but I don't think that's it", Mr. B. stated.

During the screening procedure, her parents noticed that she was "able to get the c's, n's and 'r's" and "once she had the lenses the right colour, she read fluently. She sounded like a different child reading."

However, when interviewed five months later they remarked that "I don't think the glasses have solved the problem. I think she has a problem with phonetics even with the glasses on." Her teacher confirmed this. "I had hoped that she'd be able to be helped — but seeing what she's doing now I'm not all that sure. There doesn't seem to be all that much progress." Fran's comment when asked what had changed, was: "I don't know."

Fran's Mother stated that: "No, we weren't told that there would be any follow-up."
Eva, aged fifty four years, had worn tinted lenses for approximately six months. Despite the fact that she did not have a reading problem, she felt at the age of forty six that she had sensitive eyes and hence needed glasses. She had consulted numerous ophthalmologists and optometrists, all of whom advised that she did not need glasses and recommended that she not wear them.

Eva stated that: "At Sydney Hospital they told me that I shouldn't be wearing glasses. There was nothing wrong with my sight. This has been the same with other ophthalmic surgeons. They've told me that there is nothing wrong... just a neurotic old woman. It was only in 1982 when I went to the Eye Hospital and they said I don't need glasses. You can imagine that it was an awful shock when the doctor said: 'Why are you wearing glasses?'

As well as being an avid, fluent and confident reader, Eva claimed to have no visual problems. "I could read the bottom line (of the sight chart) almost perfect. I can read it, but in reality I can't. I've never had any understanding from eye people at all."
Eventually she did find an optometrist who prescribed her magnified glasses which she found to be most uncomfortable. Pointing to her old glasses she said: "These are the ones I go for when I feel that I can't cope."

Out of frustration Eva sought tinted lenses. "Because of my frustration I was so upset at being told that I didn't need glasses. I couldn't convince anyone that I couldn't see."

Throughout the initial interview, Eva referred to brain degeneration, an issue of obvious concern to her. "If my eyesight presents to people I don't need glasses then they can say I don't have a problem. Maybe it's brain degeneration."

Eva's father suffered from Alzheimer's Disease and this worried her. "Puts a worry on me... maybe it's my brain too that's degenerating. It's hereditary."

There was no history of reading disability in the family. Eva performed well at school and worked as a nurse.

The most significant change Eva had noticed since receiving the bright yellow tinted lenses was that: "I'm not as grumpy any more. On a dull day they
put life in the atmosphere...life in the trees... sunshine has been put in the day. Things are clearer, adding hours onto my day. Things are brighter and happier. I can say that getting the glasses was a miracle for me. I know my living inside a house was a lot easier."

Eva was not at all impressed by the claims of the local optometrist that her tinted lenses were merely night-driving glasses. She stated that: "The optometrist said they are straight out night-driving glasses. I said there must be something different for them to charge so much money for them. He said "No, they are identical!"

Eva was tested by Dr. O'Connor who claimed that she was a "moderate case" and that "she didn't need them, but they would help." Eva's father accompanied her to the clinic, because she thought that he could benefit from the tinted lenses as well. When attempting to test her elderly father Dr. O'Connor found him to be uncooperative: "When Dr. O'Connor said he couldn't get him to co-operate I told him about ritolin. Dr. O'Connor said that we could give him the last dosage. I took full responsibility for giving it to him. We waited about an hour and a half to test dad again. There was no doubt that he could see with ritolin. He could differentiate the colours. The Doctor couldn't work out which colours were best for him."
Eva appeared disappointed that the doctor did not mention any follow-up. "There was no feedback... that's the only thing I found was wrong. This was the only doubt I had of them. I didn't doubt any of Dr. O'Connor's work at the time. I thought that what he was doing was great." And later: "I don't think that I've been diddled. I don't think they are charlatans, do you?" Eva then answered her own question by stating: "No, not at all."

At the follow-up interview with Eva, she claimed to have had a new set of tinted lenses made at the local optometrist. These she preferred to wear "all the time" and wore the Irlen lenses only for night driving. She had requested that the optometrist not make her new tinted lenses "as bright as the Irlen tint."

The outcomes of this case study were considered to be unusual in that Eva had sought the tinted lenses solely for reasons other than for overcoming reading or learning disabilities. Consequently, this case study was excluded from the evaluation of the overall results.
Tim

Aged fourteen years, Tim was the youngest of three boys in his family. He had his tinted lenses for approximately twelve months. Tim regarded himself as being "not so good a reader", and admitted to it being "sometimes a bit boring."

Tim's mother (Mrs. T.) confirmed this. "He wasn't interested in schoolwork, ever." Mrs. T. recognised that a problem existed from the time Tim was in Kindergarten. She said that: "When Tim started school I probably knew that he was a bit slow." Mrs. T. appeared to be sympathetic and concerned about Tim's problem. "I always helped... I never minded doing it, but it's hard when the child's not interested... he doesn't like pressure being put on him."

Based on Tim's school reports Tim was a behavioural problem in primary school. Mrs. T. claimed that "Tim doesn't know how to behave and get along with other kids. They call him 'spastic', 'slow' and 'dumb'." Consequently, the school counsellor was involved and a series of consultations with various "specialists" was initiated. A listing of the consultations, along with comments by Mrs. T. appears below.

Prince of Wales Hospital (Sydney)
"The paediatrician said that my three boys have dyslexia rather than an intellectual handicap. The report said that (quoting) "There was no specific treatment that would help and that it was a maturational lag... Examination of neurological system was normal. Recommendation: ...Read to the Headmaster for half an hour to forty minutes a couple of times a week."

Child Development Centre (Wollongong)

"Because Tim still wet his bed when he went to school the paediatrician sent me to the speech therapist at the Child Development Centre."

Dr. S. (Sydney)

"He prescribed ritolin. I think it worked for a while."

Optometrist.

"He said that there was nothing wrong."

Mrs. T. also attended a reading course for adults in the hope that she could help Tim. She attended meetings for parents of children with learning difficulties. She wept whilst explaining all the
avenues that she had explored, each to no avail. "Trouble with dyslexics... some people are really bright and have it. My kids are slow learners and have to learn it all."

Mr. T. had been a non-reader up until the age of fourteen years. There existed no other incidence of reading disability outside of the immediate family.

Tim did not enjoy school until recently when he began to enjoy "maths, agriculture and cooking." He did not wear his tinted lenses in science or cooking classes, or whilst playing hockey. "I have no trouble seeing the ball."

The only means of word-attack Tim knew was to "sound it out." He was unsure of what other readers did when confronting unknown words. He identified "Darren" as a good reader and commented: "He's just a good reader. He's brainier than me and he's moved up a class."

When Mrs. T. took her three sons to Dr. Whiting's clinic, two of them were prescribed the tinted lenses. "I wasn't sure that the glasses made any difference. Both of them wanted the glasses. I wasn't sure that they weren't having me on. Dr. Whiting was sure that they were answering him in a way to warrant getting the glasses." Mrs. T. twice observed the Irlen
screening procedure. She commented: "I still say that if you've got good eyes and it was as confined as this, you'd still make mistakes. I don't know whether they (sons) did good or bad."

Tim stated: "The glasses help me to read and write better. The letters have stopped moving forward and backwards, that's all. Improved my writing. The words are neater and that's all."

Mrs. T. confirmed this when stating: "He seems faster. Still makes lots of mistakes but seems to know more words. He's writing better when he's got them on. He would probably sound better if he read a list of words rather than put them in a book."

Mr. T. claimed that once the testing was completed, there was no mention of a follow-up consultation with Dr. Whiting.

Tony

Tony was aged fifteen years and was the third child and only boy in a family of six. He claimed to avoid reading whenever possible. "I'd dodge it when I could." When asked what sort of reader he thought he was, he responded "A short reader... I don't read too much."
On another occasion he stated that "In Fifth and Sixth Class I was hopeless. When the teacher said "who wants to read?" I'd pretend to be working. I could get away with heaps then, or I'd pretend I had a bad voice and couldn't speak. Mrs. C. (teacher) would fall for that. This kid (D.W.) would bring a little drill to school and we'd drill holes in the wall. We did this in reading time. If we got split up we'd sit there and daydream."

Tony's school reports always included remarks to the effect that "he was a dreamer."

Mrs. H. (Tony's mother) confirmed his disinterest. "Probably Tony has always been a bit slow. An easy-going child who liked to be around home and family. He didn't have any zest for reading."

Tony's parents became concerned when he reached Year Three. "We began to feel that he had a problem. He would start well and get slower and slower. We knew he was a terrible reader. We'd have tears about it and we'd read to him all the time."
Tony recalled "Not learning much in First and Second Class." "I didn't really get into reading much. I didn't do much looking at pages to notice anything." Tony's only reading strategy was to sound out words, and his mother encouraged him in this.

Tony stated that he never liked school. "In Pre-school I hated the place. I had no friends." He remembered a reading related incident in Year Two. "I remember writing letters down. There was this lady teacher and I sat next to Matthew. In the class I used to muck up heaps and I remember going in one day and she gave us this big dot-to-dot. She made me do it again and again, because I didn't do it neatly or something. I had to do it five times. I felt so embarrassed."

He also recalled his first book. "It was a Lady Beetle Book. I used to pick it up and try and read it. I remember it was about a little rabbit. He'd go on lots of adventures, and I thought 'If I could be like it, I could get out of school.'"

Mrs. H. appeared concerned and anxious. "In Year Three the teacher said that he didn't think that Tony had a problem. When the Principal tested him, he said that it was all in my mind." Mrs. H. remarked that Tony "did well for him when he was tested."
A 1986 school report remarked that Tony "reads clearly and confidently." Mrs. H. said that "I knew he couldn't do it. The teacher gave him novels and he never completed them. She said that she'd check back through her records. I said he was dyslexic and that's why he tends to dream."

It was on the issue of dyslexia that Mrs. H. sought out more information from Mrs. G. (the mother of Teena in this study).

Mrs. H. claimed that Tony "wrote letters back to front, like "b" "c" and "d". He'd mirror reverse. I used to do reading with his class when he was in Third and Fourth. He'd start off well and then he'd stop and read word by word. He'd read the same word three times."

She also stated that Tony "had difficulty handling things in the kitchen, like cups, and often failed to carry out commands. To get things done, I'd have to give instructions step by step."

Tony stated that reading was of little importance to him both at home and at school. "No, reading wasn't important. I'd read signs on the side of the road, names of places... things that were easy. I didn't like reading. I was too busy dreaming or drawing."
Tony had undertaken an eye examination prior to obtaining his tinted lenses. The optometrist remarked that "Tony could need slight magnification... he's just over the border of a child who needs them."

Tony was particularly good at sport and his Maths results were "always satisfactory." "I like Maths, and I don't wear my glasses in Maths. I'm best at using my hands... doing jobs. I pull apart a lot of things... all the electronic gear and dad finds it in my drawers."

Mrs. H. recalled that during Tony's screening procedure with Mrs. O'Connor, he referred to the music note "zipping off the line and disappearing." Mrs. H explained that Mrs. O'Connor "found colours that combined and then found the combination that would hold the music note in the same spot for the longest time. The combination was bright blue, green, and purply pink. The colour of the glasses ended up being dark green."

Mrs. H. related that Mrs. O'Connor asked "Whether there was a halo around the letter, whether it moved, or whether it lay at an angle." "She then went down a couple of lines on the alphabet chart and said "With dyslexia some letters tend to lean on others or drop off the line.""
When asked if there had been any changes since obtaining the tinted lenses, Tony responded: "They take the halo off from around the word. ...To read with glasses off feels like I'm singling every word out...the words are bigger and the view I have of the page is a lot bigger. I can read ahead. It's greener." Tony had not noticed any differences in his writing: "I don't know... I've never tried to write with my glasses on."

Mrs. H. gave the following reason for seeking the tinted lenses for Tony: "As a parent I thought if they could help I'd do something about it. Someone suggested them and I thought "Why not?" I thought I didn't have anything to lose and I could look elsewhere if they didn't work."

Tony claimed: "I wasn't told to come back but they said that the lenses might fade and I might need to come back at a later date."

Andrew

Andrew was aged twelve years and was in Year Six. He had had the tinted lenses for approximately two months. He had an older sister who was both an avid reader and an excellent student. He consulted a
remedial reading teacher weekly and his parents regarded this as essential if he was to improve his high school prospects. His mother (Mrs. P) stated that "We've decided that he should have remedial reading all the time through high school. I think he's always going to need extra help."

Andrew perceived himself as being a poor reader. "I'm not very good. I was O.K. but not the same standard as most of the other kids in the class." He also stated that he disliked reading. "I tend to get frustrated when I don't know a word."

Mrs. P. claimed that his problem was the result of disinterest. "I always got the impression that Andrew did think it was not necessary to read and write. I think he just thinks that he can acquire things and doesn't have to really work for things."

Mrs. P. seemed resolved to the fact that Andrew's academic future was not going to be bright. "He's more interested in sport and things like that. I am happy that he's not going to be an academic. He had a nice personality, and as long as he can read and write I'm not going to pressurise him. If he's going to be a natural reader he'd pick up books, and he doesn't." Andrew seemed to reinforce this conviction. "My mum said people are born to spell, and Grandma said that dad wasn't very good at it too."
The family obviously gauged reading according to "performance" or how well the reader sounded when reading aloud. Mrs. P. stated that "My husband is a really poor reader and so is my father-in-law. My husband has three Degrees but it is painful to listen to him read. Andrew has really good comprehension and he expresses himself really well. Andrew is quite good verbally."

The family identified Andrew's problem as early as Year One. "He's always been poor with spelling sounds and reading was the reason he repeated First Class. Even words like "that" he didn't know his vowel sounds."

Mrs. P. claimed that she feared insisting that Andrew read. "I didn't want to pressurise him too much. He seems to go backwards if I do." She explained that Andrew never appeared interested and this added to her frustrations. "I was trying to do what I could. It's frustrating. I was working. I was tired. For someone who wasn't wanting to try it was hard."

Mrs. P. said that Andrew's reading was inconsistent. "He's not consistently good or consistently bad. One day good and one day bad. He reacts differently to reading sessions. One day he'd read the whole chapter and then some days stumble over
words. She felt that Andrew could be "slightly dyslexic" because of his confusion between "b" and "d", and "7" and "9".

She also expressed concern for Andrew's immature behaviour and lack of confidence. "He is very immature and I think he lacks confidence. He can learn things. He recited poems at the Eisteddfod but it's just the reading to learn things." And later: "I see his teachers at the beginning of each year and I tell them that if he starts getting into trouble it's because he's sticking up for his mates. He tends to mind everyone's business and gets into trouble for that."

Andrew reluctantly recalled an incident in Year Two when he "just had to read these little books. We had to sit in a circle. We had half a page of writing and each of us had to read the page. Mrs. B. used to shout at people who did things wrong."

Andrew's mother confirmed this. "In Second Class he had this teacher and they both seemed to dislike each other." Mrs. P. became emotional when recalling the incident. "I still see that teacher and she won't talk to me. That's the only teacher we've had trouble with."
Andrew's parents sought the tinted lenses because "the remedial teacher picked up that he didn't know his sounds. The school counsellor said that he had had a bad start and gets into a bit of trouble at school." Mrs. P. was concerned that Andrew might not be able to cope in high school. "I was worried what class he might go into at high school. I hoped he wouldn't end up with the 'bad eggs'. We were willing to do anything to help him... if that was the problem."

She also stated that "sometimes you think it's your own fault. I feel it's something I've done. I feel I haven't persevered. I feel terrible. I think "what else could I have done?" Maybe I could have started remedial reading sooner. We've done everything to get him to read, but he's not a natural reader."

Andrew's main reading strategy was to sound out words. He claimed that good readers, when confronting unknown words "read on; read the line... so that they can keep words in their minds. They sort of sound it out in their heads when they are reading. I think that's all they do." Andrew said that his teacher had coached him to "syllabify". "The teacher said to break it up into syllables and it's easier to read. Sometimes you just know the word 'cause you've seen it before."
Mrs. P. confirmed Andrew’s over-reliance on phonics. "I think he can only do it by sounds. I don’t know how to do it by word recognition. Same as maths, I don’t know the new maths."

Andrew’s visual problem did not seem to interfere with his progress in any other subject. He was in the "top maths class" and claimed maths as being his best subject. He was also keen at sports and played golf and soccer.

Prior to being prescribed tinted lenses, an optometrist tested Andrew and concluded that glasses were unnecessary. "The optometrist said I didn’t need glasses. He said my eyes were alright and there’s no problem with my eyes."

Mrs. P. recognised an improvement in Andrew’s reading since Andrew had been wearing tinted lenses. "Much more smooth and flowing reading. He used to use his finger before... tries not to do that." Andrew had not expressed an opinion of the tinted lenses. "He hasn’t said very much at all. I don’t know whether he thinks it’s a gimmicky thing or not."

Andrew responded that "words are now spread about and I can read them better. If you look at the page the glare used to hurt my eyes. It doesn’t anymore because the glare had darkened down. Made the words a
bit bigger too." (There was no magnification factor in Andrew's tinted lenses.) Andrew also said that "on white paper words jumped about. On coloured paper they stayed still."

The right lens of Andrew's tinted lenses was tinted dark blue and the left lens tinted light blue. Andrew's explanation for this was that "I told Mrs. O'Connor that when I was in kindergarten a piece of steel fell into my eye and it made it lighter."

Andrew's remedial reading teacher appeared to be sceptical about Andrew's tinted lenses. Mrs. P.: "He doesn't think the lenses are doing any good. He thinks that it was a waste of money."

Andrew attended the screening procedure with his grandmother. She could not recall being asked to come back for a follow-up visit.

Warren

Warren was seventeen and an apprentice jockey. He was also the eldest of three boys. The youngest sibling was prescribed tinted lenses and Warren's father had attended remedial reading classes for adults conducted by Wollongong University.
Warren appeared to be indifferent to his reading problem and disliked reading. "It's horrible. I've always thought that." He did not know why he had the problem and he thought that "the guy up there...God... was probably the only one that would know."

Warren was defensive when discussing his problem and the tinted lenses. "I can read some things but it's still hard for me. I don't want not to know how to read for all my life."

It appeared that Warren's "problem" began when he started school. His mother (Mrs. T.) confirmed this. "I knew he had problems. The school kept saying that it was immaturity, until one day the headmaster said he thought I should do something about it."

Mrs. T. was anxious about Warren's problem and constantly made apologies or excuses for him. Examples included the following. "You'll find the boys are slow to explain things." "It's hard to get the boys to do things at home. They lose concentration." "You have to be precise and not give orders together." "I don't know if you'll get much out of him. He doesn't like to talk about it." On another occasion she said: "My kids are slow and they have to learn it all."
Mrs. T. went on to explain her inability to understand and cope with Warren's reading disability. She wept when explaining her efforts. "I don't know if it's just that I can't accept that my three boys have learning problems. It's been so many years, you just don't want to accept it. I think that tomorrow it will be better, but it's not."

She had obviously spent a lot of time and effort in helping Warren. "Warren was just so... he just couldn't sit down and read enough to make sense of it for himself. You'd have to sit next to him and put in every second word that he doesn't know."

According to Mrs. T. Warren was disinterested in school. "He hated it. I had to drag him to school." In particular, Warren remembered one teacher. "Mrs. E.... She told me to sit down and read. She told me to sound it out, miss it out and it might come to you." He claimed that it "worked sometimes" and added that "Good readers spell it out and if they're good enough they'll know the word."

Warren had been tested by two optometrists and a hearing specialist. All stated that "there was nothing wrong." He had been diagnosed at the Prince of Wales Hospital as being "dyslexic", by the Child
Development Centre as being "lazy and should be doing more", and had been prescribed ritolin, which would "quieten him down" according to Mrs. T.

It was whilst viewing the "60 Minutes" programme on tinted lenses that Warren commented to his mother "that's what happens to me." After receiving the tinted lenses he claimed that "Nothing happens, especially when it's ordinary print. If it's real small it goes around in circles and I can't see it. Glasses (tinted lenses) stop some of it going around in circles so that I can get some of the words."

Warren did not persist with the tinted lenses and had virtually stopped wearing them within a few months of them being prescribed. "When I was in Sydney I used to wear them. I've been back a month and I haven't been wearing them since." When asked what colour his tinted lenses were he responded uncertainly "brown... blue, I think. Dark blue." His mother confirmed that they were dark blue and that "he wouldn't wear them." "I assure you, he wouldn't pick up his glasses and read a book."

Mrs. T. was concerned by her sons' responses when interviewed by Dr. Whiting. "They both wanted glasses. I wasn't sure that they weren't having me on. They said all the right things to get the glasses." She
was assured by Dr. Whiting that he could "trick" the children and "could come back and ask some things back another way."

Mrs. T. concluded by saying that "it works out expensive but I said that I'd take the kids to the moon if it'd help. As a parent you tend to be very vulnerable. I sometimes think they must say "Here comes the suckers again." I've spoken to so many people."

At the interview Mr. T. claimed that: "They did all the tests and picked the colours and no, there was no mention of coming back or anything."

Gordon

A Training Officer aged forty one years, Gordon had worn tinted lenses for about six months. His daughter, Teena, was also a subject of this study.

Gordon was prompted to investigate tinted lenses for himself after noticing the effects they had on Teena. "She was much more confident. . . grown up." He stated that when he accompanied Teena to Dr. Whiting's clinic he identified with her responses. "She was describing what she saw and I thought they were pretty normal things. My wife said that we were both mad!"
Gordon's wife (Mrs. G.) intervened. "Gordon didn't think he had a problem. He was fighting him (Dr. Whiting) all the way. Gordon didn't think he saw distortions. It took a while for him to admit that he had distortions."

Gordon's perception of his reading was "appalling... not good." He claimed to have "never felt comfortable reading aloud. Never read for enjoyment." He felt sceptical about the tinted lenses because of his dislike for reading. "I was sceptical. Could they help me? 'Cause I always hated reading. Couldn't say that they changed my mind."

Two specific incidents related to reading were recalled by Gordon. "I wasn't really involved, but boys in my Class were taken out the front and their pants were taken down and they'd be belted if they couldn't do the work. I was watching, hoping that it wouldn't happen to me." He also recalled that at age fourteen "even though it wasn't dramatic, I felt bad stumbling through a book... I felt a bit of a fool I suppose, wishing I wasn't standing up." Gordon claimed that these feelings still persisted. "I've never felt comfortable reading out aloud. Never read for enjoyment. Half the time it never makes sense to me."
Gordon read both with and without his tinted lenses at the initial interview and claimed "I sound terrible reading both ways." After reading aloud, Gordon claimed that "it didn't seem to flow, and I'm thinking all the time that "I've already lost track of what I read before." If I read to myself I would go back... sort of like a line of maths. You don't trust yourself to add up numbers the first time."

Gordon recalled the following questions from the consultation with Dr. Whiting. "I had to look at this biro, and he asked me if it was distorted; if it was fuzzy; did I see a halo around it; did I see double; did the biro appear to change shape; did I experience any eye-strain." Mrs. G. interjected: "Both Gordon and Teena see halos around lights, and that sort of thing."

When asked about any changes since obtaining the tinted lenses Gordon stated: "Nothing's changed. Well, I'm not conscious that anything's changed." Much later, his reply to a rephrasing of the same question was: "I now get about twenty percent of the headaches I used to. I can read for long periods, whereas before it had to be an extremely interesting book. Fifteen minutes used to be great going...now I can read for an hour." During an opportunity for Gordon to recall any other changes, Mrs. G. interjected with "He's a sceptic."
Mrs. G. claimed that they were not asked to return for a follow-up visit, but added: "I am unsure about that... it's been a while now... no, we just understood that we could go back. Gordon hasn't been back. We weren't given an appointment card or anything."

David

David, aged fourteen was the younger of two children. He was a chronic asthmatic. He seemed nonchalant about his perceived reading disability. "I just thought it was my age or something. It doesn't bother me." He was disinterested in reading. "I wouldn't go and pick up a book. It just doesn't interest me. At school I'd read and at home I'd just read the paper."

David disliked reading during class. "If you make a mistake you feel like an idiot, so you just have to concentrate." His mother (Mrs. S) stated that "David appears very selfconscious when put in an independent situation."

Mrs. S. reported that there had been no known family history of reading disability. "David just seemed to have a disdain for reading. He just hated
it. He didn't want to borrow books. I felt he didn't know the words. I didn't think he read as well as other kids. He seemed to be battling. He's always been slower and I kept comparing him to Tim." (Tim was David's older brother).

Mr. S. was sympathetic to David's reading problem. "He's a lot like me. I struggled through school and it wasn't until I started work that I began to learn. I can't settle on anything. He'll do anything for me."

David disliked school. Mrs. S.: "I'd have to wait till someone held him down so that I could take off."

David did not show any emotional response to his apparent reading disability. He was "good at covering up" according to Mrs. S. She appeared convinced that she had investigated every avenue of remediation available. "I tried - you ask... - I did as much as I could. I felt guilty and frustrated. I couldn't do anymore for him. You can only do so much."

In the course of trying to find a solution, a paediatrician had advised Mrs. S. "not to push David."

"He said to me that you can't make him something that
he's not. Let him plod at his own pace." David's teacher commented that "David was a battler. No use pushing him. There was nothing more you can do."

Mrs. S. claimed that she "lived at the school" and spent a great deal of time helping David. David's only reading strategy was to sound out words. Mrs. S. stated that "I'd say to him: "Sound it out" but it's just like a vicious circle... didn't seem to help. By then I was getting frustrated. No-one could tell me what the problem was."

Despite David's Kindergarten and Year One report cards stating that "his oral reading and sight vocabulary are quite sound, and comprehension is good", Mrs. S. remained concerned about his progress. Referring to the school reports, she said that "he must have either gone backwards, or else they were not true reports."

The problem escalated, according to Mrs. S., and when David was in Year Six the Headmaster became involved. He introduced Mrs. S. to a reading programme called "Cracking the Code." Mrs. S. and David worked through the programme conscientiously. "Cracking the Code" was heavily phonic oriented. Mrs. S. stated that "David kept trying to get the words broken up but I found I was doing it. It was me. We lost it after we
said it. I said to him "I am going as nuts as you are." He said to me "This was stupid reading" but he got to sound his words." Mrs. S. claimed that David "read a lot better... he didn't seem to jump words." She attributed this improvement to "Cracking the Code" and not to the tinted lenses which he obtained at the same time and wore for less than a month.

Mrs. S. persevered with this approach and claimed that "within seven months I had brought him up two and a half years in reading." When confronting unknown or difficult words David claimed to leave them out as well as attempting to sound them out. His high school teacher objected to his doing this. "They said "no, don't do that. You should write it out... practice it... you can't just miss it out.""

David regarded his older brother as the best reader he knew and ventured that Tim could read anything. David believed that Tim did not need strategies for dealing with difficult words. "I don't think there are any words that he can't read. He's weird. He can read anything."

David used his tinted lenses "for a month." "They gave me headaches and made my eyes really tense. When I took them off I found that I had to adjust my eyes back."
Prior to being prescribed tinted lenses David had had sessions with the school counsellor and had consulted an eye specialist. According to Mrs. S. this specialist said that "I was a stupid mother and it wasn't necessary to have anything done to his eyes." This appointment was followed up by a consultation with an optometrist who dealt specifically with children with learning disabilities. Mrs. S. stated that "He said that David couldn't focus and as a consequence he was prescribed "normal" glasses and had to complete exercises for six months. His writing seemed to improve, but I still felt that there was something wrong somewhere. Then The Prince of Wales (hospital) assessed him and wanted to send him to a special school. "That's when we did "Cracking the Code."

In other areas, David exhibited no visual impairment. According to Mrs. S. David was particularly interested in sport and loved cricket. "He's also very confident and enjoys craft activities as well as pulling bikes apart and putting them back together again." However, in relation to David's schoolwork, Mrs. S. appeared anxious. "I got the glasses (tinted lenses) in sheer desperation. He was coming up to high school and not getting anywhere."
CHAPTER V
CASE STUDY RESULTS

Summary of Results

The following data result from the previous case studies. Where appropriate, information obtained at follow-up interviews is included. The data collected was categorised according to the nine headings identified in Chapter III. The results are summarised as follows.

Self-Perception and Attitude to Reading

All subjects (with the exception of Lawrence) perceived themselves as being "poor readers" and expressed negative attitudes to reading. When subjects were asked how they felt about themselves as readers, they responded in similar ways. Examples follow.
Peter: "As a reader... not satisfactory."

Teena: "I knew I wasn't the worst in the world but I knew I wasn't good neither."

Rory: "I felt I was stupid then "cause I couldn't write or read much."

Fran: "Dumb."

Chris: "I think I can improve a lot. I'm not all that good."

Noel: "I was never any good. I couldn't just do the work. I had trouble with reading. I used to muck up and get sent out."

Darryl: "I had trouble reading, and others could read better than me." "A poor reader." "Hopeless."

David: "If you make a mistake you feel like an idiot. I really don't like books."

Gordon: "Appalling... not good." "Never felt comfortable reading out aloud. Never read for enjoyment."

Warren: "It's horrible. I've always thought that."
Tim: "Not very good."

Tony: "I thought I was born a bad reader. I wouldn't try. I'd dodge it if I could."

Andrew: "Not very good. I was O.K. but not the same standard as the other kids in the class."

Most of the subjects expressed feelings of frustration, embarrassment, and said that they lacked confidence when reading. They tended to "dodge" or avoid reading and stated that reading was "hard." Improvement, they suggested, was only possible if a more concerted effort was forthcoming.

Lawrence was the only subject who regarded himself as an "average reader." However, he claimed to read "only when I have to."

Hereditary Factors

Most subjects and their informants claimed that reading disabilities were not hereditary for their respective families. Their responses were similar and included the following.

Rory: "None of my family's got it."
Fran's mother: "We haven't anyone in our family that we know of that has a problem."

Chris's mother: "No-one in our family has a problem."

Two subjects had brothers who were experiencing reading difficulties. Three of the sixteen subjects had fathers who claimed could read but who experienced difficulties during their own schooling. One of these fathers had gained three tertiary degrees but the family maintained that he had a reading problem. "It was painful to listen to him read."

Teena's father was prescribed the tinted lenses but claimed not to have a reading problem. He did, however, "hate it... and never felt comfortable reading out aloud."

Parental Expectations

All parents stated that they recognised that a problem existed with the subjects from an early age. Comments relating to their children include the following.

Teena's Mother: "Slow to walk, never interested... She's got learning problems." "Even in Kindergarten I began to see the seeds of her feeling different."
Lawrence’s Mother: "He’s always been a bad writer. Never coloured in... never sat with pens and paper."

Noel’s Mother: "Headmaster said he was a spoilt little boy and I was an over-indulgent mother."

Darryl’s Mother: "Going back to Kindergarten I realised that he had a problem."

Tim’s Mother: "Always been slower."

Warren’s Mother: "It was when Warren started I knew he had problems. School kept saying it was immaturity."

Tony’s Mother: "Probably Tony has always been a bit slow."

Tim T.’s Mother: "Wasn’t interested in schoolwork ever. When Tim started school I probably knew that he was slow."

Chris’s Mother: "Never really interested. Never liked to colour in or draw. At the end of Kindergarten he didn’t do all that much. Wasn’t interested. Wouldn’t look at books."
All parents stated that they recognised that the problem endured. They frequently related the perceived disability to that of a "slow learner" or tended to seek a variety of labels. Examples follow.

Darryl's Mother: "He finds school hard enough."
"All along I thought he wasn't coping."

David's Mother: "I didn't think he read as well as the other kids. He seemed to be battling."

Tony's Mother: "I knew he was a terrible reader."

Andrew's Mother: "He's very immature. I think he lacks confidence."

Tim T's Mother: "Tim doesn't know how to behave. He's very slow."

Teena's Mother: "She was fighting and scratching with a lot of kids. I knew that she was disturbed. This was against her nature."

Noel's Mother: "He's never stuck with anything."

Chris's Mother: "He has the intelligence, but hasn't shown it with his work."
Fran's Father: "Without the insight of the teachers she's had, we would have just accepted that she's a slow learner."

Rory's Father: "He can't stand reading. He's got the same problem I've got."

Noel's Mother: "His memory is one of his problems."

The term dyslexia was used in the following three instances.

Warren's Mother: "That's the trouble with dyslexia. My kids are slow learners and have to learn it all."

Tim's Mother: "I said that he was dyslexic and that's why he couldn't read."

Teena's Mother: "I saw a programme on dyslexia and I borrowed books from the library. I noticed Teena matched the checklists in the books."

Two parents refused to accept the views of others they had consulted when the parents were told that the problem was non-existent.

David's Mother: "Specialist said not to push him. You can't make him something that he's not."
Teena's Mother: "Primary School said that she's normal. School kept telling me that there's no problem."

Three parents stated that they were reluctant to insist that their children "do anything" because the parents feared adverse consequences.

Andrew's Mother: "I didn't want to pressurise him too much. He goes backwards if I do."

Tim's Mother: "He doesn't like pressure put on him.

Noel's Mother: "I don't demand anything of him. He'd rebel."

Parents with children older than the subjects reported no reading difficulties with the older children. An exception here was Tim's parents. In most instances the word "comparison" was used.

David's Mother: "I kept comparing him to Tim. He can read anything."

Greg's Mother: "It's hard for me. The older one is an exception."
Chris's Mother: "... my fifteen year old is very intelligent and all along the teachers have been telling me I've been comparing him. But I haven't."

Other parents expressed feeling of concern.

Fran's Father: "Problem with being a parent. Have no-one of the same age to compare her with."

Darryl's Mother: "There was nothing to relate to what their learning should be." "How can you compare?...can only relate back to my own experience."

Two subjects had younger sisters who, according to their parents, were by comparison "good readers."

Fran's Father: "I think she's pressured by her younger sister."

Rory's Father: "His younger sister is as good as or better than him."

All parents expressed feelings of guilt or frustration. The expectation that their children could and should do better resulted in tears and anxiety.

Darryl's Mother: "Did homework with him... frustrations started to show up then."
David's Mother: "I tried... You ask... I did as much as I could." "I felt guilty and frustrated."

Warren's Mother: "I don't know if I just can't accept that they have problems."

Andrew's Mother: "It's frustrating."

Tim's Mother: "I always helped... but it's hard when the child's not interested."

Noel's Mother: "In a way I don't think I've let him down. I've tried my best to let him get on top of it." "If I didn't sit there with him until he got it down he wouldn't get it done."

Chris's Mother: "As soon as it looked like I would help he would be in tears."

Fran's Father: "She isn't a backward child. I find it most frustrating."

Greg's Mother: "Couldn't understand why he wasn't getting anywhere."
Perceptions of Schooling

Almost all subjects recalled an incident or experience from Year One or Year Two which, they claimed, contributed to their reading and writing disabilities. The data would suggest that all subjects placed an enduring interpretation on these incidents. Even though at the time the experiences seemed to be unique, they invariably led to similar outcomes for all the subjects. The interpretations could be summarised in the following assumptions: "I can't do it." "I am embarrassed about it." "I'm no good at it." Specific examples follow.

Darryl (Year One): "Everybody read really good and I was down the bottom. Had to read by yourself. I didn't know where we were up to. Raymond showed me and I didn't know what the first word was. I read it and read it. I'd stop and go, stop and go. I felt awful. I didn't feel like reading after that."

Tony: "I remember this book. I used to pick it up and try to read it. I remember it was about a rabbit. I remember daydreaming a lot about that rabbit. I thought if I could be like it you could get out of school, you know."
Teena: "I remember in Second Class. I'd written a story and had to read it in assembly and I didn't know what to say or how to read it. It got pretty embarrassing. It was humiliating and I kept feeling kids were whispering behind my back, and what would the teachers be thinking?"

Rory (Year Two). "'Mrs. G. She asked me if I could read and I couldn't. She got me to read maths and I got everything wrong. It was embarrassing. Everyone started laughing and I made up something to go back there... I walked back to my place. I felt really scary. I kept on shaking. I didn't like myself much then."

Most of the subjects disliked school. Noel stated that "being in the classroom was like being court-martialled." Others claimed that they coped by daydreaming, getting into trouble, being absent on messages during reading time, or avoiding it completely. Five subjects cried their way through Kindergarten or pre-school and expressed sentiments similar to Tony:

"I remember pre-school. I used to hate it. I would get out of it as often as I could. I didn't want to be away from mum and my house. I didn't know any of the people there. I hated the place. I had no friends."
In total, three reading strategies were identified by the subjects, but most subjects employed only one, namely "sounding out" of unknown words. Parents tended to re-enforce the use of the strategies identified. Examples follow.

Fran: "Sound it out and use syllable breaks."

Noel: "People told me that they sound it out and take it from there. I start by trying to sound it out... if that doesn't work I throw the book down."

Peter's Mother: "When Peter comes to a word he sounds it out and breaks it into syllables."

Peter: "I try and wait there. Try to get basic parts out of it and put it together. Sound it out... not out aloud."

Andrew: "I think I can only do by sounds."

"I don't know how to do it by word recognition."

"Good readers sort of sound it out in their heads when they're reading."

Tony: "I try to sound it out."
Greg: "I’d try to sound it out and then if I knew it I’d keep going but if I don’t (laughed) and no-one’s around, I keep going.

"For me, if you can’t work something out, you sound it out."

Warren: "Good readers spell it out."

Some subjects stated that their only word attack strategy was to omit the word.

Noel: "I’d miss words and it wouldn’t make sense and I wouldn’t go back.

Darryl: "I just leave it out."

Warren: "Miss it out... read on."

David: "I usually miss it out."

Four subjects claimed that they were reliant on significant others.

Rory: "Ask Andrew, Mark or John because they’re really good readers."
Fran: "Ask my friends or teachers what the word means."

Chris: "I have a go and the teacher corrects me if I'm wrong."

Teena: "Sometimes, usually, the teacher has to say it."

Many subjects assumed that good readers never made mistakes, nor confronted words that they couldn't read.

Chris: "I haven't really heard her make a mistake out loud.

Tim: "David's just a good reader. He's brainier than me."

Teena: "Good readers read fast."

Warren: "If they're good enough, they'll know the word."

David: "I don't think that there are any words that he (a good reader) can't read. He's weird. He can read anything."
Only two subjects mentioned that the purpose of reading has anything to do with striving for meaning, or gaining sense from the text.

Noel: "Read ahead and work it out by making sense of the sentence."

Mr. G.: "Half the time it doesn't make sense to me."

Visual History

All subjects had been tested by at least one optometrist prior to being screened for the tinted lenses. With the exception of Mr. G., who wore prescription lenses prior to being screened, all the subjects were told by optometrists that they had no visual problems warranting the wearing of prescription lenses. Visual History statements include the following.

David's Mother: "I went to an optometrist who said that I was a stupid mother and it wasn't necessary to have anything to do with eyes."

Warren's Mother: "Optometrist said that there was nothing wrong with the eyes of the three boys."
Tony's Mother: "We went to an Optometrist and he said he could need slight magnification. He was just over the border for a child who needs them."

Andrew: "Optometrist said that I didn't need glasses. My eyes are alright. There's no problems with my eyes."

Lawrence's Mother: "He was tested by two optometrists with differing viewpoints. One said "No, nothing wrong with him." The other said "Yes, he has tunnel vision and needed magnification." These appointments were followed by appointments with two specialists and an orthoptist. The general consensus was "Don't give him glasses. He doesn't need them."

Peter's Mother: "Had his eyes tested. Doctor said "Fine... no problems."

Teena's Mother: "Three times she had her eyes tested. In Year Three the ophthalmologist said she was having him on. He got angry. She could identify the little letters but not the big letters."

"Took her to an optometrist. He said her eyes were normal. Year Six she went to an ophthalmologist who said there was nothing wrong. Fourth eye test was at the Prince of Wales Hospital... nothing wrong."
Rory's Father: "One optometrist said he was short sighted, another long sighted and another specialist said that there was nothing wrong. Sydney specialist said that his eyes were better than a lot of adults that he had tested."

Chris's Mother: "We went to an optometrist. Said that there is nothing wrong with his eyes. Perfectly O.K."

Noel: "Eye specialist—eyesight was normal. Everything was alright. I have no problem seeing."

Visual problems did not appear to interfere with any of the subjects pursuing interests in a variety of sports and fine motor activities when not wearing tinted lenses. Examples follow.

David's Father: "Plays cricket for Dapto."

"Pulls bikes apart and puts them back together."

Darryl: "I fix radios. I don't see anything wrong then. It seems funny when I'm reading something and it goes wrong but when I'm fixing something it doesn't."

"Darryl plays the guitar and reads music without the lenses. He does electrical things. Pulls things to bits and puts them back again. Got the
hairdryer to work, fixed the car radio and blinkers before he got the glasses. This is the enigma... if he can do these things... this is what gave us hope."

Greg's Mother: "He plays the recorder, tennis. He could do his number work really well. I think that's what saved him a lot." .

Tony: "I'm best at using my hands - doing jobs. I pull apart a lot of things... all the electrical gear and dad finds it in my drawers."

"Maths is always satisfactory."

Andrew: "I'm in the top maths class. My best subject is maths. I'm keen at sport... soccer and golf."

Lawrence: "I don't need to wear them for band practice where I need to read the music."

"The other day I was picked in the top ten percent of the State for maths."

Peter's Father: "He plays comp. cricket. That's why I think he has perfect vision." "He plays the piano." When asked if he wore his lenses in maths, he replied "No, not really."

Tim: "I'm good at hockey."
Teena: Teena stated that she found reading music difficult. "It was too hard to read music and move fingers. I used to look at music to see if it was the right note, look at fingers to see if it was the right place. It was too complicating."

"I'm good at art and craft."

Rory: "I play basketball, football and ride BMX."

Fran's Mother: "She's very musical. Her music teacher says that. She's very good at maths, handicrafts, piano, needlework and things like that."

Chris's Mother: "He's been playing the piano for three years. He completed the Second Grade examination. He plays tennis, golf, hockey, squash, and surfs. He has a good eye for things. Maths, he's always in the highest group."

Noel: "I work as an apprentice mechanic. Mechanical side was good. Handled that."

"I've got a drivers licence. Took me three tries to get it."
Performance on Irlen Screening

The subjects and their informants referred to a number of the tests used at the screening procedure for tinted lenses. They recalled the types of questions asked and examples follow.

Tony's Mother: "There was an alphabet chart on the wall and the doctor asked him to look at the letters and tell how they were shaped... whether there was a halo around it, whether it moved or whether it lay at an angle. Then she (the doctor) went down a couple of lines and said with dyslexics some letters tend to drop off the line."

Darryl's Father: "He (Dr. O'Connor) asked Darryl if he saw rivers or waterfalls running through the words. He (Darryl) said he could see tree roots. None of these things he ever spoke to us about. He said he saw grey halos around letters."

Warren's Mother: "They had to look to see how far the lines (music staffs) went before they ran together."

Rory's Father: "He (Dr. O'Connor) said 'Do you have trouble reading a whole lot of words, like a full line, and then do they come together, blur, wave? Do they squash together, spread apart? Is there too much white on the page? Do they leave snake lines on the page?"
Rory was given the right signal to the whole message. I mean, if the doctor said "You're seeing lines" he would nod.

When referring to the specific tasks that were undertaken, the following statements were made. Most informants stated that the subjects "sounded better" when the coloured overlays were applied.

Fran's Father: "Read little stories of three or four sentences. Some had more... I made a mistake and didn't realise it." Her father stated that "It was something like 'did' or 'done'. She read it three times and got it wrong. With the glasses on she got it correct."

Lawrence's Father: "Could definitely tell the difference with reading. Flowed much better from one line to the next than if he didn't have the lenses on."

Peter's Father: "He (Dr. O'Connor) placed this blue overlay over the page. His reading improved twenty five percent. He re-read what he had read before."

Tony's Mother: "Often, when he (Dr. O'Connor) dropped a different colour, his reading improved. With certain colours he became a good, steady reader without hesitating."
Darryl's Mother: "He had no reading material that
Darryl could read for him."

Rory's Father: When asked "What did Rory have to read?"
he replied: "It was something stupid. It was repetitive
like "the rain in Spain." I can't remember that. He
had to make sure he didn't read it. He just had to stop
the snaking, waving and all of that."

Other tests were undertaken, and the subjects
made reference to these as well.

Tony's Mother: "Had a circle with little squares. I
thought "That was funny" because if you looked at it
long enough it would be like a mess."

Greg's Mother: "Came to music notes and said that the
music swam. Up till then he was having recorder
lessons."

Lawrence: "Music lines... nothing happened."

Teena: "Doctor (Dr. Whiting) took me for a walk down
stairs to see if I'd fall. I managed to go down really
fast without using the railing."

Noel: "Gave me some plastic and did some exercises
and made a lot of difference. I could see it clearly...
a lot clearer."
Fran's Mother: "He (Dr. Whiting) assessed that she had a number of disabilities but didn't go into any of them. Dr. Whiting said that he had picked up that she had a aural problem. He said that she doesn't always hear what was said. Therefore she can't translate what she says; that is, the sounds into writing."

When asked how Fran was tested, her father replied: "She was asked to read and then asked questions. Her answers weren't exactly what she read. I don't think that there is anything wrong. He read sentences and asked her to repeat them."

"I definitely don't think that she has a hearing problem."

Chris: "I had to stare at a page of print. I saw rainbows. I've only ever really seen them once, and that was when I was being tested."

At the time of the second interview, there had been almost no follow-up by those prescribing the lenses. An exception was Peter, whose mother claimed that at the time of the interview "Dr. O'Connor said he'd get back to us if he had any information for us."
Just lately he did contact us for Peter to have a check-up to see if the lenses were still satisfactory."

Other subjects related the following incidents.

Rory's Father: "I said: What happens now? She (Mrs. O'Connor) said: "We had to go with these for as long as he was happy with them." At the second interview, Mr. X claimed: "We got a letter twelve months later to say that they've got this new U.V. glass."

Lawrence's Mother: "Said "No, there's no need for a follow up."

Darryl's Father: "I asked the question, and he said: "I'd only be too willing for you to come back or relate to me by correspondence." It appeared at that stage that it was all experimental... that this program was in it's infancy and he'd only be too willing to have any feedback."

Mrs. C.: "No check-up.... nothing like that. Same with Jenny. There was no feedback. That's the only thing I found was wrong. This was the only doubt I had of them."

Noel's Mother: "At the time of the interview, Mrs. O'Connor said that because of Noel's age it was not necessary to come back for another appointment, or to have them checked."
Some subjects and their informants described those prescribing the tinted lenses as professional and committed to selling their product.

Peter's Father: "I have had lots of dealings with professional people and he's impressed me with his thoroughness and keenness to find a solution. I think he believes in the product."

Eva: "I didn't doubt any of his work at the time. I thought that what he was doing was great."

Other subjects tended to remain sceptical, and their comments appear below.

Tim's Mother: "I still say that if you've got good eyes and it was as confined as this you'd still make mistakes. I don't know whether they did good or bad."

Warren's Mother: "They said all the right things to get the glasses. Dr. Whiting said that he could trick the kid. I... cross out the word "trick." He could ask things one way and he could come back and ask the same thing another way and he was sure they were answering in a way to get the glasses."

Rory's Father: "I didn't know if he was leading me up the garden path or not."
Andrew's Mother: "No, he's not wearing them. Rarely wears them—whether he forgets, or doesn't wear them makes me think the whole thing's a bit of a farce. Whether it's the glasses or Andrew... I just don't know."

Reasons for Obtaining Tinted Lenses

All subjects were involved in seeking a cure to their perceived reading disability from the diverse range of available solutions. All solutions, up to obtaining the tinted lenses, had not achieved the anticipated outcome. A wide range of unsuccessful solutions were identified and included the following.

The use of Methylpenidate (Ritalin): This was employed by Noel, Tim, Warren, Teena and Darryl. It is defined by The A-Z of Australian Family Medicines (1984) as a "central nervous stimulant."

Side Effects of Drugs (Meyler, 1984) states that:

Considerable concern surrounds the use of methylpenidate and, to a lesser extent amphetamine and pemoline in hyperactive or attention deficit syndrome in children and
possible detrimental effects on general physical and emotional growth and central nervous system development.


Stimulant drugs seem to be the most effective agents for the treatment of the characteristic behaviour disorders, although little is known of their effect on such aspects as poor motor integration, deficits in the perception of space, form, movement and time and disorders of language and symbol development.

Tutoring: Tutors were engaged to work with Andrew, Noel, Chris, Darryl, Andrew and Greg.

Change of Schools: Unsatisfactory results prompted the parents of Fran, Teena and Rory to change the schools attended by their children. Mrs. P. insisted that Niel should change schools but "...my husband refused to let him."

School Counsellor Assessment: Noel, Chris, Fran, David, Warren, Tim, Teena, Darryl, Greg and Andrew were all assessed by school counsellors.
Specialist Consultation: (Not including Optometrist, Ophthalmologist, etc.)

Speech Therapists: Chris, Tim, Teena
Ear Specialist: Teena, Darryl, Greg
Child Development Centre: Fran, Warren, Teena, Tim, Darryl

Prince of Wales Hospital Learning Disabilities Clinic:
Tim, Warren, Teena

SPELD: Teena
Chiropractor: Teena
Naturopath: Teena
Occupational Therapist: Teena
Parents of Children with Learning Disabilities:
Warren, Tim

Specialist Labelling:
"Dyslexic": Teena, Tim, Warren, Tony
"Minimal Brain Dysfunction": Teena
"Attention Deficit Syndrome": Darryl, Noel.

Parents expressed feelings of desperation in relation to their motives for seeking the tinted lenses. Most had seen the tinted lenses featured on the "60 Minutes" programme. All informants wanted to believe that the lenses would solve the perceived problem. Examples follow.

Chris's Mother: "Whether it's a physical thing or a mental thing I don't know. I think it's just a "wait and see."
David's Mother: "I got the glasses in sheer desperation. He was coming up to high school and not getting anywhere."

Rory's Father: "I understand how Rory is now, but he would be worse off if he had to go the rest of his life."

Warren's Mother: "It works out expensive but I said I'd take the kids to the moon if it'd help. As a parent you are very vulnerable, I sometimes think they must say "Here come the suckers again." I've spoken to so many people.

Peter's Mother: "We had to try something. It got to the stage we knew something had to be done."

Teena's Mother: "You'd do anything for your kids. We would have taken Teena to America if we were sure it would work."

Greg's Mother: "We thought of glasses prior to the headmaster (suggesting them). He said it was the only option left."

Tim's Mother: "I thought I didn't have anything to lose and I could look elsewhere if the glasses didn't work."
Darryl's Mother: "We've spent two years pulling our hair out trying to find the answer."

"As a parent, you just see that they won't get so much out of life. I can see that he's going to miss out."

Andrew's Mother: "We were willing to do anything to help him."

Changes Occurring Since Tinted Lenses Were Obtained

The changes noted by the subjects were often expressed in the terms of the I.D.P.S. Examples include the following.

Darryl: "When the man tried the glasses on I didn't believe what the words looked like. I don't know if they looked like normal words. They're easy to follow... no circles, no creeks." The appearance of numbers were "not really different."

Tony: "They take the halo off from around the word."

"The halo goes off from around them and it's bigger. The view I have of the page is a lot bigger and I can read ahead. It's greener."

Referring to magnification of the print: "They've made the words bigger too."
Andrew's Mother: "On white paper he said words jumped around; on coloured, they stayed still."

"If you look at the page the glare used to hurt my eyes."

Rory: "Everytime I look at words I almost know them off by heart. I know I've been getting better because I've been reading and there's no blurring or rivers or that."

Warren: "Nothing. Especially when it's ordinary print. If it's real small it goes around in circles and I can't see it. Glasses stop some of it going around in circles so that I can get some of the words. Nothing (else has changed)."

Tony: "A lot. Helps me to read, write better. When they're moving, they've stopped moving forward and backwards, that's all."

Darryl: "They're good. They help me. Without them I was learning but not as good as this. With these it's easier to learn."

With tinted lenses off, Darryl made reference to the following:
"Book'd go blurry."
"Wasn't in straight sentences. It was in steps."
"Words had circles around them."
"Circles would cut off some of the word."

Other visual factors affected by the tinted lenses, as explained by the subjects, included the following.

Teena: "I don't get words mixed up like I used to. Don't get them muddled around, "p" and "d", like I did in spelling tests."

Fran's Father: "She'd be able to get the "c's, n's and r's." Because she had trouble reading she was not able to comprehend. It was really lacking.

Teena: "Catching balls and playing sport easier. Hitting a ball with a cricket bat. Watching T.V. was easier."

Darryl's Mother: "His writing's better when he's got them on."

Noel: "Brighter colours show up, dark colours go darker."
One informant recognised a decrease in the number of headaches his son had suffered since wearing the tinted lenses.

Rory’s Father: "Maybe these people that come up with these glasses could be a trick, but I’ve noticed that he doesn’t get as many headaches... well, he’s had one, or that’s the only one he’s complained about."

Another subject ceased wearing the tinted lenses because of headaches.

David: "Got bad headaches and made my eyes tense."

David’s Mother: "From wearing the glasses he got bad headaches."

Informants often referred to changes in the way the subject sounded when reading aloud. Subjects stated that they felt that their reading speed had increased.

Darryl’s Father: "Seems faster. Still makes a lot of mistakes but seems to know more words."

Fran’s Father: "Once she had the lenses the right colour she read fluently. (You) would have thought that it was a different child reading."
Chris: "I felt I was stopping and starting. Now I seem more fluent."

Andrew's Mother: "He's a much smoother and more fluent reader. He used to read with a finger before... tries not to do that."

Teena: (When asked how her reading had changed): "At first it was... when first tried glasses on I read faster. When I got to high school my reading had improved two and a half years in one year."

Tony's Mother: "One day he did read a bit faster."

Some subjects referred to an increase in concentration.

Teena: "... I am able to concentrate more." (Mrs. G. interrupted with "We put her on ritolin as well so that might be helping her to concentrate.")

Noel: "Things are getting better. Still have a lot to do. Do a lot of practice because I missed a lot when I was younger."

"It's much easier to concentrate... concentrate on the writing."
Mr. G.: "Changes were not as significant as Teena's. Greatest benefit is that I know I can read for long periods whereas before it had to be an extremely interesting book... fifteen minutes was great going."

Lawrence: "Seem to be concentrating more... keeping my place. I'm finding it a lot easier to see the board."

A change in attitude was recognised by some subjects and their informants.

Peter's Mother: "I'd say there's been a lot of marked improvement... his attitude has changed... he's much more positive towards school. His grades are up and I don't know whether it's the glasses or a change in his attitude. His teacher thinks it's a change in attitude rather than the glasses. As I said, I don't know."

Peter had had the tinted lenses for sixteen months and his mother stated that the changes had taken place only recently.

"It's only been this term and we put it down to the teacher... well, I do. Teacher gave him a kick-start. Pull your socks up or get no-where."
Chris: "Things are easier... like reading is not as hard."

Teena: "It's a lot easier to read and I found it more interesting to read. I still don't read a lot. Read more than I used to."
"I felt better; more grown-up. Didn't feel like a baby. Didn't feel as dumb. Didn't bump into as many people. I used to be really clumsy."
"It's (now) less embarrassing."

Chris: (When asked how words looked now) "No real difference. Can't explain it. Just made it easier."

Peter: "How I feel is, it makes it a bit more comfortable when I see words but not that much."

Rory's Father: "He's getting a bit better in reading. He's reading things more."

All subjects and informants were revisited and were again asked if the tinted lenses had assisted, and if so, in what way(s) had they done so. These interviews took place between June 1987 and January 1988. Responses were significantly different from those given at the previous interview.
Fran's Father: "I had hoped that she'd be able to be helped but seeing what she's doing now I'm not all that sure. There doesn't seem to be all that much progress."

Chris: "Weren't really quick changes but sort of alright but not that quick. Maybe there were changes a month after or maybe two weeks.

"That's one thing... my writing has not really improved."

Chris's Mother: "No significant changes. Has a lot to do with his attitude to schoolwork."

Mr. G.: (When asked were there any specific changes in relation to how the print looked, he responded "No").

Mrs. G.: "He's (Mr. G.) a sceptic."

Mr. G.: "Nothing's changed. Well I'm not conscious that anything's changed."

Warren's Mother: "I assure you, he wouldn't pick up his glasses and read a book."

Noel: "Not much really. Maybe haven't had them long enough (two months). Maybe I haven't got used to them."
Lawrence's Mother: "Can't say I've noticed a difference." "I can't pass an opinion on Lawrence's yet... feel he hasn't had them long enough to get a reaction from them."

Lawrence's Teacher: "No, not at this stage. I can't say I have." "He's got poor handwriting and there's no improvement in handwriting. Can't say there's any significant improvement in any subject."

Peter's Teacher: "Can't see that there's any real change. I think it's more an attitude thing."

Peter's Father: "No, not a lot. About twenty percent with reading clearly."

Darryl: "With the glasses I have them on for about ten minutes and I have to take them off and blink or everything goes back to the normal colour. When I have them on now after ten minutes they go back to looking through a pane of glass."

Darryl's Father: (When asked if any changes had been noticed) "No, not really. If anything, the hesitancy to read is not there. Seems to flow more."
Darryl's Teacher: "I have got some of his work from last year and I think it is marginally better but only because of time. If they've helped it's only been marginal. Nothing magical like on "60 Minutes."

Tony: (When asked if his writing had been affected by the tinted lenses) "Don't know. I've never tried writing with them on."

Andrew's Mother: "His remedial reading teacher doesn't think the lenses are doing any good. He thinks it's a waste of money.

Fran's Father: (When asked if anything had changed) "Don't know. I don't think the glasses have solved the problem. I think she has a problem with phonetics even with glasses on."

All subjects or their informants were telephoned approximately ten to twelve months after their initial interview and then again approximately ten months after that. The intention of the final interview was twofold: to confirm all the details of the case study transcripts, and secondly to ask: "What, if anything, has changed concerning your use of the tinted lenses?"
Ten of the fifteen subjects had ceased wearing the tinted lenses. (Andrew, Darryl, David, Fran, Lawrence, Peter, Rory, Tim, Tony, and Warren). Noel wore them on Mondays when attending TAFE, and occasionally when doing his homework, but did not wear them whilst working as a mechanic. The responses of the ten non-wearers could be summarised as: "They don't make that much difference." In addition to the above, Gordon and Mrs. C. had alternative "tinted lenses" fabricated by their local optometrists. Information obtained from the Hobart Assessment Centre states that: "Under no circumstances should you attempt to have your lenses tinted through a vision specialist who is not trained in the Irlen Lens Technique." (Refer Appendix).

In effect, it could be considered that three of the subjects continued to wear their tinted lenses on any regular basis at all when contacted. Only one subject continued to wear the originally prescribed tinted lenses.

Rory's Father: "No, he doesn't wear them at home. No, not that much at all really. His headaches stopped, and he doesn't use them watching T.V. anymore. Maybe it was just the age he was at."

Darryl's Mother: "Darryl said: "No, I don't need to wear them...I'm alright now.""
Andrew's Mother: "Things haven't changed that much. His work is still not neat... still has a reading problem... still, his spelling is not good. He rarely wears them now... makes me think the whole thing's a bit of a farce... on Andrew's part, or what, I'm not sure."

Andrew's Remedial Reading Teacher: "Maybe it was a placebo. I don't know."

Tony's Mother: "Tony said that "I don't need them as much because reading's easy now.""

Lawrence's Mother: "Lawrence says that they don't make any difference. Whether that's true or not I don't know."

Warren's Mother: "Warren doesn't wear his tinted lenses anymore."

Peter's Mother: "No, Peter's not wearing them at all that much. Seems to be coping with his work."

"Whether at the time it was a bit of false sense of security or immaturity it is difficult to say."

"I'm not sure that they don't work, but maybe it's just a confidence boost- might have been a crutch. He'd then have something else to blame rather than his own inadequacies."
Noel: At the second interview he stated that he "Didn't wear them much at all, except occasionally as sunglasses. They don't make that much of a difference."

At the final interview he claimed: "I use them every Monday at Tech and I haven't failed at Tech yet. The glasses seem to be helping. I wouldn't be as confident without my glasses... no, there are a few other things that have built my confidence up—like my girlfriend... and a bloke at work who is really good."

"I don't need them when working on cars, you get diagrams to read but they're usually colour-coded."

Noel's Mother: "He is wearing them at Tech... he packs them in his bag. I don't think that's to please me."

Only three subjects continued to wear Irlen tinted lenses on a regular basis. Of those continuing with the tinted lenses after twelve months, Mrs. G. and Teena had appeared on the "60 Minutes" programme and Mrs. G. had recommended the tinted lenses to many others, including three of the subjects of this study. Mrs. G. reported that "Teena went through a period a few months ago when she was really distressed. She said that as far as her eyesight went she felt that the glasses weren't helping. She said that the distortions were worse. I wondered about that. I felt that it was emotionally related. She was saying that she saw more distortions and said the glasses weren't working. She
didn't tell me at the time... maybe she was too scared to. I presumed a week went by when she was feeling like this. She puts them on now as soon as she gets up."

Mr. G. had since had his normal prescription lenses tinted by a local optometrist. Mr. G's response to the question "What changes, if any, have occurred in relation to the use of your tinted lenses?" was: "Nothing's changed... Well, I'm not conscious that anything's changed." At a previous interview Mr. G. had stated that he "could now read for longer periods." At the final interview, however, he stated that: "No, I don't read for the same time anymore. I usually end up going to sleep in less than an hour."

The other two subjects still wearing the tinted lenses had returned to the A.C.T. for the prescription of different coloured tinted lenses from their original sets. In both cases, parents claimed that this was necessary when it appeared that reading improvement rates declined.

Chris's Mother: "He was getting back to being the way he was... Oh well, not quite. He was hesitant and getting little words confused again. We had him retested and we are now waiting for the new coloured lenses. They are still green, but a different shade of green. Dr. O'Connor got him to read with his old glasses and then the new colour that he selected. He
read really well. Quite amazing, such an improvement. He says that the old ones don't make that much of a difference now at all. Well... I think that they might make a little bit of a difference but not as significant as the new ones."

The other subject who had changed the colour of his lenses was Greg. He had changed from rose coloured tinted lenses to blue substitutes. Mrs. S. explained it thus:

Mrs. S: "He's now more confident. He's really fine. I think I'm just anxious. He's now doing lots of things like playing golf. No, he doesn't wear his glasses playing golf. I think he's beginning to think he's normal. Possibly a combination of confidence and determination and knowing that his older brother can do it. Could just be beginning to know that he can be as good as him... or whether it's sub-conscious. I don't think he's competitive."

"Like I said it could just be a combination of maturity and glasses. I think that it's not all glasses. Probably a lot to do with maturity as well."

"His attitude's changed. Now, not everything's a struggle. He's not fighting back saying "No! No! I'm not doing this!" This was where the big block was before... fighting back all the time."

"Greg has changed his glasses from red to blue. He didn't notice any difference with his red glasses but when he put on blue ones he said that his eyes weren't sore as they were with red. He wasn't going forward with red... just sort of stopped but has picked up more with the blue ones. Reading is a little better but his spelling has improved a lot."

"Dr. O'Connor said that "We don't know why or for what reason, but some people just need a change in the colour of their lenses."

Ten months later Mrs. S. stated: "Greg's reading tutor said that "I don't think that the colour is as good as the first colour— not as dramatic as his first rose coloured glasses." I don't think that his writing is anything marvellous, but at least you can read it. He's still not a fast reader, but his spelling has improved. His outlook is a lot better, maybe it's maturity and he is keen to read."
Greg continues to be tutored. Mrs. S.: "Donna (the tutor) claims that he still jumps lines, still loses his place... but in himself he is a lot more confident. He's on the school council."
CHAPTER VI

RESULTS EXPERIMENTAL SIMULATIONS

The results of the experimental simulations are explained below.

Visual Discomfort Test

The Visual Discomfort Test was administered to all but two of the subjects, and to eighteen others identified by their teachers as being "exceptionally good readers."

Subsequent to administering the test to the control group of eighteen, the test was reformatted by the University. Many of the questions remained unaltered. Responses were only collated for those questions which remained the same. Other questions not relevant to the subjects (driving a motor vehicle, for example) were unasked.
The results of the first section were closely matched across both groups tested. For example, a similar number in both groups sometimes suffered from the following symptoms: red sore eyes, shooting pains in eyes, rubbing eyes and eyes that hurt when tired.

There was only a slight difference in the number of children who wore the tinted lenses and suffered from headaches, compared with the good reader group. Most children claimed to get headaches "sometimes."

The length of time those tested claimed to be able to read before their eyes were adversely affected varied from less than half an hour to "it never happens." In both groups, the majority of those tested felt comfortable reading for half an hour to an hour. Fifty percent of those wearing lenses claimed to be able to read for one hour without suffering discomfort. It was difficult to judge the reliability of this question as those tested appeared to have a vague knowledge of "time-span."

Children from both groups claimed that cream or pastel colours in the background with dark print made reading easy.
Section Three focussed on the types of distortions identified when confronting a grid pattern. None of the subjects wore their tinted lenses whilst this test was conducted. All those tested, except for one from each group, stated that the smallest grid pattern was the most uncomfortable to view. The exceptions chose the next grid closest in size as being the most uncomfortable.

All subjects identified colours in the grid patterns. Red and green were the colours identified by the majority of those tested.

All of those tested recognised one or more distortions in the grid-patterns. These distortions included movement, swirling movement, shimmering, thicker lines at different angles, and thinner lines at different angles. Primarily, both groups said that they experienced movement when viewing grid patterns. Both groups identified a variety of other perceived distortions when viewing the grid patterns, and these variations are set out below.

**Tinted Lenses Group.**

- Big gap in white every few spaces
- Jagged pattern going down slowly
- Little diamonds
- Straight, thin lines
Thick white lines and medium black

Stick together... no gaps

V-shapes

All different lines... shimmering red and green.

Good Readers.

Blurry lines

Kinda coming close together

Makes eyes feel funny

Three lines space; three lines moving apart. Can't see it very well. Strains my eyes

One kind, all thick lines but in middle looks blurry.

Looks like a picture sort of... like an eye that grows bigger, and comes on and off

Keeps going up and down

Small ones get blurry

Stripes going downward.

The patterns produced a variety of reactions from the subjects. The most common alternative selected by the tinted lens group was that the patterns "made their eyes tired." The most common response from the "good reader group" was that "the patterns made them feel dizzy." However, the patterns caused no difficulty for about a third of good readers, and for two of the tinted lens group.
All subjects in both groups stated that placing a coloured transparency over the page made the print easier to read. Colours favoured by both groups were green, dark blue and pink.

Proof Reading Exercise

All subjects when not wearing tinted lenses identified all of the typographical errors in the text. As well, they made meaningful substitutions.

Miscue Analysis

The following patterns could be identified from the substitution miscues made by the subjects.

1. There was a heavy over-reliance on grapho-phonetic cues at the expense of semantic and syntactic cues. Most substitutions looked and sounded similar, but did not make contextual sense.

2. There was no significant difference in the number of miscues or the type of miscues made by the subjects when reading; irregardless of whether the lenses were worn.
3. Subjects rarely self corrected on the basis of meaning.

The following data supports the patterns outlined above.

Examples

Warren: Text: "Birds" McDonald Readers.

<table>
<thead>
<tr>
<th>Text</th>
<th>Miscues</th>
</tr>
</thead>
<tbody>
<tr>
<td>feathers</td>
<td>flap</td>
</tr>
<tr>
<td>they</td>
<td>there</td>
</tr>
<tr>
<td>of</td>
<td>from</td>
</tr>
<tr>
<td>little</td>
<td>like</td>
</tr>
<tr>
<td>on</td>
<td>onto</td>
</tr>
<tr>
<td>its</td>
<td>the</td>
</tr>
<tr>
<td>mother</td>
<td>mothers</td>
</tr>
<tr>
<td>sit</td>
<td>sleep</td>
</tr>
<tr>
<td>father</td>
<td>feather</td>
</tr>
</tbody>
</table>

(Reading with tinted lenses off)

Text                  Miscues

for                   from
emu                   ostrich
like                  live
there                 they
always                all
it                    if
hard                  hunt

Tim: Text: "Zero People" Gurney Williams III.

Text                  Miscues

(on read with tinted lenses on)

on                   no
where                there
write                wrote
he                   the
other                others
than                 the
but                  put
<table>
<thead>
<tr>
<th>tower</th>
<th>town</th>
</tr>
</thead>
<tbody>
<tr>
<td>that</td>
<td>the</td>
</tr>
</tbody>
</table>

**Text**

**Miscues**

*(Read with tinted lenses off)*

<table>
<thead>
<tr>
<th>stops</th>
<th>stop</th>
</tr>
</thead>
<tbody>
<tr>
<td>thought</td>
<td>thou</td>
</tr>
<tr>
<td>off</td>
<td>of</td>
</tr>
<tr>
<td>before</td>
<td>for</td>
</tr>
<tr>
<td>now</td>
<td>how</td>
</tr>
<tr>
<td>stories</td>
<td>story</td>
</tr>
<tr>
<td>air</td>
<td>era</td>
</tr>
<tr>
<td>noses</td>
<td>noises</td>
</tr>
<tr>
<td>live</td>
<td>lived</td>
</tr>
<tr>
<td>for</td>
<td>of</td>
</tr>
<tr>
<td>will</td>
<td>well</td>
</tr>
</tbody>
</table>

**Darryl: Text: "Island of Helos"**

**Text**

**Miscues**

*(Read with tinted lenses off)*

<table>
<thead>
<tr>
<th>could</th>
<th>come</th>
</tr>
</thead>
<tbody>
<tr>
<td>pretty</td>
<td>places</td>
</tr>
<tr>
<td>even</td>
<td>over</td>
</tr>
<tr>
<td>midget</td>
<td>middish</td>
</tr>
<tr>
<td>submarine</td>
<td>sub</td>
</tr>
<tr>
<td>move</td>
<td>more</td>
</tr>
<tr>
<td>Carla</td>
<td>Carlina</td>
</tr>
</tbody>
</table>

**Text**

**Miscues**

*(With tinted lenses on)*

<table>
<thead>
<tr>
<th>snag</th>
<th>shape</th>
</tr>
</thead>
<tbody>
<tr>
<td>replied</td>
<td>relied (self-corrected)</td>
</tr>
<tr>
<td>three</td>
<td>tree</td>
</tr>
<tr>
<td>agents</td>
<td>guests</td>
</tr>
<tr>
<td>last</td>
<td>lest</td>
</tr>
<tr>
<td>sat</td>
<td>say</td>
</tr>
<tr>
<td>on</td>
<td>one</td>
</tr>
<tr>
<td>seagull</td>
<td>subsharine (sic)</td>
</tr>
<tr>
<td>fast</td>
<td>first</td>
</tr>
</tbody>
</table>

**Noel: Text: "Big League, 1987.**

**Text**

**Miscues**

*(With tinted lenses off)*

<table>
<thead>
<tr>
<th>given</th>
<th>gave</th>
</tr>
</thead>
<tbody>
<tr>
<td>July</td>
<td>January</td>
</tr>
</tbody>
</table>
trait
compu
electrical
continuall
backed
when

Text Miscues
(with tinted lenses on)

realise realised
for of
want wants
Pat Patricia
presents parents
strangest strongest
youngest young
devotion division

Tim: Text: "Rupert" (Daily Express Pub)

Text Miscues
(with tinted lenses off)

travel trousers
was is
sighs sighted
brainy brainly (sic)

Text Miscues
(with tinted lenses on)

this his
study stood
buried hurried
gasped gasps
fixes fits
forward forwards

Trudy: Text: "A Walk Through the Hills"
(G.M. Glaskin)

Text Miscues
(with tinted lenses on)

and sense as tense
lightning lighting
charred chartered
withering writhing

Text Miscues
(with tinted lenses off)

wait
sticks
conceded
guest
like
triumphant
eccstasy
that

Lawrence:

Text: "Second Hand Magic"
(Ruth Chew)

Text:

(with tinted lenses on)

spooky
dragged

(with tinted lenses off)

spent
later
you've

Darryl:

Text: "Digging for Treasure"
(Richard Parker)

Text:

(with tinted lenses on)

which
stringer
boots
don't
turned
round
miners

(with tinted lenses off)

Dave
mag
he
wind
he
river
start
worked
how
another
he

David
Meg
thee
wouldn't
she (self-corrected)
creek
shame
wanted
now
other
we
Four subjects commenced reading with their tinted lenses off. Apart from Rory, most subjects gained some understanding from what they read.

If, as stated in Chapter Two, reading disability results merely from a visual deficit then it is difficult to explain the following miscues made by the subjects.

<table>
<thead>
<tr>
<th>Text</th>
<th>Miscue</th>
</tr>
</thead>
<tbody>
<tr>
<td>emu</td>
<td>ostrich</td>
</tr>
<tr>
<td>agents</td>
<td>guests</td>
</tr>
<tr>
<td>July</td>
<td>January</td>
</tr>
<tr>
<td>river</td>
<td>creek</td>
</tr>
</tbody>
</table>

There is almost no visual similarity at all between the text presented and the miscues made.

**Visual Discrimination Exercise**

This exercise was completed correctly and quickly by all subjects.

**Visual Concentration Test**

All subjects completed this exercise successfully. No mistakes were made.
Copying Exercise

All subjects completed this exercise successfully. The following data are offered as examples.

```
fmprn ovn oetfg efgbda eghrs
```

```
fmprn ovn oetfg efgbda eghrs
```

```
fron aug hoe minsuvw efablo
fron aug hoe minsuvw efablo
```

```
fghb aei aret hompg btrv.
*fghb aei aret hompg btrv
```

```
mtp qurs ont qrbckl abdpe.
mtp qurs ont qrbckl abdpe.
```

```
fron ovre et megh fover exgbde
fron ovre ct megh fover exgbde
```
Handwriting Samples

There was no significant difference in the letter formations irrespective of whether the subjects wore their tinted lenses. The following examples indicate this.

Lawrence
I was sitting down playing strip pecker with Fea and bang a couple of good looking chicks when suddenly I was down to my unders. Just then the phone rang it was sergeant Rick he had a big job no glasses on

I jumped in my turbo charged VW and roared off to the sight of the crime. I opened the door of the house and cautiously Daniel he ran to the front door
I was the time twister. In the quiet room he.

My name is P. I go to Allison Park Rail Public School on Tongarra Road. I play cricket, tennis and go to the beach a lot and take my boogie board.

I have a dog, cat, bird, rabbit and I used to have a fish. One day I would like to race my miniature racing car which I own. I have three brothers: Wayne, Tony, and Luke.
Noel 22-6-87

No lenses

The history of the Holden. The first Holden was made in 1938 which was named "B". Week later changed and was named FX. The FX was basic of the E. Enlarged the American plant was in Victoria. Then FX was followed by the FE, FC, FE, they were all a same design with different lights and colours. The last Holden VB was a HK in 1968 with a 4.2 liter engine.

Greg 8-7-87

Lenses on

I am reading a book. That is called Adventures at Bonagator Junction. So far I have read 4 chapters and 57 pages. It is really good.

Lenses off

My birthday was yesterday. I got a tape holder and a watch and look of other things. I have a really nice white dog. She jumps on everyone that comes even if she has never seen them before.
CHAPTER VII
CONCLUSION

Discussion of Results

This project set out to evaluate the effectiveness of the Irlen Photopic Transmittance Lenses (tinted lenses) as a therapy for reading disability. A case-study methodology was applied to sixteen subjects prescribed tinted lenses. Nine themes that related to the use of the tinted lenses as a remedial therapy emerged from the data collected. As well, experimental simulations were devised so that the performance of those prescribed tinted lenses could be examined in a variety of reading and writing contexts. This final chapter draws conclusions from all the data collected. When the data that emerged was analysed, three major themes became apparent.
1. There was a lack of congruence between what the Irlen literature and practitioners claimed in relation to the effectiveness of tinted lenses and the literacy related performance of the subjects of this project.

Irlen (1983) states that "results are immediate and marked improvements..." are to be expected. However, most subjects or their informants responded negatively when asked this question twelve months or more after obtaining the tinted lenses. Of the three subjects still regularly wearing their tinted lenses, two had ceased making "noticeable progress" and had an alternative colour prescribed.

While some parents appeared reluctant to say that no improvement had taken place during the prior twelve months, none of them claimed that they could attribute improvements solely to the use of tinted lenses. Other contributing factors were identified and included growth in maturity, change of teachers, gains in confidence and improvement in attitude.

In the first few months, most of the subjects were pleased with their tinted lenses. However all were selective about when they chose to wear them. The wearing of tinted lenses was primarily confined to "reading type activities". It appeared that visual deficits did not manifest themselves in areas outside
Subjects undertook and succeeded with activities demanding high levels of visual concentration, visual discrimination skills and visual accuracy (when not wearing their tinted lenses).

Specialists in the field of vision concluded that the subjects did not warrant the prescription of glasses to assist their vision. Gordon was the only subject who had been prescribed glasses prior to his obtaining tinted lenses.

Results of experimental simulations indicated that the subjects did not lack visual concentration, nor did they have difficulty dealing with the visual aspects of print. All subjects except Corey identified all letters by both name and sound. This would suggest that their visual discrimination skills were intact and that their phonic knowledge was adequate. Responses to the visual discomfort test matched closely those of the "good reader group". Even the eighteen "good readers" agreed that placing coloured filters over the print made it easier to read.

The difference between the oral reading performance of the two groups was not a result of the way in which they processed the visual aspects of print, but more a result of the way in which the "good readers" made use of all available cueing systems rather than relying only on the graphophonic ones. (See
Miscue Analysis results). The "good readers" self corrected on the basis of meaning whilst only two of the project's subjects referred to the need for reading to make sense. The subjects tended to "sound out" words and this was the strategy most reinforced by parents.

Irlen practitioners claim that the symptoms of Scotopic Sensitivity Syndrome do not abate with age, and the problem can only be dealt with by the wearing of tinted lenses. However, the majority of subjects voluntarily ceased wearing their tinted lenses. They claimed that they no longer needed them. From this it can be inferred that either the subjects believed that they were cured or the tinted lenses were discarded because they did not achieve the expected outcomes.

2. The role played by parents was an important factor in the acquisition and use of tinted lenses.

Initially, all parents believed that the tinted lenses could help their children overcome the "perceived disability". Out of concern for their children and often motivated by feelings of guilt and frustration, these parents sought a solution. It seemed that they were looking for the "magic fairy dust" after having tried many other avenues without success. Basically all parents wanted to be seen as doing the
Parents generally noticed improvements in their children's oral reading performance during the Irlen screening procedure. Whilst a few parents were sceptical of the procedures used, most parents believed that the procedures were conducted in a professional manner.

Parents attending the clinics did so in order to seek a solution and not to question the validity of information received. In most instances they were a "captive audience" having been convinced of the worth of the tinted lenses through the "60 Minutes" programme. However they were quite sincerely motivated and were at the mercy of the practitioners, but it often seemed that not all information was made available to them.

Chapter One of this project referred to an experiment conducted in March, 1985 by "60 Minutes", featuring John a reading disabled student. A corollary of this was that John's remedial teacher was contacted in July 1987. She claimed that when John returned to school from America it was only for a few days, and he did not return to Year Ten. "The glasses didn't really do much for him. He stopped coming to school. I haven't
seen him at all, and for all I know, he hasn’t worn them." She also stated that "60 Minutes" telephoned several times after the initial screening but John had not made any contact with her. She added that "I knew that he had lots of psychological and emotional problems as well that affected his learning ability."

Subsequent to this episode, "60 Minutes" featured the tinted lenses on another programme. Mr. G (reporting in Teena’s case study) referred to the way in which subjects were selected for the second "60 Minutes" programme: "When "60 Minutes" was there, this fellow went before us and was a bit of a dud. Then Doctor Whiting came back and said (to the filming crew) "Quick, we've got one.""

Parent reactions were generally positive during the first few months of the tinted lenses use. However, at the follow-up and final interviews their comments were less than enthusiastic. Most subjects’ teachers responded similarly.

Parents of the three subjects still wearing tinted lenses on a regular basis responded differently. The parents of two subjects who had been prescribed a second colour believed that this was necessary because improvement had declined. The mother of the third subject was interested in investigating other possible
avenues of assistance even though her daughter was the only subject still wearing her original pair of tinted lenses.

There was heavy reliance by parents and subjects on media generated information as well as information made available by tinted lenses prescribers. Parents and subjects lacked knowledge of the reading process and could draw only on their experiences as successful literacy users. They were not in the position to question the validity of statements made in the context of reading research, including the statements made and the procedures used by the Irlen practitioners. As the Irlen promotional literature did not refer to any minimum age for the prescription of tinted lenses parents were also unaware of the claim made by Dr. Whiting:

...since the successful administration of the I.D.P.S. is very dependent on the ability of clients to report their own experiences, it is considered that no people under the age of ten years be included in the study." (Refer Appendix: New Help for the Learning Disabled).

One of this project's subjects was aged eight years.
Parents sought solutions out of concern for their children. This did not guarantee, however, that the judgements they made concerning the most appropriate remedial therapies were always sound. It was as though parents had little choice in the matter, as the information they were given led them to the natural conclusion that they were making the right decisions for their children.

3. Perceptions subjects held of themselves influenced their behaviour as literacy users.

When first questioned about perceived changes, if any, since obtaining the tinted lenses the subjects responded in terms of the questions asked in the I.D.P.S. In two extreme cases the subjects were able to illustrate how words looked when viewed without their tinted lenses. (See Appendix: Work Samples).

All subjects (except Lance) perceived themselves as being poor readers, were generally not interested in reading, had unhappy memories of past unsuccessful reading experiences and had limited knowledge of available reading strategies. They had all hoped that the tinted lenses would "make them better readers". Initially the subjects claimed that "Things looked different, they could concentrate more, and
reading was easier". However, as this project progressed most subjects tended to wear their tinted lenses less and less.
Coping Strategies

Based on unsuccessful literacy-related experiences

"I can't read."

"I'm not good enough."

"It's boring."

"I'm dumb."

"I haven't time."

"Not interested."

"Excuses."

- "Adopt a label."
- "'Dyslexia'."
- "Reading disabled."
- "Adopt a label."
- "Dyslexia."
- "Reading disabled."

Subjects perceive themselves as "disabled readers" regardless of actual reading ability reinforced by expectations of significant others.

"Seek solutions."

- "Therapies."
- "Reading disabled."
- "Adopt a label."
- "Dyslexia."
- "Reading disabled."

Based on unsuccessful literacy-related experiences
In meaningful demonstrations, fails to engage in.

Grounded Theory and Interpretation of the Data

When the data was interpreted, the following theory emerged.

Collected data

Page 247
All subjects (except Lance) perceived themselves as being poor readers. Their earliest recollection of reading or writing was of unpleasant experiences, usually in Year One or Year Two. These experiences were interpreted as "I can't read" or "I'm no good at it". This interpretation then became entrenched as a part of the subject's identity.

The expectations of significant others appeared to the subjects to justify this interpretation as being the correct one. Parents expected there to be a problem and spent money and time hoping someone could diagnose it. But the problem persisted.

The subjects, in conforming to the expectations of those around them became what they thought was expected of them—unsuccessful readers.

It would appear that in many instances there was a payoff for remaining "disabled". For example, the subject often received attention for being different from peers and siblings, allowed themselves to form a close affinity with a parent who also had similar problems, or was noticed for being different. (This was particularly so with the tinted lenses).
Consequently, subjects refused or avoided engaging fully in the learning process. Despite the fact that all subjects had had ample opportunities to master reading they failed according to their own perceptions and the perceptions of significant others. The perception they held of themselves as disabled interfered with or blocked their participation and progress. Faced with the choice of participating or not participating at all, the subjects chose the latter. Such excuses as "I'm not interested"; "It's boring"; "I haven't got the time" became convenient for them. There was no reason for pursuing something that was interpreted as offering little reward.

In the meantime, parents wanting only the best for their children assumed responsibility for the problem. As literate adults, they held a different perception of what was at stake, including lost opportunities and fewer career choices. Frustrated, anxious and often guilt ridden, they sought many costly and diverse solutions. Tinted lenses was just one of several.

Despite the fact that all subjects could read to varying degrees, parents were convinced that their children were capable of doing better. Classroom teachers were often less convinced that a problem existed.
For those for whom the tinted lenses "worked" it seemed that the focus of "the problem" shifted from one of the subject as a failure to an eyesight problem. This allowed the subject "space" to succeed or at least to change their self perception. The subject could decide "It wasn't really me... it was my eyes. Therefore I'm O.K." The tinted lenses became the key to unlocking the perception subjects held of themselves. The majority however recognised that their problem could not be solved by the wearing of tinted lenses, or the prescription of ritolin, upside-down reading, or words in colour, to name a few.

Concluding Remarks

When a child fails to learn... he is trying to safeguard his picture of himself, his self-concept, the illusions concerning himself which he has built and which give him much trouble. (Hamachek, 1968).

Kozol (1980) refers to the state of failure as one of "age-old bondage." Smith (1977) claims that the reading disabled do not see themselves as being members of the literacy club.
If we do not belong to a particular club, then we do not apprentice ourselves to people who are members of that club. Our minds fail to engage with the demonstrations that are provided for us. We cease seeing ourselves as "that kind of person." (p. 48).

The reading disabled perceive themselves as being disabled and act accordingly. They in fact remain true to the picture they have created for themselves, based on the expectations of significant others. It would seem that the unsuccessful literacy user has three available choices. In practice, these choices assume many guises but they can be summarised as follows:

1. "I accept my inadequacies and choose to succeed despite them. I want to do it."

2. "I remain unconvinced of the need to read. I accept the excuses, labels and therapies while ever someone is willing to create them. If I fail, it's the therapy, label or excuse that has failed, and not I."

3. "I accept the payoff for remaining illiterate is greater than the payoff for reading. Succeeding is not worth the effort of changing my self perception."
Success is only possible when the subject and significant others disregard "the story" as to why it is that achievement is not a possibility for them. "The story" is usually about why it is that some inadequacy or "disability" prevents success with reading (whether it be physical, emotional, educational, socio-economic or environmental). Until the story is surrendered in favour of the perception that reading is a definite possibility then it simply will not occur. The subject must begin to perceive that "I want to read. I can succeed. I can join the 'literacy club'. I am O.K!" The mother of a subject states it as she understands it. "He's now more confident. He's really fine. I think I'm just anxious....I think he's beginning to think he's normal."
An Evaluation of the Effectiveness of Irlen Photopic Transmittance Lenses in Overcoming Reading Disabilities

VOLUME TWO

Kaye Lowe
APPENDIX

Australian Women’s Weekly Article
Newspaper Articles
Wollongong University Visual Discomfort Test
Scotopic Sensitivity Syndrome: An Overview
Insight
Parent Letter
Using Coloured Lenses in the Treatment of Disabilities
How Difficult Can Reading Be—New Insight into
Reading Problems

What is Scotopic Sensitivity Syndrome?
About the New Discovery (Hobart Assessment Centre)
Guidelines for Irlen Lenses
Reading Disabilities and Use of Coloured Filters
(Abstract)

New Help for the Learning Disabled: Irlen Lenses
Visual Dyslexia: Successful Treatment with Irlen Lenses
(Draft)

Successful Treatment of Learning Disabilities—
(Irlen, 1983)

Rose Coloured Glasses—A Further Insight into
the Reading Process

Work Samples: Darren, Tony
Thanks to tinted lenses, Elizabeth and John Merce are able to read properly for the first time in their lives

After what Elizabeth and John Merce had been through, it seemed only fair that something encouraging should happen.

When they tried to read, their eyes felt strained and dry. They blinked and squinted and got headaches as the words played tricks in front of them, changing size, throbbing and swirling about the page. It was like alphabet soup beating in a slow-turning mixing bowl.

Elizabeth, now 33, always thought her problem had something to do with the jolt she got as a baby, when the car rolled. Later, prescription glasses did nothing for her so she threw them away.

John, Elizabeth's 16-year-old son, had complained at primary school that he couldn't read the letters on the blackboard, and had progressively withdrawn into himself. "I just thought he had bad eyes," said Elizabeth. "I took him to the eye hospital. The doctor who checked him said 'John's dyslexic'."

He was, in other words, one of thousands who have seemingly unexplainable difficulties with reading and writing.

At high school in the inner-Sydney suburb of Newtown, John pushed on doggedly with some remedial help and counselling but, despite his normal intelligence, learning remained an uphill battle.

Then one day earlier this year he rang his mother from school and said: "I could be flying to America with '60 Minutes' and Ian Leslie."

"Stop exaggerating," said Elizabeth, aware of John's obsession with building model aircraft. She went back to her household.

But John wasn't exaggerating, and within days she was lined up at the passport office clutching tickets to America for John and herself, courtesy of the Nine Network, and "60 Minutes".

Elizabeth had been watching the test and found herself automatically agreeing with Helen Irlen's observations. The psychologist looked at her quizzically. "You'd better have a go," she said.

So, by the same technique, Elizabeth, who never suspected she was dyslexic, found tremendous relief reading. The lenses that helped her most turned out to be purple.

"It's like a dream," she said, back home from the whirlwind tour that left her dumbfounded. "I've had such a dull and drab life until now." A single parent supporting John and daughter, Leah, 10, on the pension, she was about to head for the library.

As a child, Elizabeth would burn books because of her frustration when
trying to read. Later, after leaving primary school at 14½, she managed to catch up a little by sheer perseverance and the help of a dictionary she kept in her bag. She had read poetry, "The Thorn Birds" and some of "Jane Fonda's Workout Book" before she went to America.

Both mother and son have a lot of catching up to do. The new specs are not magic cure-alls for dyslexia, but are likely to remove an enormous learning and concentration block.

John's remedial resource teacher, Anne Meadows, hopes by the end of the year to see a big improvement in his progress.

Just what do these tinted glasses do? Dr. Paul Whiting, who is head of the Evelyn McCloughan Children's Centre and senior lecturer in primary teacher education at the Sydney Institute of Education, went to California to investigate Helen Irlen's programme.

In his professional role and as senior vice-president of SPELD (Specific Learning Difficulties Association) in NSW, he has recommended special funding from the Department of Health to start a similar programme.

We asked him if ordinary tinted sunglasses might be a simple answer. He says not. "If they're good sunglasses they reduce the whole light spectrum — the glare. That's one kind of filter that Helen Irlen's programme does not use at all.

"She is using selective filtering: finding what part of the light spectrum is difficult for the individual concerned, and reducing the glare in that area."

The light spectrum, Dr. Whiting explains, is the whole range of colours of the rainbow that make up what is called white light.

"Helen Irlen tries mixing and matching the colours, or the tinted lenses, until she gets it right for the individual. One colour can be comfortable for one person's vision, and utterly abhorrent to another's," says Dr. Whiting.

He says the tinted lenses discovery is probably a most significant breakthrough in the understanding of learning difficulties.

"There are lots of avenues of research but they are not coming up with very good answers for a lot of people," he says.

Diet has been studied, helping to quieten down hyperactive children so they can attempt their reading: an American doctor believes in anti-motion sickness pills; others believe in anti-depressants.

"We aren't really keen on drug therapy," Dr. Whiting says. And while it isn't understood exactly what is happening, one of the theories being considered is that a problem of the eye's retina is involved.

Why haven't eye doctors picked up the problem? Because, says Dr. Whiting, the profession has not known what questions to ask. For instance, asking people, "Can you see that?" and getting the answer "Yes" is quite different from asking "HOW do you see that?" The answer then might be, "All distorted."

Says Dr. Whiting: "We are looking at a group of people who are very sensitive to light. They prefer to read by dim light rather than by those enormous banks of fluorescent lights classrooms have these days..."

And colleagues here and in America, he says, have noticed an increase in learning disabilities since World War II — along with a tremendous increase in fluorescent lighting.

Dr. Whiting says a conservative estimate of people with learning difficulties around the world is 10 percent of the population. "Of these, half might be helped through an appropriate 'tinted lens' programme — in other words, some 750,000 Australians."

— ROSEMARY MUNDAY

TOP: Elizabeth and John have both discovered that reading can open up new worlds. TOP RIGHT: Dr Paul Whiting, senior vice-president of SPELD.
Coloured Lenses

Many people from all walks of life have learning disabilities.

The Helen Institute, now part of the Lansdowne Group, specializes in the perceptual and learning difficulties of children, students, and adults. Prof. Helen Helen, an American educational psychologist, discovered through research at California State University in Long Beach, that about 75% of students with learning disabilities show a visual component to their disabilities. For many people this "scotopic sensitivity" (sensitivity to some parts of light) is relieved by use of coloured lenses (no, not contact lenses). People of all ages can have this sensitivity and these lenses have been found to help those who have problems with reading comprehension, sharpness and clearness of words, movements of the lines and words as they read.

As they can be put in spectacle frames chosen by the wearer, these lenses can be quite trendy, and nothing to be ashamed of, because they are just like glasses.

There are many different layers of dyslexia, not all of which are visual, so coloured lenses do not work for everyone. For dyslexic adults like Duncan Goodhew, the Olympic swimmer, however, it may seem too good to be true. He was able to see a full page clearing before his eyes during his initial screening session. Like many of the parents and children who responded to two features on BBC Television news slots, he undoubtedly hopes to be wearing his coloured lenses as soon as possible.

There will be FREE pre-screening for all Lansdowne students who wish to be tested. Everyone who should take advantage of this opportunity. The full diagnostic procedure usually lasts about 1½ hours with an estimated cost of ££££ for the lenses, but the initial testing stages, for Lansdowne students, will be free.

The Institute must insist that every person must have had a recent standard eye test before making an appointment for assessment.

Patricia White
New lenses help correct scotopic sensitivity syndrome

by Judy Gimby
and Barbara Proctor

Jackie Hutchby of Atascadero is seeing things she has never seen in her life. It's not that she has needed corrective lenses. She has a drawer full of glasses and still she had never seen the leaves on trees.

She was quicker to recognize people on the phone than in person because she could not look closely at people, knowing their features would vanish before her eyes if she looked at them too long. Reading was agony. Features would vanish before her eyes if she tried to read but the term suffers from confusion, associated as it often is with many visual, auditory, conceptual, and memory problems.

Through her work with learning disabled students at California State University Long Beach, Helen Irlcn was able to isolate a group of interrelated learning disabilities she came to call “Scotopic Sensitivity Syndrome.” Studies have since shown that fifty percent of those with learning disabilities fit the syndrome’s profile and ninety percent of those can be helped with the Irlen lenses.

General characteristics of the syndrome include slow inefficient reading, poor comprehension, an inability to read comfortably for more than an hour, eye strain, frequent headaches, and depth perception problems. The syndrome often exists in a complex of other learning disabilities such as auditory difficulties of expression. In her studies, Irlen was able to ask adult learning disabled students about what they see and it was then she learned of the further problems such as Jackie Hutchby’s. For some, the print runs off the page. Others see the printed lines form a swayed pattern on the page. Still others see everything blurred or experience spaces in the black letters when the white bleeds through the print. For some the print runs, lines move, letters double or triple, appear to have halos around them or just disappear altogether.

Scotopic Sensitivity Syndrome is a visual perception problem but one not correctable with conventional glasses. Instead, it is related to difficulties with light source, intensity of light and color. For these people, full spectral, or white light, produces overstimulation of the retinal receptors in the eyes and, in turn, causes visual problems such as Jackie Hutchby has been experiencing.

Professor Irlen discovered that specific bands, not the complete spectrum, cause the problem and by filtering out the offensive band or bands for each person, she is able to control most if not all of the problems. Over 140 tint variations are available and only through intensive diagnostics can the correct prescription be determined for each person.

After reading the article last February, Jackie Hutchby was tested by a trained Irlen Institute diagnostician. She went through approximately two hours of tests to determine her specific problem areas, answering questions about her learning history, her present reading habits and difficulties and responding to tasks developed by Helen Irlen to isolate visual distortion problems. She was evaluated in the areas of photophobia (the inability to adjust to strong light), visual distortion, span of focus (the area one can clearly see at a time), depth perception, eye strain and sustained focus (the ability to clearly see print and things in the environment with eyes in a relaxed state). When it was determined that she could be helped by wearing the lenses, Jackie travelled to the Irlen Institute in Long Beach to be fitted with a pair of cranberry colored glasses, which she wears all the time.

“I love them,” she says.

The best change in her life, she says, is that she is no longer so tired at the end of the day. Most notable is that she now sees people and recognizes them when she sees them again. Before, when she looked at people, she explains, “You may not have stayed in place, your eye maybe didn’t stay where it was supposed to. Sometimes there would be two of you but I never thought to question it.” She is currently working at the desk of her husband’s chiropractic office and everyday her reading skills improve. Still there are words she doesn’t know but she is learning new words every day.

“W hen I held up the lenses and looked through them for the first time and the words held still, I was so intent at looking at them that I really wasn’t aware of anything else,” she explains. She continues to make new discoveries daily.

Those interested in more information about the Irlen lenses or who wish to be screened may contact Judy Gimby (805) 279-1272 or Barbara Proctor (805) 729-2891.
Coloured glasses may help dyslexics

By RADA ROUSE

CHILDREN with poor reading ability may soon be able to catch up to their schoolmates with the help of special sunglasses, Australian researchers say.

Experiments in NSW and Tasmania have bolstered the theory that children suffering dyslexia have a visual impairment rather than a low IQ.

Dr Robert Solman, senior education lecturer at the University of NSW, said more experiments this year with coloured filters and lenses might pave the way to improved reading ability for many “backward” youngsters.

“It may be as simple as having the children wear special sunglasses in the classroom,” Dr Solman said.

He said other remedial ideas being investigated included blurring the printed page to compensate for the malfunction in vision, but he warned not all reading disabilities could be corrected.

Dr Solman said his research, which followed that of Tasmania’s Dr Bill Lovegrove, had important implications for government education policies.

“Most remedial reading programs are based on the premise that there is nothing physically wrong with the individual, that the reason they can’t read properly is because of environmental or social factors or at the very least memory problems.

“That has been the basis of remediation for the past 10 years, but our research shows it is unlikely to be correct.”

Dr Solman said he had studied Australian dyslexics with Dr Jim May of the University of New Orleans, US, and this year would continue a project at the University of Canterbury in New Zealand.

He said New Zealand had an extensive remedial program in which children assessed to be at risk of dyslexia in their first school year were given special attention.

While most improved, for 20 to 30 per cent of children the remediation was unsuccessful.

Dr Lovegrove, professor of psychology at the University of Wollongong, said two research projects this year would provide more information about different causes of dyslexia.

He said his seven-year study of children in Hobart, which was still being analysed, had shown that in 70 per cent of disabled readers a particular section of the brain governing vision had malfunctioned.

This year the Tasmanian Education Department was backing a further survey of 300 Hobart children in a bid to sort out how much of the problem is visual, how much relates to audio problems (converting letters to sound), and how much to short-term memory problems.

“The question is, are all disabled readers the same or do they fall into different categories?” he said.

“We need to find out whether these different problems are linked or whether one could be the cause of the other.”

AAP
THE AUSTRALIAN
1.21.2187
PLEASE CIRCLE THE CORRECT RESPONSE OR ANSWER AS QUICKLY AS POSSIBLE.

SECTION 1 - PERSONAL PARTICULARS

1. Age in years - years

2. Sex

   M     F

3. Nationality

   If non - Australian: How long have you been resident in Australia:

   a. Full time student
   b. part-time student
   c. teacher
   d. office/clerical/admin work
   e. technical
   f. other: please specify

5. Do you wear prescription glasses or contact lenses when reading? Yes No

5a. If you answered Yes to Q5.
   What type of eye-problem do you have?
   Please state:

6. Do you wear sunglasses? Yes No

   If Yes:
   i) are these prescribed Yes No

   ii) When do you wear them: Indicate as many as applicable
       a. Only when sun is bright
       b. outdoors during the day
       c. always when driving
       d. driving in' glarey' conditions only
       e. for aesthetic reasons
       f. other Please state:

7. Do you spend a lot of time in smoky rooms? Yes No

8. How often do you use eye-drops or eye-ointment? N R S I F

9. Do you experience visual discomfort for no apparent reason? N R S I F
10. Of the following - which are true: Circle as many as you need to.

   a. Each day my eyes become red and sore.
   b. My eyes sometimes ache
   c. I often rub my eyes because they are sore or itchy
   d. My eyes become tired when I am tired
   e. My eyes tire easily
   f. My eyes feel dry and gritty only on windy days
   g. My eyes feel dry and gritty most days
   h. My eyes are generally clear and bright

11. Do your eyes get sore and red or dry and gritty when watching TV or working at a computer terminal?

12. Do your eyes get red and sore or dry and gritty when you are reading the newspaper?

13. Do your eyes get dry and itchy or red and sore when you are in bright sunlight?

14. Do you experience sharp shooting pains behind your eyes?

15. Do your eyes get sore and red or dry and itchy when in a brightly lit room?

16. Do your eyes get red and sore when you are tired?

17. Do your eyes stay clear and bright all day?

18. Do your eyes get dry and itchy or red and sore when you are tired?

19. If you are working in dim light do your eyes become easily fatigued? (Assume you are not tired.)

20. Do your eyes become sore or tired when you are working under fluorescent light? (Assume you are not physically tired.)

21. Do you work with the aid of a reading light?
22. How often do you get headaches?
   a. Never
   b. Rarely (Once a year)
   c. Up to 6 in a year
   d. One a month
   e. Almost daily

23. In what part of your head are the headaches located:
   (You may circle more than one)
   a. At back of head
   b. on right side of head only
   c. on left side of head only
   d. behind the eyes
   e. pain in the forehead
   f. other  Please Specify

24. Do your neck and shoulders ache when your head aches?  Yes  No

25. Do you often get ear aches?  Yes  No

26. Do you often experience low back pain?  Yes  No

27. Do you suffer from hay fever or allergies?  Yes  No

SECTION B

1. I read for pleasure?  N  R  S  I  F

2. How long, on average, do you spend reading each day?  (Includes academic and non-academic books, newspapers etc.)
   a. more than 4 hours
   b. more than 2 hours
   c. one to two hours
   d. less than an hour
   e. more than 8 hours

3. Does the print on the page of a text book or novel ever become distorted when you are reading?  N  R  S  I  F
4. Please state which type of distortion if any, you experience when reading print (Circle as many as you like)

a. the writing becomes blurred
b. double images appear
c. the print begins to move
d. bright lights or colour appear on the page
e. the print becomes blurred
f. the print fades into the background
g. I don't experience any of these things

5. Please circle Yes or No to the following questions

a. Large print (e.g., Cat) is easiest to read
   Yes  No
b. Small print (e.g., cat) is easiest to read
   Yes  No
c. Print like that on this page is easiest to read
   Yes  No
d. The type of print makes no difference to my reading
   Yes  No
e. Bright white glossy pages with bold black letters are best for reading
   Yes  No
f. Off-white or coloured paper in the background is easiest to read
   Yes  No

6. When the overhead projector is properly focussed do you have trouble reading the information presented when people sitting near you have no trouble? N R S I F

7. The light from the overhead projector make your eyes sore? N R S I F

8. Material written legibly on a white board is more readable than material written legibly on a blackboard N R S I F

9. Written material written legibly on a blackboard is more readable than material written legibly on
10. Which do you prefer: (Please circle the preferred mode of teaching presentation.)
   a. material presented on an overhead projector
   b. Material presented on a blackboard
   c. Material presented on a white board
   d. use of video tapes
   e. use of slide projectors
   f. all of the above
   g. Don't care.
   h. None of the above
TYPES OF DISTORTION WHICH MAY BE GENERATED
(This will go on a separate page.)

I am going to show you a pattern for 20 seconds. I want you to look at the centre of the pattern and circle on this sheet any pattern/distortion you saw generated in the display while viewing: Mark as many as you like. If you see things that are not listed please write them down in the spaces provided.

1. colour
   a. red
   b. blue
   c. green
   d. red
   e. other. Please specify

2. Movement
3. Swirling movement
4. shimmer
5. thicker lines at a different angle
6. thinner lines at a different angle.

7. what is the dominant pattern that you see:
   a. clear
   b. red
   c. blue
   d. yellow
   e. green
   f. other
   (This section will be conducted by experimenter)
Scotopic Sensitivity Syndrome (SSS) is usually considered a type of visual dyslexia related to difficulties with light source, intensity, and specific colors. As many as 50% of individuals who have reading difficulties to some extent have SSS. SSS is often found in a complex of difficulties (e.g. auditory difficulties, poor handwriting, hyperactivity, eye muscle imbalances, allergies, emotional overlay and feelings of educational and personal inadequacy). In addition, some individuals may also suffer from inhibition disorders which make thought, language, interpretation, and even control of supposedly willful activity difficult.

It is not uncommon these individuals have been labeled as "dumb, stupid, or lazy." Those thought "lazy" appear to be bright and are thought not to be using enough effort to complete assignments at their level of intellectual ability. However, it is quite common these individuals are using much more effort than their contemporaries not so affected to get the same or even lower grades. Parents and teachers may become quite frustrated as remedial efforts are at best "spotty" and seldom achieve any lasting results.

Current research in families and by geneticists researching families with reading difficulties using specialized gene inspection techniques indicate reading difficulties can be genetic in origin, residing on chromosome 15. These scientific genetic findings are consistent with population studies of up to three generations of families and in immediate family groupings with SSS. However, there are cases of individuals with acquired SSS symptoms following head trauma, viral encephalitis, stroke activity, etc. These latter cases are difficult, if not impossible, to treat. Excepting apparently exacerbated cases, research indicates males generally have more dramatic symptoms of SSS than their female relatives and are detected at a higher rate in the general population. Excepting traumatic or degenerative exacerbating difficulties, the symptoms of SSS do not appear to change as a function of maturity or growth. Rather, individuals adopt various coping strategies to overcome and compensate for their symptoms and difficulties.

Since SSS is a different visual problem from visual acuity and refractive errors, it is not detected by visual examinations by ophthalmologists, optometrists, opticians, or developmental vision therapists. While some have attempted vision therapy using exercises and even special optically ground lenses, no research has substantiated any longterm or particularly useful gains for those with SSS.

Some of the features which an individual may experience with SSS are slow reading rate, inefficient reading, poor concentration, limited reading time, eye strain or fatigue, headaches, difficulty judging distances, and visual difficulties while using a computer monitor, etc. The major components evaluated to determine the presence of SSS are:

Photophobia. The ability to adjust to various lighting conditions, particularly fluorescent lights. Ability to accommodate to black/white contrast and glare.

Prepared by Dr. Norman C. Murphy, Licensed Psychologist, Test Office, Counseling Services, Division of Student Affairs, Cal Poly, San Luis Obispo, California in cooperation with the Irlen Institute, 1988.
Visual Resolution. Ability to see print clearly and free of distortion.

Span of Focus. The ability to perceive groups of words at the same time. Persons with good span of focus not only see the word they are looking at with clarity, but many of the words in the periphery. Poor span of focus is often likened to "tunnel vision."

Sustained Focus. The ability to read or do other visually demanding tasks for a period of time with the eyes in a relaxed state and for words and objects in the environment to stay in focus.

The usual treatment for SSS is the use of spectrally modified Irlen Lenses which specifically reduce light and color which is causing disruption to the visual process. The exact method is not known; however, it has been suggested that by selectively reducing activity of visual pigments in the retina, vision is enhanced and an overload of visual material is reduced. Research has indicated most persons treated with the Irlen Lenses show increased: reading comprehension, attention span, depth perception, visual comfort, and night vision, etc.

Few, if any, individuals have all of the symptoms associated with SSS. However, commonly reported symptoms of SSS are:

General Characteristics. Finds lighting situations difficult. May read in light that seems dim by others' standards or may feel there is never quite enough light, bothered by glare and generally light sensitive.

Complaints. Reading or light related headaches; eyes that feel itchy, burning, sandy, scratchy, dry; drowsiness when reading; words double, move, look funny, blurry, fuzzy, or even partially or completely disappear.

Observations while Reading. Rubs eyes, moves closer to or further from the book, excessive blinking, squinting, opening eyes wide, shading of the page with the hand or body, needs to take frequent breaks from reading, moves the book to eliminate glare, closes or covers one eye, moves head not eyes when reading, reads close to the page, reads word-by-word, uses fingers or other marker to blockout part of the page, great difficulty skimming for comprehension or attempting speed reading.

Types of Reading Difficulties. Skips words or lines, repeats or rereads lines, cannot read for longer than an hour, has more difficulty than normal reading poorly copied class handouts, loses place, reads slowly, hesitantly, possibly in a monotone, reads in stop-go rhythm, omits small words, reading skills and comprehension deteriorate as reading continues.

Writing. Writes up or down hill, unequal spacing between letters and words, inability to write on the line, errors while copying from books or board, squints or blinks while copying from chalkboard, takes down only a word or two at a time as opposed to phrases or sentences.

Mathematics. Misaligns digits in number columns, difficulty seeing numbers in correct column, sloppy or careless errors.

Music. Plays by ear and has difficulty reading two music staffs at a time.
Depth Perception. Difficulty getting on and off escalators, clumsy, walks into table edges or door jams, difficulty judging distances, drops or knocks things over.

Seeking Treatment. If a treatment seeking individual has not had an extremely thorough eye examination in the past year or believes their current prescription is in need of change, they must undergo visual examination with a licensed professional ophthalmologist, optometrist, or optician. The examination should include, but not be limited to, refractive errors, convergence, stereopsis, muscle imbalance, contrast sensitivity, photophobia, binocular vision, color vision, peripheral vision, glaucoma, etc. Individuals who desire to be evaluated for SSS should seek out a specifically trained specialist who deals exclusively with SSS. As with any treatment individuals should be re-evaluated on a continual basis. Slight changes in the visual system or adaptation to the Irlen Lenses or other corrective visual measures may result in the need for a new prescription to maintain or even improve over initial gains.

The Irlen lenses have had some success in helping to reduce or eliminate visual or other difficulties in such circumstances as: floaters, retinitis pigmentosa, low vision, cataracts, amblyopia, strabismus, wandering eye, nystagmus, agoraphobia, vertigo, etc. The Irlen Lenses are always prescribed after a thorough visual examination by a licensed professional, an analysis of specific visual difficulties, and careful selection of colors which eliminate specific difficulties. The Irlen Lenses are chosen by the client with the aid of a trained professional. While colored overlays have proven valuable in ameliorating the symptoms of SSS, their lack of individualized prescription and convenience in general use make Irlen Lenses preferable.

As with any functional difficulty which can be ameliorated or aided through optical and neuropsychological techniques, clients should seek re-evaluation when they experience any loss of function and at annual or other scheduled times as recommended by the examining professional.

Irlen Lenses and suggested coping mechanisms are not a panacea for dyslexia, SSS, or any other condition they might be considered to ameliorate, treat, or help alleviate. However, professional research, individual self-reported improvement among many thousands, extensive clinical trials and observations have proven the Irlen Lenses most successful for many who have tried them.

Additional Information

The Irlen Institute
P.O. Box 7175
4425 Atlantic Avenue, Suite A-14
Long Beach, California 90807
U.S.A.

Telephone (213) 422-2723
READING DIFFICULTIES AND TINTED LENSES.
INFORMATION FOR PRINCIPALS, TEACHERS, & SCHOOL COUNSELLORS.

Have you heard of tinted lenses as a remedy for reading difficulties? We have been obtaining some very exciting results with this new technique in Canberra. It is possible that a child for whom tinted lenses has been prescribed attends your school. In order for you to be more informed about these tinted lenses, we wish to draw to your attention some of the common symptoms of "Scotopic Sensitivity" to 'white light' and white paper and the value of tinted lenses.

Scotopic sensitivity is an inherited physical disability which appears to be a major contributing factor in at least 65% of cases of reading disabilities. It is also a limiting factor which leads to hesitant reading among people who can read adequately. The retina appears to be transmitting an interference signal to the brain from one or more of the light frequencies comprising the white light spectrum. Within the electro-magnetic spectrum, the range of light frequencies from long wave length (low frequency) to short wave length (high frequency) we see various colours depending on the combination of frequencies. For people with "Scotopic sensitivity", certain light frequencies cause perceptual disorders which vary in number and severity, but include the following:

* Distortions of print, especially on white paper. This includes letters distorted in shape; words scrunched together; parts of letters missing; letters and words disappearing, etc.

* Swirling of print on white paper after a few seconds. This can be a swirling of the whole page or spinning of individual letters, or reversing of words or parts of words. Some children actually read better with the print upside down.

* Movement of the print in a shimmering, wavering, vibrating or fluorescent effect.

* Seeing streaks of bright white through and between the print, often described as rivers, creeks, or waterfalls through the print.

* Blurring of the print after varying lengths of time, from 1 or 2 seconds to 5 or 10 minutes.

* Seeing doubling or ghosting of letters, or seeing shadows and
circles of light like halos around letters or words.

* Seeing the print scrunched with no spaces, or all run together "like runny ink".

* Frequent skipping of whole lines or skipping of words, or repeating a line just read—i.e. unable to track smoothly from line to line.

* Restricted visual span, similar to tunnel vision, often apparent from reading one word at a time. Large words require two or three eye movements to comprehend.

* Eye strain from surprisingly little reading; e.g. itchy eyes, aching eyes, watery eyes, stingy eyes, or frequent blinking and squinting.

* Rapid fatigue when reading, and noticeable deterioration in reading performance.

* Tremendous effort to concentrate, with low level of attention and avoidance of reading where possible.

* High sensitivity to glare outside, and fluorescent lights inside, often accompanied by frequent headaches.

* Poor depth perception, apparent in poor ball skills, lack of confidence on stairs and escalators, and clumsiness.

Not all symptoms will be present with different people, and individuals vary in degree of sensitivity and disability. Some will be very poor readers; some will be hesitant, stumbling readers lacking fluency especially reading aloud. Others read adequately for a while and fatigue rapidly.

The problem is not degenerative, nor will it dissipate with age. That is, children will not "grow out of it". Also, we see as many adults as children with the same problems.

If you suspect a child can be helped, you should inform the parents and suggest that an appointment to have their child assessed is recommended. If the child has not had a proper optometric check in the past 12 months, we would require the parents to have this done before we see the child.

Our assessment consists of two stages:

1. Assessment to ascertain for sure that the child is suffering from scotopic sensitivity. This takes at least one hour of assessment with the parents present.

2. If the initial assessment clearly indicates 'scotopic sensitivity', a second appointment is made to precisely determine the appropriate tint to eliminate the problems. This can take
from one to three hours.

If clients are from out of Canberra requiring considerable travelling, the two appointments can be completed together with a break between.

A detailed report is provided to parents at the time that lenses are provided. This report is available to schools on request, with approval of the parents. Most parents are keen for schools to receive a copy of the report and be fully informed about the assessment and the reasons for the tinted lenses.

If a child at your school begins wearing tinted lenses, we would appreciate your support for the child, and that you make an effort to become informed about what the lenses do for that child. I am prepared to speak at a school meeting for parents and teachers to provide more information and respond to questions. Please contact us on (062) 951319 to make an appointment for a child or arrange for me to speak at your school.

Yours sincerely,

Dr Peter D. O'Connor &
Margaret R. O'Connor
Dear

Thank you for your letter requesting further information about the use of coloured lenses in treating learning difficulties. This discovery was made by a Psychologist, Mrs. Helen Irlen, at California State University in America. She was working with adults who had suffered from learning disabilities for many years, and who were able to describe to her the difficulties they had in reading. Thus she discovered, that there were many people who had visual difficulties that were not being detected by conventional visual examinations.

As a result of talking with these adults, she realised that the application of lenses to modify the light input that these people were receiving, could be of great assistance to them. This observation had also been made in 1972 by a Clinician in New Zealand, who had noted that many children in her clinic claimed to have visual difficulties. She too had found that by placing transparent coloured (or even just dirty!) plastic sheets over the white page, the children experienced a great improvement in the ease with which they could read the material. The symptoms which this New Zealander had noted were very similar to those reported to Mrs Irlen.

In brief, the symptoms that we are looking at are: eye strain (indicated by symptoms such as headaches, itchy, burning, sore, dry eyes, rubbing eyes during reading, red and watery eyes etc), sensitivity to bright light (indicated by dislike of working under fluorescent light, preference for reading in dim light rather than bright light, squinting when outdoors in sunlight etc), difficulty in holding focus (indicated by words going blurry or fuzzy, words or pages easily going out of focus, inability to read for longer than half an hour without having a break etc), and narrow span of focus where only a short portion of print is seen clearly at any one time. In addition, many of the people experienced difficulties in depth perception, frequently bumping into things, being called clumsy, having difficulty judging distance when driving, crossing roads etc. This is very brief summary of some of the symptoms that we are finding in people with these difficulties. Many of them report that the words move about on the page, go blurry or fuzzy, swirl, or such unusual things.
At the present time, treatment for this disability requires two sessions: a diagnostic session of about one hour's duration, where we determine the precise areas that are causing problems; and a treatment session, where the appropriate tint is prescribed. This is very much an individualised procedure, as the precise tint will be different for each individual.

After that, the lenses have to be supplied. There is no follow-up normally necessary, except to check that everything is going well.

The cost is $75.00 for each of the 2 consultations, plus $90.00 for the lenses. A total of $240.00

It should be emphasised that all clients need to have had a visual examination before being examined for the Irlen lenses, as refractive errors need to be corrected by using appropriate lenses. These lenses, however, if made in high quality optical plastic, can be tinted just as other lenses can be. The lenses are not sunglasses, and sunglasses rarely achieve the desired effect for people.

We have put your name on our waiting list but it may be some months before we can contact you to arrange an appointment.

I thank you for your enquiry and trust that the above information will be of some assistance to you.

Yours sincerely,

Paul R. Whiting
Head.
ASPECTS OF THE PROBLEM

Five areas of difficulty have been defined. Not all the learning disabled adults exhibit these symptoms, but a large proportion exhibit more than one of them:

1. Photophobia

Photophobia refers to the inability of the person to tolerate bright light. These people dislike bright sunlight, dislike fluorescent light if it is too bright (especially the "cool white" type), they also find reading black lettering on white paper difficult. The white seems to distract their attention from the black, making reading a laborious task. It is difficult to find reference to this problem in the literature on reading and learning difficulties. The earliest reference to it is in a duplicated paper distributed by Olive Meares in 1972, and published in its final form in 1980.

The adults are now telling us that white/black contrast is a serious problem and a barrier to reading. From what they tell us, the effect may be like a normally-sighted person trying to look at an object at night, when a bright light is shining beside the object and pointing towards the viewer. The bright light intrudes on the outline of the object, making it difficult to see and even causing its shape to appear to distort.

2. Visual Resolution

The conclusion of our description of photophobia implies the problem of visual resolution. Many of the adults described the difficulty they had in keeping the image of the print stable. Again, there have been rare accounts of these phenomena in the literature. Jordan lists the following in addition to those mentioned above:

Seeing double images, words appearing to spread apart, letters or symbols appearing to move about, and symbols blinking on and off.

Meares quotes her discussion with one boy, who indicated that for him, the words moved when printed on white paper. This boy insisted that the white makes the words move and added, "they move a lot worse if you stop to work out a word". Another child in Meares' clinic reported that for him, the words "jump about" on the page.

What Irlen found, was that for many adults black print on white paper was unstable. Letters moved about, or in some cases, the whole of the print on the page appeared to swirl, double, blur or "white out". An example of one pattern of distortion is shown in figure 1. How difficult is reading when print looks like this?
FIGURE 1 - One of a number of different patterns of print distortion described by learning disabled adults. Here, the print 'swirls' around the point of eye fixation (the centre of the figure in this case). In other cases, the print appears to double, letters merge together, a blur, or parts of the letters disappear altogether. The last mentioned phenomenon explains why such readers confuse b and d, n and h, m and n, etc.
3. Sustained Focus

Many children and adults report their difficulties in keeping words in focus. This has always been assumed to be due to visual defect which could be corrected by appropriate lenses. We have been dealing with a group of children and adults who have appropriate lenses, but who still have difficulty in keeping words in focus.

4. Span of Focus

All those conversant with reading theory, will know the importance of a broad span of focus for efficient reading. Speed reading courses direct a good deal of their attention to broadening the span of focus of the reader, so that in one fixation the eye is enabled to take in as much of the print as possible. The best speed readers are able to maximise their use of the print cues so that the eye makes as few movements as possible. Poor readers are well known to make many fixations and regressive eye movements. The reason for these fixations and regressive eye movements is not known, but good remedial teaching practice has endeavoured to provide compensatory techniques to allow poor readers to minimise the difficulties caused by these problems.

When we measure the span of focus of learning disabled adults, we find that it tends to be restricted, and in some cases extremely restricted. Some of the learning disabled are able to see only three or four letters clearly at a time. This means that word attack skills become impossibly difficult, and as readers they tend to leave off the end of words, reverse words, begin in the middle of words, or not even be able to attempt longer words. In addition, important items such as small words, full stops, and other punctuation may not be observed at all. Reading, if it can be done at all, will be laboriously slow.

5. Depth Perception

The fifth area of difficulty which adults indicated was not immediately related to reading at all. Yet it follows that if many of the problems are visually based, then some adults at least should have visual difficulties in the environment. Such is indeed the case. Many of the adults reported a difficulty with catching balls; unsteadiness going down staircases; difficulty with entering or leaving escalators; uncertainty judging the distance of oncoming traffic, and other distance-related problems.

VALIDITY STUDIES

Some research has been undertaken into the validity of this syndrome as a predictor of reading success or failure and while it was not very sophisticated, it indicates that some 74% low ability readers exhibit the symptoms, while only 15% high ability readers do (p.01) Miller, L. Scotopic Sensitivity and Reading Disability. thesis presented to the California State University at Long Beach, December 1984.) A validity study conducted on the Irlen Differential Perceptual Schedule in the same year concluded that all parts of the IDPS differentiated between

TREATMENT

Irlen developed a procedure for screening parts of the light spectrum which appeared to be responsible for the distortion or eye strain experienced by these clients. The idea was to admit as much as possible of the light spectrum, while excluding those parts of the spectrum that seemed to be causing the problems. The difficulty was that part of the spectrum causing problems seemed to vary from one individual to another. It therefore became necessary to develop a series of visual filters that would be suitable for people with scotopic sensitivity syndrome.

At present some 140 colours are used, and the selection of the correct tint can be critical.

The result of using the correct lenses is that clients reported a marked lessening or complete absence of headaches, increased or normal reading concentration and endurance, improved depth perception, loss of associated physical symptoms previously experienced (nausea, dizziness), reduced irritability, improved handwriting, and most important of all, increased comprehension in reading.

RESULTS

In a paper delivered to the American Psychological Association, Irlen reports the results of observations on 37 students at California State University at Long Beach. These students were all referred to the Adult Learning Disability Programme, and identified as learning disabled under US Law. The age range was from 18 to 49 years. An additional population of 70 clients referred for perceptual impairments, ages ranging from 9 to 54 years, was observed.

All subjects received an ophthalmological examination, and had any necessary lenses prescribed. After that, they were screened using the Irlen Differential Perceptual Schedule, and where appropriate placed in photopic transmittance lenses, either superimposed on their existing lenses, or alone where no prescription lenses were indicated.

After the subjects had worn the glasses for one month, they were interviewed to determine whether changes in performance levels in reading, writing, eye strain, attention and concentration, and eye-hand co-ordination had occurred. Of the original population, 74% qualified for treatment with the lenses. Prior to treatment, most of these subjects experienced eye strain and frustration after a maximum of 15 to 20 minutes of sustained reading. After wearing the lenses, the reading period was extended to 2 to 3 hours. Most symptoms of eye strain such as headache and red or watery eyes had disappeared.
For all subjects visual resolution improved and distortions in the letters eliminated. This resulted in an improvement in reading rate. In the case of one subject, the reading rate increased from 63 words per minute to 117 words per minute with no additional remediation.

The most important improvement however, was in comprehension. All subjects reported that prior to treatment they were unable to comprehend textbook material unless they read it three to five times. After treatment, however, they were able to comprehend material on the first or second reading.

A large number of subjects also reported improvements in depth perception. They were able to see the outline of objects clearly, or were able simultaneously to see objects close and far away. As a result, eye-hand co-ordination improved for sports involving balls, and especially catching. Olive Meares experimented with changing the background to facilitate reading. She did this by using a plastic sheet which would slightly obscure the page. Irlen does it by using coloured transparencies, and maintains that only some colours have the optimal effect, while others have a negative or no effect. My colleague Dr. Greg Robinson at the Newcastle Special Educational Centre at Newcastle CAE has in fact done a simple experiment designed to investigate whether this contention can be substantiated. It is published in Exceptional Children, 34,1, March, 1987. His results tend to confirm this clinical finding in the following way.

Robinson randomly selected 40 subjects aged from 9 to 74 years from his clients at the Special Education Centre. All but two of them had had recent visual examinations, and had either normal or corrected eyesight. Using the Irlen Differential Perceptual Schedule (the diagnostic tool we have been using), he identified 3 groups of subjects (High, Moderate and Low on the IDPS). He then tested these three groups on four tasks: word matching, word reading, letter reading and number reading. These he tested under three conditions: with a randomly selected coloured plastic overlay, with a clear plastic overlay and with a methodically selected coloured overlay. In brief, his results show clearly that there is a significantly beneficial effect from the methodically selected coloured overlay for the High Indicators group on the word-matching, letter-reading and number-reading tasks (p.01). As might be expected, they did not have a significantly beneficial effect on the word recognition task.

The study does show that colour filtering has a beneficial effect on certain simple reading tasks with a group of Learning Disabled individuals selected using the IDPS. The fact that not all results were significant is strong evidence that improvements were not due to placebo effects. Task difficulty has an effect as well: the word reading task required the prior development of word attack and word recognition skills, which would have operated as intervening variables in the experiment. Such skills are not usually well developed in an LD population.

Coloured lenses do not help all people with reading difficulties, only those whose difficulties are at least partly visual, and then not all those. Our early figures, which we predicted would be inflated, showed that we were helping 78% of our clients to some degree. Later
figures from research in USA presently under way suggest that 65% might be more realistic.

We are in the process of following up clients who have had Irlen lenses for 12 months or more, and the early results are most encouraging. 91% are still wearing them and still contend that they have made a significant improvement to their reading and or related skills development. The graphs give an indication of relative improvements in different areas of problem. Considering the high percentage of clients treated, we consider these results very encouraging.

My colleague, Dr Greg Robinson at Newcastle Special Education Centre (Newcastle CAE) is concluding a study on changes in measured reading performance in children and adults after two, four and six months wearing of the lenses. His preliminary findings are showing average increases in reading comprehension age of more than 2 years in the six months, while rate of reading has increased only about 6 months. He is observing that the subjects are doing much more self-correction, and thus are improving more in accuracy than in rate. The most interesting finding, however, will be the one on comprehension. Other variables, most of which cannot be controlled, also seem to be significant. These are things like school and parental support, and the base reading level of the client. There seem also to be differences depending on severity of the presenting symptoms, and the degree to which they are resolved.

REFERENCES

Olive, Meares. Figure/Background, brightness contrast, and reading disabilities. *Visible Language*, XIV, 1, 13-29.

Taken from Meares Paper.


The following article taken from the journal

"The Teaching of English"
Vol. 49, October 1985

Outlines the main symptoms of scotopic sensitivity and can be used as a guide to an understanding of the problem.
How Difficult can Reading be?
New Insight into
Reading Problems

How many times have parents of young children with learning difficulties been told: “He’ll grow out of it”?

Fifteen years ago that was a common piece of advice given to parents of children with learning difficulties. In some places, it is still given. Yet today we have a whole generation of learning disabled adults who were children of twenty years ago, and they have not “grown out of it”.

Today, conservative estimates put the number of learning disabled in the population at 10% or more. Most of these have reading difficulties.

Clearly, there are no easy solutions. Learning difficulties seem to have a multitude of different etiologies, and diagnostic treatment procedures are symptomatic, at best. In many cases, all we can do is prescribe continued intensive remedial treatment. At the Evelyn McGloughan Children’s Centre, we have seen children who have had eight or more years of continuous remedial instruction, which has cost the parents in excess of ten thousand dollars. The result is in most cases, a child who reads poorly, or with difficulty. Rarely do we see a learning disabled child who is completely “cured”.

To have a generation of learning disabled who have grown up into adulthood and are still learning disabled has one advantage for those of us working in the field. We can ask the adults to tell us about their problems, and many of them have had sufficient time and intelligence to enable them to reflect helpfully on those problems.

This is in fact what psychologist Helen Irlen at California State University at Long Beach did in her Adult Learning Disabilities Clinic. What she discovered was that many of her adult clients had symptoms which had not been taken seriously before. They indicated to her that many of their problems seemed to be with visual processing; perhaps the kind of thing that we call “visual perceptual problems”. Of course, this was not to ignore the auditory component, for clearly that is also important in developing reading skills.

But programmes in visual perception training are notoriously unsuccessful at improving reading skills, and so it was interesting to hear of so many visual symptoms. Those who have taught children with reading problems will recognise many of the following:

- They skip lines unintentionally
- They skip words unintentionally
- They repeat the same line
- They exhibit eye strain symptoms: headaches, red and sore eyes, etc.
- They move their head across the page as they read
- They use their finger to keep the place
- They confuse similar letters like m/n, n/h, i/l, p/h/d/q and so on
- They read word by word, or even in small units if the words are long words.
In addition, these adults spoke of difficulties when trying to work or read under fluorescent light, of a need to wear sunglasses outdoors (and even indoors in some cases), of being bothered by lights when driving at night, of having trouble adjusting from bright light to darkness, or from darkness to bright light.

was a group of people with visually-based problems in reading. They had all had their eyes checked by optometrists or ophthalmologists, and all their eyes were said to be in good order. What was the problem?

Aspects of the Problem

Probing further, the following five areas of difficulty were revealed. Not all the learning disabled adults exhibited all these symptoms, but most exhibited one, and a large proportion exhibited more than one of these areas of difficulty:

1. Photophobia

Photophobia refers to the inability of the person to tolerate bright light. These people dislike bright sunlight, dislike fluorescent light if it is too bright (especially the "cool white" type), they also find reading black lettering on white paper difficult. The white seems to distract their attention from the black, making reading a laborious task. It is difficult to find reference to this problem in the literature on reading and learning difficulties. The earliest reference to it is in a duplicated paper distributed by Olive Meares in 1972, and published in its final form in 1980. In her paper, Meares gave an account which included many of the symptoms that we will describe in this paper. Among them, was the difficulty that some children were having with the white of the page. In questioning children about the way they saw the page, Meares asked one child:

'When I want to read a word, I look at the black marks. What about you?'

'Oh yes, I do too. But you've got to keep putting the white away. It stands out a lot."

Later on, she asked the child about whether it would be better to have white words on a black page. The child answered:

'That would be better, but I'd rather not have any black or white at all. It's too dazzling.'

Later he added:

'You don't want too much difference between the words and the paper.'

Another child in Meares' study answered more emotionally when asked:

'Peter, do you like the way books are printed? You know, black words on white paper'. He shook his head vigorously but didn't speak. The head shaking was an answer, so I asked,

'Why not? 'It's all the little white dots . . . Then a flood of tears came.'

It is clear from the above examples, that the problems of white/black contrast in the normal print of books has been observed, but most of us have not taken them seriously. The adults are now telling us that white/black contrast is a serious problem and a barrier to reading. From what they tell us, the effect may be like a normally-sighted person trying to look at an object in the night, when a bright light is shining beside the object and pointing towards the viewer.
The bright light intrudes on the outline of the object, making it difficult to see and even causing its shape to appear to distort.

2. Visual Resolution

The conclusion of our description of photophobia implies the problem of visual resolution. Many of the adults described the difficulty they had in keeping the image of the print stable. Again, there have been rare accounts of these phenomena in the literature. Jordan (1972) lists the following in addition to those mentioned above:

- Seeing double images, words appearing to spread apart, letters or symbols appearing to move about, and symbols blinking on and off.

Meares quotes her discussion with one boy, who indicated that for him, the words moved when printed on white paper. This boy insisted that the white makes the words move, and added: “they move a lot worse if you stop to work out a word”. Another child in Meares’ clinic reported that for him, the words “jump about” on the page. The problem of letters appearing to get thinner and fade away had been known for some time, from studies carried out in New Zealand on traffic signs. The New Zealand Road Signs Committee had found that for night visibility, road signs had to be light on dark because black symbols on a white background would appear to thin down, and even, for some people, disappear.

What Irlen found, was that for many adults black print on white paper was unstable. Letters moved about, or in some cases, the whole of the print on the page appeared to swirl, double, blur or “white out”. An example of one pattern of distortion is shown in Figure 1. How difficult is reading when the print looks like this?

3. Sustained Focus

Many children and adults report their difficulties in keeping words in focus. This has always been assumed to be due to a visual defect which could be corrected by appropriate lenses. We have been dealing with a group of children and adults who have appropriate lenses, but who still have difficulty in keeping the words in focus. There is another group of people who do not know that they are having difficulty in keeping the words in focus, but who find that even after a short time of reading they are tired, their eyes hurt, itch, water or burn, or they just need to have a break from reading. These people are compensating automatically for the eyes’ natural tendency to lose focus. Clearly, there is some visual problem here which is not being detected by conventional eyesight tests.

4. Span of Focus

All those conversant with reading theory, will know the importance of a broad span of focus for efficient reading. Speed reading courses direct a good deal of their attention to broadening the span of focus of the reader, so that in one fixation the eye is enabled to take in as much of the print as possible. The best speed readers are able to maximise their use of the print cues so that the eyes make as few movements as possible. The poor readers are well known to make many fixations and regressive eye movements. The reason for these
fixations and regressive eye movements is not known, but good remedial teaching practice has endeavoured to provide compensatory techniques to allow the poor reader to minimise the difficulties caused by these problems.

When we measure the span of focus of learning disabled adults, we find that it tends to be restricted, and in some cases extremely restricted. Some of the learning disabled are able to see clearly only three or four letters at a time. This means that word attack skills become impossibly difficult, and as readers they tend to leave off the end of words, reverse words, begin in the middle of words, or not even be able to attempt longer words. In addition, important items such as small words, full stops, and other punctuation may not be observed at all. Reading, if it can be done at all, will be laboriously slow.

5. Depth Perception

The fifth area of difficulty which the adults indicated was not immediately related to reading at all. Yet it follows that if many of the problems are visually based, then some adults at least should have visual difficulties in the environment. Such indeed is the case. Many of the adults reported a difficulty with catching balls; unsteadiness going down staircases; difficulty with entering or leaving escalators; uncertainty judging the distance of oncoming traffic, and other distance-related problems.

Thus, five groups of symptoms were discovered among these learning disabled adults. They have been identified among children as well.

Based on these findings, Irlen developed what she called a "Differential Perceptual Schedule" (I.D.P.S.). The IDPS consisted of questions that related to the six general categories: visual resolution, depth perception, sustained focus, span of focus, photophobia and eye strain symptoms.

This Perceptual Schedule enabled Irlen to identify those clients who would fit the category which she came to call "Scotopic Sensitivity Syndrome". The name was chosen because of the assumption that there was some retinal defect responsible for this extreme sensitivity to certain kinds of light.

Treatment

Irlen developed a procedure for screening parts of the light spectrum which appeared to be responsible for the distortion or eye strain experienced by these clients. The idea was to admit as much as possible of the light spectrum, while excluding those parts of the spectrum that seem to be causing problems. The difficulty was that the part of the spectrum causing problems seemed to vary from one individual to another. It therefore became necessary to develop a series of visual filters that would be suitable for people with scotopic sensitivity syndrome.

Some improvement could be obtained by using coloured plastic overlays on white paper, but not all subjects indicated a marked improvement with overlays. Coloured paper also helped, apparently
by reducing the contrast between the black print and the white of the paper. Again, it was found that different colours improved the visual image for different individuals, while some colours made the contrast appear worse.

Even when improvement could be obtained with coloured overlays, there was obviously no help in the area of handwriting and spelling, because a plastic overlay cannot be used while writing. Here, the use of coloured paper certainly assisted some people, but the optimum effect was obviously to be obtained by having the coloured filter interposed between the eye and the page at a place closer to the eye than to the page. In this way, improvement might be obtained while writing, as well as during reading.

The solution to this problem was the development of a series of colour filters to be mounted in spectacle frames and worn by the client. These lenses, called Photopic Transmittance Lenses, were developed from a wide range of colours. At present, some 130 colours are used, and the selection of the correct tint can be critical.

The result of using the correct lenses is that clients report a marked lessening or complete absence of headaches, increased or normal reading concentration and endurance, improved depth perception, loss of associated physical symptoms previously experienced (nausea, dizziness), reduced irritability, improved handwriting, and most important of all, increased comprehension in reading.

In a paper delivered to the American Psychological Association, Irlen reports the results of observations on 37 students at California State University at Long Beach. These students were all referred to the Adult Learning Disability Programme, and identified as learning disabled under U.S. Law. The age range was from 18 to 49 years. An additional population of 70 clients referred for perceptual impairments, ages ranging from nine to 54 years, was observed.

All subjects received an opthalmological examination, and had any necessary lenses prescribed. After that, they were screened using the Irlen Differential Perceptual Schedule, and where appropriate placed in photopic transmittance lenses, either superimposed on their existing lenses, or alone where no prescription lenses were indicated.

After the subjects had worn the glasses for one month, they were interviewed to determine whether changes in performance levels in reading, writing, eye strain, attention and concentration, and eye-hand co-ordination had occurred. 74% of the original population qualified for treatment with the lenses. Prior to treatment, most of these subjects experienced eye strain and frustration after a maximum of 15 to 20 minutes of sustained reading. After wearing the lenses, the reading period was extended to two to three hours. Most symptoms of eye strain such as headaches and red or watery eyes had disappeared.

For all subjects, visual resolution improved and distortions in the letters were eliminated. This resulted in an improvement in reading rate. In the case of one subject, the reading rate increased from 63
words per minute to 117 words per minute with no additional remediation.

The most important improvement, however, was in comprehension. All subjects reported that prior to treatment they were unable to comprehend textbook material unless they read it three to five times. After treatment, however, they were able to comprehend material on the first or second reading.

A large number of the subjects also reported improvements in depth perception. They were able to see the outline of objects clearly, or were able to simultaneously see objects close and far away. As a result, eye-hand co-ordination improved for sports involving balls, and especially catching.

Over the last four and a half years, some 3,000 people have been treated at the small clinic in California State University. In Australia, this is a new development, which is being established at Sydney College of Advanced Education in the Evelyn McCloughan Children's Centre. Preliminary results there indicate that between 50% and 70% of learning disabled referred to the Centre are able to be assisted to some significant degree with the Irlen lenses. Most of these people have had many different kinds of treatment, resulting in some improvement, or in a large number of cases no marked improvement at all. It is hoped that the development of the Irlen lens programme will enable a much larger number of people to lead more normal lives, and certainly to be more successful in their reading.

For teachers, the development raises important questions about our understanding of how learning disabled children may see the work they are required to do at school. It should be emphasised that the vast majority of these children work very hard, but fail consistently. The experience of repeated failures means that in the end they rebel or give up. That is not a mark of their anti-social stance, but rather a behaviour typical of all human beings, when placed in a situation of continued and inescapable frustration. Secondly, it should be remarked that these people are not helped by "trying harder". For many of them, the harder they try the more impossible the task becomes. They will find that if they stop at a word and look at it closely, puzzling over it to decode it, the word may go blurry, become lighter, begin to vibrate, or disappear completely. It is therefore an impossible task for them to decode words. But they are no better off if they try to minimise their use of visual cues, for many of them will see only parts of the word, and in trying to identify the word as a whole, will miss the ending, or the beginning, and generally find it impossible to attack long or difficult words. "Trying harder" will not help them.

The degree of effort these people require for any level of success is indicated by the speed with which they exhibit eye strain symptoms, and their general tiredness at the end of a day's work which involves much close visual attention. These observations add an important
new dimension to our understanding of the reading process, and how we need to work to assist those who are learning disabled in reading.

Finally, these new observations may bear on the question of the reading process itself, and the degree of visual information which is necessary for success in reading. Where visual information is minimised, for some people reading becomes an impossibility. Only when we maximise the amount of visual information available to them does reading become fluent, and comprehension easy. Further work remains to be done in this area.

The Children's Centre at Sydney College of Advanced Education is developing a research programme initially to evaluate the degree to which learning disabled people in Australia can be helped by the Irlen Lens technique.

Paul R. Whiting
Sydney College of Advanced Education

Footnotes

1. Olive Meares, Figure/ground, brightness contrast, and reading disabilities. Visible Language, XIV, 1, 13-29.

Figure 1. One of a number of different patterns of print distortion described by learning disabled adults. Here, the print "swirls" around the point of refixation (the center of the page in this case). In other cases, the print appears to double, letters merge together, blur, or parts of the letters disappear altogether. The last mentioned phenomenon explains why such readers confuse b and d, n and h, m and n, etc.
COMMON CHARACTERISTICS

What are the clues to look for when Scotopic Sensitivity Syndrome is suspected?

General Characteristics:
- reads in dim light
- never feels there is enough light
- bothered by glare
- light sensitive

Appearance of the Eyes:
- reddened eyes and lids
- watery eyes

Complaints:
- headaches
- burning or itching eyes
- sandy, scratchy, dry eyes
- falls asleep when reading
- words double, move, or look fuzzy
- words are blurry or fuzzy
- words disappear

Observations While Reading:
- rubs eyes
- moves closer to or further from the book
- excessive blinking
- squinting
- open eyes wide
- shades the page with hand or body
- must incorporate breaks into reading
- moves the book to reduce glare
- closes or covers one eye
- moves head
- reads close to the page
- reads word-by-word
- uses fingers or other marker to block out part of the page
- unable to skim or speed read

Types of Reading Difficulties:
- skips words or lines
- repeats or rereads line
- cannot read for longer than one hour
- loses place
- reading is slow and hesitant
- reads in a "stop and go" rhythm
- omits small words
- reading skills and comprehension deteriorates as reading continues

Complaints on Computers:
- eye strain and fatigue
- headaches

Writing:
- writes up or down hill
- unequal spacing between letters and words
- inability to write on the line
- makes errors copying from books or chalkboard
- squints or blinks while copying from chalkboard

Mathematics:
- misaligns digits in number columns
- difficulty seeing numbers in the correct column
- sloppy, careless errors

Music:
- plays by ear and has difficulty reading musical notes

Depth Perception:
- difficulty getting on and off escalators
- clumsy
- walks into table edges or door jams
- difficulty judging distances
- drops or knocks things over

"I thought everyone sees the page the way I do. They are just smarter than me. I am so frustrated because I have to work so much harder than other students in order to get the same grade."

"I feel like I'm locked in a room. I know there's something more outside, but I just can't get out to see it. I can't escape."

WHAT IS SCOTOPIC SENSITIVITY SYNDROME?

Scotopic Sensitivity Syndrome is a distinct type of visual dyslexia. Scotopic Sensitivity Syndrome is related to difficulties with light source, intensity, and color. Research has shown that 50% of those with reading difficulties suffer from Scotopic Sensitivity Syndrome.

This syndrome often is found in a complex of other learning disabilities such as auditory difficulties, poor handwriting, hyperactivity, eye muscle imbalances, allergies, and emotional overlay from feelings of educational or personal inadequacy. In addition to these more common signs, some individuals also exhibit other inhibition disorders which make thought, language, interpretation, and even control of supposedly willful activity difficult.

Often these individuals have been labeled "dumb", "stupid", or "lazy." This label is usually given to those students who appear bright but are not producing to a level considered appropriate for their intellect. But, in fact, these individuals usually are expending more effort to complete assignments. Often parents and teachers become frustrated with such individuals because attempts at remediation produce little gains.

Scotopic Sensitivity Syndrome is a dysfunction which may be hereditary. As such, one is born with the condition and it does not improve or deteriorate with time. What does improve is the individual's ability to adapt coping strategies to compensate for their education problems.

Scotopic Sensitivity Syndrome is a distinctively different visual problem from visual acuity and refractive errors. Therefore, visual examinations from ophthalmologists and optometrists will not detect this condition.

Scotopic Sensitivity Syndrome is a different condition from that which is evaluated by a developmental optometrist. Therefore; this condition is not amenable to vision therapy.

Irlen Institute
4425 Atlantic Ave, Suite A-14
Long Beach, Ca. 90807

800-422-3793
About 15% of the GENERAL POPULATION suffers from Scotopic Sensitivity Syndrome but not dyslexia. These individuals suffer from:

- slow reading rate
- inefficient reading
- poor comprehension
- inability to read continuously for an hour or longer
- eye strain or eye fatigue
- difficulty judging distance
- headaches
- eye strain when using a computer monitor

While not in all cases, some people suffering from other visual conditions also may find great relief and help from the Irlen technique and the Irlen Lenses. They are individuals who suffer from:

- floaters
- strabismus
- retinitis pigmentosa
- low vision
- cataracts
- amblyopia
- wandering eye
- nystagmus
- agrophobia
- vertigo

WHAT IS VISION?

The eye is only one part of vision. There are numerous pathways and specific areas in the brain which play an important part in what we see and visually interpret. It has been estimated that 75-90% of all classroom learning comes via the visual pathways. If there is any interference with these pathways, the individual will probably experience difficulty with learning and other visually related tasks.

Vision enables an individual to look at an object and not only identify it, but determine where it is, its size, its distance from the observer, its rate of movement, and its texture. Vision specialists deal with the function of the eye as it relates to visual acuity, refractive status, eye coordination, focusing ability and specific diseases or conditions of the eye. However, eyesight is also composed of photophobia, visual resolution, span of focus, and sustained focus. These last four categories are measured by clinics specializing in Scotopic Sensitivity Syndrome.

HOW ARE VISUAL PROBLEMS OF SCOTOPIC SENSITIVITY EVALUATED?

First, a comprehensive analysis of a person's visual functioning by a vision specialist, including an eye health evaluation, measurement of visual acuity, refractive status (nearsightedness, farsightedness, and astigmatism), binocularity and accommodation is completed.

Second, a trained and certified Irlen specialist evaluates the individual in the following areas:

- **PHOTOPHOBIA.** The ability to adjust to various lighting conditions, particularly fluorescent lights. Ability to accommodate to black/white contrast and glare.
- **VISUAL RESOLUTION.** Ability to see print clearly free from distortions.
- **SPAN OF FOCUS.** The ability to perceive groups of words at the same time. The opposite of this would be a type of tunnel vision where one object is clear, but everything else around it is fuzzy or slightly out of focus.
- **SUSTAINED FOCUS.** The ability to read or do other visual tasks for a period of time with eyes in a relaxed state and for words and objects in the environment to stay in focus.

HOW ARE VISUAL PROBLEMS OF SCOTOPIC SENSITIVITY TREATED?

Research has shown that approximately 90% of those with Scotopic Sensitivity Syndrome can be helped after careful identification and diagnosis. Research indicates these individuals respond dysfunctionally to specific wave lengths of light. Research by John Ott showed that different colored filters could disrupt cellular functioning of cells similar to those in the retina. For individuals with Scotopic Sensitivity Syndrome, full spectral light produces overstimulation of the retinal receptors which, in turn, causes problems seeing.

Irlen lenses are spectrally modified to meet an individual's specific need. There are over 140 possible variations, and it is only through an intensive diagnostic process that the correct prescription can be determined.

While the exact mechanisms are not fully understood, it is believed that by selectively reducing specific wavelengths of light and letting in those rays which the eye can handle, the focus on the retina is slightly shifted to produce sharper, clearer, and more stable vision. Most sunglasses only reduce the intensity of light without eliminating specific wavelengths within the spectrum.

WHAT ARE IRLEN LENSES?

Irlen lenses are spectrally modified to meet an individual's specific need. There are over 140 possible variations, and it is only through an intensive diagnostic process that the correct prescription can be determined.

DO IRLEN LENSES WORK?

YES! Experience and research over the years with this approach show that 90% of those suffering from Scotopic Sensitivity Syndrome usually experience the following:

- gains in reading comprehension
- increase in attention span
- increase in reading speed
- better depth perception
- reduced eye strain symptoms
- reduced headaches
- better night vision

As with any treatment, it is imperative that individuals are re-evaluated on a continual basis. Slight changes in the visual system produce changes in adaptation to the spectral modification. This means that an individual's initial prescription may not continue to be beneficial, and re-evaluation and new prescriptions may be necessary to maintain effectiveness.
ABOUT THE NEW DISCOVERY:

Helen Irlen, a psychologist and researcher in perception at Long Beach State University has discovered that at least 60% of individuals with severe reading difficulties might best be described as having "scotopic sensitivity".

This means basically that the retina is transmitting an interference signal to the brain from one of the many colours contained in the white background. It appears that sensitivity to one of these colours in the "white light spectrum" can interfere with the true perception of other images in the same visual field such as print.

Correctly changing the background colour makes the page appear "normal" to the dyslexic person with scotopic sensitivity; i.e. the particular colour which is disturbing the visual field of the individual is blocked out.

Distortions that are commonly reported are vibration and pulsation of letters; stretching of letters at the top and bottom; and unequal shading and blurring of letters. In the more severe cases, visual resolution is so impaired that the individual is unable to receive meaning from the printed page without great effort, resulting in headaches, eye strain, difficulty with sustained concentration; slow reading rate and poor comprehension.

With the introduction of photopic, or specially coloured lenses, visual resolution improves and distortions of clarity and stability of letters are eliminated. The reading rate can improve dramatically. New confidence and ability in perception leads to a great impact on comprehension. Prior to treatment, students reported great difficulty in understanding textbook material unless they read the same material 3 to 5 times.

With the addition of photopic lenses these children & adults were able to comprehend material on the first or second reading.
GUIDELINES FOR IRLEN LENSES

1. To assure maximum benefit from the Irlen Lenses, all clients must have six (6) and twelve (12) months check.

2. If for any reason your vision is not improved or you experience increased eye strain or fatigue, IMMEDIATELY contact us.

3. Irlen Lenses are not intended to replace the need for sunglasses. In sunlight a clip-on (e.g. grey polaroid cut to fit your frames) may be necessary for protection of the eye.

4. Depending on how and where the Irlen Lenses are used, the tint in Irlen Lenses may fade over time. This is natural and there will be an attendant loss in benefit. Therefore, when your new Irlen Lenses arrive, try to match your tint color to a fabric or crayon color for later comparison to your lenses. Also, at no charge, you may have your lens color checked.

5. Should your lenses have faded or changed in color, they can be bleached and retinted. Regular tinting fee charges will apply. If your lenses have been damaged and need replacement, your vision specialist trained in the Irlen Lens Technique will explain why new lenses will be necessary in the tinting procedure. Under no circumstances should you attempt to have your lenses tinted through a vision specialist who is not trained in the Irlen Lens Technique. Slight variations in color may create both visual and other problems.

6. Due to the complexities involved in reading and other learning related skills, Perceptual Development Corporation and those who represent its products make no claims that tinted lenses will automatically increase reading and other academic skills. However, Perceptual Development Corporation and those who represent its products do claim that the tinted lenses will reduce eye strain and increase perceptual ability, resulting in an associated increase in the probability of gaining the skills and confidence necessary for academic accomplishment.

7. Perceptual Development Corporation and Irlen trained specialists shall not be responsible for difficulties which may arise due to misuse of their products, misunderstandings resulting from claims made by others, tint failures resulting from excessive heat or exposure to light, or any events or activities outside the direct control of Perceptual Development Corporation. Perceptual Development Corporation guarantees to deliver to you the specific tinted lenses chosen by you resulting from a prescription by a vision specialist trained in the Irlen Lens Technique. If the lenses received by you are not the ones specified by your diagnosis, they will be replaced free of charge.
READING DISABILITIES AND USE OF COLOURED FILTERS

By
O'CONNOR, P.D., SOFO, F., KENDALL, L. & OLSEN, G.

ABSTRACT

The study was designed to test the efficacy of the relationship between reading disabilities and "scotopic sensitivity" in such a way as to control for most of the factors usually raised by critics of the Irlen lenses. Ninety-two children in grades from 2 to 6 at two large primary schools in Canberra were nominated by their teachers as reading significantly below their ability. Each of the children were screened for "scotopic sensitivity" by a person qualified in the Irlen procedures. On the basis of this screening, the children were classified as either "scotopic" or "non-scotopic" in terms of the Irlen definition. Sixty-seven (44 boys and 22 girls) proved to be scotopic, and twenty-five (14 boys and 11 girls) were nonscotopic.

The children were randomly assigned to one of six groups (4 scotopic groups, and 2 nonscotopic groups). Subsequently, the children were tested by independent assessors on two reading diagnostic tests (Neale Analysis of Reading Ability, and The Formal Reading Inventory). The reading assessors were not aware whether the children were scotopic or not; nor were they aware to which group the children had been randomly assigned. Five groups were both pre-tested and post-tested on parallel forms of each test, while one group was just post-tested. This was done to control for possible testing and maturational effects. Of the scotopic groups, one group was given a coloured overlay matching the best colour for each of the children based on the initial screening. Another scotopic group was given a clear overlay each, and the third scotopic group was given a coloured overlay other than the preferred colour for each child. The fourth scotopic group was not pretested but given a clear overlay. One of the non-scatopic groups was given clear overlays, and the other group was given a random selection of ten coloured overlays. After the pretesting, the children in all six groups were asked to use the assigned overlays for all reading activities for one week and were told "we think this will make reading easier for you." All children in the six groups were post-tested after one week on both reading tests using the assigned overlays over the white paper.

The results of the reading assessments after one week with the assigned overlays showed a gain of 6 months in reading rate, 6 months in reading accuracy, and 19 months in reading comprehension level for the scotopic group using the correct coloured overlays that matched the screening for each child. This compared with a 3 month regression in both rate and accuracy, and a 7 month regression in comprehension for the scotopic group assigned the clear overlays. The scotopic group given the incorrect coloured overlays and the nonscatopic groups were essentially unchanged. Using a Kruskall-Wallis one-way analysis of variance each of the differences were significant beyond the .001 level. That is, the scotopic children given the clear overlays on white paper had increased levels of difficulty in reading. Many complained that the "sheet hurt their eyes". The scotopic children given the incorrect coloured overlays as a group were unchanged; yet within the
group some improved and some regressed. It seems that for these children, even though the overlay was not the preferred colour, any colour was better than white; while others found the coloured overlay hurt their eyes and made the reading more difficult.

In summary, the scotopic children given the correct coloured overlays did dramatically better than all other groups, gaining an average of 19 months in reading comprehension level in just one week. The implications for substantially reducing the number of children and adults with reading disabilities is discussed in the article.
VISUAL DYSLEXIA: SUCCESSFUL TREATMENT WITH IRLEN LENSES

By

Norman C. Murphy, Ph.D.
Licensed Psychologist
Lecturer
University of Hong Kong
Hong Kong

"Dyslexia" as a Diagnostic Category

"Dyslexia" as a diagnostic category covers a broad range of possible symptoms and syndromes (e.g. visual and auditory difficulties, hyperactivity, expressive aphasias, neuromuscular problems, dysgraphia, general learning disabilities, etc.). The literature, which once appeared to specify dyslexia in terms of the visual; thus, visual dyslexia. It is only this portion, visual dyslexia, of the possibly broader concepts, to be covered in this paper. And, under what may be other types of visual dyslexia, this paper intends to address only that part of dyslexia which might best be referred to as "scotopic sensitivity syndrome" (e.g. persons with visual perceptual disturbances related to light intensity, light source, and specific colors).

When only reading is affected, the most likely diagnostic category should be:

"Specific Reading Disability (scotopic sensitivity syndrome)."

When visual perceptual tasks of a broader nature are found (e.g. field ground problems in open spaces, buildings that appear crooked, stairs that are not straight, difficulty in catching a ball, etc.), then the diagnostic category, even though reading may be affected, most likely should be:

"Perceptual Disability (scotopic sensitivity syndrome)."

While some readers may find this distinction artificial, it may help educators and other professionals to better understand the areas of visual perception affected so as to create appropriate individualized prescriptive educational and personal development programs.

The Diagnostic and Statistical Manual of Mental Disorders (Third Edition) of the American Psychiatric Association (DSM III) does not appear to have an adequate category to fully cover scotopic sensitivity syndrome. DSM III would most likely place scotopic sensitivity syndrome under Axis II, 315.00, "Developmental Reading Disorder" and, since mathematics computations may be affected, 315.10, "Developmental Arithmetic Disorder" In addition language acquisition a related skills may also be inhibited. While persons may learn various coping strategies to increase skills in reading and other visual perception tasks, there remains a gap between the individual's innate ability and performance. For most the perceptual anomalies do not appear to significantly alter over time and, indeed, persons can be diagnosed well into adulthood.

BACKGROUND

The basic treatment using tinted lenses, was developed by Mrs. Helen Irlen, Director, Adult Learning Disabled Program, Long Beach State University, Long Beach, California, U.S.A. While a psychodiagnostician at another California State University campus, California Polytechnic State
University, San Luis Obispo, California, this psychologist worked with Mrs. Irlen.

This psychologist was extremely incredulous regarding the use of tinted lenses to help in remediation of visual dyslexia or scotopic sensitivity syndrome. This psychologist, under protest, was directed by the Dean of Student Affairs to meet with Mrs. Irlen. Mrs. Irlen showed this psychologist video tapes of individuals virtually unable to read orally becoming excellent oral readers within seconds. While impressed, skepticism remained. Eight Cal Poly students independently diagnosed as dyslexic, prior to being referred to this psychologist, were sent to be diagnosed, symptoms determined, and aided through Mrs. Irlen's tinted lens technique. Two additional students with learning problems, not diagnosed as dyslexic, were also sent to Mrs. Irlen. The eight dyslexics reported being aided by use of the tinted lenses in a number of perceptual areas. Most subjectively reported their visual dyslexic condition to be dramatically reduced after receipt of specially tinted lenses. The scholastic achievements of these "marginal students" were found to be highly improved based on grades and faculty comments. The two cases without a diagnosis of dyslexia found no relief with the tinted lenses and none were either suggested or prescribed.

While some clients reported dramatic gains, it has been difficult to measure such subjectively reported gains against some absolute personal ability or quantitatively assess subjectively reported gains in visual perception. For a number of years, researchers have shown a clear genetic component based on population studies. Work in the United States has isolated a chromosomal anomaly for persons with specific reading disabilities on chromosome 15 and there are cases that appear to be the result of neurological compromise from impact trauma, viral encephalitis, and other processes resulting in a minimal brain syndrome. Screening research, conducted by this psychologist and Mrs. Helen Irlen, indicated the number of persons in the population who have scotopic sensitivity may be well over 30%. This does not mean all will have severe or clearly noticeable reading disabilities; rather, the disability may be as mild as visual discomfort and as dramatic as letter "blindness." Since scotopic sensitivity syndrome usually appears to be genetic, it is most likely not diagnosed among those with subnormal intellect, those who perform in an average manner who are not identified as gifted, and among many females because of the sex influence in terms of the effects of this dominant gene (see later research) Thus, the more conservative estimate of 4% for visual dyslexia is most likely inaccurate. Typically males suffer more from scotopic sensitivity syndrome than their mother or sisters, who appear to adapt well and are usually not diagnosed. It appears that females are much more able to adapt. Thus, individuals with mild scotopic sensitivity syndrome are often not diagnosed as having reading disabilities by reading or other specialists. Dramatic scotopic sensitivity syndrome (Developmental Reading Disorder) in females does exist; but, is much less frequently found than for males. From this psychologist's research with 47 individuals diagnosed as having dyslexia or a developmental reading disorder in the U.K., U.S., Japan, Switzerland, Australia, Austria, Italy, Germany, South Africa, etc. 100% were diagnosed to have scotopic sensitivity syndrome. It is possible that as the number of subjects escalates, such a coincidence will no longer exist.

Mrs. Irlen's writings were in the form of reports to the Federal Government and short presentations to such groups as the American Psychological Association. The use of tinted lenses for remediation effects for scotopic sensitivity syndrome is a clearly proven technique; however, as with many new techniques greater refinement will most likely follow. Mrs. Irlen's research activities were thoroughly reviewed and accepted in terms of research design, procedures, and results by a multidisciplined advisory
committee comprised of researchers and professionals including, but not limited to, reading specialists, optometrists, neurologists, ophthalmologists. Because of a need to prove the technique over a four year period, to obtain appropriate patents, and develop an appropriate and understandable theoretical base, Mrs. Irlen was most reluctant to publish in a professional journal. The research, theoretical base, and patent issues being resolved, such a defensive posture can now be relaxed.

Mrs. Irlen's research was completed using an adult consenting population of individuals diagnosed as dyslexic or as having reading disorders not related to optometrics. Mrs. Irlen literally tried thousands of lenses on hundreds of subjects before arriving at the approximately 30 lenses which combine to make about 140 different distinct color tints useful for those with scotopic sensitivity syndrome.

Prior to Mrs. Irlen's lenses, this psychologist referred visually dyslexic clients to speech and reading therapists with mixed success and extremely intensive work on the part of both client and therapist taking many months, usually with little or "no" success.

THEORETICAL BASIS

If one is to believe written reports and parent comments, practicing educational and school psychologists, teachers, and administrators often believe that the inability to read at a level appropriate to intellect is due to emotional factors. However, an emotional etiology for reading disabilities was discarded by Jastak as extremely implausible and later Burd writes:

"It is true, as the neuropsychological report pointed out, that Lara had emotional problems, but instead of seeing them as the cause of her reading and spelling problems, the reading specialist views them as one of the results of inadequate skills. Improvement of these skills is often more beneficial than counseling.

Dyslexic children almost certainly develop emotional problems, but they are not necessarily responsive to traditional psychological counseling or therapy..."

(In fact, there is no established link between emotional difficulties and a resultant learning disability. Rather, as the work of this author and that of Mrs. Irlen suggest, individuals who are aided with the Irlen lenses find emotional problems to abate. It is not uncommon to see such a change based only on the knowledge that the lenses will be coming. Both teachers and parents often comment on the immediate change in attitude after only one session in which an appropriate tint is found. It may well be that the changes in attitude, motivation, and self-concept are more prominent than changes in reading ability per se. While reading programs designed by educational specialists may be helpful, there is no reason to believe the underlying functional problem related to dyslexia is in any manner removed. Research has clearly established those diagnosed as having reading dysabilities or visual dyslexia continue to have difficulties even after extensive remediation.

Assertions that paired reading or most forms of remediation will result in some sort of real change in the dyslexic are doomed to failure. The requirements of tests lasting only 10 to fifteen minutes or sessions not much longer are not the same requirements as those placed on a student who must read for a number of hours to compete with peers in academics. Thus, current group testing methods have not been capable of extracting who has such difficulties and many, by the nature of the testing system, have
appeared to be at least normal. In fact, this researcher, using 38 sex, class, and age matched scotopically sensitive and non-scotopically sensitive students showed there was a significant difference between their standardized reading scores. The scotopically sensitive were significantly below the non-scotopically sensitive. However, the scotopically sensitive in terms of the mean were slightly above the mean for the publisher's normative group. The school used had very bright and capable children. The U.S. and British attitude that one must be far behind their norm group before they are learning disabled must be criticized for its rigid assumption that normative data can be applied and accepted for all children. Surely, the genius, using his talents and much time to do well in academics, only at grade level should be considered as learning disabled.

The first record of a case of "congenital word blindness" was by Morgan.\textsuperscript{14} It was suggested that the disability was due to defective development of the dominant angular gyrus. Neurological findings related to color and reading were first reported in 1899.\textsuperscript{15} In this case a transient reading disability was noted with a continuing color perception disturbance. Upon autopsy it was found that the right fusiform gyrus about 2 cm. to 6.5 cm. from the occipital lobe tip was infarcted with similar and less extensive, but much deeper changes in the left hemisphere; in addition, there was a small portion of calcarine cortex to the left. These results and a relationship between reading and color perception were found by numerous neurologists and pathologists.\textsuperscript{16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26} Probably the most inferential statement was:

"Hemiachromatopsic patients can read correctly but slowly in the colorless field."\textsuperscript{27}

Furthermore, at the Ordblinde Institute in Copenhagen a color phonic method was developed by Edith Norrie. The method involved the use of color cues for recall of specific sounds. Vowels were in red and consonants were colored according to lip sound, palatals, gutterals, voiceless, etc. However, it was found that the translation from color to black and white can be most difficult.\textsuperscript{28}

In "A Neurological Basis for Visual Discomfort"\textsuperscript{29} it was reported 15 experiments dealing with persons who experience visual illusions (e.g. colors, diamond shaped lattices, shimmer, blurring, dazzle, glare, bending of lines, fading, 'blobs,' and flickering). These persons were prone to visual discomfort such as headaches, dizziness, 'eyeache,' tiredness. Using the student t test, statistical probability of these findings was 0.005. These findings were carefully checked for the possibility of guessing the nature of the experiment and outcomes; no significant relationship was found (Spearman Rank Order Correlations of 0.06 and 0.07). However, the Spearman Rank Order Correlations of estimated annual headaches were 0.44 (p = .05) and 0.49 (p = .05).

While the studies just presented may seem quite disparate, they tend to lead to the conclusion that color and reading are contiguous and that white on black surfaces can be difficult for some individuals and create both visual illusions and discomfort. The latter phenomena are found most commonly in individuals with scotopic sensitivity syndrome. And, the visual gratings and light sources used by this researcher in the diagnosis of scotopic sensitivity syndrome clearly fit within the parameters discussed by Wilkins and Nimmo-Smith\textsuperscript{30} in their discussions of eye strain reduction and the elimination of white by use of a reading aid covering the lines above and below those being read. It is interesting to note that the illusions were more predictive of success in use of the referenced reading aid than any ophtalmological findings. However, the relationship between photo receptors and optical properties was not a central issue in their
discussions. In fact, until Mrs. Irlen's original work, apparently no references specifically related colors to retinal and neurological activity with reduction in discomfort or increases in efficiency of reading.

Based upon the work of Mrs. Irlen into the relationship between retinal and/or neurological dysfunction and reading difficulties, this researcher believed there would be a relationship between lined gratings on a lighted background and persons found to have scotopic sensitivity syndrome. The paradigm was quite simple:

If reading is made difficult on a horizontal line because of color; then, horizontal lines on a highly lit white background containing all colors should be seen differently by the reading disabled.

Thus, programs were designed and a light box built to specifically test this hypothesis and develop a simple safe, and effective tool for the diagnosis of scotopic sensitivity. The light box grating was set at a level which greatly reduces the possibility of noticeable epileptic seizures and beyond the limits for creation of illusion. And, the computer driven colored monitor program is clearly outside the range of illusion and probability of noticeable epileptic seizure activity. In fact with the screening of over 300 individuals, no noticeable seizure activity has been observed.

Although unaware at the time, other researchers were using similar devices to explore group differences between visual dyslexics and persons in control groups. The theory behind the treatment is relatively simple. The retina fires a disruptive signal to the brain. The disruptive signal appears to relate to the many colors inherent in a white page, containing all colors. In some, but not all cases, it would appear background color is a major issue for those with scotopic sensitivity syndrome. For example, some clients report seeing perfectly straight lines as crossed on a high intensity white background and straight on dark blue, red, magenta, green, yellow, cyan or other colored backgrounds. A recent article on encephalography quoted a noted Japanese researcher who stated he has cured some photic epilepsy with blue contact lenses. Given this current research and that of Mrs. Irlen, this seems quite plausible. Although retinal activity per se must be considered along with other issues, it would appear in scotopic sensitivity syndrome there may be deep neurological phenomenon which do not easily yield explanations for every case. Such a viewpoint is supported by neurological findings on those with reading disabilities.

Furthermore, as has been state regarding the relationship between visual discomfort and epilepsy:

"In patients with photosensitive epilepsy the probability of paroxysmal activity is dependent on the same parameters in almost precisely the same way. This would suggest that the neural processes that underlie the illusions may share mechanisms in common with those responsible for triggering epileptic disturbances. . . . If the discharge remains localized within the visual cortex, neurons may nevertheless be inappropriately excited so as to produce anomalous visual effects, without any electrical disturbances being measureable at the scalp. If the discharge spreads further, EEG phenomenon may be produced followed by clinical seizures." Given the work on the Macaque, color coding in humans, lesions and
color effects, studies of the prestriate area and color perception, and recovery from "dyslexia" following neurological improvement, dyslexia as it relates to color and other neurological processes is only a partially understood phenomenon.

In terms of the tinted glasses acting as a remedial tool, most likely a type of reciprocal inhibition is operating; that is, if certain photo receptors are being stimulated this creates an inability for the "offending" spectrum of light to cause difficulties with reading. This theoretical position is supported by the work of Edward Pugh, University of Pennsylvania, showing retinal firing to color as bidirectional. For example, when yellow and violet are fired at the same time by an optical device, nothing is perceived. When they are separately fired, each is seen. In case studies reported, with only three instances violating such parameters, this phenomenon is supported by colors independently chosen by individuals with scotopic sensitivity syndrome. These findings are consistent with opposition color theory and complementary colors. However, even in the cases which defy direct color opposition theory, the photo receptors may be held in a static position by the continual presentation of opposites. Thus, it would appear that by stabilizing photo receptors in a specific color, there is insufficient neurological activity to overstimulate the cortex and result in a failure of cortical inhibition. Since this phenomenon may be linked to GABA, it is not unreasonable to suspect a genetic defect which alters GABAergic activity. However, given that both acquired (e.g. trauma and encephalitis) and genetic causes exist for scotopic sensitivity, the specific neurological concomitants and events are as yet unknown and may include diverse causes and effects.

A subject with a long history of learning disabilities was seen by this researcher, given the work on piracetam and on GABA, this researcher in collaboration with a physician provided a course of three month treatment with piracetam and GABA. The age 26 male subject reported cleared thought processes, better understanding of both written and oral materials, and better control of both thought and emotion. Although the subject had reported remarkable gains with the glasses before introduction to the neuroleptic chemicals, he reported only moderate gains while on medication. He reported no side affects (i.e. drowsiness, lowered blood pressure, etc.). It was recommended that the subject follow-up and continue with the medication with periodic checks. The confounding of two chemicals make a clear analysis impossible; however, this may point the direction for continued research with consenting adult subjects.

A limited number of diagnostic observations support this author's position regarding color. For subjects who reported seeing absolute distortion in white and no distortion in blue, in most cases when the screen was split into blue and white, the subjects reported the white side as having the distortion as before and the blue side as not being distorted. In 16 cases, subjects reported a reduction in distortion when compared to a completely white background. However, in nine cases, subjects reported both blue and white sides to be straight. Subjects reporting blue as straightening the lines later chose a blue hue as part of their lens tint. The latter phenomenon has also been observed in two occasions with red, one with yellow, and one with magenta. Two cases are interesting in that they appear to defy the rule. Both cases were in red. The lines appeared straight in all red and in one case when white was introduced both sides became distorted and in the other the red side was distorted and the white side straight. This latter phenomenon is most likely the result of the limited colors available with the computer driven color monitor, the effects of unknown colors in the white side, and/or bilateral presentation of the colors.

In counterdistinction, in twenty-two cases where persons reported green as
very distorting and hurting their eyes on the monitor, green was never chosen as a tint and; except in three of these cases problems were reported with even the least of a green tint (e.g. headaches, eyes hurting, nausea, tears, greater distortion, etc.). At these points, testing was stopped, the overhead lights turned out and a very low light from behind the subject lit until effects were diminished. This phenomenon was reported in six cases for yellow. While these individuals did not always take the complementary color, some did (e.g. purple for green and violet for yellow).

The computer driven colored monitor test uses both horizontal and vertical lines with variable line spacing. While all subjects (N = 171) reported distortion on the horizontal axis, 54 reported absolute distortion on the vertical axis and 39 reported minimal distortion on the vertical axis, and the remainder reported no significant distortion on the vertical axis. Because of the RGB II Color Monitor used with Laser equipment and software, the vertical axis shows more gray between lines when close; thus, reports at fine tolerance distances may be inaccurate representing monitor function and were not considered in either the absolute or minimal distortion categories. However, an interesting finding was that 48 of those reporting absolute distortion of vertical lines reported both mathematics and reading to be difficult while of those showing no difficulty on the vertical axis only 5 reported mathematics to be difficult. In fact, an Oxford 1st honors in mathematics was found among those with no difficulty on the vertical axis. However, he reported having to read "everything five times" in courses outside of mathematics.

Another interesting finding in a limited number of adolescents and adults (N = 5) is the fact that hue intensity in certain spectra was different from eye to eye for maximum correction. In these cases, the eye which perceived the best was used as a marker for tinting of the least effective lens. Thus, differential hue intensity created a greater equalization between eyes. Also, these persons when looking at a vista described an overall heightening in stereoscopic vision and 3-dimensionality. These findings are consistent with those of the optician, Mr. Errich Schwabbe reported later.

To counteract interference and/or inappropriate firing from the retina, Mrs. Irlen developed primary colors, secondary colors, and some special U.V. frequencies in different combinations to inhibit the undesirable hues and make the page appear as "normal" to a scotopically sensitive individual.

In 1983 Mrs. Irlen reported a remediation effect rate for scotopic sensitivity syndrome in from 70 to 80 percent of her population who had been screened with her survey forms dealing with various visual issues. Recently using other optical equipment, Mrs. Irlen has reported and increasing number of individuals who self-report remediation effects. However, neither Mrs. Irlen nor this psychologist in any manner claim that all reading problems or visual dyslexia are found to be in the realm of scotopic sensitivity syndrome.

NEW DIAGNOSTIC TOOLS

Based on color techniques and computer graphics, this researcher developed a method to screen for scotopic sensitivity syndrome which appears to be very rapid, less than one minute. The clients and/or parents and siblings were asked to evaluate geometric patterns. When their evaluation showed an inconsistency with what was actually displayed, and could not be considered an optical illusion, the rate of self-reported remediation effect using tinted lenses rose to above 90%. Particularly in mothers and female siblings, where a reading problem was not suspected, the computer driven
color monitor quickly identified those persons with a genetic component and light phenotypic signs. A more simplified screening device has now been perfected which correlates well with the computer design and display research and has proved useful in mass screenings.

**RESEARCH ON TINTED LENSES FOR SCHOOL CHILDREN**

Some questioned whether a child could make distinctions regarding changes in perception using tinted lenses. If the assumption is they cannot, then no optician could prescribe glasses to a child patient. And, this psychologist's clients reported a scatter of answers from tints that caused eye strain or did nothing to the page to some that cleared the printed page and allowed for a greater visual field. The research into children is here reported case by case with an analysis of the results. A U.S. first grade randomized sight word list was used beginning in two different locations so that no memorization was possible. An incorrect word was considered any word which was substituted for another word, incomprehensible pronunciation, or a skipped word. Timed trials lasted for 30 seconds. In all cases here reported, the clients indicated individually chosen specifically tinted lenses decreased perceptual difficulties on a page of printed text.

The cases presented here are from ages 6 through 9 with the bulk being ages 8 and 9. The ability to discriminate was much better than this author had thought for younger subjects. However, when exposed to different lenses, children showed a distinct scatter pattern and explained perceived and self-reported page and letter differences.

As the subjects were from a broad age range with varying levels of scotopic sensitivity syndrome and reported reading difficulty, the use of a U.S. first grade randomized sight word lists placed serious limitations on this investigation.

**METHODOLOGY**

This methodology was applied comprehensively only to the subjects reported in the age group of 6 to 9 years reported hereinafter.

a. a regular check of 20/20 vision using a standard eye chart from 20 feet.

b. visual laterality test using a piece of cardboard with a hole to determine eye preference. Questions followed regarding hand and leg preference.

c. a 30 second timed trial reading a list of random U.S. first grade sight words.

d. light box testing to determine level of reported pattern distortion and distance of most appropriate placement from computer driven color monitor.

e. computer driven color monitor testing using both horizontal and vertical lines to determine reported distortion. The subject was asked to trace with their fingers in the air the pattern they were seeing. Although the person was observing straight lines the finger tracings and verbal descriptions which often accompanied, indicated such phenomenon as missing parts of lines, missing parts of the pattern, crooked, wavey, crossed, or touching horizontal and/or vertical lines.

f. use of the Irlen Differential Perceptual Survey (IDPS).
g. fitting with a pair of goggles to hold the tinted and nonprescription ground lenses. If the goggles were too cumbersome, individuals were allowed to hold the lenses to their eyes with their fingers.

h. comparing tinted lenses to see if perception was increased as related to the page as a whole, individual areas, letters, and words to see if the IDPS signs were now missing.

i. when the basic tint was found, then secondary tints were added to see if there was any increase in self-reported visual acuity and clearness of page.

j. in addition, various objects in the room were observed to see if differences were found.

k. "fool" lenses were introduced at random intervals to see if there was "more" improvement. These same primary lenses which are not used in combinations had earlier been rejected being of no value or as creating a worse condition. Lenses previously causing pain were not used in this experiment. The lens case was positioned so that no subject could see which lenses were being removed and since they already had lenses in place, they could not determine the exact hue or intensity of the newly added "fool" lenses.

l. the individual was again checked for visual span and other page qualities found on the IDPS (e.g. photophobia, visual distortions, span of focus, ability to sustain concentration, etc.).

m. the individual was requested to read from the same set of random words using a differing randomization to reduce any word learning effects.

n. after 10 minutes to allow a decrease in residual photo receptor stimulation, without the tinted lenses, the individual was taken to the computer driven color monitor.

o. the individual was requested to look at some of the parallel lines on the white background, which for all subjects with scotopic sensitivity were positive for distortion. Without using the lowest line height, which was distorted, missing or a black block for most of these subjects, the lines were placed at the most distorting line height difference found previously for the specific subject.

p. using the tinting prescription self-reported as improving the written page, the individual then put the lenses before their eyes and was asked to report any perceived changes in the lines.

q. the tinted lenses were then removed and the individual was asked to report any perceived changes with removal of the tinted lenses.

r. when compound lenses were used, lens sets were removed to see if reported changes were maintained.

s. based on the results, the individual, or parents where applicable, made a qualitative judgement about whether or not the tint was making enough improvement for purchase of tinted lenses. This investigator warned clients to be conservative. The individual client was always asked a number of times if the tint caused any difficulties and to think carefully about any improvements.
2. Hypotheses:

a. using pre and post 30 second timed trials with random sight words at the U.S. first grade level, in those persons ages 6 to 9 showing scotopic sensitivity syndrome, the tinted lenses will significantly decrease error rate (.01 level of confidence).

b. using pre and post 30 second timed trials with random sight words at the U.S. first grade level, in those persons ages 6 to 9 showing scotopic sensitivity syndrome, the tinted lenses will significantly increase correct words.

c. using pre and post 30 second timed trials with random sight words at the U.S. first grade level, in those persons age 6 to 9 showing scoptopic sensitivity syndrome, the tinted lenses will significantly increase total oral word output.

d. using pre, post, and post-post testing at the computer driven colored monitor, in those persons with scotopic sensitivity syndrome, those seeing absolute or minimal distortions will show noticeably less or none when the glasses are introduced and absolute or minimal distortion both before and after introduction of glasses. The success rate will be significant.

e. upon removal of a lens in a combination tint, distortion will return either totally or partially.

f. using families, a genetic pattern will show itself in a manner consistent with a dominant sex influenced gene and family members affected by scotopic sensitivity will find relief with the glasses. Success rate for prediction of a genetic base and efficacy of treatment will be significant.

g. placebo effects will be negligible based on "fool" lenses and complementary color combinations being absent. The success rate will be significant.

h. there will be a significant relationship between tinted lenses and increases in stereopsis. The success rate will be significant.

i. there will be a significant relationship between findings on the light box screening device and the computer driven color monitor.

j. there will be a significant difference between class, sex, and age matched children with scotopic sensitivity and those without on standard scores reported for their annual school reading test.
<table>
<thead>
<tr>
<th>SUBJECT</th>
<th>PRE-TEST</th>
<th>POST-TEST</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>INCORRECT</td>
<td>CORRECT</td>
</tr>
<tr>
<td>001</td>
<td>6</td>
<td>32</td>
</tr>
<tr>
<td>002</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>003</td>
<td>0</td>
<td>21</td>
</tr>
<tr>
<td>004</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>005</td>
<td>1</td>
<td>40</td>
</tr>
<tr>
<td>006</td>
<td>13</td>
<td>26</td>
</tr>
<tr>
<td>007</td>
<td>1</td>
<td>24</td>
</tr>
<tr>
<td>008</td>
<td>3</td>
<td>23</td>
</tr>
<tr>
<td>009</td>
<td>6</td>
<td>47</td>
</tr>
<tr>
<td>010</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>011</td>
<td>1</td>
<td>48</td>
</tr>
<tr>
<td>012</td>
<td>4</td>
<td>40</td>
</tr>
<tr>
<td>013</td>
<td>7</td>
<td>17</td>
</tr>
<tr>
<td>014</td>
<td>3</td>
<td>48</td>
</tr>
<tr>
<td>015</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>016</td>
<td>6</td>
<td>47</td>
</tr>
<tr>
<td>017</td>
<td>5</td>
<td>19</td>
</tr>
<tr>
<td>018</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>019</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>020</td>
<td>3</td>
<td>7</td>
</tr>
</tbody>
</table>

53 490 37 677
**Parametric Testing**

Student \( t \) Test between error rates

\[ t = 3.74 \quad p = < .002 \]

Student \( t \) Test between correct rates

\[ t = -4.88 \quad p = < .0003 \]

Student \( t \) Test between total word rates

\[ t = -3.73, \quad p = < .005 \]

**Nonparametric Testing**

Wilcoxon Sign Test

ALL CASES SIGN = 3

PROBABILITY = < .005

**Correlational Information**

**Pearson's Product Moment Correlation**

Pre-Test Error to Correct = -.10

Post-Test Error to Correct = -.36

Pre-Test Correct to Post-Test Correct = +.85

Pre-Test Error to Post Test Error = +.24

Total Words to Total Words = +.86

**COMPUTER GRAPHIC PRE AND POST SCREENING**

Based on a Brief Irlen Survey, 181 clients with suspected scotopic sensitivity syndrome were placed before the computer driven color monitor. Of these 167 reported absolute distortion (e.g. parallel lines crossing or touching, curving, wavy, "scraggily," etc.), four (4) reported a bit less distortion (e.g. slight touching of lines, fuzziness of lines, one line wavy, a slight tilt of the whole design, etc.), and ten reported no distortion whatsoever. With the lenses placed before their eyes 150 reported completely straight lines, 9 reported much less distortion (a slight lack of clarity when before the lines touched and crossed), and 12 reported no change whatsoever with the lines being absolutely distorted. Upon removal of the lenses, 155 reported absolute distortion, four (4) reported a bit less distortion, and 12 reported no change whatsoever. Ten did not appear in any manner to have scotopic sensitivity syndrome when screened fully with the Irlen Perceptual Differential Survey and the computer driven color monitor. The ten without scotopic sensitivity syndrome were dropped from the group, thus 159 were considered as being successful and 12 were considered as unsuccessful. Using the critical ratio for the number of successes test, the following results were obtained:

\[ Z = 11.17 \]

\[ P = < .0001 \]

**TINTED LENS REMOVAL**

In 158 successful cases, 129 had compound lenses, some being U.V. 400 lenses, which shall for the purposes of this study be considered as tinted.
With the removal of any lens, except the U.V. 400, subject reported increased or absolute distortion while before the computer driven color monitor, 6 reported no distortion with removal of the U.V. 400 lenses. Using these data 123 cases were considered as successful and 6 as unsuccessful. The following results were obtained:

\[ Z = 10.21 \]
\[ P = < .0001 \]

**KIN COMPARISONS**

In 57 cases where scotopic sensitivity syndrome was found in the referred child, parents and Hong Kong available siblings were checked with the computer driven colored monitor regarding number of individuals reporting absolute and minimal distortion. Those siblings available in Hong Kong were usually either grown or in boarding school abroad and no reading difficulties were reported by parents. The siblings mentioned here are only those who actually took part. And, in a number of cases reading difficulties were suspected by parents. The following results were found:

Families with 2 children, present \((N = 41)\)
- Fathers: 17 reported absolute distortion, 3 reported minimal distortion, 21 reported no distortion.
- Mothers: 21 reported absolute distortion, 7 reported minimal distortion, 13 reported no distortion.
- Siblings: 8 reported absolute distortion, 3 reported minimal distortion, 30 reported no distortion.

Families with 3 children, present \((N = 15)\)
- Fathers: 6 reported absolute distortion, 1 reported minimal distortion, 8 reported no distortion.
- Mothers: 6 reported absolute distortion, 3 reported minimal distortion, 6 reported no distortion.
- Siblings: 9 reported absolute distortion, 2 reported minimal distortion, 21 reported no distortion.

Families with 4 children, all present \((N = 1)\)
- Father: No distortion reported.
- Mother: Absolute distortion reported.
- Siblings: 3 reported absolute distortion.

It should be noted, except for the child originally referred who may have been diagnosed in the U.S. or U.K. as "dyslexic" no other family member had been so diagnosed among these cases. In 2 cases no other family member reported any distortion. However, they reported head injuries for the child who was successfully treated with the tinted lenses. Those reporting
no distortion were asked to look through a number of lenses as well as the lens or combination of lenses at the page and monitor. Except for some reduction in page glare, none of these reported any qualitative changes in letter or page quality or changes to the computer driven colored monitor. Those who showed absolute or minimal distortion were also put through the entire lens series to find an appropriate prescription (N = 91). Of the 91, 4 had no success with the lenses, and 3 who reported absolute distortion reported minimal distortion. Thus, 87 were considered as successful and 4 as unsuccessful. The statistical evaluation revealed:

\[ Z = 8.60 \]
\[ P = < .0001 \]

In the case where the mother and the three male offspring had scotopic sensitivity syndrome, she reported both parents and most siblings (N = 9) to have reading difficulties. Thus, it may be that she had a double chromosome 15 genetic heritage. She appeared to be more scotopically sensitive than any of her sons. The father showed no signs of scotopic sensitivity on any testing. Furthermore, she reported minimal distortion after a quite complex prescription. Her offspring reported no monitor distortion with their tinted lens prescriptions.

Based on parent data, the kin relationship was evident in families. Thus, 55 were considered as successful and 2 were considered as unsuccessful. The statistics revealed:

\[ Z = 6.89 \]
\[ P = < .0001 \]

These data give little rise to speculation regarding genetic influences. The ratios and clear cut findings implicate a large genetic factor as found in genetic structural analyses. As might be expected in some families bringing their reading disabled child for testing, there were families where both parents were diagnosed as having scotopic sensitivity syndrome.

Based on current diagnosis rates for reading disorders, 4 times the number of males as females are diagnosed. Thus, the ratio should be 80% males and 20% females. In referrals, almost the same ratio was found. However, when the parent population was found for families where both parents did not have scotopic sensitivity syndrome, the numbers of mothers was actually higher than the number of fathers (mothers 62% and fathers 38%). Using proportional analysis of these data, the probability of 20% versus 62%

\[ Z = 6.08 \]
\[ P = < .0001 \]

This statistic appears quite remarkable; however, in only four cases was the mother aware she might have a perceptual difficulty. In an unreported study of the California Youth Authority, which as most correctional populations is filled with males, over 80% were found to be suspect for scotopic sensitivity syndrome. Thus, it is quite possible that men have the syndrome to such an extent that they are not suitable as marital partners. Further, in the fathers who had scotopic sensitivity syndrome, all reported themselves to have reading difficulties as children and adults. In a recent screening, for pattern sensitivity in a junior school setting, the number of males and females with pattern sensitivity was almost equal. Yet, boys clearly outnumbered females as being suspected by staff as having a difficulty. The sex influenced nature of the gene is
clearly evident in these data. However, socioeconomic factors may weight these data so as to create the unusually high number of mothers as carriers. Males with scotopic sensitivity syndrome would not be expected to be as highly successful as this generally economically privileged group.

These results were further amplified in a mass screening of 257 junior school children. The screening was conducted only on those students where parent permission was obtained, approximately 85% of the school population. Thus, this cannot be said to be a completely random sample. Of the 257 screened 86 were found to have some type of scotopic sensitivity based on both light box and brief IDPS. Of these children 39 were brought for a full examination. All of the 39 clearly had scotopic sensitivity syndrome and all found Irlen Lenses which helped. In all cases, except with adopted children, one or both parents were found to also have scotopic sensitivity syndrome. The ratio of males to females was respectively 52% and 48%. When the 52% was compared to the 80% diagnostic ratio found in the general population, proportional analysis revealed:

\[ Z = 5.23 \]
\[ P = < .0001 \]

These results appear to result from two possibilities: (1) sex influenced genetics or ability to cope and/or (2) social pressures which tend to favour diagnosis of males over females. Given this researchers numerous cases with families, since few of the mothers with scotopic sensitivity syndrome had suspected a reading problem in themselves, the first would seem to predominate. However, one cannot rule out the effects of sexual discrimination in which males are given more attention in the educational system than females.

**PLACEBO EFFECT**

The use of "fool" lenses was effective in all 171 cases, the success rate was considered as 171. The following statistics were thus generated:

\[ Z = 13.00 \]
\[ P = < .0001 \]

Using the green-purple and violet-yellow paradigms of complementary color with self-selected tints, 104 cases fell within the category and 3 defied the complementary color combination (i.e. 1 yellow-violet, 1 purple-light green, and 1 purple-dark green). Thus, 101 cases were considered as successful and 3 as unsuccessful:

\[ Z = 9.51 \]
\[ P = < .0001 \]

**STEREOSCOPIC VISION**

A Hong Kong optometrist, Mr. Errich Schwabbe, using devices to determine stereopsis, indicated that he saw 160 of the clients of these 83 had a lack of stereopsis. Of these 83, 74 had returned to his office, a number being abroad at the time of receipt of lenses and frames; of the 74, 67 had increased stereopsis via the tinted lenses. Further, it was reported that these clients as a group had either a squint or wandering eye. Thus, 67 were considered as successful and 7 as unsuccessful. The statistical analysis revealed:

\[ Z = 6.86 \]
These results are confirmed by the majority of subjects, over 90%, who report increases in three dimensional vision while looking through a vista of objects (e.g. trees, apartment houses, clouds, etc.). As a regular part final check on the tinted lenses, every client inspects a vista which extends for some distance. It is very rare that a client does not report an increase in three dimensionality and the ability to see more in the periphery with the lenses in place. Even for those subjects already in prescription lenses, this is also true.

**LIGHT BOX SCREENING**

In all 171 cases, the light box identified individuals with scotopic sensitivity syndrome \((Z = 13.00 \ P = 10 < .0001)\). Preliminary results in a school population \((N = 237)\) indicate that as many as 30% of individuals may to some extent have scotopic sensitivity syndrome. This is consistent with the findings of Mrs. Helen Irlen using her survey format. In this case, not included in this research, an adopted boy was seen and neither parent showed any signs of scotopic sensitivity using either the light box or computer driven color monitor. In another family two boys were found to have scotopic sensivity syndrome in the school screening and their adopted brother had none. Both boys were aided with the tinted lenses. Recent cases implicated scotopic sensitivity syndrome to be genetic in Chinese populations. The light box is soon to be used in a mass screening among Hong Kong Chinese.

**SCOTOPIC VERSUS NON-SCOTOPIC**

A post hoc analysis was performed using data provided on students from a number of classes in a school screened for scotopic sensitivity. In a random manner, a student who matched a student for age, sex, and class was chosen to compare each of some 38 children with full data sets.

<table>
<thead>
<tr>
<th>Scotopic</th>
<th>Non-Scotopic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean/SD</td>
<td>105.65/11.16</td>
</tr>
<tr>
<td>Student t Test</td>
<td>4.76</td>
</tr>
<tr>
<td>(P = &lt;.005)</td>
<td></td>
</tr>
</tbody>
</table>

Thus, it would appear scotopic children appear to be at the norm for a large normative group and are below age, sex, and class matched sample. This suggests that current U.S. and British beliefs about learning disabilities (two years behind normative levels) may be in need of revision.

**HYPOTHESIS TESTING**

All hypotheses were accepted at the .01 level of confidence using one tailed testing to determine level of probability.

**REMEDICATION RATE**

| Irlen Full Testing and Monitor Testing showing no scotopic sensitivity syndrome | 10 |
| Irlen Testing and monitor showing scotopic sensitivity syndrome present | 171 |

16
FOUR SELECTED CASE STUDIES

The case of Master T. Master T. suffered from extreme scotopic sensitivity syndrome. He showed up on the light box as seeing crossed and missing lines at near and midpoint and as seeing only one black patch at the far point. He began to show up very early to the color monitor, long before most clients. There was no history of reading problems in any other family member. After other concussions, Master T. had fallen from approximately six feet onto a gymnasium floor without a mat. He was taken to hospital with a concussion and no apparent sequelae were noted. After screening using the color monitor, diagnosis using the IDPS, and finding of an acceptable prescription which straightened the lines and minimized background and/or print distortion, his mother took him to a neurologist who found minimal diffuse firing. No medical intervention was recommended.

The case of Mistress L. Mistress L. and Mistress S. were previously diagnosed as "dyslexic" in the U.K. Local school authorities told the parents the diagnosis was inappropriate as the two girls did not have "dyslexia" or a learning disability. The parents were informed that they were merely overly concerned about their two daughters. In the screening it was found that the father had moderate scotopic sensitivity, Mistress S. very mild scotopic sensitivity, and Mistress L. very severe scotopic sensitivity. Given the sex influenced nature of the genetics usually more disruptive to males, it was difficult for this psychologist to understand why the one daughter would be so much worse than her sister and particularly her father. The mother, without signs of scotopic sensitivity, reported that at about age four years Mistress L. had fallen from the top of a slide at onto the left side of the head and pointed to left parietal-occipital area as the place of injury.

The case of Ms. X. Ms. X. in her early 50's went through the lenses and found a combination that worked particularly well on the page. However, subjectively she reported that a certain color was not something she would like to wear and asked this psychologist to remove the color. She felt that the amount of improvement on the page was only very slight with the addition of the color. When she was taken to the computer driven color monitor, although the lines became more straight with her chosen combination, they were not completely straight. This psychologist suggested she try the tinted lenses she had rejected as being an undesirable color. When the lens was placed into the compound lenses, she reported complete clearing of all distortion. She has since written this psychologist stating that her vision and ability to concentrate are "much" improved.

The case of Master B. Master B. had been diagnosed as dyslexic in Germany. At age 8, he was brought by his parents for a diagnostic session and possible tinted lenses. Both he and his father clearly showed signs of scotopic sensitivity on the mass screening device and the computer driven colored monitor. Master B. reported when using violet lenses that the letters became small, moved about, and he could not keep the lenses in front of his eyes without discomfort. When he tried yellow, he reported that the words became very distinct, larger, separated, and very easy to read. This is interesting in light of the findings of Pugh. Pugh found that when violet and yellow are fired simultaneously subjects reported seeing nothing and that when fired separately they reported seeing violet ad yellow. Thus, in Pugh's proof of bimodal firing of the pigments violet and yellow are opposites. When Master B. was placed before the computer driven colored monitor the lines were reported as more distorted with violet and as being completely straight with yellow. Although in most
cases on record violet and yellow have been mutually exclusive in lens tint choice, 39 yellow and 23 violet, in one case a combination of both was chosen.

An artist, Mr. L., was referred by another client. He indicated that he left secondary school unable to read and that at age 42 he had taught himself to read. He movement on the page at all times and could only read for a few minutes at a time before becoming "exhausted and frustrated." When tinted into either yellow or violet, he found some relief from the movement. However, a minimal movement continued. When tested in the monocular state, he indicated that all movement was stopped in one eye and not the other. This psychologist then attempted to tint eye by eye. When a yellow and a violet lens were used, all movement stopped. Mr. L.'s chin appears to have a clear asymmetry. The right half appears to be separated from the left half by about two centimeters. This gives rise to speculation that Mr. L. may have had a birth trauma which caused his head to be pushed sideways in the birth canal; thus, corpus collosumal damage may be suspected. The different colors for eyes is extremely unusual. The only case of this author, among approximately six found over a four year period. Mr. L., whose drawings lack a three dimensional quality, reported that he had never seen with such depth perception before in his life. It will be interesting for any differences that may arise in his artistic style.

In the Case of Master T., it appears we have a clear case of acquired scotopic sensitivity. In the Case of Mistress L., it would appear we have a case of genetically transmitted and exacerbated scotopic sensitivity syndrome. In the case of Ms. X, there were no relatives available to find out about etiology; however, she stated she thought it was in her family. Mrs. X's subjective removal of a lens which subsequently proved of value in straightening the lines suggests that multiple tints may be more corrective in some cases than a single tint or a specific combination of tints without a necessary tint included and that individuals indeed can see minor differences with the addition of various tints. In the case of Master B. we can by inference see the relationship between bimodal firing and the theoretical basis upon which the tinted lenses operate being further proved. Although only one case study, among a number which show violet and yellow to be opposites, is presented such a distinct link to Pugn's well recognized work cannot be seen as mere coincidence. Also, the case of Mr. L. which appears to link neurological trauma and bimodal color is most interesting.

Discussion

The results for the children in the study of 6 to 9 year olds confirms that reading improves both by reduction of error rate and increased number of correct words and number of total words. Given that the children had been through an extremely tiring process with high intensity lights, colored monitors, trying of lenses and many combinations of lenses, reported themselves as being very tired, and were seen as tired by this psychologist and their parents (e.g. laying with their heads on a parent's lap, yawning, rubbing their eyes, stating they wanted to go home and sleep, etc.). One should expect the overall accuracy to go down and not up as was shown. Since that formal study with the 20, numerous children in this age range have been tested on differing U.S. grade word lists suited more to their ability. Preliminary results suggest greater differences in speed and accuracy when using word lists corresponding to the child's grade level. In the original study there were a number of children who showed little if any change because they were older and familiar with the low level of words and the exact impact of scotopic sensitivity on each individual may be variable; however, this investigator wanted to keep the stimuli constant. Furthermore, post hoc analysis using a standardized reading scores from a
group screened for scotopic sensitivity showed a significant difference between students with scotopic sensitivity and those without scotopic sensitivity.

The efficacy of the colored monitor as a tool for screening and proof of clearance of a perceptual disturbance can hardly be doubted. Such dramatic changes in so many people cannot be put down to suggestion. In fact, there is no reason to believe that anyone would report a visual stimuli change when none had occurred. Furthermore, removal of a lens, except U.V. 400, in a compound lens situation always resulted in a noticeable change toward distortion and away from lines being described as having negligible distortion or perfectly straight. Present at most pre and post testings were other individuals such as parents, relatives, siblings, professionals, computer programmers, and university staff. Because of disbelief, many times individuals were asked by relatives to try it again and to make certain they were right. Often, a mother or father who had seen distortion would look through their child's glasses and get a partial change to more straightening and in one case a father took exactly the same tint as the son with both seeing lines as straight after seeing them with absolute distortion. In this case the father had been screened as the son and the profile of responses was virtually identical. In only one other case, that of male and female siblings, was the same tint found as remedial; however, the overall answer pattern for lenses was variable between the two. Most people who brought their children were very dubious about tinted lenses and some were outright disbelievers. In the case of adolescents who often had gone from specialist to specialist for some answer to their perceptual problem, they did not want to come and thought help to be impossible.

In 8 cases, not all reported in the body of this study, where both natural parents were present, often without other siblings, neither parent reported any sort of distortion, reading difficulty, or anything suggestive of a genetic cause for the scotopic sensitivity syndrome. Instead, these parents reported viral problems during the pregnancy, difficult births, infant high fevers and other medical difficulties, and injuries to the head. Head injuries were the phenomenon most reported and the left side (parietal-occipital) implicated. However, the remediation rate in this small group was less than for the group as a whole. Only 5 could be helped and 2 of these reported a little distortion on the monitor even with their tinted lenses. Thus, it would appear that acquired scotopic sensitivity syndrome has multiple etiologies and may be less amenable to treatment with tinted lenses.

At this time, there is no method to evaluate the exact extent of relief found through use of the tinted lenses. While Mrs. Irlen's subjects reported increases in reading ability and comprehension and the current research indicated dramatic results with reduction of visual distortions and excellent results in terms of error rate reduction and increases in words read correctly, there is no way to evaluate against some measure of true innate ability or to evaluate subjective comments. Possibly at some time in the future, individuals who fire from photic stimulation off the visual cortex may provide clues if they fire less or not at all while wearing their tinted lenses. In the handout given to those who received tinted lenses, approximately 94 in Hong Kong, there is a paragraph which asks them to contact this psychologist either at home or work should there not be improvement upon receipt or any sort of loss of effectiveness after some use. These individuals have had the tinted lenses from 2 to 4 1/2 months. Only one call has been received. It was from a mother who stated the lenses were not helping her son. This psychologist saw the mother and son with the lenses. A clerical error had been typed on a lens prescription. Although very similar in hue, the intensity was different. The boy was only able to hold focus on the computer driven colored monitor for 3.5 seconds. With the correct lenses in place, after two minutes, the
boy politely said, "I am tired of looking at straight lines. May I stop now?" Many have called, written or come by to say how outstanding the tinted lenses were in helping them to maintain concentration, read with ease, gain greater comprehension and retention, and not tire while reading. Some report gains even in their ability to do sports activities, watch T.V. and movies, etc. However, this does not preclude difficulties arising in the future related to such things as bleaching of lens colors, changes in neurochemistry, etc. which may make it necessary to reevaluate tinting.

The light box with straight lines clearly distinguished those with scotopic sensitivity from those without in all cases of families. The box appears at this time to be suitable for quick mass screenings with only 1 minute per person being required and the time before the light box only 20 seconds. It is possible in a larger population some developmental lags may result in a transitory type of scotopic sensitivity. However, given the current research and the genetic etiology, this researcher believes such would be minimal. The light box, at this point, is best not considered as a diagnostic tool per se; rather, it should be considered a screening device with other follow-up as appropriate. From follow-up examinations using colored plastic overlays and optometric screenings, it was apparent the light box with the close gratings was sensitive to muscle imbalances, stigmatism, photophobia, and a number of eye disorders in addition to scotopic sensitivity syndrome. However, given this increase of range in functional eye problems, and the cost effectiveness of such a system it may be ideal for agencies who need to do eye screenings.

Bibliography


28. Berstein, M. Reading methods and materials based on linguistic principle for basic remedial instruction. Academic Therapy
30. Wilkins, A.J. & Nimmo-Smith, I. On the reduction of eye-strain when 
   duration and spatial frequency on visible persistence in normal 
   and specifically disabled readers. Journal of Experimental Psychology: 
32. Bowling, A. & Lovegrove, W., & Mapperson, B. The effect of spatial 
   frequency and contrast on visible perception. Perception, 8, 529- 
   539. 1979.
34. Gross, K. & Rotenberg, S. An examination of methods used to test the 
   visual perceptual deficit hypothesis of dyslexia. Journal of 
35. Hyvarinen, L. & Laurinen, P. Opthalmological findings and contrast 
   sensitivity in children with reading difficulties. In Y. 
   Zotterman (Ed.) Dyslexia: neural, cognitive and linguistic 
36. Lovegrove, W., Bowling, A., Badcock, D. & Blackwood, M. Specific 
   reading disability: Differences in contrast sensitivity as a 
37. Lovegrove, W.J. & Brown, C. Development of information processing in 
   normal and disabled readers. Perceptual and Motor Skills, 46, 
   1047-1054. 1978.
38. Lovegrove, W. J., Heddle, M. & Slaghuis, W. Reading disability: 
   Spatial frequency and specific deficits in visual information store. 
   Neuropsychologica, 18, 111-115. 1980.
39. Lovegrove, W.J., & Maartin, F., Bowling, A., Blackwood, M., Badcock, 
   D. & Paxton, S. Contrast sensitivity functions and specific 
   luminance on contrast sensitivity between specifically reading 
   disabled and normal children. Neuropsychologica, 22, 73-77.
41. Binnie, C.D., Estevez, O., Kastelein-Nolst Trente, D.G.A., & Peters, 
   A. Colour and Photosensitive Epilepsy. Electroencephalography and 
42. Takahashi, T., & Tsukahara, Y. Influence of colour: The photo- 
   convulsive response electroencephalograph. Clinical Neuro- 
   physiology, 41. 1976.
43. Conners, C. K. Cortical visual evoked responses in children with 
44. De Monisterio, F.M., Schein, S.J. Spectral bandwidths of color- 
   opponent cells of geniculocortical pathway of macaque monkey.


57. Bruning & Kintz, Op Cit.
SUCCESSFUL TREATMENT OF LEARNING DISABILITIES

Helen Irlen

California State University, Long Beach
1250 Bellflower Blvd.
Long Beach, California 90840
(213) 498-4430

Presented at the Ninety-First Annual Convention of the American Psychological Association at Anaheim, California August 1983
SUCCESSFUL TREATMENT OF LEARNING DISABILITIES

Helen Irlen
Co-Director, Adult Learning Disability Program
California State University, Long Beach
Presented at APA (August 1983)

There is no single established cause for dyslexia and other related learning disabilities despite a multi-disciplinary approach from the fields of medicine, education and psychology. To date, the etiology and symptoms of dyslexia remain poorly understood. Therefore, recent research into dyslexia has refocused its attention toward biochemical, genetic, physiological and structural brain changes. Dyslexia is currently believed to be a structural brain defect involving the central nervous system.

In contrast to current theories, research being conducted at California State University, Long Beach (CSULB) has yielded results that redirect attention back to a specific visual dysfunction as a major factor in dyslexia. In the past, visual dysfunctions have been limited to refractive errors of the eye, muscle imbalance, and vergency and accommodative difficulties. This presentation explores a dysfunction that occurs once the image has been focused on the retina called scotopic sensitivity.

Methodology: The present research was conducted using 37 students at CSULB who were referred to the Adult Learning Disability Program and qualified as a learning disabled by state and federal guidelines. The students ranged in age from 18 to 49 years of age. An additional population consisting of 70 clients who had been referred to the Perceptual and Learning Disability Clinic of Long Beach were also tested for perceptual impairments. The clients were referred to the clinic complaining of eye strain, headaches, clumsiness, photophobia and various learning problems including reading difficulties. Their ages ranged from 9 to 54 years of age.

All the subjects were administered the Irlen Differential Perceptual Schedule (IDPS). The IDPS consists of questions in six general categories: visual resolution, depth perception, sustained focus, span of focus, peripheral vision, and eye strain symptoms. The subjects were checked to determine the existence of impaired resolution in areas of haloing, shadowing, or blurring of letters. Other distortions categorized were: vibration and pulsation of letters, stretching of letters at the top and bottom, and unequal shading of the letters.

Those subjects who received scores of 302 or greater on the IDPS were required to have an ophthalmological examination to rule out eye pathology and refractive errors as the cause of the dysfunction. Treatment was never prescribed as a substitute for refractive lenses and a consulting ophthalmologist found subject symptoms to be nontreatable by standard ophthalmological means.

After receiving an ophthalmological examination and necessary changes in prescription, the subjects were prescribed the newly developed photopic transmittance lenses.

Immediately after placement in photopic transmittance lenses, the subjects were readministered the IDPS to measure changes in visual resolution. After the subjects had worn the glasses for one month, they were interviewed to determine whether changes in performance levels in reading, penmanship,
eye strain, attention and concentration, and eye-hand coordination had occurred.

Results: Of the original 37 students from CSULB, 31 students (78%) had a visual dysfunction affecting their learning. Of the 70 clients studied from the private clinic, 58 clients (80%) had a perceptual impairment. Their reading problems consisted of difficulty with sustained concentration, slow reading rate and poor comprehension.

Prior to treatment most subjects experienced eye strain and frustration after a maximum of 15 - 20 minutes of sustained reading. With the addition of photopic transmittance lenses the reading period was extended to two to three hours. There was an increase in the ease and extent of sustained focus resulting in the disappearance of most symptoms of eye strain such as headaches and red watery eyes.

For all subjects visual resolution improved and distortions of clarity and stability of letters were eliminated. Consequently there was a substantial reduction in compensatory responses of the eye (regressions, blinking and squinting). In addition there was a subsequent improvement in reading rate. In the case of one client the reading rate increased from 63 words per minute to 117 words per minute with no additional remediation besides the introduction of photopic lenses.

Of greatest impact was comprehension. Prior to treatment the subjects all reported that they were unable to comprehend textbook material unless they read the same material three to five times. With the addition of photopic lenses they were able to comprehend material on the first or second reading.

Visual changes were noted at mid-point and far-point, as well as near-point. A large number of subjects reported improved depth perception. They were able to clearly see the outline of objects or simultaneously see objects close and far away. This aided in judgement of depth perception and perception of distance. Glasses also eliminated the perception of objects in the environment as vibrating and increased the range of focus. Consequently eye-hand coordination improved for sports such as basketball, throwing and catching, racketball, golf and cutting straight lines.

Discussion: Evidence is present to support the existence of a previously unrecognized dysfunction of the eye that effects reading and depth perception. Preliminary research indicates a correlation between difficulty with eye-hand coordination and reading problems which have a similar functional basis.

The question arises whether the same incidence of this dysfunction occurs in the general population. As with many functional disorders the severity of the disorder determines the degree of disability. In the case of the scotopic sensitivity syndrome, the mildest symptoms manifest themselves in eye strain, headaches and increasing difficulty in maintaining focus over a sustained period of concentration. People will often complain that they read slowly. For these people the impaired visual resolution is a hindrance but does not actually impede comprehension. With a decrease in resolution the ability to maintain sustained attention and comprehension becomes more difficult. In the more severe cases such as those upon which this study is based, the visual resolution is so impaired that the individual is unable to receive meaning from the printed page without great effort and it is at this point that she/he becomes labelled dyslexic. Perception in reading must precede comprehension.
The Irlen tinted lens procedure uses a large range of colour filters to minimise visual distortions reported by some children and adults with learning problems. These distortions are more likely to be reported when they attempt a visually intense activity such as reading or writing. The distortions are also reported despite the fact that these people have had a full optometric or ophthalmological assessment and appropriate lenses have been fitted where necessary.

While reading, these people may skip lines, reread lines, skip words, confuse similar letters or words, read word by word and complain of eye strain or headaches. The specific visual distortions they report while reading are outlined below with one or more of these distortions being evident.

1. Photophobia, or the inability to tolerate bright light, especially bright fluorescent lighting and bright sunlight. The white background on glossy printed pages also seems to distract attention from black print. People with this problem complain of the page pulsating, eyes hurting and print disappearing due to the glare of the white background.

2. Visual resolution. People with this particular difficulty report problems in keeping the image of the print stable, especially with black print on white paper. Print can be reported to blur, to double, to merge, to have shadows and also to have halos. Letters and words may be reported to be moving and in some cases the whole page of print may appear to swirl around the point of eye fixation. These symptoms are more likely to be reported after the person has read for some duration of time. An attempted replication of one pattern of distortion taken from Whiting (1985) is shown below.
3. **Sustained focus.** People with this difficulty will report that an effort is needed to keep words in focus, although even when this effort is made, the reported duration of clarity is limited. In almost all cases the visual distortions reported become worse with sustained visual activity and are accompanied by tiredness and complaints that eyes hurt, itch, water or burn.

In cases with a significant problem, the distortions occur very quickly, severely restricting the time available for reading, study or assignment writing. In less severe cases there is sufficient distortion - free time available for the person to learn basic reading skills but not sufficient time for the extended reading needed to effectively study or complete assignments. Children in the latter category may cope at lower levels of schooling but have increasing difficulty at higher grades. Most children with this difficulty are accused of lacking concentration.

4. **Span of focus.** A large number of these people report a restriction in the span of words which they can attend to. The initial span may be as wide as 3 or 4 words but is more likely only to be 1 or 2 words, which becomes narrower as reading progresses. As span narrows word recognition becomes difficult with endings being left off words, words reversed and longer words not being attempted. Reading is also likely to become a word-by-word process, having little fluency and making comprehension difficult because the story lacks coherence and significant story events are too separated in time to be remembered. A great deal of re-reading is also likely to occur.

5. **Depth Perception.** In severe cases adults in particular will report difficulties with general visual functioning tasks such as using staircases and escalators, judging distances (especially on the road), and with ball sports.

While the full diagnosis of problems takes some time, there is a simple screening procedure based on the fact that symptoms become more evident when a visually intense activity is undertaken. This procedure involves selecting a page of print of the size a person must deal with in everyday reading and asking the person to stare at a word in the middle of that page without blinking. In this situation a person will soon (within 5 to 30 seconds) report some of the previously discussed symptoms, the most common being peripheral blurriness, movement, eye soreness and a narrowing of span of focus.

Helen Irlen has developed a "Perceptual Schedule" which is used to identify problems in detail. She calls the difficulty "Scotopic Sensitivity" because of the possibility that there is some form of retinal defect which is responsible for the extreme sensitivity to certain kinds of light. Her full tinting procedure involves screening parts of the light spectrum which appear to be responsible for the distortions and eye strain reported. The part of the spectrum causing problems varies greatly from one person to another, requiring the use of a large number of visual filters to identify the specific problem area. The selection of the correct combination of filters can be very critical, with fine differences in colour combination making a significant difference to the reported reduction in symptoms.
The identification of this problem adds an important new dimension to our understanding of the reading process and to our awareness of procedures which can assist people with reading, writing, spelling and any visually intense activity.

rock

Normal

with glasses
Real light grey dusty look

Rupert

Really white

Without my glasses
APRIL

Aprill — how appears glasses off

DAPTO — glasses off

DAPTO — glasses on

Work Samples
Darren
BIBLIOGRAPHY


Grant, A. Fear, resistance and change in adult literacy learners – Making messages, making meaning. Australian: Journal of Reading Vol 9 No. 1.


Hinselwood, J. Congenital Word Blindness 1917 London: Lewis


Keogh, B.K., Major-Kingsleys, Omori-Gordon,H, Reid, H.A. A System of Marker Variables for the Field of Learning Disabilities Syracuse: Syracuse University Press.

Keeney, A.H. and Keeney, M.T. Dyslexia and Treatment of Reading Disorders 1968
St. Louis: Mosby


Miller, G.A. The magical number seven, plus or minus two: some limits on our capacity for processing information. Psychological Review 63, 1956.


Rousch, P.D. and Cambourne B.L. Psycholinguistic dimensions of oral reading in Australian children, Research funded by E.R.O.C. Riverinal College of Advanced Education.


Smith, F. Insult to Intelligence- the bureaucratic invasion of our classrooms 1986. Portsmouth: Heinmann Educational Books Inc.


Stake: Some Alternative Presuppositions Evaluation News (3).
Strang, R. *Reading Diagnosis and Remediation* 1968. Newark Del.: IRA


Weintraub, S. Auditory Perception and Deafness in *Reading Research Profiles* 1972 Newark: IRA.


Young, F.A. Reading Measures of Intelligence and Refractive Errors *American Journal and Archives of American Academy of Optometry* 1963.