The role of the optometrist in dyslexia

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Disclosure
- Funding for lectures, KOL/product feedback, research:
- I.O.O. Sales Ltd, Markets IFS orthoptic exercises, which the speaker designed, and for which he receives a small royalty.
- Community optometric practice in Brentwood, Essex.

Background
- Polarised views on vision & dyslexia
  - Zealots: middle view
  - Deniers
- Visual factors cause dyslexia: Vision irrelevant to dyslexia
  - maybe visual problems can co-occur with dyslexia
  - Visual stress major cause of RD: Visual stress does not exist
  - maybe visual stress can co-occur with dyslexia
- Evans et al. (1994)
  - Dyslexic children are significantly more likely to report text transience (26% vs 9%) & doubling (23% vs 7%).
  - N.B., most dyslexics don’t have visual symptoms.
  - Study concluded that visual factors are “not a major cause of the dyslexia.”
  - Eliminating any visual symptoms is likely to be helpful.

Role of visual factors in dyslexia
- Dyslexia is a learning difficulty that primarily affects the skills involved in accurate and fluent word reading and spelling (Rose, 2009).
- Characteristic features of dyslexia are difficulties in phonological awareness, verbal memory & verbal processing speed (Rose, 2009).

- Visual problems are not “the cause” of dyslexia
  - ECPs do not treat dyslexia
- The term “visual dyslexia” is a misnomer
- Visual problems may contribute to reading difficulties
  - In these cases visual treatments may help.
Optometric correlates of reading difficulties: binocular instability

**SYMPTOMS:** blur, double vision, visual perceptual distortions, eye strain & headaches

**SIGNS:**
- low fusional reserves
- unstable heterophoria

**PREVALENCE:** circa 15% in dyslexia; c.f., 5% good readers (so, not found in 85% of dyslexics)

**TREATMENT:**
- fusional reserve exercises
- refractive correction

**EVIDENCE:** moderate for correlate; weak for cause


Optometric correlates of dyslexia: accommodative anomalies

**SYMPTOMS:** blur, eye strain & headaches

**SIGNS:**
- low amplitude of accommodation
- high accommodative lag
- poor accommodative facility

**TREATMENT:** accommodative exercises (if appropriate)
- refractive correction

**EVIDENCE:** weak for correlate; very weak for cause

**Magno & parvo sub-systems**  
*(Transient and sustained)*

<table>
<thead>
<tr>
<th>System</th>
<th>Dominant Sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magno</td>
<td>Rapid, low acuity, low contrast, colour insensitive</td>
</tr>
<tr>
<td>Parvo</td>
<td>Slow, high acuity, high contrast, colour sensitive</td>
</tr>
</tbody>
</table>

Dyslexia is correlated with a deficit of the magno-cellular visual sub-system

**Dyslexia: linking the visual deficits (a)**

- Magno visual deficit is correlated with binocular instability (Evans et al., 1996)

**Dyslexia: linking the visual deficits (b)**

- BUT, magno system is not colour-specific
- Magno deficit is not directly related to the benefit from coloured filters
  - Evans et al., 1994
  - Evans et al., 1995
  - Simmers et al., 2001
  - White et al., 2002
  - Conlon et al., 2009

**Behavioral optometry**

- Detailed symptomatology
- Holistic approach
- Good orthoptic assessment & treatment
- Eye movement assessment & treatment
- Perceptual-motor and gross co-ordination exercises
- "Learning lenses"
- Photo-syntonics

Weak evidence

- Jennings (2000)
- Barrett (2008)

**Behavioral optometry**

- As many therapies as there are practitioners
- "no randomised controlled trials" (Jennings, 2000)
- "a large majority of behavioral management therapies are not evidence-based" (Barrett, 2008)
- Doubt is not a pleasant condition, but certainty is an absurd one (Voltaire)

Voltaire: "Practical therapeutics is the art of keeping the patient entertained until nature effects a cure."

"I do not agree with what you have to say, but I’ll defend to the death your right to say it."
"Tracking" & dyslexia

- Saccades are not unique to reading
- Most studies have not found a saccadic eye movement deficit in dyslexia
  - Dyslexia influences saccades: "search for meaning" (Aiyah et al., 2009)
  - ADD influences saccades
- The DEM test does not measure eye movements (Aiyah et al., 2009; Webber et al., 2011)
- Poor DEM scores do not mean that reading difficulties result from poor eye movements (Webber et al., 2011)
- ADD influences saccades: "search for meaning" (Aiyah et al., 2009)
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Plan

Introduction

Conventional optometric correlates

Magn (Transient) visual deficit

Behavioral optometry

Meares-Irlen syndrome/Visual stress (MISVIS)

Conclusions

Visual stress = symptoms + benefit from colour

A.K.A. Scotopic sensitivity syndrome, Irlen syndrome

Meares-Irlen syndrome / Visual stress (MISVIS)
Why might the tints help?

Successful treatment

OR

Placebo

Treatment effect


The Intuitive Colorimeter

Wilkins et al. (1992)  Figures courtesy of Prof Arnold Wilkins

Precision Tinted Lenses (PTL)

Wilkins et al. (1992)  Figures courtesy of Prof. Arnold Wilkins

Intuitive Overlays

Wilkins (1992)  Figures courtesy of Prof. Arnold Wilkins

Assessing optometric interventions

Wilkins Rate of Reading Test

come see the play look up is cat not my and dog for you to the cat up dog and is play come you see for not to look my you for the and not see my play come is look dog cat is up dog to you and play cat up is my not come for the look see play come see cat not look dog is my up the for to and you to not cat for look is my you not is play your you see the dog my play see to for you is the look up cat not dog come and look to for my some play the dog see you not cat up and he up come look for the not dog cat you to see to and my play is you dog for not cat my look come and up to play see the


Key research with the “Intuitive” system

- PTL may alleviate symptoms when reading
  Wilkins, Evans, Busby et al. (1994)
- Overlays can improve speed of reading
  Wilkins et al., (1996); Southbraven, Wilkins, Evans (2002)
- Overlays may improve visual performance
  Evans et al. (1994); Singelton & Henderson (2007); Allen et al. (2008)
- Binocular & accommodative anomalies need to be detected
  Scheiman et al. (1990) but MISViS is an independent sensory dysfunction
  Evans, Wilkins, Busby et al. (1995); Scott et al. (2002)
- The benefit from PTL is linked to pattern glare
  Evans et al. (1994, 1996); Singleton & Henderson (2007); Allen et al. (2008)
Key research with the "Intuitive" system (cont)

- >80% of people prescribed PTL report still using after one year.
  - Evans, Patel, Wilkins et al. (1999)

- Lens colour is different to overlay colour
  - Lightstone, Lightstone, Wilkins (1999)

- MISVIS appears to be about 2-3x more common in dyslexic children than non-dyslexic
  - [c. 20% of dyslexic]
  - Knae & Evans (2003), Evans & Allen (2016)

- Delphi study proposed diagnostic criteria
  - Evans, Allen, Wilkins (2016)

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Pitfalls in researching MISVIS

- Research the target condition
  - Menacker et al. (1990) & Henderson et al. (2012) researched dyslexics
  - Mitchel et al. (2006) did not study people with MISVIS

- Avoid participant bias who "reported relief from overlays"
  - Boudoun et al. (2002) studied participants who "reported relief from overlays"

- Ritchie et al. (2011) used an trial diagnostic process which found MISVIS in 77% of poor readers

- Prescribe colour individually, allowing for a degree of precision
  - Menacker et al. (1990) & Ritchie et al. (2011) used limited range of colours
  - Debate ongoing concerning precision
  - Suttle et al. (2017)

- Clinically, precision varies but is required by some patients

- Use appropriate outcome measures
  - Ritchie et al. (2011) used standardised WRRT test

- Systematic reviews with inappropriate selection criteria will reach negative conclusions
  - (e.g., Griffiths et al., 2016)

  - BUT, in part owing to these issues, MISVIS is not controversial

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Conservative clinical practice

- Readily:
  - ICCP do not treat dyslexia: need to support a multi-disciplinary approach
  - Only a minority of dyslexics need glasses & very few need eye exercises
  - Many children who choose coloured filters do so for placebo or other non-organic reasons

- Listen to symptoms but don’t over-treat
  - This applies to VS & conventional orthoptic anomalies

- Beware referral bias:
  - VS probably less common than astigmatism
  - VS probably more common than amblyopia

- Beware favourite colour & gender effects

- Solution for many is digital devices

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Sequential management plan: optometrist with overlays

- Suspected learning difficulties & symptoms from text
  - refer to optometrist

- Are eyes healthy?
  - yes
  - no

- Is there a significant refractive error?
  - yes
  - no

- Is cyclopaic vision & accommodation OK?
  - yes
  - no

-法定

Evans (1994); Lightstone & Evans (1995); Evans et al. (1999); Allen, Evans, Wilkins (2010)

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Representation of colour in macaque area V2

- Used optical recording & confirmed with electrode recording
- Identified “colour-prefering” modules
- Did not overlap with “orientation-prefering modules”
- Each contour illustrates the cortical region giving the maximal response to each tested colour
- But different colours produce different response magnitudes

Xiao et al., 2005, Nature
**Pattern glare**

DO NOT VIEW THIS IF YOU HAVE EPILEPSY OR MIGRAINE

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**Visual stress**

PREVALENCE: c. 20% of people with dyslexia

SYMPTOMS: eyestrain, headaches, visual perceptual distortions (text moves & blurs)

SIGNS: diagnosis of last resort – rule out other causes of symptoms

TREATMENT: coloured overlays alleviate symptoms

EVIDENCE: debated & controversial

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**PLAN**

INTRODUCTION

CONVENTIONAL OPTOMETRIC CORRELATES

MAGNO (TRANSIENT) VISUAL DEFICIT

BEHAVIORAL OPTOMETRY

MEARES-IRLEN SYNDROME & VISUAL STRESS

CONCLUSIONS

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**Conclusions**

- A minority of patients with reading difficulties report visual symptoms
  - Does text start clear & then move or blur?

- If symptoms, suspect:
  - Visual stress, binocular instability,
  - Accommodative insufficiency
  - Treatment may help symptoms but will not cure dyslexia

- People with reading difficulties & symptoms can be referred to interested ECPs via www.s4clp.org

- Openly discuss controversial nature of some treatments
  - May include (for SpLD): coloured filters, low plus, bifocals, prisms, vision therapy

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**Are you doctorate material?**

- In 2008 the Institute of Optometry launched Doctor of Optometry degree in collaboration with London South Bank University
  - 5 year part time professional doctorate
  - Year 1 has 13 taught days & 2 assignments
  - Year 2 has 8 taught days & 2 assignments
  - Years 3-5 are supervised doctoral research
  - Research most likely to be clinical, in practice

- Also Prof Doc available from Aston University

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**Society for Coloured lens Prescribers**

www.s4clp.org

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**Evidence-based practice**

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Wilkins, 1993

for regular tweets on optometric research

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Join supporting organisations

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  - Relevant training - 10 hrs in last 5 yrs
  - Equipment - for BV & PTL
  - Evidence-based practice
  - List is publicised to teachers, educational psychologists, parents
  - International Institute of Colorimetry: promotes colorimetry, organises CET & conferences

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