The role of the optometrist in dyslexia

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Disclosure

- Funding for lectures, KOL/product feedback, research:
- Lecture content always my own
- I.O.O. Sales Ltd
  - Markets IFS orthoptic exercises, which the speaker designed, and for which he receives a small royalty

Background

- Polarised views on vision & dyslexia
  - Zealots: middle view
  - Deniers: Vision irrelevant to dyslexia
  - 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 transient blurring (26% of 9%) & doubling (23% of 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
- The term "visual dyslexia" is a misnomer
- Visual problems may contribute to reading difficulties
  - In these cases visual treatments may help

ECPs do not treat dyslexia
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 reading difficulties: 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


Plan

**INTRODUCTION**

**CONVENTIONAL OPTOMETRIC CORRELATES**

**MAGNO (TRANSIENT) VISUAL DEFICIT**

**BEHAVIORAL OPTOMETRY**

**MEARES-IRLEN SYNDROME & VISUAL STRESS**

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

<table>
<thead>
<tr>
<th>Magno system</th>
<th>Parvo system</th>
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<tbody>
<tr>
<td>Is predominant</td>
<td>Is predominant</td>
</tr>
<tr>
<td>Rapid</td>
<td>Slow</td>
</tr>
<tr>
<td>Low acuity</td>
<td>High acuity</td>
</tr>
<tr>
<td>Low contrast</td>
<td>High contrast</td>
</tr>
<tr>
<td>Colour insensitive</td>
<td>Colour sensitive</td>
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</tbody>
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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., 2005
  - Condon 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

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"
  - ADD influences saccades
- The DEM test does not measure eye movements (Aytton 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)
- Treatments based on training saccadic or pursuit eye movements are controversial
- The DDAT has not been validated by masked controlled trials (Medland et al., 2010)

**PLAN**

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CONVENTIONAL OPTOMETRIC CORRELATES

MAGNO (TRANSIENT) VISUAL DEFICIT

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MEARES-IRLEN SYNDROME/VISUAL STRESS

(MISVIS)

CONCLUSIONS

Follow @BruceJEvans for regular tweets on optometric research

Handout from www.bruce-evans.co.uk
Why might the tints help?

Successful treatment = Placebo Treatment effect
OR Placebo only


The Intuitive Colorimeter

Intuitive Overlays

Precision Tinted Lenses (PTL)

Assessing optometric interventions

Wilkins Rate of Reading Test

Key research with the “Intuitive” system

- PTL may alleviate symptoms when reading
- Wilkins, Evans, Busby et al. (1994)
- Overlays associated with improved speed of reading
- Wilkins et al. (1994), Bouldoukian, Wilkins, Evans (2002)
- Overlays may improve visual performance
- Binocular & accommodative anomalies need to be detected (Schiefenhöfel et al., 1993) 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


N=6
N=19
N=11
N=19
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
  - Lightbown, Lightbown, Wilkins (1999)
- MISVIS appears to be about 2-3x more common in dyslexic children than non-dyslexic
  - (c. 20% of dyslexics)
  - Kriss & Evans (2005); Evans & Allen (2016)
- Delphi study proposed diagnostic criteria
  - Evans, Allen, Wilkins (2017)

Pitfalls in researching MISVIS

- Research the target condition
  - Mitchell et al (2008) did not study people with MISVIS
  - Bouldoukian et al (2002) studied participants who "reported relief from overlays"
  - Ritchie et al (2011) used an Irlen diagnostic process which found MISVIS in 77% of poor readers
- Prescribe colour individually, allowing for a degree of precision
  - Debate ongoing concerning precision (e.g., Suttle et al., 2017)
- Clinically, precision varies but is required by some patients
- Use appropriate outcome measures
  - Ritchie et al (2011) used enlarged WRRT text
- Systematic reviews with inappropriate selection criteria will reach negative conclusions (e.g., Griffiths et al., 2016)
  - BUT, in part driven by these issues, MISVIS is still controversial

Conservative clinical practice

- Listen to symptoms but don’t over-treat
  - This applies to VS & conventional optometric anomalies
- Beware favourite colour & gender effects
- Solution for many is digital devices

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

Pattern glare

- High prevalence in c. 20% of people with dyslexia

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, coloured overlays alleviate symptoms

TREATMENT: coloured filters or coloured background

EVIDENCE: debated & controversial evidence is weaker than would be required for a new drug or for surgery
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, pseudocommodative 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