The role of the optometrist in dyslexia

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PLAN
INTRODUCTION
CONVENTIONAL OPTOMETRIC CORRELATES
MAGNO (TRANSIENT) VISUAL DEFICIT
BEHAVIORAL OPTOMETRY
MEARES-IRLEN SYNDROME & VISUAL STRESS
CONCLUSIONS

Disclosure
- Funding for lectures, KOL/product feedback, research:
  - Alcon, American Academy of Optometry (UK), Association of Optometrists
- 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
  - Community optometric practice in Brentwood, Essex

Background
- Polarised views on vision & dyslexia
  - Zealots: Visual factors cause dyslexia
  - Deniers: Vision irrelevant to dyslexia
  - Middle view: 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 (1991):
  - 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
  - This study concluded that visual factors are “not a major cause of the dyslexia”
- Eliminating any visual symptoms is likely to be helpful

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This study concluded that visual factors are “not a major cause of the dyslexia”
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

Optometric correlates of reading difficulties: binocular instability

SYMPTOMS: blur, double vision, visual perceptual distortions, eye strain & headaches
SIGNS: low fusional reserves, unstable heterophoria
SIGNS: low amplitude of accommodation, eye strain & headaches
TREATMENT: fusional reserve exercises, refractive correction
TREATMENT: accommodative exercises (if appropriate), 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

Magno & parvo sub-systems
(Transient and sustained)

<table>
<thead>
<tr>
<th>Magno System</th>
<th>Parvo System</th>
</tr>
</thead>
<tbody>
<tr>
<td>High speed</td>
<td>Low speed</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>
</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 precision tinted lenses
  - Evans et al., 1994
  - Evans et al., 1995
  - Simmers et al., 2001
  - White et al., 2006
  - 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-synthonics

**Handout from www.bruce-evans.co.uk** for regular tweets on optometric research
**Behavioral optometry**

- As many therapies as there are practitioners
- "no randomised controlled trials" (Jervis, 2000)
- "a large majority of behavioral management therapies are not evidence-based" (Bonk, 2004)

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**"Tracking" & dyslexia**

- Saccades are not unique to reading
- Most studies have not found a saccadic eye movement defect in dyslexia
- Dyslexia influences saccades: "search for meaning"
- ADD influences saccades

**Dyslexia influences saccades: "search for meaning" - Barrett (2008)**

**ADD influences saccades - Barrett (2008)**

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**CONCLUSIONS**

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**Visual Stress = symptoms + benefit from colour**

- a.k.a. Scotopic Sensitivity syndrome, then syndrome Meares-Irlen Syndrome / Visual Stress (MISVIS)

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

Why might the tints help?

Successful treatment

Placebo only

OR

Placbebo

Treatment effect

The Intuitive Colorimeter

Precision Tinted Lenses (PTL)

Assessing optometric interventions

Wilkins Rate of Reading Test
Key research on MISVis
- PTL may alleviate symptoms when reading
  - Wilkins, Evans, Bussby et al. (1984)
- Overlays can improve speed of reading
  - Wilkins, Evans, Lightstone (1984)
  - Lightstone, Lightstone, Wilkins (1999)
- Overlays may improve visual performance
  - Lightstone, Lightstone, Evans (1997)
- Binocular & accommodative anomalies need to be detected
  - Scheiman et al. (1990)
  - MISVis is an independent sensory dysfuncion
- The benefit from PTL is linked to pattern glare
  - Evans et al. (1984, 1989)

Key research on MISVis (cont)
- >80% of people prescribed PTL report still using after one year
  - Lightstone, Lightstone, Wilkins (1999)
- Overlay colour cannot be used to predict lens colour
- MISVis appears to be about 2-3x more common in dyslexic children than non-dyslexic
  - 20% of dyslexia
  - Koo & Evans (2015)
  - Evans & Allen (2016)

Pitfalls in researching MISVis
- Research the target condition
  - Menacker et al. (1993) & Lightstone et al. (2012) researched dyslexics
  - Mitchell et al. (2008) did not study people with MISVis
- Systematic review with inappropriate selection criteria will reach negative conclusions (e.g., Griffiths et al., 2016)
  - BUT, in part owing to these issues, MISVis is still controversial

Conservative clinical practice
- Should PTL be prescribed to every child with dyslexia?
- Should PTL be prescribed to every child who likes an overlay?
- Should PTL be prescribed before eye exam?
- Research the target condition
  - Ritchie et al. (2011) used limited range of colours
  - Marder et al. (2009) & Ritchie et al. (2011) used limited range of colours
  - Use precision in prescribing colour
  - Ritchie et al. (2011) used limited range of colours
  - Use appropriate outcome measures
  - Ritchie et al. (2011) used limited range of colours
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SEQUENTIAL MANAGEMENT PLAN: educator with overlays
- Test with digestive overlays
  - Position
  - Assess

Is there a significant refractive error?
- Yes
- No

Is there a significant accommodative error?
- Yes
- No

Refer to optometrist with no refraction
- Assess

Are there colour vision defects?
- Yes
- No

Intuitive colorimetry:
- Positive
- Negative

Precision tests
- refer to optometrist

YEARLY CHECKS
- Optometric treatment
- Annual checks
- Intermittent checks

Note: This does not apply to VS & conventional optometric anomalies.
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Do not view this if you have epilepsy or migraine.

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

Is there a doctorate in you?
- In 2008 the Institute of Optometry launched a 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
- A chance to take your career to the next level
- www.ioo.org.uk

Prescribers of precision tinted lenses who agree to:
- Relevant training - 10 hrs in last 5 yrs
- Equipment - for BV & PTL
- Evidence-based practice
- List is publicised to teachers, educational psychologists, parents
- Most Intuitive Colormeters used by community optometrists without NHS funding. Typical fees:
  - Special investigation £25-100, typical £70
  - Colourometry £30-70, typical £40
  - Exceptionally available FOC in NHS

www.s4clp.org

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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 stimulus
- Out different colours produce different response magnitudes

Xiao et al., 2003, Nature

Society for Coloured lens Prescribers

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We find comfort among those who agree with us – growth among those who don’t.

Frank A. Clark

Some famous people who were dyslexic:
- Thomas Edison
- Albert Einstein
- Michael Faraday
- Willem Hollenbach
- Orlando Bloom
- Tom Cruise
- Danny Glover
- Whoopi Goldberg
- Keanu Reeves
- Oliver Reed
- David Bailey
- Leonardo da Vinci
- Tommy Hilfiger
- Pablo Picasso
- Auguste Rodin
- Andy Warhol
- Duncan Goodhew
- Cher
- John Lennon
- King Carl Gustav
- Winston Churchill
- Michael Heseltine
- John F Kennedy
- Nelson Rockefeller
- George Washington
- Hans Christian Anderson
- Agatha Christie
- F. Scott Fitzgerald
- Richard Branson
- F.W. Woolworth
- Walt Disney
- W.B. Yeats