

Optometric Investigation of Dyslexic Children

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Prevalence of dyslexia

- 4 - 10% of children (Rutter 1978; Yule, 1988)
- Higher in optometric practice as parents are likely to seek optometric care
- Boys > girls... supports genetic theories of aetiology (Pennington & Smith, 1983)

Correlates of dyslexia

- most correlates do not relate to vision
- many psychometric correlates ... best measured by psychologist... e.g. decoding memory, planning skills, rhyming skills (Miles & Miles, 1990)
- some of these psychological correlates are important for reading and may be causally related to the reading difficulty (e.g. short term memory; decoding).

Aetiology of dyslexia

- many theories
- dyslexia is likely to be heterogeneous
- slight abnormalities of cerebral organisation + *subtle* lesions at several focal sites mainly in the left cerebral cortex (Hynd & Semrud-Clikeman, 1989)... ?
- functions that are abnormal in dyslexia may be associated with cortical areas showing these focal lesions
- one hypothesis is that these lesions occur during foetal development and that it could be a coincidence that many of these lesions impair functions important for reading
- if this model is correct then not all the *CORRELATES* of dyslexia need necessarily be causes of the reading difficulty
- and... therefore any visual correlates are not necessarily causative and correction of those anomalies will not be curative

Optometric correlates of dyslexia

Refractive errors & accommodative dysfunction

Refractive errors

- Some evidence of increased prevalence of hypermetropia in the reading disabled
- Apply normal clinical criteria in deciding when to carry out cycloplegic refraction and in whether to prescribe

Accommodation

- High prevalence of reduced amplitudes of accommodation (Evans et al, 1994)
- Possible measurements include:
 - amplitudes (RAF rule)
 - lag (retinoscopy)
 - facility (with flippers)

Binocular vision dysfunction and dyslexia

Amplitude of convergence

- Normal near point (NP) = 6 to 10 cm (Lyle & Wybar, 1979)
- Reduced amplitude is frequently associated with dyslexia (Evans, 1996)
- Treated with conventional orthoptics /vision therapy

Heterophoria

- Possible correlates of dyslexia include
 - Associated phoria (Evans, 1996)
 - Reduced vergence ranges
 - Central suppression

Heterotropia

- Stable unilateral strabismus unlikely to be a causative factor or a correlate
- Alternating strabismus can result in unstable perception of print (Fowler & Stein, 1983)

Binocular instability

- characterised by (Gibson, 1955; Giles, 1960):
 - unstable heterophoria
 - reduced vergence reserves
- both positive and negative vergence reserves are often reduced in dyslexia (Evans et al, 1994)
- instability on Maddox wing
- variable associated phoria on Mallett unit
- binocular vision problems can cause asthenopia (Yekta et al, 1989) and may discourage a child from reading

Ocular dominance

- many theories relating to crossed or unstable ocular dominance and dyslexia
- three main categories of ocular/visual dominance
 - Motor
 - Sensory
 - Sighting
- most authorities now agree that atypical *sighting dominance* is not a factor in dyslexia (Evans, 1991)

Dunlop test

- eyes are *diverged* to produce a fixation disparity
- synoptophore
- test carried out 10 times
- purports to determine the *reference eye* which was claimed to be a sign of *poor visuomotor control* (Stein & Fowler, 1985)
- if unstable dominance diagnosed then unilateral occlusion prescribed for reading for up to six months
- debate over validity and significance (Bishop, 1989)
- the test is difficult and probably not reliable
- near dominance can be investigated using the near Mallett unit

Eye movements

- infrared limbal recording systems
- dyslexics show higher prevalence of regressions. These are a correlate and not a cause
- a useful test to evaluate tracking
- dental bite preferable to enable accurate evaluation of binocular co-ordination
- provides useful supplementary information

Tinted lenses

- Olive Meares, an Australian SEN teacher, reported coloured sheets helped some of her pupils... hence Meares- Irlen Syndrome
- Irlen & Lass (1989) claimed that 50% of dyslexics have a perceptual dysfunction that can be treated with tinted lenses
- double masked placebo control trial (Wilkins et al, 1994) showed a positive effect on symptoms reported by some children, that **could not be solely explained by a placebo effect**

Intuitive Colorimeter

- developed by the Department of Applied Psychology, MRC, Cambridge
- used by optometrists specialising in visual aspects of dyslexia
- initial screening with Intuitive coloured overlays... important role for SEN teachers
- important to rule out a placebo effect
- Precision tinting of lenses

Potential mechanisms for benefit from colour

- pattern glare (Wilkins et al, 1984)
- effect on transient visual system

Optometric management protocol for tinted lens prescribing

- eye examination and visual assessment
- treat any visual or binocular anomalies
- if no other anomalies present then screen with overlays
- overlay screening/trial may have already been instituted by teacher

1998

- following a sustained positive effect with overlay, child should be referred to specialist optometrist for Intuitive Colorimetry and prescribing precision tinted lenses (Cerium Visual Technologies)

Controversial optometric therapies

developmental vision therapy

behavioural optometry

- one recent review concluded that “the results of the preponderance of controlled studies in the research literature have been negative or inconclusive” (Grisham & Simons, 1990)
- the placebo effect can be very large (Evans, 1992) and as with tinted lenses, optometrists have a duty to counsel their patients on the basis of the results of published controlled studies rather than anecdotal observations

Summary

- High prevalence of visual anomalies amongst dyslexics
- These are correlates not cause but may be contributory factors
- “Significant” anomalies should be treated by the optometrist
- The effect of colour should be considered
- Intuitive Colorimetry should be used when indicated
- The optometrist should work closely with the SEN teacher, Ed Psych, OT, Physiotherapist, GP

For further reading and full details of references quoted:

Evans B (1996) The optometric investigation of children with dyslexia. Chapter 9
In Pediatric Eye Care, Eds. Simon Barnard & David Edgar, Blackwell, Science

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