Understanding Dyslexia

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"Dyslexia is a complex neurological condition which is constitutional in origin. The symptoms may affect many areas of learning and function, and may be described as a specific difficulty in reading, spelling and written language. ……oral language may be affected to some degree."

British Dyslexia Association 1996

Other Specific Learning Disabilities

- ADHD (Attention Deficit Hyperactivity Disorder)
- Dyspraxia
- Dysphasia, speech/language delay or deficit
- Dyscalculia
- Autism/Aspergers Syndrome/Tourette Syndrome

Neurological and biological basis

Brain structure

MRI scanning results

The planum temporale cortical language area, which is normally larger in the left hemisphere than in the right, is symmetrical in most dyslexics.

The corpus callosum is physically less well developed in dyslexics than in non-dyslexics.
fMRI Findings

- Electrical patterns of activity are different
- Dyslexics use different parts of their brain
- Process information differently:
  - Some strengths, but some weaknesses

Key phases of literacy development

- Logographic phase
- Alphabetic phase
- Orthographic phase

Logographic Phase

- Basic sight vocabulary – high frequency words or words with special significance
- Words recognised holistically – from overall shape
- Similar looking words confused
- No understanding of letter/sound correspondence

Alphabetic Phase

- Recognition of sound/letter correspondence
- Decoding and encoding take place
- Phonic knowledge used
- Pupil can spell simple, regular words
- Errors are phonetic (coff)
- Lacks sophisticated understanding of word structure
- Reading slow and laboured – limited fluency

Orthographic Phase

- Rapid whole word recognition – holistic
- Words have become sight vocabulary
- Reading fluency achieved
- Understanding of sophisticated spelling patterns (-ough)

Brain Systems for Reading

- Broca's area
- Superior parietal lobule (word formation)
- Parieto-temporal (verbal analysis)
A Neural Signature for Dyslexia

Magnocellular pathways

Dyslexic brains show abnormalities of the magnocellular component of the visual system, which is specialized for processing fast temporal information.

Compensatory Systems

Current conclusions

“The evidence is consistent with an increasingly sophisticated account of dyslexia that does not single out either phonological or visual or motor deficits. Rather, temporal processing in all three systems seems to be impaired. Dyslexics may be unable to process fast incoming sensory information adequately in any domain.”

Nutritional aspects

Dyslexics are less able to convert EFAs to myelin in the brain.
Gene links

- Chromosome 6 (DCDC2) linked with dyslexia
- Chromosome 15 (KIAA0319) also implicated
- Genetic abnormalities in Broca’s and Wernicke’s areas (the main language areas in the left hemisphere)

Heritability

Dyslexia runs in families!
- If a boy’s father is dyslexic, he has a 40% chance of being dyslexic.
- If his mother is dyslexic, he has a 50% chance of being dyslexic.
- Boys are 4 times more likely to be dyslexic than girls.

Dyslexia and behaviour

Internationally, 60 – 80% of prison populations are dyslexic

Dyslexia causes huge anxiety and self-esteem problems, particularly with brighter pupils. This magnifies behavioural issues at school age and beyond.

Possible Indicators

- Obvious ‘good’ or ‘bad’ days with no reason
- Confusion between directional words
- Difficulties with sequences, days, months, tables
- Family history
- Discrepancy between oral and written language
- Reversals/mis-sequencing letters

- Poor concentration
- Forgets or misunderstands instructions
- Has difficulty understanding what has been read
- Takes longer to do written work
- Slow processor
- Problems copying, particularly from the board
- Problems planning essays

- Poor confidence or self-esteem
- Poor social skills
- Can appear awkward or clumsy
- Very inconsistent abilities
- Unexpected difficulties with certain tasks
- Sometimes tongue-tied
- Anxious about answering questions in class
Possible strengths
- Innovative thinkers
- Excellent trouble shooters
- Intuitive problem solving
- Creative – arts, architecture, design, engineering
- Lateral thinkers
- Often excellent with computers
- Often brilliant ‘higher level’ mathematicians

Famous dyslexics
Alexander Graham Bell         Nelson Rockefeller
John Britten                  Henry Ford
Thomas Edison                 Walt Disney
Michael Faraday               Cher
Erin Brockovich              John Lennon
George Patton                 Auguste Rodin
Orlando Bloom                 Nigel Kennedy
Tom Cruise                    Henry Winkler

Whoopi Goldberg            Jackie Stewart
Susan Hampshire           Muhammed Ali
Keanu Reeves              Thomas Jefferson
Kiera Knightly             Winston Churchill
Oliver Reed                 J F Kennedy
Robin Williams             George Washington
Leonardo da Vinci          Agatha Christie
Picasso                    W B Yeats
Andy Warhol                Terry Goodkind

Patterns of difficulty
One feature of dyslexia is that there is no link between dyslexia and intelligence.

There are typical patterns, but huge variability between individual difficulties.

Processing skills
(The big 5)
- Motor development (fine and gross)
- Sequencing
- Phonological awareness
- Visual perception (Visual discrimination)
- Memory (working)

Memory implications
- A non-dyslexic child takes between 4 and 10 exposures to a word to fix it in long-term memory.
- A dyslexic child can take anything between 500 and 1300 exposures.

Therefore: teaching needs to incorporate huge amounts of ‘overlearning’
**Longer-Term Memory Difficulties**
- Retaining factual information
- Retrieving factual information

Consequently dyslexics need:
- More help to develop study skills
- To be taught mind-mapping and planning skills

**Common language problems**
- Interpretation – very literal, don’t understand ‘figures of speech’
- Language of mathematics – “70% of dyslexics experience difficulty with number language words (sum, total, odd, take away)” — Chasty 1985
- Comprehension – reading and oral

**Remediation or support?**
- In-class support v. withdrawal
- Reader-writer/extra time
- Scribe for homework?
- Writing or word-processing/dictating

**Exam Conditions**
- Extra time
- Use computer
- Reader/Writer

Need assessment report from Registered Psychologist or C Grade Tester

**Homework Issues**
- Tiredness
- Slow processors – need extra time
- Overload – written work
- Often inappropriate to needs – need to adapt

**Assistive Technology**
- Hand-held digital voice recorder
- Laptop/Computer in class and for homework
- TextHelp
- Speech Recognition software – Dragon Naturally Speaking
How you can help most

- By understanding that your learner may learn in a completely different way
- By not judging from written work
- By seeing individual needs and catering for them

Most importantly

- By judging your learner by their intellectual ability, not their written work
- By giving your learner the opportunity to shine in other fields – give them the chance to show their abilities