Dyslexia, Language and Learning to Read

Maggie Snowling
University of Oxford
This Evening

• History of Dyslexia
  – Does it exist?

• Scientific Understanding of Dyslexia
  – A language learning disorder

• ‘What Works’ for Dyslexia
  – Interventions for language and literacy
A selection of key events

2010 - UK Equality Act
The UK Equality Act is published, protecting dyslexia persons in the workplace

1877 - Adolph Kussmaul
Adolph Kussmaul, a German physician, first diagnoses 'word blindness'

1887 - Rudolph Berlin
Rudolph Berlin, a German ophthalmologist, coins the word 'dyslexia'

1896 - William Pringle Morgan
William Pringle Morgan publishes 'A Case of Congenital Word Blindness'
Congenital Word Blindness

Pringle Morgan 1896

Hinshelwood 1917
Strephosymbolia

READING, WRITING AND SPEECH PROBLEMS IN CHILDREN
A PRESENTATION OF CERTAIN TYPES OF DISORDERS IN THE DEVELOPMENT OF THE LANGUAGE FACULTY

By SAMUEL TORREY ORTON, M.D.
Formerly Professor of Neurology and Neuropathology, Columbia University.

This volume is the third of a series of books based on the Thomas W. Salmon Memorial Lectures given under the auspices of the New York Academy of Medicine.

Dr. Orton describes a number of types of disorders occurring during childhood, discusses their origin, and the methods of correcting them, and criticizes certain methods now in widespread use as contributing to the reading disability which in turn gives rise to academic failures and emotional disturbances. Again, he calls attention to the fact that interference by parents in the normal development of children, particularly by attempting to force a left-handed child to acquire the pattern of right-handedness, is frequently the basis of serious disorders in speech. Also presented in this book are discussions of certain types of deafness, abnormal clumsiness, stuttering and other problems of definite concern to teacher and to parent.

Orton, 1925
Isle of Wight Study (Rutter & Yule, 1973)

- Two kinds of reading problem
  - Age discrepant: General Reading Backwardness
  - IQ discrepant: specific reading retardation
- Language difficulties predated reading problems
  - Children with both SRR and GRB experienced language delays and difficulties

Warnock Report (1978)

- Used term ‘Specific Learning Difficulties’ in preference to ‘dyslexia’
Verbal Deficit Hypothesis

Specific reading disability (dyslexia): what have we learned in the past four decades?

Frank R. Vellutino, 1 Jack M. Fletcher, 2 Margaret J. Snowling, 3 and Donna M. Scanlon 1

1 The University at Albany, USA; 2 The University of Texas Health Science Center at Houston, USA; 3 The University of York, UK

We summarize some of the most important findings from research evaluating the hypothesized causes of specific reading disability (dyslexia) over the past four decades. After outlining components of reading ability, we discuss manifest causes of reading difficulties in terms of deficiencies in
Three Facts About Dyslexia

- **Biology**: Dyslexia runs in families
- **Cognition**: Dyslexia associated with a ‘phonological ‘deficit
- **Behaviour**: Dyslexia has a variable manifestation

Environment
Specific Learning Disorder: Dyslexia

- Pattern of learning difficulties characterized by problems with accurate or fluent word recognition, poor decoding and poor spelling abilities
- ...specify additional difficulties with reading comprehension or math reasoning
Refining Understanding of Dyslexia

- Studies of children at family-risk of dyslexia
- Profile of dyslexia early in development
- Who becomes dyslexic?
Family–Risk Studies

• Heritability of reading skills
  – dyslexia runs in families

• Recruit children who have a first degree relative with dyslexia
  – Usually a parent (some studies include younger siblings of children with dyslexia)

• Follow longitudinally
Methodology

• Children assessed around Year 3 and classified:
  – FR-dyslexia
  – FR-No dyslexia
  – TD control (not-at-risk; low-risk)

• Retrospective analysis of group and sub-group differences at earlier developmental stages

• Reveals precursors of RD
Infancy

Preschool

Grade 2

Compared with controls

- Family Risk Dyslexia
  - Delayed Speech and Language
    - Phonological Difficulties

Dyslexia

Normal Reader

45%

continuum
Infancy

Preschool

Grade 2

Compared with controls

- Dyslexia
- Poor Spelling

45%

LD persists
PA deficits

LD resolves
PA deficits

Delay Speech and Language

Phonological Difficulties

Family Risk
Dyslexia

continuum
- Family Risk of Dyslexia
- Pre-school LD
- Children at low-risk of RD

<table>
<thead>
<tr>
<th>Phase</th>
<th>Duration</th>
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<tbody>
<tr>
<td>Phase 1</td>
<td>3 ½ yrs</td>
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<tr>
<td>Phase 2</td>
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<tr>
<td>Phase 3</td>
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<td>6 ½ yrs</td>
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<tr>
<td>Phase 5</td>
<td>8 yrs</td>
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Family risk of dyslexia?

No            Yes

Language Impairment

TD  N=69

LI  N=32

FR+LI N=29

FR  N=83
Speech and Language Delays
Preschool

Language deficits:
- Vocabulary
- Grammar

Phonological Deficits:
- Speech processing
- Phonological awareness

FR
N=83

FR+LI
N=29

LI
N=32

FR+LI
N=29

LI
N=32
Motor delays and poor attention at 3-4 years
• Children at family risk of dyslexia *and* children with preschool LD show phonological deficits
  – Phonological Deficit = shared risk factor
  – Children with preschool LD *differ* from FR-dyslexia in vocabulary, grammar and comprehension
  – Non-shared deficit
• Executive and motor deficits commonly co-morbid with LD, less so with FR
• Non-shared deficit
Dyslexia Outcomes at age 8

- **Dyslexia:** ...‘poor decoding and poor spelling abilities’ [DSM5]
- -1.5SD below the mean of the TD group on a composite of word reading/spelling (SS <= 88)

Possible risk factors for dyslexia:
- Family-risk
- Poor language
- Poor phonology
- Poor motor skills and attention
Dyslexia Outcomes by Risk Group

- **Language Impaired**
  - LI +: 40%
  - LI -: 26%

- **Typical Language**
  - FR +: 26%
  - FR -: 7% Control
Pathways to ‘Dyslexia’

• A heritable form of dyslexia associated with preschool phonological difficulties which persist
• A consequence of an underlying language disorder (co-occurring executive and motor difficulties) which persists
• ?Environmental factors associated with speech or language delay ?
Endophenotype [risk factor 2] \n\nEndophenotype [risk factor 1] \n\nEndophenotype [risk factor 3] \n\nMultiple Genes \ng1 \ng2 \ng3 \ng4 etc 

Phenotype 

Likelihood of diagnosis
Multiple Genes

- g1
- g2
- g3
- g4 etc

Endophenotype
[risk factor 2]

Phonological Deficit
[risk factor 1]

Endophenotype
[risk factor 3]

Dyslexia Phenotype
Multiple Genes

- g1
- g2
- g3
- g4
- etc

Language Deficit [risk factor 2]

Phonological Deficit [risk factor 1]

Endophenotype [risk factor 3]

Co-occurring deficits in motor / attention

Dyslexia Phenotype
Developing Language and Literacy

Julia M. Carroll, Claudine Bowyer-Crane, Fiona J. Duff, Charles Hulme and Margaret J. Snowling
Promoting Decoding Skills

- Letter-Sound knowledge
- Phoneme Awareness
- In context of book reading and linking letters and sounds

A series of RCTs shows this approach to be effective for poor readers.
‘Further data collection has also demonstrated that the intervention brings about improvements in children’s self-esteem, confidence and ability to participate in classroom activities.’
In North Yorkshire
>1000 teachers trained since 2002
~400 schools use reading intervention
Now used in primary and secondary school settings
What about Language?

- Children who enter school with poor oral language are at high-risk of dyslexia
- The impact of social disadvantage is mediated through language differences already evident at the time of school entry
- Language critical for reading comprehension
Efficacy of language intervention in the early years

Silke Fricke,1 Claudine Bowyer-Crane,2 Allyson J. Haley,3 Charles Hulme,4 and Margaret J. Snowling3

1Department of Human Communication Sciences, University of Sheffield, Sheffield; 2Department of Psychology, Sociology and Politics, Sheffield Hallam University, Sheffield; 3Department of Psychology, University of York, York; 4Division of Psychology and Language Sciences, University College London, London, UK

Background: Oral language skills in the preschool and early school years are critical to educational success and provide the foundations for the later development of reading comprehension. Methods: In a randomized controlled trial, 180 children from 15 UK nursery schools (n = 12 from each setting; Mage = 4.0) were randomly allocated to receive a 30-week oral language intervention or to a waiting control group. Children in the intervention group received 30 weeks of oral language intervention, and the control group received no intervention.
Outcomes at T6 (+6 months)

- Language: 0.83
- Narrative: 0.3
- Phonological Awareness: 0.49
- LK: 0.52
- Decoding: 0.07
- Reading Comprehension: 0.52

Effect Size
• Oral language intervention can be successfully delivered by trained and supported TAs in nursery classes (3 robust trials conducted by our group)

• Children who enter school with poorly developed language can be identified in nursery classes and their oral language skills can improve significantly

• When early intervention includes training in PA and LSK, it also has a positive impact on emergent literacy skills

**BUT** there is no quick fix:
Interventions need to be of high quality
Excellent implementation is of key importance
Contemporary Framing

• Dyslexia is not a ‘diagnosis’, rather a dimension (mild->severe)
  • a language learning impairment
  • the outcome of multiple risk factors

• The status of the language system at school entry is a critical prognostic indicator

• Dyslexia can be ameliorated with appropriate interventions
  – But not by snake-oil or bogus therapies....!
Dyslexia primarily affects the skills involved in accurate and fluent word reading and spelling.

Characteristic features of dyslexia are difficulties in phonological awareness, verbal memory and verbal processing speed.
• Dyslexia occurs across the range of intellectual abilities

• It is best thought of as a continuum, not a distinct category, and there are no clear cut-off points.

• Co-occurring difficulties may be seen in aspects of language, motor co-ordination, ... and personal organisation, but these are not, by themselves, markers of dyslexia
The history must be written...