Barker INSTITUTE

Opening & Inaugural Address

Why too many Australian students struggle with reading and what we should do about it.

"Insights from the latest in research on reading acquisition and dyslexia that every educator must know"

Dr. Bartek Rajkowski, PhD
Speech & Language Pathologist
Director, Adelaide Speech Pathology Services
Managing Director, ReadingDoctor Software

Introduction…a bit about me

Speech and Language Pathologist at Adelaide Speech Pathology Services

- Special interest in literacy difficulties
- Private practice since 2001

Advocate for kids with reading difficulties!

Introduction

Flinders UNIVERSITY ADELAIDE • AUSTRALIA

Doctorate completed in 2012

- Interested in relationship between speech, language, auditory processing and literacy
- Thesis "A Multisensory Model of Phonological Representations: Implications for Dyslexia and Auditory Processing Disorder."
- Investigating the mechanisms of word storage in the brain

Introduction…a bit about me

ReadingDoctor

- Frustrated with lack of quality **research based** computer programmes for literacy improvement
- **Most educational software developers have a lack of understanding of the mechanisms of learning and the process of learning to read**
- **Lack of Australian software!**

Officially Endorsed by SPELD(SA)

The Reading Process

The Reading Process

How do children learn to read?

The Reading Process

The written representation of English is based on sounds

- English has 40-45 sounds, or **PHONEMES** *phone = sound*
- Sounds are represented by abstract squiggles (**LETTERS**)
- Individual letters or groups of letters which represent single sounds in English are called **GRAPHEMES** *graph = picture*

[sh] [i] [p] [s]	**Phonemes (Sounds)**
ch i p s	**Graphemes (Letter-Sound Patterns)**
c h i p s	**Letters**

The Reading Process

2 Types of Words

REGULAR WORDS

Word	Graphemes (Visual)	Phonemes (Sounds)

s t o p

- Consistent sound-symbol patterns
- Around 80% of words

The Reading Process

REGULAR WORDS

Learnt through *phonological (phono + logic)* + visual skills:

Children need to form a connection between the visual representations of sounds (graphemes) and phonemes (sounds)

Children need to understand the relationship between spoken and written language to **DECODE** unfamiliar words

The Reading Process

IRREGULAR WORDS

Word	Phonemes (Sounds)	Irregular because
a		
o		
s		
e		
f		
s		
ou		

- Inconsistent sound-symbol patterns
- Around 20% of words
- Many high frequency words are irregular

The Reading Process

IRREGULAR WORDS

Learnt through *visual* + phonological skills:

- Research suggests irregular word knowledge is related to reading experience

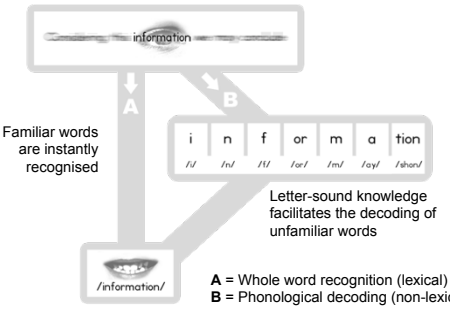
  (Sprenger-Charolles & Serniclaes, 2006)

- "Whole word" learning: visual memorisation of letter order and word shape (e.g. 'Yacht')
- Some parts of irregular words are usually regular e.g. "Yacht"

The Reading Process

A Dual Route Model of Reading Aloud

Coltheart et al., (2001)

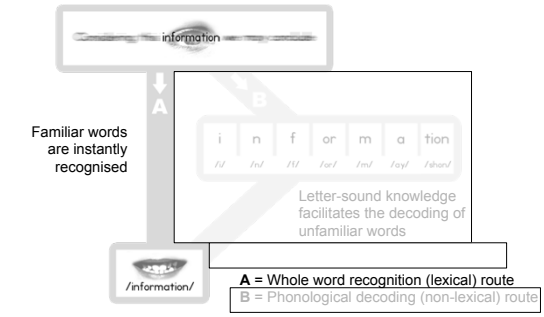


The Reading Process

Aoccdrnig to rscheearch at an Elingsh uinervtisy, it deosn't mttaer in waht oredr the ltteers in a wrod are, the olny iprmoetnt tihng is taht frist and lsat ltteer is at the rghit pclae. The rset can be a toatl mses and you can sitll raed it wouthit porbelm. Tihs is bcuseae we do not raed ervey lteter by it slef but the wrod as a wlohe. Ceehiro.

The Reading Process

A Dual Route Model of Reading Aloud
(Coltheart et al., 2001)



The Reading Process

sploorther

The Reading Process

Try some nonwords!

The Reading Process

creeting

The Reading Process

bloadge

The Reading Process

cermot

The Reading Process

strone

The Reading Process

phloked

Background The Reading Process

What about real words?

Background The Reading Process

Rhinotillexomania

Background The Reading Process

Rhinotillexomania

Compulsive nose picking

The Reading Process

Hippopotomonstrosesquippedaliophobia

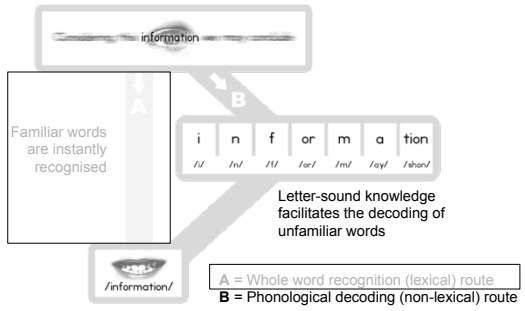
The Reading Process

Hippopotomonstrosesquippedaliophobia

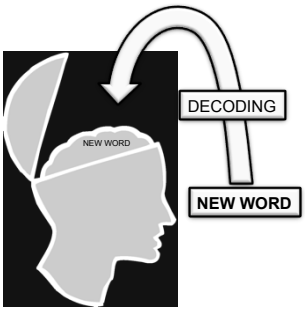
The fear of long words

The Reading Process

A Dual Route Model of Reading Aloud
(Coltheart et al., 2001)



The Reading Process



Good Decoding = Effective Self Teaching
(Share, 1995)

Reading Impairment

Reading Impairment

The problem

•Approximately 16% of Australian children have difficulties learning to read (Westwood, 2001).

•Poor reading ability has been associated with

- •school failure
- •unemployment
- •welfare dependency
- •criminal behaviour
- •mental illness

(Shapiro, 2001).

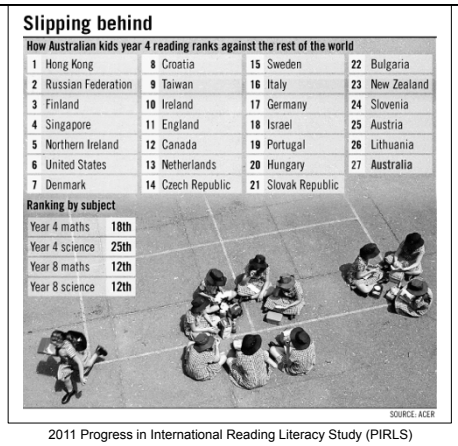
Reading Impairment

The problem

2011 Progress in International Reading Literacy Study (PIRLS)

- year four reading standards in 45 countries
- Australia ranked 27th
  - substantially lower level than 21 countries including the US, England, Canada

http://timssandpirls.bc.edu/pirls2011/



2011 Progress in International Reading Literacy Study (PIRLS)

Why do some students struggle to read?

Why do some students struggle to read?

Three types of reading difficulties

Why do some students struggle to read?

1. Dyslexia

Why do some students struggle to read?

So what is Dyslexia?

Why do some students struggle to read?

What is Dyslexia?

- Specific learning disability characterised by difficulties in accurate and fluent word reading and spelling
  - •Often unexpected in relation to other cognitive abilities
  - •Not due to lack of opportunity
  - •Not due to laziness

Why do some students struggle to read?

What is Dyslexia?

- •Across continuum of severity and intellectual abilities
  Lyon, Shaywitz, and Shaywitz, 2003, Rose (2009)
- Neurologically based with a hereditary component (Snowling, 2001).
- Prevalence rates range from 5 to 17.5% (Shaywitz & Shaywitz, 2005).

Why do some students struggle to read?

What is the core deficit in dyslexia?

- **Decoding difficulties** in dyslexia stem from an impairment in the ability to map the written representations of the language onto its sound structure

  (Brkanac et al., 2008)

- Large body of research suggesting a deficit in phonological processing skills is the underlying cause of dyslexia

  (e.g. Foy & Mann, 2001; Griffiths & Snowling, 2001; Swan & Goswami, 1997; Hulme & Snowling, 2001; Griffiths & Snowling, 2002; Ramus, 2001).

Why do some students struggle to read?

What is the core deficit in dyslexia?

- •Weaknesses in phonological processing skills

  = the ability to use the sound structure of a language in order to process information (Simpson, 2000)

Why do some students struggle to read?

What is the core deficit in dyslexia?

Phonological processing skills: 3 MAIN AREAS OF DIFFICULTY

1. Phonological awareness

Ability to identify, reflect upon and manipulate the sound units of a language.

- E.g. breaking words into syllables, detecting rhyme

Phonemic awareness

Awareness of individual phonemes

Gives children an advantage in learning to read the printed form of language (Wagner, Torgesen, & Rashotte, 1999)

- E.g. elision, blending, segmentation, spoonerisms

Why do some students struggle to read?

What is the core deficit in dyslexia?

Phonological processing skills

2. Phonological memory

Process of temporarily coding and processing information in short-term memory.

- E.g. Memory for digits, non-word repetition

3. Rapid naming

Ability to name a limited set of items such as objects, colours, numbers or letters as quickly as possible.

- E.g. Speed of naming objects, colours, letters

(for a review, see Wagner et al., 1999)

Why do some students struggle to read?

What causes phonological processing difficulties?

Phonological deficit hypothesis

-Phonological processing taps into the strength of *phonological representations* (e.g. Thomson & Goswami, 2009; Snowling, Bishop, & Stothard, 2000).

Phonological representations (PRs)

= neurological information regarding the sound structure of language

⇨ weaker, or 'less specific' in individuals with dyslexia

Why do some students struggle to read?

What causes weaker PRs? 2 Theories…

1. Poorer language skills: the **segmentation hypothesis**

As vocabulary size grows during language acquisition in childhood:

- phonological representations become more refined, with progressively smaller-grained sound and speech based representational capacity (Ziegler & Goswami, 2005)
- phonological system becomes increasingly sensitive to phonemic differences between words (Ziegler & Goswami, 2005)
- eventually, high quality phonological representations that reflect the exact phonemic structure of language are formed (Fowler, 1991; Walley, Metsala, & Garlock, 2003 for a review)

Why do some students struggle to read?

What causes weaker PRs? 2 Theories…

2. **Auditory perceptual deficits**

Difficulties with the perception of auditory signals may cause weak PRs
(Benasich, Thomas, Choudhury, & Leppänen, 2002; Laasonen, Tomma-Halme, Lahti-Nuuttila, Service, & Virsu, 2000; Tallal, 1980, 1999)

e.g.

- Rapid temporal auditory processing deficit (RTAPD) hypothesis
  (Tallal, 1980)
  Deficit in the processing of rapidly changing acoustic spectra in at least a sub-population of individuals with dyslexia

Why do some students struggle to read?

Do individuals with dyslexia have other deficits?

Speech deficits
(e.g. Fawcett & Nicolson 2002; Ramus et al., 2003; Heilman et al., 1996; de Gelder & Vroomen, 1998)

Articulatory awareness
Understanding of and ability to reflect on articulatory gestures
(e.g. Griffiths & Frith 2002)

Language Difficulties
Phonological processing, vocabulary, some have SLI (Specific Language Impairment)

Why do some students struggle to read?

Do individuals with dyslexia have other deficits?

Visual processing
(e.g. Iles et al., 2000, Goulandris et al., 1998, Lovegrove, 1996 for a review)

Lack of evidence demonstrating support for a specific visual or orthographic **CAUSAL** deficit in developmental forms of dyslexia
(e.g. Harm & Seidenberg, 2001; Sprenger-Charolles & Serniclaes, 2006).

Why do some students struggle to read?

"Numerous studies have shown that children with dyslexia or related learning disabilities have the same visual function and ocular health as children without such conditions. Specifically, subtle eye or visual problems, including visual perceptual disorders, refractive error, abnormal focusing, jerky eye movements, binocular dysfunction or crossed eyes, do not cause dyslexia" *

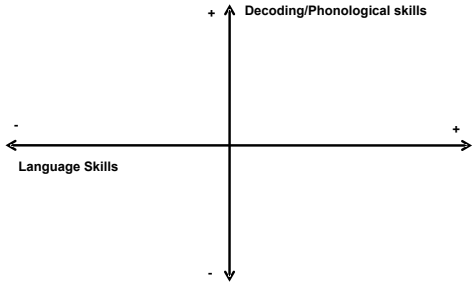
Joint policy statement issued by the American Academy of Pediatrics (2009)(p. 839).

Why do some students struggle to read?

2. The poor comprehender

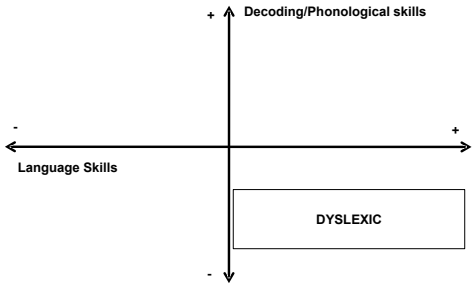
Why do some students struggle to read?

The reading ability spectrum



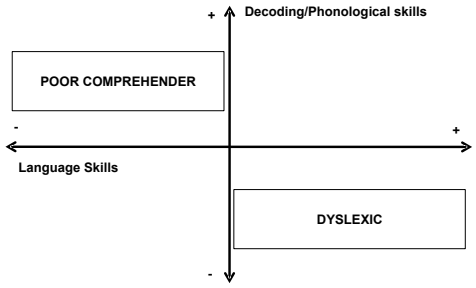
Why do some students struggle to read?

The reading ability spectrum



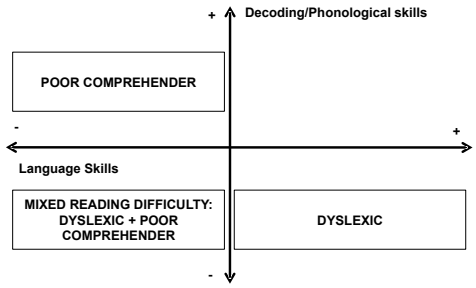
Why do some students struggle to read?

The reading ability spectrum



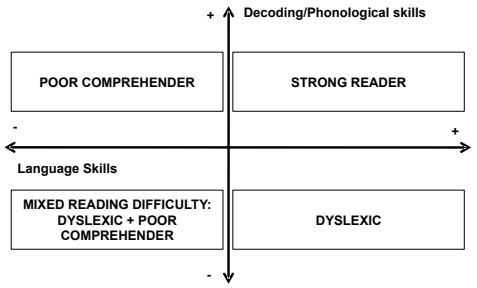
Why do some students struggle to read?

The reading ability spectrum



Why do some students struggle to read?

The reading ability spectrum



Why do some students struggle to read?

3. The instructional casualty

Bartek's PhD research

Bartek's PhD Research

Reading impairment in children with APD

Auditory Processing Disorder (APD)

"A deficit in the processing of information that is specific to the auditory modality"

(Chermak, 2001, pp. 10).

- Associated with a range of learning deficits including language and literacy difficulties (Ferre, 2002).

Bartek's PhD Research

Reading impairment in children with APD

Mallen (2010)
Children with APD (N=21) significantly older than reading-accuracy age matched 'average reader' group (N=21)

Dawes and Bishop (2010)
52% of children with APD (N=25) would fit diagnosis of dyslexia or specific language impairment (SLI), or both

⇨ No measures of PA or RAN

There is a paucity of research investigating reading ability in children with diagnosed auditory processing deficits
(Mallen, 2010).

Objectives

Objectives

Aims of the study

Goal 1 – to propose a

Neurologically plausible model of

phonological representations

which provides a possible explanation for the relationship between

- phonological processing
- auditory processing
- visual processing
- speech
- articulatory awareness
- vocabulary

deficits found in dyslexia.

Objectives

Aims of the study

Goal 2

To evaluate the phonological processing and reading skills of a group of children diagnosed with dyslexia and a group of children diagnosed with auditory processing disorder (APD) within the context of this model.

The objective was to investigate two main questions:

1. Do children with APD demonstrate phonological processing and reading difficulties?
2. Do children with APD and children with dyslexia demonstrate weaker phonological representations than a control group of children?

Method

Method

Participants

All participants N = 57,

Inclusion criteria:

- Aged between 8;0 and 11;0 years
- Normal peripheral hearing
- Normal non-verbal IQ

Exclusion criteria:

- Severe physical impairment (e.g. cerebral palsy)
- Visual sensory impairment (corrected vision OK)
- Motor impairment (e.g. dyspraxia)
- Severe behavioural difficulties
- ESL

Method

Participants

1. APD group
N = 19,

- Diagnosis of APD in the last twelve months

2. Dyslexic (DYS) group
N = 19,

- Diagnosis or reconfirmed diagnosis of dyslexia in the last twelve months

3. Control (CON) Group
N = 19,

- No history of speech, language or literacy difficulties
- No diagnosed or suspected auditory, visual or sensori-motor processing disorder

Method

Participants

No significant differences in:

- Chronological age
- Non-verbal intelligence
  Measured with Raven's Coloured Progressive Matrices (RCPM)

Method

Part I: Assessment of phonological processing and reading skills

CTOPP – Comprehensive Test of Phonological Processing (Wagner et al., 1999)

Phonological awareness
•Subtests: Elision, Blending Words

Phonological memory
•Subtests: Memory for Digits, Non-word Repetition

Rapid naming
•Subtests: Rapid Digit Naming, Rapid Letter Naming, Rapid Object Naming

Method

Part I: Assessment of phonological processing and reading skills

Visual word recognition
Assessment of Lexical and Non-lexical Reading Abilities in Children (Coltheart & Leahy, 1996)

test of

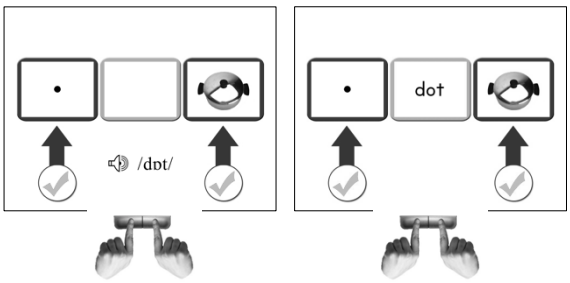
- regular word reading (e.g. spot)
- irregular word reading (e.g. yacht)
- non-word reading (e.g. sploorther)

Grapheme recognition
•Computer administered, custom assessment evaluating recognition of 44 graphemes

- •er
- •or
- •Igh etc

Method Part II: Assessment of PRs

Auditory discrimination task ***Visual discrimination task***



•SAME CVC stimuli presented visually in the visual task, and auditorily in the auditory task
•80 minimal pairs in each task

Method

Part II: Assessment of PRs

Visual and auditory discrimination tasks

•Minimal pairs classified according to visual (V) and auditory (A) similarity of the contrasting segment

e.g. **s**un **g**un = V0A0
fan **v**an = V0A1
tin **f**in = V1A0
dig **b**ig = V1A1

•Auditorily similar contrasting segments differed by 1 phonemic feature

•Word pairs matched for word frequency, familiarity, neighbourhood density

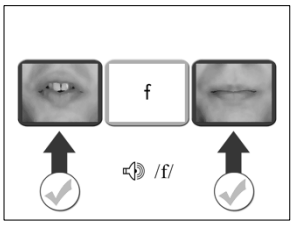
Method

Part II: Assessment of PRs

Articulatory Discrimination

•Subjects presented with two pictures of mouth positions

•stimulus sound accompanied by the corresponding letter



Results and discussion

Results and discussion

Question 1:
Do children with APD demonstrate phonological processing and reading difficulties?

Results and discussion

Did children with APD and children with dyslexia have significantly poorer phonological processing skills than control participants?

- Significant differences for PA, RAN and PM measures between the
  - CON and APD
  - CON and DYS groups.
- No significant differences in PA, RN or PM between the APD and DYS groups.

CON

⇕

APD and DYS

⇨ **YES.**

Results and discussion

Did children with APD and children with dyslexia have significantly poorer reading skills than control participants?

- Significant differences between mean scores for the CON and DYS groups as well as between the CON and APD groups
- Significant difference between the mean reading scores of the APD and DYS groups

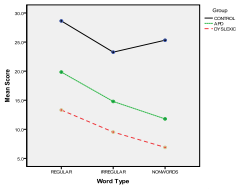


Figure 1 Mean scores (words correctly read out of a maximum of 30) for regular, irregular and non-word reading for the three groups.

ALSO

APD and DYS groups demonstrated a significant relative weakness in reading non-words compared with the CON group.

⇨ **YES.**

Results and discussion

Did children with APD and children with dyslexia have significantly poorer grapheme naming skills than control participants?

- Significant differences in grapheme naming between the
  - CON and APD
  - CON and DYS
  - APD and DYS groups

CON

⇕

APD ⇨ **YES.**

⇕

DYS

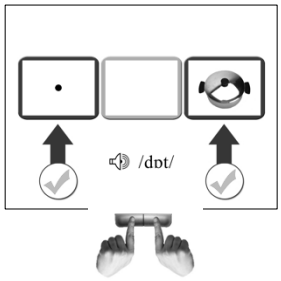
Bartek's PhD…

Question 2:

Do children with APD and children with dyslexia demonstrate weaker phonological representations than a control group of children?

Results and discussion

Did children with APD and children with dyslexia have significantly poorer auditory discrimination performance than the control group?



Results and discussion

Did children with APD and children with dyslexia have significantly poorer auditory discrimination performance than the control group?

•significant differences between

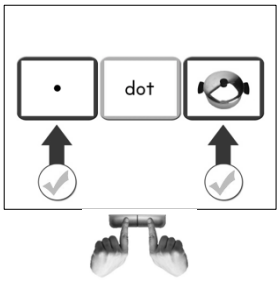
- •CON and the APD groups
- •CON and the DYS groups

but not between the APD and DYS groups

CON ⇕ APD and DYS ⇨ **YES.**

Results and discussion

Did children with APD and children with dyslexia have significantly poorer visual discrimination performance than the control group?



Results and discussion

Did children with APD and children with dyslexia have significantly poorer visual discrimination performance than the control group?

- Significant differences between
  - CON and the DYS groups

but not between the CON and APD groups

CON ⇕ DYS ⇨ **YES for DYS but not for APD**

Results and discussion

Were children with APD and children with dyslexia significantly more affected by auditory or visual similarity in the auditory and visual discrimination tasks?

VISUAL SIMILARITY

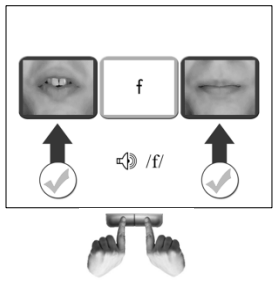
- Differences between the groups were not significant

AUDITORY SIMILARITY

- the DYS group was significantly more affected by increased auditory similarity compared to the CON group in the visual task discrimination task (but NOT in the auditory task)

Results and discussion

Did children with APD and children with dyslexia have significantly poorer articulatory discrimination performance than the control group?



Results and discussion

Did children with APD and children with dyslexia have significantly poorer articulatory discrimination performance than the control group?

- Significant differences between
  - CON and the APD groups
  - CON and DYS groups

  But not between the APD and DYS groups

CON ⇕ APD and DYS ⇨ **YES.**

Conclusion / key points

- Children with APD show significant phonological processing and reading difficulties
- Children with dyslexia and children with APD show impaired phonological representations

  We need to be aware of the relationship between APD and reading difficulties
  - Need for appropriate referrals
  - Screening of children with APD diagnosis for reading difficulties

Implications of research for reading intervention and instruction

Implications of research

Most importantly:

My PhD research supports approaches to reading instruction/ intervention which strengthen:

- mapping of graphemes to phonemes
- decoding ability
- Phonological awareness / processing, especially phonemic awareness

Implications of research

In agreement with

"Systematic phonics instruction is critical if children are to be taught to read well, whether or not they experience reading difficulties."

- Australian Government National Inquiry into the Teaching of Literacy 2005*

Implications of research

In agreement with

"…phonics is an essential methodology in teaching children to read. The present debate revolves around the status of phonics within early teaching of reading and the type of phonics programme that should be used".

- House of Commons Select Committee on the Teaching of Reading 2004 (UK)*

Implications of research

In agreement with

"The Panel's findings demonstrate that learning phonics skills is critical for positive reading development".

- National Reading Panel 2000 (US)*

Implications of research

"The research literature shows that phonics is most effectively taught by the '**synthetic' approach** - a highly structured, sequential and explicit method that teaches beginning and remedial readers how to construct words from the smallest language 'building blocks' of letters and letter combinations, and their corresponding sounds. Implicit or incidental teaching of phonics is not effective evidence-based reading instruction"

Buckingham, J., Wheldall, K., & Beaman-Wheldall, R. (2013). Why Jaydon can't read: The triumph of ideology over evidence in teaching reading. *Policy: A Journal of Public Policy and Ideas*, *29*(3), 21.

Teaching reading in Australia

Where are we now?

Where are we now?

The way reading is taught in most Australian schools is not consistent with the latest in reading research:

"...the Whole Language approach to the teaching of reading, currently the most widely used approach to the teaching of reading in Australian schools is not in the best interests of students, especially those students who are having difficulty learning to read."

Coltheart, M., & Prior, M. (2006), p. 4

Where are we now?

"The highly robust scientific evidence on reading instruction has yet to influence classroom teaching in Australia"

Buckingham, J., Wheldall, K., & Beaman-Wheldall, R. (2013). Why Jaydon can't read: The triumph of ideology over evidence in teaching reading. *Policy: A Journal of Public Policy and Ideas*, *29*(3), 21.

Summary

Dyslexia is

- A learning difficulty affecting reading (& spelling) skills associated with phonological processing & decoding difficulties.

Reading remediation and reading instruction must include:

- Phonological, especially phonemic awareness instruction
- Letter-sound (grapheme) knowledge instruction
- Explicit teaching of high frequency, irregular words

  + Vocabulary/language/comprehension/fluency!

USE A SYNTHETIC PHONICS APPROACH!

What an opportunity for Australian educators!