Prevention of Reading Disabilities: What We Know From Research

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Learning to read entails...

- Normally developed language skills
- Knowledge of phonological structures
- Knowledge of how written units connect with spoken units (alphabetic principle); Grain size matters!
- Phonological recoding and fluency
- Print exposure
Three potential stumbling blocks on the road to becoming a good reader (NRC report, 1998)

1. Difficulty applying the alphabetic principle -- the idea that written spellings systematically represent spoken words (most common)

2. Failure to transfer oral language comprehension skills to reading, and to acquire new strategies that may be specifically needed for reading

3. Loss of initial motivation to read, or failure to develop a mature appreciation of the rewards of reading (usually a result of failure/ lack of opportunity)
Types of RD

There is good evidence for 3 forms of disability in reading that co-occur and occur in isolation:

- Word recognition
- Comprehension
- Fluency
Most common and best understood form of LD (Dyslexia)

Phonological Awareness
Rapid Naming
Phonological (Working) Memory
Largest single group of students in special education
Dyslexia is a specific language-based disorder characterized by difficulties in the development of accurate and fluent single word decoding skills, usually associated with insufficient phonological processing and rapid naming abilities. These difficulties in single word decoding are often unexpected in relation to age and other cognitive and academic abilities; they are not result of generalized developmental disability or sensory impairment.
1. Dyslexia occurs primarily at the level of the single word and involves the ability to decode printed words. This has been known for many years. It has not been clear why.
2. Alphabetic Principle

- Print represents speech through the alphabet.
- Words are composed of internal units based on sound called “phonemes”.
- In learning to read, the child must make explicit an implicit understanding that words have internal structures linked to sounds.
3. Reading problems occur as part of a natural, unbroken continuum of ability—what causes good reading also causes poor reading.

We only need one theory to explain success and failure in reading.
4. Dyslexia is best identified through domain-specific assessments of reading and reading-related skills. IQ tests are not necessary and models for identification based on IQ-discrepancy lack validity. Funds spent to establish eligibility may be better spent on prevention and early intervention.

**IDEA 2004 allows for this!**
Implementing IDEA 2004

- Need to assess achievement (including accuracy, fluency, and comprehension)
- Document failure to respond adequately to quality instruction
- Apply exclusions as primary cause (in the interest of services)

Progress Must be Monitored!
5. Children with dyslexia have problems outside phonology

- Phonology explains the reading problem, but reading is not the only problem of students with dyslexia

- Comorbidity- academics, ADHD

- Word recognition not the only type of RD
What Is ADHD

... it arises as a developmental failure in the brain circuitry that underlies inhibition and self-control. This loss of self-control in turn impairs other important brain functions critical for maintaining attention, including the ability to defer immediate rewards for later, greater gain

-Barkley, 1998
6. Of all children identified as learning disabled in schools, 80-90% are primarily impaired in reading; most of these children have problems with word recognition skills.
7. Children Do NOT Outgrow Dyslexia

Over 70% identified as dyslexic in Grade 3 remained dyslexic as adults

Without adequate intervention, dyslexia is a lifelong, chronic disorder

Connecticut Longitudinal Project- Shaywitz et al., Pediatrics, 1999
Important Research Findings

8. Causes of Dyslexia & Poor Reading
   - Neurological
   - Familial
   - Economic disadvantage; cultural and linguistic diversity
   - Instructional
CAUSES

Neurological- brain metabolism when doing reading tasks involving word reading is different in dyslexic and non-dyslexic readers. The problem is not brain structure, but brain function.

Does improved reading result in changes in brain function?
A Theoretical Model Regarding the Brain Circuits for Reading (Pugh, Shaywitz, Eden, Simos)

- Wernicke’s area
- Broca’s area
- Angular gyrus
- Visual association areas
A Theoretical Model for the Brain Circuit for Reading (Component Processes)

Phonological processing: correspondence between letter and sound

Phonological processing: articulatory mapping

Relay station; Cross-modality integration

Graphemic analysis
What’s Happening in the Brain?
Magnetic Source Imaging: 
Andy Papanicolaou & Akis Simos

- Safe & painless
- Non-invasive
- Detects small bio-magnetic brain signals
- Provides real-time information about which brain areas are active and when during task performance
Neural Response to Intervention

Does the pattern of brain activation change in response to intervention?

8 children with severe dyslexia

8 week intense phonologically-based intervention (2 hours a day = up to 80 hours of instruction)

Simos et al., *Neurology*, 2002
## Demographic Information

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<th>Child</th>
<th>Gender</th>
<th>(years/mo Age)</th>
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<th>WJ-III post (%)</th>
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<th>Medication</th>
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At Risk Reader

(Simos et al., 2006)
Genetic Factors in Reading Disability

- Sites on chromosomes 3, 10, & 19 (at p< .01); 6 at p< .05.
- No evidence for genes specific to poor reading
- 50% of the variability explained by genetic factors
Environmental factors

Print exposure, parental literacy, & “lap time” reading to the child are clearly important.
Instructional factors are underestimated

- Skills that prevent poor reading can be taught—they must be taught early in school
- Many children placed in special education are instructional casualties
Special Education does not close the gap

- Models of service delivery demonstrably ineffective for children with dyslexia
- Group sizes too large for pull out programs
- Teachers not adequately prepared to provide specialized reading intervention services
- System oriented to procedural compliance, not services and outcomes
- Wait to Fail model that sometimes stabilizes but rarely remediates
Months

Reading Standard Score

Pre-pretest  2 years  Post  1 year  Post
Enter Special Education

Enter Exit Intervention
Intervention Intervention

Intervention Intervention

1  16  18  30  42

(Torgesen et al., 2001)
Reading rate remained quite impaired

Accuracy: 91%
Rate: 72

Comparison over time:
- Pretest
- Posttest
- 1-year
- 2-year
Remediation is not a solution!

Reading rate is limited because the proportion of words in grade level passages that children can read “by sight” is less than for average readers.

How do you close the gap when the student is already 3-5 years behind?
Yet, there are some impressive remediation results

- Berninger et al., 2003; Blachman et al., 2004; Olson & Wise, 2006
- Lovett et al. (2000): PHAB/DI + WI ST → PHAST Track Reading Program
- Wolf, Miller, & Donnelly’s (2002) RAVE-O
Early Intervention is Clearly Effective

Prevention studies commonly show that 70-90% of at risk children (bottom 20%) in K-2 can learn to read in average range.
Effective Early Interventions

- Reading Recovery: Schwartz’s (2005) RCT concludes that 5% of RR graduates don’t read on grade level.
- Peer Assisted Learning Strategies (PALS): Studies show that 5-6% of 1st graders read above 30th %ile.
- Mathes et al. (RRQ; 2005)
A Widely Proposed Model

Level 1: Primary Intervention
Enhanced general education classroom instruction (90 min minimum).

Level 2: Secondary Intervention
Child receives more intense intervention in general education, presumably in small groups.

Level 3: Tertiary
Child placed in special education. Intervention increases in intensity and duration.

If progress is inadequate, move to next level.
Early Intervention Reduces the At-Risk Population

- Primary alone: 5-7%
- Secondary alone: 2-6%
- Primary and Secondary: .01% to < 2%
- Tertiary: ???????????????
8. Reading Comprehension Disabilities

Most children with word level disorders have comprehension problems.

Subset with intact word recognition and deficient comprehension estimated as high as 5-10%.

More apparent in older children.
9. Disabilities related to comprehension are related to oral language.

“The comprehension deficit experienced by the poor comprehender is clearly not specific to reading, but rather represents a general language comprehension limitation.”

- Stothard & Hulme, 1996
13 higher-SES children (professional)

23 middle/lower-SES children (working class)

6 welfare children

Cumulative Vocabulary words

Age of child in months

Hart & Risley, 1995
Students do not acquire the ability to search for deeper meaning by osmosis. Teachers must structure opportunities for children to learn how to analyze and think about what they have read.” (Knapp et al., 1995)
10. Reading Fluency Disabilities

- Rate deficit in children who are accurate word readers - often after intervention
- Related to poor automaticity of word reading skills
- Need to consolidate code and practice reading
Table 3

<table>
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<th>%</th>
<th>Independent Reading Minutes Per Day</th>
<th>Words Read Per Year</th>
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Variation in Amount of Independent Reading
Older Federal Initiatives Have Not Proven effective

- Title 1 shows efficacy only in school reform (Success for All), curriculum reform (Project Follow Through), and tutorial models, but accountability poor.
- Special education demonstrably ineffective for children with reading difficulties.
Newer Federal Initiatives

- No Child Left Behind; Reading First & Early Reading First
- IDEA 2004’s Response to Intervention (RTI)

The key is instruction, first in the classroom, then more intensely based on assessments of progress.
Thank You

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