Prevention and Remediation of Reading and Learning 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
Word Level Reading Disability

Most common and best understood form of LD (Dyslexia)

<table>
<thead>
<tr>
<th>Phonological Awareness</th>
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<tr>
<td>Rapid Naming</td>
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<tr>
<td>Phonological (Working) Memory</td>
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<tr>
<td>Largest single group of students in special education</td>
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Dyslexia is a specific learning disability that is neurological in origin. It is characterized by difficulties with accurate and/or fluent word recognition and by poor spelling and decoding abilities. These difficulties typically result from a deficit in the phonological component of language that is often unexpected in relation to cognitive abilities and the provision of effective classroom instruction. Secondary consequences may include problems in reading comprehension and reduced reading experience that can impede growth of vocabulary and background knowledge. (IDA, 2002)
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
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)
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: Safe & painless
Non-invasive
Detects small biomagnetic 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

<table>
<thead>
<tr>
<th>Child</th>
<th>Gender</th>
<th>(years/mo Age)</th>
<th>WJ-III pre (%)</th>
<th>WJ-III post (%)</th>
<th>IQ</th>
<th>Medication</th>
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<tr>
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<td>13</td>
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<tr>
<td>8</td>
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<td>17</td>
<td>1</td>
<td>45</td>
<td>102</td>
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At Risk Reader

Kindergarten

First Grade

(Simos et al., 2006)
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.
Important Research Findings

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
(Torgesen et al., 2001)

The graph shows the reading standard scores over time. It includes pre-pretest, pretest, posttest, 1 year post intervention, and 2 years post intervention. The x-axis represents months, and the y-axis represents reading standard scores. The graph indicates an improvement in reading scores after entering special education intervention.
Reading rate remained quite impaired

Accuracy: 91%
Rate: 72%

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)
### Core Sample for Mathes et al.

#### Children
- sampled across 2 years
- 300 At-Risk Readers identified with the Texas Primary Reading Inventory - assigned randomly to intervention.
- 100 Typically Developing Readers

#### Teachers
- 6 Intervention (3 Proactive & 3 Responsive)
- 30 General Education 1st-grade Teachers

#### Schools
- 6 non-Title 1 elementary schools (large urban school district with aggressive, long-term reading initiative)
The Interventions

Enhanced Classroom Instruction

- All children identified as at-risk by principal, teachers, and parents
- Progress monitored with feedback to principal, teachers, and parents (oral reading probes every 3 weeks)
- Professional development of classroom teachers in strategies for accommodating academic diversity and linking assessment to instructional planning for struggling readers
Comparison of Two Interventions

Proactive and Responsive

- 40 minutes, 5 days per week, all school year (30 weeks)
- 1:3 teacher-student ratio
- Taught by certified teachers who are school employees, but trained and supervised by researchers
- Provided in addition to enhanced classroom instruction
Proactive Intervention

- Explicit instruction in synthetic phonics, with emphasis on fluency.
- Integrates decoding, fluency, and comprehension strategies.
- 100% decodable text.
- Carefully constructed scope and sequence designed to prevent possible confusions.
- Every activity taught to 100% mastery everyday.
Responsive Intervention

- Explicit instruction in synthetic phonics & analogy phonics.
- Teaches decoding, using the alphabetic principle, fluency, & comprehension strategies in the context of reading and writing.
- No pre-determined scope and sequence.
- Teachers respond to student needs as they are observed.
- Leveled text not phonetically decodable.
The Responsive Intervention

- **Fluency Work** (Repeated Reading) and Assessment: 8-10 minutes
- **Word Work**: 10-12 Minutes
- **Supported Reading**: 10-12 Minutes
- **Supported Writing**: 8-10 Minutes
Predicted growth in CMERS by group
### A Widely Proposed Model

<table>
<thead>
<tr>
<th>Level 1: Primary Intervention</th>
<th>Enhanced general education classroom instruction (90 min minimum).</th>
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<tbody>
<tr>
<td>If progress is inadequate,</td>
<td>move to next level.</td>
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**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.
Early Intervention Reduces the At-Risk Population

- Primary alone: 5-7%
- Secondary alone: 2-6%
- Primary and Secondary: .01% to < 2%
- Tertiary: ??
9. 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
## 10. Reading Comprehension Disabilities

<table>
<thead>
<tr>
<th>Most children with word level disorders have comprehension problems.</th>
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<tbody>
<tr>
<td>Subset with intact word recognition and deficient comprehension estimated as high as 5-10%.</td>
</tr>
<tr>
<td>More apparent in older children.</td>
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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
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)
Reading Improvement is a Systemic Undertaking

PELP Coherence Framework
The Kennewick, WA Success Story: Reading Improvement Requires...

- Data: good assessments—benchmark and normative—and expert use of the data
- Increased direct instructional time; additional time for those behind
- Quality instruction in small, fluid, skill groups
- Targeted accelerated growth; knowledgeable reading specialists

Fielding, Kerr, Rosier, 2007
Instructional leadership at Kennewick

- Instructional conferences for all administrators (viewing videotaped lessons)
- Learning walks (to observe lesson purpose and rigor and student engagement; debrief)
- The two-ten goal (administrators spend 2 hrs/day or 10 hrs/week on instructionally focused activities)
- Literacy coaches at middle and high school (meet weekly with principal to plan instruction & PD; confer regularly with teachers)
Initial status + Growth = Outcome

- Correlation of initial achievement and ending achievement is .83-.90.
- Students who start ahead, stay ahead; students who start behind, stay behind.
- Schools don’t create the achievement gap; they inherit it.
13 higher-SES children (professional)

23 middle/lower-SES children (working class)

6 welfare children

Hart & Risley, 1995
Language Experience

Age of child in months

Estimated cumulative words addressed to child

Professional

Working-class

Welfare

Hart & Risley, 1995
<table>
<thead>
<tr>
<th>%</th>
<th>Independent Reading</th>
<th>Words Read Per Minutes Per Day</th>
<th>Words Read Per Year</th>
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<tbody>
<tr>
<td>98</td>
<td>65.0</td>
<td>4,358,000</td>
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</tr>
<tr>
<td>90</td>
<td>21.1</td>
<td>1,823,000</td>
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<tr>
<td>80</td>
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Variation in Amount of Independent Reading

(Cunningham & Stanovich, 1998, adapted from Anderson, Wilson, & Fielding, 1988)
Early Learning is Crucial

- Narrowing the achievement gap before kindergarten is a powerful, proactive, and doable task.
- Build oral language and literacy development into pre-K classes.
- Have parents read to their children 20 min. a day to expose them to rare vocabulary, complex syntax, and rich discussion.
Thank You

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