The Linguistic Basis of Reading Disabilities

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(Perfetti, 1997)
Learning to read entails...

• Normally developed language skills
• Knowledge of phonological structures
• Knowledge of how written units connect with spoken units (alphabetic principle)
• Phonological recoding and fluency
• Print exposure
Phonological (phonemic) awareness

- Children’s knowledge of the internal sound structures of spoken words
- Correlational AND causal connection to reading success
- Becomes reciprocal with reading
- Dialect differences fade with orthographic experience
- Strongest predictor of reading success, more than IQ
Phonological recoding...

- Recodings of spellings into pronunciations
- Main mechanism for word-specific learning (self-teaching model)
- Allows words to move from a functional to autonomous lexicon; with practice, words become high frequency, “sight”, automatic
“The act of reading a text is like playing music and listening to it at the same time”

Margaret Atwood (2002), “Negotiating with the Dead”
Comprehension

Application to written text of:
- nonlinguistic (conceptual) knowledge
- general language comprehension skills

Reading comprehension approaches listening comprehension as printed word identification is mastered
Skilled readers

- Process all the letters in a word during word identification
- Activate phonological codes early in eye fixations
- Use (a) simple comprehension procedures linked to word processing and syntax, and (b) more complex knowledge-driven processes
The Reading Pillar

Skilled Reading

Fluency

Comprehension

Word Recognition

Emergent Reading

Print Awareness & Letter Knowledge

Motivation to Read

Oral Language including Phonological Awareness

Speed and ease of reading with comprehension

Conceptual Knowledge/vocabulary

Strategic processing of text

Decoding using alphabetic principle

Decoding using other cues

Sight Recognition

(NRC, 1998)
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)
Dyslexia

- Evidence for phonological processing deficit with or without deficits in speech perception or auditory processing; may have less impact on readers of shallow orthographies (e.g., Italian). Grain size matters!
- May have multiple causes; co-morbidity common
- Intervention requires PA training, explicit phonics & spelling, decodable texts
Seidenberg & McClelland’s (1989) Model
The Harm & Seidenberg 1999 Model of Reading

Begin by modeling pre-literate phonological knowledge that children have

Can vary the strength and consistency of this knowledge

... and simulate the different degrees of phonological ability children bring to bear on learning to read
Reading Uses this Phonological Knowledge

The model must map print onto this structured phonological representation to read aloud.

The nature of the phonological representations influences what is learned during reading.

Core result: the phonologically impaired model learns differently.
Analysis of the Model

The core impairment is in phonology

... But leads to poor representations between spelling and sound

So effective interventions must target the relationship between spelling and sound
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
- Relay station; Cross-modality integration
- Phonological processing: articulatory mapping
- Graphemic analysis
What’s Happening in the Brain?
# Magnetic Source Imaging

**Andy Papanicolaou & Akis Simos**

- Safe & painless
- Non-invasive
- Detects small biomagnetic brain signals
- Provides real-time information about which brain areas are active and when during task performance
Early Detection of Aberrant Brain Activation Profiles for Reading

N = 45 children 6 yrs old

Simos et al., J Child Neurol, 2002
**Multi- Tiered Reading Instruction**

<table>
<thead>
<tr>
<th>If progress is inadequate, move to next level.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1: Primary Intervention</td>
</tr>
<tr>
<td>Enhanced general education classroom instruction (90 min, uninterrupted).</td>
</tr>
<tr>
<td>Level 2: Secondary Intervention</td>
</tr>
<tr>
<td>Child receives more intense instruction in general education in small groups (30 min).</td>
</tr>
<tr>
<td>Level 3: Tertiary</td>
</tr>
<tr>
<td>Intervention increases in intensity and duration; remedial, small groups (30+ min.)</td>
</tr>
</tbody>
</table>
Multi-tiered Instruction Can Reduce the Number of At-Risk Students

- Primary alone: 5-7%
- Secondary alone: 2-6%
- Both primary and secondary: <2%?
- Tertiary after two doses: ?????????

What happens if we layer instruction??
Implementing 3 Tier Models

• Enhanced core reading instruction is the key
• Primary model: begins in the classroom with professional development, assessment, and better materials; alternatives like PALS underutilized
• Screening, diagnostic assessments, and progress monitoring must be in place
• Goal is differentiated instruction and monitoring response to instruction
What Is Measured Can Be Managed

1. Screening
   - Identifies success

2. Diagnosis
   - Validates need for instructional support
   - Guides classroom instruction & support

3. Progress Monitoring
   - Determines student progress toward benchmarks

4. Outcome Assessments
   - Measures significant gains or losses in student performance
Valid & reliable predictors of risk for reading difficulty are:

- Print concepts and letter names (pre-K)
- Phonological awareness and letter sounds (K)
- Rapid naming of letters (end of K to early G1)
- Word recognition (G1 and beyond)
- [Vocabulary and phonological memory within RD]

(Fletcher et al., 2002; Scarsborough, 1998; Schatschneider et al., 2002; Torgesen, 2002)
Converging Evidence on Assessment

The most cost-effective early intervention is prevention—prevention in the form of differentiated classroom instruction.

Therefore

We need to assist teachers in translating results of early reading assessment to small-group instruction

(Snow et al., 1998)
Converging Evidence on Intervention

- Small-group intervention is just as effective as 1:1 intervention (Elbaum et al., 2000).

- Content is the same as for effective classroom intervention: explicit instruction in the alphabetic principle, reading for meaning and opportunities to learn (Foorman & Torgesen, 2001).
Assessment-Driven Early Instruction

- Small-group lessons
- Systematic/explicit plan for at-risk readers
- Skills not taught in isolation; integrated with total reading & writing program
- Monitor progress
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)
Home & School experiences: ages 3-6
Skills developed: ages 3-6
School performance

Literacy
- Print focus
- Understanding literacy
- Kindergarten and first grade reading

Conversation
- Extended discourse forms and nonfamiliar audiences
- Conversational language
- Instruction and Practice in reading
- Decontextualized language
- Reading comprehension In Grade 4

(Snow, 1991)
Hart & Risley, 1995

- 13 higher-SES children (professional)
- 23 middle/lower-SES children (working class)
- 6 welfare children
Quality Teacher Talk
(Snow et al., 2007)

• Rare words
• Ability to listen to children and to extend their comments
• Tendency to engage children in cognitively challenging talk
• Promotes emergent literacy & vocabulary & literacy success in middle grades
<table>
<thead>
<tr>
<th>%</th>
<th>Independent Reading</th>
<th>Words Read Per Year</th>
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<tbody>
<tr>
<td></td>
<td>Minutes Per Day</td>
<td></td>
</tr>
<tr>
<td>98</td>
<td>65.0</td>
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<td>90</td>
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<td>80</td>
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<td>50</td>
<td>4.6</td>
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</tr>
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<td>8,000</td>
</tr>
<tr>
<td>2</td>
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</table>

Variation in Amount of Independent Reading

(Cunningham & Stanovich, 1998, adapted from Anderson, Wilson, & Fielding, 1988)
Is Literacy Enough? (Snow et al., 2007)

For adolescents, oral language and literacy skills need to be adequate, but also need:

- Caring adult(s) at home
- Caring adults at school who provide guidance about how to meet goals (often need smaller school)
- Minimal risk: Not many school transitions; minimal family disturbances.
What is Reading Comprehension?

• “the process of simultaneously extracting and constructing meaning through interaction and involvement with written language” (RAND, 2002, p. 11)

• “Reading is an active and complex process that involves
  – Understanding written text
  – Developing and interpreting meaning; and
  – Using meaning as appropriate to type of text, purpose, and situation” (NAEP Framework, 2009)
A heuristic for thinking about reading comprehension (Sweet & Snow, 2003).
What Makes a Text Difficult?
Components of Reading Comprehension (Perfetti, 1999)

- **Comprehension Processes**
  - Situation Model
  - Text Representation
  - Parser

- **General Knowledge**
  - Linguistic System
    - Phonology
    - Syntax
    - Morphology

- **Meaning and Form Selection**
  - Lexicon
    - Meaning
    - Morphology
    - Syntax

- **Orthography**
  - Mapping to phonology

- **Visual Input**

- **Inferences**

- **Word Representation**

- **Orthographic Units**

- **Phonological Units**

- **Word Identification**
From Barbara Tuckman’s *The Zimmerman Telegram*…

The first message of the morning watch plopped out of the pneumatic tube into a wire basket with no more premonitory rattle than usual. The duty officer at the British Navel Intelligence twisted open the cartridge and examined the German wireless intercept it contained without noting anything of unusual significance. When a glance showed him that the message was in non-navel code, he sent it in to the Political Section in the inner room and thought no more about it. The date was January 17, 1917, past the halfway mark of a war that had already ground through thirty months of reckless carnage and no gain.
What Makes This Text Difficult?

- Consider the text type and structure
- Consider prior knowledge
- Consider the vocabulary
- Consider the discourse features—linguistic markers for coherence, coreference, deixis
- Consider the inferences needed
Instructional Considerations

• Text Type/Structure
  – persuasive text
    • anti-war sentiment, “thirty months of reckless carnage and no gain”
    • indictment of war bureaucracy
  – narrative structure
  – historical non-fiction

• Prior Knowledge
  – World War I
    • text references: war, 1917, British, German, duty officer
  – early 20th century communications
    • text references: telegram, pneumatic tube, wire basket, wireless intercept
  – Zimmerman telegram
    • text references: German wireless, non-naval code
"We intend to begin on the first of February unrestricted submarine warfare. We shall endeavor in spite of this to keep the United States of America neutral. In the event of this not succeeding, we make Mexico a proposal of alliance on the following basis: make war together, make peace together, generous financial support and an understanding on our part that Mexico is to reconquer the lost territory in Texas, New Mexico, and Arizona. The settlement in detail is left to you. You will inform the President of the above most secretly as soon as the outbreak of war with the United States of America is certain and add the suggestion that he should, on his own initiative, invite Japan to immediate adherence and at the same time mediate between Japan and ourselves. Please call the President's attention to the fact that the ruthless employment of our submarines now offers the prospect of compelling England in a few months to make peace." Signed, ZIRNHENN.
Instructional Considerations (continued)

- **Vocabulary**
  - academic language
    - examined, significance, “ground through”
  - generative words
    - premonitory, carnage, intercept
  - Tier 3 vocabulary (military domain)
    - “morning watch,” non-naval code, German wireless, pneumatic tube

- **Linguistic Markers (Coherence Relations)**
  - pronouns
    - duty officer = he, him
  - co-references
    - German wireless intercept = the message
  - deixis
    - “in the inner room”
  - chronology
    - “When a glance showed him that the message was in non-naval code,…”
Situation Model  (Kintsch & Rawson, 2005)

The situation model for the Tuchman text requires knowledge of:

a) The war Britain & Germany were engaged in during early 1917

b) The ability to draw inferences about the relevance of a German message intercepted by the British and about the author’s anti-war sentiment.
Instructional Delivery

• Model strategies (activating background knowledge, questioning, searching for information, summarizing, organizing graphically, identifying story structure (e.g., Guthrie et al., 2004; Brown, Pressley et al., 1996)

• Keep the focus on the meaning of the text through high quality discussion.

• Model “thinking like an historian” (e.g., sourcing) to provide a purpose for reading (Biancarosa & Snow, 2004).
Children Must be *Taught* to Read!

We are all born dyslexic--the difference among us is that some of us are easy to cure and others more difficult.

-Liberman, 1996