Early Identification and Intervention of Language-Based Reading Disabilities

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Simple View of Reading
(Gough & Tunmer, 1986; Hoover & Gough, 1990)

![Diagram showing the Simple View of Reading]

IDA Definition of Dyslexia (2003)

Dyslexia is a specific learning disability that is neurobiological 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 other 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.

Neurological Basis

- Most evidence of brain differences involves individuals who already have RD
- Are these differences the cause or consequence of RD?
- Some evidence of aberrant structure or function
- Some evidence of differences prior to reading instruction
- Are these bio-markers for dyslexia?

Genetic Basis

- Runs in families. About 50% of children with a parent or sibling with dyslexia will have dyslexia themselves
- Not a single gene but a complex interplay of multiple genes
- Currently 20 or more genes or gene regions have been found to be associated with dyslexia
Genetic Basis

- Impact of family history is continuous rather than discrete
- Non-affected siblings often have mild reading problems and associated deficits

Phonological Processing Deficit

Phonological Core Deficit

A single deficit in phonology cannot account for the occurrence of dyslexia

- Not all those with dyslexia have a phonological deficit
- Not all those with a phonological deficit develop dyslexia

Catts, McIlraith, Bridges, & Nielsen (2017)

- From a large sample of kindergarten children, we identified 63 children with severe deficits in phonological awareness (< 10th percentile on battery of PA tests)
- Assessed their word reading ability in 2nd grade and identified those with dyslexia

N=63

N=25 (no other problems)

Multifactorial Causal Models

- Multiple causal factors interact to result in dyslexia
- Phonological processing deficit may be a primary cause but other factors increase or decrease the likelihood of dyslexia
- Better explains the complex interaction between environmental factors and the multiple genes involved
- Probabilistic rather than deterministic

Probabilistic Model of Dyslexia

- Phonological deficits and other risk factors may not be a sufficient cause a reading disability
- Rather they increase the risk of such a disability
- May be additive or multiplicative

Pennington, 2006; Catts & Adlof, 2011; Catts et al., 2017; Snowling, 2012; Van Bergen et al., 2014
Additional risk factors

- Oral language impairments
  - children with dyslexia often have history of language problems
    Orton, 1925; Scarborough, 1991; Catts et al., 1999; Snowling et al. 2019
  - children with early language problems often have dyslexia; late talkers; SLI/DLD
    Catts et al. 2002; Lyytinen et al. 2005; Menyuk et al., 1993; Snowling et al. 2019

- Family studies show that many unaffected children have phonological deficits
  - but they don't have language deficits like their affected siblings
  - Most significant when these deficits were apparent at the beginning of school (persistent or late-emerging deficits)
    Moll, Loff, & Snowling, 2013; Snowling et al. 2003; Snowling et al., 2015; van Bergen et al., 2011

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  - but they don't have language deficits like their affected siblings
  - Most significant when these deficits were apparent at the beginning of school (persistent or late-emerging deficits)

Specific Language Impairment (SLI)

- A disorder that involves delayed onset and protracted development of language (including morphosyntax, semantics, phonology, or pragmatics) relative to other areas of development
  - Generally identifiable during the preschool years (3 to 5 years of age)  Tager-Flusber & Cooper (1999)
  - 30-50% may also have dyslexia (Catts et al. 2005)

Exclusionary Criteria?

- Some have suggested that children with word reading problems and general language problems not be identified as having dyslexia (e.g., Tunmer & Greaney, 2010).
- Excluded on basis of poor listening comprehension
- Parsimony would suggest this is not the best option
- Children with word reading problems who do and do not have accompanying language problems both have underlying phonological deficits (Catts et al., 2005; Snowling et al. 2019)
- Approach for intervening on the word reading problems of these groups would be the same
- If we excluded these children, would we not have to exclude children with other comorbid conditions, e.g. ADHD.
- Better to recognize that dyslexia can co-occur with other developmental disabilities

Additional risk factors

- Family history
- Attention problems
- Visual deficits
- Processing speed
- Trauma/stress
- Language differences
**Additional risk factors**

- Family history
- Attention problems
- Visual deficits
- Processing speed
- Trauma/stress
- Language differences

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**Cumulative Risk and Protection Model**

Catts & Petscher, 2018

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**Mindset: The New Psychology of Success (Dweck, 2006)**

Education Week

September 23, 2015

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**Grit**

- Tenacity, perseverance, and the ability to never give up; mental toughness in face of challenges
- Related to academic achievement and reading ability

Eklund, Torppa, Lyytinen, 2013; Hirvonen et al., 2010; Stephenson et al., 2008; Petscher et al., 2017

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**Affective disorder**

- Child experiences difficulties learning to read
- Other children seem to be learning easily and it seems important for school
- Child and teacher recognizes child has a problem
- Child develops negative attitude toward reading – it is an aversive and frustrating task
- Flight-fight-freeze response kicks in – avoids, acts out, or freezes up when forced to read
- Accused of not trying hard enough
- Others think child is not very smart
- Child begins to think so as well

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**Don’t wait**

IQ-Achievement Discrepancy

- IQ has only a low-moderate relationship to word reading ability
- No differences in behavioral deficits and neurological correlates of discrepant vs. non-discrepant groups of children
- IQ is not predictive of response to intervention or long-term outcome
- Delays identification of the problem
- Limits availability of services for children with lower IQs

Benchmark & Progress Monitoring Tools

- DIBELS Next
- AimswebPlus
- Formative Assessment System for Teachers (FAST early reading)
- Lexia RAPID
- Istation
- STAR Early Reading


Clinical Decision Model

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dyslexia</td>
<td>True Positive</td>
<td>False Positive</td>
</tr>
<tr>
<td>Typical</td>
<td>False Negative</td>
<td>True Negative</td>
</tr>
</tbody>
</table>

Classification Calculator

- Correlation (r) = 0.70
- Sensitivity = 0.90
- False positive = 0.64
- Sensitivity = 0.80
- False positive = 0.57

Classification Calculator

- Correlation (r) = 0.90
- Sensitivity = 0.90
- False positive = 0.40
- Sensitivity = 0.80
- False positive = 0.29

Screening Measures: Checklists

- The Shaywitz DyslexiaScreen™
- Early Identification Checklist (Catts, 1997)
Early Identification Checklist*

This checklist is designed to aid in the identification of kindergarten children who are at risk for language-based reading problems. Carefully consider if these descriptors match the behavior or history of the child under consideration:

- has family history of dyslexia
- has history of speech and language problems
- does not appreciate that words start/end with the same sound
- has difficulty retelling the months of the year
- has problems pronouncing some words (says "aminal" for animal; "feniman" for feminine)
- shows difficulties remembering instructions or directions
- confuses similar sounding words (e.g., saying "The Entire State Building is in New York")
- does not easily learn or remember the names of classmates
- speech is often hesitant, filled with pauses or vocalizations (e.g., "um," "you know")
- relates stories in a disorganized or incomplete manner
- gives up easily when trying to sound out or spell words


Dyslexia Screening Tests

- Dyslexia Screening Test-Junior
- Predictive Assessment of Reading (PAR)
- Boston Early Language and Literacy Assessment/Screening System (BELLAS)
- Dyslexia Quest Screener
- KTEA-3 Dyslexia Index
- WIAT-III Dyslexia Index

CZI New Generation Screener

- Game-based
- Computer adaptive
- Multiple indicators
- Psycho-social indicators
- Trauma-informed
- Sensitive to dialect
- Reading & language
- Calculate risk probability

Response to Intervention

- Intervention is an integral part of early identification
- Best evidence that a child has a reading problem, is failure to learn to read when given appropriate and effective reading instruction
- Avoid “wait to fail” within RTI
- Continue to monitor progress

Early Intervention

- Systematic phonics based intervention
  - enhancing phonological awareness
  - teaching alphabetic principle
  - practice and feedback with word reading
  - rich literacy experiences

Early Intervention
Say it and Move it

Poor Comprehenders

Language problems

• Some poor comprehenders have severe language deficits (SLI)
• Most have more limited language problems (Catts, Adlof, & Weismer, 2005; Nation et al. 2010) – far less severe than comprehension deficits

Catts, Adlof, & Weismer (2006)

• 57 poor comprehenders (PC)
• 27 poor decoders (PD)
• 98 typical readers

13-14 years of age

• Phonological processing
• Vocabulary, grammar, & narrative discourse
Complexities of Reading

- Reading ability/disability is a more fluid concept than typically thought
- Given different combinations of text and activity, the best reader can be expected to perform quite poorly and the poorest reader quite well
- Because of the interactive nature of the process, we are unable to reduce RC performance down to a single score
- It’s not a single thing

Poor Comprehenders

- About 1/3 met criteria for LI (also see Nation et al., 2004)
- Parents reported that only 18% had received speech and language services
- Must be more to language comprehension than basic language abilities

RAND Reading Study Group (2002)

RAND Model of Reading Comprehension

Reading Comprehension Tests

- Examined how 4 commonly used standardized reading comprehension tests compared with each other (QRI, GORT-3, WJPC-3, PIAT)
- Bivariate correlations ranged from .45-.68 (median = .54)
- Overlap in diagnosis was only 43%
LARRC Study

- Approximately 700 3rd grade children
- Presented with 8 passages adapted from QRI
- Read 4, Listened to 4
- 2 narrative and 2 expository passages in each condition
- Answered 5-8 open-ended questions

Bivariate Correlations between Passages (Percent Correct)

<table>
<thead>
<tr>
<th></th>
<th>RC.1</th>
<th>RC.2</th>
<th>RC.3</th>
<th>RC.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>RC.1 The Trip to the Zoo</td>
<td>.434</td>
<td>.436</td>
<td>.404</td>
<td></td>
</tr>
<tr>
<td>RC.2 Bomb Beetle</td>
<td>.417</td>
<td>.474</td>
<td>.466</td>
<td></td>
</tr>
<tr>
<td>RC.3 The Horned Frog</td>
<td>.591</td>
<td>.604</td>
<td>.603</td>
<td></td>
</tr>
<tr>
<td>RC.4 A New Friend from Europe</td>
<td>.438</td>
<td></td>
<td></td>
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</tbody>
</table>

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</tr>
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<tbody>
<tr>
<td>LC.1 The Friend</td>
<td>.498</td>
<td>.467</td>
<td>.370</td>
<td></td>
</tr>
<tr>
<td>LC.2 Puffin</td>
<td>.411</td>
<td>.385</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LC.3 Windshield Wiper</td>
<td>.418</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LC.4 A Special Birthday for Rosa</td>
<td></td>
<td></td>
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</tbody>
</table>

Predicting Reading Comprehension Over Time: Third through Fifth Grade Children (Lonigan, 2015)

Implications

- Stop measuring comprehension as if it is a single thing
- Stop relying on “RC tests” to judge student or school achievement
- Accept the multidimensional nature of reading comprehension and examine more specific educationally-relevant activities involving comprehension
Assessment

- Assess children's abilities on specific comprehension text-tasks scenarios
- Select educationally relevant comprehension activities
- Assess whether a student can evaluate an argument concerning a social or health issue
- Identify author's perspective in a history lesson
- Discuss character's motivation and impact on actions taken
- Compare and contrast findings from two related science articles

Intervention

- Interventions should include the specific strategies and knowledge necessary to successfully complete a task-test scenario
- Look for transfer to other texts or similar tasks
- “Near” vs. “far transfer”

Knowledge

➢ Provides the reader with guidelines by which to search and organize information in the text
➢ Provides a mental space to put new information
➢ Allows for inference making to fill in the gaps in the text
➢ Provides a means for remembering what has been read
➢ Can be especially beneficial to struggling readers

Knowledge Gap

- Schools have dramatically reduced time spent teaching subject matters like science and social studies in lieu of generic reading comprehension instruction
- Teach strategies like “finding the main idea” or “summarization.”
- Students do read subject matter material within RC lessons – but it is one subject one day and another the next – no time to build knowledge
- Skills may help but knowledge is the building block of our mental models

NAEP Reading Topics

<table>
<thead>
<tr>
<th>4th Grade</th>
<th>8th Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue crabs</td>
<td>Oregon trail</td>
</tr>
<tr>
<td>Brazilian beetles</td>
<td>Great white shark</td>
</tr>
<tr>
<td>Antarctica penguins</td>
<td>Anasazi Indians</td>
</tr>
<tr>
<td>Ellis Island</td>
<td>19th Amendment</td>
</tr>
<tr>
<td>Woman astronaut</td>
<td>Robots</td>
</tr>
<tr>
<td>Telescopes and space</td>
<td>Can toads</td>
</tr>
<tr>
<td>Cultural stereotypes (N)</td>
<td>Bus schedules</td>
</tr>
<tr>
<td>Fishing with granddaddy (N)</td>
<td>Chinese Emperor (N)</td>
</tr>
</tbody>
</table>

*Reading tests are knowledge tests in disguise* (Willingham, 2015)

Knowledge Matters

http://www.knowledgematterscampaign.org

- We don’t have a reading crisis, we have a knowledge crisis – knowledge is literacy
- Daniel Willingham -Teaching content is teaching reading
  https://www.youtube.com/watch?v=RiPiJdxqEc
- Reading comprehension is not a skill but a condition you create (Robert Pondiscio)
Louisiana proposal

• Educators in LA have introduced a proposal to replace LEAP reading assessment with periodic reading & writing assessments on social studies subject matter directly taught to students
• Pilot project in 5 districts, but may be the first wave of a change in reading assessment.


Word Reading

• Problems in reading comprehension can be the result of poor word reading accuracy and/or fluency
• Systematic phonics instruction has been shown to not only improve word reading but also comprehension (NRP, 2000)

Academic language

• Discipline-general language knowledge and skills that cut across content areas and allow students to communicate about and gain discipline-specific knowledge
  - tier 2 words (analyze, evidently, whereas)
  - morphological knowledge needed for multisyllabic words
  - complex syntax (expanded NP, subordination)
  - cohesive devices to tie together text
  - discourse structures (argumentative text, essay)

Uccelli, Phillips Galloway, Barr, Meneses, & Dobbs (RRQ, 2015)

Academic Vocabulary

• Tier 2 words (analyze, enormous, evidently)
  - context of storybooks or text
  - teach synonyms and antonyms
  - provide opportunity to forget and relearn

• Morphology (include, inclusion, inclusive)
  - unpacking complex words
  - learn how morphemes work

Bringing Word to Life: Robust Vocabulary Instruction
(Beck, McKeown, & Kucan, 2013)

Unlocking Literacy: 2nd Ed. (Henry, 2010)

Complex Syntax

• Unpacking of noun phrases
  - prepositional phrases
  - relative clauses
• Subordination
  – because, although, unless, even though, if, whenever, provided that, though, since, while, whereas

Cohesion

• Cohesive devices tie one portion of the text to another
  - enumeration (first, next, then)
  - anaphoric pronouns
  - repetition
  - synonyms
  - substitutions (e.g., some)
LARRC: Language and Reading Research Consortium

Institute of Education Sciences (Grant# R305F100002)

Investigators:
- Laura Justice (PI)
- Shelley Gray (Co-PI)
- Hugh Catts (Co-PI)
- Tiffany Hogan (Co-PI)
- Kate Cain (Co-PI)
- Ron Nelson
- Diane Nielsen
- Laila Restrepo
- Stephen Petrill
- J. M. Bovaird
- Richard Lomax
- Shayne Piasta
- Ann O'Connell
- Mindy Bridges
- Jill Pentimonti

LARRC:
- Reading Comprehension
- Vocabulary
- Syntax
- Discourse
- Inference Making
- Comprehension Monitoring
- Sight Word Decoding
- Phonological Awareness
- Working Memory

School-Wide Focus

- All school personnel need to be involved in promoting academic language
- Most are not trained in language instruction
- May require SLPs to provide guidance on how and what to teach

Reading Comprehension

“Thinking guided by print” (Perfetti, 85)

“Thinking with a book in one’s hand”

Word recognition + Thinking = RC

System 1
- automatic
- intuitive
- attention limited
- “seat of the pants”

System 2
- deliberate
- logical
- rational
- resource demanding

Standard of Coherence
van den Broek et al. (2011)

- One’s explicit or implicit criteria for how coherent one’s understanding should be
- Purpose of reading – gist or deep comprehension
- Motivation or interest in topic
- Grit and perseverance
- Fatigue
- Distractions
Reading Strategies

• Increases cognitive engagement
• Easily taught
• More is not always better

Comprehension as a skill

• Problem goes well beyond limited focus on knowledge
• Problem with the way we have conceptualized reading comprehension
• Conceived of reading comprehension as if it were a single ability or skill, like riding a bike

Strategy Instruction

• Comprehension monitoring
• Prediction
• Find the main idea
• Summarizing
• Paraphrasing
• Generating questions
• Inferencing
• Visualize
• Graphic organizer

Multidimensional Model

• Strategy instruction may have greater value when tied to the particular text-task situation
• Comprehension is more than knowledge acquisition/literature appreciation
• Students must do something with the knowledge

Comprehension

- Problem goes well beyond limited focus on knowledge
- Problem with the way we have conceptualized reading comprehension
- Conceived of reading comprehension as if it were a single ability or skill, like riding a bike

Argumentation

• Read two articles with contrasting viewpoints and write a reflective essay
  - Identify claim, argument, & counterargument; evaluate evidence; take a stance; check biases
  - teach specific to discipline

Reading Like an Historian

https://sheg.stanford.edu/history-lessons

• The Reading Like a Historian curriculum engages students in historical inquiry. Each lesson revolves around a central historical question and features a set of primary documents designed for groups of students with a range of reading skills.
• This curriculum teaches students how to investigate historical questions by employing reading strategies such as sourcing, contextualizing, corroborating, and close reading. Instead of memorizing historical facts, students evaluate the trustworthiness of multiple perspectives on historical issues and learn to make historical claims backed by documentary evidence. To learn more about how to use Reading Like a Historian lessons, watch this series of videos about how teachers use these materials in their classrooms.