Dyslexia: Part 2

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NICHD P50 HD52120

Learning Objective 2: Identify Problems with Common Approaches to Identification of Individuals with Dyslexia

Fundamental Problem

- Existing operational definitions of reading disability yield unstable phenotypes.
- Occurs for both traditional IQ-achievement discrepancy and RTI-based models.
- Represents weak link in the chain for research and detrimental for practice.

Study of Agreement and Stabilty for Alternative Definitions

- Waesche, Schatschneider, Maner, Ahmed, & Wagner (2011), *Journal of Learning Disabilities*, *44*, 296-307.

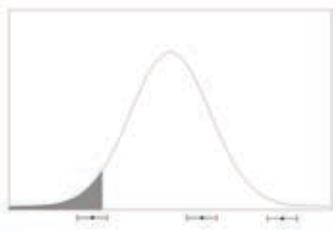
Agreement Rates for Alternative Definitions for 5th Percentile Level of Severity

- Discrepancy vs. RTI (DD) 31 percent
- Discrepancy vs. LA 32 percent

One-Year Stabilities for Alternative Definitions for 5th Percentile Level of Severity

- Discrepancy 24 percent
- RTI (DD) 34 percent
- LA (simple low ach.) 41 percent

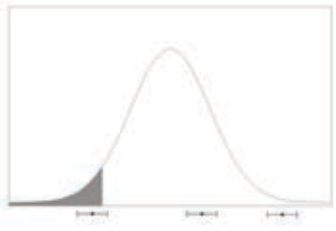
Explanation of Instability (e.g., Francis et al., 2005)



Testing the Explanation with a Counterintuitive Prediction

- Common sense would predict that there should be more agreement and stability for identification of profound reading impairments compared to more mild reading impairments.

Proposed Explanation of Instability Predicts the Opposite

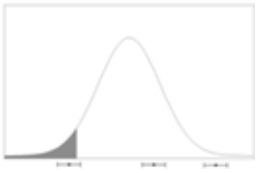


Counterintuitive Prediction Supported: 1-Year Stability Decreases with Increasing Severity

Degree of Impairment	Kappa	AFAS	Consistency
25th %-ile	.38	.37	.47
20th %-ile	.36	.32	.42
15th %-ile	.34	.28	.37
10th %-ile	.31	.23	.31
5th %-ile	.27	.18	.24
3rd %-ile	.23	.15	.21

Second Source of Support for Proposed Explanation of Instability

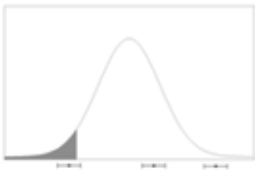
- Stability of classification should be greater for non-dyslexia than for dyslexia.



Combining Information to Better Identify Individuals with Dyslexia

Power of Combining Information

- More Information!
- Reduce error bars by looking at multiple indicators.
- Find ways to minimize or eliminate effect of cut-off.



What are the Basic Facts about Dyslexia We Discussed?

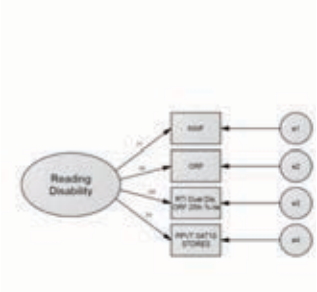
- 1. poor nonword decoding
- 2. impoverished sight-word vocabulary
- 3. phonological impairment
- 4. unresponsive to instruction/intervention
- 5. listening comprehension better than RC
- 6. familial risk for it
- 7. co-morbidities common (e.g., ADHD)
- 8. more common in males (2:1).

Constellation Approach to RD

- Addresses instability by considering more information (e.g., “constellation” of symptoms).
- By evaluating multiple symptoms, threshold for any one can be relaxed or eliminated by taking dimensional approach.
- Distinguishes causes, consequences, and correlates.

The Model

Four Symptom Constellation Model Implemented in Recent Study



Stability

- Consistency is defined as proportion of individuals identified in first grade who meet criteria in second grade.
- Low (.2 to .6) for various univariate models examined.

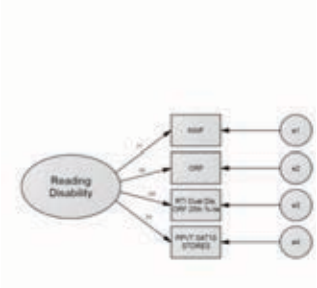
Consistency Values for Constellation Model

Number of Symptoms	Consistency Values
1 or more	.70
2 or more	.65
3 or more	.59
4 or more	.39

Consistency Values for Constellation Model

Number of Symptoms	Consistency Values
4 or more to at least 3 or more	.66
4 or more to at last 2 or more	.76
4 or more to at least 1 or more	.91

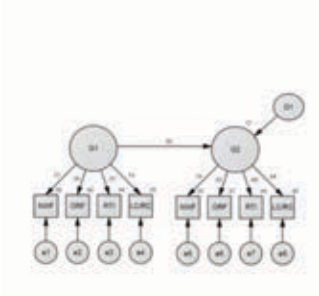
Implementing Constellation Model as a CFA



Model Fit

- Chi-Square (2) = 263.4 (*N* = 31,339)
- CFI = .99
- TLI = .97
- RMSEA = .065 (.058-.071)

One Year Stability of Reading Ability/Disability Construct



How Best to Combine Information for Predicting Reading Disability?

- A Bayesian approach provides flexibility to combine behavioral and neuro-biological variables in a single model.

Paying a Visit to Reverend Bayes

Nate Silver's fivethirtyeight.com

Examples of Using Bayes Theorem to Estimate Probability of RD

- Let's operationally define word-level RD as scoring at or below the 5th %-ile on a factor score representing the 4 behavioral symptoms (NWF, ORF, RTI, LC RC discrepant).

Male versus Female

- All we know is that you are male:
  - Chance of RD increases 5% to 7%.
- All we know if that you are female:
  - Chance of RD decreases from 5% to 3%.

Low Scores in Predictor Test Battery

- Score at or below 20th % ile on battery of first-grade reading predictors (unit weighted composite of NWF, ORF, RTI, LC RC discrepancy):
  - Chances of RD go from 5% to 15%.

Comorbid ADHD

- Chances of RD go from 5% to 19%.

Affected Parent?

- Chances of RD go from 5% to 26%.

Combinations

- ADHD and Male?
  - Chance of RD is 24%.
- ADHD, Male, and Affected Parent?
  - Chance of RD is 76%.
- ADHD, Male, Affected Parent, Low Scores on Predictor Battery?
  - Chance of RD is 92%!

Conclusions About Identification Problems

- 1. No single criterion (IQ-achievement discrepancy, RTI, or anything else) can provide reliable and valid identification.

Conclusions About Identification Problems

- 2. Using a theoretically-motivated constellation of symptoms is promising for better identification of individuals with dyslexia.

Conclusions About Identification Problems

- 3. A Bayesian approach can be used to extend the approach beyond behavioral measures.

Conclusions About Identification Problems

- 4. Approach is flexible. As individual-level neurobiological indicators come online, they can be incorporated.

Learning Objective 3: Identify Best Practices for Early, Reliable, and Valid Identification of Indviduals with Dyslexia

Best Practices

- 1. Rely on evaluation of multiple sources of information—no single criterion will be reliable or valid.
- What should you evaluate?

Targets Come From the Basic Facts about Dyslexia

- 1. nonword decoding
- 2. sight-word vocabulary
- 3. phonological processing
- 4. unresponsive to instruction/intervention
- 5. listening comprehension better than RC
- 6. family history of reading problems.
- 7. presence of inattention (ADHD)
- 8. gender.

Best Practices

- 2. Channel Reverend Bayes using your clinical judgment informed by data.
  - In the next few years, it may be possible to feed information into a Bayesian model and get probabilities out about:
    - Presence of dyslexia.
    - Likely benefit of intervention X.
    - Likely benefit of assistive technology.

Not All Indicators Will be Present

- 1. nonword decoding
- 2. sight-word vocabulary
- 3. phonological processing
- 4. unresponsive to instruction/intervention
- 5. listening comprehension better than RC
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Issues for Earlier Identification

- Old model: Learning to read began with formal instruction.

Issues for Earlier Identification

- Old model: Learning to read began with formal instruction.
- New model: Reading is the culmination of a known developmental trajectory. Rudimentary forms of literacy and language can be assessed that predict subsequent reading problems.

Example of Rudimentary Forms: Decoding

- No need to wait until decoding words and nonwords is firmly established.
- Letter name and letter sound knowledge are rudimentary forms that predict later decoding.

Example of Rudimentary Forms: Phonological Processing

- Prereaders are not able to do phonological tasks that require access to or manipulation of phonemes (e.g., say "bat" without /b/).
  - Can work with larger units.
- Phonological units from large to small:
  - Compound words; syllables; onset-rimes; individual phonemes; phonemes in consonant clusters.

Preschool Appropriate Phonological Awareness Item

- Preschool age children can do elision with larger units:
  - Say “starfish.”
  - Now say “starfish” without “star.”
  - “fish”

Cognitive Complexity Still Too Much for Some Young Children

- Examiner: “Say doorbell”
- Child: “doorbell”
- Examiner: “Now say doorbell without bell”
- Child: “Doorbell without bell”

Solution is to Rely More on Phonological Memory

- Recall that for preschool children, phonological awareness and phonological memory tasks measure nearly the same underlying ability.
- Nonword repetition is a cognitively simple task.

Learning Objective 4: Identify Best Practices for Prevention, Intervention, and Accommodation

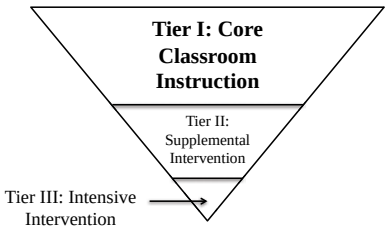
Prevention or Minimizing Severity of Unpreventable Dyslexia

- Early identification and intervention is key.
- Using Response to Intervention (RTI) or Multi-Tiered Systems of Support

Purpose

- School-wide system
- Prevention and intervention
- Ongoing assessment

Three-Tiered Models of RTI



Research

- Improved reading achievement with effective Tier I (Al Otaiba et al., 2011; Vaughn et al., 2008)
- Improved outcomes for students at-risk receiving Tier II (O'Connor et al., 2013; Gersten et al., 2009)
- Accelerated learning for students with severe difficulties receiving Tier III(Vaughn et al., 2009)
- Decreased numbers of students requiring evaluation (Bollman et al., 2007; VanDerHeyden et al., 2007)

Components of RTI

- Screening
- Scientifically-based reading research
  - Effective classroom instruction
  - Intervention supports increasing in intensity
- Data-based decision-making
- Identification of students with specialized needs, including dyslexia

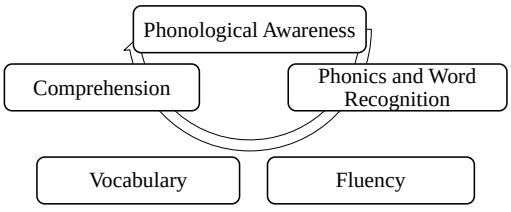
Tier I Purpose

- Foundation for successful RTI
- Effective, research-based instruction for all students
- Large majority of student needs met

Tier I Components

- Screening of all students
- Scientifically-based reading research focused on grade-specific reading standards across content areas
- Ongoing professional development

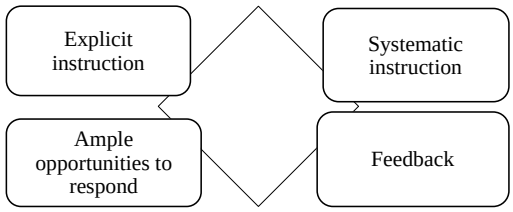
Essential Elements



Tier I Implementation

- How does it address the essential components? What do you need to know?
- What is the daily/weekly amount of time spent on each of the essential components? What do you need to know?

Effective Features



Data Use

- Planning instruction
- Differentiating instruction
- Flexible grouping
- Monitoring progress and mastery of grade level standards
- Determining learning supports and scaffolds

Professional Development

- Data Driven
  - Student
  - Implementation
  - Teacher needs
- Responsive and timely

Tier II Purpose

Target students identified as at-risk for or with reading difficulties

Accelerate learning

Tier II Components

Supplemental, small group instruction

Address major components of reading, build foundational skills

Systematic, highly explicit, highly interactive

Frequent, ongoing progress monitoring

Targeted, data-based decision making

Gersten et al., 2009

Tier III Purpose

Intensive intervention for students that do not demonstrate adequate response to Tier II intervention

Tier III

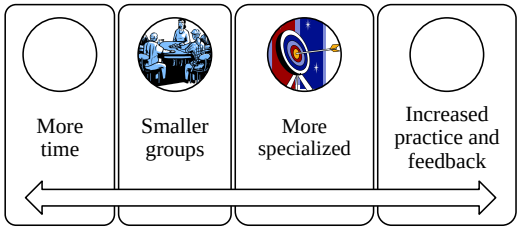
Provided to students who do not progress after a reasonable amount of time with the Tier 2 intervention

Focused, targeted, extended instruction with extensive practice and high-quality feedback

Ongoing analysis of student performance data

Gersten et al., 2009

Increasing intensity



So How Well Does it Work?

Recent Large-Scale Evaluation

- Evaluation of Response to Intervention Practices for Elementary School Reading
- Institute of Education Sciences (IES)
  - Research arm of US Department of Education
- National Center for Education Evaluation and Regional Assistance

Study Design

- Compared two samples of schools from 13 states.
  - Impact Sample—146 elementary schools with 3 or more years of experience implementing RTI approaches in reading.
  - Reference Sample—a representative sample of 100 elementary schools from same states.

3 Study Questions

- 1. How did impact and reference samples compare in prevalence of RTI practices?
- 2. How well did schools in impact sample place students in tiers as suggested by RTI models.
- 3. What were the impacts on student reading outcomes?

3 Study Questions

- 1. How did impact and reference samples compare in prevalence of RTI practices?
  - As expected, the percentage of schools reporting full implementation of RTI was higher for impact sample (86 percent) than reference sample (56 percent).

3 Study Questions

- 2. How well did schools in impact sample place students in tiers as suggested by RTI models.
  - Implementation of RTI in impact schools was good overall but with variability across schools.

3 Study Questions

- 3. What were the impacts on student reading outcomes?
  - Regression discontinuity design used. Students "on the bubble" or at edge for assignment to tier 2 or tier 3 services were randomly assigned to either move to the more intense tier or stay put.

Disconnect Between Prior Research and Implementation

- Two flavors of RTI: standard protocol and problem-solving consolation model.
  - Standard protocol requires higher levels of expertise in literacy and high fidelity of implementation.
  - Problem-solving approaches focus on problem-solving, in this case a reading problem.

Disconnect Between Prior Research and Implementation

- Research base relies mostly on standard protocol; problem-solving approach may be more popular in practice.
  - Case of Florida.

Fundamental Problems with Basic RTI Model?

- Although IQ-achievement criterion was criticized as wait to fail model, traditional RTI is also a wait to fail model and failure has to be documented.
  - Even students with clear evidence of severe impairment in reading have to fail through tiers 1 and 2.

Comparing "Traditional" and "Dynamic" RTI

- Al Otaiba, S., Connor, C. M., Folsom, J. S., Wanzek, J., Greulich, L., Schatschneider, C., & Wagner, R. K. (in press). To wait in tier 1 or intervene immediately: A randomized experiment examining first grade response to intervention (RTI) in reading. *Exceptional Children.*

Comparing “Traditional” and “Dynamic” RTI

- Students randomly assigned to dynamic RTI model outperformed students assigned to traditional RTI model.

So What Works?

- There are many dubious treatments for dyslexia.
- The standard to adopt is using evidenced-based interventions.

IES What Works Clearinghouse

- http://ies.ed.gov/ncee/wwc/

Summary

- 1. No single criterion (IQ-achievement discrepancy, RTI, or anything else) can provide reliable and valid identification

Summary

- 2. Using a theoretically-motivated constellation of symptoms is promising for better identification of individuals with dyslexia.
  - Channel your inner Bayes using your expertise and clinical judgment of the evidence.

Summary

- 3. For Multi-Tier RTI models:
  - Important to distinguish standard protocol and problem-solving models.
  - Dynamic models better than traditional ones.

Summary

- 4. Standard to adopt is use only evidenced-based interventions.
  - What Works Clearinghouse is good resource.

Questions or Comments?