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Texas Center *for* Learning Disabilities

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Overcoming Dyslexia: What We Know From Science

*Jack M. Fletcher, Ph.D.
Department of Psychology
University of Houston*

*jackfletcher@uh.edu
www.texasldcenter.org*

The Texas Center for Learning Disabilities (TCLD) investigates the classification, early intervention, and remediation of learning disabilities.



Word Level Reading Difficulties

Most common and best understood form of LD (Dyslexia)

- Largest single group of students in special education: almost 2/5 of all children identified for special education
- Many children not identified for special education have word level difficulties
- Addressed in IDEA as “basic reading” domain and often through 504
- Key to overcoming dyslexia is to prevent it through MTSS, with intensive remediation for inadequate responders



Important Research Findings

Dyslexia occurs primarily at the level of the single word and involves the ability to decode, and spell printed words in isolation (accurately and automatically). It leads to problems reading text but is not a text level disability.



Important Research Findings

Single word decoding problems in reading and spelling are strongly associated with problems segmenting words and syllables into phonemes.

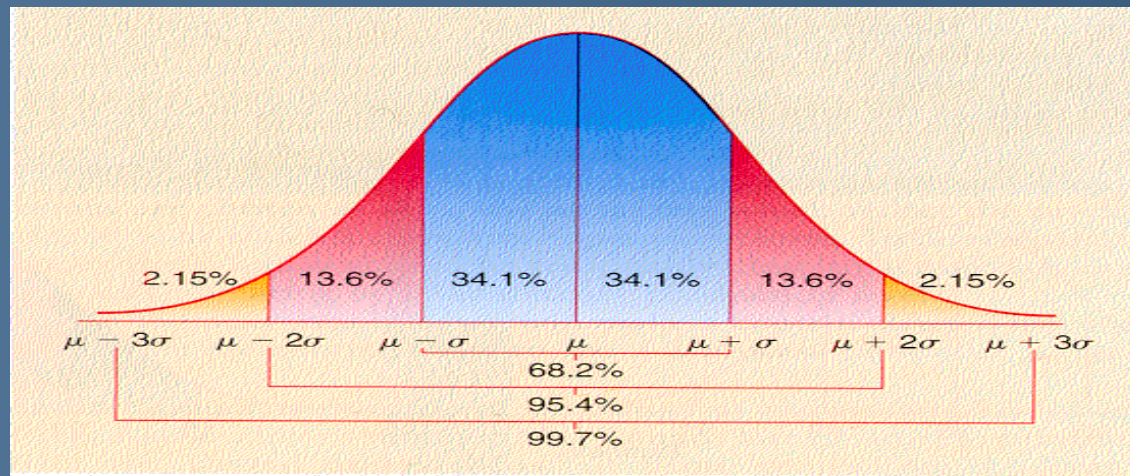


Alphabetic Principle

- Print represents speech through the alphabet or other visual symbol
- Regardless of surface appearance (orthography), words represent internal units based on sound (phonemes)
- In learning to read, the child makes explicit an implicit understanding that words have internal structures linked to sounds (phonological awareness)
- Reading is parasitic on language

Dyslexia- Prevalence Depends on the Threshold (Dimensional)

- Variation on normal development (like high blood pressure or obesity, not the flu or a broken leg)
- Caused and influenced by both genetic and environmental factors, including inadequate instruction



← Ease of Learning to Read →



Important Research Findings: Identification

Dyslexia is best identified through assessments of reading and spelling skills, and instructional response. Cannot be identified independently of instruction

IQ tests are not necessary (Dyslexia is uncoupled from IQ): Methods for identification of LD based on IQ-discrepancy or patterns of cognitive strengths and weaknesses lack validity. Documentation of processing deficits not required.



Screening for Dyslexia

- Screening is rapid triage that does not burden the teacher
- Goal is to determine who needs more assessment
- Should be <5 minutes
- Accuracy is best geared to minimizing false negative errors; false positive error
- Cannot separate students with dyslexia from others with foundational reading problems; instructional response is key!



Screening for Dyslexia

- KG: timed and untimed letter names and sounds, phonological awareness
- Beginning G1: timed and untimed word reading, phonological awareness
- End Grade 1, grade 2: Timed and untimed word reading
- Positives need progress monitoring and/or reading inventory
- Embrace the concept of risk and reserve eligibility for comprehensive evaluations. Dyslexia should not be diagnosed independently of efforts to treat it.



Progress Monitoring

- KG: timed knowledge of letter sounds
- G1-3: Timed word reading (lists or passages)
- G4-8: Timed Passages (Maze)



Specificity

- Dyslexia is often part of a complex presentation; generalist genes affect multiple LDs and ADHD (continuity hypothesis)
- Comorbidity: ADHD common; if language and working memory problems significant, math impaired; anxiety is common. Written expression and reading comprehension almost always impaired
- Phonological processing/decoding presentation shines through the glare of complexity, but must deal with the complexity, especially in inadequate responders



Important Research Findings

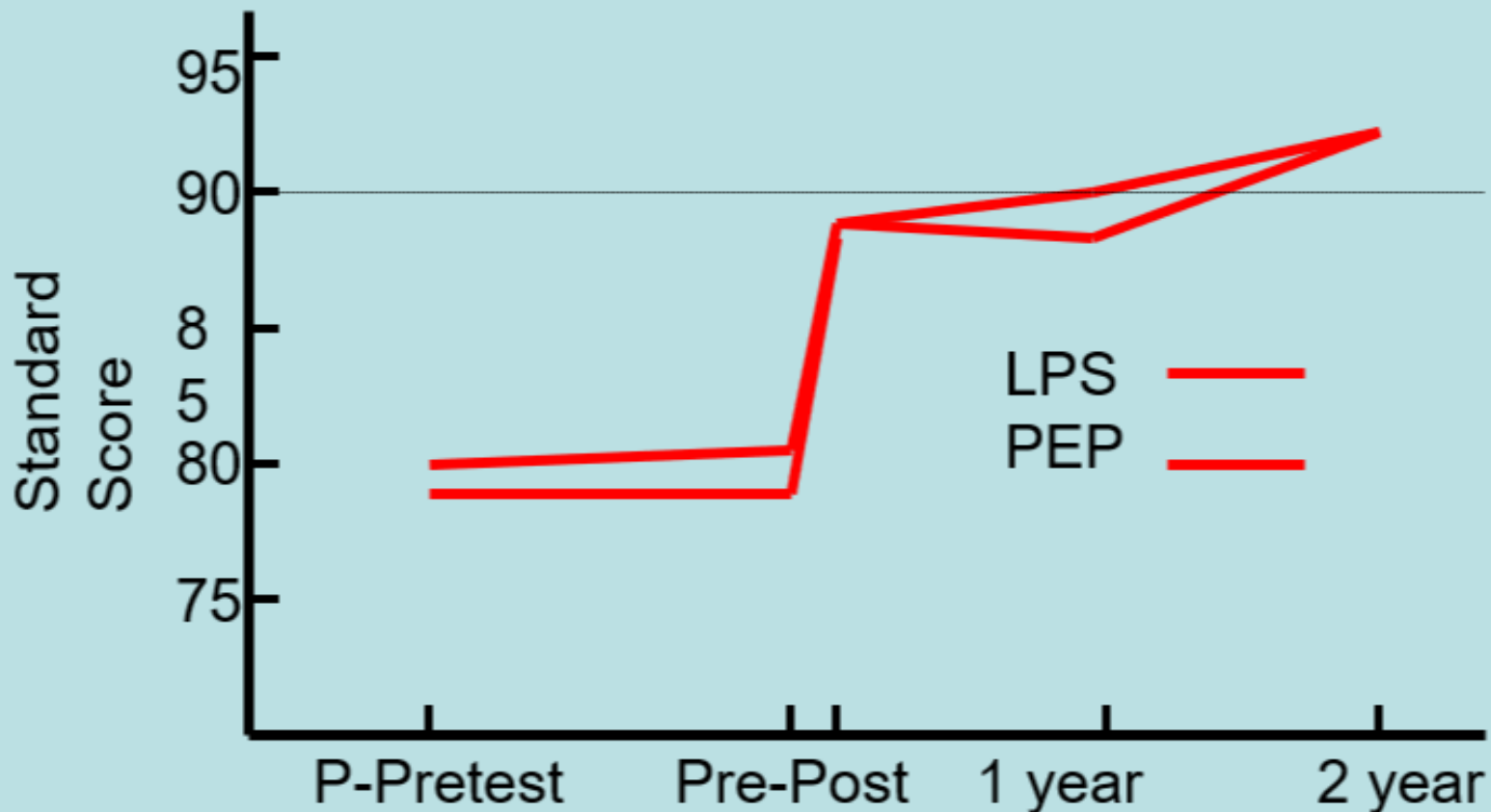
Dyslexia can (often) be prevented.

Remediation requires much more intensity

Skills that prevent dyslexia must be taught early in school

Remediation after Grade 2 demonstrably less effective (Connor; Lovett): diminishing returns

Growth in Total Reading Skill Before, During, and Following Intensive Intervention

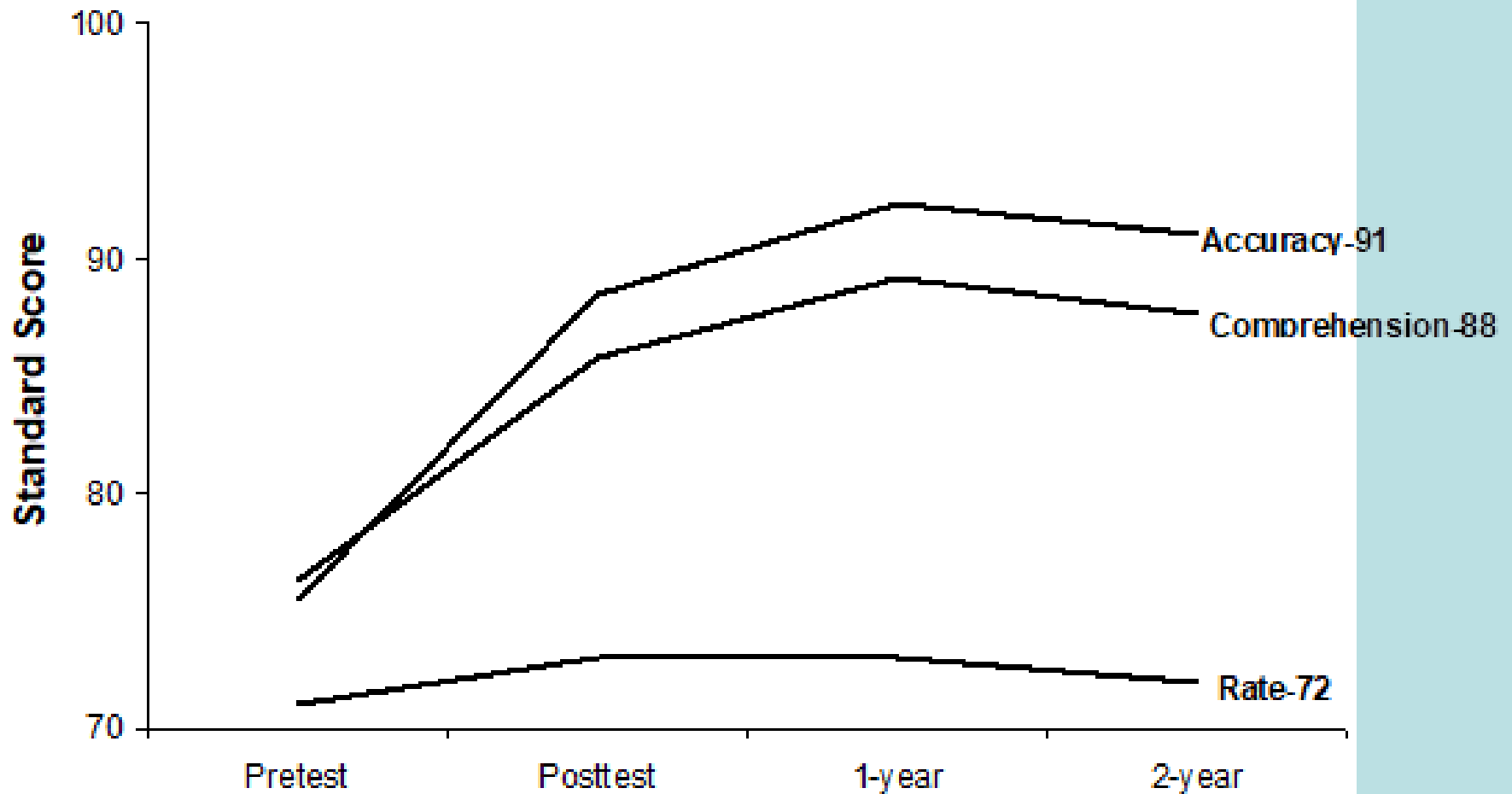


Torgesen et al., 2001

Time x Activity Analyses for the Two Intervention Approaches

	LIPS	EP
Phonemic Awareness and Phonemic Decoding	85%	20%
Sight Word Instruction	10%	30%
Reading or writing connected text	5%	50%

Automaticity!





Remediation is not a solution to overcoming dyslexia!

Decoding usually teachable at any age with sufficient intensity

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 (exposure and experience, not age)?

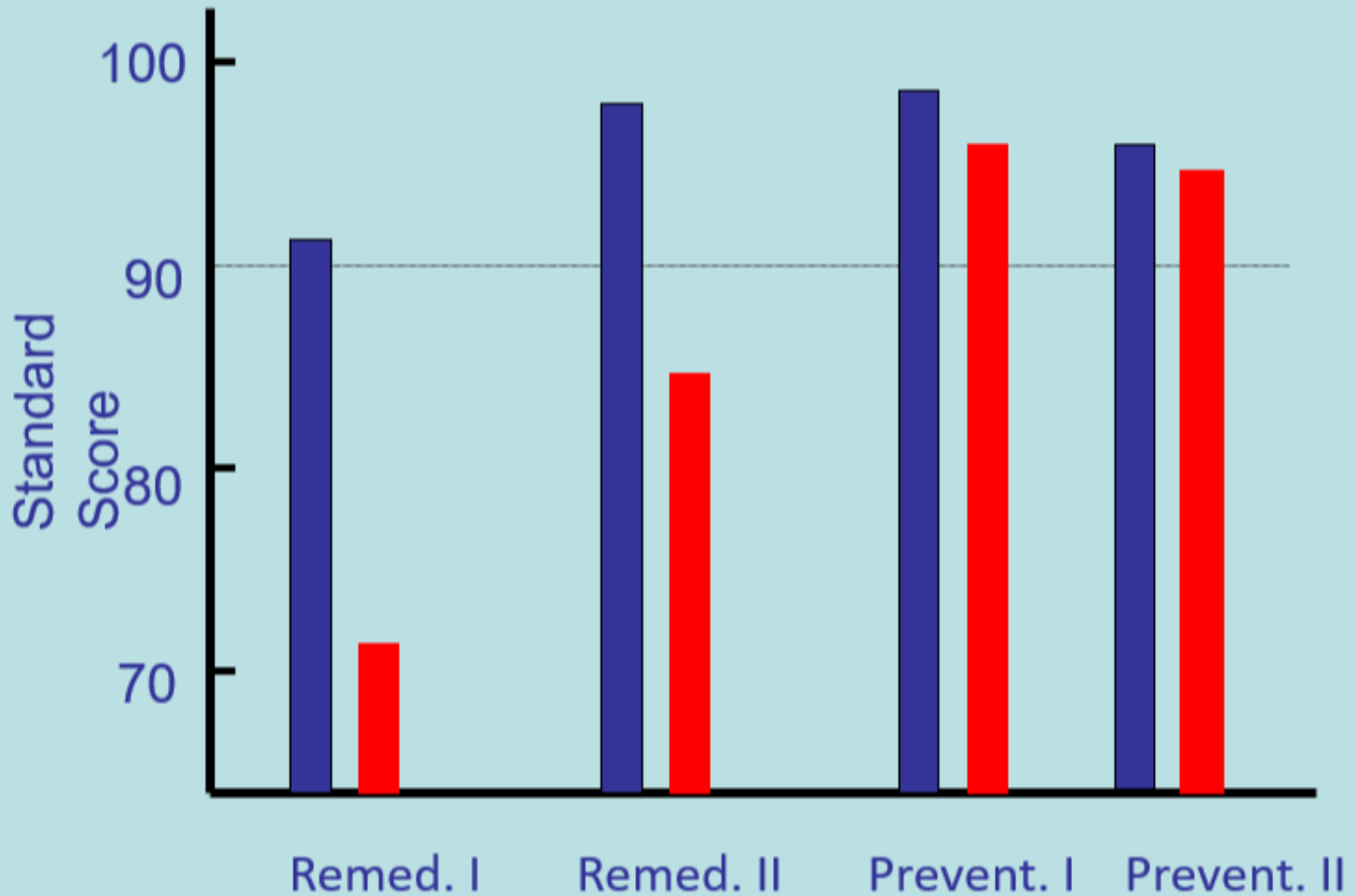


Early Intervention is Effective

- Prevention studies show that 70- 90% of at-risk children (bottom 20%) in K- 2 can learn to read in average range. Prevents automaticity problems.



Differences in outcomes for Basic Reading Skills and Rate in Prevention vs. Remediation Studies





Dyslexia must be treated in the context of MTSS

- Must focus on instruction and amplify the role of general education instruction
- Isolating students with dyslexia as a disorder that must be remediated is a recipe for persistence
- Restricting eligible interventions to “multisensory” is not empirically supported unless multisensory means “multimodality: see it, say it, write it, etc.



Effective Intervention

- Strong core reading program that teaches decoding, fluency practices, and comprehension (NRP). Tier 2 builds on Tier 1. Tier 3 may isolate an area that is not developing.
- If a component is missing in the core program, students will experience difficulties in that area
- No specificity of appropriate interventions. Research supports **explicit, comprehensive, differentiated** approaches at classroom and supplemental level
- Research does not support **multisensory** (in traditional sense), **balanced, manualized, multiple cuing systems, discovery or constructionist or rule-based approaches**



Intervention: Summary

- Teach phonics explicitly as part of a comprehensive program that addresses multiple competencies: decoding, fluency, comprehension
- Teach spelling in larger graphemic/morphological units
- Prevent word recognition problems because remediation is difficult and requires considerable intensity, especially for automaticity
- Older students and adults can be taught word recognition if the approach is sufficiently intense



Early Development of Reading Skills: A Cognitive Neuroscience Approach (Jack M. Fletcher – PI)

Grade 1 Multi-Tiered Intervention Funded by NSF
through the IERI

Patricia Mathes and Carolyn Denton:
Early Reading Intervention (Mathes et al., RRQ, 2005; Denton et al., 2006, JLD). Recipient, Albert J. Harris award, 2007, IRA

A. Papanicolaou, P. Simos: **Brain Activation Patterns** (Simos et al., Neuropsychology, 2005; 2007; JLD, 2007)





Double Dose of Instruction for Struggling Readers

***90 Minutes of
Quality
Classroom
Reading/LA
Instruction***

+

***Intervention:
40 minutes per
day in groups of
3-4***



Proactive Intervention (Mathes, Torgesen)

- Explicit instruction in synthetic phonics (blending), with emphasis on fluency.
- Integrated decoding, fluency, and comprehension strategies (authentic stories by hired authors with phonics principles).
- 100% decodable text, isolated practice
- Prescriptive: Carefully constructed scope and sequence designed to prevent possible confusions taught to mastery taught to mastery



Responsive Intervention

- Explicit instruction in synthetic phonics (blending) and analogy phonics (word families)
- Taught decoding, using the alphabetic principle, fluency, and comprehension strategies in the context of reading and writing
- No scope and sequence
- Teachers responded to student needs as they are observed.
- Leveled text, not phonetically decodable

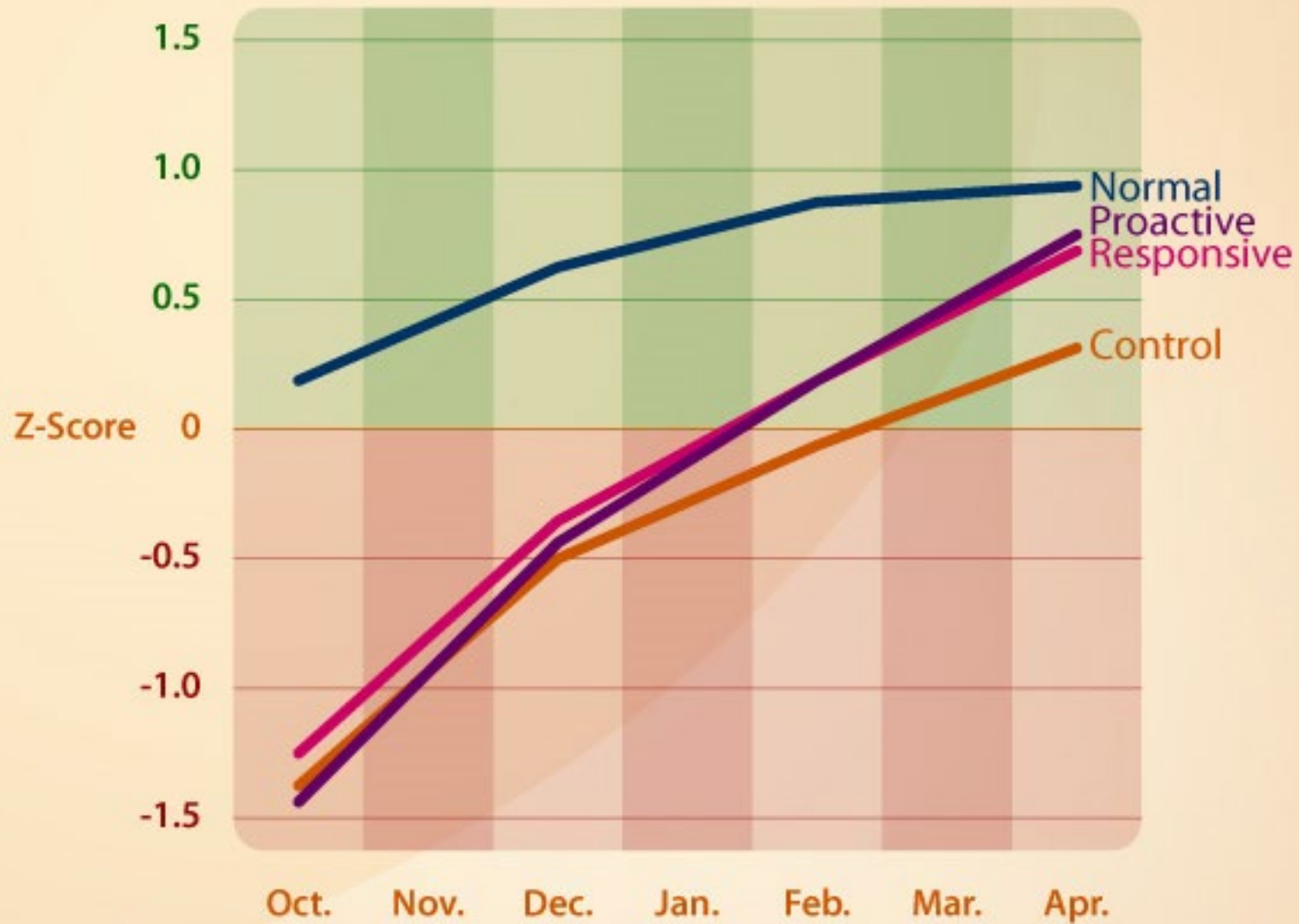


The Responsive Intervention

- Fluency Work (Repeated Reading) and Assessment: 8-10 minutes
- Word Work: 10-12 Minutes (only sounding out)
- Supported Reading: 10-12 Minutes
- Supported Writing: 8-10 Minutes



Growth in Fluency by Intervention





What percentage of children don't respond adequately to quality intervention?

ECI only: $15/92 = 16\%$ (3.2% of school population)

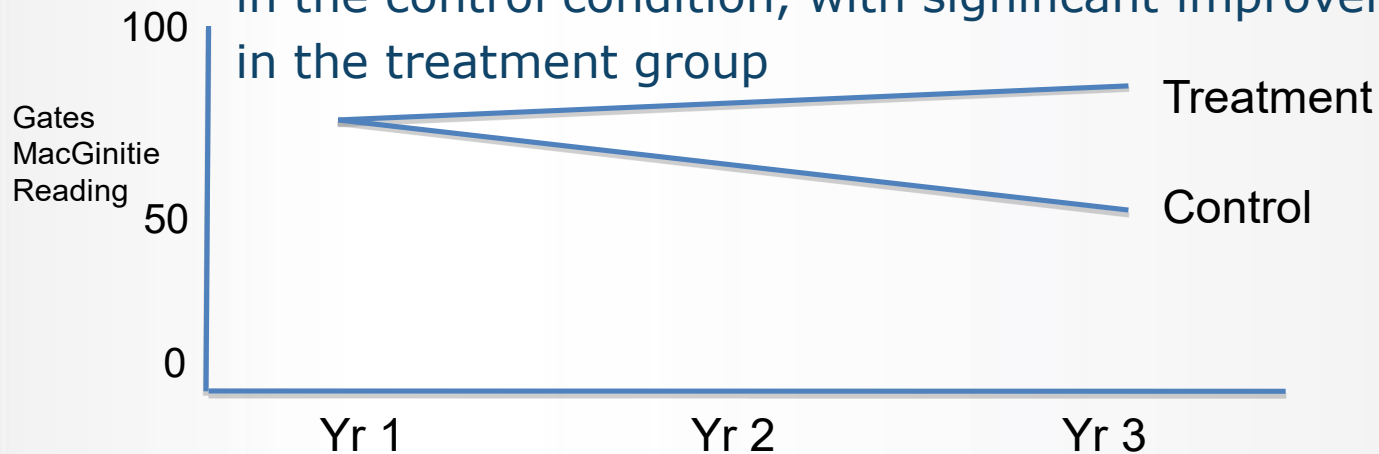
ECI + Tutoring:

- $7/163 = 4\%$ (<1% of school population)

(Basic Reading < 30th percentile) (5 others did not meet fluency benchmarks)

- NICHD middle school studies – intensive interventions for adolescents with severe reading difficulties

Cohort of minimal responders followed for three years indicated a decline in performance for the participants in the control condition, with significant improvement in the treatment group





Neuroscience explains why

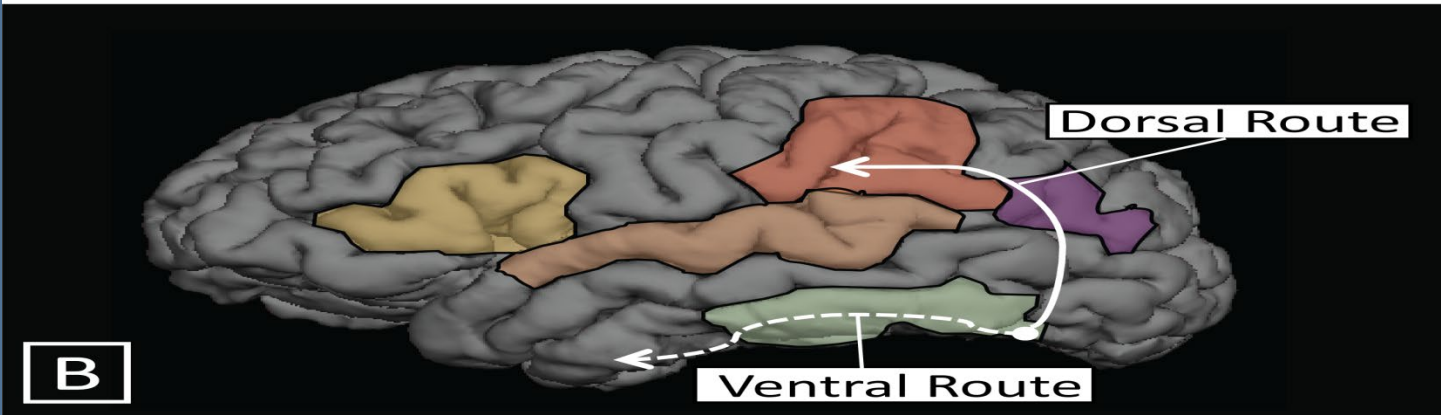
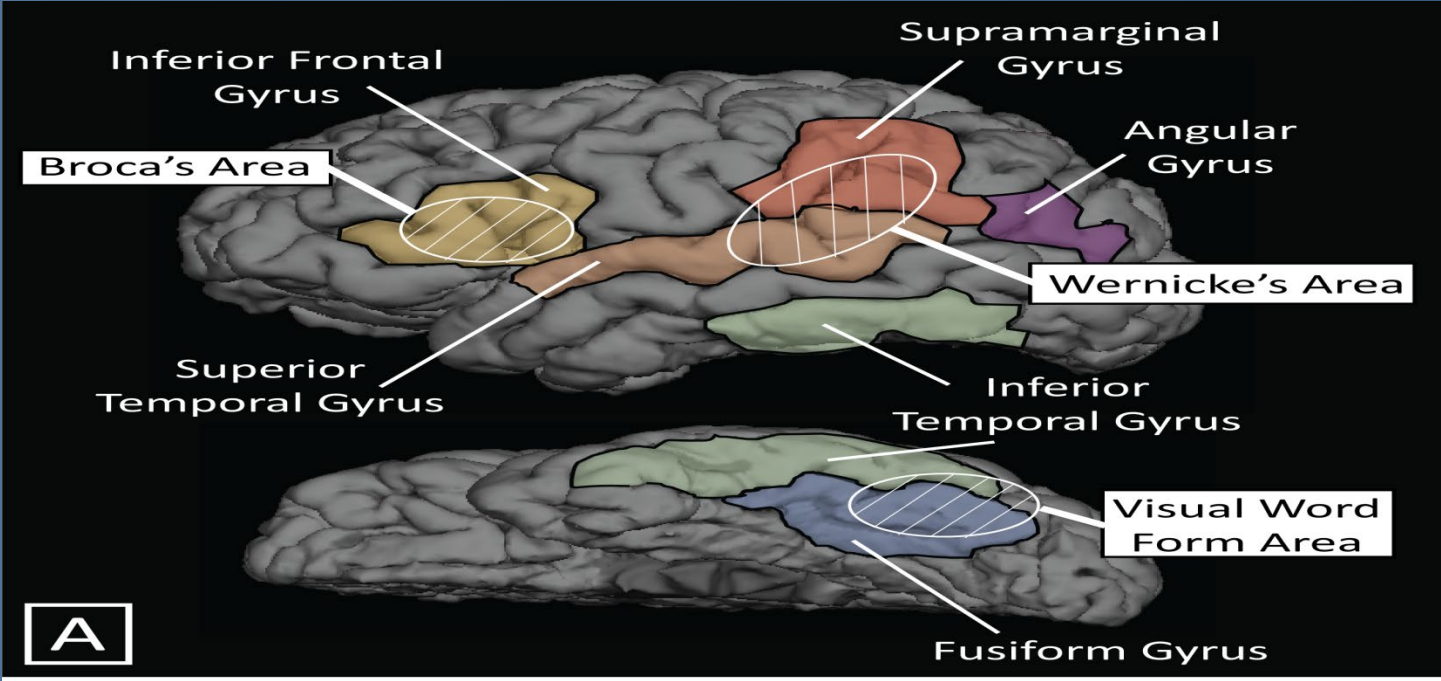
- Two metaphors
 1. Reading is parasitic on speech (Liberman; sublexical, dorsal system)
 2. Reading is unlocking language from vision (Dehaene) or language at the speed of sight (Seidenberg)
- Malleability in development and in instructional response, but access and experience is key for automaticity



Dual Route Theory

- Dorsal (assembled) route: sublexical, must access phonological representation and identify substituent parts (indirect)- (reading is parasitic on language; sound and print)
- Ventral (stipulated or addressed) route: lexical, directly from word form to pronunciation (Reading is unlocking language from vision; language at the speed of sight; print and meaning; requires experience)
- Operate in parallel depending on the properties of the word

The Reading Brain



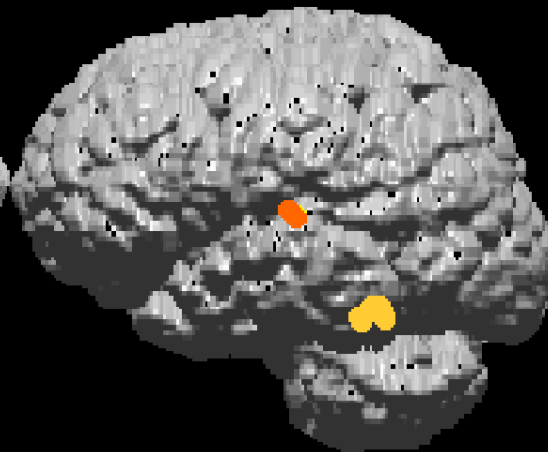
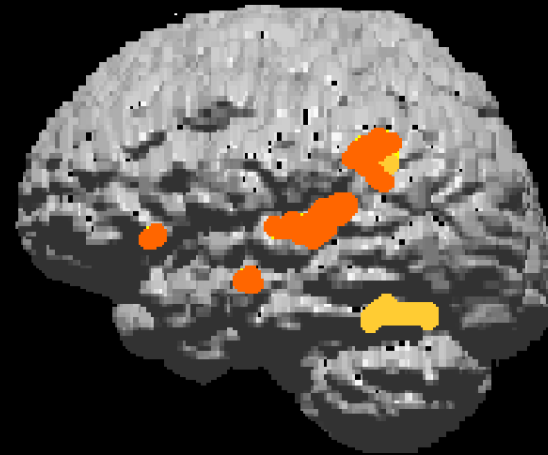
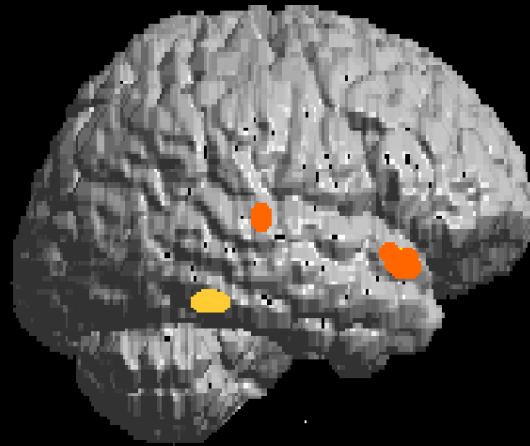
Brain Function in Dyslexia (Simos et al., 2001; Pseudowords)

Child #1:
Normal Reader

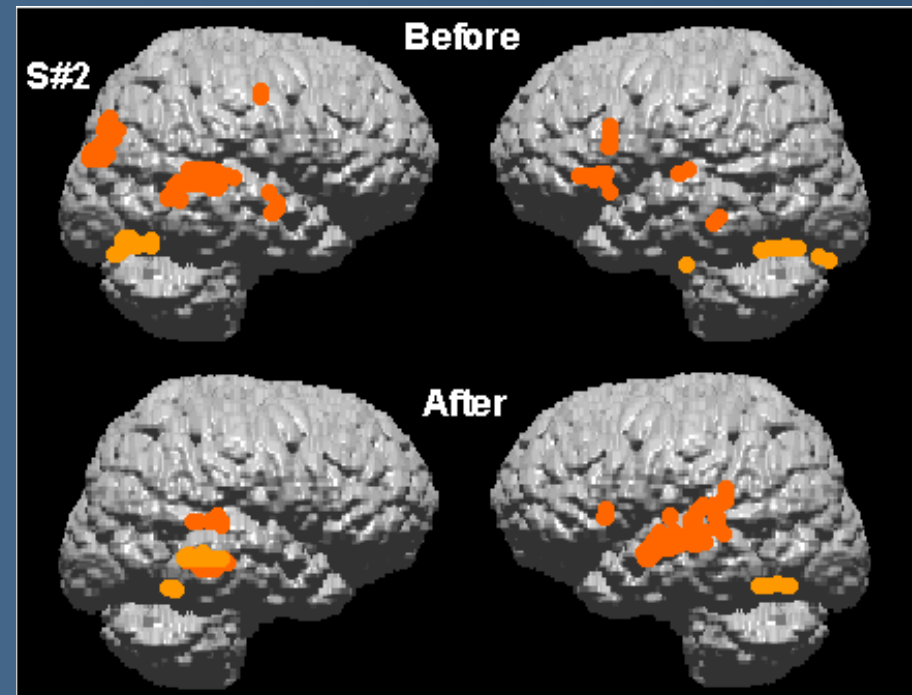
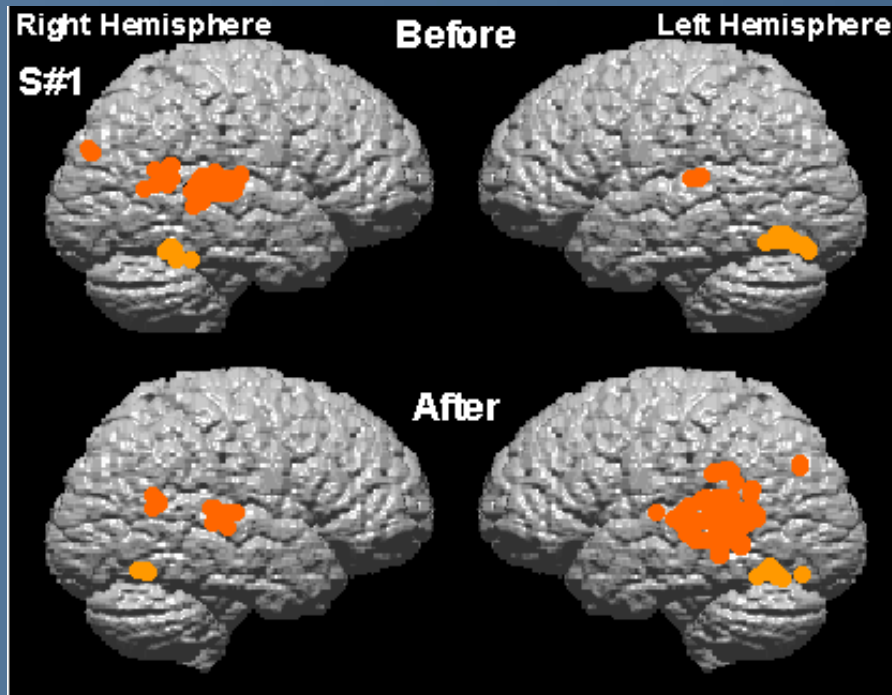
Child #12: with
Reading Difficulties

Right Hemisphere

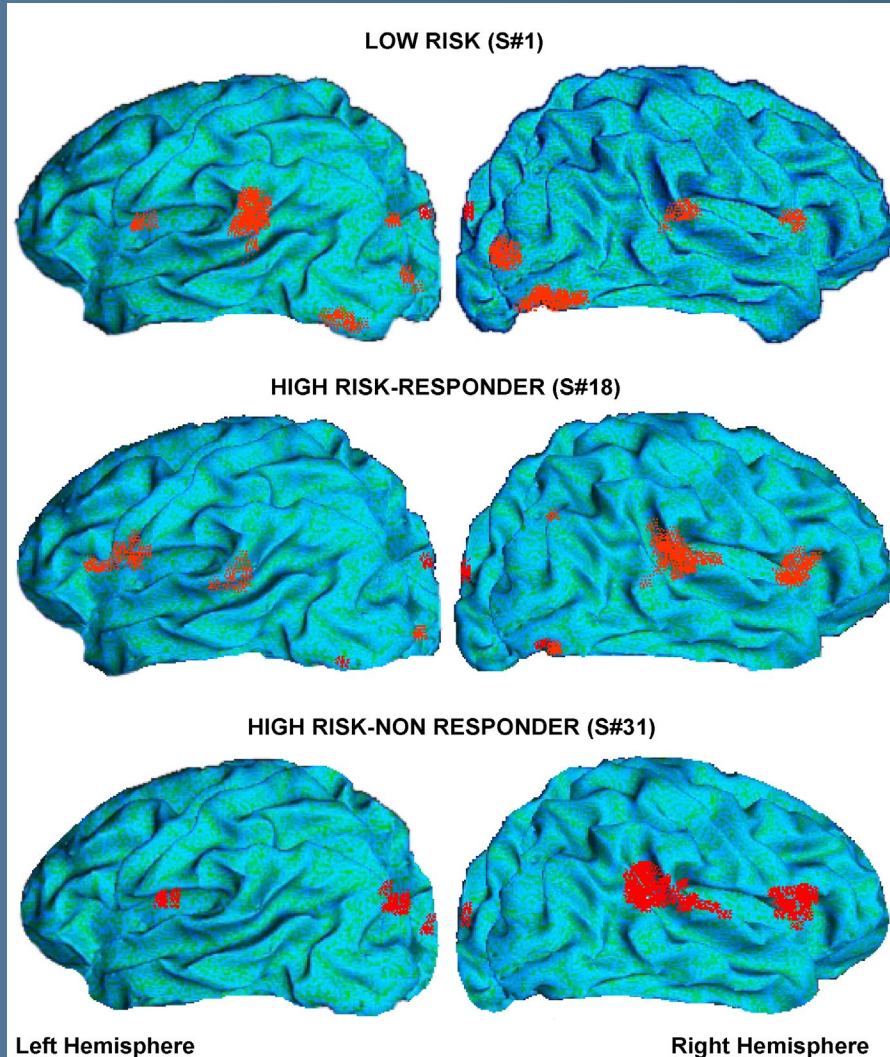
Left Hemisphere



Neural response to intervention; (Pseudoword Task; Simos et al., 2002)



Grade 1 Intervention (pseudoword task)



- Simos et al (Neuropsychology, 2005)- after Grade 1 intervention in Mathes et al. (RRQ, 2005)



Who is Dyslexic?

- The student who does not respond to quality instruction: *hard to teach, not unable to learn*
- Low achievement and inadequate instructional response
- Often preventable with early intervention
- Heritable, but neural systems are malleable in development and instructional response



Reading Sculpts the Brain But Must Be Taught!!

“We are all born with dyslexia.
The difference among us is that
some are easy to cure and
others are not.”

- Liberman, 1997

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