Today’s Objectives

1. Understand word-level reading development, including fluency
2. Learn why some children struggle in word reading
3. Learn the highly effective yet “elusive” research based reading interventions
Key Terms to Understand this Presentation

- Auditory vs. phonological
- Phonological vs. phonemic
- Orthography and orthographic
- Phonological awareness vs. phonics
- Sight word and sight word vocabulary
  - Also called orthographic lexicon

An Important Note About Dyslexia

- Multiple definitions – organizations and popular
- Researcher Definition:
  - **Word-level reading difficulty despite adequate opportunity and effort**
  - **Exclusionary clause:** Not due to blindness, deafness, or very low intellectual functioning
  - All else is popular lore that has been with us for over 100 years
- Relationship to SLD in IDEA
- Relationship to IDEA in general
  - Cuts across many disability categories
The Phonological–Core Deficit of Dyslexia

- From the “most common cause” to the “universal cause”
- Weakness in one or more of the following:
  - Phonemic awareness/analysis
  - Phonemic blending/synthesis
  - Rapid automatized naming
  - Phonological working memory
  - Nonsense word reading, letter–sound knowledge acquisition
- Typically more than one of these, sometimes all
- Very well established with no substantive alternatives

To properly understand word-level reading difficulties, we need a

CRASH COURSE ON HOW WORDS ARE LEARNED
The Basis for Intervention

“Any well-founded educational intervention must be based on a sound theory of the causes of a particular form of learning difficulty, which in turn must be based on an understanding of how a given skill is learned by typically developing children.”

Snowling & Hulme (2011)


What is YOUR Theory About How We Remember the Words We Read?

- We all have a theory, but you may not know yours
  - If you can’t think of yours, work backward from interventions you use or recommend

- Most approaches focus on identifying new words
  - Including phonics and whole language/three cueing
The Three–Cueing Systems Approach

- This has been the dominant approach to reading for the last three decades
  - Balanced literacy; whole language; literacy–based approach
  - Reading Recovery
  - Guided reading
  - Fountas & Pinnell Literacy; Leveled Literacy Intervention (LLI)
- This theory was developed in the 1960s but has ignored the thousands of scientific studies conducted since then
- It is continuously affirmed as valid despite extensive evidence to the contrary
  - Frequently uses the term “research–based” or “evidence–based”
- There is no evidence that it helps weaker readers catch up and plenty of evidence that it does not

Poor Readers, Not Skilled Readers Read Based on the “Three–Cueing Systems” Approach

Contextual
- Skilled readers recognize most of the words they read. Context is not required to recognize familiar words
- Poor readers know fewer words so they rely on context

Grammatical/Syntactic
- Grammatical/syntactic skills are virtually uncorrelated with word-level reading

Grapho–phonic
- Skilled readers effectively sound out unfamiliar words via phonic decoding & set for variability (80% accuracy rate)
- Poor readers are weak in phonic decoding—they have to rely on guessing from context to compensate (25% accuracy)
Sight Word Vocabulary is NOT Based on Visual Memory/Visual Skills

- Input and storage are not the same thing
- Input is visual, storage is orthographic, phonological, & semantic
- Cattell’s findings in 1886
- Findings from the 1970s
  - Correlation between word reading & visual memory: zero to weak
  - RD (only) kids have equivalent visual memory to non-RD
- 1960s to 1980s mixed case studies
  - Kevin reading Calvin & Hobbes
  - Our “abstract representation” of every letter
  - Consider all the fonts and personal handwriting we read
  - M.J. Adam’s comment about student reactions to her study

Word reading correlates strongly with phonological skills
- *Phonological awareness & Word Reading: r = .5 to .7;*
- *Visual Memory & Word Reading: r = .1 to .2*

- Note how we sometimes “block” on names of people and things (visual–phonological memory), but never written words
- Most students who are deaf struggle tremendously with word–level reading
  - *This should not be a problem if word reading was based on visual memory!*

- Neuroimaging studies since 2000 show that visual memory and orthographic memory (memory for written words) involve different areas of the brain
Orthographic Mapping

- Orthographic mapping is the mental process we use to turn an unfamiliar written word into an instantly accessible, and familiar "sight word"
- Orthographic mapping requires:
  - Letter-sound proficiency
  - Phonemic proficiency (this goes well beyond what is tested on our universal screeners)
  - The ability to establish a relationship between sounds and letters unconsciously while reading
- Orthographic mapping develops naturally in about 60%-70% of students via exposure to literacy activities
  - Most students learn to read regardless of how they were taught

Common Misunderstandings About the Role of Phoneme Skills in Reading

- Thought to only relate do early learning of CVC words
- Not thought to be involved in sight word acquisition
- Not thought to be worth training after first grade
- Some still think it is not causal in reading – only a byproduct of learning to read
  - (This is actually true! — but only for the top 2/3rds of readers)
The Difference Between Phoneme Awareness and Phonemic Proficiency

- “Awareness” implies conscious attention
  - Many tasks get at conscious phoneme awareness, such as phoneme segmentation tasks
- Proficiency refers to automatic access to phonemes
  - This is instant access, either preconscious or unconscious
  - Only instant responses to phoneme manipulation tasks assess this

How We “Map” Words

“Transparent” Words
(i.e. words with one-to-one correspondence)

PLTM

Phoneme Awareness/Analysis

/red/
/r/ /ě/ /d/
red
Oral First: A mind prepared to store words

/haz/
/h/ /á/ /z/
has

/win/
/w/ /ɪ/ /n/

Orthographic Mapping

Letter-Sound Knowledge

Phoneme Blending

Phoneme Awareness/Analysis

Phonological LTM Activation

Self-Teaching Hypothesis

Print First: Mapping while reading
How We “Map” Words

Words that are “Opaque”
(i.e. words without a one-to-one correspondence)

/m/ /â/ /k/  /r/ /ē/ /d/  /c/ /ō/ /m/

make  read  comb

What about irregular words?

• Irregular and opaque words take longer to learn
• Only 1–2 extra exposures for typical readers; many more for RD
• Most irregular words are off by only one element
  • (said, put, comb, island, multiple violations are rare: one, iron)
• Irregular words not a challenge for orthographic mapping
  • “Exception words are only exceptional when someone tries to read them by applying a [phonic] decoding strategy. When they are learned as sight words, they are secured in memory by the same connections as regularly spelled words . . .” (Ehri, 2005 p. 171–172)
What about irregular words?

- Many regular words require mapping "adjustments like irregular words
  - Silent e words, vowel digraphs, consonant digraphs are all opaque
  - Multisyllabic "regular" words with vowel reduction require mapping adjustment, much like irregular words (e.g., holiday, market)
- Irregular words are not the cause of reading problems in English
  - Even very regular orthographies (e.g., Italian, Spanish) have RD, and their RD is based upon poor orthographic mapping
  - It makes English phonic decoding harder to learn, but these irregularities are not the cause of poor sight word reading
  - Even regular words are poorly represented in the orthographic lexicons of poor readers

Three Phases of Word Reading Development and their Phonological Counterparts

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IMPORTANT FINDINGS FROM THE INTERVENTION RESEARCH ON WORD–LEVEL READING

What Works Very Well, and What Does Not

Caveat Emptor:
Determining Intervention Effectiveness

- Raw score improvements
- Statistical significance
  - Normally, “statistically significant gain” ≠ “closing the gap”
  - Many abstracts are misleading
  - “Significant” often means 3 standard score point gains
- Effect sizes
  - The most unsuspectingly misleading index of improvement
    - E.g., 0 SS improvement on national norms = 22 SS improvement?!
    - A <1 SS gain (.96) is nearly twice as effective as 22 SS gain (.53)
- Standard score gains
  - Some high profile intervention researchers recommended this
  - The only one to indicate if a student is closing the gap
The Largely “Untapped” Intervention Research

The little known origins of RTI

- **TIER 1**: Prevention research in 1980s–1990s
  - 50%–75% reduction in reading problems (reviewed by the *National Reading Panel*, 2000)
  - E.g. Foorman et al., (1998) *Journal of Educational Psychology*

- **TIER 2**: Vellutino, et al. (1996) *Journal of Educational Psychology*
  - Reduced RD kids down to 3% under 30th %ile & 1.5% under 16th %ile!
  - Results maintained 3 years later

- **TIER 3**: Torgesen et al., (2001) *Journal of Learning Disabilities*
  - Severely RD 3rd to 5th graders (mean standard score on Word ID = 67)
  - Mean improvement was 14 SS points at post test, 18 points 2 years later
  - 40% discontinued from special educational reading support
  - Replicated with older students and adults
  - A common faulty assumption is that there is a ‘statute of limitations’ on reading improvement

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**Vellutino et al. (1996) Long Term Results**

- VLG (n = 19)
- LG (n = 15)
- GG (n = 17)
- VGG (n = 18)
- AbVQNorm (n = 21)
- AbVRQNorm (n = 30)

VLG = Very Limited Growth
LG = Limited Growth
GG = Good Growth
VGG = Very Good Growth
WRMT-R = Woodcock Reading Mastery Test-Revised
The Largely “Untapped” Intervention Research

The little known origins of RTI
- Doesn’t this all sound too good to be true?
- RTI was designed to “capture” these amazing results
  - Yet focus seems to have shifted to the “framework” and “process” of RTI
  - The actual instructional approaches were lost in translation
    - Everyone has to find these elusive “research-based” approaches on their own
    - Those highly successful intervention approaches will be covered next

Sight Vocabulary and Reading Fluency

“Sight word” has multiple definitions in education:
- Phonically irregular word (also called “exception words”)
- Early taught word in K or early 1st (of, and, we, the)
- Known words that are instantly familiar – regardless of phonic regularity or how early they were learned (i.e., familiar words)

Sight vocabulary – the pool of familiar words
- Researchers also call this the “orthographic lexicon”

Sight words are effortless & pre-cognitive
- Words “pop out” involuntarily
- We are not capable of not reading a sight word
- A sight vocabulary is established by orthographic mapping
**Sight Vocabulary and Reading Fluency**

- The elusive key to reading fluency is:
  - **SIGHT VOCABULARY SIZE**
    - With a large sight vocabulary, most or all words “pop out”
      - Reading is thus *fast* and *accurate*
    - With a limited sight vocabulary, reading is effortful
    - How do we know this?
      - Examples of two types of studies
  - **Conclusions:**
    - Fluency is a BY–PRODUCT of sight vocabulary size
      - It is not an independent reading–related sub–skill
        (It is a very useful for screening because it lets you know there are underlying problems that need further assessment)

**Summary & Conclusions**

- We have not been working from a scientifically–established understanding about how words are learned
- Our intervention approaches have been around for decades, but not informed by word–learning research
- The “culprit” in poor word–level reading is phonology
- Skilled readers have letter–sound proficiency and phonemic proficiency, weak readers do not
- Interventions that address these skill deficits have the best results, by far
I. Prevention of Word-Level Reading Difficulties

- Tier 1 instruction – What is effective K–1?
  - KEY COMPONENTS
  - Phonological Awareness
  - Letter–Sound Knowledge
  - Connecting phonological awareness to word–level reading
  - Good teaching techniques based on general learning principles
    - Seems to be the focus of RTI efforts
- Early, rigorous development of PA and LS skills in K–1 dramatically reduces the number of struggling readers
- Quick Survey:
  - How many of you work in schools that have a formalized, systematic, whole class, Tier 1 PA training in K–1?
Examples of Successful Prevention Programs

- Programs used in studies with highly successful outcomes
  - Experimenter designed – not commercially available
  - Florida Center for Reading Research (pieces of these experimenter designed approaches) – all free! [www.fcrr.org](http://www.fcrr.org)
  - *Road to the Code* (Benita Blachman et al.)
  - *Phonemic Awareness in Young Children* (Adams et al.)
  - *Ladders to Literacy* (O’Connor et al.)
  - *Interactive Strategies Approach* (Scanlon, et al.)
  - Other programs:
    - Rosner program – long track record of success in schools
    - *Equipped for Reading Success* (studies underway; based on Rosner) [www.equippedforreadingsuccess.com](http://www.equippedforreadingsuccess.com)

- Most of these programs are effective for K–1 prevention & early intervention, but not for Gr. 2–12 remediation
  - Other programs are more well suited for intervention (see below)

The Significance of the “Big W”

- Numerous reviews of intervention research and meta-analyses have been conducted since 1999
- They routinely look at the obvious factors:
  - Socioeconomic Status (SES)
  - Age of students (e.g., 2nd graders vs. 5th graders vs. 9th graders)
  - Length of intervention (e.g., 35 hours? 65 hours? 110 hours?)
  - Group size (e.g., 1:1? 1:3? 1:5? 1:8? whole class?)
  - Severity of problem (2nd percentile? 10th? 20th? 30th?)

- Contrary to the expectations, the first two show small effects and the other three show no consistent effects
  - SES showed greater impact with reading comprehension, however
The Significance of the “Big W”

- Unlike all the other reviews, the “Big W” involved looking at intervention outcomes in standard score points and working backward from there to the techniques that brought about those outcomes.
- This is all good news!
- We can’t change kids’ SES or age or initial severity, and we typically don’t have enough personnel for 1:1 group sizes.
- *This means that what we control (instruction) can make the most difference!*

Intervention Research
My 90/10 “Insight” Spring 2013

- A breakthrough in intervention research?
- *About 85%–90% of intervention studies show 0 to 9 SS point improvements while about 10%–15% of intervention studies show 12.5 to 25 SS point improvements*
  - Results maintained at 1, 2, 3 & 4 year follow ups (depending on the study)
  - Results from the 0–9 studies often lost in follow up studies
- *Summer 2014: The 0–9 category can be subdivided in two*
  - 0 to 5 SS points and 6 to 9 SS points
- Thus a “tripartite” division within the intervention research
  - *Minimal results group:* 0 to 5 standard score improvements
    - Mostly 2–4 points
  - *Moderate results group:* 6 to 9 standard score improvements
    - Mostly 6–7 points
  - *Highly successful group:* 12.5 to 25 standard score point improvements
    - Mostly 14–17 points
Tripartite Intervention Research

- Studies in all three categories cut across age, SES, and severity level of reading difficulty
  - Thus, these factors cannot explain the disparity in outcomes
- Studies in all three groups used explicit, systematic phonics instruction
  - Thus, phonics is not "the answer"
  - (But it’s an important part of the answer: All studies not using phonics were in the minimal outcome group)

The Phonological Proficiency Intervention Continuum

Three categories based on outcomes align with three different intervention approaches relative to orthographic mapping!

- This provides confirmation of the orthographic mapping hypothesis
- Superb alignment of theory with empirical outcomes
- Minimal Group (0 – 5 SS improvements)
  - None formally trained phonological awareness/analysis
  - Most did explicit, systematic phonics
  - All provided reading practice with connected text
- Moderate Group (6–9 SS improvements)
  - All did explicit, systematic phonics
  - All provided reading practice
  - Nearly all trained phonological segmentation and/or blending
  - This is “basic phonological awareness” (mastered by most at end of 1st grade)
The Phonological Proficiency Intervention Continuum

- Highly Successful Group (12–25 improvements)
  - Aggressively addressed and “fixed” PA issues using advanced PA training
  - All did explicit, systematic phonics
  - All provided reading practice with connected text

Intervention with At–Risk and Weak Readers

- Conclusions consistent with orthographic mapping
- Unless their problem with advanced phonemic awareness is fixed, poor word–level readers don’t catch up
- Advanced phonemic awareness is necessary for sight word development and if they don’t have it, they cannot efficiently add to their sight vocabulary

REVIEW:
- Phonemic proficiency and letter–sound proficiency and why they are important
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### The “Formula” for Word-Level Reading Success

- The three part “formula” used in the studies with highly successful outcomes
  1. Aggressively train phonological awareness to the advanced level
  2. Teach and/or reinforce letter-sound knowledge & skills (phonics)
  3. Extensive opportunities to read connected text
- Do these sound familiar . . .?  What are we missing?
  - Phonological awareness assessment training is typically segmentation
    - Only takes a child to an ending 1st grade level
    - Not enough PA for orthographic mapping
  - Phonological awareness training assumed not to be helpful with older students
  - Phonological awareness assessments only take us to the basic level – we do not assess the advanced level on our current tests (I’ll provide you with the one exception)
Interventions We are Using Now
(i.e., why RTI is having limited results)

- The following interventions have been studied in the empirical reading literature and have been shown to yield 2 to 4 standard score point improvements:
  - Repeated Readings, READ 180, Reading Recovery, Fast ForWord, Read Naturally, Failure Free Reading, Seeing Stars, and Great Leaps
  - School psychologists recommend these not knowing they have already been studied and shown to have limited results
    - Students almost never “catch up” with these approaches
    - Most of these have studies with “statistically significant” results!
      - So they can all themselves “research based”!

“Gold Standard” phonic programs
(i.e., Wilson, Orton–Gillingham, DISTAR/Reading Mastery)

- These can yield huge improvements in Word Attack (15–25 SS points), but modest improvements in general word identification (e.g., 3–5 SS points)
- They do not develop phonological proficiency, which is needed for orthographic mapping/sight word development
  - Phonological-core deficit students only develop PA skills to the level that we teach them
- Also, reading comprehension interventions in the presence of significant word reading difficulties are minimally helpful
Examples of Successful Programs

- Programs used in studies with highly successful outcomes
  - (Note: All programs with the “three key elements” were very successful)
  - Experimenter designed – not commercially available 😊
  - Lindamood (ADD now LiPS)
    - Be cautious about the one they are promoting now – has limited results
  - Interactive Skills Program (now in book form)
  - PhonoGraphix
  - Read, Write, Type (only one study so far)
  - Discover Reading (Reading Foundation, Alberta, Canada)
  - Other programs using advanced PA training not in these studies:
    - Rosner program – long track record of success in schools
    - Equipped for Reading Success (studies underway) is the only program based upon Orthographic Mapping—should have equivalent results to the others but is easier to implement (based on the Rosner program)
  - All studies with highly successful outcomes (12–25 groups) did “advanced” phonological awareness training!

The Phonological Proficiency Intervention Continuum

- Minimal Group (0 – 5 SS improvements)
  - No formal training of phonological awareness/analysis
- Moderate Group (6–9 SS improvements)
  - Trained only basic phonological awareness (segmentation and/or blending)
- Highly Successful Group (12–25 improvements)
  - Did advanced phonological awareness training using phonological manipulation
Recall Orthographic Mapping

Orthographic mapping is the process we use to turn an unfamiliar written word into an instantly accessible, and familiar “sight word”

Many factors affect reading fluency, but one is more powerful than all the others combined: Having a large sight vocabulary

Orthographic Mapping Requires . . .

- Letter-sound proficiency
- Phonemic proficiency (this goes well beyond what is tested on our universal screeners)
- The ability to establish a relationship between sounds and letters unconsciously while reading
- Reading opportunities to add more words to the sight vocabulary
Summary

- Words are remembered based upon orthographic memory, not visual memory
- Orthographic memory is the product of orthographic mapping
- Orthographic mapping requires letter–sound proficiency and phoneme proficiency
- With these two skills intact, the orthographic memory can only be improved via wide reading experiences
  - Reading practice of limited value for poor orthographic mappers

Contact for follow up materials

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