Understanding Word-Level Reading and Dyslexia:

Implications for Assessment, Instruction, and Intervention

National Association of
Special Education Teachers

October 22, 2025

David A. Kilpatrick, PhD
Psychology Department
State University of New York at Cortland

1

Today's Objectives

1) Learn about how word-level reading works.
2) Learn about the specific skills needed for efficient word-level reading.
3) Learn why some students struggle.
4) Consider best practices for assessment and intervention.

2

The Nature of Dyslexia

3

Word-Level Reading Difficulties and Dyslexia

- Poor reading skills can result from lack of opportunity, inadequate instruction, or the phonological-core deficit.
  - Yet despite inadequate instruction, many become good readers, so we will focus on the last of these.
- Basic definition found in studies of dyslexia:
  Word-level reading difficulty despite adequate opportunity and effort (not due to blindness, deafness, emotional disturbance, brain damage, or extremely low IQ).
  - All else is popular lore that has been with us for over 125 years.
- Some researchers are shifting from the term "dyslexia" to "**word-level reading disability**" (WLRD).
  - This (1) avoids the folklore and (2) applies across disability areas.
- A problem translating research to practice:
  - *Where do we draw the line?*

4

The Phonological-Core Deficit of Dyslexia

From the "most common cause" to the "universal cause"

"[A]lthough some individuals with dyslexia have weaknesses in a variety of areas, impaired phonological processing appears to be a universal cause of dyslexia."

Ahmed, Y., Wagner, R. K., & Kantor, P. T. (2012). How visual word recognition is affected by developmental dyslexia. In J. S. Adelman (Ed.), *Visual word recognition: Vol. 2. Meaning and context, individuals and development* (pp. 196-215). New York, NY: Psychology Press.

". . . the predominant cognitive cause of dyslexia is a deficit in the phonological system . . . Although other causes have been [proposed], the evidence suggests that many of these may reflect comorbidities between dyslexia and other developmental disorders (e.g., ADHD), or if they are causally implicated then this is likely to be to exacerbate the risk of dyslexia rather than as a primary risk factor.""

Hulme, C., & Snowling, M. J. (2009). *Developmental disorders of language learning and cognition.* Malden, MA: Wiley-Blackwell.

"The predominant core cognitive correlate of word-level reading disability [i.e., dyslexia] involves phonological awareness."

Fletcher, J. M., Lyon, G. R., Fuchs, L. S. & Barnes, M. A. (2019). Learning disabilities: From identification to intervention (2nd ed.). Guilford.

5

Other Notes on Dyslexia

- Most individuals with dyslexia can read.
  - They are not illiterate.
- They may or may not be good at sounding out newly encountered words, depending on their instruction.
- But remembering words for later retrieval is a problem—that memory process is very inefficient.
  - To remember newly encountered words permanently, most kids from 2nd grade on need 1-5 exposures (adults need 1-2), while those with dyslexia need many, many more exposures.
  - Due to their struggles, they do less reading, compounding the problem.
  - Thus, they have a smaller number of words that "jump out at them."
  - Having to figure out many of the words is laborious and can affect comprehension.
  - Reading is such a chore they almost never read for pleasure.

6

Addressing Dyslexia

- The most common issue is to address the underlying phoneme-level processing difficulties, coupled with code-based instruction and reading practice.
  - No, simple phonemic awareness is not enough (more later).
- In almost all cases, dyslexia is "fixable," or at minimum "improvable"—consider:

> The word-recognition skills of students with identified reading disabilities can be normalized with effective interventions. —*Foorman and Al Otaiba (2009, p. 257)*
>
> Several decades of research on effective reading interventions shows us that it is possible to substantially reduce the 36% of fourth graders reading below grade level on NAEP or the 17.5% of students with reading disabilities. Better classroom instruction can reduce the numbers of low-achieving students to around 5%. Supplemental small-group or one-on-one tutoring can reduce the numbers even further to 1%-3%. —*Foorman and Al Otaiba (2009, p. 269-270)*

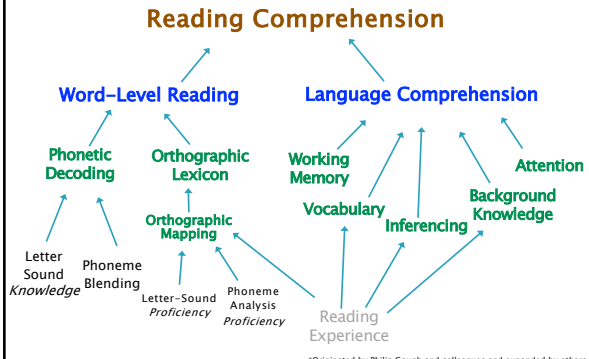
Foorman, B., & Al Otaiba, S. (2009). Reading remediation: State of the art. In K. Pugh & P. McCardle (Eds.), *How children learn to read: Current issues and new directions in the integration of cognition, neurobiology and genetics of reading and dyslexia research and practice* (pp. 257-274). New York, NY: Psychology Press.

7

Understanding the Skills Needed for Reading

8

The Simple View of Reading*



*Originated by Philip Gough and colleagues and expanded by others based upon later research. This version by David A. Kilpatrick.

9

The Value of the Simple View for Educators

- Understand the components of reading.
- Design assessments to evaluate those components.
- Make sense of reading difficulties.
- Guide instructional decisions in terms of what skills require development.

10

Two Levels of Word Reading Skill

1) The ability to ***identify unfamiliar words*** by sounding them out
2) The ability to ***remember written words*** for later, instant and effortless retrieval

Unfortunately, the "Science of Reading" movement focuses on the first and not the second.

As we will see (and contrary to our intuition), the first level of skill is required for the second

11

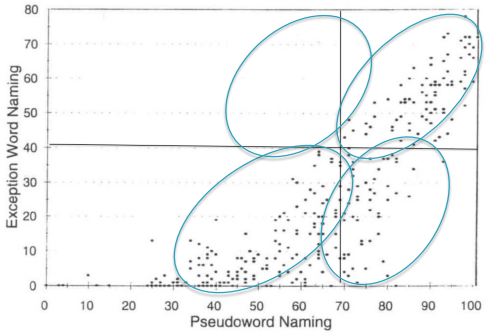
Two Levels of Word-Level Reading Skill Deficits

Study of 305 2nd and 3rd graders

r = +.78

Tunmer & Chapman (1998)

Replicated in:
- Gough & Walsh (1991)
- Stahl (1998)
- WIAT-4 scatterplots (Breaux & Kilpatrick, 2023)



12

Limits to the Efficacy of Phonics

- Phonetic decoding is the most efficient way to identify new words.
  - All skilled readers of alphabetic writing systems have phonics skills.
  - This is true even if they were never taught phonics; they figured out the "system" on their own.
  - We know this is the case because all skilled readers can read nonsense words, which is impossible without phonics skills.
- However, phonics skills do not guarantee memory for words or reading fluency.

13

An Observation and an Intuitive Puzzle

Observation

- What's the most obvious thing about our own reading?
  - We instantly and effortless retrieve all (or nearly all) the words on the page.
  - We are neither sounding out words as we go along, nor guessing at words.
    - We only do those if we see a word we don't already know.

Intuitive Puzzle

What would an "auditory" skill like phonemic awareness have to do with visual word reading?

Unraveling the Mystery

To make sense of the connection, we need to understand

(1) How alphabetic writing works.

(2) How our memory system interacts with alphabetic writing.

14

How We Remember the Words We Read

15

The Nature of Alphabetic Writing

- Chinese writing vs. alphabetic writing.
- In alphabetic writing, individual characters do not represent words.
- *We don't write words!* We write phoneme characters.
- Written characters (letters) represent oral phonemes *not* words.
  - We only write three words in English: *a, I, O.*
- **We write sequences of phoneme characters (alphabetic) that line up with the phoneme sequences in spoken words.**
- *Alphabetic writing is phonemic writing!*
- Poor access to phonemes in spoken words makes learning to read alphabetic languages very difficult.
- Phoneme skills are needed for BOTH sounding out new words AND for remembering written words.
- Assessment of phoneme skills is essential for struggling readers.

16

Linnea Ehri's Orthographic Mapping Theory

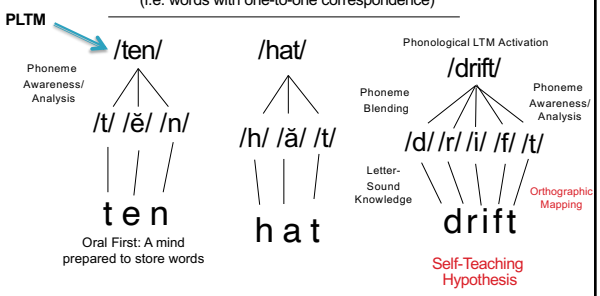
- Sight words are highly familiar spellings (i.e., letter sequences), regardless of the visual look of the word
  - e.g., bear, BEAR, **Bear,** *bear*, **bear**, BEAR , **bear**, *bear*, BEAR
- Sight words are anchored in long-term memory (LTM) via a grapho-phonemic connection forming process
- We connect something well established in LTM (the word's pronunciation) to the stimulus that needs to be learned (the letter sequence in the word's spelling)
- Phoneme-level analysis and letter-sound knowledge are central to this connection-forming process

17

How We "Map" Words

"Transparent" Words

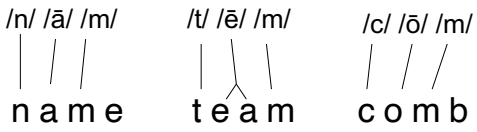
(i.e. words with one-to-one correspondence)



18

How We "Map" Words

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



19

What about irregular words?

- Irregular and opaque words take a little longer to learn
  - Perhaps 1–2 extra exposures for typical readers; many more for RD
- Most irregular words are off by only one element
  - E.g., *said, put, comb, island*; multiple violations are rare: *of, one, iron*
- Irregular words are not a challenge for orthographic mapping
  - "Exception words are only exceptional when someone tries to read them by applying a [phonetic] 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)
- Many regular words require mapping "adjustments," just 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*)

20

Skills Required for Efficient Orthographic Mapping
(and thus necessary for skilled reading)

- Orthographic mapping is a grapho-phonemic connection forming process that occurs automatically
- To do this efficiently, readers must have:
  - **Letter-sound proficiency**
  - **Phonemic proficiency**
  - The ability to automatically/unconsciously establish a relationship between phonemes and graphemes while reading
- This helps us understand two things:
  - Why phoneme manipulation tasks are so useful
  - How we can unconsciously encode words so efficiently
- **Letter-sound "knowledge" and phoneme "awareness" are not enough!**
  - Automaticity is essential with both letter sounds and phoneme skills

21

Deductive Logical Support for Phonemic Proficiency and Sight-Word Learning

- Deductive, inductive, and abductive reasoning, and axioms

The Deductive argument:

(1) The encoding of written words into long-term memory is primarily an automatic and unconscious process *(axiom).*

(2) Any skills required for an automatic/unconscious process must themselves be automatic and unconscious (axiom).

(3) Ehri's theory indicates that we need to have access to the phonemes in the pronunciations of spoken words to efficiently encode written words into long-term memory *(inductive/abductive conclusion based upon empirical research).*

Thus

- Access to phonemes must be automatic/unconscious to efficiently encode written words into long-term memory

22

Extensive Support for Ehri's Theory From the WIAT-4 Norming Sample

(Thank you to Pearson, Inc. for permission to use this)

Age Level	Non-Instant Responses	Instant Responses	Combined
6	0.11	0.67	0.68
7	0.17	0.67	0.69
8	0.00	0.63	0.65
9	0.00	0.64	0.68
10-11	-0.07	0.61	0.66
12-13	-0.11	0.63	0.67
14-15	-0.12	0.66	0.69
16-17	-0.13	0.50	0.53
18-50	-0.14	0.60	0.65

Correlations between the WIAT-4 Word Reading Subtest and the Phonemic Proficiency Subtest

23

Insight Into Dyslexia

Phonemic Skills of High Schoolers with Dyslexia vs. K-5 Students

Grade Level	N	Total Correct	Instant Response
K	46	15.0	12.1
1	57	23.5	**18.5**
2	58	**29.3**	21.5
3	35	31.5	22.2
4 & 5	22	35.1	25.0
9-12	68	**27.3**	**17.2**

24

Phoneme Awareness, Letters, and Social Media Misinformation

The conclusion from the National Reading Panel's (NRP) review of experimental studies was that teaching phonemic awareness (PA) results in better reading outcomes than not teaching PA.

- They made some additional recommendations they described as "tentative," and "suggestive," one of which was that PA instruction works better "with letters" than "without letters."
- They never defined what they meant by that distinction.
- However, they illustrated what they meant by describing eight "with letters" studies, all of which taught PA via oral activities.
  - An examination of all the other studies they categorized as teaching PA "with letters" indicates that most relied heavily on oral *activities* to teach PA, but letters were introduced at some point in the instruction (thus, teaching PA "with letters")
  - By contrast, none of the "without letters" studies incorporated letters in any way into the PA instruction.

25

Phoneme Awareness, Letters, and Social Media Misinformation

- The NRP's findings have been widely misinterpreted on social media, even by university faculty who are passing along secondhand information.
- Contrary to social media misinformation, the NRP:

(1) Never downplayed the value of oral phonemic awareness activities.
- Oral activities were foundational for most "with letters" studies.

(2) Never said letters should be visible during all or most PA activities.
- Again, most "with letters" studies relied heavily on oral activities.

(3) Never said that once letters are introduced, oral PA activities should be discontinued.
- Many "with letters studies" continued oral activities after the introduction of letters.

- This social media misinformation undermines the NRP's research findings and must be disregarded.

26

Understanding and Developing Reading Fluency

27

Sight Vocabulary and Reading Fluency

- *Sight words* are effortless & pre-cognitive—words "pop out"
- The elusive key to reading fluency is:

SIGHT VOCABULARY SIZE

- With a large sight vocabulary:

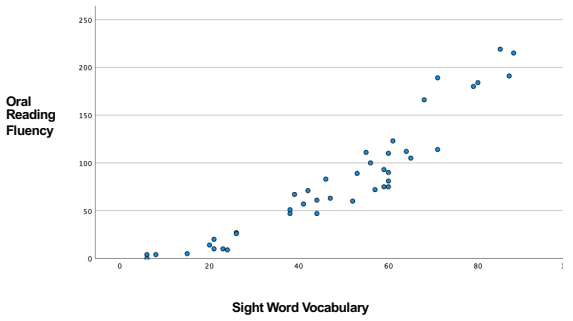
  Most (or all) words "pop out"; reading is *accurate* and *fast*

- With a limited sight vocabulary:
  - Reading is effortful and often inaccurate because too many unfamiliar words require attention and strategic decoding
  - Poor fluency is NOT about speed of access to known words
    - Known words are responded to instantly
    - It is about *how many* words you already know

28

Grade 1 Students

Our test that estimated the sight vocabulary (SWE) aligns very closely with paragraph reading fluency

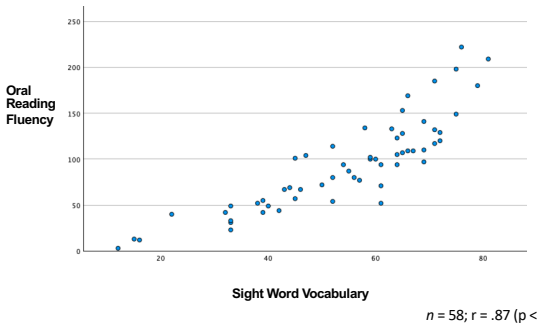


N = 42; r = .94 (p < .001)

29

Grade 2 Students

Our test that estimated the sight vocabulary (SWE) aligns very closely with paragraph reading fluency



n = 58; r = .87 (p < .001)

30

How Does One Become a Fluent Reader?

To improve reading fluency, students need two things:

1) **Efficient Orthographic Mapping Skill**
   - Students need to become skilled in remembering newly encountered words after very few exposures.
2) **Reading Experience** (and a lot of it!)
   - Once they are good at orthographic mapping, they need to do a lot of reading to continually build the orthographic lexicon.
     - **NOTE:** Teachers should *not* delay exposure to print or "reading practice" while addressing orthographic mapping skill deficits—the two occur simultaneously.
     - Yet providing "reading practice" without addressing deficits in orthographic mapping provides students with no reliable way to become better readers.
       - They don't efficiently or reliably remember the words they encounter.

31

IMPLICATIONS FOR READING ASSESSMENT

Determining Which Skills are Responsible for a Student's Difficulties

32

Distinguishing Between Tasks and Skills

- Tasks and skills are not the same thing.
  - We cannot directly "see" cognitive or linguistic skills.
  - We infer them from what we *can* see, which is student task performance.
- *Examples:* Math skill or second language knowledge.
- ASSESSMENT: Tasks estimate the unseen skills.
- INSTRUCTION: Tasks are used to teach/train skills.
- It is essential for us to understand the underlying skills for reading.
- That understanding determines what assessment tasks we will use and how we will interpret them.

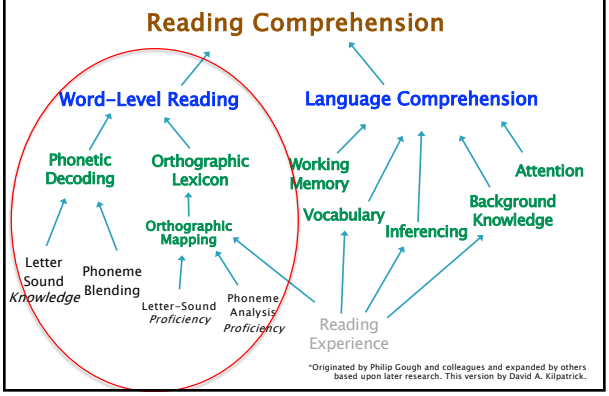
33

The Inherent Skill Confound of Three Reading-Related Skills in Our Conventional Word Identification Subtests

- These cannot be normatively teased out of these tests
  - (1) Orthographic Memory
    - Words students instantly recognize as familiar reflect their ability to remember words. Thus, these tests partially test the extent of the orthographic lexicon.
  - (2) Phonetic Decoding
    - A student can sound out words on word identification subtests, even if they've never seen them before.
  - (3) Set for Variability
    - Students can often guess correctly when a misread word (or phonetically decoded irregular word) sounds close enough to the actual word.

34

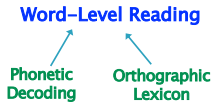
The Simple View of Reading*



*Originated by Philip Gough and colleagues and expanded by others based upon later research. This version by David A. Kilpatrick.

35

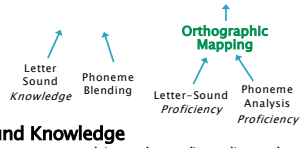
We Should Assess Each Component of Word-Level Reading



- **Word-Level Reading**
  - Fluency is a great "thermometer" and a good "task" to assess word-level reading "skill."
    - It tells you something is not right but doesn't tell you what.
    - Also, it can take as little as 1 minute!
- **Phonetic decoding**
  - This can be assessed via untimed nonsense word reading subtests (e.g., from WIAT-4; KTEA-4; WJ-4).
- **The Orthographic Lexicon**
  - This can be estimated by timed, single-word reading subtests (TOWRE-2; WIAT-4; KTEA-4).

36

We Should Assess Each Component of Word-Level Reading



- **Letter-Sound Knowledge**
  - Untimed nonsense word (pseudoword) reading subtests.
- **Phoneme Blending**
  - CTOPP-2 Blending Words (blending is built into nonsense word reading).
- **Letter-Sound Proficiency**
  - Timed nonsense word reading (TOWRE-2; WIAT-4; KTEA-4).
- **Phonemic Proficiency**
  - Per-item timed phonemic assessment (PAST, WIAT-4).

37

IMPLICATIONS FOR INSTRUCTION AND INTERVENTION

38

What the Intervention Researchers Say

The word-recognition skills of students with identified reading disabilities can be normalized with effective interventions.

—Foorman and Al Otaiba (2009, p. 257)

Several decades of research on effective reading interventions shows us that it is possible to substantially reduce the 36% of fourth graders reading below grade level on NAEP or the 17.5% of students with reading disabilities. Better classroom instruction can reduce the numbers of low-achieving students to around 5%. Supplemental small-group or one-on-one tutoring can reduce the numbers even further to 1%-3%.

—Foorman and Al Otaiba (2009, p. 269-270)

Foorman, B., & Al Otaiba, S. (2009). Reading remediation: State of the art. In K. Pugh & P. McCardle (Eds.), *How children learn to read: Current issues and new directions in the integration of cognition, neurobiology and genetics of reading and dyslexia research and practice* (pp. 257-274). New York, NY: Psychology Press.

39

Prevention: Tier 1 Results

K-1 phonological Awareness Instruction

- *Overall* improvement in reading scores
- Average of 8 standard score points
- Results did not always last after 1-2 year follow ups

HOWEVER . . .

- At-risk students averaged 13 standard score point gains!
- Gains increased to an average of 20 points at 6 month to 2 year follow ups!

40

I. Prevention of Word-Level Reading Difficulties

- Tier 1 instruction – What is effective K-1?
  - KEY COMPONENTS
  - Phonological/Phonemic Awareness Instruction
  - Letter-Sound Knowledge Instruction and Practice
  - 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

41

Research on Word Reading Intervention Outcomes Based Upon Standard Score Gains

These three groups approached instruction differently!

- Minimal Group (0 – 5.85 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
  - All trained phonological segmentation and/or blending
    - This is "basic phonological awareness" (mastered by most at end of 1st grade)
- Highly Successful Group (10-25 point improvements)
  - Aggressively addressed and "fixed" PA issues with rigorous PA training
  - All did explicit, systematic phonics
  - All provided reading practice with connected text

42

Skills That Need to Be Developed

- Identifying new words via phonetic decoding
  - Letter-sound knowledge
  - Phonemic blending
  - Set for variability
- Encoding words (remembering) via orthographic mapping
  - Letter-sound proficiency/automaticity
  - Phonemic proficiency/automaticity

43

Summary

- Word-level reading is primarily phonological in nature
  - This is based upon the alphabetic nature of our writing system
  - Visual memory is not a significant contributor to word reading
- Skilled readers are all good at 1) phonetic decoding and 2) orthographic mapping, neither is optional
  - Efficiently remembering words via orthographic mapping appears to require 1) letter-sound *proficiency* and 2) phonemic *proficiency*
- Fluency appears to be primarily a function of sight vocabulary size.
- Reading problems are preventable and correctable.
  - Tier 1 instruction and Tiers 2, 3 (or 4) intervention should teach the skills needed for both phonetic decoding and orthographic mapping.
  - Phonemic awareness and letter-sound knowledge is not enough. Students need proficiency/automaticity in their phonemic skills and letter-sound skills.

44

For Further Reading

Beck, I. L., McKeown, M. G., & Kucan, L. (2013). *Bringing words to life: Robust vocabulary instruction (2nd ed.).* Guilford.

Geva, E., & Ramirez, R. (2015). *Focus on reading (Oxford key concepts for the language classroom).* Oxford University Press. (Reviews the research on English Language Learners)

Kilpatrick, D. A. (2015). *Essentials of assessing, preventing, and overcoming reading difficulties.* Wiley & Sons.

Kilpatrick, D. A. (2016). *Equipped for reading success.* Casey & Kirsch.

Moats, L. C. (2020). *Speech to print: Language essentials for teachers.* Brookes.

Oakhill, J., Cain, K., & Elbro, C. (2015). *Understanding and teaching reading comprehension: A handbook.* Routledge.

45