

# Introduction to the Tests of Dyslexia (TOD™)

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Sherry Mee Bell, PhD, & Barbara J. Wendling, MA

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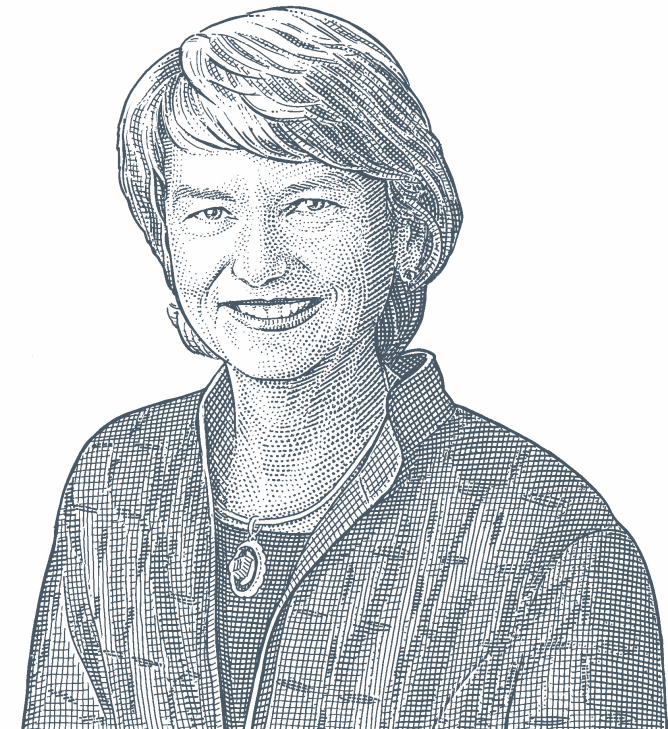
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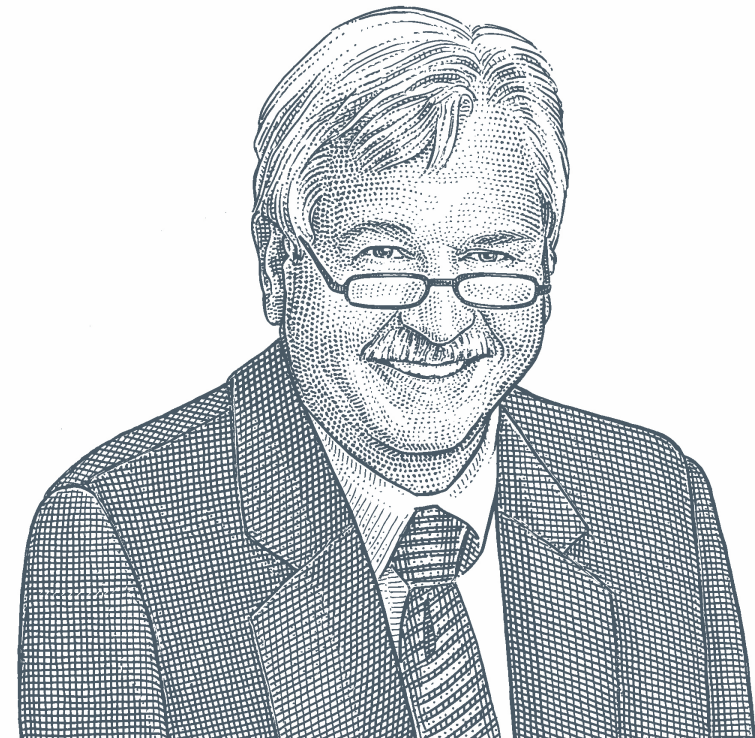
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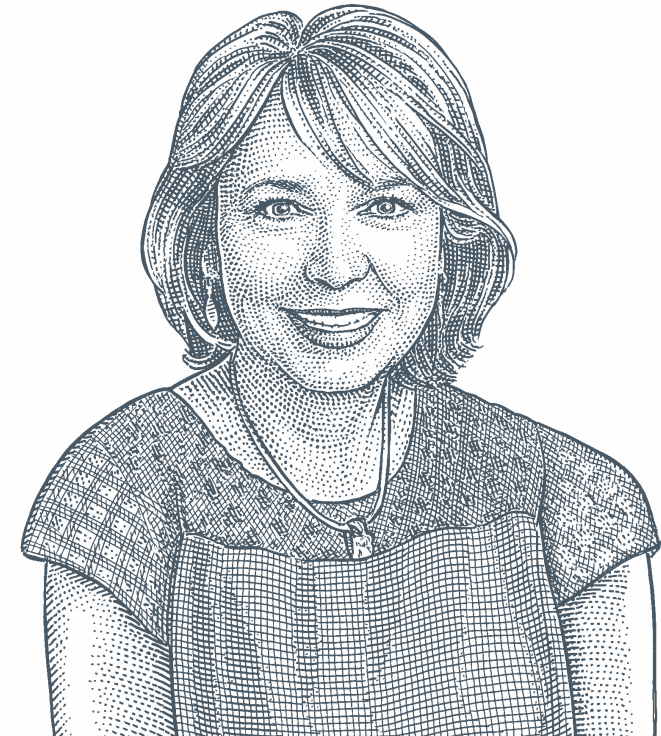
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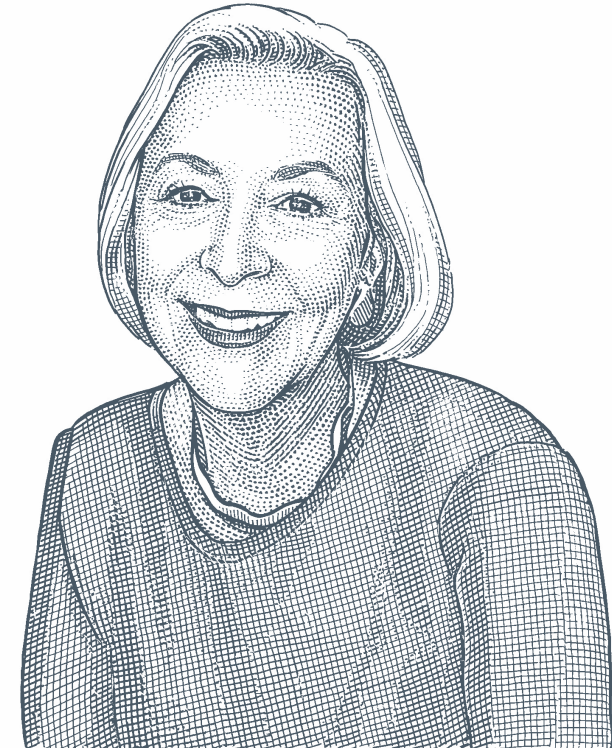
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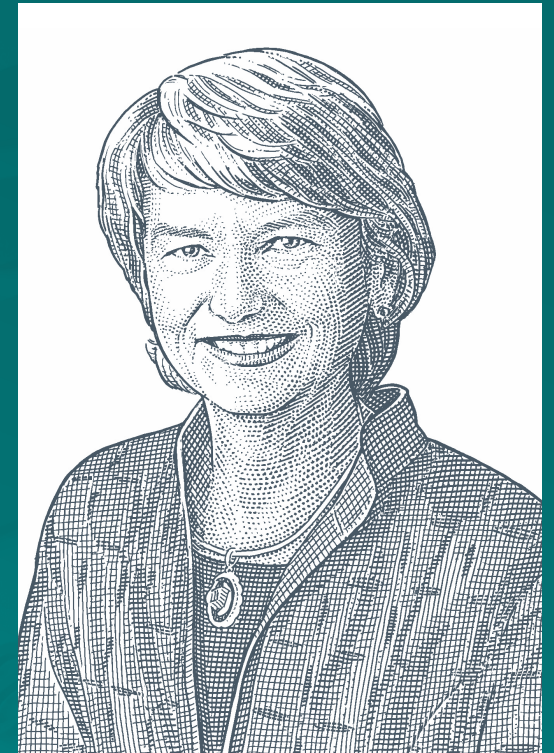
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# Agenda

- Rationale for and Overview of the TOD—  
Nancy Mather, PhD
- Introduction to the TOD Rating Scales—  
Sherry Mee Bell, PhD
- Highlights of TOD Development and Psychometrics—  
R. Steve McCallum, PhD
- Dyslexia Interventions and Recommendations Guidebook—  
Barbara J. Wendling, MA

# Rationale for and Overview of the TOD



Nancy Mather, PhD

# The Question

Why do we need to use 3 or 4 different tests to perform a comprehensive dyslexia assessment?









# Use of Multiple Tests

- Different norm samples
- Different age and grade ranges
- Access to various tests
- Different types of test scores







# I call 85–115 “Average.”

There are 200 &s.  
Each && = 1%.



-69			70–79			80–89		90–109				110–119		120–129		130–		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
<b>Extremely Low</b> -69			Borderline 70–79			Low Average 80–89		<b>Average</b> 90–109				High Average 110–119		<b>Superior</b> 120–129		Very Superior 130–		
Very Low -55	Low 55–69	Below Average 70–84			<b>Average</b> 85–115				Above Average 116–130			Superior 131–145		Very Superior 146–				

Slide from Dr. John Willis

# Consensus on the Definition

- It is a neurobiological disorder that affects the development of basic reading skills, spelling, and automaticity with sound–symbol connections.
- It is often accompanied by specific linguistic risk factors that predict poor reading and spelling.
- It is a lifelong condition, but effective interventions reduce the impact.
- Many other abilities are often intact and can even be advanced.



# What should be included in a comprehensive test for dyslexia?

- Linguistic Risk Factors
- Reading Skills
- Word Reading and Rate
- Spelling
- Vocabulary and Reasoning
- Co-normed with Parent, Teacher, and Self-Rating Scales
- Recommendations for Intervention

# Linguistic Risk Factors

- Linguistic risk factors are related to and affect the development of reading and spelling skills.
- They predict an individual will have difficulties with reading and spelling development.
- Some are more trainable than others (e.g., phonological awareness vs. working memory).
- Some we'd want to train (e.g., phonological awareness) and some we would not (e.g., rapid automatized naming [RAN]).

# Going Beyond Phonological Awareness

A single deficit model suggests that difficulties with reading stem primarily from poor phonological awareness (PA).

- International Dyslexia Association (IDA) definition emphasizes PA.
- State definitions and handbooks emphasize PA.



# Going Beyond Phonological Awareness *(cont.)*



The phonological deficit view that has dominated the field for years is inadequate for explaining all cases of reading disorder (Peterson & Pennington, 2012; Snowling & Hulme, 2012) and its importance has been overstated (Swanson et al., 2003).

**Sources:** Peterson, R. L., & Pennington, B. F. (2012). Developmental dyslexia. *The Lancet*, 379(9830), 1997–2007.

Snowling, M. J., & Hulme, C. (2012). Annual research review: The nature and classification of reading disorders—a commentary for proposals on DSM-5. *Journal of Child Psychology and Psychiatry*, 53, 593–607.

Swanson, H. L., Trainin, G., Necochea, D. M., & Hammill, D. D. (2003). Rapid naming, phonological awareness, and reading. A meta-analysis of the correlational evidence. *Review of Educational Research*, 73, 407–444.



# Multiple Deficit View

Adherence to a single deficit profile has limited utility; using only poor phonological awareness as a criterion for dyslexia would result in missing about one half of the cases.



**Source:** Pennington, B. F., Santerre-Lemmon, L., Rosenberg, J., MacDonald, B., Boada, R., Friend, A., Leopold, D. R., Samuelsson, S., Byrne, B., Willcutt, E. G., & Olson, R. K. (2012). Individual prediction of dyslexia by single versus multiple deficit models. *Journal of Abnormal Psychology, 121*(1), 212–224.

<https://doi.org/10.1037/a0025823>

# Multiple Deficit View (*cont.*)

“Thus, requiring a deficit in phonological processing (or any other cognitive skill) for diagnosis is inappropriate and would unfairly exclude some individuals with clinically impairing literacy difficulties” (p. 159).

**Source:** Pennington, B. F., McGrath, L. M., & Peterson, R. L. (2019). Reading disability (Dyslexia). *Diagnosing learning disorders: From science to practice* (3rd ed.). Guilford.

# Linguistic Risk Factors

- Phonological Awareness
  - Blending and Segmenting
  - Manipulation
- Rapid Automated Naming
  - Letters
  - Numbers
- Working Memory
- Orthographic Processing
- Visual–Verbal Paired-Associate Learning



# TOD-Comprehensive

## Test 6C. Rapid Letter Naming

In this timed test, the examinee is presented with rows of confusable letters (e.g., *b*, *d*, *p*) and must name the letters as rapidly as possible within 1 minute.

**p      d      u      n      b      q**

# TOD-Comprehensive *(cont.)*

## Test 17C. Rapid Number and Letter Naming

The examinee is presented with rows of confusable letters and numbers and must name the letters as rapidly as possible within 1 minute.

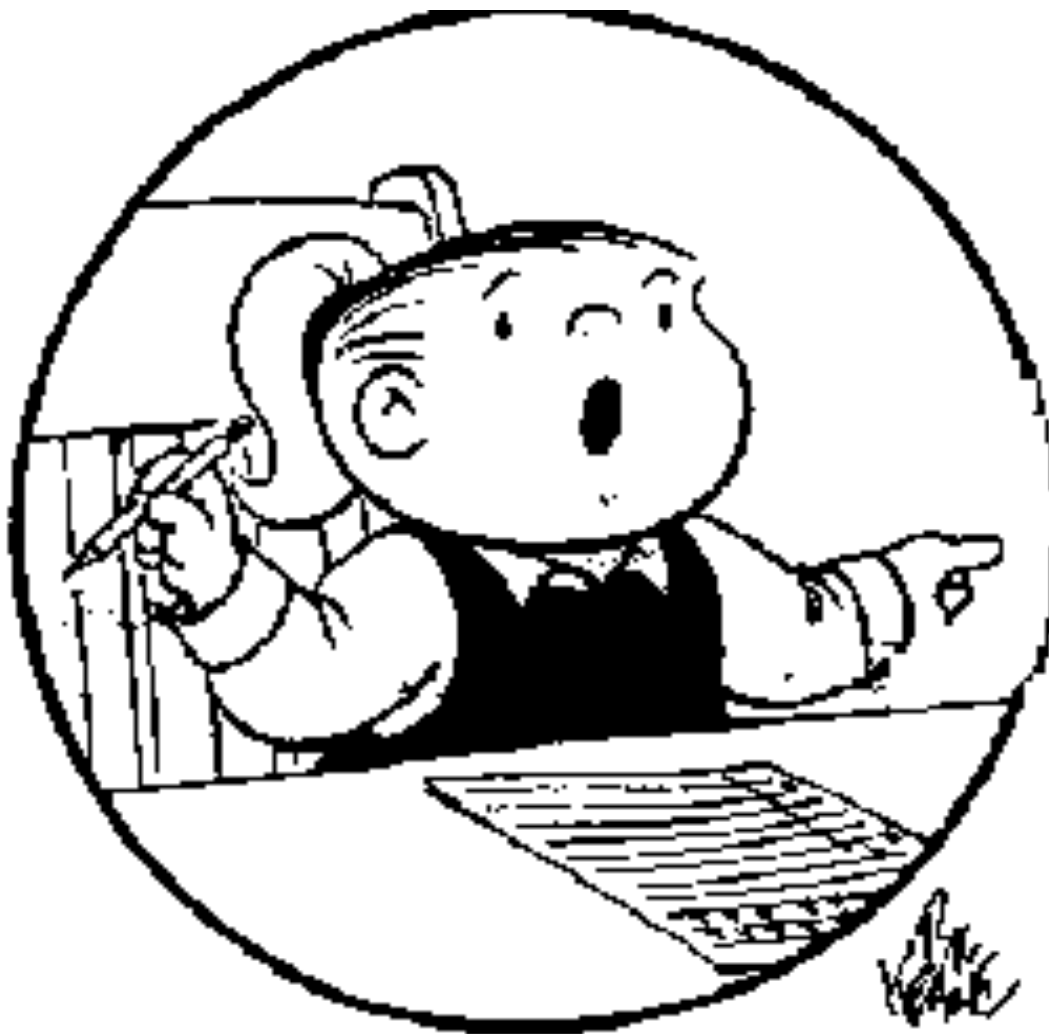


# Confusable Letters

On letter-naming tasks, even adults with dyslexia have longer fixation times and more regressions than typical readers when the selected letters are confusing (Dahhan et al., 2020).



**Source:** Dahhan, N. Z. A., Kirby, J. R., Brien, D. C., Gupta, R., Harrison, A., Munoz, D. P. (2020). Understanding the biological basis of dyslexia at a neural systems level. *Brain Communications*, 2, 1–16. fcaa173, <https://doi.org/10.1093/braincomms/fcaa173>



**"Do the bumps on a "B" go  
toward the living room or the  
kitchen?"**



# TOD-Early

## **6E. Early Rapid Letter and Number Naming**

The examinee is presented with rows of letters (A B C) and numbers (1 2 3) in a random sequence and must name as many as possible within 1 minute.



Dan, Grade 5

the ROLL OF  
ORTHOGRAPHY

IN  
DYSLEXIA

Ben, Grade 8

The roll of  
orthography in  
dyslexia

# Orthographic Processing

Orthographic processing is also a linguistic risk factor. Findings from a recent meta-analysis indicated that individuals with dyslexia have a deficit in orthographic knowledge that is as large as that of phonological awareness and RAN.



**Source:** Georgiou, G. K., Martinez, D., Vieira, A. P. A., & Guo, K. (2021). Is orthographic knowledge a strength or a weakness in individuals with dyslexia? Evidence from a meta-analysis. *Annals of Dyslexia*, 71, 5–27. <https://doi.org/10.1007/s11881-021-00220-6>

# TOD-Screener

## Test 2S. Letter and Word Choice

The examiner reads a letter or word aloud and the examinee circles the correct letter, or correctly spelled word, from a choice of four options (e.g., *A, O, K, M; prak, park, karp, rakp*).

Sample A	N	<b>B</b>	G	P
Sample B	K	h	L	o

uf	of	uff	fo
----	----	-----	----

# TOD-Comprehensive

## Test 8C. Word Pattern Choice

In this timed test, the examinee looks at a row of four letter groups and chooses the one that is most like a real English word (e.g., *ffeb*, *fefb*, *beff*, *bffe*) within 2 minutes.

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### Sample A:

**Use the Response Booklet**

Open the TOD-C Response Booklet to Test 8C on page 4 and say: I want you to look at some groups of letters in a row and try to find the group that looks most like a real word. Point to Sample A and say: Look at these groups of letters. One of these could be a real English word, but the other three could not.

xc

im

bv

kq

# Additional Measures of Orthography

- **Test 5C. Irregular Word Spelling:** Examinee spells words that have an irregular element
- **Test 11C. Irregular Word Reading:** Examinee reads words with an irregular element
- **Test 20C. Rapid Irregular Word Reading (timed):** Examinee reads words with an irregular element as quickly as possible



# Visual–Verbal Paired-Associate Learning (PAL)

“The learning of mappings between orthography and phonology is critical for learning to read and likely operates at numerous levels, including the process of learning letter–sound correspondences and the learning of mappings at the level of single letters, letter groups, and whole words when acquiring a word recognition system” (p. 47).

**Source:** Warmington, M., & Hulme, C. (2012). Phoneme awareness, visual-verbal paired associate learning, and rapid automatized naming as predictors of individual differences in reading ability. *Scientific Studies of Reading, 16*, 45–62.

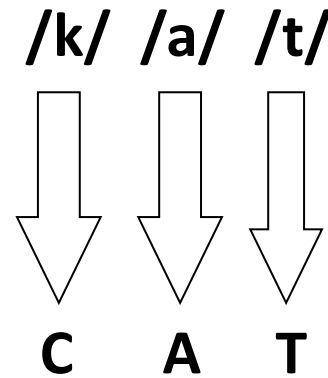


# Orthographic Mapping

Forming the connections between the phonemes and the graphemes.

Whole word: **cat**

Analyzed into phonemes:



Mapped to graphemes:

Recognized as the whole word: **cat**



# Orthographic Mapping *(cont.)*

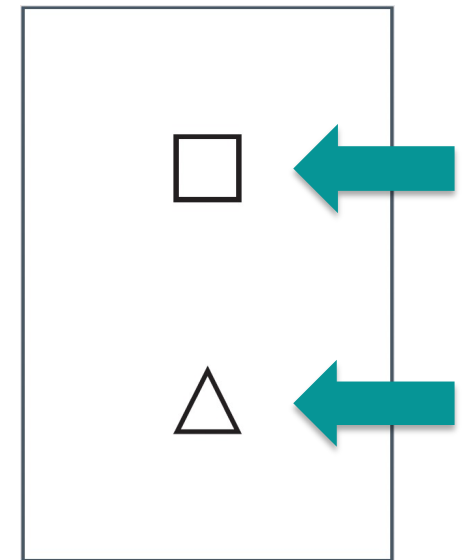
## Test 21C. *Symbol to Sound Learning*

### Sample A:

Say: I am going to show you some symbols and tell you the sound that each one makes. Each symbol stands for only one sound.

Point to the symbol □ and say: This stands for /ă/ as in *apple*. What sound does it make?

Then point to the symbol △ and say: This stands for /m/ as in *monkey*. What sound does it make?



**After Sample A, administer Items 1–5.**

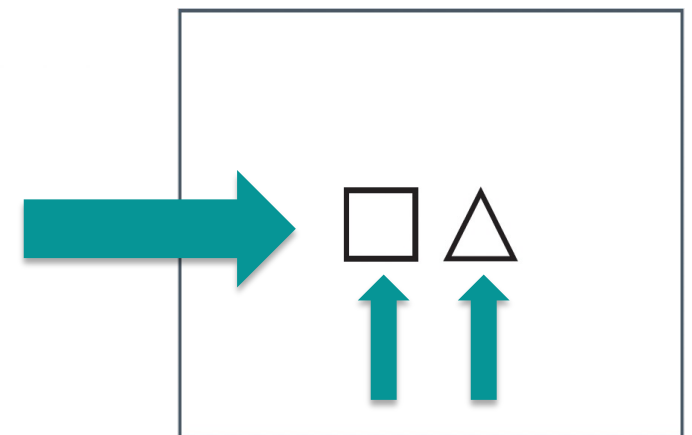
# Orthographic Mapping (*cont.*)

## Test 21C. *Symbol to Sound Learning (cont.)*

### Sample B:

Say: **Now we will put two of these sounds together to make a real word.**

Point to the symbols □△ and say: **These stand for two of the sounds you just learned.** Point to each symbol and say: /ă/ /m/. When we put these two sounds together, they make the word *am*.



# Reading and Spelling

- “The core impairment is in basic literacy skills such as *reading accuracy, reading fluency, and/or spelling*” (p. 158).



**Source:** Pennington, B. F., McGrath, L. M., & Peterson, R. L. (2019). Reading disability (Dyslexia). *Diagnosing learning disorders: From science to practice* (3rd ed.). Guilford.

“Tests of accuracy and speed of word recognition and pseudoword reading are absolutely essential for understanding whether an individual is experiencing reading difficulties” (p. 26).

**Source:** Siegel, L. S., & Hurford, D. P. (2019). The case against discrepancy models in the evaluation of dyslexia. *Perspectives on Language and Literacy*, 45(1), 23–28.



# Reading and Spelling *(cont.)*



- Phonics Knowledge
  - Pseudoword Reading (untimed and timed)
- Sight Word Acquisition
  - Irregular Word Reading (untimed and timed)
- Reading Rate (Oral Reading Fluency—timed)
- Comprehension Efficiency (timed passage reading with questions)
- Spelling (regular and exception words)



**Sorry to hear that you're dyslexic,  
Simkins... er, how do you spell that?**

NAME Bradley DATE 2-20

ANSWER THESE QUESTIONS ABOUT THE STORY IN COMPLETE SENTENCES.

SOCKS

90%  
Please spell  
words correctly

1. How did Socks feel about the diet the Brickers put him on? Why did he feel this way?

He did not like it because they  
were starving him. *because*

2. How did Tiffy feel when Socks left her house? Why did she feel this way?

She did not eat any food.

3. What did Mrs. Risley do that made Socks like her immediately?

She scratched his back and loved  
him.

4. What was Socks really hungry for and who gave it to him?

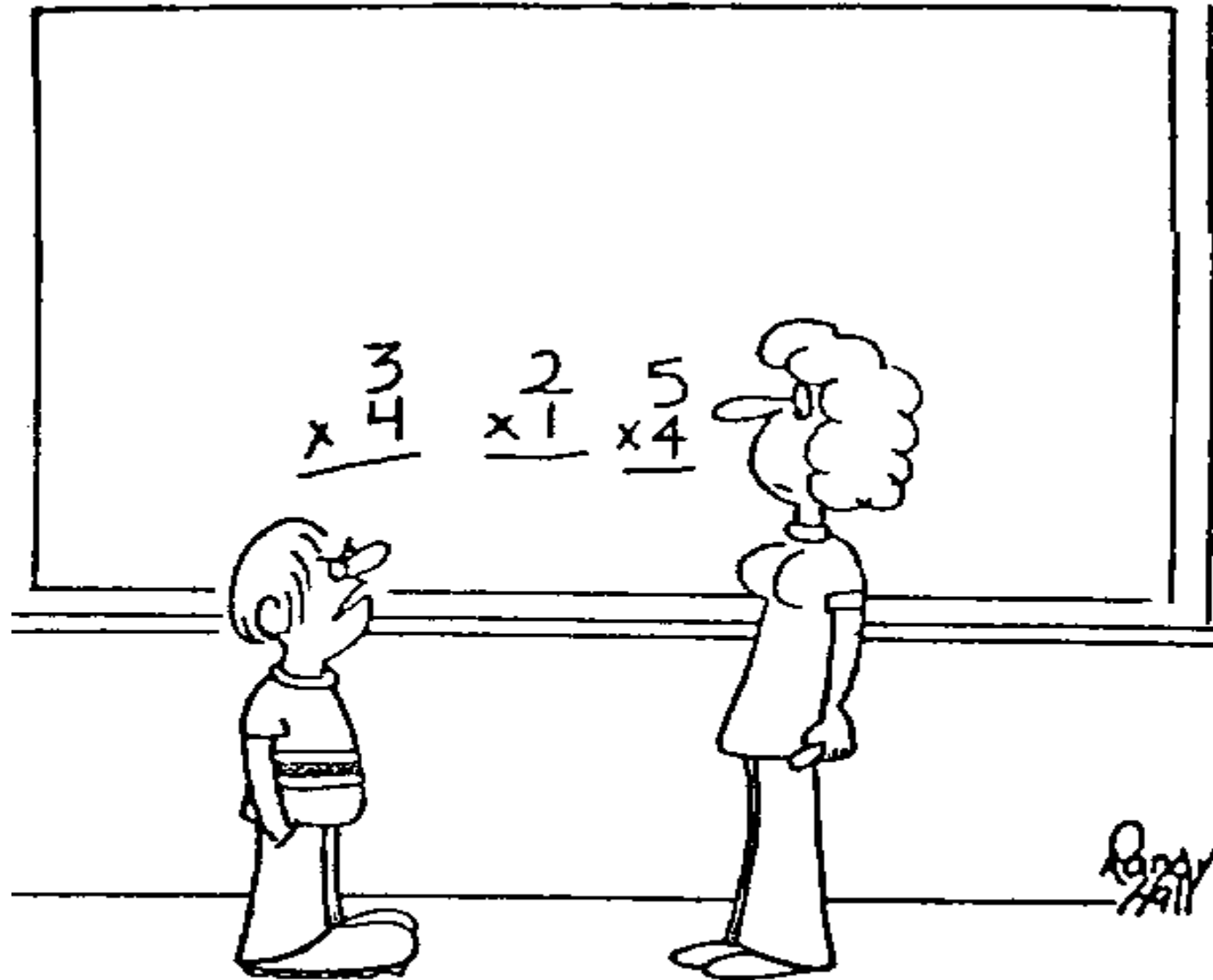
Mrs. Risley gave him Love and  
attention

5. If you were Socks, how would you let the Brickers know that you needed love and affection?

I would love them.  
*would*

# Vocabulary and Reasoning

- Vocabulary: high comorbidity with developmental language disorder
- Vocabulary: unexpected nature of dyslexia
- Reasoning: rule out intellectual impairments, English Language Learners
- Vocabulary and Reasoning: ability–achievement discrepancies
- Vocabulary and Reasoning: identification of twice-exceptional students

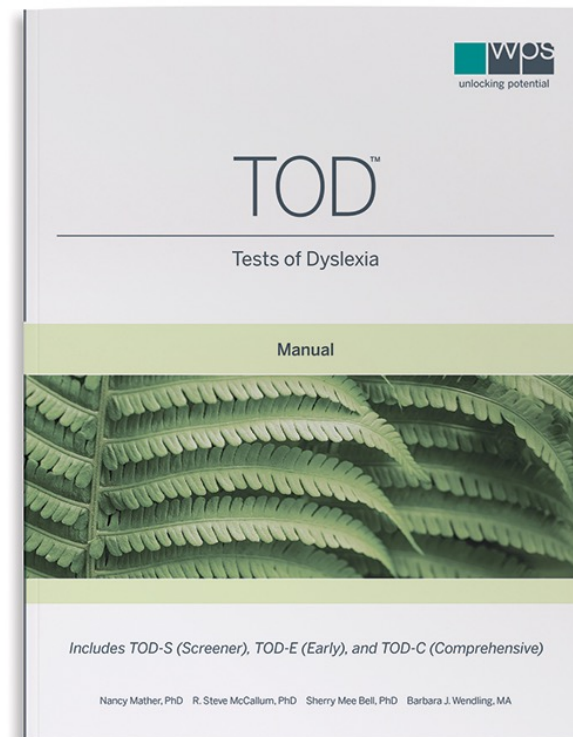


**“I’m not an underachiever.  
You are an overexpecter.”**



# Tests of Dyslexia (TOD)

- TOD-Screener
- TOD-Early
- TOD-Comprehensive
- TOD Rating Scales
- Dyslexia Interventions and Recommendations



# TOD-Early (Grades K–2)

## ■ TOD-Early Tests

1. Picture Vocabulary+
2. **Letter and Word Choice**
3. **Word Reading Fluency (K–1) or Question Reading Fluency**  
(Grade 2 and up)

Dyslexia Risk Index  
(DRI) = **Bold Tests**

+Picture Vocabulary is useful in the DRI and EDDI interpretation.

1. Picture Vocabulary+
2. **Letter and Word Choice**
3. **Word Reading Fluency**
4. **Sounds and Pseudowords**
5. **Rhyming**
6. **Early Rapid Number and Letter Naming**
7. **Letter and Sight Word Recognition**
8. **Early Segmenting**
9. **Letter and Sound Knowledge**

Early Dyslexia Diagnostic  
Index (EDDI) = **Bold Tests**

# TOD-Early (Grades K–2)

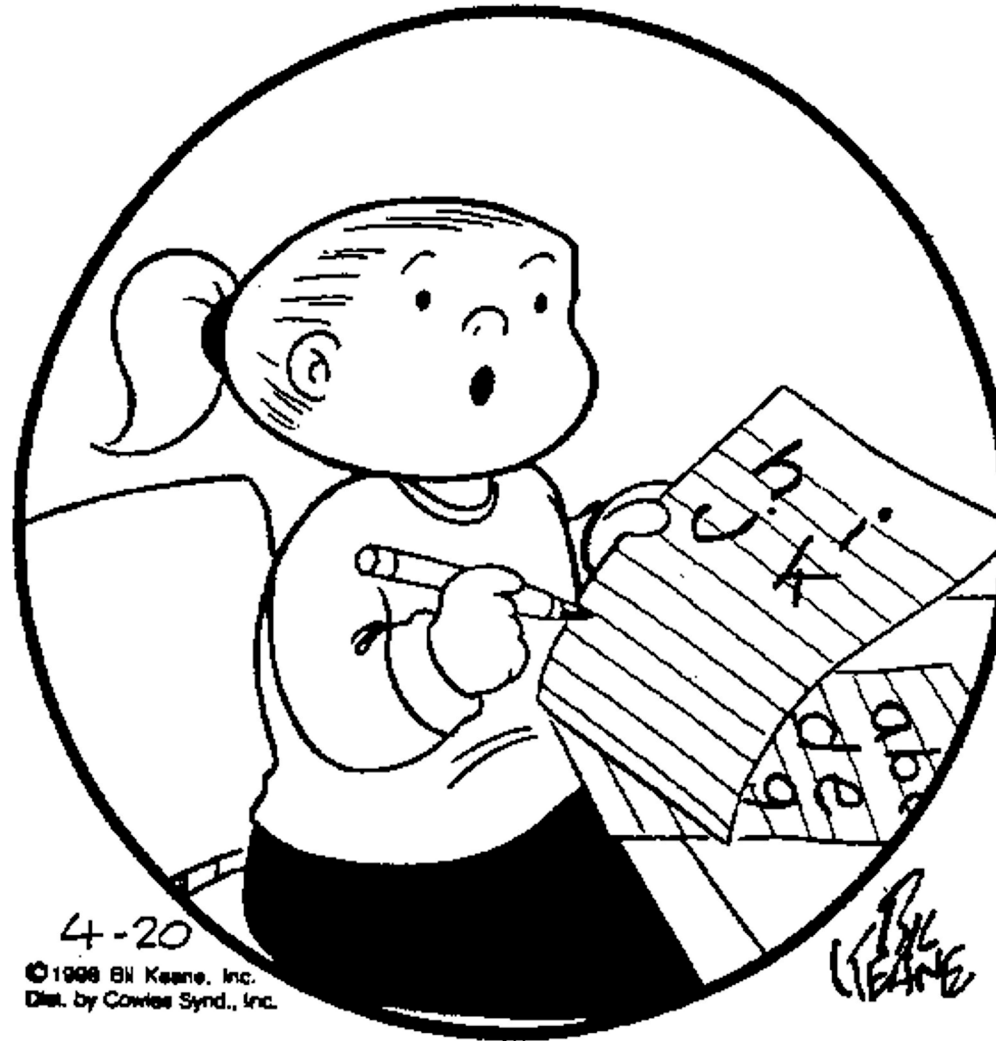
*(cont.)*

- TOD-Early Composites
  - Early Sight Word Acquisition
  - Early Phonics Knowledge
  - Early Basic Reading Skills
  - Early Phonological Awareness



# The Family Circus

by Bil Keane



**“How do I write an elemenopee?”**

# TOD-Comprehensive (Grade 1 and Up)

## ■ TOD-Comprehensive Tests

1. Picture Vocabulary
2. **Letter and Word Choice**
3. **Word or Question Reading Fluency**
4. **Phonological Manipulation**
5. **Irregular Word Spelling**
6. **Rapid Letter Naming**
7. **Pseudoword Reading**
8. **Word Pattern Choice**
9. **Word Memory**
10. Picture Analogies
11. Irregular Word Reading
12. Oral Reading Efficiency
13. Blending
14. Segmenting
15. Regular Word Spelling
16. Silent Reading Efficiency
17. Rapid Number and Letter Naming
18. Letter Memory
19. Rapid Pseudoword Reading
20. Rapid Irregular Word Reading
21. Symbol to Sound Learning
22. Listening Vocabulary
23. Geometric Analogies



Dyslexia Diagnostic Index (DDI)  
= **Bold Tests**



# TOD-Comprehensive (cont.)



- TOD-Comprehensive Composites

Reading and Spelling	Linguistic Processing	Vocabulary and Reasoning
Sight Word Acquisition	Phonological Awareness	Vocabulary and Reasoning-2
Phonics Knowledge	Rapid Automatized Naming	Vocabulary and Reasoning-4
Basic Reading Skills	Auditory Working Memory	Vocabulary
Decoding Efficiency	Orthographic Processing	Reasoning
Spelling	Visual-Verbal Paired-Associate Learning (Symbol to Sound Test)	
Reading Fluency		
Reading Comprehension Efficiency		

# Introduction to the TOD Rating Scales

Sherry Mee Bell, PhD



# TOD Rating Scales

## TOD-E

**Parent/Caregiver**  
(K–Grade 2)

**Teacher**  
(K–Grade 2)

## TOD-C

**Self-Rating**  
(Grade 1–Adult)

**Parent/Caregiver**  
(Grade 1–Adult)

**Teacher**  
(Grade 1–Adult)

# Value of Rating Scales

- As part of a comprehensive screening and assessment of dyslexia, rating scales can provide relevant family and developmental history and should inform the results of direct assessment (Pennington et al., 2019; Wagner et al., 2019).
- Provide observational/descriptive data
- Add relevant history (i.e., family history of reading difficulties, developmental history, and history of tutorial or remedial support)
- Tap salient sources (i.e., knowledgeable informants):
  - examinees themselves (self-report)
  - teachers
  - parents/caregivers
- For example, an extensive body of research affirms the validity of teacher ratings (McCallum & Bracken, 2018).

# Value of Rating Scales *(cont.)*

- Rating scales:
  - can help inform early identification decisions for those who have reading related problems
  - are easy and quick to administer
  - have potential to add to diagnostic accuracy of dyslexia using direct assessments
- Consequently, the authors of the Tests of Dyslexia created self, parent/caregiver, and teacher rating scales across the age span.
- The TOD Rating Scales were co-normed with the TOD direct assessment tests and are designed to be comprehensive.



# Child Perspective

*For some, reading is very difficult.*

“I would rather clean mold from the bathtub than read!”

*Real quote from a child with dyslexia (in Wolf, 2007).*

# Adult Perspective

A 24-year-old female (pseudonym Sara) recently underwent a psychoeducational evaluation to procure extended time eligibility and other accommodations in her university setting related to her history of struggles with reading and writing. Sara's general intellectual ability was assessed at the 97th percentile. She reads extensively but almost exclusively through audiobooks. She has a very strong GPA (3.83) and hopes to attend graduate school. She is a dedicated student who spends extensive time studying and preparing for class and tests. Sara describes her reading and spelling skills like this:

“I have difficulty reading. I often mistake one word for another. I have cried a river over spelling mistakes by this point in my life. I have an extensive vocabulary, but I cannot spell the majority of words. I have long since accepted these difficulties to be part of who I am and I do not allow them to prevent me from participating.”

# Teacher Perspective

*When describing a 14-year-old male (Percy F) with what we now know as dyslexia, Dr. Pringle Morgan wrote:*

“The schoolmaster who has taught him for some years says that he would be the smartest lad in the school if the instruction were entirely oral” (Morgan, 1896).

# Parent Perspective

“I think it is safe to say that parents of dyslexics worry about their children more than most. There is good reason for this: dyslexic children spend most of their early school dealing with a lot of failure and struggle.”

**Source:** <https://dyslexia.yale.edu/resources/parents/stories-from-parents/mother-worry-academic-support-away-from-home/>. Yale Center for Dyslexia and Creativity.

# Rating Scale Samples

*(Standardization and Clinical Cases Combined)*

## **TOD-E**

Total  $N = 211$

Parent/Caregiver Rating  $n = 154$

Teacher Rating  $n = 142$

## **TOD-C Adult Sample**

Self-Rating  $N = 267$

## **TOD-C Child (Ages 6–18) Sample**

Total  $N = 1,215$

Parent/Caregiver Rating  $n = 997$

Teacher Rating  $n = 448$

Self-Rating  $n = 1,066$

# TOD Rating Scales

- Each of the Rating Scales contains several yes-or-no questions related to:
  - family history
  - history of reading support
  - grade retention
  - previous diagnoses
- These are followed by a number of items with responses ranging from Strongly Disagree (1) to Strongly Agree (4)
  - A higher score on the Rating Scales is more indicative of dyslexia



# TOD Rating Scales *(cont.)*

- Items are designed to elicit relevant background/history and content focusing on:
  - Motivation for Reading
  - General Reasoning
  - Verbal Comprehension
  - Orthographic Processing
  - Phonological Awareness
  - Rapid Automated Naming
  - Memory
  - Basic Reading Skills
  - Reading Fluency
  - Reading Comprehension
  - Spelling

# TOD Rating Scales (*cont.*)

TOD-C Rating Scales assess reading-related skills and history from the perspectives of:

- Examinees themselves (Self-Rating)
- Parents/Caregivers
- Teachers

TOD-E Rating Scales that provide perspectives of:

- Parents/Caregivers, and
- Teachers

*TOD-E examinees were too young to provide reliable/valid data in a self-rating format, but the TOD manual contains questions appropriate to ask a young examinee*

# Possible Questions to Ask a Young Child

- Do you have a lot of books at home?
- Does anyone at home read books to you?
- Do you like listening to a book when someone reads it to you?
- Do you like to look at the words in the book when someone reads to you?
- Do you like to point to the words in a book?
- Do you ever ask someone to read a book to you?
- Do you like reading?
- Do you know the names of the letters in the alphabet?
- Do you know the sounds the letters make?

# Possible Questions to Ask A Young Child *(cont.)*

- Can you say the whole alphabet?
- Do you think it is easy to rhyme words, like dog and log?
- Can you write your name?
- Can you write the letters of the alphabet?
- Do you like to try to spell words?
- Would you rather sing a song or paint a picture than listen to a book?
- Would you rather write numbers than letters or words?
- Do you like to go to the library?
- Are you good at putting puzzles together?

# TOD-C Rating Scales

- **TOD-C Self-Rating Scale:** contains 39 items
  - A sample item reads *Because I read slowly, I have trouble understanding what I read* (Reading Fluency, Reading Comprehension).
- **TOD-C Teacher Rating Scale:** contains 34 items
  - A sample item reads *Can blend separate sounds to make a word (e.g., /m/ /a/ /t/ = mat)* (Phonological Awareness, Basic Reading Skills).
- **TOD-C Parent Rating Scale:** contains 34 items
  - A sample item reads *Gets confused by little words that look alike (e.g., was and saw; who and how)* (Orthographic Processing).

# TOD-E Rating Scales

- **TOD-E Teacher Rating Scale:** contains 32 items
  - A sample item reads *Can write most letters and a few simple words (e.g., A, B, C, I, see) (Spelling)*.
- **TOD-E Parent/Caregiver Rating Scale:** contains 37 items
  - A sample item reads *Has trouble saying the alphabet in order (Memory)*.





# TOD Rating Scales Scores

- **T-scores** ( $M = 50$ ;  $SD = 10$ ) are frequently used for rating scales.
- The initial step of creating rating-scale  $T$ -scores involved evaluating mean differences by age and grade. No significant differences were found, so a single raw-to- $T$ -score lookup table can be used for each rating scale sample.
- This process involved transforming the raw-score distribution to approximate a normal distribution. The normalized raw scores were transformed into  $Z$ -scores, which were then converted to  $T$ -scores.
- The use of normalized  $T$ -scores means that a given  $T$ -score value corresponds to the same percentile rank for all scales.

# TOD Rating Scales Dyslexia Risk Categories

Interpretive Categories	Rating Scale T-Scores
<b>Very low probability of risk</b> (About 25% of the population earn scores in this range)	40–43
<b>Moderately low probability of risk</b> (About 25% of the population earn scores in this range)	44–49
<b>Moderately high probability of risk</b> (About 25% of the population earn scores in this range)	50–56
<b>High probability of risk</b> (About 15% of the population earn scores in this range)	57–62
<b>Very high probably of risk</b> (About 8% of the population earn scores in this range)	63–69
<b>Extremely high probability of risk</b> (Less than 2% of the population earn scores higher than 70)	70 and above

**Table 3.12: Probability of Dyslexia Risk Based on Rating Scale T-Scores**

# TOD Rating Scales Reliability

- Internal consistency ranges for Rating Scales
  - TOD-C Self: .91–.95
  - TOD-C Parent/Caregiver: .93–.96
  - TOD-C Teacher: .95–.97

**TOD-C Classification Table for Parent Rating Scale Prediction of Reading LD**

		Predicted		Percentage Correct
		No Reading LD	Reading LD	
Observed	No Reading LD	25	8	75.8
	Reading LD	7	26	78.8
Total				77.3

**TOD-C Classification Table for Teacher Rating Scale Prediction of Reading LD**

		Predicted		Percentage Correct
		No Reading LD	Reading LD	
Observed	No Reading LD	26	7	78.8
	Reading LD	5	28	84.8
Total				81.8

**TOD-C Classification Table for Self-Rating Scale Prediction of Reading LD**

		Predicted		Percentage Correct
		No Reading LD	Reading LD	
Observed	No Reading LD	28	5	84.8
	Reading LD	6	27	81.8
Total				83.3

# TOD-C Rating Scales Predict Group Membership

## RD versus Matched Control

- Each of the TOD-C Rating Scales provides statistically significant improvement over chance in detecting reading disability status.
- All three rating scales provide impressive correct diagnostic decisions, 77%, 82%, and 83% for the Parent/Caregiver, Teacher, and Self-Rating Scales, respectively.
- TOD-C Rating Scales are credible predictors of students who have a learning disability in reading and, consequently, those who most likely have dyslexia.

# TOD Rating Scales: Uses and Limitations

## Uses

- Stand-alone screener as indicator of the need for further testing or monitoring
- In conjunction with the TOD-Screener (3 group-administered tests) to improve prediction of risk
- In conjunction with the TOD-Early and TOD-Comprehensive to improve diagnostic accuracy
- In conjunction with other dyslexia/reading screeners to improve prediction of risk

## Limitations

- Requires further validation in clinical practice



# TOD Rating Scales: User Friendliness

- Quick and easy to administer
- TOD-E and TOD-C Parent/Caregiver Rating Scales available in both English and Spanish
- Electronically administered and scored
- Option to hand administer and electronically score
- Raw scores transformed to *T*-scores

# Perspective matters!

“I, myself, was always recognized.... as the ‘slow one’ in the family. It was quite true, and I knew it and accepted it. Writing and spelling were always terribly difficult for me. My letters were without originality. I was .... an extraordinarily bad speller and have remained so until this day.”

—Agatha Christie

“I was on the whole considerably discouraged by my school days.... It is not pleasant to feel oneself so completely outclassed and left behind at the very beginning of the race.”

—Winston Churchill

# Highlights of TOD Development and Psychometrics

R. Steve McCallum, PhD

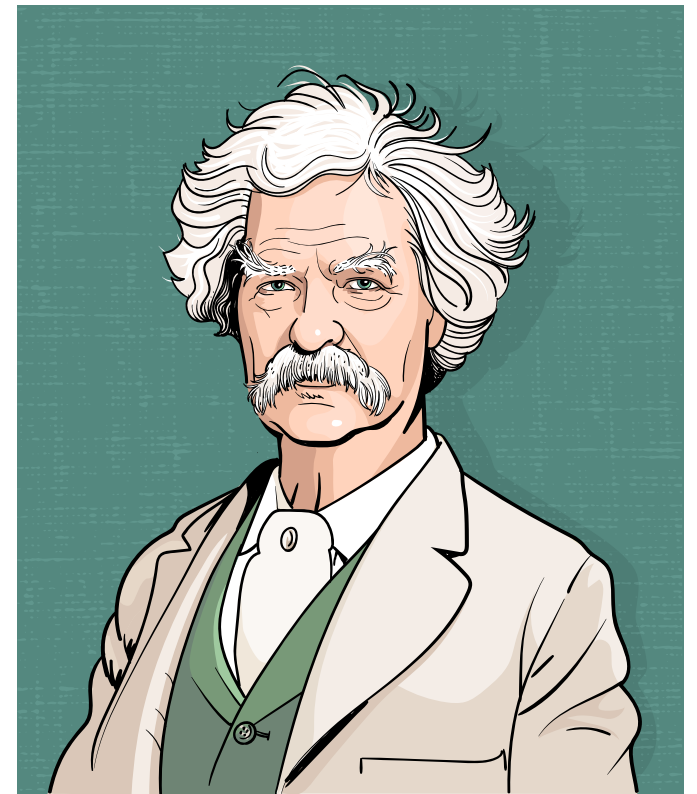


# What This Segment Covers

- Development (item creation and scale selection) and standardization
- Reliability
  - Internal consistency
  - Test–retest
- Validity
  - Content/construct
  - Concurrent
  - Predictive

# Three Kinds of Lies: Lies, Damned Lies, and Statistics!

Mark Twain, American humorist  
Attributed to Benjamin Disraeli, British Prime Minister



# Baker's Dozen Steps in TOD Development

1. Plan/describe construct(s) of interest; relevant for building the test blueprint.
2. Define the overall purpose of the test and describe the target population, types of items needed, how the scores can be used for diagnosis and/or instruction.
3. Steps 1 and 2 guide making a test blueprint, which guided item creation by TOD authors.
4. Obtain expert opinion of item quality.
5. Conduct a pilot test of items from Rasch and classical test theory ( $P$  values of difficulty, discrimination indices, item–scale correlation coefficients, reliability, validity).
6. Select items for standardization.
7. Create a stratified random selection of sample that reflects population of interest.
8. Collect standardization data.
9. Refine/select items & transform raw scores to standard scores, age and/or grade norms.
10. Create final version, with psychometrics (e.g., reliability, validity).
11. Create manual.
12. Disseminate.
13. Continue validation—never ends.



# Blueprint for the TOD

Composites	TOD-Screener	TOD-Early*	TOD-Comprehensive*
<b>Reading and Spelling</b>			
Sight Word Acquisition	Letter and Word Choice	Letter and Sight Word Recognition	Irregular Word Reading Rapid Irregular Word Reading <sup>†</sup>
Phonics Knowledge		Sounds and Pseudowords Letter and Sound Knowledge	Pseudoword Reading Rapid Pseudoword Reading <sup>†</sup>
Basic Reading Skills		Letter and Sight Word Recognition Letter and Sound Knowledge	Irregular Word Reading Pseudoword Reading
Decoding Efficiency			Rapid Irregular Word Reading <sup>†</sup> Rapid Pseudoword Reading <sup>†</sup>
Spelling	Letter and Word Choice		Irregular Word Spelling Regular Word Spelling
Reading Fluency	Word Reading Fluency <sup>†</sup> (or) Question Reading Fluency <sup>†</sup>		Oral Reading Efficiency <sup>†</sup>
Reading Comprehension Efficiency	Word Reading Fluency <sup>†</sup> (or) Question Reading Fluency <sup>†</sup>		Silent Reading Efficiency <sup>†</sup>
<b>Linguistic Processing</b>			
Phonological Awareness		Early Segmenting Rhyming	Phonological Manipulation Blending Segmenting
Rapid Automatized Naming		Early Rapid Number and Letter Naming <sup>†</sup>	Rapid Letter Naming <sup>†</sup> Rapid Number and Letter Naming
Auditory Working Memory			Word Memory Letter Memory
Orthographic Processing	Letter and Word Choice <sup>†</sup>		Word Pattern Choice <sup>†</sup>
Symbol to Sound Learning (Single Test)			Symbol to Sound Learning
<b>Vocabulary and Reasoning</b>			
Vocabulary	Picture Vocabulary		Listening Vocabulary
Reasoning			Picture Analogies Geometric Analogies

**T = Timed**

**\* = The 3 screening tests are the first 3 tests in the TOD-E and the TOD-C**

# Scale Development Scores: Tests, Composites, and Rating Scale Scores

- **Tests:** Each TOD-S, TOD-E, and TOD-C direct assessment test produces a standard score with a mean of 100 and standard deviation of 15.
- **Risk Composites:** TOD-S Dyslexia Risk Index (DRI), TOD-E Early Dyslexia Diagnostic Index (EDDI), and TOD-C Dyslexia Diagnostic Index (DDI) reflect dyslexia risk/status; same metrics.
- **Rating Scales:** (Self, Parent, Teacher) produces a *T*-score with a mean of 50 and a standard deviation of 10.

# TOD-Screener Tests & Risk Composite (Grade K–Adult)

1. Picture Vocabulary+
2. **Letter and Word Choice**
3. **Word Reading Fluency** (K–1) *or*  
**Question Reading Fluency** (Grade 2 and up)



Dyslexia Risk Index (DRI)  
= **Bold Tests**

+Picture Vocabulary is useful in the DRI and EDDI interpretation.

# Dyslexia Risk Index

- Two TOD-S tests (*Letter and Word Choice; Word or Question Reading Fluency*) yield the Dyslexia Risk Index (DRI).
- Indicates the need for further evaluation.
- DRI scores in the at-risk range suggest further testing is needed with the TOD-C or TOD-E.

Risk of Dyslexia Based on DRI score		
Risk	Interpretive description	Standard Score range
No or Low Risk	Above average	109–130
Possible Risk	Average	90–109
At-Risk	Below average	89 and below

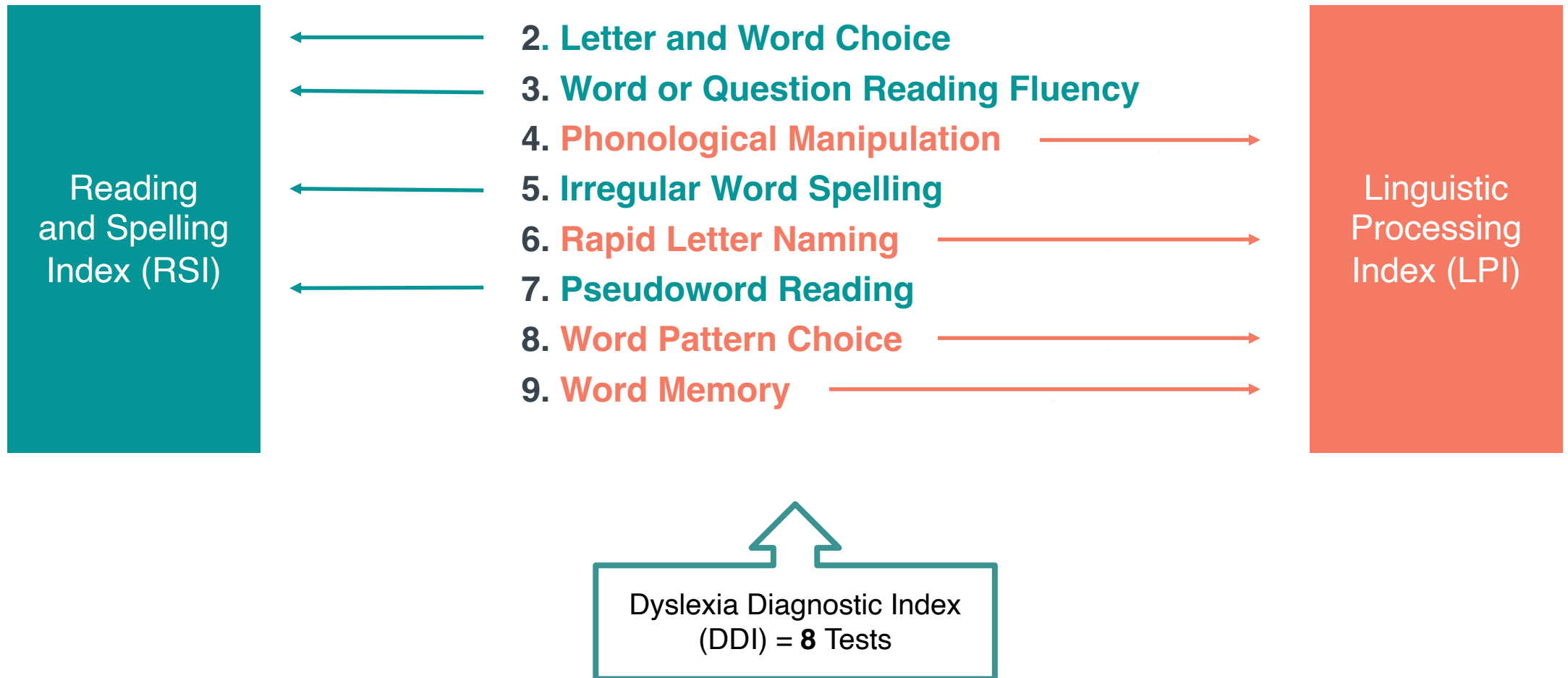
# TOD-C DDI Composition

## TOD-Comprehensive Indexes



# TOD-C RSI and LPI Composition

*(Grade 1 and Up)*



# Dyslexia Diagnostic Index

- TOD-C Dyslexia Diagnostic Index (DDI) and TOD-E Early Dyslexia Diagnostic Index (EDDI) both require administering 8 tests.
- The DDI and EDDI indicate the probability of dyslexia.

**Table 3.4. Probability of Dyslexia Risk Based on DDI Score**

Probability	Interpretive description	Standard Score range
<b>Very Low Probability</b> (About 10% of the population earns scores in this range)	Well above average	120 – 130
<b>Low Probability</b> (About 15% of the population earns scores in this range)	Above average	110 – 119
<b>Moderately Low Probability</b> (About 25% of the population earns scores in this range)	Moderately above average	100 – 109
<b>Moderately High Probability</b> (About 25% of the population earns scores in this range)	Moderately below average	90 – 99
<b>High Probability</b> (About 15% of the population earns scores in this range)	Below average	80 – 89
<b>Very High Probability</b> (About 8% of the population earns scores in this range)	Well below average	70 – 79
<b>Extremely High Probability</b> (Less than 2% of the population earns scores of 69 or lower)	Significantly below average	69 and below





**“I didn’t do well on the test because my memory is full.”**

# TOD Standardization Samples

- Standardization and clinical samples (Total; 2,518 participants)
  - TOD-S child sample: 1,723 (337 of whom are also in clinical sample)
  - TOD-S and TOD-C adult sample: 347 (64 of whom are also in clinical sample)
  - TOD-C child sample: 1,401 children (272 of whom are also in clinical sample)
  - TOD-E: 342 (70 of whom are also in clinical sample)
- Demographics match well to the U.S. Census figures; most of the match data show that samples exceed the guidelines (i.e., they are within 5% of the proportions shown within the most recent Census figures)

Table 4.1 Demographic Characteristics of the TOD-S Child  
(Standardization Sample Note: N = 1,723)

Characteristics	n	% of Sample	U.S. Census %
<b>Gender</b>			
Male	845	49.0	51.1
Female	877	50.9	48.9
Other	1	0.1	0.0
<b>SES</b>			
Did Not Complete High School	146	8.5	11.5
High School Graduate/GED	477	27.7	26.1
Some College or Associate's Degree	485	28.2	30.3
Bachelor's Degree or Higher	615	35.7	32.2
<b>Ethnicity</b>			
Asian	83	4.8	4.7
Black/African American	247	14.3	13.6
White	865	50.2	52.1
American Indian/Alaska Native	25	1.5	0.7
Native Hawaiian/Pacific Islander	16	0.9	0.2
Other/Multiracial	57	3.31	4.6
Hispanic	430	25.0	24.1
<b>Region</b>			
Northeast	177	10.3	16.3
Midwest	330	19.2	21.4
South	814	47.2	38.3
West	402	23.3	24.1

# Clinical Data

- Clinical samples included a large group of individuals with reading disability/dyslexia used to demonstrate validity of the TOD.
  - Intellectual disability
  - Developmental disability
  - Autism spectrum disorder
  - ADHD
  - Language disorder
  - Speech disorder
  - Emotional or behavior disorder
  - Hearing impaired
  - Visually impaired
  - Other physical disability

# Example of Test Construction Issues: Floor, Ceilings, Item Gradients

**Table 5.13: TOD-C Test Ceilings**

Middle School	High School	Beyond High School
<b>Phonological Awareness</b> <ul style="list-style-type: none"> <li>▪ Blending</li> <li>▪ Segmenting</li> <li>▪ Phonological Manipulation</li> </ul>	<b>Auditory Working Memory</b> <ul style="list-style-type: none"> <li>▪ Word Memory</li> <li>▪ Letter Memory</li> </ul>	<b>Spelling</b> <ul style="list-style-type: none"> <li>▪ Regular Word Spelling</li> <li>▪ Irregular Word Spelling</li> </ul>
	<b>Rapid Automatized Naming</b> <ul style="list-style-type: none"> <li>▪ Rapid Letter Naming</li> <li>▪ Rapid Number and Letter Naming</li> </ul>	<b>Vocabulary</b> <ul style="list-style-type: none"> <li>▪ Listening Vocabulary</li> </ul>
<b>Visual–Verbal Paired-Associate Learning</b> <ul style="list-style-type: none"> <li>▪ Symbol to Sound Learning</li> </ul>	<b>Orthographic Processing</b> <ul style="list-style-type: none"> <li>▪ Word Pattern Choice</li> </ul>	<b>Reasoning</b> <ul style="list-style-type: none"> <li>▪ Picture Analogies</li> <li>▪ Geometric Analogies</li> </ul>
	<b>Phonics Knowledge</b> <ul style="list-style-type: none"> <li>▪ Pseudoword Reading</li> <li>▪ Rapid Pseudoword Reading</li> </ul>	<b>Word Reading</b> <ul style="list-style-type: none"> <li>▪ Irregular Word Reading</li> <li>▪ Rapid Irregular Word Reading</li> </ul>
	<b>Reading Fluency</b> <ul style="list-style-type: none"> <li>▪ Oral Reading Efficiency</li> </ul>	<b>Reading Comprehension Fluency</b> <ul style="list-style-type: none"> <li>▪ Silent Reading Efficiency</li> </ul>



**“Wait a minute! Yesterday, X equaled 4!”**



# Psychometric Properties

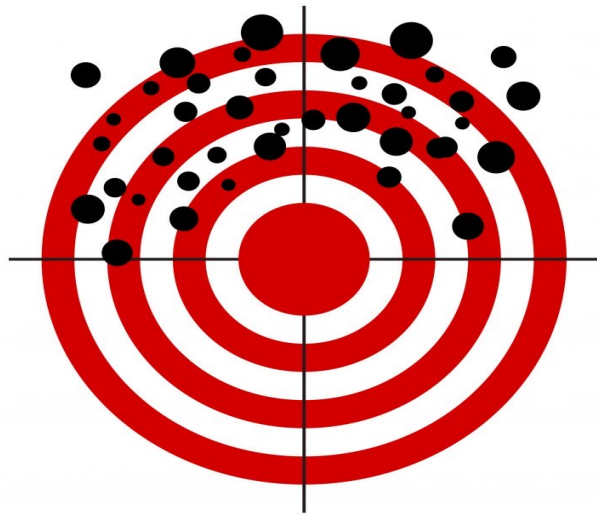
- Reliability is defined as an estimate of systematic test variance; error is defined as 1–reliability)
  - Internal consistency
  - Test–retest
- Reliability estimates are used to create standard error of measurement (**SEm**) and related **confidence** bands



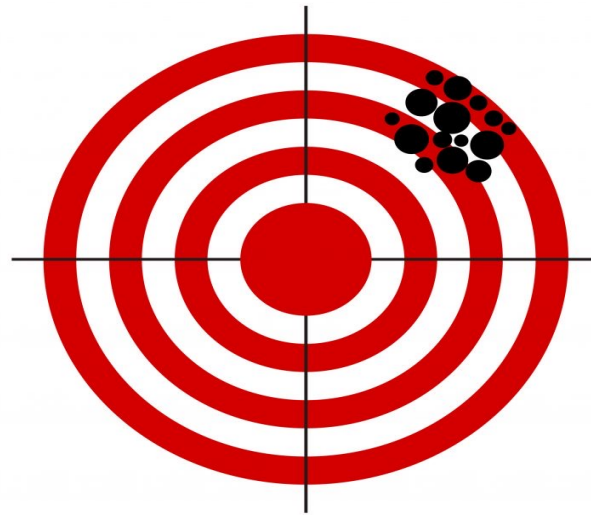
# Reliability: So, we have scores! How good are they, and why do we care?



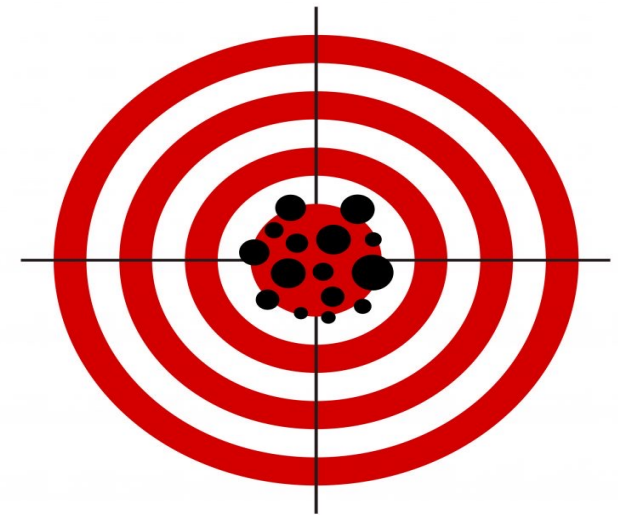
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***Neither reliable  
nor valid***



***Reliable, but not  
valid***

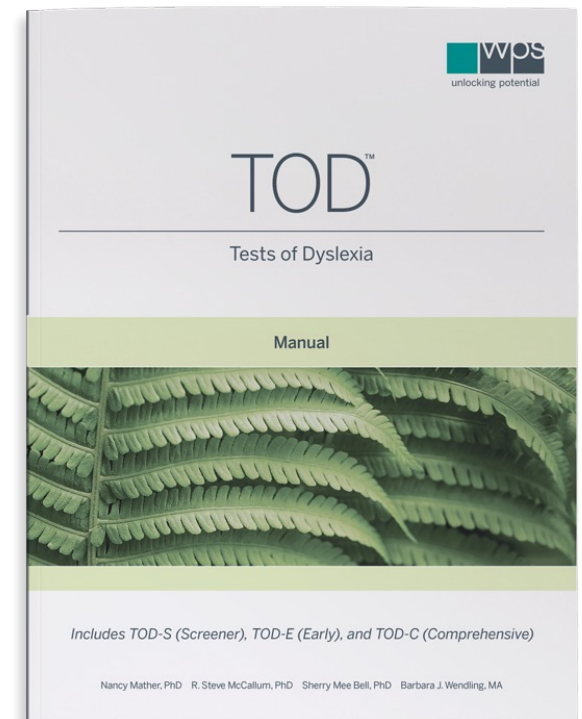


***Valid***

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# Reliability

- Internal consistency reliability of tests, indexes, and composites almost all  $> .80$ .
- Test–retest reliability for all tests, indexes, and composites ranges from  $.70$  to  $.97$  (median  $.88$ ); most effect sizes of change from first to second testing are small.



# Reliability (*cont.*)

- Internal consistency ranges for DRI, DDI, and EDDI
  - **TOD-S:** DRI, Children by grade, .81 — .95, 9 of 13 > .92
  - **TOD-S:** DRI, Adults by 6 ages, .85 — .94
  - **TOD-C:** DDI, Children by grade, .94 — .98
  - **TOD-C:** DDI, Adults by age, .92 — .96
  - **TOD-E:** EDDI, Children by grade, .97 — .98

I JUST DON'T TRUST KEEPING  
OUR DATA IN THE CLOUD.  
PLUS, IF WE GOT RID OF THE  
SERVER, WHERE WOULD WE KEEP  
THE COFFEE MAKER?



WHEN RELIABILITY MATTERS

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virtustream.com

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# Construct Validity: Evidence Based on Growth Curves

## Regular Word Spelling

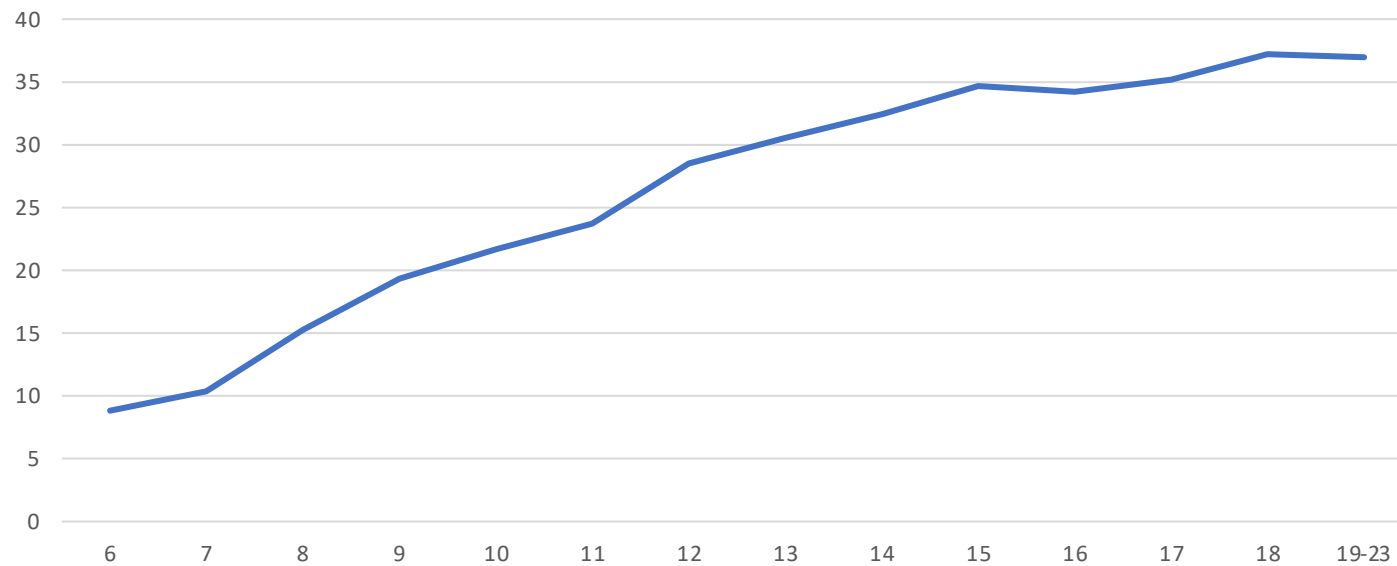


Figure 5.4 Growth beyond high school



# Construct Validity Test Intercorrelations: TOD-S, TOD-C, TOD-E

- Almost all inter-coefficients range between .20 and .60 for the three batteries.
- Of about 805 coefficients, only 6 are below .20 and most are between .30 and .60.
- So, most tests share some variance but also contain significant unique variance.



# Construct Validity from Clinical Group Comparisons

## **TOD-C Reading Learning Disability (RLD) vs. Controls**

- RLD means range from 80.72 to 93.20, but only 6 of 49 comparisons exceed 90.
- Control means range from 101.00 to 103.23.
- Effect size differences range from .31 to 1.71, with most above 1.0.

# Construct Validity from Confirmatory Factor Analyses

**Table 5.19: Comparing Confirmatory Factor Analysis Model Fit for the TOD-C Standardization Sample**

Model fit statistics	One-factor model	Two-factor model	
Chi-square	456	452	
<i>df</i>	20	19	
<i>p</i>	<.001	<.001	
SRMR	0.04	0.04	
RMSEA	0.11	0.11	
CFI	0.92	0.92	
TLI	0.89	0.88	
Factor loadings	Dyslexia Diagnostic Index (DDI)	Linguistic Processing Index (LPI)	Reading & Spelling Index (RSI)
Letter and Word Choice	0.72	—	0.72
Word/Question Reading Fluency	0.68	—	0.68
Phonological Manipulation	0.70	0.71	—
Irregular Word Spelling	0.83	—	0.84
Rapid Letter Naming	0.62	0.62	--
Pseudoword Reading	0.75	—	0.75
Word Pattern Choice	0.49	0.49	—
Word Memory	0.51	0.52	—

Note. *n* = 1748. *df* = degrees of freedom; *p* = the probability, testing against the null hypothesis, that the RMSEA is zero; SRMR = standardized root-mean-square residual, average correlation residuals; RMSEA = root-mean-square error of approximation, function of chi-square test of close fit; CFI = comparative fit index; TLI = Tucker-Lewis index.

# Concurrent Validity: TOD-C Rating Scale and Dyslexia Risk Index/Dyslexia Diagnostic Index Correlations\*

	TOD-C Parent/Caregiver Rating Scale	TOD-C Teacher Rating Scale	TOD-C Self-Rating Scale
TOD-C Teacher Rating Scale	0.81		
TOD-C Self-Rating Scale	0.77	0.77	
DRI	-0.71	-0.65	-0.70
DDI	-0.69	-0.64	-0.65

\*Based on sample of 66 examinees with a reading disability, for whom all 3 TOD-C Rating Scales were completed.

# Concurrent/Convergent Validity: TOD-C and TOD-E with Related Measures

Most correlations between tests of similar constructs were moderate, indicating support for the measurement of the TOD tests. The convergent validity tests are:

## TOD-C:

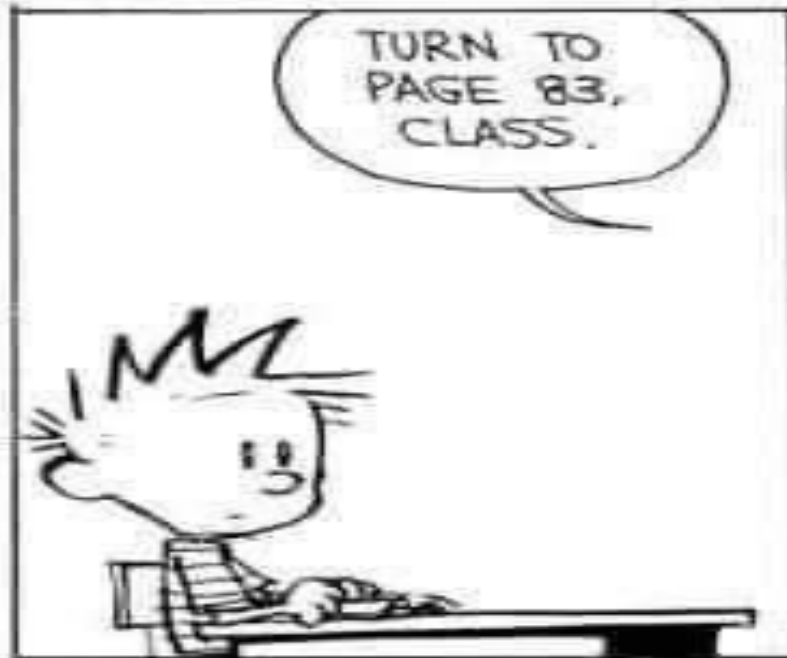
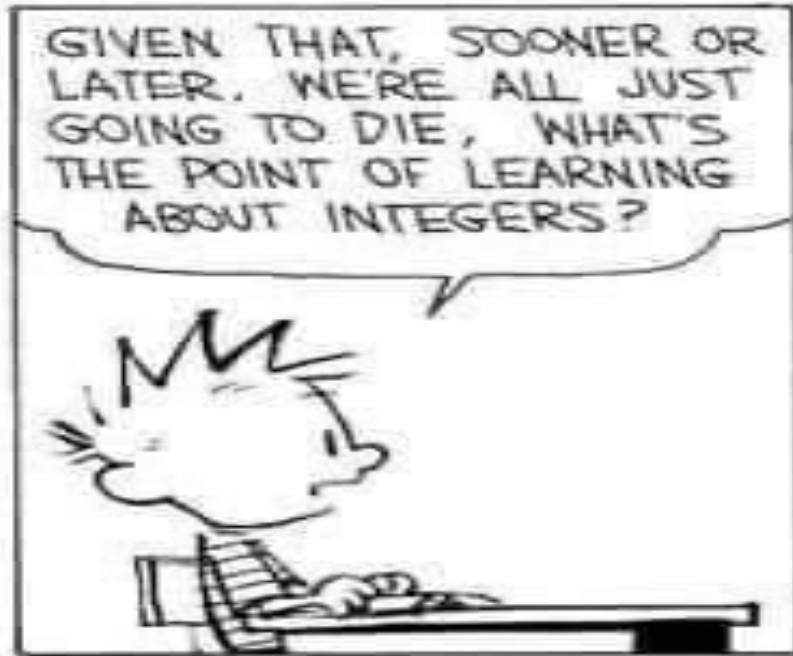
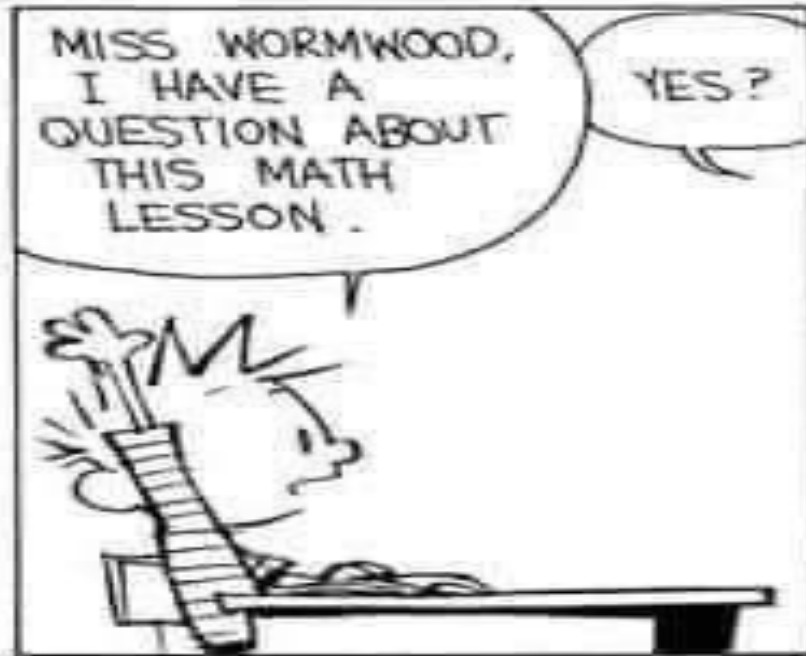
- CASL-2
- TOC-2
- WJ IV Cognitive
- WJ IV Achievement
- CTOPP-2
- UNIT-GAT
- TOWRE-2

## TOD-E:

- CASL-2
- WJ IV Achievement
- CTOPP-2

## Dyslexia

		Yes	No	
Test Result	Positive	True Positive (TP)	False Positive (FP)	→ PPV
	Negative	False Negative (FN)	True Negative (TN)	→ NPV
		↓ Sensitivity	↓ Specificity	

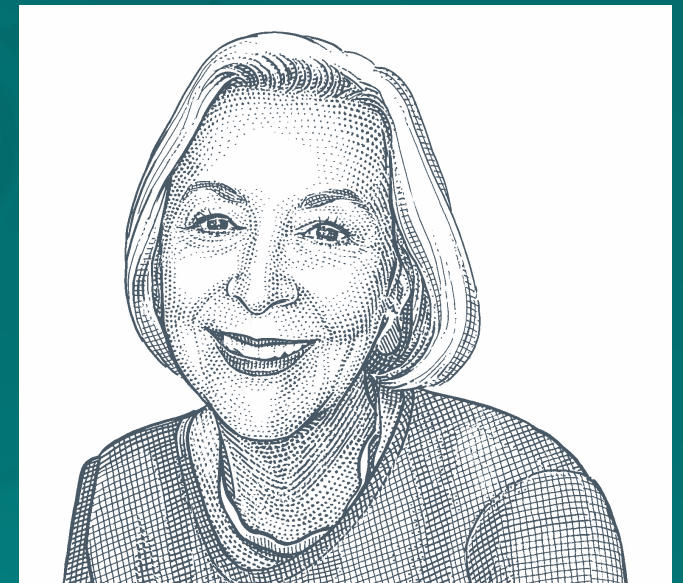


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# Dyslexia Interventions and Recommendations Guidebook

Barbara J. Wendling, MA





# Dyslexia Interventions and Recommendations

## Linking Assessment to Instruction



# Diagnosis and Instruction

Diagnosis must take **second** place to instruction and must be made a **tool of instruction**, not an end in itself.



**Source:** Cruickshank, W. M. (1977). Least-restrictive placement: Administrative wishful thinking. *Journal of Learning Disabilities, 10*, 193–194.

# Dyslexia Interventions and Recommendations

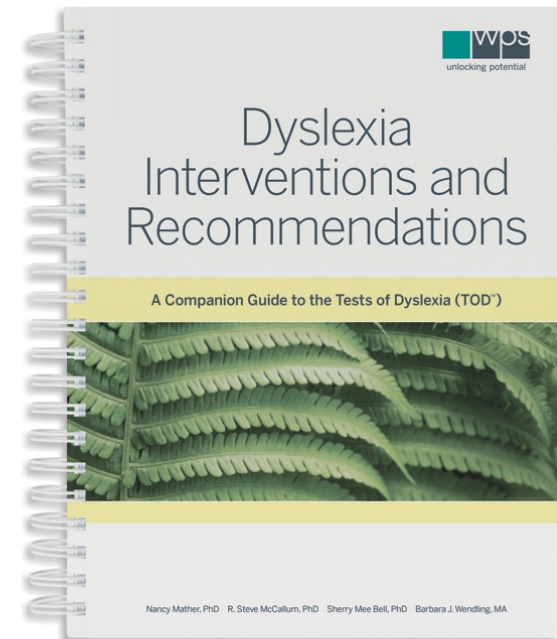
**Section 1.** Structured Literacy: An Approach to Intervention

**Section 2.** Phonological/Phonemic Awareness

**Section 3.** Moving from Speech to Print/Orthographic Mapping

**Section 4.** Sight Word Acquisition

**Section 5.** Phonics and Structural Analysis



# Dyslexia Interventions and Recommendations *(cont.)*

**Section 6.** Spelling

**Section 7.** Reading Fluency

**Section 8.** Vocabulary

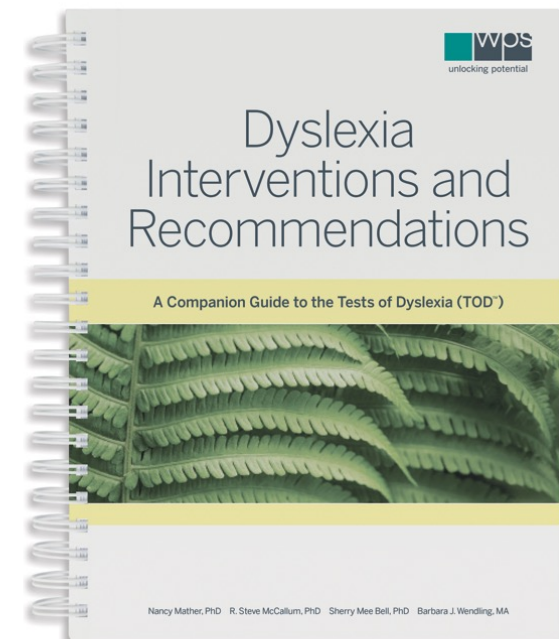
**Section 9.** Reading Comprehension

**Section 10.** Accommodations

**Section 11.** Self-Advocacy/Strengths/  
Transitions

**Appendix:** Teaching Students with Dyslexia

**Glossary of Terms**



# Organization of Each Section

- Provides an introduction to the skill area being presented
- Provides guidance on selecting recommendations and interventions including a general sequence of expected skill development
- Lists the TOD tests related to the skill area as well as related sections
- Provides a number of interventions ranging from beginning skill level to more advanced skill level
- Lists references



# Structured Literacy

Explicitly teaches systematic word identification and decoding strategies. This type of approach benefits most students but is critical for students with dyslexia.

Principles of Structured Literacy:

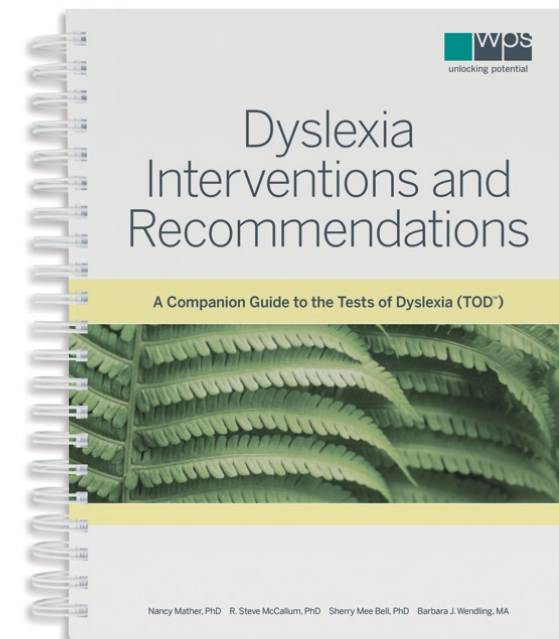
- Systematic and cumulative
- Explicit
- Diagnostic



# Structured Literacy *(cont.)*

## Provides explicit instruction in:

- Phonology
- Sound–symbol correspondences
- Syllables
- Morphology
- Syntax
- Semantics





# Explicit Instruction

- **Model: (I Do)**
  - Teacher demonstrates while thinking aloud
- **Guided Practice: (We Do)**
  - Student practices with teacher supervision
  - Immediate corrective feedback
- **Independent Practice: (You Do)**
  - Student works independently only after task is understood

# Example of an Orthographic Mapping Intervention

## Phoneme–Grapheme Mapping

Provide the student with daily practice in phoneme–grapheme mapping (Grace, 2022). Using enlarged graph paper and tokens, the student will first represent an orally presented word with tokens and then with letters underneath. The two questions posed are: *What do you hear? What do you write?* One token represents one sound. Follow this progression:

- Begin with regular words where the number of phonemes equals the number of graphemes
- Introduce words with consonant blends
- Introduce words with digraphs (written in one box)
- Introduce words with silent letters (e.g., *v-c-e*, *mb*)
- Introduce words with vowel digraphs (e.g., *oa*, *ee*)

# Orthographic Mapping Example

Specific rules for mapping:

- Vowel and consonant digraphs go in one box with a box drawn around the digraph
- Consonant blends go in separate boxes with a circle drawn around each blend
- The letter *x* goes in the middle of two boxes because it makes two sounds
- CVCe words: the last consonant and small *e* go in one box with an arrow pointing to the long vowel
- Double consonants go in one box

<b>ch</b>	<b>a</b>	<b>se</b>		
<b>s</b>	<b>t</b>	<b>a</b>	<b>m</b>	<b>p</b>
<b>f</b>	<b>o</b>	<b>x</b>		
<b>r</b>	<b>a</b>	<b>bb</b>	<b>i</b>	<b>t</b>

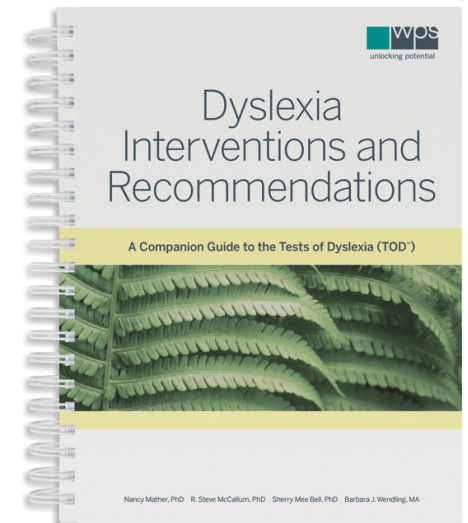
# Appendix

## Teaching Students with Dyslexia

- Designed to be a handout to share with teachers
- Provides a general overview of the types of interventions, accommodations, and modifications that students with dyslexia often need
- The eight sections of the appendix also provide a framework for understanding the rationale for these interventions.
- You may focus on just one section that applies to a certain student with a specific need or provide the entire appendix.

# A Companion Resource to the Tests of Dyslexia

- **Section 1.** Structured Literacy: An Approach to Intervention
- **Section 2.** Phonological/Phonemic Awareness
- **Section 3.** Moving from Speech to Print/Orthographic Mapping
- **Section 4.** Sight Word Acquisition
- **Section 5.** Phonics and Structural Analysis
- **Section 6.** Spelling
- **Section 7.** Reading Fluency
- **Section 8.** Vocabulary
- **Section 9.** Reading Comprehension
- **Section 10.** Accommodations
- **Section 11.** Self-Advocacy/Strengths/Transitions
- **Appendix:** Teaching Students with Dyslexia
- **Glossary of Terms**



# Summary

- Use the Dyslexia Interventions and Recommendations Guide to help link your assessment results to instruction.
- Included with each TOD test kit
- Available in a paper or digital version
- Know the score, but get so much more!

# Get 10% Off When You Pre-Order the TOD Today!\*

Join the [mailing list](#) to stay up to date on all things TOD, including pre-order discounts, case studies, events, and more.

**TOD™** | Tests of Dyslexia

**Pre-Order Now!**

The First Comprehensive Dyslexia Assessment

The only single co-normed test that highlights components and interventions, while measuring the five main areas of reading:

- Phonological awareness
- Phonics
- Fluency
- Vocabulary
- Comprehension

**TOD™**  
Tests of Dyslexia  
Manual

**Dyslexia Interventions and Recommendations**  
A Companion Guide to the Tests of Dyslexia (TOD™)

WPS  
unlocking potential

\*Discount cannot be combined with any other promotion or applied to a previously placed order. Offer valid on the TOD assessment only.



# TOD Training Courses

Join the [mailing list](#) to stay up to date on all things TOD, including discounts, case studies, events, and more.



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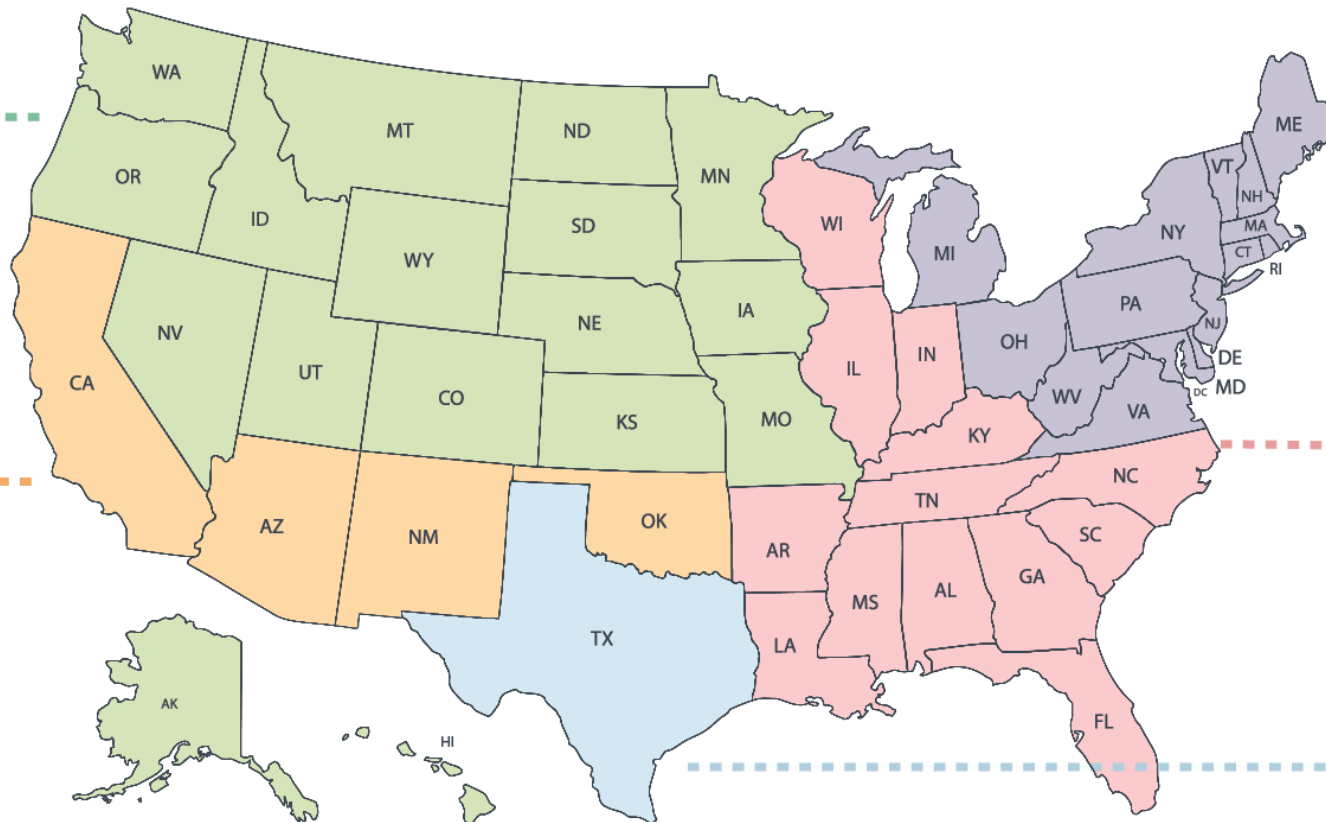
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# Resources



WPS Online  
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WPS YouTube Channel  
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## WPS Headquarters

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424.201.8800  
424.201.6950 (Fax)

## Hours of Operation

6:00 AM - 4:00 PM PST  
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## Contact Us



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# Questions?

