DLD, Dyslexia, and Supporting Language to Improve Literacy

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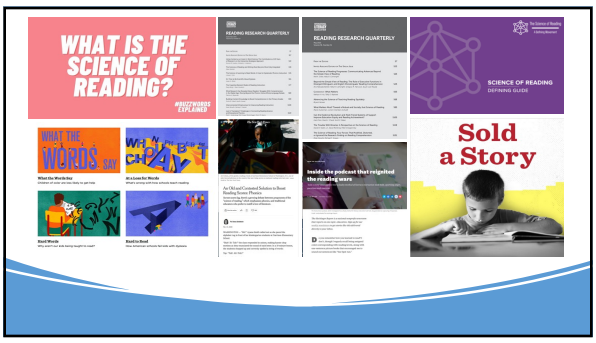
1



2

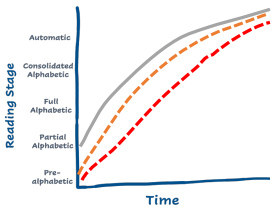
Science of Reading

- Emphasizes the importance of explicit, systematic reading instruction
  - "necessary for some, beneficial to most, harmful to none"
- To become skilled at reading words, children need to know
  - That spoken words are comprised of sounds
  - How to segment and blend the sounds of spoken words
  - That letters are used to represent sounds
  - Which letters represent which sounds
- Some children acquire this knowledge implicitly, from experience with print, but most require some amount of explicit instruction
  - Children with dyslexia require more (more explicit, higher dosage)

3

Who Needs Explicit Instruction and How Much Is Needed?

- Some children come to school already "reading"
  - Enriched home literacy environment
  - Strong statistical learning abilities
- Most children need *some* explicit instruction,
  - With some decoding instruction, "self-teaching" takes off
- Children with persistent reading difficulties (e.g., dyslexia) need *more*
  - More explicit, more intensive, more practice



4

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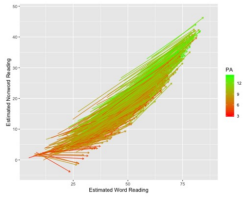


(Steacy et al., 2021)

5

Science of Reading

- Emphasizes the importance of explicit, systematic reading instruction
- Often perceived as just about phonics, although it is much broader
  - Phonics instruction alone does not guarantee good reading comprehension
- Focus of this talk is on the need for increased attention to oral language to improve children's reading comprehension and writing proficiency.

"Necessary for some, beneficial to most, harmful to none"

6

Simple View of Reading
(Gough & Tunmer, 1986; Hoover & Gough, 1990)

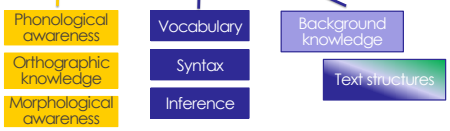
~ *Language develops automatically, through experience, but reading must be taught*

7

Word reading and comprehension are supported by different language skills

Simple View of Reading
(Gough & Tunmer, 1986)

Language Basis of SVR



8

Simple View of Reading
(Gough & Tunmer, 1986)

Shifting developmental influence
(Adlof, et al., 2006; Foorman et al., 2018)

- Strongest predictor of RC in primary grades
- Learning to read

9

Simple View of Reading
(Gough & Tunmer, 1986)

Shifting developmental influence
(Adlof, et al., 2006; Foorman et al., 2018)

- Strongest predictor of RC after ~2nd grade
- Reading to learn

10

Common Misunderstandings

X Word reading and language comprehension are equally important for reading comprehension

✓ Both are necessary, but once adequate word reading is established, language comprehension is the stronger predictor

11

Common Misunderstandings

X Language arts instruction should focus on decoding first and comprehension later

✓ Written language is more complex than spoken conversation

12

Conversation	Text
Words	
Lower lexical diversity • More pronouns, proper names, and fillers (ah)	Higher lexical diversity • More complex words (syllables & morphemes)
Sentences	
• Shorter, simpler • Information delivered in small units • Prosody modulates flow of information and cues linguistic structure	• Longer, more complex, and more varied structures • Punctuation provides limited cues to structure and meaning
Pragmatics	
• Shared message • Opportunity to immediately repair communication breakdowns	• One-way communication • Content determined by writer • Reader responsible for monitoring understanding

Overall, the task demands of reading are more complex than listening; and the task demands of writing are more complex than speaking.

e.g., Dawson et al., 2021; Montag, 2019; Hsaio et al., 2022

13

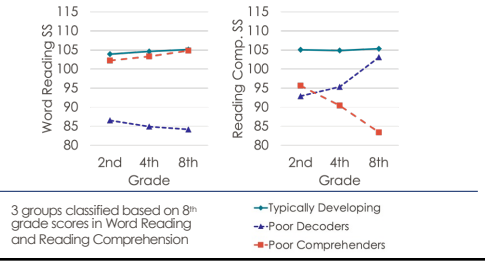
Common Misunderstandings

X Language arts instruction should focus on decoding first and comprehension later

- ✓ Written language is more complex than spoken conversation
- ✓ Instruction in the language skills that support reading comprehension can be provided immediately, in the spoken domain
- ✓ Waiting to teach these skills may be particularly harmful for children with lower language and reading abilities

14

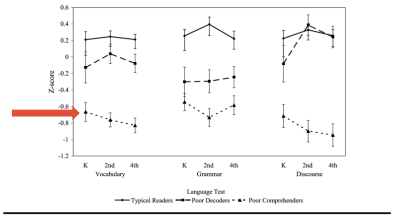
Some children exhibit reading comprehension difficulties despite average word reading skills. These RC difficulties may appear to be late-emerging (Catts, Adlof, & Weismer, 2006).



15

Late-emerging reading comprehension difficulties are linked to earlier oral language weakness, in vocabulary, grammar/syntax, and discourse
(Catts, Adlof, & Weismer, 2006)

Figure 3. Subgroups' mean z scores on individual measures of language comprehension in kindergarten (K), second (2nd), and fourth (4th) grades.



16

Language Difficulties in Children with "Specific Reading Comprehension Deficit"

- Vocabulary knowledge
  - Words known
  - Depth of knowledge
- Grammar, syntax
  - Following directions
  - Sentence-picture matching
  - Sentence repetition
  - Word order correction
  - Sentence construction
- Inferences

(Adlof & Catts, 2015; Cain et al., 2004; Catts et al., 2006; Elwér et al., 2015; Justice et al., 2013; Nation et al., 1999; Nation et al., 2004; Yuill & Oakhill, 1991; Stothard & Hulme, 1992; Spencer & Wagner, 2018)

- Detectable prior to formal reading instruction
  - As early as 15 months of age, and significantly decline relative to TD over time (Justice et al., 2013; Petscher et al., 2018)
  - Mild-moderate weakness in phonological skills in preschool, kindergarten; resolves relatively quickly (Catts et al., 2006; Elwér et al., 2015)
  - Moderate weakness in vocabulary, grammar, syntax; maintained and/or increases across grades (Catts et al., 2006; Elwér et al., 2015)

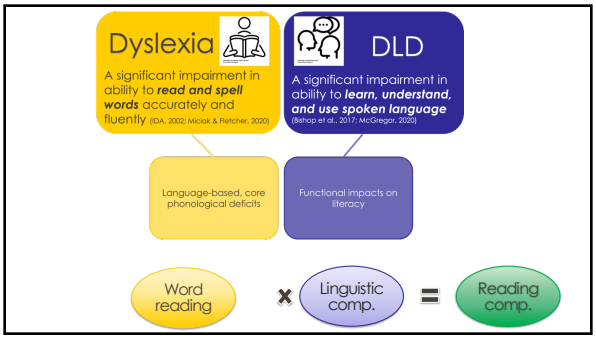
17

Developmental Language Disorder (DLD)
(Bishop et al., 2017)

See also: specific language impairment, primary language impairment, language learning disability

- Significant and persistent impairment in ability to learn, understand, and use spoken language that is not attributable to any clear cause or biomedical condition (Bishop et al., 2017)
- Typically involves deficits in multiple aspects of language; morpho-syntactic difficulties are often considered a hallmark (Bedore et al., 2018; Bishop et al., 2017; Leonard, 2014; Rice et al., 2009)
- Functional impacts on literacy, academic progress, socioemotional development, and employment opportunities (McGregor, 2020)
- Estimated prevalence = 7-9% of 4-6 year-old students (Tomblin et al., 1997; Norbury et al., 2016), but under-identified and under-served

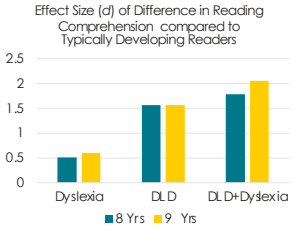
18



19

Dyslexia and DLD are *different disorders* that often co-occur

- Average overlap in studies recruiting from clinical caseloads is 50% (Dewey, 2023) range is 17-71% (Adlof & Hogan, 2018).
- Children with *either* ***dyslexia or DLD*** (or both) are likely to struggle with reading comprehension, ***but they require different focus of intervention***
- Children with both DLD and dyslexia need support for both areas of weakness.



(Snowling et al., 2020)

20

https://www.nidcd.nih.gov/sites/default/files/developmental-language-disorder.pdf

What are the symptoms of DLD?

A child with DLD often has a history of being a late talker (reaching spoken language milestones later than peers, *https://www.nidcd.nih.gov/health/speech-and-language*). Although some late talkers eventually catch up with peers, children with DLD have persistent language difficulties.

Younger children with DLD may:

- Be late to put words together into sentences.
- Struggle to learn new words and make conversation.
- Have difficulty following directions, not because they are stubborn, but because they do not fully understand the words spoken to them.
- Make frequent grammatical errors when speaking.

Symptoms common in older children and adults with DLD include:

- Limited use of complex sentences.
- Difficulty finding the right words.
- Difficulty understanding figurative language.
- Reading problems.
- Disorganized storytelling and writing.
- Frequent grammatical and spelling errors.

21

Language Difficulties Are Easy to Miss

- Difference between normal and impaired oral language is hard to track without direct measurement – even among experts
- Conversational language is less demanding than written language (Dawson et al., 2021; Hsaio et al., 2022; Montag, 2019)
  - Attention is on the message, not on the form
  - Production errors are infrequent, even in DLD
  - Communication breakdowns can be attributed to other factors, e.g., attention, shyness, etc.
- TD children understand much more complex language than they regularly use

Symptoms of DLD may be less visible than other types of disabilities, e.g., physical disabilities, speech-sound disorder, ADHD, dyslexia

22

Children with DLD fly under the radar.

In epidemiologic studies in the UK and US, < 40% of kindergarten students with DLD had been clinically identified (Norbury et al., 2016; Tomblin et al., 1997)

- Yet, kindergarten teachers rated only 11% of children with DLD as having "good" academic achievement, compared to 70% of children with typical language skills (Norbury et al., 2016)
- And 75% of kindergarten students with DLD exhibited impaired reading comprehension by adolescence (Catts et al., 2012)

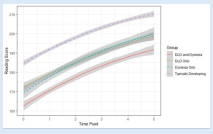
23

DLD in Danish Adults (Nudel et al., 2023)

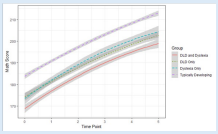
- Lower prevalence of DLD in Danish healthy adults than epidemiologic studies of children when DLD measured by self-report questionnaires (3.4-3.6%)
  - Extremely low based on healthcare records (0.04%)
  - Rarely received "language" support (all received "speech" support)
- Higher prevalence of reading (OR = 3.63) & learning disabilities (OR = 7.21) in DLD vs. controls
- Presence of DLD was associated with reduced physical and mental health.

24

MAP Reading



MAP Math



Duff, Hendricks, Fitton, & Adlof (2023)

Is DLD more "hidden" than dyslexia?

- Children with combined DLD and dyslexia showed lowest performance on MAP Reading and Math from 2nd -4th grades
- Children with DLD-only or dyslexia-only were impacted to a similar degree.
- Despite similar levels of impact, children with DLD received support services at < ½ the rate of children with dyslexia
  - Receipt of speech, language, or reading services, according to parent or school report
    - DLD-only: 8-15%
    - Dyslexia–only: 16-33%
    - DLD+Dyslexia: 31-38%
    - TD: 2-9%

25

DLD flies under the radar

Receipt of speech, language, or reading services, according to parent or school report
- DLD-only: 8-15%
- Dyslexia–only: 16-33%
- DLD+Dyslexia: 31-38%
- TD: 2-9%

Parent concerns about reading *or* language skills
- DLD-only: 29%
- Dyslexia–only: 60%
- DLD+Dyslexia: 56%
- TD: 7%

- Within all groups, parents more often report concerns about reading than oral language

(Adlof, et al., 2017; Chan, et al., 2022; Duff et al., 2023; Hendricks et al., 2019)

26

Policy Insights from the Behavioral and Brain Sciences
Volume 6, Issue 2, October 2019, Pages 210-217
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SAGE journals

Article - Measurement

If We Don't Look, We Won't See: Measuring Language Development to Inform Literacy Instruction

Suzanne M. Adlof[1] and Tiffany P. Hogan[2]

- Call for increased attention to oral language
- Directly monitor students' vocabulary, syntax and higher-level language skills
- Systematic instruction and support for language skills to promote reading comprehension and written expression

27

Measuring Language Comprehension in the Primary Grades

CLIMB

Within Project CLIMB, we are developing and validating efficient, evidence-based class-wide assessments to measure current levels of language comprehension performance as well as growth over time.

We hope these tools will help to identify which students in the primary grades are most in need of support *and* determine how they respond to varying types or amount of support.

CLIMB is supported by NIH R01DC021177 and conducted in collaboration with researchers from the University of South Carolina (S. Adlof, L. Fitton), University at Buffalo (A. Hendricks) and Georgia State University (L. Branum-Martin)

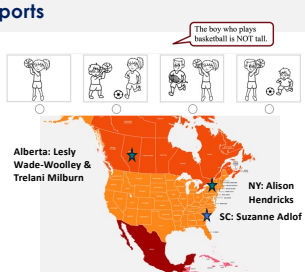
https://www.scrolllab.org/s-projects-side-by-side

28

Developing Efficient Oral Language Assessments to Guide Differentiated Supports

Preliminary Studies on Sentence Comprehension

- Group-administered sentence-picture matching tasks show promise as universal screens for DLD in 1st and 2nd grades (Adlof et al., 2017; Hendricks et al., 2019)
- SC Screen
  - 21-item sentence-picture matching task
  - initial validation study > 3700 students, grades K-2 in South Carolina, New York, and Alberta (Adlof, Hendricks, Chapman, & Wade-Woolley, forthcoming)
  - 20-30 min per classroom to administer; < 5 min per student to score



29

Developing Efficient Oral Language Assessments to Guide Differentiated Supports

CLIMB Work in Progress

CLIMB

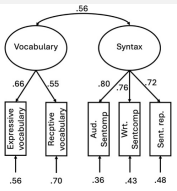
- Group-administered measures of
  - Vocabulary
  - Syntax
  - Contextual inferencing
- Group assessments within and across grades K – 2
- Validated against individual assessments of LC and RC in grades K – 3.

CLIMB is supported by NIH R01DC021177 and conducted in collaboration with researchers from the University of South Carolina (S. Adlof, L. Fitton), University at Buffalo (A. Hendricks) and Georgia State University (L. Branum-Martin)

30

Word knowledge & syntax knowledge are different, but correlated constructs, with unique effects on reading comprehension

- Language skills in preschool are best represented as a unitary construct, and dimensionality increases across the school grades (LARRC, 2015; Lonigan & Milburn, 2017; Zhang & Tomblin, 2008).



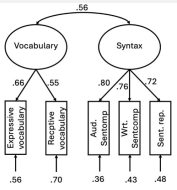
Nielsen et al., 2025
https://doi.org/10.1002/rrq.70003

31

Word knowledge & syntax knowledge are different, but correlated constructs, with unique effects on reading comprehension

Mary likes chocolate only.

Only Mary likes chocolate.



Nielsen et al., 2025
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32

Building Word Knowledge is Very Important! Tips and Resources for Vocabulary

1. **Expose** children to sophisticated words
   - Most words are learned incidentally. Provide quick definitions when feasible.
2. **Explicitly and systematically** teach words that have been **strategically selected** for instruction.
   - Show the **printed word** while teaching its meaning
   - Teach **definitions** and provide **contextual examples**
   - Include activities for active processing
     - Compare/contrast semantically related words;
     - Discuss contexts where words do/don't fit
   - **Review** taught words so they are not forgotten
3. Teach children **multiple strategies** for discovering the meanings of unknown words
   - Dictionary/digital look-up skills
   - Context strategies
   - Morphological analysis
4. Make word learning **fun**

33

Why Syntax Deserves More Attention

- Conveys relationships between the concepts that words represent

1. The boy hit the ball.
2. The ball hit the boy.
3. The boy was hit by the ball.

4. The car is red.
5. The red car is . . .

6. Simple: *Mary wants chocolate.*
7. Compound: *Mary wants chocolate, but John buys fruit.*
8. Complex: *Until Mary buys chocolate, John will eat fruit.*
9. Complex: *Unless Mary buys chocolate, John will eat fruit.*
10. Compound-complex: *Although Mary wanted chocolate, the store was closed, so she ate fruit.*

Complex syntax is required to convey complex ideas!

34

Why Syntax Deserves More Attention

- Important predictor of concurrent and future reading comprehension
  - Meta-analysis of 59 studies, mean r = .54 (Tong et al., 2024)
  - Uniquely predicted reading comprehension after controlling for vocabulary and word reading in 4th and 6th grade students (Poulsen et al., 2022; Nielsen et al., 2024; Nielsen et al., 2025) and high school students (Brimo et al., 2017)
  - Measures of kindergarten syntax abilities were among the top predictors of 8th grade reading comprehension scores (Adlof et al., 2010)

35

Why Syntax Deserves More Attention

- Difficulties with morpho-syntax
  - Verb tense: *John wants chocolate*. vs. *John wanted chocolate*.
  - Subject- verb agreement: *John wants chocolate*. vs. *John and Mary want chocolate*.

  and complex syntax are indicators of broader language problems, such as those seen in children with DLD

- For identifying DLD, measures of (morpho-) syntax have better sensitivity and specificity than measures of vocabulary (Gray et al., 1999; Spaulding et al., 2006)

36

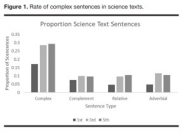
Complex syntax is required to express complex ideas.

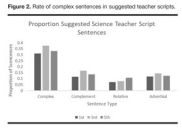
- Science textbooks and associated teacher scripts show increasing syntactic complexity between grades 1 and 5 (Curran, 2020).
  - By 3rd grade 30% of all sentences contained some type of complex syntax

"The plants that were watered grew in the soil."

"The bulbs that we planted were called ____."

"Capillaries are tiny blood vessels that make contact with every cell in your body."





37

What do we know about syntax instruction?

- Active area of investigation
- More research is needed

Effects on Writing

- Little evidence that teaching grammar in isolation made students (who were primarily adolescents) better writers (Andrews et al., 2006)
- However, a growing body of research shows positive effects of explicit instruction in basic sentence writing for students with/at risk for learning disabilities and/or struggling writers (Ritchey et al., 2023)
- Additionally, there are repeated positive effects on writing accuracy and quality with writing instruction focused on sentence combining (Andrews et al., 2006; Graham et al., 2015)

38

Syntax Interventions for DLD

- Preschool children with DLD show improved morpho-syntax with interventions that use focused stimulation, recasts, and expansions to provide increased exposure to target forms (e.g., Cleave et al., 2015; Plante et al., 2018)
- Recast intervention was also effective for teaching complex syntax to young, school-aged children (4-7 years) within the context of a science curriculum (Hiebert et al., 2025; Owen Van Horne et al., 2023)
  - Clinicians were encouraged to focus on verbs of perception, cognition, and communication which often obligate clausal complements (e.g., think, know, remember, say, observe, wonder)
  - High intervention dose: 38 sessions in 4 weeks
  - Gains in syntax and retention of science concepts

39

Syntax Interventions for DLD

- Whereas discussing grammar and syntax may be too abstract/difficult for preschoolers, it's within reach for school-age children
  - Discussing parts of speech, grammatical rules engages metalinguistic awareness
  - Finestack (2018) found that explicit+implicit grammar intervention was more effective than implicit-only for children with DLD aged 5-8 years to learn novel grammatical forms

40

Syntax Interventions for DLD

- Growing body of research on the efficacy of explicit, meta-linguistic interventions for teaching grammar and complex syntax to school-aged children and adolescents with DLD
  - Shape Coding (Ebbels et al., 2014; Calder et al., 2021)
  - Meta-Taal (Zwisterlood et al., 2015)
  - Complex Sentence Intervention (CSI; Balthazar & Scott, 2018)
- Explicit instruction & deductive reasoning serve as "a bootstrap, not a replacement, for learning that occurs implicitly" (Balthazar et al., 2020).
  - Interventions systematically organize treatment stimuli to maximize inductive learning, high density presentations of target forms, multiple exemplars with varying vocabulary and discourse contexts

41

What about reading comprehension?

Vang Christensen et al. (forthcoming)

- Adaptation of Shape Coding as Tier 2 intervention for 5th grade students with lower comprehension skills
- 12 weeks, 1 individual + 1 group session per week
- Significant, positive effects on near-transfer tests: written sentence comprehension, written paragraph comprehension
- No significant effects for auditory sentence comprehension, sentence repetition, or standardized reading comprehension test

42

Who Needs Explicit Syntax Instruction and How Much Is Needed?

- Like other language and literacy skills (e.g., phonemic awareness, decoding, vocabulary), potential benefits of explicit syntax instruction include
  - Not leaving the learning "up to chance"
  - Increasing the learning efficiency
  - Increasing meta-linguistic awareness to support reading comprehension and writing
- Small but growing evidence base supporting the use of explicit interventions to teach (morpho-)syntax, and for sentence generation and sentence combining instruction to improve writing accuracy and quality.
- **Continued research will be needed to determine what works best for whom, and how much.**

43

Thank you!

- SCROLL Lab Research Team
- Collaborators: Dr. Alison Hendricks, Dr. Lisa Fitton, Dr. Lee Branum-Martin
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44