# Speech Sound Disorders and Dyslexia

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/fɑɹkwɑɹsən/

Financial – I am receiving a speaking fee and travel support for this workshop. I receive a salary from Florida State University. I am an Amazon affiliate and often post links to items/ my storefront on social media; several links in the Resources handout are affliate links, and are marked as such. I will discuss products that I developed with Bjorem Speech Publications, for which I receive royalties. I do consulting work with SLP Toolkit, Bright Ideas Media, The Informed SLP, and Bjorem Speech Publications.

Nonfinancial – I am an affiliated faculty member with the Florida Center for Reading Research and Editor-in-Chief of Language, Speech, and Hearing Services in Schools (LSHSS)

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#PhoneticsFriday

# Colorado & CLaSS Lab

- March 14, 2024: In-Person 6-hour presentation titled: Choosing and Using the Right Treatment Approaches
- Office hours!
  - April 9th 4-5 pm MT (6-7 pm ET)
  - April 16th 4-5 pm MT (6-7 pm ET)
  - April 23rd 4-5 pm MT (6-7 pm ET)

# What is reading?

Alt text: Young mother with long blonde hair reading a book with two children on her lap. The little boy is wearing an orange shirt and smiling. The little girl is holding a sippy cup and pointing to the pictures on the screen.

# Who is reading?

Alt text: In the picture above, there is an older man reading a magazine. He is wearing a blue shirt and black zipped hoodie. He has white hair and is balding.

Alt text: In the picture to the right, there is a young Asian boy reading a chapter book. He is wearing glasses and a white and black winter coat.

# Simple View of Reading (SVR)

(Catts, Hogan, & Fey, 2003; Catts, Hogan, & Adlof, 2005; Gough & Tunmer, 1986; Hoover & Gough, 1990)


(Hogan, Adlof, & Alonzo, 2014, p. 200)

# Simple View of Reading (SVR)

(Catts, Hogan, & Fey, 2003; Catts, Hogan, & Adlof, 2005; Gough & Tunmer, 1986; Hoover & Gough, 1990)

Ability to translate printed text into pronounceable words

×

Ability to understand text if it is heard instead of read

=

Ability to understand text

(Hogan, Adlof, & Alonzo, 2014, p. 200)

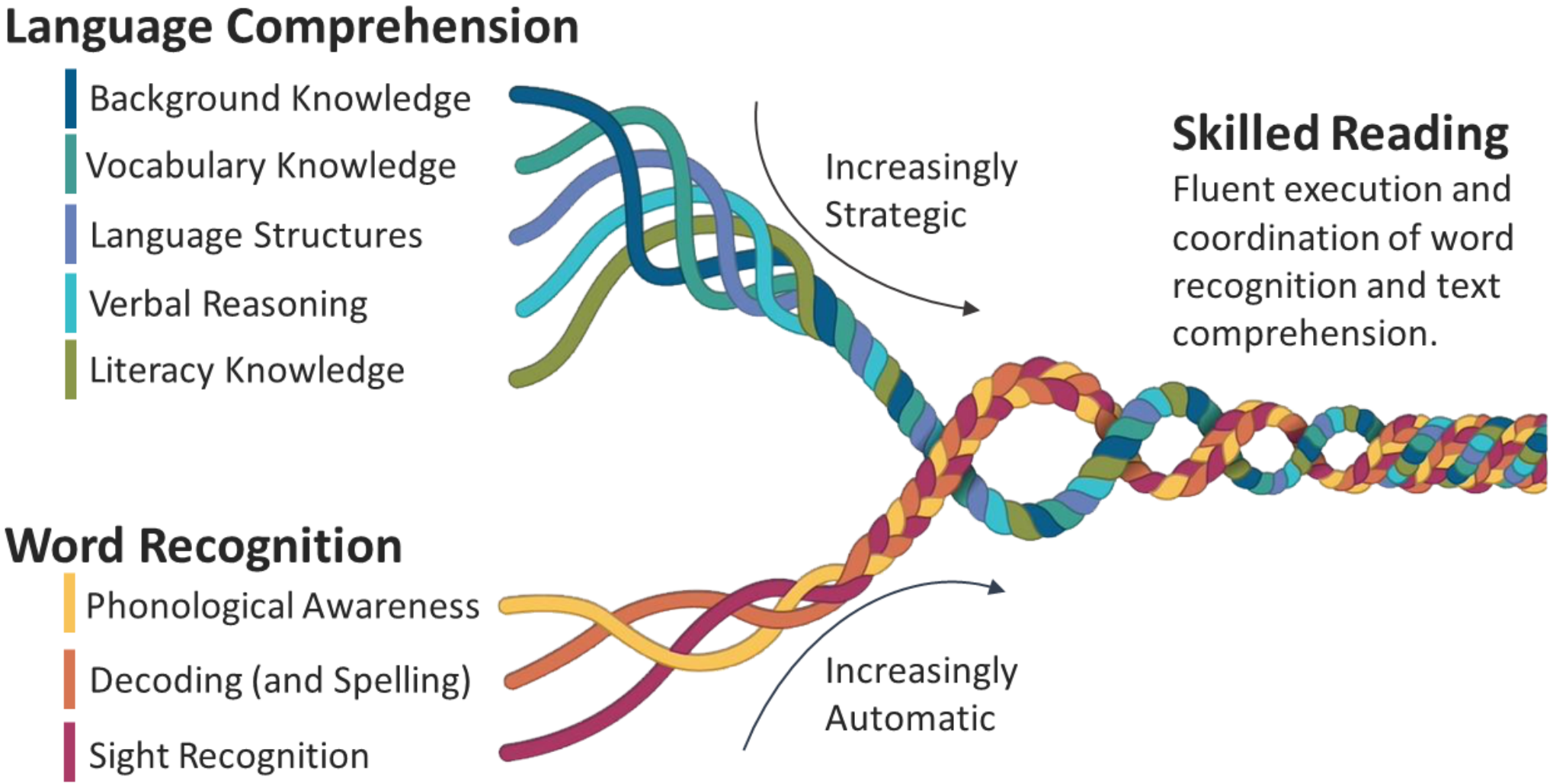
Alt text: The young Asian boy and the older balding man are presented here again

# Simple View of Reading (SVR):

(Catts, Hogan, & Fey, 2003; Catts, Hogan, & Adlof, 2005; Gough & Tunmer, 1986; Hoover & Gough, 1990)


(Hogan, Adlof, & Alonzo, 2014, p. 200)

# Is it really that simple?

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Alt text: This image presents a colorful rope that is woven out of blue and green strands corresponding to language comprehension skills; there are also red and orange strands corresponding with word recognition skills.

# The Science of Reading

- The Science of Reading is a **vast, interdisciplinary body of scientifically-based research** about reading and issues related to reading and writing.

# What is the science of reading (SOR)?

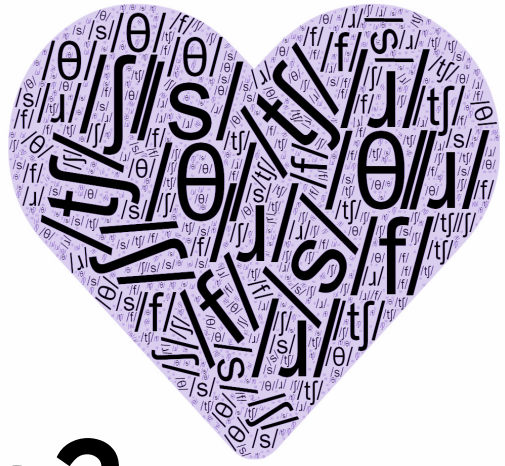
**(Petscher et al., 2020; https://www.whatisthescienceofreading.org/science-of-reading-guide)**

- Over 5 decades of global research
- Thousands of multi-linguistic studies, including randomized-control trials
- Evidence regarding how skilled reading develops (any sometimes why it doesn’t)
- Guidance for how to effectively assess and teach reading

# The Science of Reading is NOT

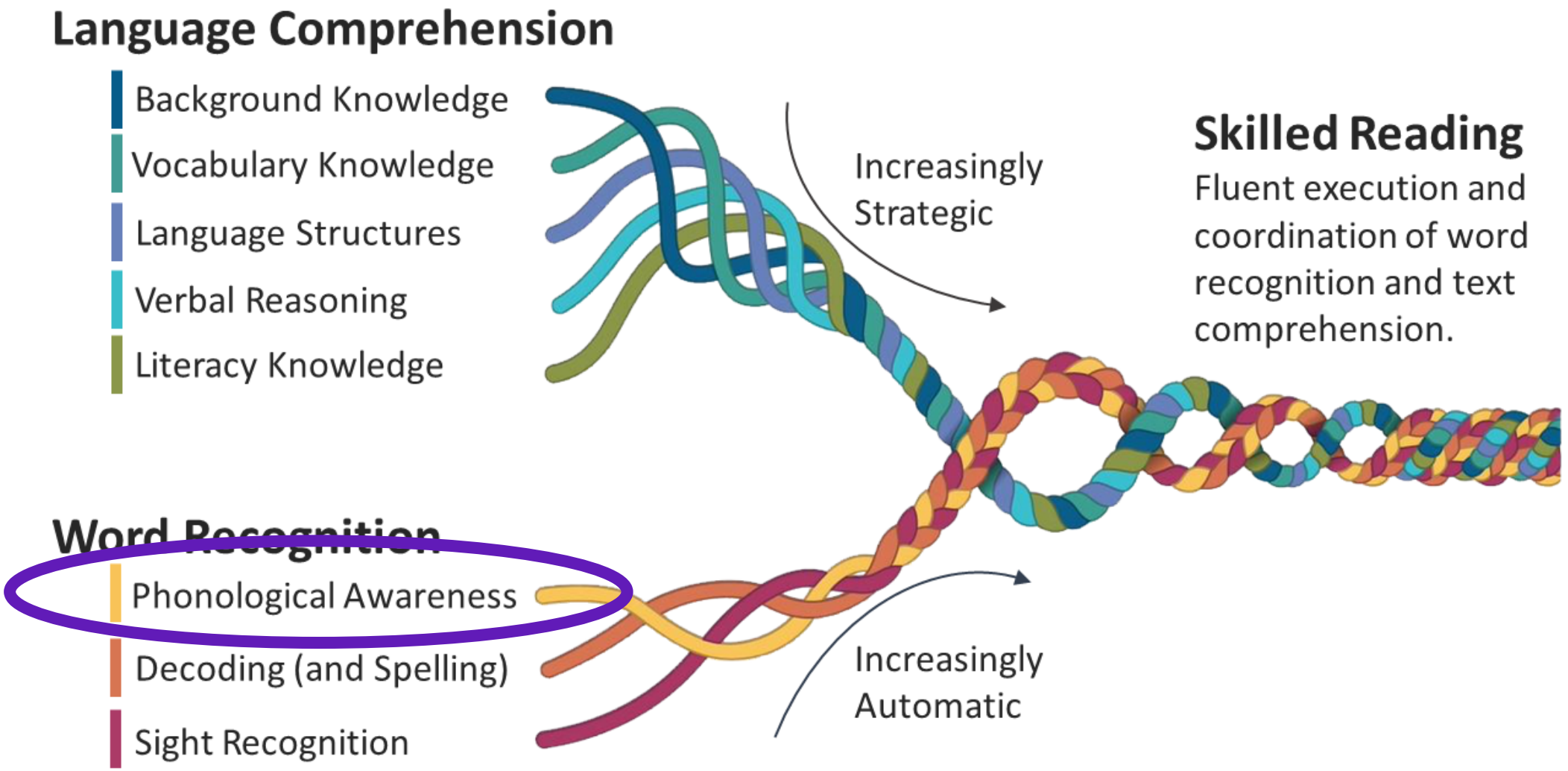
- A philosophy or trend
- A one-size-fits-all approach
- A program
- Based solely on phonics

# How does this apply to phonological impairments?



# Reading is a language-based skill!

Alt text: In this image, there is a young boy with very short hair screaming into a microphone.

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# Phonological Impairments

- Speech sound disorders
  - Articulation
  - Phonology

- Dyslexia
  - Word reading
  - Phonemic decoding

Assuming articulation = underlying motor impairment

Assuming phonology = underlying language-based impairment

**THE PROBLEMS**

| | |
|---|---|
| These skills must be TESTED to rule out or confirm | These skills overlap heavily |
| It can be a combination of both | The number of sound errors does not tell us the answer |

Farquharson, 2019; Fey, 1992;Pennington, 2006

# Speech Sound Disorders

“ SSD was formerly called *articulation* disorder (which emphasized putative problems in the motor programming of speech) and *phonological* disorder (which emphasized putative problems in the cognitive representations of speech). Since each of these terms made a **premature commitment to the underlying processing deficit** that causes the speech production problem, the neutral and descriptive term SSD is now preferred.”

- Pennington (2006)

Speech sound disorders are characterized by a delay in the acquisition of appropriate speech sounds

(Lewis, Freebairn, Hansen, Shriberg, Stein, Taylor, & Iyengar, 2006).

Children with speech sound disorders are the primary population treated by school-based speech language pathologists

(ASHA, 2022, 2020, 2018)

Speech sound disorders can impact academic, linguistic, vocational, and socio-emotional skills in children and adolescents

(Hitchcock & McAlister-Byun, 2015; Lewis, Freebairn, Hansen, Iyengar & Taylor, 2004)

Even once the speech sound disorder has been remediated through speech therapy services

(Anthony, et al, 2007; Farquharson, 2015; Overby, Trainin, Smit, Bernthal, & Nelson, 2012; Raitano et al., 2010)

50-70% of children with speech sound disorders require some level of special education services through the 12th grade (Felsenfeld, Broen, & McGue, 1994; Shriberg & Kwiatkowski, 1988).

# 11-13%

# of children ages 5-7 have an SSD

(Shriberg, Tomblin, & McSweeney, 1999)

# Approximately 10% of children ages 9-11 have a persistent speech sound disorder

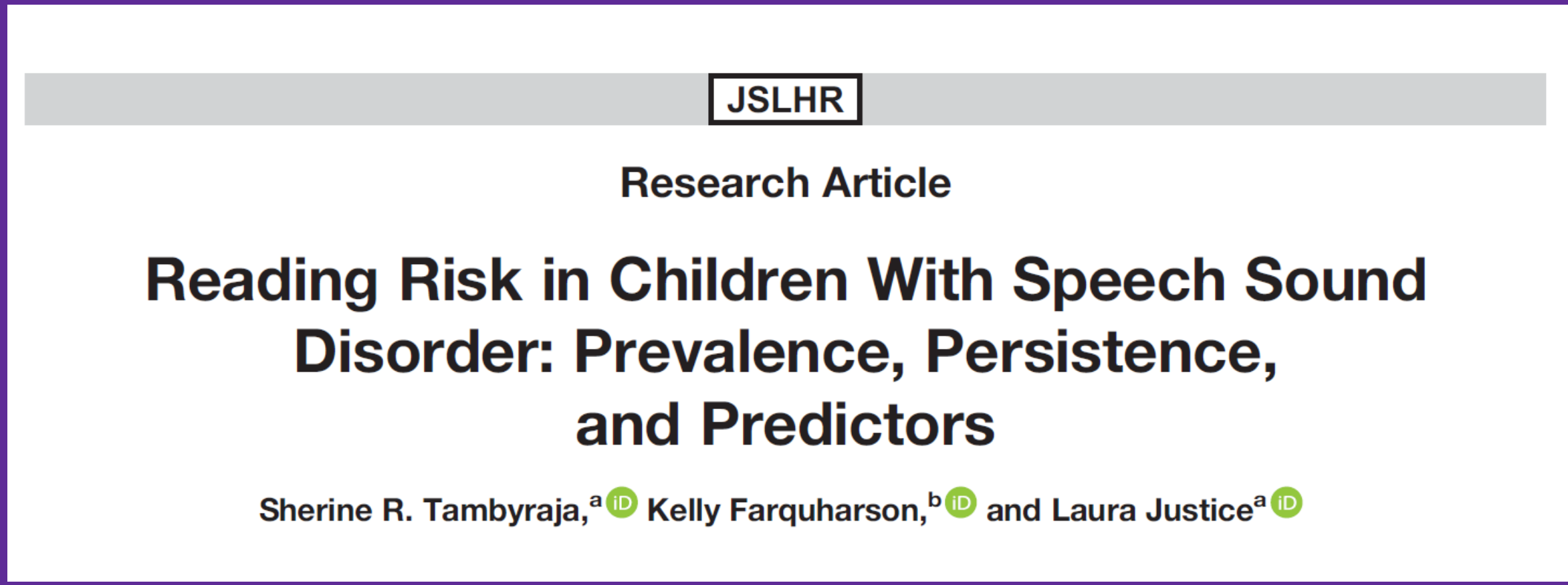
(Shriberg, 2002; Shriberg, Tomblin, & McSweeney, 1999; Wren. Roulstone, & Miller, 2011).


(Bishop & Adams, 1990; Catts et al., 2004; Catts, 1986; Catts, 1991; Catts et al., 2002; Farquharson et al., 2015; Farquharson et al., 2018; McCardle et al., 2001; Nathan et al., 2004; Tambyraja, Farquharson & Justice, 2020; Tomblin et al., 2000).


Deficits in the phonological system often result in difficulty acquiring **phonological awareness (PA) skills**, a necessary pre-requisite for reading success

(Larrivee & Catts, 1999)

(Bishop & Adams, 1990; Catts et al., 2004; Catts, 1986; Catts, 1991; Catts et al., 2002; Farquharson et al., 2015; Farquharson et al., 2018; McCardle et al., 2001; Nathan et al., 2004; Tambyraja, Farquharson & Justice, 2020; Tomblin et al., 2000).




Alt text: A screenshot of the title of a journal article from the Journal of Speech, Language, and Hearing Research (JSLHR), “Reading Risk in Children with Speech Sound Disorder: Prevalence, Persistence, and Predictors” by authors Sherine Tambyraja, Kelly Farquharson, and Laura Justice

# Speech Sound Disorders and Literacy

- In a sample of children receiving school-based SSD therapy, 25% had comorbid deficits in word decoding (Tambyraja, Farquharson, & Justice, 2020)
  - Those exhibiting this deficit at the beginning of the school year were likely to continue to be at risk

# Speech Sound Disorders and Literacy Cont.

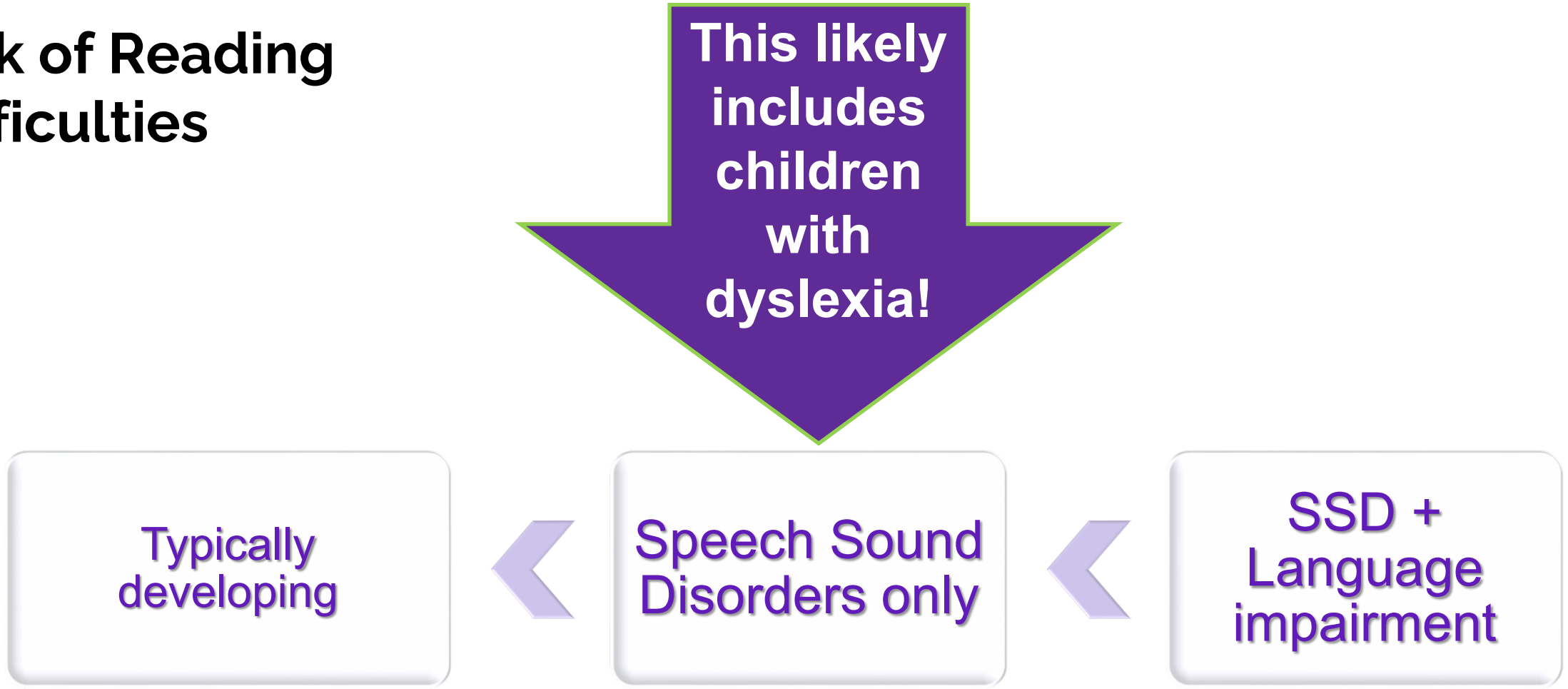
- What predicted that risk?

Phonological awareness ability

Severity of speech sound disorder

Controlling for age, language, and SES

# Risk of Reading Difficulties



# Poor Reader Subgroups

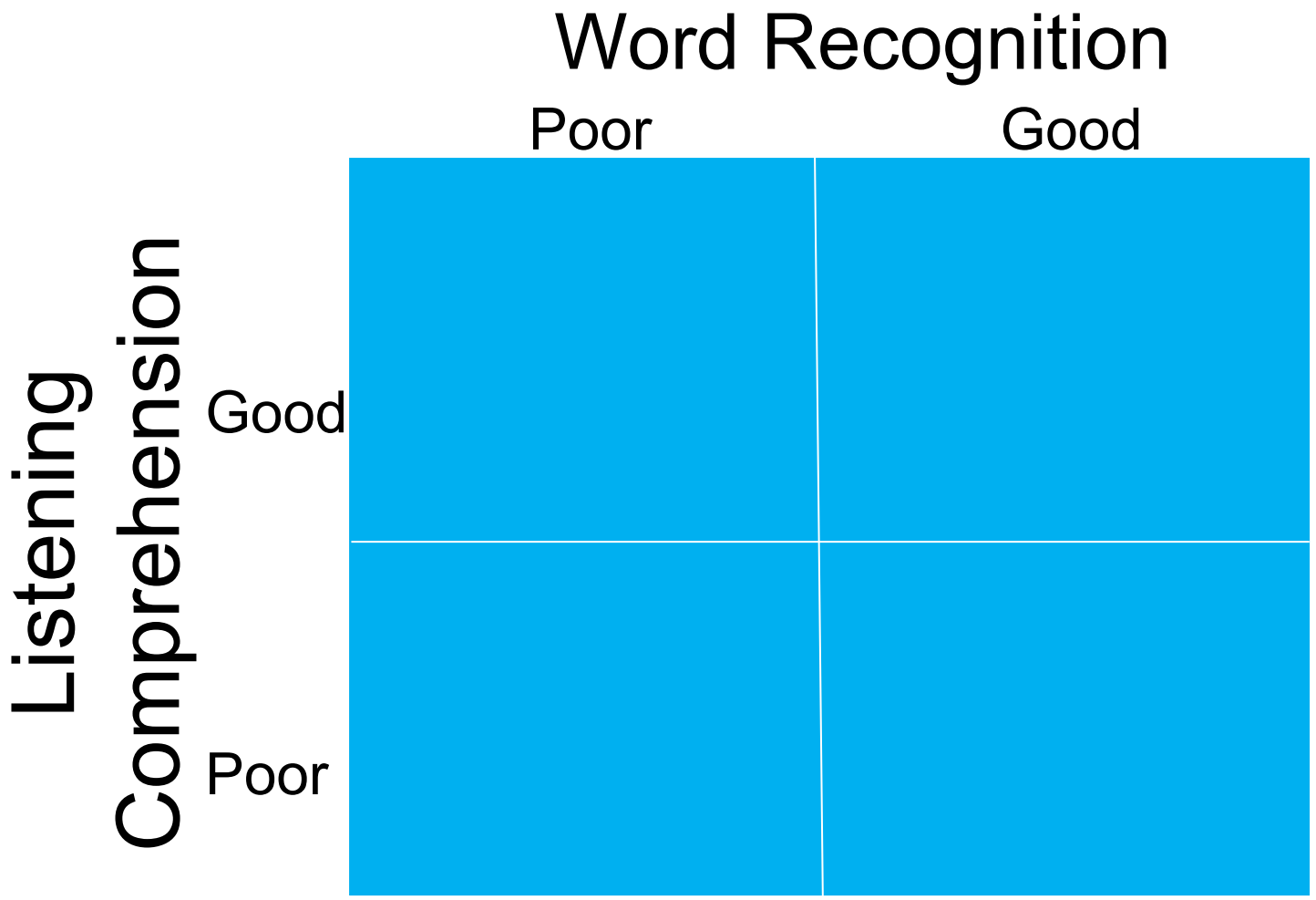
# Subgrouping poor readers

- Poor readers are not all the same…

- The Simple View of Reading can be used to subgroup poor readers based on **individual differences**

# Reader Subgroups

(Catts, Hogan, & Adlof, 2005; Catts, Hogan, & Fey, 2003)



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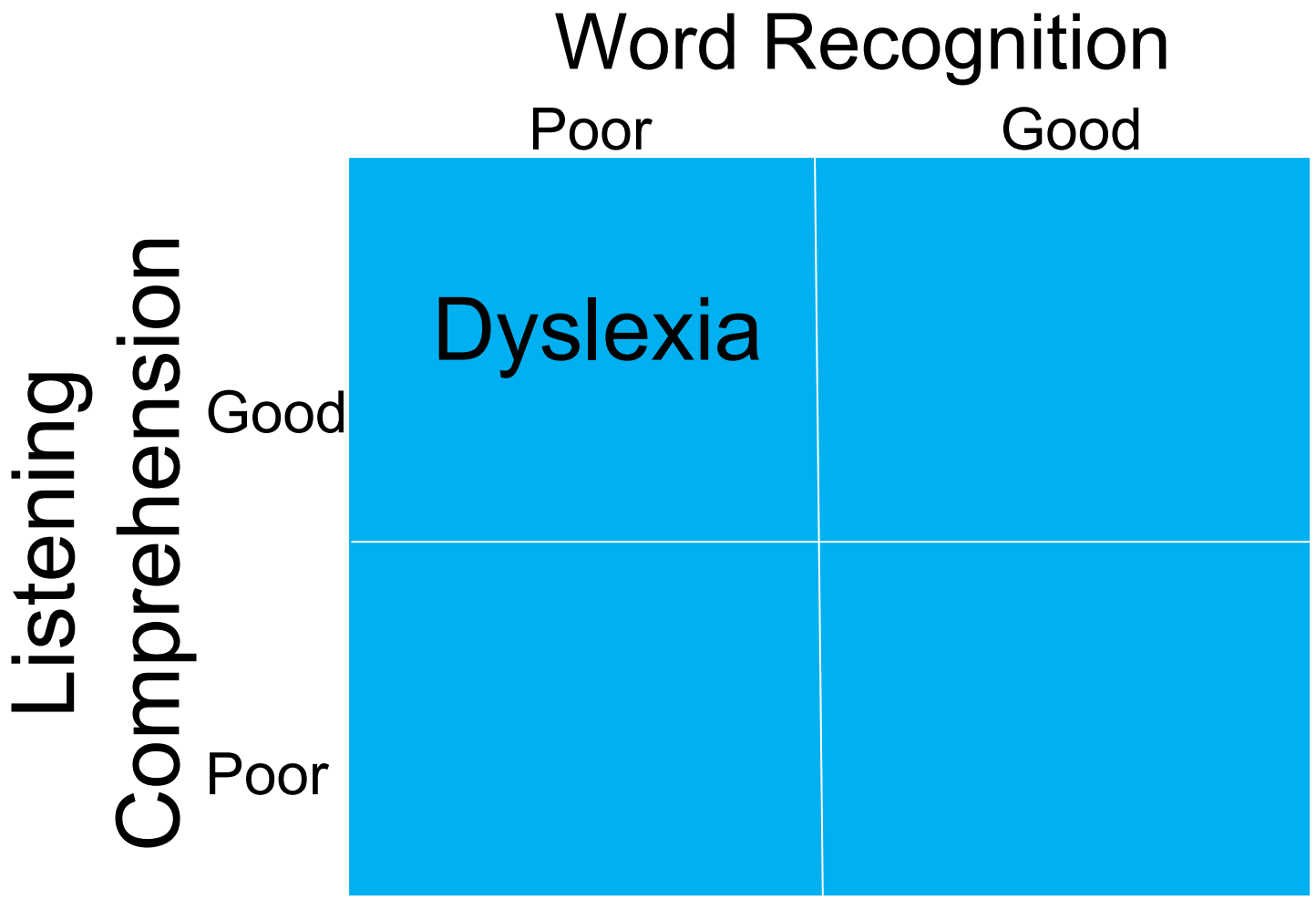

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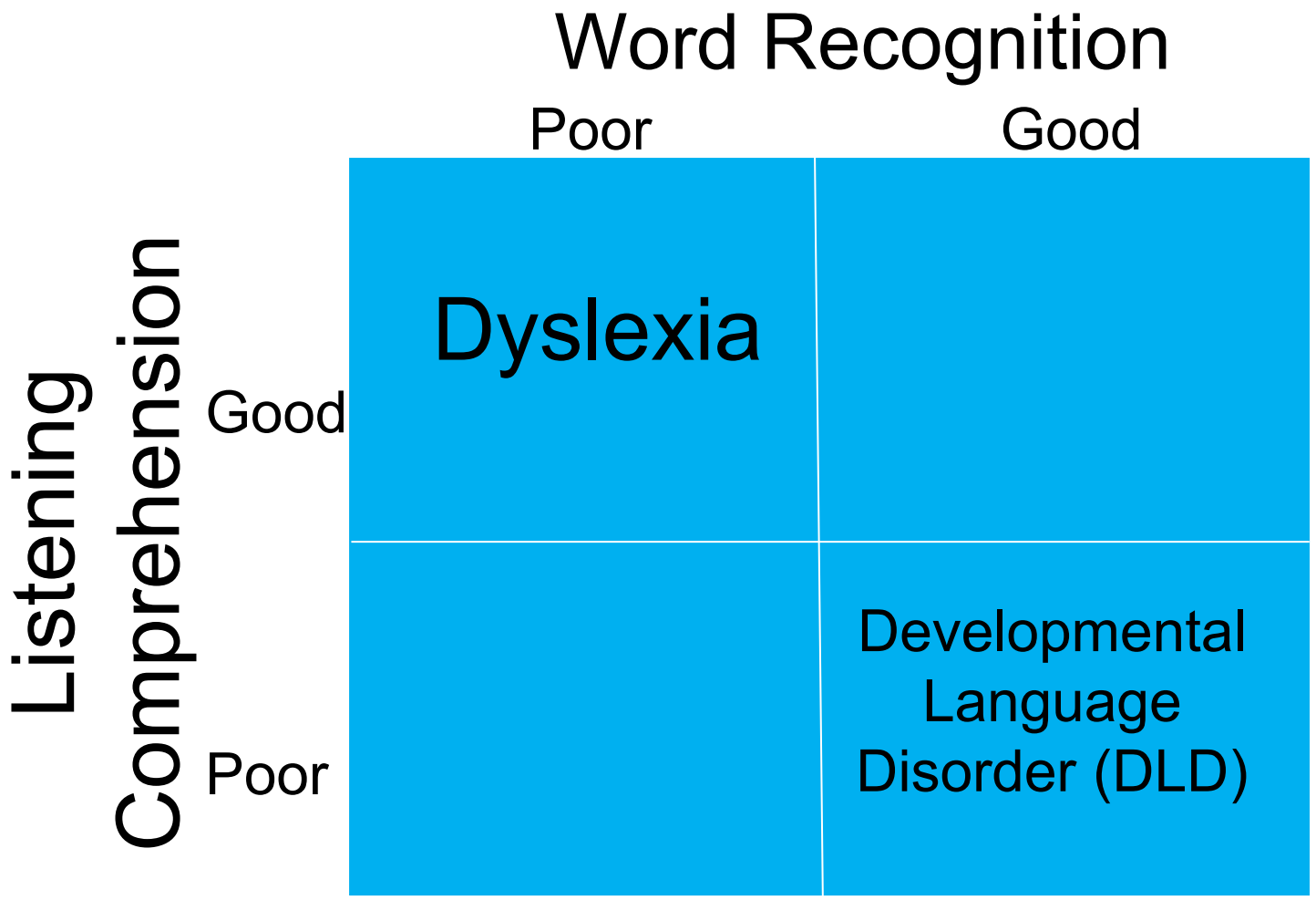

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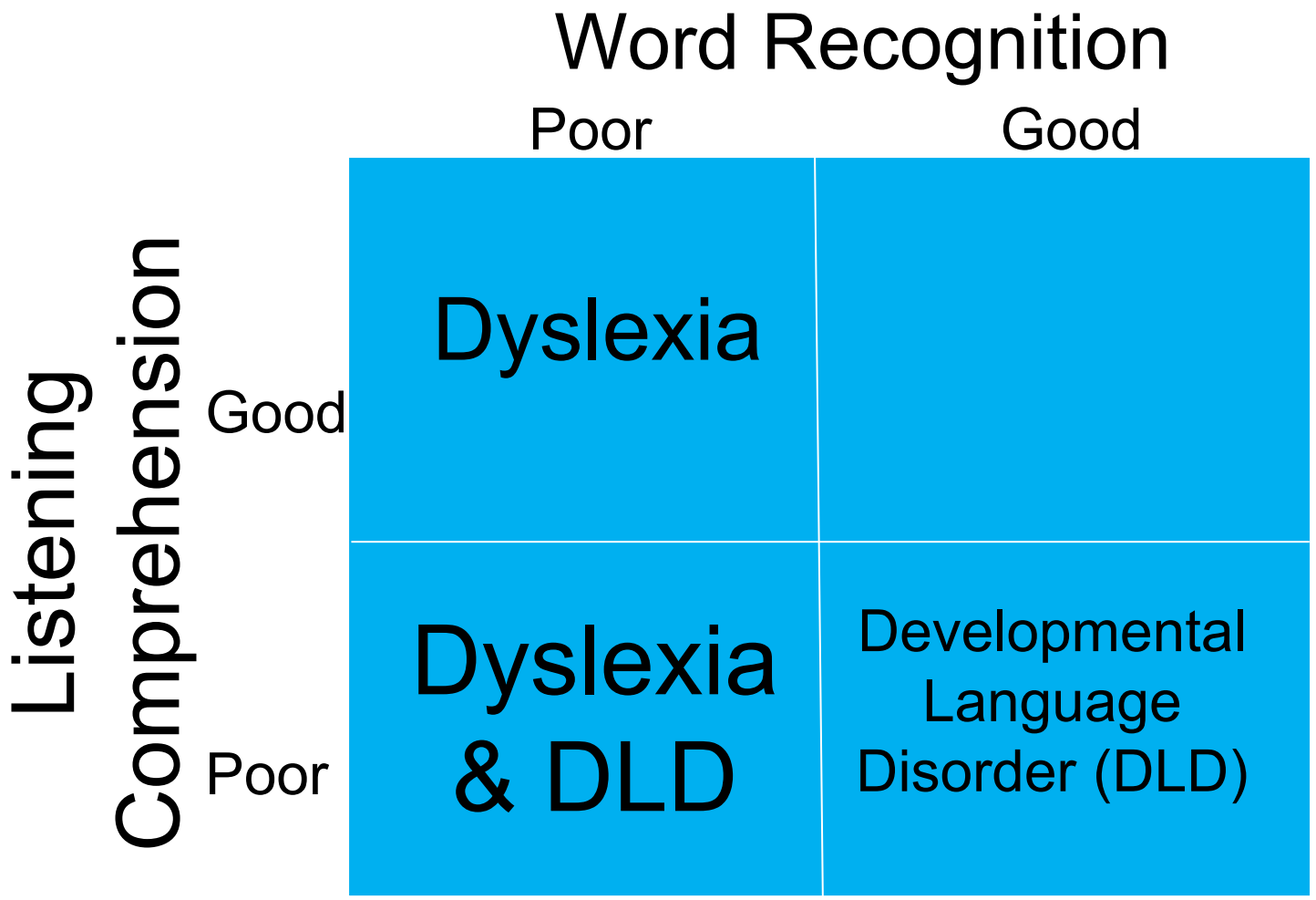

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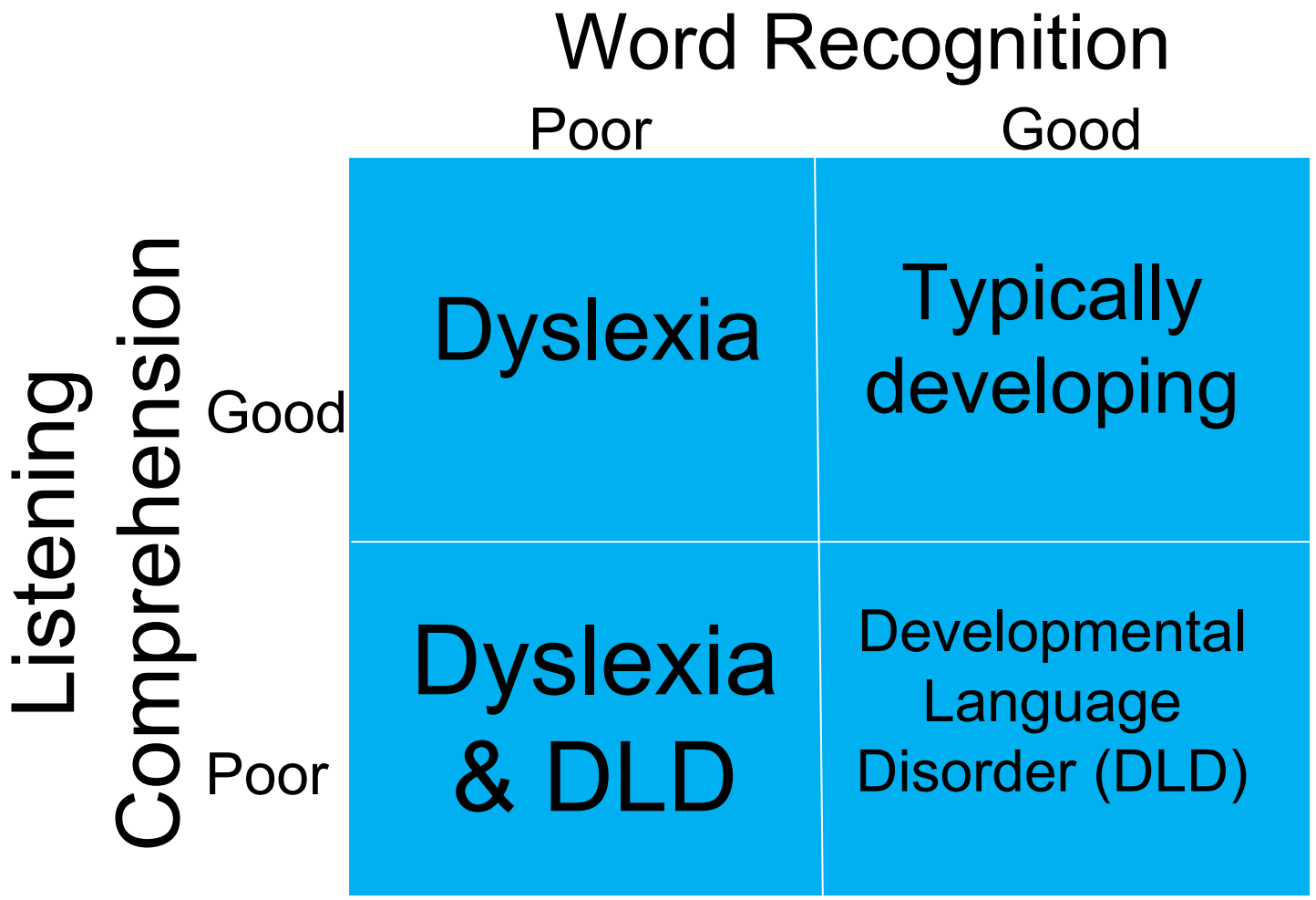

# Poor Readers can be Subgrouped

**(Catts, Hogan, & Adlof, 2005; Catts, Hogan, & Fey, 2003)**

- Using the Simple View of Reading, you can:
  - Better understand individual reading deficits
  - Create targeted intervention leading to improved outcomes

# Simple View of Reading (SVR) Over Time

(Catts, Hogan, & Fey, 2003; Catts, Hogan, & Adlof, 2005; Gough & Tunmer, 1986; Hoover & Gough, 1990)


(Hogan, Adlof, & Alonzo, 2014, p. 200)

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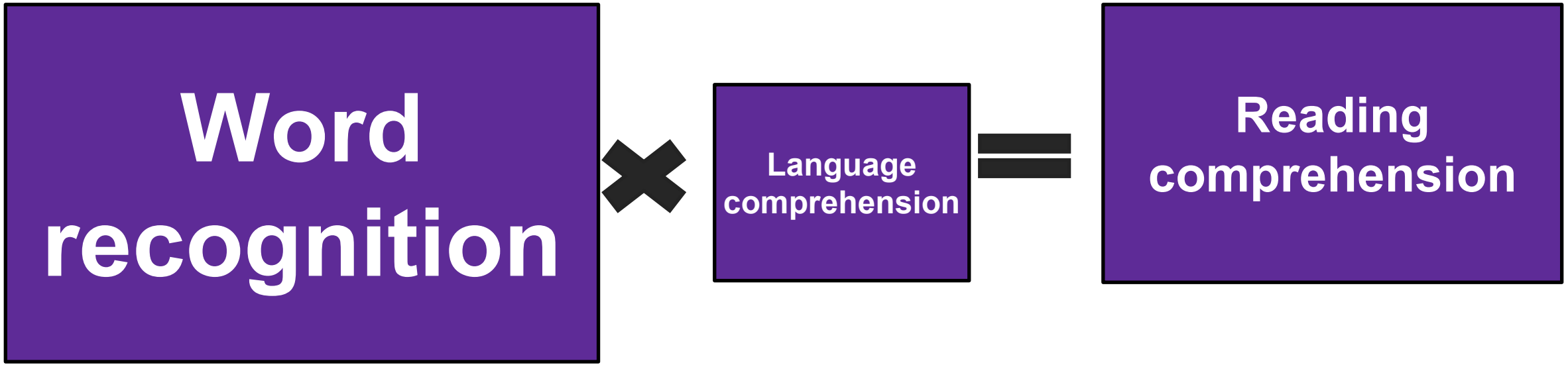


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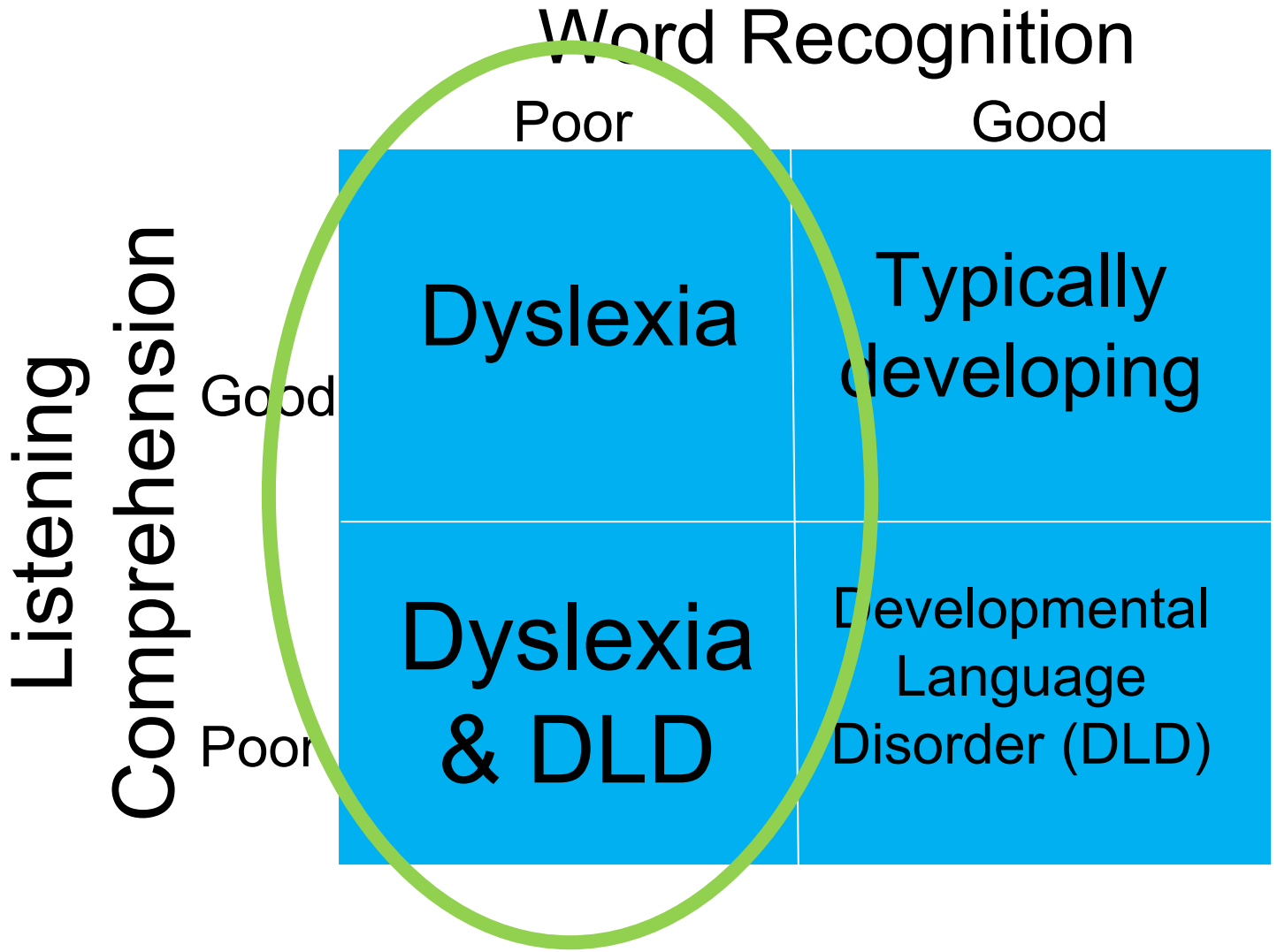
# Poor Reader Subgroups Change Over Time

# Poor Reader Subgroups

(Catts, Hogan, & Adlof, 2005; Catts, Hogan, & Fey, 2003)



# What is dyslexia?

# 1. Dyslexia is...

- A language-based problem
- A phonological processing disorder
- Neurobiological in origin
- Present from birth
- Usually experienced for life

# 2. Dyslexia is...

- A spectrum disorder than can range from annoyance to severe limitation
- More common than any other kind of learning disability
- Responsive to expert, informed instruction (Moats, 2008)

# 3. Dyslexia is...

- Characterized by weaknesses in word reading, phonemic decoding, and spelling
- Surprising, because this weakness exists in the presence of normal intelligence
- Present in adults who have compensated but are poor spellers, are slow readers, and have difficulty with novel and complex phonological forms

(Kamhi & Catts, 2012; Lyon et al, 2003; Moats, 2008)

# Dyslexia is NOT...

- Characterized or diagnosed by seeing letters backwards
- Indicative of “gifted” status
- A disorder that cannot be diagnosed until 3rd grade
- A visual problem
- Responsive to colored lenses and/or eye tracking exercises

Alt text: An image of glasses that have a pink/ rose color. An animation appears with a red X over the colored lenses.

# 1 in 5

School-aged children have dyslexia

# There are children with dyslexia on your caseload right now

Alt text: A white hand holding a microphone

# Dyslexia and Developmental Language Disorder (DLD)
(Hogan & Adlof, 2018)

- 51% of children with developmental language disorders (Adlof & Hogan, 2018)

# Dyslexia and Developmental Language Disorder (DLD) (Hogan & Adlof, 2018)

- Children with dyslexia and DLD will have language difficulties outside of the phonological domain
- Intervention should target reading outcomes – regardless of labels
- Slower language acquisition is to be expected over the lifetime

# Dyslexia and Developmental Language Disorder (DLD)

- https://dldandme.org/

# Early identification of dyslexia

- Speech discrimination at 3-5 days old
  - Guttorm et al., 2005
- Babbling complexity in infants
  - Farquharson, Hogan, Hoffman, Green, Wang, & Green, 2018;  Lambrecht-Smith et al., 2008
    - Link to open-access (free) article in PLOS one journal

# Dyslexia resources

- International Dyslexia Association (IDA)
  - International Dyslexia Association website
  - Rocky Mountain Branch of the International Dyslexia Association
- Decoding Dyslexia
  - Decoding dyslexia website
  - Facebook page for Decoding Dyslexia – Colorado chapter
- Colorado Department of Education website – Dyslexia Handbook

# What should I look for in the classroom?

- Content Credit: Joy Propst

# Preschool

- Family history of learning or reading disorders
- Delayed speech as a toddler
- Difficulty with direction words
- Trouble recalling the right word
- Trouble with sequencing/following directions
- Difficulty **learning letter names and sounds**, the alphabet, numbers, days of the week, colors, shapes, how to spell their name

# Kindergarten & 1st Grade

- Family history of reading difficulty
- Difficulty remembering directions
- Poor phonological & phonemic awareness
- Difficulty **learning letter names and sounds** (Alonzo et al., 2020)
- Difficulty recognizing high frequency words
- May develop frustration, anxiety, or complain of stomach aches or headaches
- Poor working memory

# 2nd & 3rd grade

- Slow, labored, inaccurate decoding of words in isolation and in context
- Great difficulty with spelling
- Misreads, adds, or omits  small function words & articles
- May read word by word without expression
- May guess based on picture, context, or beginning letter
- Difficulty with segmenting, blending, and manipulating phonemes
- May confuse voiced and unvoiced cognates (d/t, b/p, g/k)
- Word substitutions – house for home/pony for horse

# 4th – 6th grades

- Continued difficulty with oral reading fluency & accuracy
- Difficulty decoding novel & nonsense words
- Poor spelling, often including high frequency words
- Often spells the same word different ways within the same assignment
- Fatigues quickly when reading
- Avoids reading and writing
- Frustrated, may develop low self esteem
- Better listening comprehension than reading comprehension
- Skips or misreads suffixes

5th graders who were poor readers in 3rd grade are more likely to consider themselves:

Angry

Distractible

Sad

Lonely

Unpopular

Morgan et al., 2011

# 7th – 12th grades

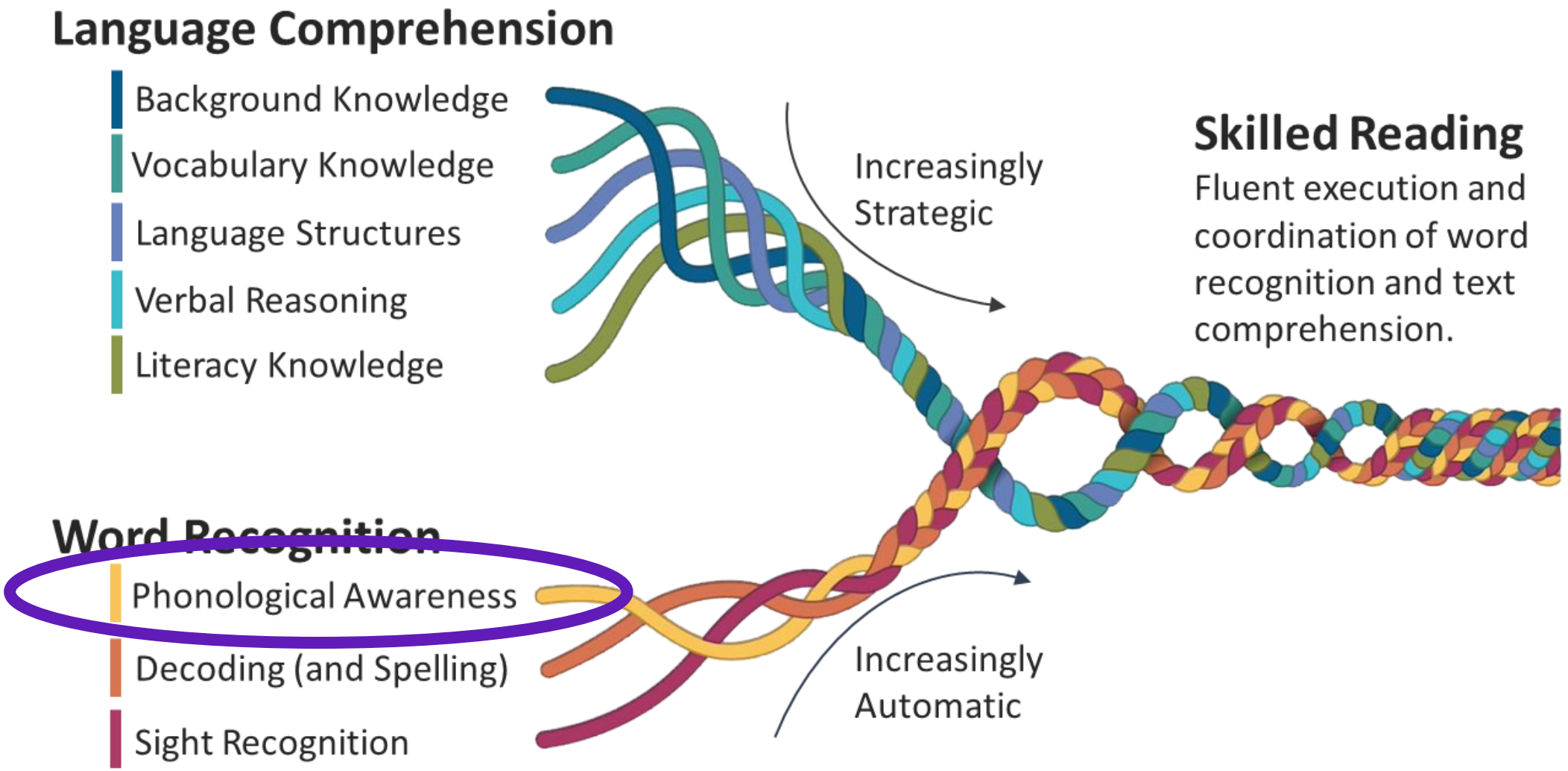
- Reads slowly
- May omit, substitute, or add small words and parts of longer words when reading aloud
- Avoids reading aloud
- May have reduced background knowledge and vocabulary
- Over simplified written expression and a significant discrepancy between verbal and written expression
- Difficulty learning foreign languages
- Poor grades and **in danger of dropping out of school**, **especially if retained**

Children with dyslexia are at a higher risk for suicidal ideations

Daniel et al., 2006

# Adults

- Slow reader – may have to re-read for comprehension
- May dislike or avoid reading, or simply take months to finish a book
- Reading results in tiredness
- May continue to struggle with organized, efficient written expression
- May continue to have difficulty with spelling
- Word retrieval problems continue

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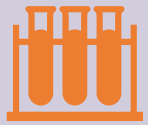
# Phonological Awareness

Alt text: colorful puzzle pieces

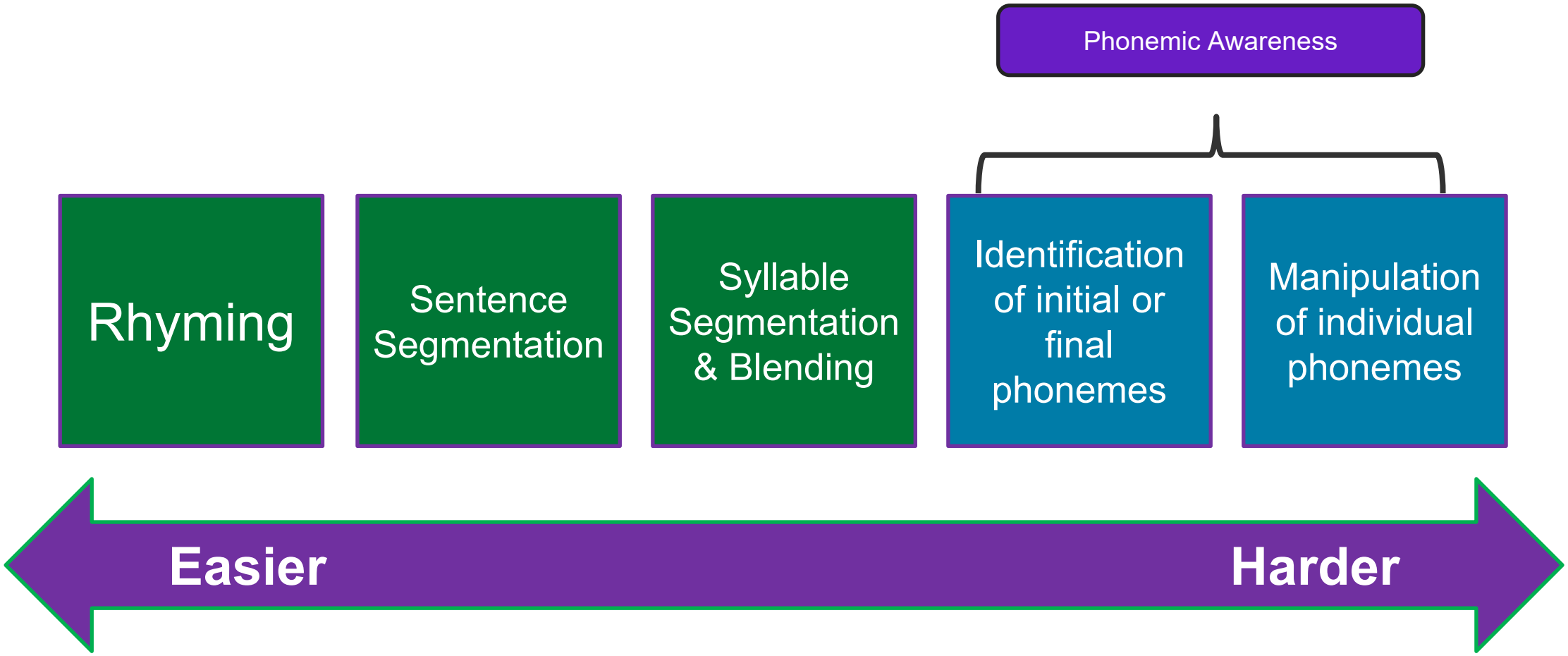
# Phonological Awareness (Wagner & Torgesen, 1987)

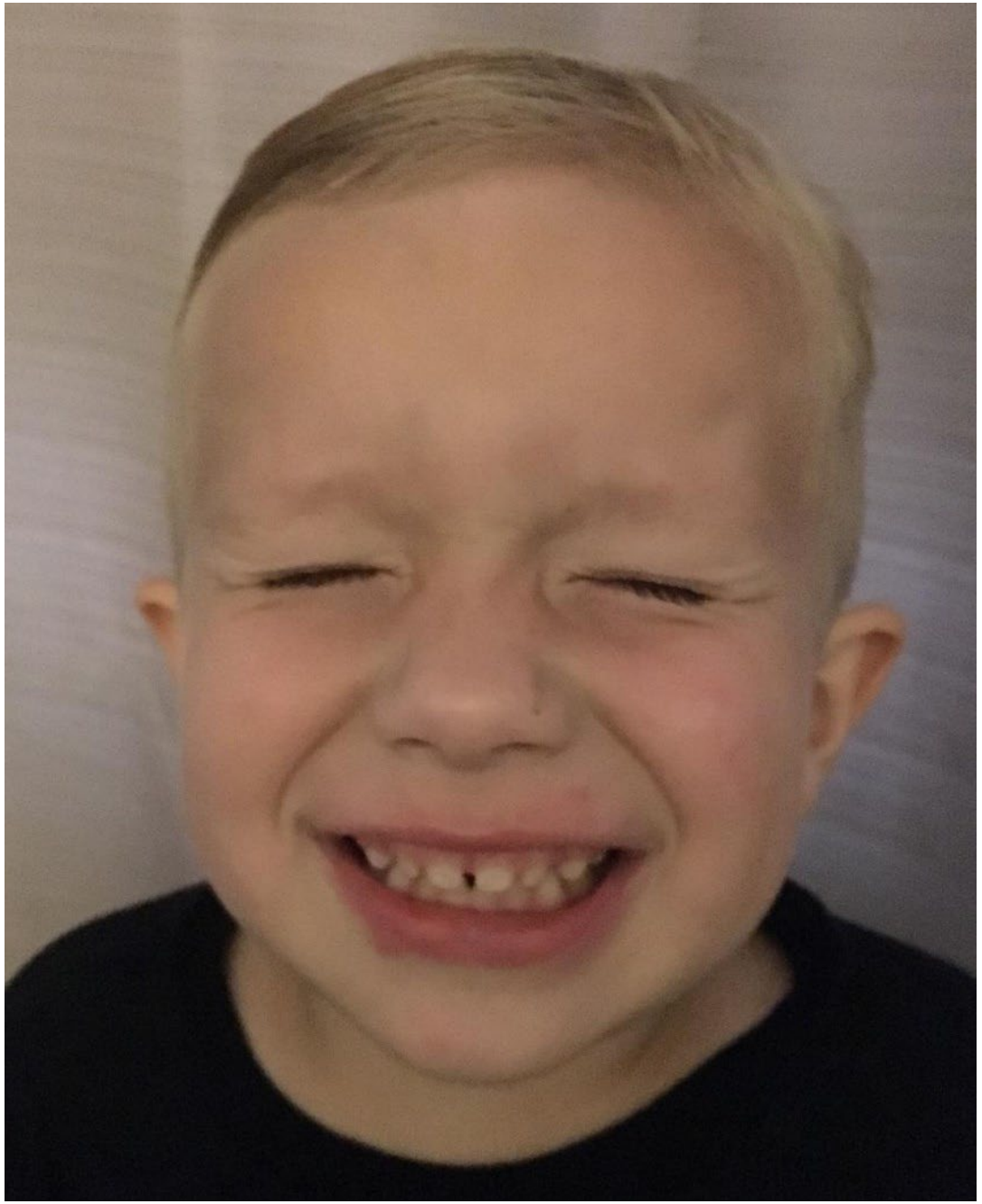
An awareness of the sound structures of language (Whitehurst & Lonigan, 1998).



Measured by rhyming, blending, and deletion tasks

# Phonological Awareness Continuum





Phonological awareness = eyes shut tasks

Alt text: a young white male with short blonde hair is squeezing his eyes shut. He is wearing a black shirt.

Alt text: a young white female with brown hair has her eyes wide open.

Phonological awareness = eyes shut tasks

Phonics = eyes open tasks

# Test your Segmentation Skills

Directions: Reverse the sequence of speech sounds and write the word.

1. teach: cheat
2. sigh: _____
3. cuts: _____
4. speak:_____
5. jab: _____
6. scene:_____
7. might: _____
8. tax: _____
9. caught: _____

Borrowed with permission from Barbara Hodson

# PA & SSD – Relations over time

Preschool:

- Preschoolers with SSDs are at increased risk for deficits with phonological awareness (Anthony et al., 2011; Bird, Bishop, & Freeman, 1995; Foy & Mann, 2011; Lewis et al., 2011; Lewis & Freebairn, 1992; Peterson, Pennington, Shriberg, & Boada, 2009; Raitano, Pennington, Tunick, Boada, & Shriberg, 2004; Rvachew, Ohberg, Grawburg, & Heyding, 2003)
- Atypical speech sound errors and distortions in preschool are predictive of weak PA skills (Preston & Edwards, 2010)
- This is true even when language is normal (Bird et al., 1995; Overby, Trainin, Smit, Bernthal, & Nelson, 2012; Raitano et al., 2004; Rvachew et al., 2003)
- The proportion of speech sounds in error at age 5 is related to the likelihood of persistant errors at age 8 (Roulstone et al., 2009)

# PA & SSD – Relations over time

School-aged:

- Children with persistent speech sound disorders (2-5th grade) have markedly weaker PA skills compared to same-age peers (Farquharson, 2012)

- Children with "residual" SSD, ages 8.5-10, exhibit cortical and subcortical differences during phonological processing tasks (Preston, Felsenfeld, Frost, Mencl, Fulbright, Grigorenko, Landi, Seki, & Pugh, 2012)

- Atypical speech sound errors in preschool are predictive of school-age PA abilities; if more than 10% of the child's speech has atypical errors, the child is likely to have deficits in PA, reading, and spelling (Preston & Hull, 2012)

# PA & SSD – Relations over time

## Adolescents:

- 10-14 year old children with “residual” speech sound errors (no comorbid diagnoses) have weaker phonological processing skills compared to same-aged peers (Preston & Edwards, 2007)

- Phonological processing (word reading and phonological working memory) skills have been shown to be weak even once the speech sound disorder is remediated (Farquharson, 2015; Raitano, Tunick, Pennington, Boada, & Shriberg, 2004)

# Constructs to assess

## Nonword Reading

Woodcock Reading Mastery Test – 3rd Edition

Test of Word Reading Efficency (TOWRE)

## Real word reading

Woodcock Reading Mastery Test – 3rd Edition

Test of Word Reading Efficiency (TOWRE)

## Nonverbal intelligence

Reynolds Intellectual Assessment Scales (RIAS)

Kaufmann Brief Intelligence Test (KBIT)

## Phonological Processing

Comprehensive Test of Phonological Processing (CTOPP)
Test of Integrated Language and Literacy (TILLS)

## Language

Test of Integrated Language and Literacy (TILLS)

## Speech Sound production

Arizona Articulation Phonology Scale-4th Edition