Debunking Neuromyths

Teaching Academy

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Agenda

- **Illiteracy in America**
- What are the neurological differences in the dyslexic brain?
- What are common neuromyths surrounding dyslexia?
- Discuss the HW: podcast *At A Loss for Words*
- What is effective reading instruction?

Learning Objectives

1. Define dyslexia including its prevalence rate, underlying cause, and neural signature
2. Define a neuromyth
3. Explain evidence to dispel common neuromyths related to reading and dyslexia
4. List hallmarks of evidence-based reading instruction

Illiteracy in America

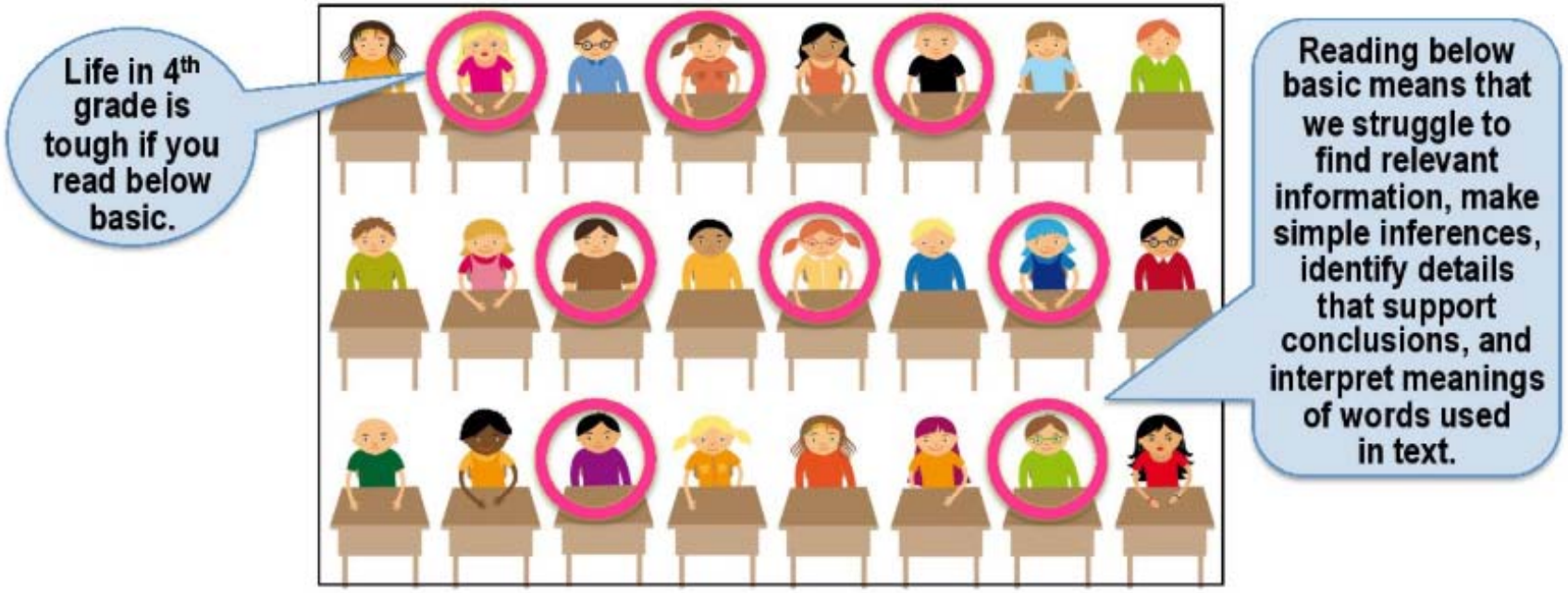
Literacy is a crucial piece to

- Social justice
- Economic opportunity
- Public health
- Planet health

35% of 4th graders read below basic

https://dyslexiaida.org/most-reading-difficulties-can-be-resolved-or-diminished/

1. About 35% of US 4th graders read below the basic level



The National Assessment of Educational Progress (NAEP) consistently finds that about **35%** of US 4th graders read at a level that is below basic. So, in an average class of 24 4th graders, about **8-9 students** *cannot read at a basic level*. Most are capable of learning to read at higher levels.

Won't all kids eventually catch up?

- Students who don't read proficiently by the 3rd grade are 4x likelier to drop out of school.
- 2/3 of students who cannot read proficiently by the end of 4th grade will end up in jail or on welfare.
- 32 million adults in the United States can't read above a fifth grade level, and 19% of high school graduates can't read.
- 46% of American adults cannot understand the labels on their pharmaceutical prescriptions.

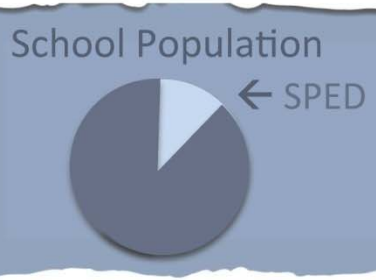
http://literacyinc.com/about-us/

What is dyslexia?

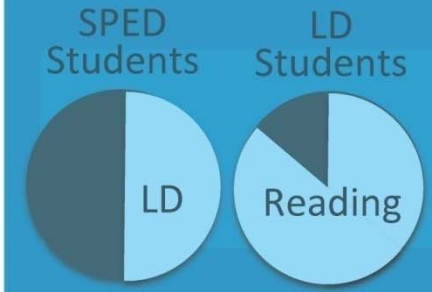
"Dyslexia is a specific learning disability that is **neurobiological** in origin. It is characterized by difficulties with accurate and/or fluent **word recognition** and by **poor spelling** and **decoding abilities**. These difficulties typically result from a deficit in the **phonological component of language** that is often unexpected in relation to other cognitive abilities and the provision of effective classroom instruction. Secondary consequences may include problems in reading comprehension and reduced reading experience that can impede growth of vocabulary and background knowledge."

Source: https://dyslexiaida.org/definition-of-dyslexia/

How widespread is dyslexia?



About 13-14% of the school population nationwide are identified as having a handicapping condition that qualifies for Special Education (SPED) services.



One half of all students who are identified for special education are classified as having a learning disability (LD). About 85% of those students have a primary learning disability in reading and language processing.

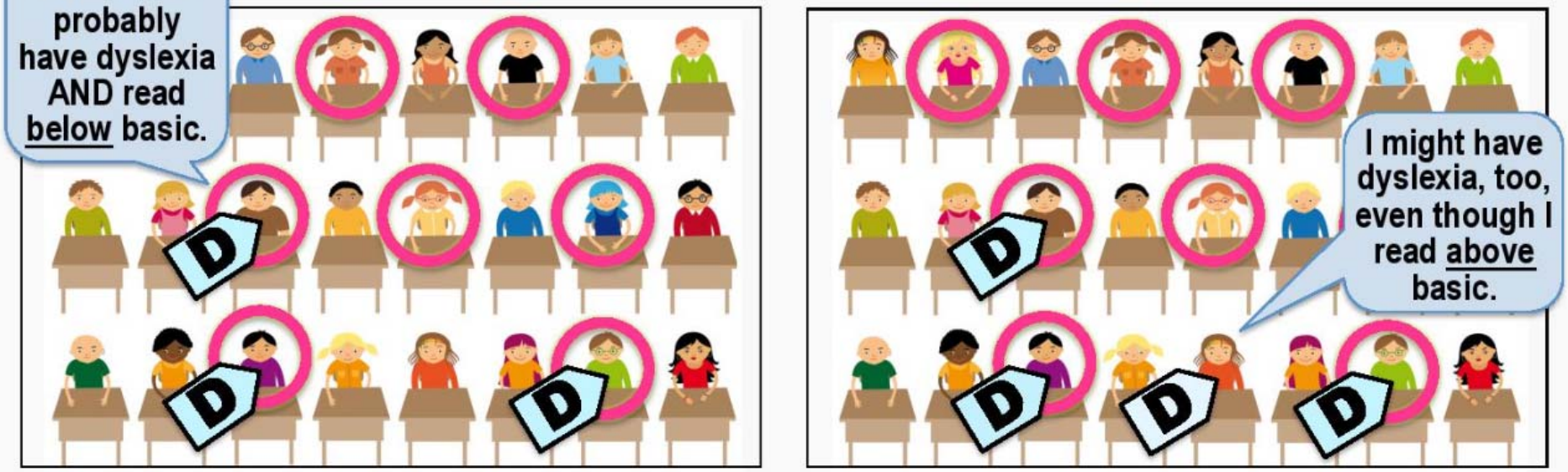
Up to 15-20% of the population as a whole may have symptoms of dyslexia, including slow or inaccurate reading, weak spelling, and poor writing. Not all will qualify for Special Education, but most benefit from systematic, explicit instruction in reading, writing, and language (AKA, Structured Literacy Instruction).

Find solutions at the International Dyslexia Association (IDA) • eida.org
Source: IDA Fact Sheet, "Dyslexia Basics" • Moats & Dakin

Every classroom will have students with dyslexia

https://dyslexiaida.org/most-reading-difficulties-can-be-resolved-or-diminished/

The International Dyslexia Association (IDA) estimates that **15-20%** of the population as a whole may have symptoms of dyslexia.



Even using IDA's conservative estimate (15%), as many as **3-4 students** in this 4th grade class may have symptoms of **dyslexia**. Most probably are among those reading *below* basic.

However, some students with dyslexia may read *above* basic and may not be identified for Special Education. They may be capable of much more, but struggle just to keep up.

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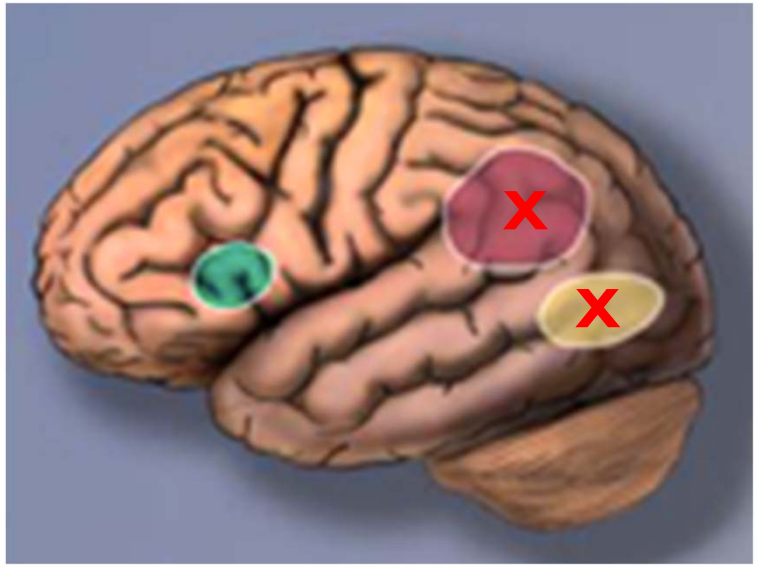
Agree or Disagree

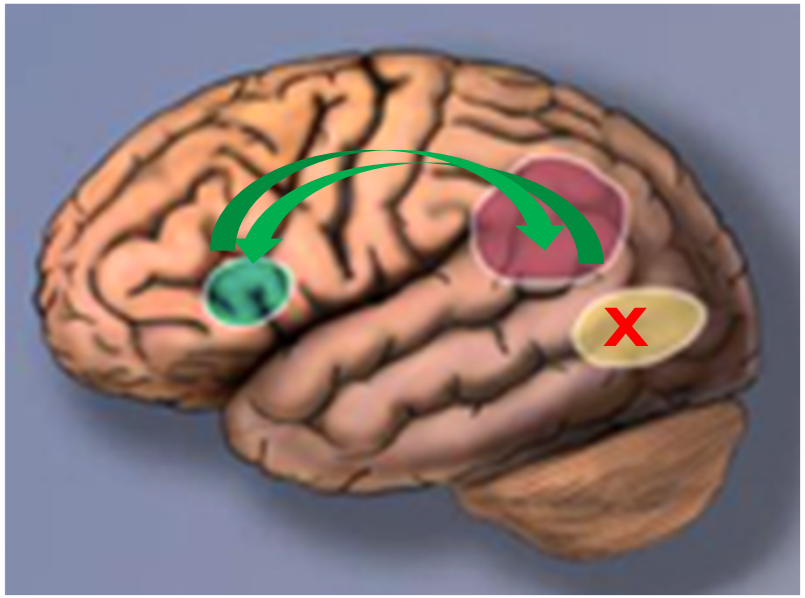
- The human brain was wired to learn how to read and write.

Brain Network Development for Intuitive Readers

Non-reader

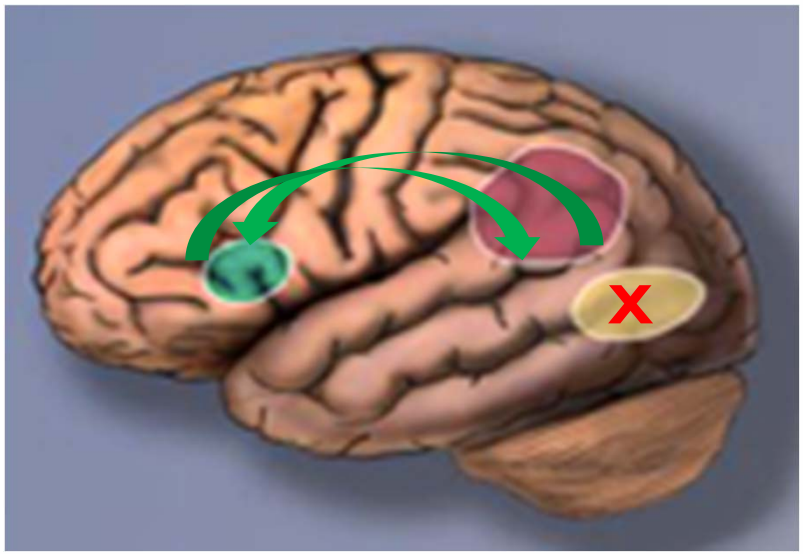


Beginning Reader

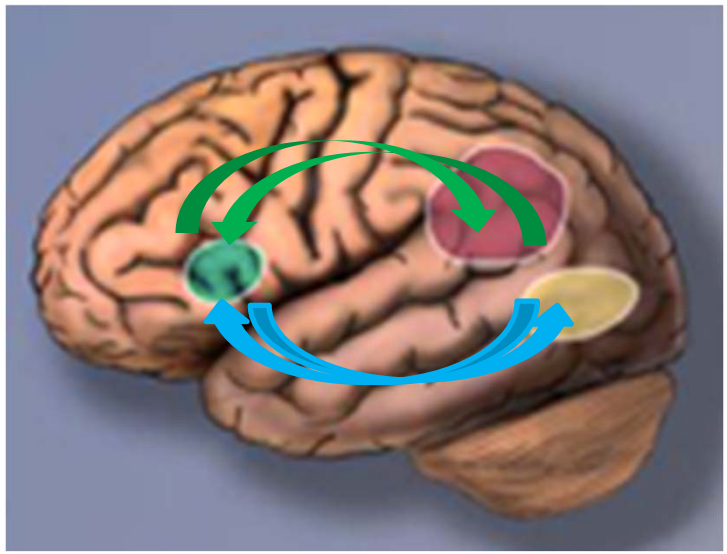


Jane Ashby, PhD (2018)

Beginning Reader

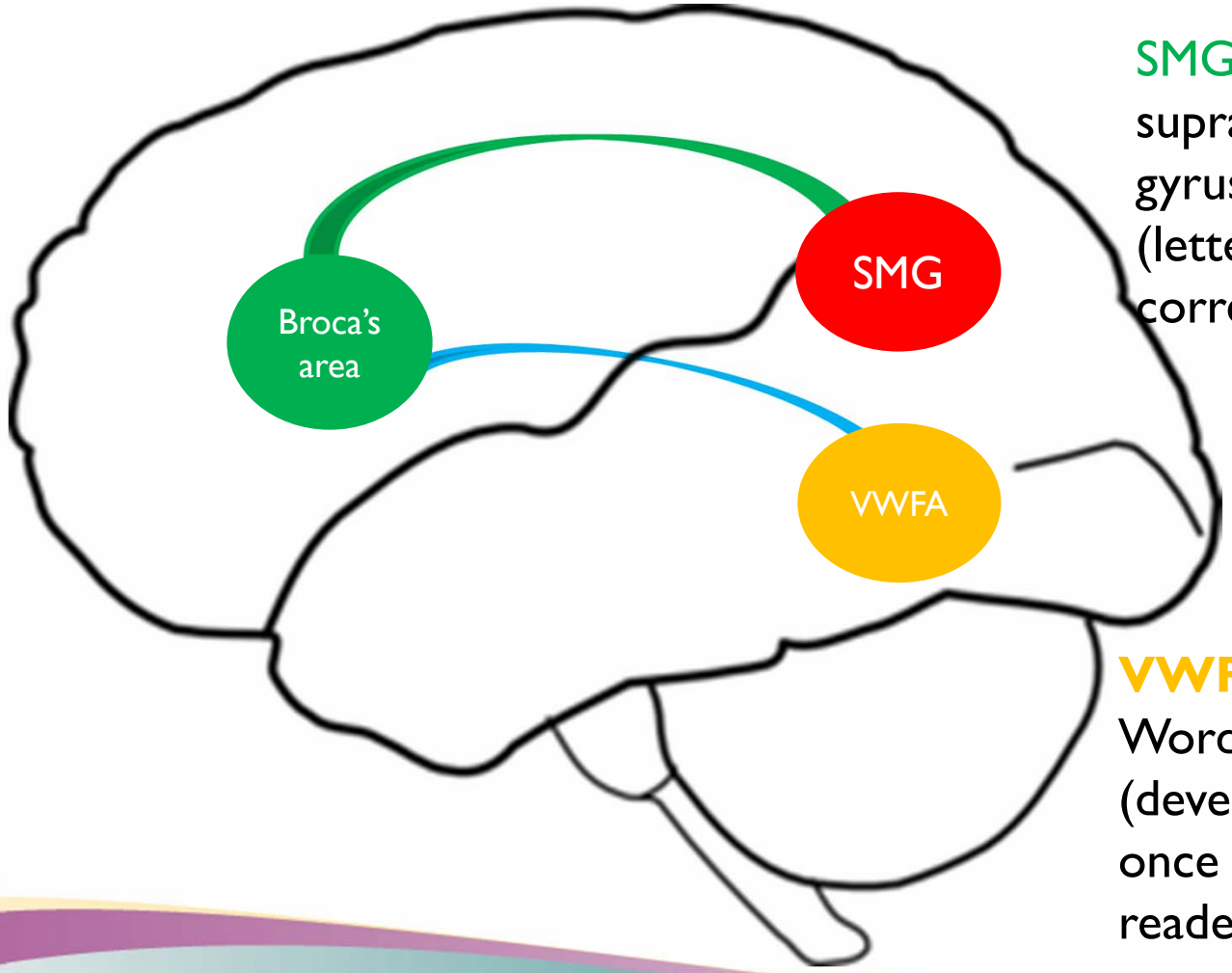


Skilled Reader



Jane Ashby, PhD (2018)

Let's draw the brain!

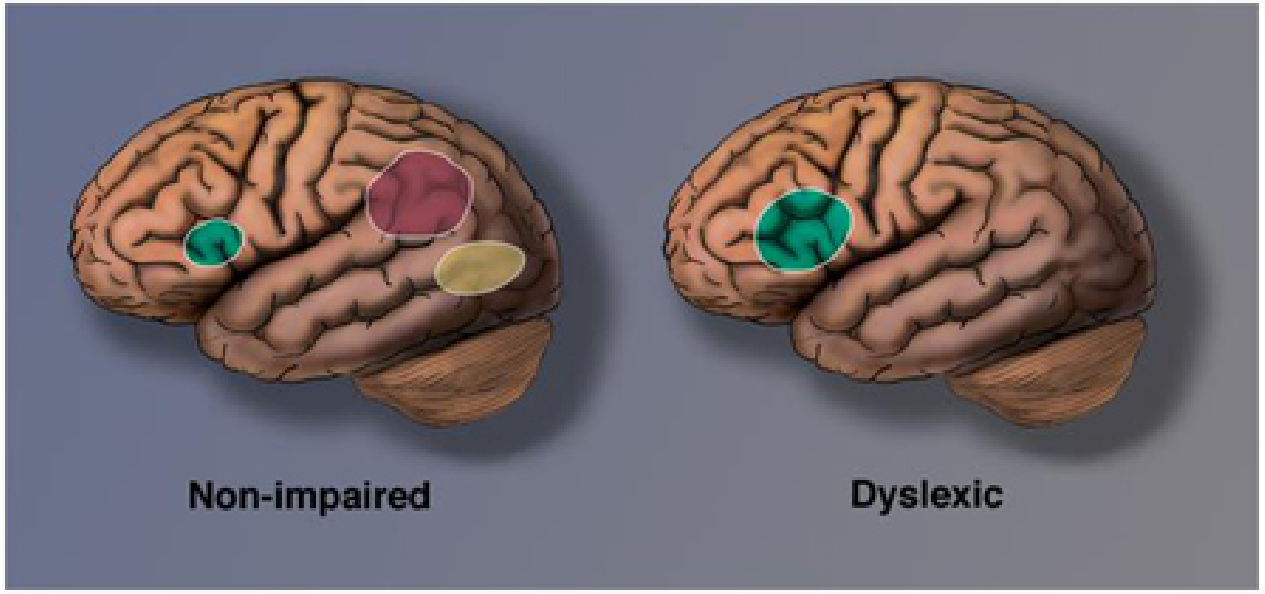


SMG = supramarginal gyrus (letter-sound correspondence)

VWFA = Visual Word Form Area (develops only once skilled reader)

Neural Signature for Dyslexia:

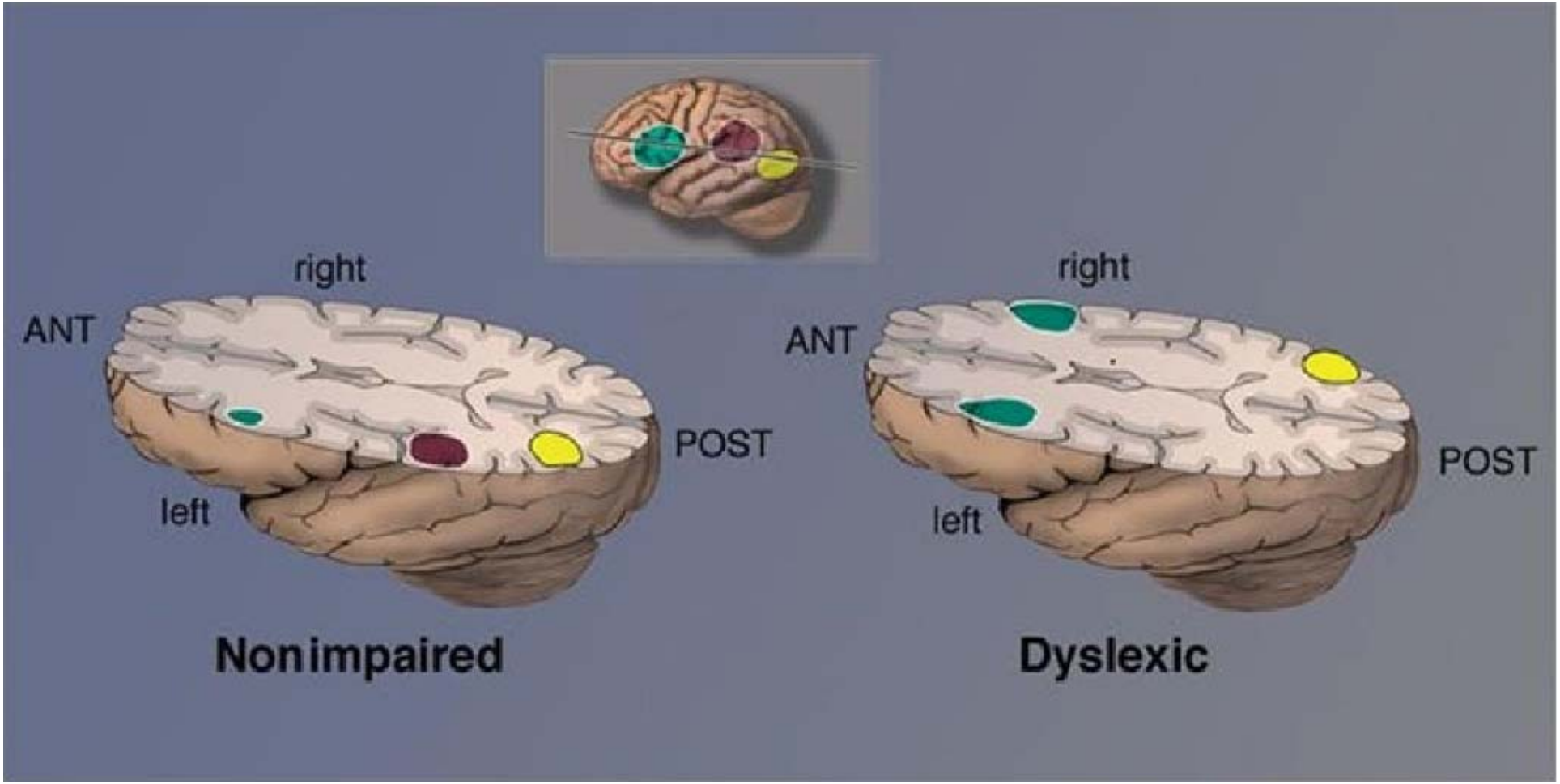
Disruption of Posterior Reading Systems



© Sally Shaywitz, *Overcoming Dyslexia*, 2003

In the dyslexic brain, the green area is bigger because it's inefficient.
It's like painting with your toes instead of your fingers.

http://dyslexia.yale.edu/



Shaywitz, S. E., & Shaywitz, B. A. (2008). Paying attention to reading: the neurobiology of reading and dyslexia. *Development and psychopathology*, *20*(4), 1329-1349.
Image retrieved from: https://images.app.goo.gl/op23aWGAD7N5AkP8A

What causes dyslexia?

- Heritable and brain-based
  - "consequence of a brain organization that is not optimal for reading" – Dr. John Gabrieli
  - NOT caused by a lack of books at home
- Core deficit in dyslexia is phonological processing
  - Spoken words can be broken into smaller units
    - bridge = /b/ /r/ /i/ /j/
  - "…Language problems that ultimately impact the visual learning of reading." -Dr. Kenneth Pugh
  - Great 25-minute interview on YouTube: *Embracing Dyslexia: The Interviews - Dr. Ken Pugh*

Agree or Disagree

1. Individuals with dyslexia have difficulties with spelling as well as inaccurate and/or slow reading.
2. Dyslexia has a low prevalence of under 5% in the general population.
3. The neural signature of dyslexia is more activation in the frontal lobe and posterior right hemisphere when reading.
4. Visual issues are the core deficit of dyslexia.
5. Learning to read is largely dependent on a student's IQ.

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What is a neuromyth?

- A commonly-held false belief about how the mind and brain function.

- *The Office S6:16 Manager and Salesman (12:57)*

Separating Science from Neuromyth

1. VAK Learning Styles
2. Vision therapy, tinted filters, or lenses
3. Dyslexia font

4. Three-Cuing System*

1. VAK Learning Styles

AUDITORY

Auditory learners make up **30%** of the population.

If you're an auditory learner information comes in best through your ears, from speeches, presentations or audio books. You have a knack for foreign languages and benefit from study groups.

VISUAL

Visual learners make up **65%** of the population.

They tend to be neat and tidy, excellent spellers and quick to read charts. Visual learners also tend to be the fastest talkers.

KINESTHETIC

Kinesthetic make up just **5%** of the population.

They are primarily male and love anything hands-on. These learners are often skilled athletes or musicians and are drawn to construction projects, science experiments and field trips.

1. VAK Learning Styles

- Claim: children can be tested to determine their dominant learning style (V, A, or K) and taught in that learning style.
  - Based on assumption that information gained through one sensory modality is processed **independently** in the brain from information gained through another sensory modality.

Newton, P. M. (2015). The learning styles myth is thriving in higher education. *Frontiers in psychology*, *6*, 1908.

1. VAK Learning Styles

- Do not confuse this with multisensory instruction, which *is* supported by fMRI research.
  - **Simultaneously seeing and hearing the same information** works better than first just seeing and then hearing it (Calvert, Campbell, and Brammer, 2000).
  - "Learning a language… requires the coordinated use of visual, auditory, and kinesthetic modalities, in addition to memory, emotion, will, thinking and imagination." -Dr. John Geake, Oxford, UK

Geake, J. (2008). Neuromythologies in education. *Educational Research*, *50*(2), 123-133.

1. VAK Learning Styles Science says: *Neuromyth!*

- Yes, we have 5 senses and learn differently as individuals.
- No, learning is not restricted or even associated with one's "dominant sense."
- Modifying a teaching approach to cater for differences in learning styles does not result in any improvement (Coffield et al., 2004).

Coffield, F., Moseley, D., Hall, E., and Ecclestone, K. (2004). *Learning Styles and Pedagogy in Post 16 Learning: A Systematic and Critical Review.* London: Learning and Skills Research Centre.

"The use of Learning Styles may cause harm through 'pigeon-holing' and the diversion of resources away from evidence-based practices."

Newton, P. M. (2015). The learning styles myth is thriving in higher education. *Frontiers in psychology*, *6*, 1908.

1. VAK Learning Styles
Science says: *Neuromyth!*

"Good teachers find a variety of ways to engage students… What has been refuted is the notion of attempting to match teaching to individual students' supposed learning style."

– Steve Masson and Jeremie Blanchette Sarrasin (at Universite du Quebec)

Masson, S. & Sarrasin, J.B. (2015). Neuromyths in education: It's time to bust these widely held myths about the brain. Canadian Education Association (28-31).
https://static1.squarespace.com/static/510c0d84e4b0cdc785fa72c5/t/582b19ee20099eab9d56ec4b/1479219695956/Masson2015i.pdf

2. Vision Therapy

Claim: "Vision therapy is actually a 'gym' for the brain as it helps to retrain the eye-brain connections and speed up a child's *visual information superhighway!"* https://www.visiontherapy.org/

- Includes: Colored Overlay Assessment and Meares-Irlen Syndrome

2. Vision Therapy

- A vision therapy plan is created that may include the following activities:
  - Wearing an eye patch during part of the therapy session
  - Looking through prisms
  - Doing letter-finding puzzles
  - Wearing tinted glasses or **placing tinted plastic over reading material**

https://www.understood.org/en/learning-attention-issues/treatments-approaches/alternative-therapies/vision-therapy-what-it-is-and-how-it-works

Behav Analysis Practice (2016) 9:191–198
DOI 10.1007/s40617-015-0079-7

EMPIRICAL REPORT

The Effect of Colored Overlays on Reading Fluency in Individuals with Dyslexia

Tiffany Freeze Denton[1] · James N. Meindl[2]

"The data from this study suggest that colored overlays do not improve performance on reading, but other evidence-based treatments do. It is also important to note that preference for an intervention, such as colored overlays, is not indicative of effectiveness."

Denton, T. F., & Meindl, J. N. (2016). The effect of colored overlays on reading fluency in individuals with dyslexia. *Behavior analysis in practice*, *9*(3), 191-198.

2. Vision Therapy
Ophthalmologists say: *Neuromyth!*

http://www.aao.org/clinical-statement/joint-statement-learning-disabilities-dyslexia-vis

2. Vision Therapy
Ophthalmologists say: *Neuromyth!*

- "Most experts believe that dyslexia is a language-based disorder.
- "Vision problems can interfere with the process of learning; however, vision problems are not the cause of primary dyslexia or learning disabilities.
- "**Scientific evidence does not support the efficacy of eye exercises, behavioral vision therapy, or special tinted filters or lenses** for improving the long-term educational performance..."

3. Dyslexia Font

3. Dyslexia Font

- Claim: "Why was a special typeface needed for people with dyslexia? Christian Boer, a dyslexic himself, knew why. While researching ways to improve readability he saw, for the millionth time, words turning and letters mirroring and swapping, and suddenly he knew the answer: a typeface that would prevent these 3D letter movements."

https://www.dyslexiefont.com/en/typeface/

3. Dyslexia Font
Science Says: *Neuromyth!*

- "Unfortunately, the only scientific studies done so far show **no evidence** that these fonts help kids or adults read faster or more accurately... there have been three solid, peer-reviewed research studies on these fonts. They were done in 2016, 2017 and 2018. Together they conclude that the Dyslexie or Open Dyslexic font have **no measurable benefits or deliver any reading gains**." –Guinevere Eden, Ph.D.

https://www.understood.org/en/learning-attention-issues/child-learning-disabilities/dyslexia/dyslexia-friendly-font

3. Dyslexia Font
Science Says: *Neuromyth!*

- It is a myth that readers process letters A, A, a, **ɑ** differently. Our brain recognizes them all as 'a'.
  - Microsoft tried to develop a font that would be easier to read for adults. Seven studies were done, but the different fonts made no difference in reading times (Rayner at U-Mass).
- Bigger Problem: How does this help dyslexic readers when they need to read something not in this font?

https://www.understood.org/en/learning-attention-issues/child-learning-disabilities/dyslexia/dyslexia-friendly-font

Dyslexia Font & Vision Therapy

Why do people say it works for them?

- **G, G, g, g, #**
- Larger font is more salient and fewer serifs
- Larger font = see fewer letters at a time, so you need to look at a word more times
- Novelty effect
- Placebo effect
- Takes ¼ of a second to recognize a word.
  - So fast, hard to think about what the brain is doing.
  - It may ***feel*** different, but not actually be different.

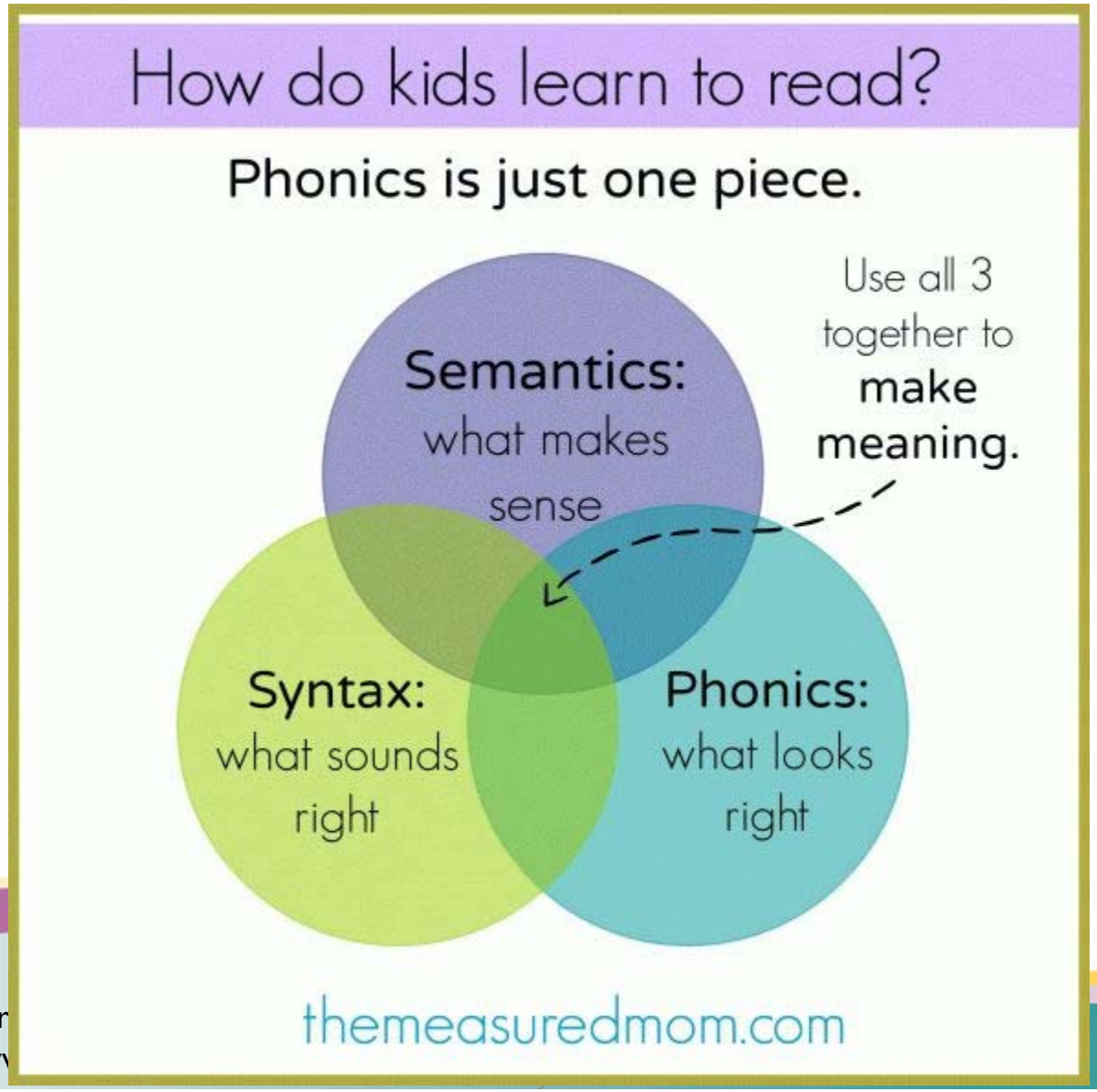
Wery, J. J., & Diliberto, J. A. (2017). The effect of a specialized dyslexia font, OpenDyslexic, on reading rate and accuracy. *Annals of dyslexia*, *67*(2), 114-127
Kuster, S. M., van Weerdenburg, M., Gompel, M., & Bosman, A. M. (2018). Dyslexie font does not benefit reading in children with or without dyslexia. *Annals of dyslexia*, *68*(1), 25-42

4. Three-Cuing System also called Miscue Analysis

- Initially Developed by: Ken Goodman
- Claim: "Effective readers draw on three main cueing systems for predicting meaning in text."
  - 1. Contextual Cues or Semantic Cues
  - 2. Grammatical/Syntactic Cues
  - 3. Grapho-Phonic Cues

Sharrio, C. (2011). *Knowledge of cueing systems*. Florida Department of Education, University of Central Florida and State College of Florida. Retrieved from http://faculty.scf.edu/sharric/lesson4/lesson4topic2.htm

4. Three-Cuing System's Claim



An advisory booklets provided to parents from a public school:

"During reading. When your child gets stuck on a word, follow these 4 steps.

Ask your child to:

1. **Guess** what the word might be.
2. **Look at the picture** to help **guess** what the word might be.
3. Go back to the start of the sentence and re-read it, **adding the word you think might make sense.**
4. Read to the end of the sentence and check that the word "makes sense".
5. If the word makes sense then check if it "looks right" (could it be that word?).

- If the word is still incorrect, tell your child the word and allow him/her to continue reading. **It is inappropriate for your child to be directed to "sound out" words, using individual letter sounds, as many words cannot be identified in this manner."**

Hempenstall, K. (2013, November 6). The three-cueing system in reading: Will it ever go away? Retrieved from: https://www.nifdi.org/resources/news/hempenstall-blog/402-the-three-cueing-system-in-reading-will-it-ever-go-away

4. Three-Cuing System

- It's not a neuromyth per se, but belief in this debunked reading theory is widely used for both beginning literacy instruction and reading intervention for those with dyslexia.
- Basis of many common curriculum and interventions
  - *Fountas and Pinnell*
  - *Leveled Literacy Intervention*
  - *Lucy Calkins Reader's Workshop*
  - *Reading Recovery*
  - The broad instructional approach known as *Balanced Literacy*

The Podcast Documentary that Shook the Literacy World

https://www.apmreports.org/episode/2019/08/22/whats-wrong-how-schools-teach-reading

August 22, 2019 podcast by Emily Hanford

"For decades, schools have taught children the strategies of struggling readers, using a theory about reading that cognitive scientists have repeatedly debunked."

Review with a Partner

I. What is the three-cuing system, and why was it debunked by the scientific community?

- Discuss something you learned from Hanford's *At a Loss for Words* podcast.

II. Discuss one neuromyth you were surprised to learn.

1. VAK Learning Styles
2. Vision therapy, tinted filters, or lenses
3. Dyslexia font

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What is effective literacy instruction?

- Evidence-based instruction means
  - Peer-reviewed research
  - Multiple research studies across multiple settings
  - How does this study fit into the overall scientific consensus?
- Fact: Skilled readers recognize words automatically and minimally rely on context. Balanced Literacy and Three-Cuing System encourage students to mimic the habits of struggling readers.

Evidenced-Based Literacy Instruction

- Simply put, readers must first master letter-sound correspondence from *systematic* phonics instruction which incorporates phonemic awareness, handwriting, and spelling instruction.

What is Structured Literacy?

https://dyslexiaida.org/effective-reading-instruction/
https://dyslexiaida.org/what-is-structured-literacy/

- Derived from the Orton-Gillingham (OG) Approach
- "Explicitly teaches systematic word-identification and decoding strategies.
- Key Principles of Structured Literacy:
  - Systematic and cumulative
  - Explicit Instruction
  - Diagnostic Teaching

Some Good News!

https://dyslexiaida.org/most-reading-difficulties-can-be-resolved-or-diminished/

- Most reading difficulties can be resolved or significantly reduced *if* we understand the science of reading and teach it right!

If doctors complete a residency after medical school…

- Why can't teachers complete a rigorous residency where they learn how to teach Structured Literacy or Orton-Gillingham?
- A course alone is insufficient training to teach a child with dyslexia.
  - Intensive training is needed to be an effective practitioner.
  - For example, a certified Orton-Gillingham practitioner completes the minimum of a 100-hour supervised practicum.

We ignore science at our own peril.

- "Resources are scarce. Instructional interventions that are based upon misinterpretations or over-interpretations of brain science take time away from things that do work."
  - Liane Wardlow, Ph.D., Senior Research Scientist at Pearson

What will you do with this information?

- How is this information relevant to your work?
- How can you help debunk these popular neuromyths?

Questions?

pprice@sterncenter.org

- Learn more about dyslexia and literacy:
  - Stern Center www.sterncenter.org
  - International Dyslexia Association: https://dyslexiaida.org/
  - Orton-Gillingham Academy https://www.ortonacademy.org/
  - https://www.thereadingleague.org/
  - https://www.readingrockets.org/
  - Listen to or read more of Emily Hanford's reporting on the podcast *Educate*
- Learn more about neuromyths: https://bit.ly/2RRgP1q