

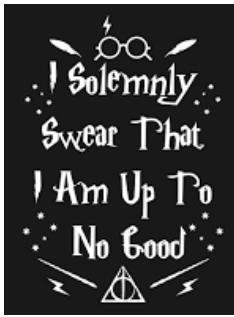
Books Build Better Brains!

(Stories, Screens and Synapses: The neurobiology of shared reading and digital media use in early childhood and “novel” approaches to screening and guidance)



Dr. John S. Hutton, (MS)² MD, Associate Professor
Division of General & Community Pediatrics





Disclosures



- Dr. Hutton is the founder of blue manatee press, a children's book publisher not affiliated with Cincinnati Children's, UT Southwestern, or ROR, which provides books at low-cost literacy and other non-profit organizations. This is cited in COI and disclosure statements.



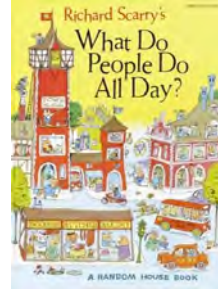
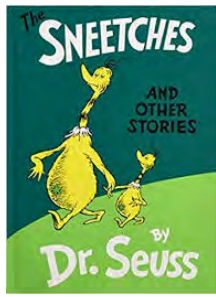
- Dr. Hutton's books are available from All About Books, which serves ROR and other literacy organizations.



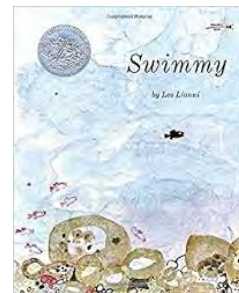
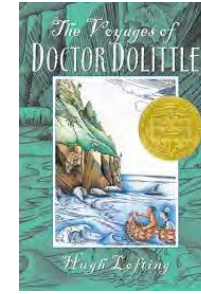
- Dr. Hutton is the author of *The Reading House* screener and other children's books featured here, cited in COI and other disclosures.



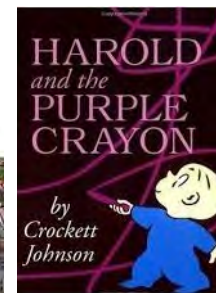
- Dr. Hutton serves on the medical advisory committee of Reach Out and Read, with no compensation or research funding for this work.



What Keeps Me Turning Pages...

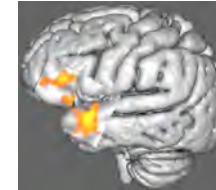


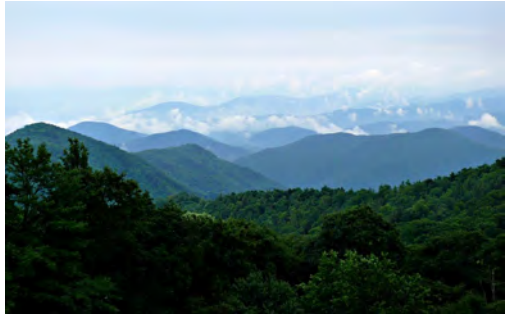
STORY AND PICTURES BY MAURICE SENDAK



Objectives

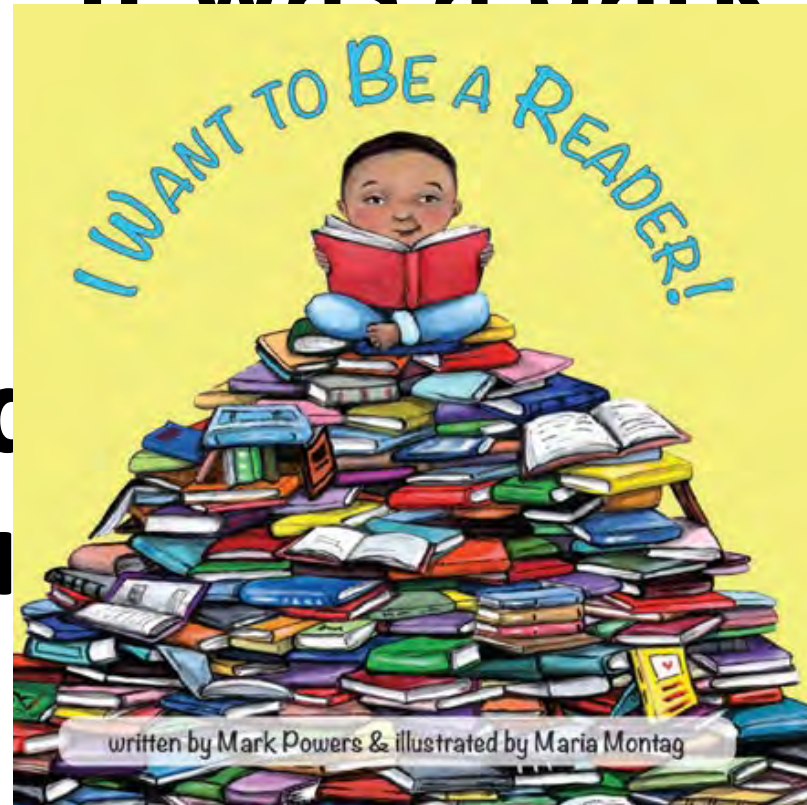
- ✓ The lumpy literacy landscape
- ✓ What is “Emergent Literacy”?
- ✓ Risk Factors for Reading Difficulties
- ✓ “Recycling” brain networks for reading
- ✓ MRI Evidence: Shared Reading (and Screen Time)
- ✓ Call to Action
- ✓ Early Reading Intervention Puzzle
 1. “Novel” approaches to screening
 2. “How-to” Guidance (Stealthy Training Manuals)





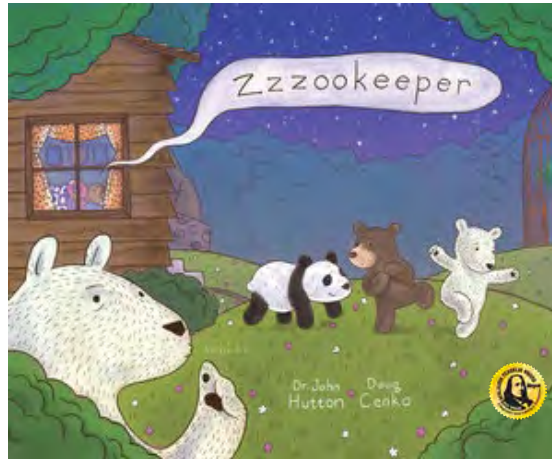
It was a dark
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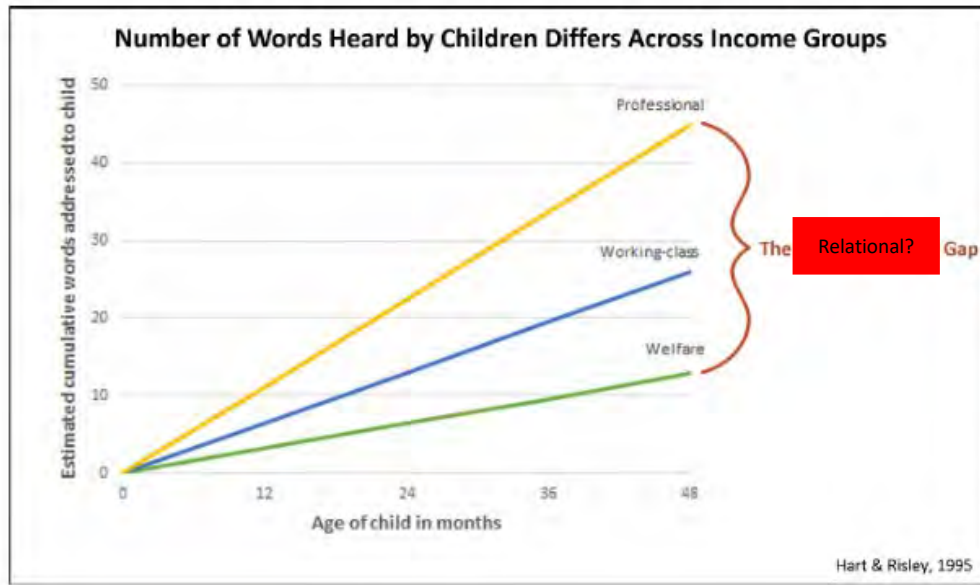
music and song...

Pop Quiz: what's this?

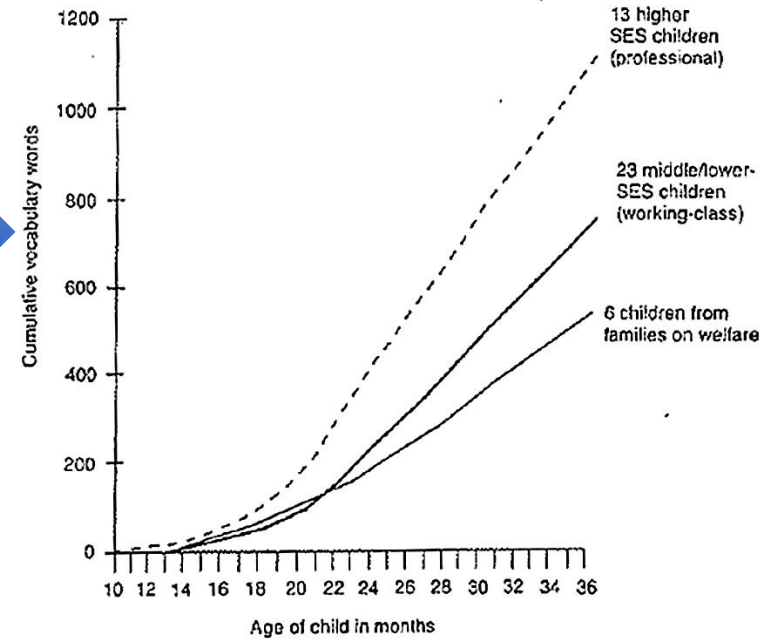


- A) A test preparation manual
- B) A nostalgic compliment to videos & apps
- C) A chew toy/coaster
- D) A neat thing to read...*if there's time*
- E) A CATALYST for human engagement

Kids Who Start Behind... The “Relational? Gap”



Children's **Relational Health** Differs Greatly Across Income Groups



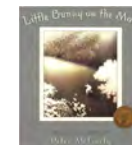
***1.4 million from books!**



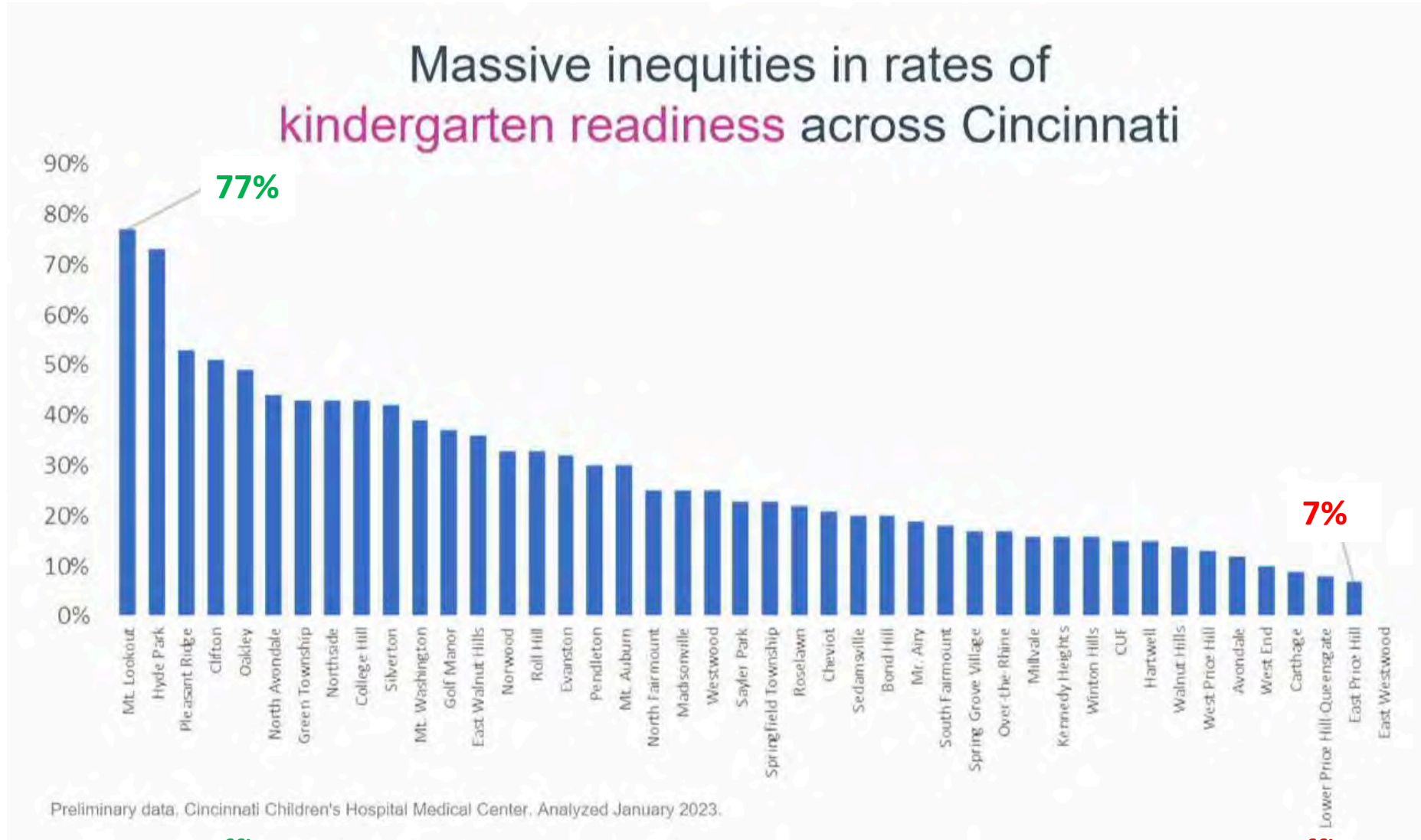
Words in Picture Books: Cat in the Hat (1626/223 unique), Where the Wild Things Are (336), Goodnight Moon (131), Goodnight Gorilla (10)



Feelings Sharing Picture Books: Too numerous to count...



Different Town, Same Problem



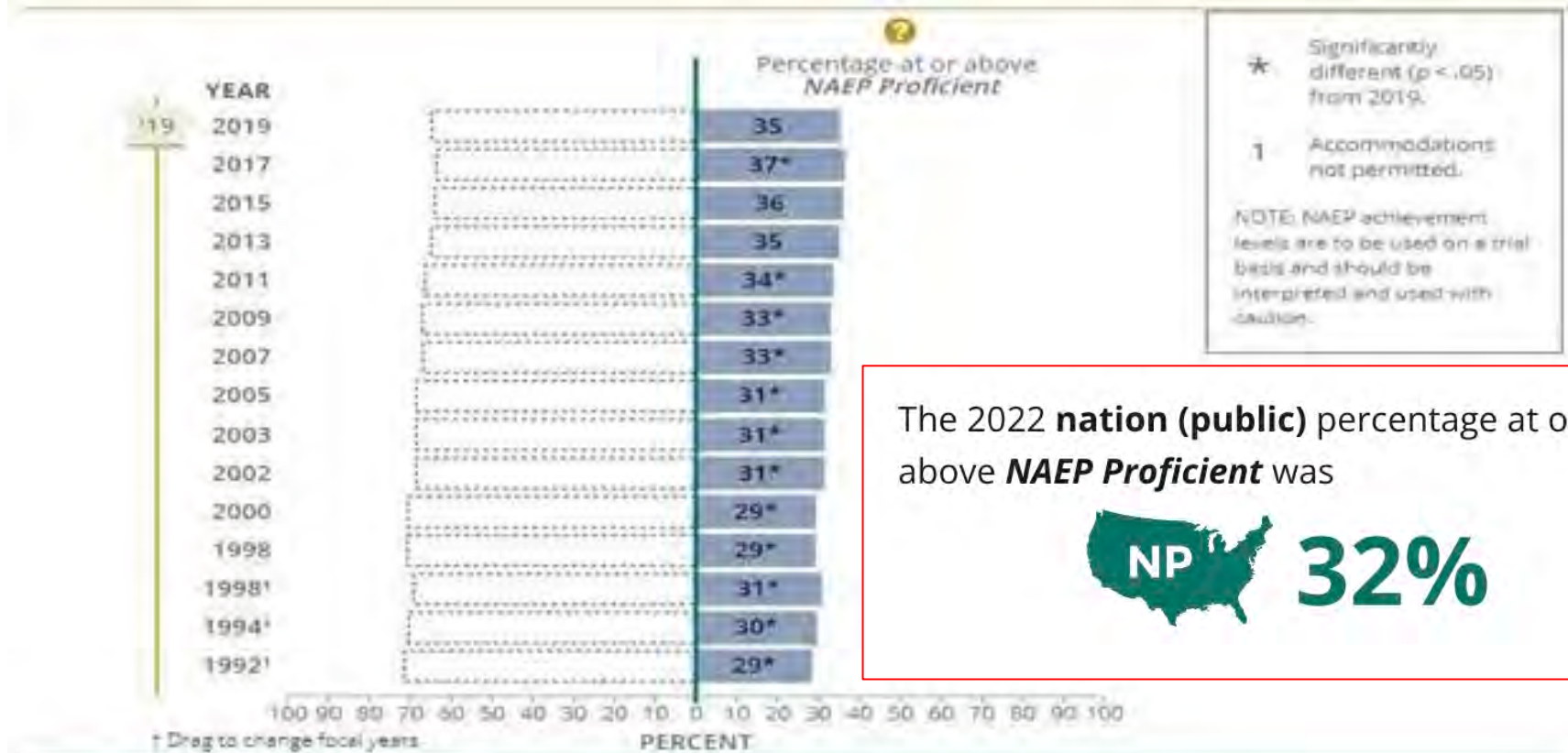
More affluent



Less affluent

...Tend to Stay Behind

2019 National 4th Grade Reading Statistics

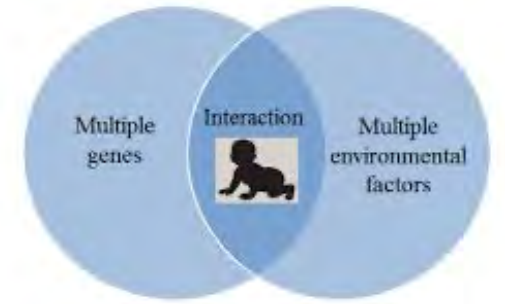


Another Pop Quiz!

Risk Factors for Reading Difficulties Include...

- A) Genetics
- B) Congenital Heart Disease
- C) Asthma
- D) ADHD
- E) Premature birth
- F) Hearing loss
- G) Poverty
- H) All of the above**

Risk Factors for Reading Difficulties

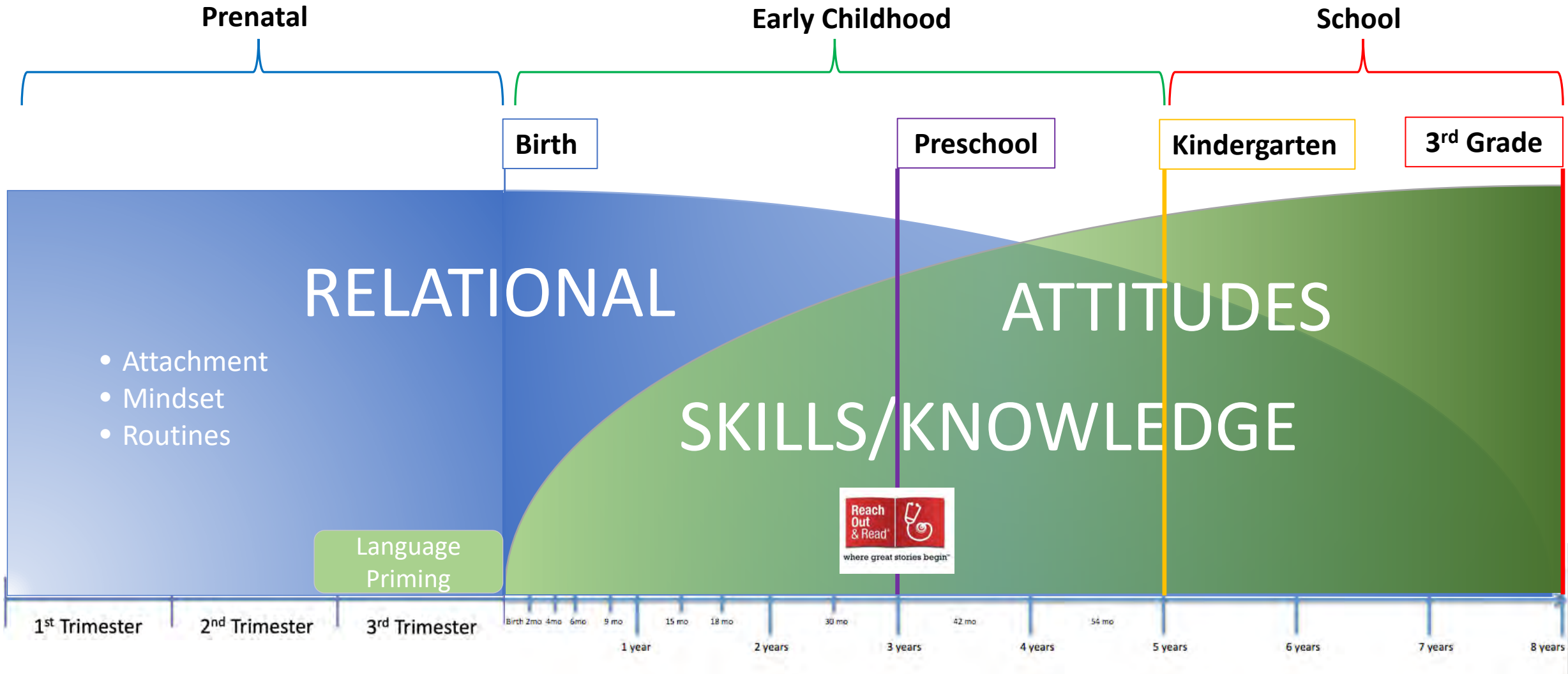


- **Genetics/Family History**
 - Dyslexia ~ 40-80% heritable (≥ 9 genes)
- **Home Literacy Environment (HLE)**
 - Oral language, print concepts, interest
 - Poverty highly negatively correlated
 - Excessive/inopportune *screen time* (displacement)
- **Chronic and/or Complex Medical Conditions**
 - Direct and indirect (e.g., missed school) mechanisms
 - Prematurity (esp. < 32 weeks')
 - Hearing loss
 - ADHD
 - Moderate/Severe Asthma
 - Epilepsy
 - Pediatric leukemias/CNS Tumors
 - Congenital Heart Disease
 - Many more!

$$\sum_{i=1}^n a_i$$

Additive!

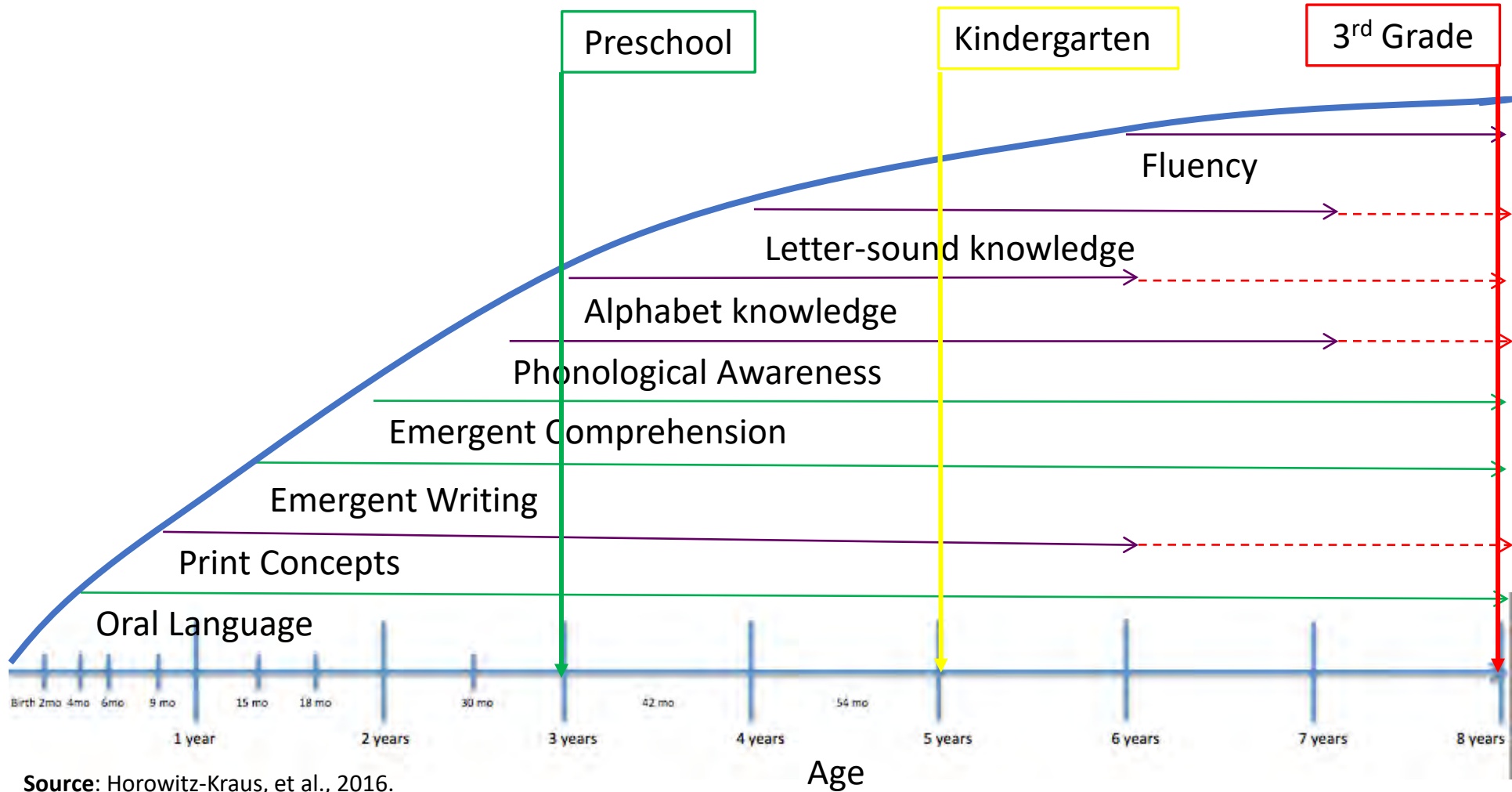
Benefits of Shared Reading by Age





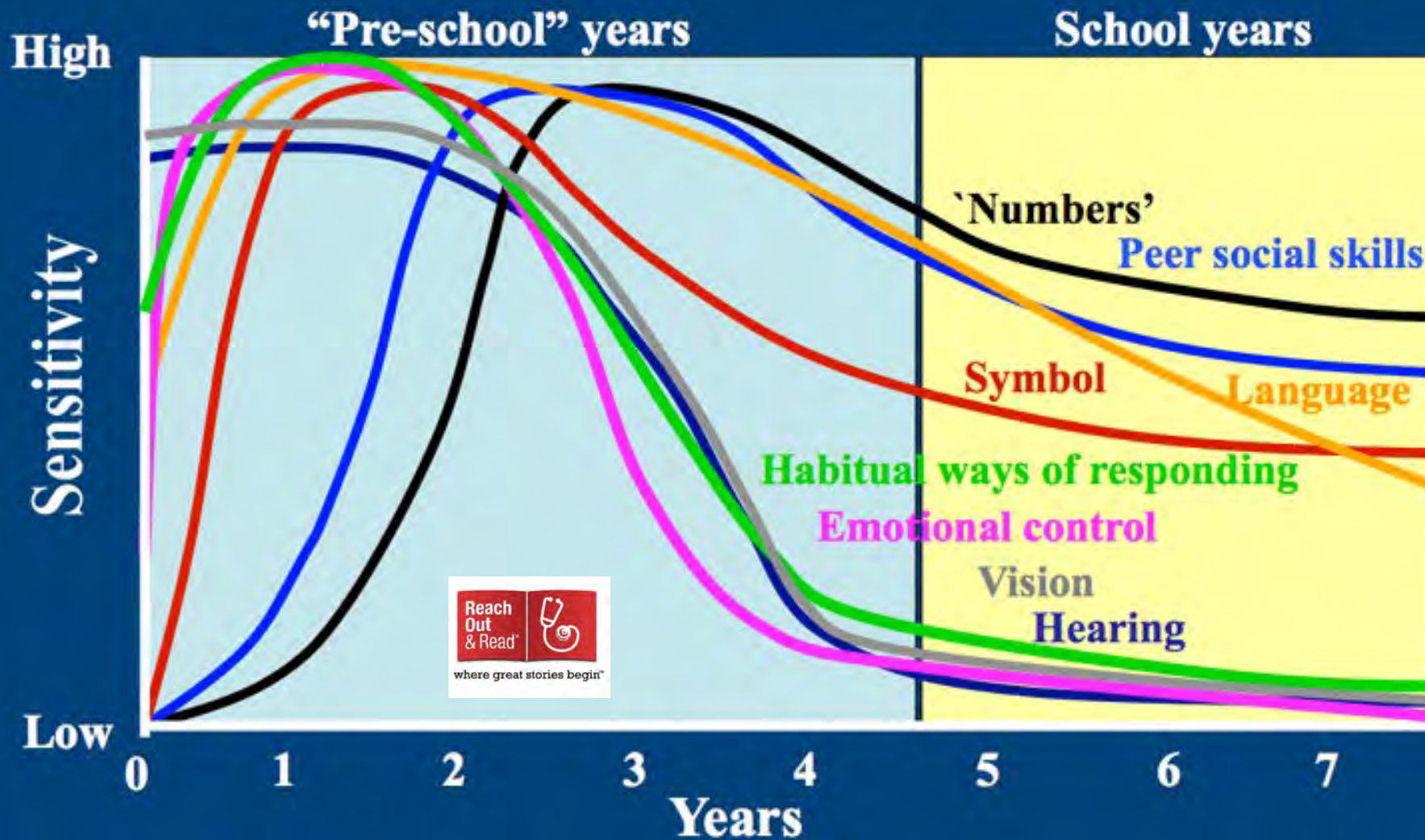
Emergent Literacy Skill Trajectory

Home Literacy Environment



Source: Horowitz-Kraus, et al., 2016.

'Sensitive periods' in early brain development

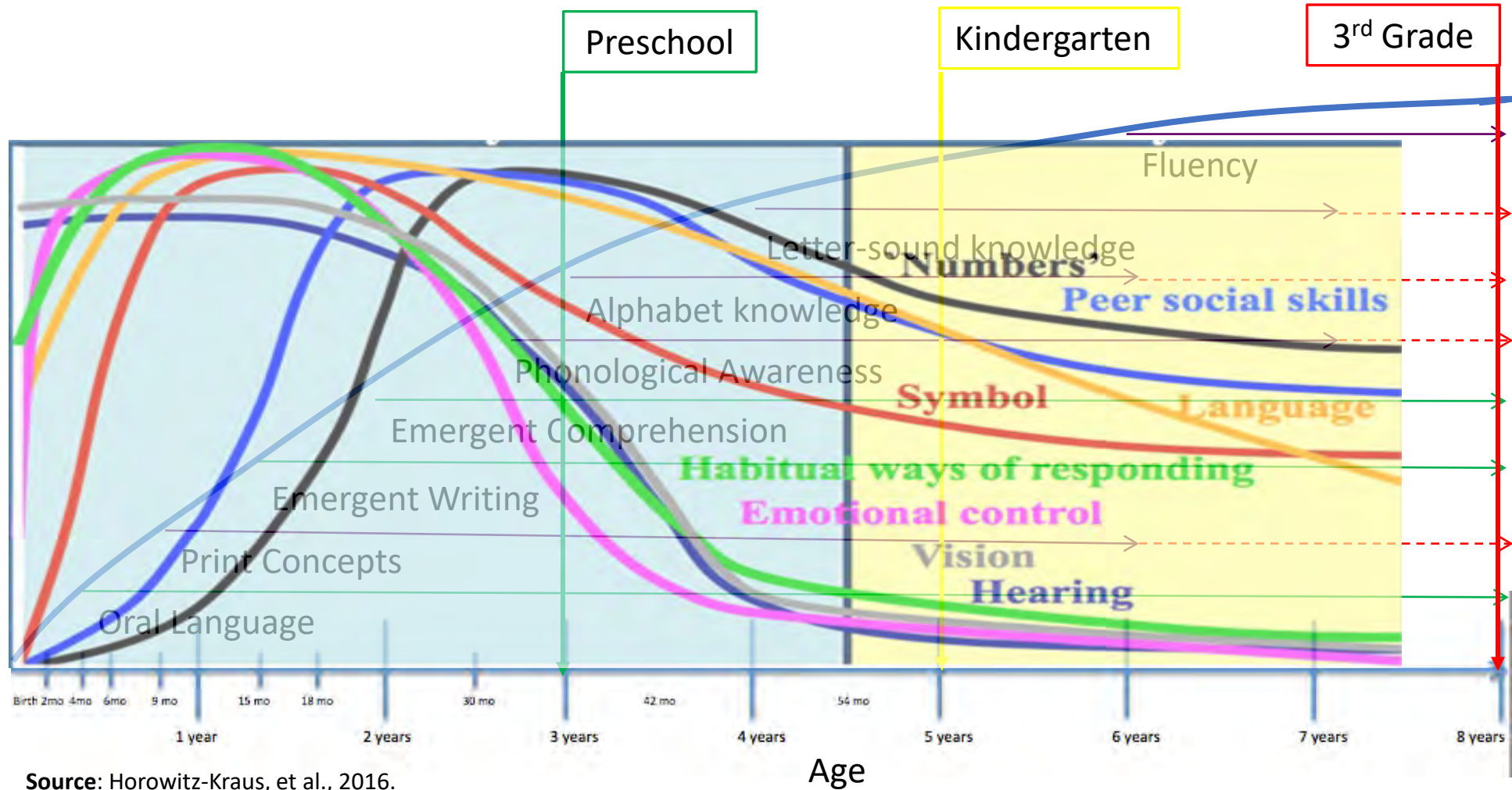


Graph developed by Council for Early Child Development (ref: Nash, 1997; *Early Years Study*, 1999; Shonkoff, 2000.)



Emergent Literacy, Emergent Brain

Home Literacy Environment



Source: Horowitz-Kraus, et al., 2016.

Yet Another Pop Quiz! When babies are born, their Reading Brain Network is located in the....

- A) Parietal Lobe
- B) Temporal Lobe
- C) Frontal Lobe
- D) Occipital Lobe
- E) Cerebellar Lobes
- F) Earlobes
- G) Future**



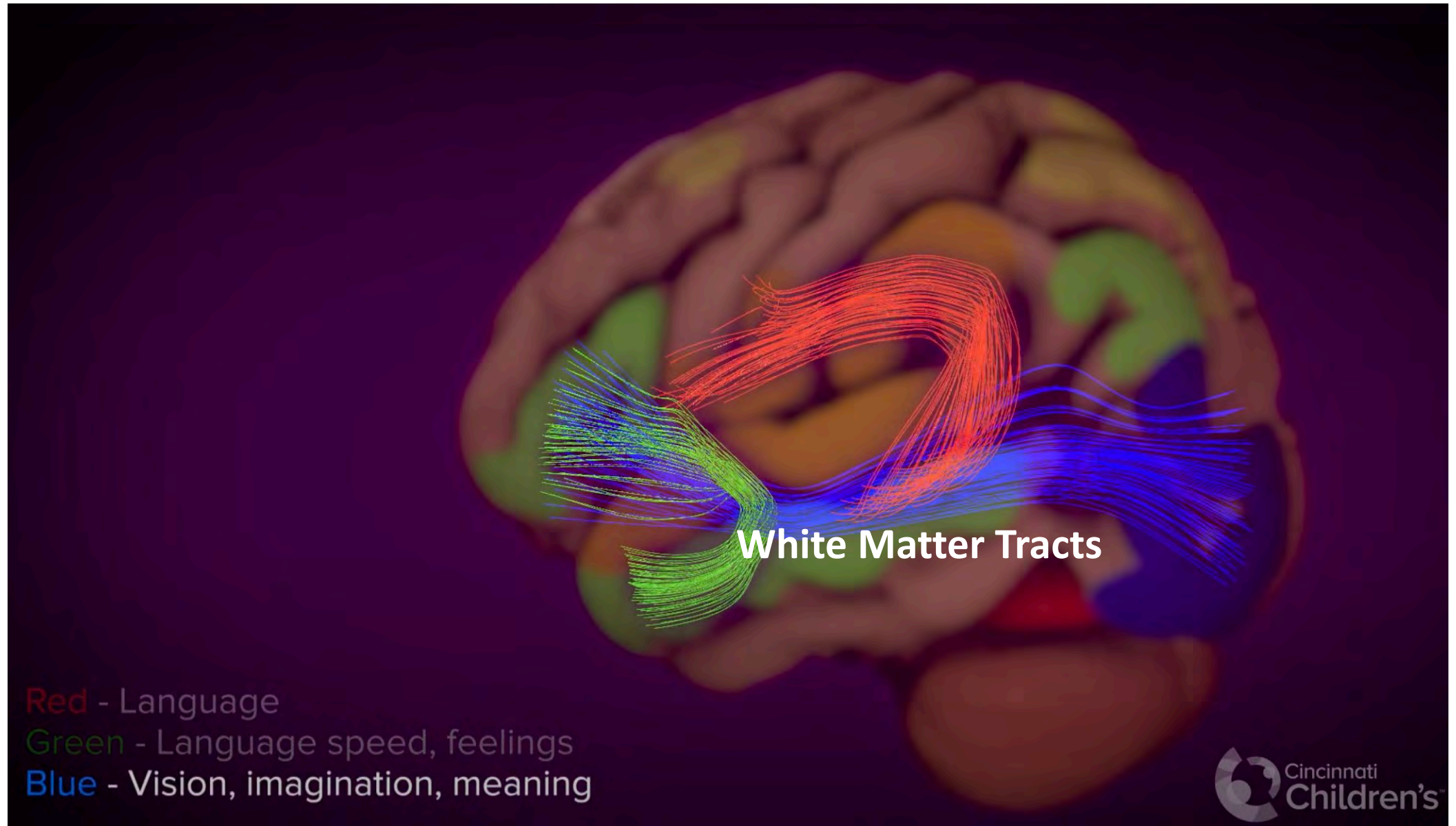
Recycling the Brain



- ✓ Reading = cultural invention (~ 6000 years)
- ✓ **No hardwired brain network**
- ✓ “Recycle” visual, language, other brain networks
 - Must be adequately developed + effectively integrated
 - Emergent network!
- ✓ Predictable sequence in *typically developing* readers
 - Books with pictures → no pictures (“scaffolding”)
 - Reading difficulties: “**Recycling problem**”
 - **Poverty** – underdeveloped oral language
 - **Dyslexia** – phonological/processing
 - **ADHD** – attention/working memory/comprehension

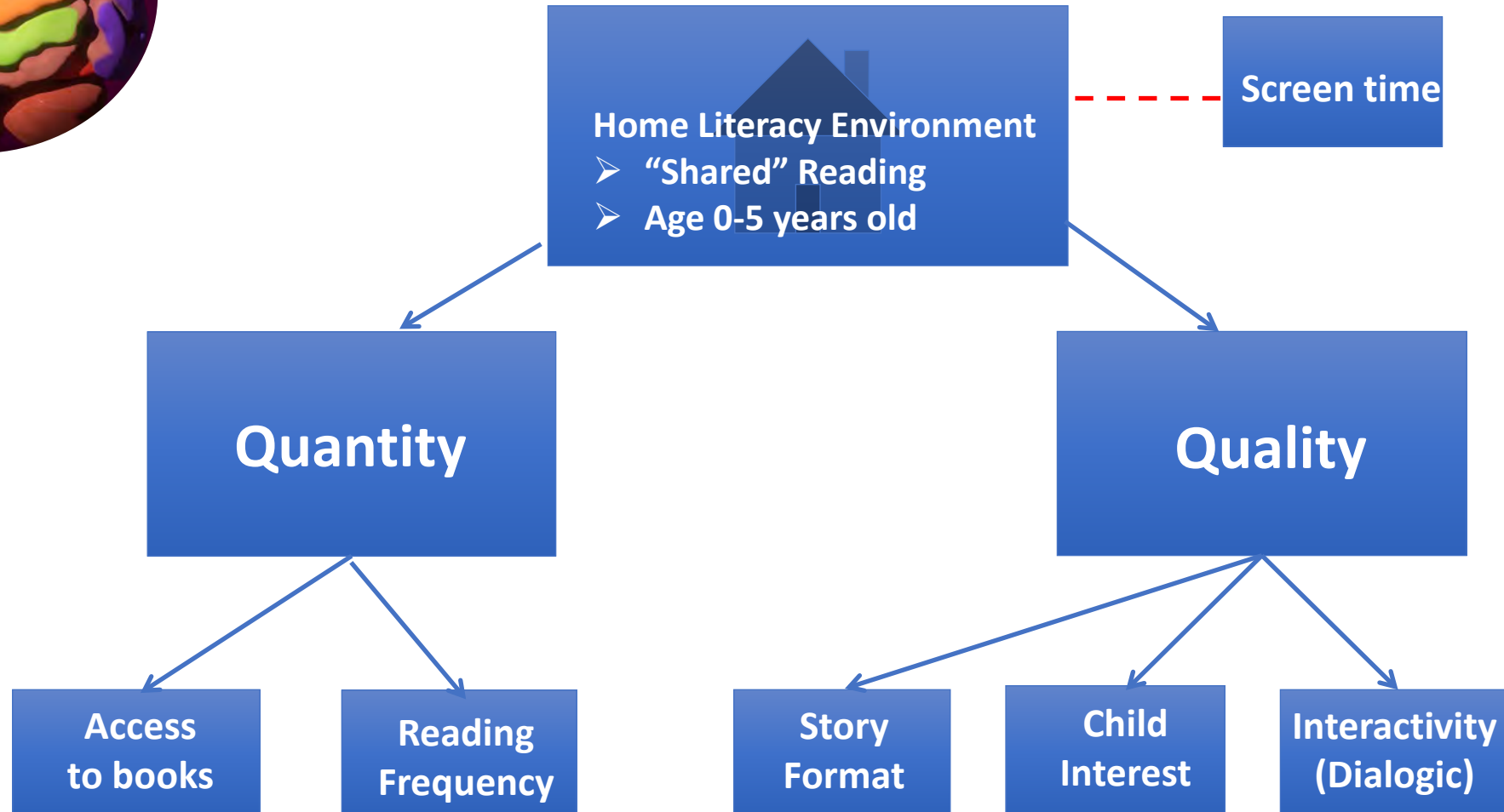


The “Reading Network”

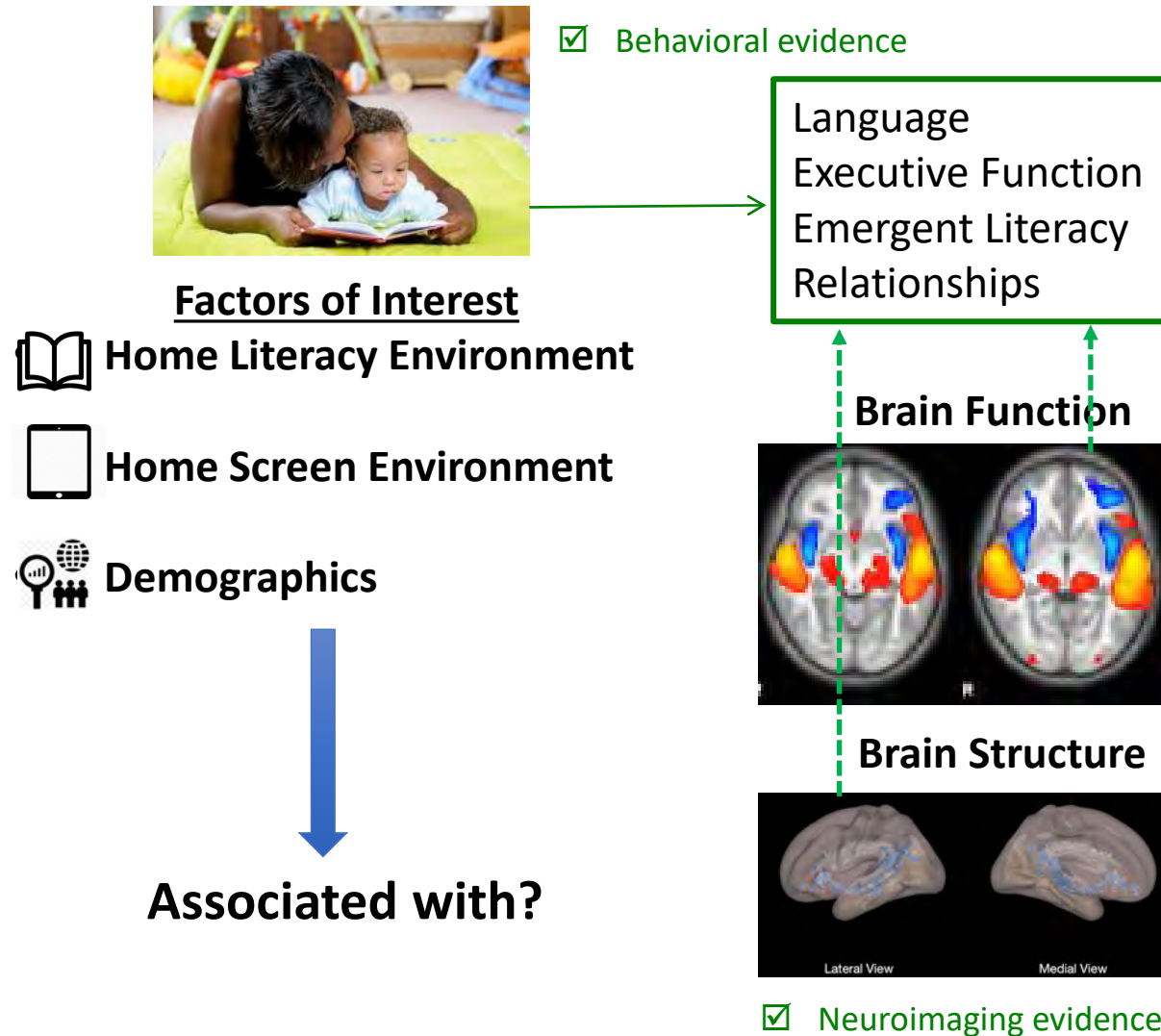
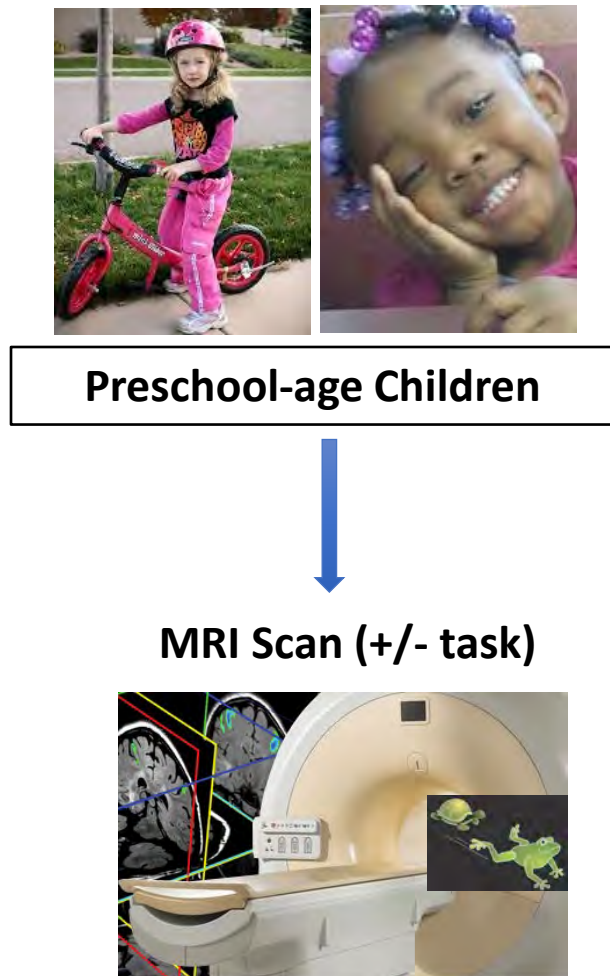




What Moves the Neuronal Needle?

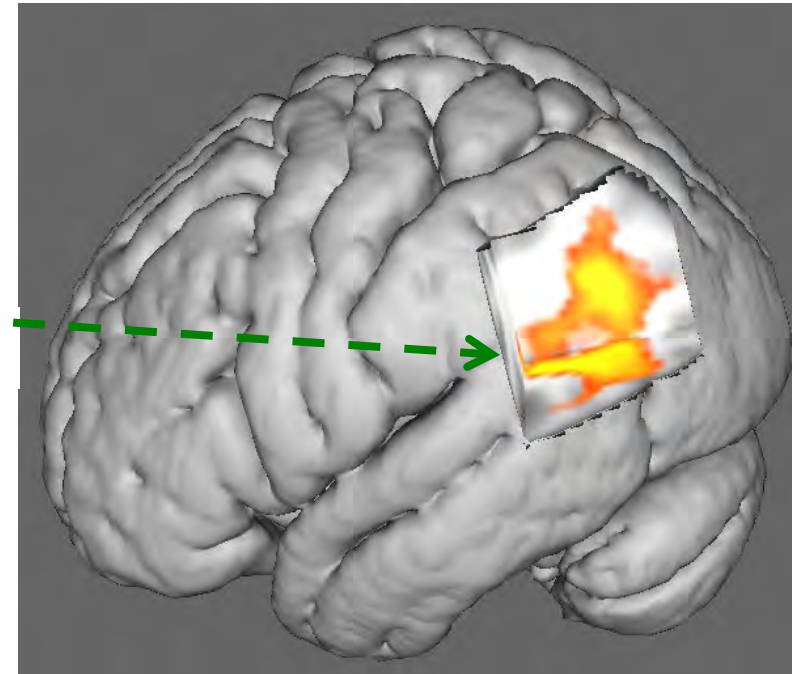
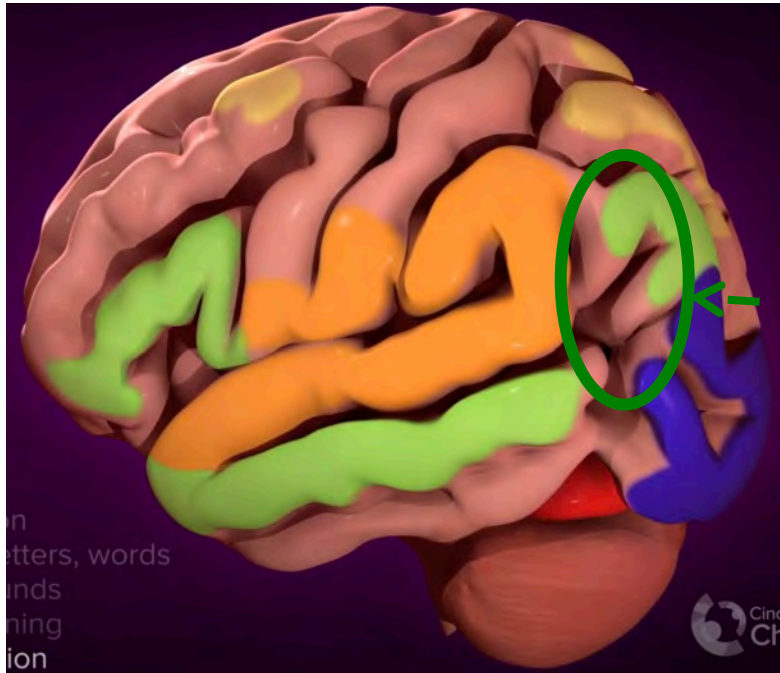


Imagin' This....



Quantitative Home Literacy Environment and Brain Function in 3-5 y/o Children

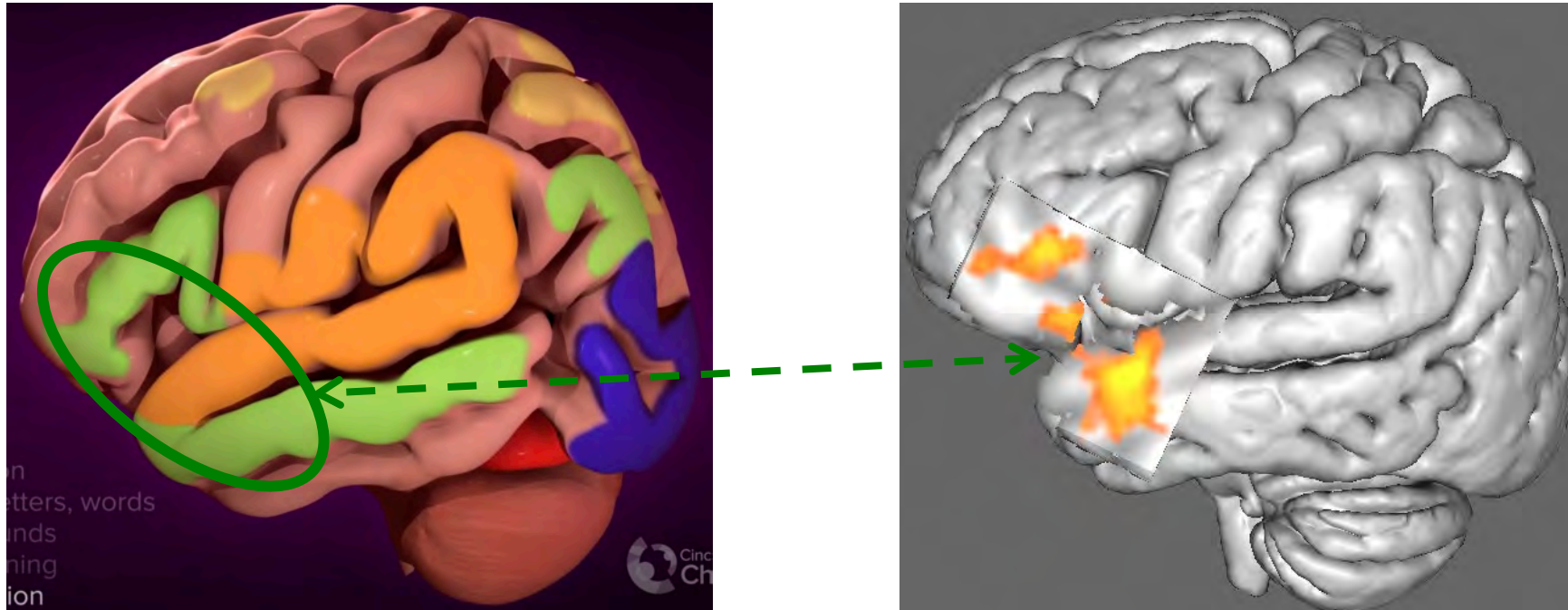
Left Hemisphere



- ✓ **Semantic Processing** (Understanding)
- ✓ **Visual Imagery** (Imagination)

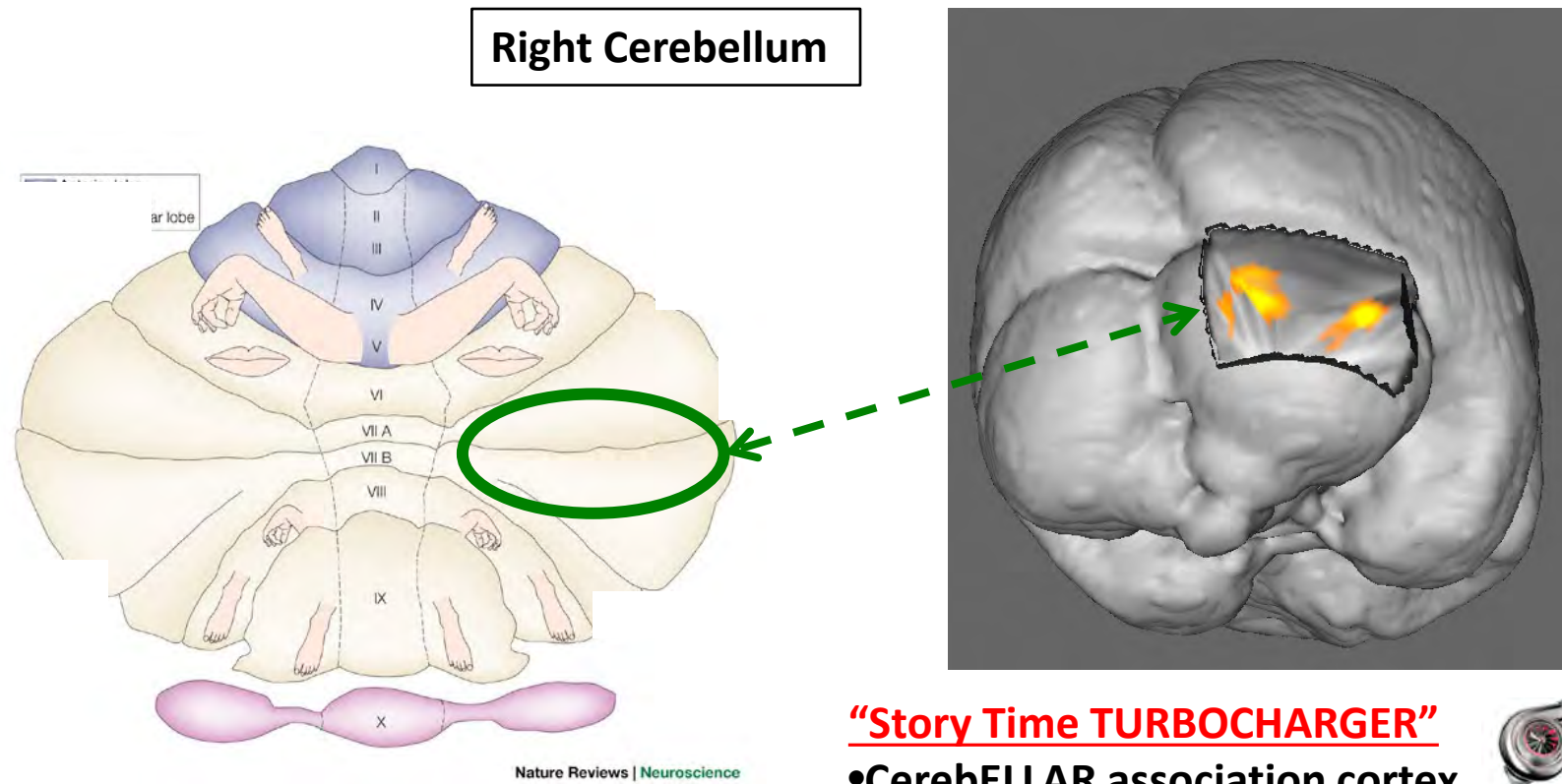
Shared (Dialogic) Reading **Quality** and Brain Function in 4 y/o children

Left Hemisphere



- ✓ Expressive language
- ✓ Complex language processing
- ✓ Social-emotional integration
- ✓ Working memory/attention

Child Engagement During Shared Reading and Brain Function in 4 y/o Children



- CerebELLAR association cortex
- Map to L cerebral language/association
- Skill refinement: language and reading

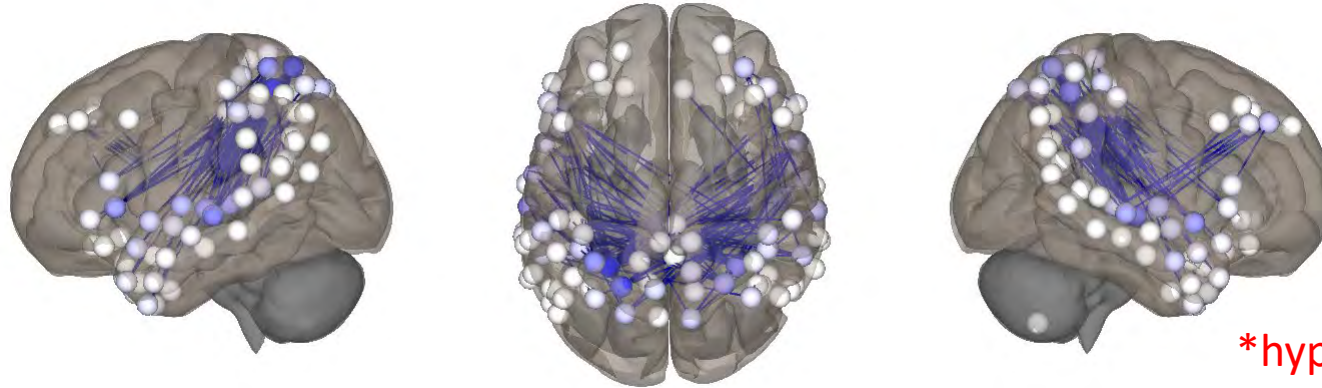
What About “Educational” Videos?



Attention!

Changes in Functional Connectivity for **Animation>Illustration**

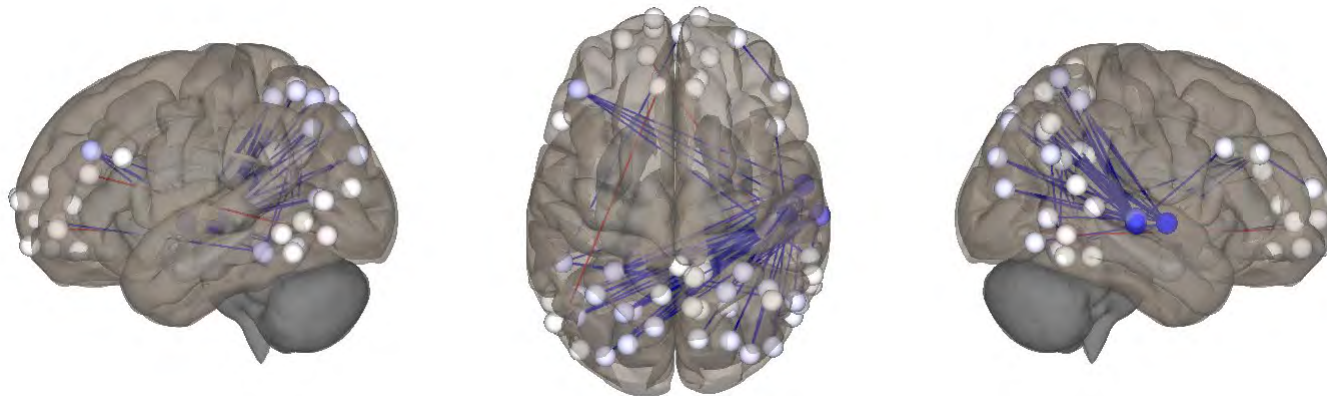
Between Dorsal Attention (“top-down” focus) & Language



- -49% connectivity
- Less focus on language during the animated story

*hyper-focus on visual stimuli

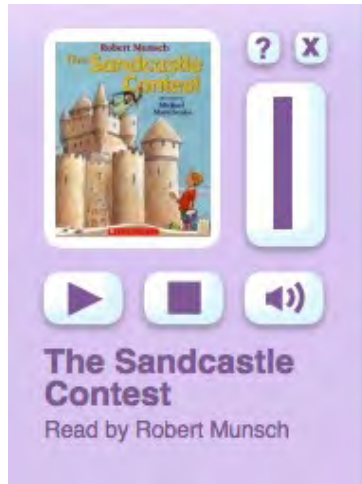
Between Ventral Attention (“bottom-up” reorienting) & Visual Imagery



- -47% connectivity
- Less reorienting to visual imagery

*Working memory capacity → blunted reorienting

Influence of Story **Format** on Brain Network Connectivity in 3-5 y/o children

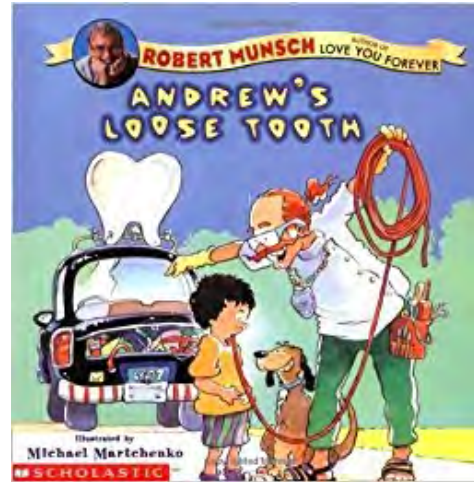


Audio

Too cold...

~5 minutes

Pause

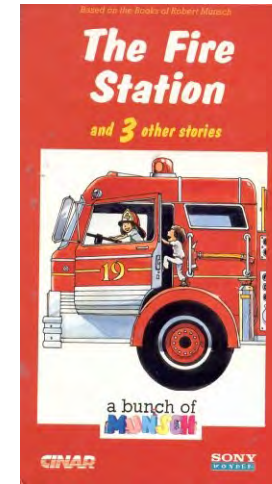


**Audio +
Illustrations**

Just right!

~5 minutes

Pause

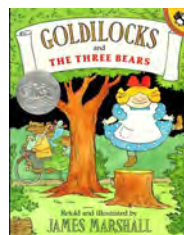


Animation

Too hot...

~5 minutes

time

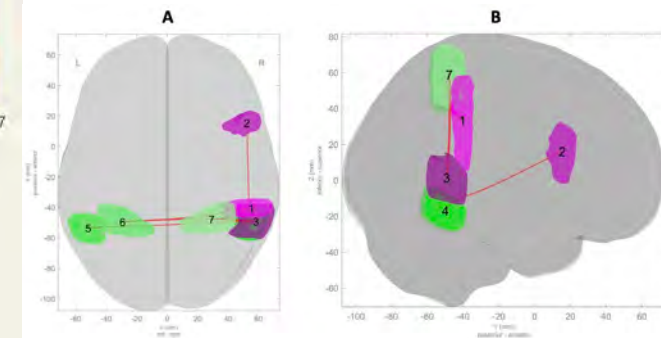
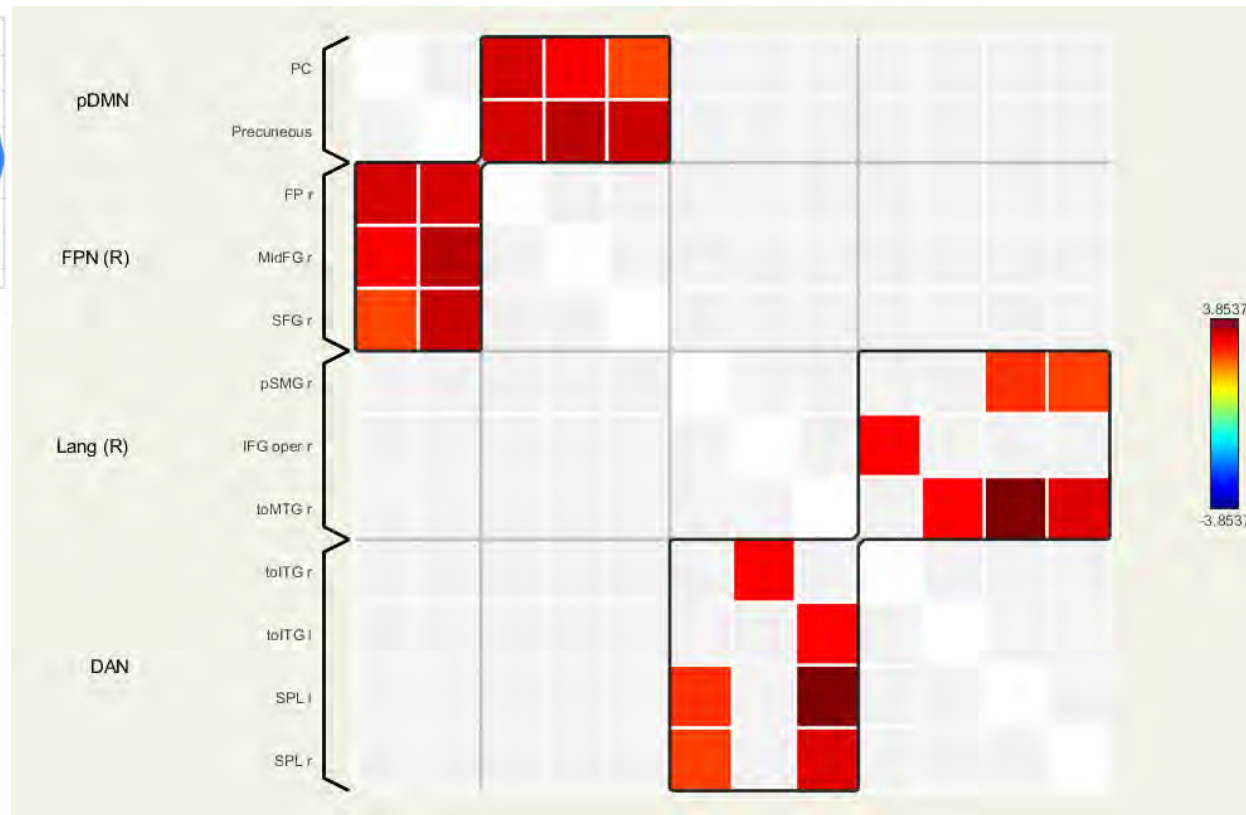
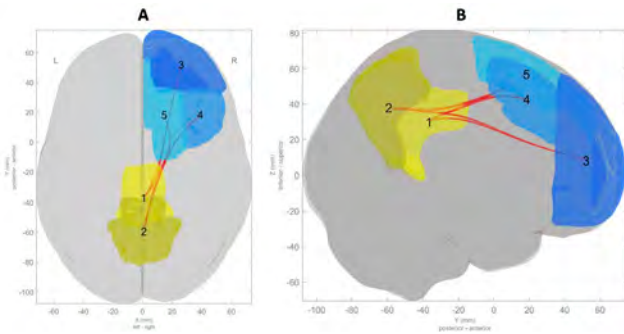


“Goldilocks Effect”

My Oh My: MRI!

Neural Signature of Early **Rhyming** Abilities

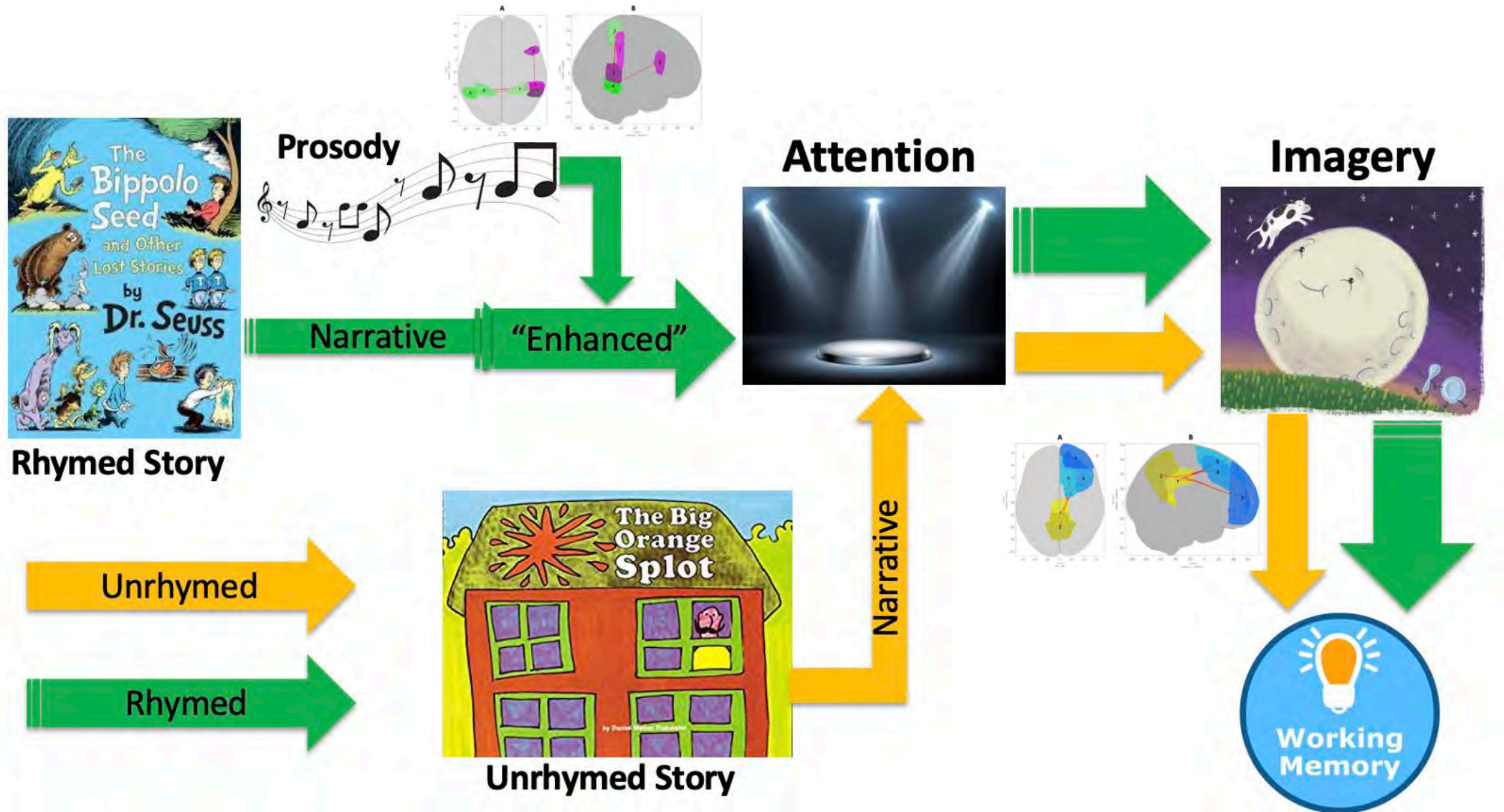
- Outcome Variable: BOLD fMRI Activation during Rhymed vs. Unrhymed Story
- Predictor Variable: Rhyming Ability (PIPA Rhyming subscale score)
- Control for: Age, Sex, Maternal Education Level (n=45; 26F; 37-63 months)



- ✓ Prosody
- ✓ Attention

- ✓ ExecFnx/Working Memory
- ✓ Imagery

Why Young Children Love Rhymed Stories: “Attention Enhancer” Model

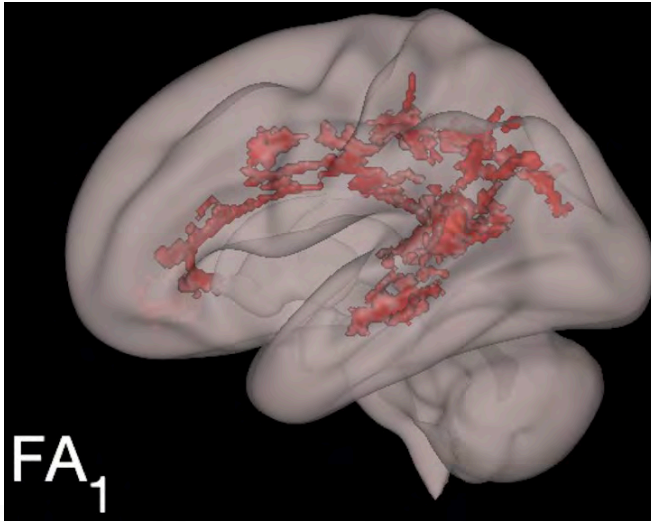


What About Screen Time?



Reading vs Digital Media Use in Preschool-Age Children Impact on Brain “Wiring”

More Reading

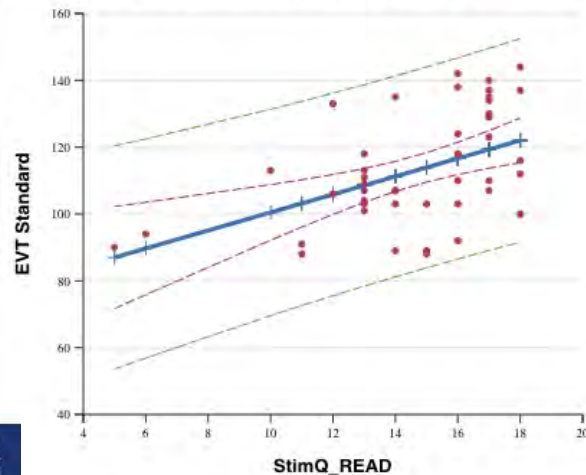


More
Developed



Higher
Skills

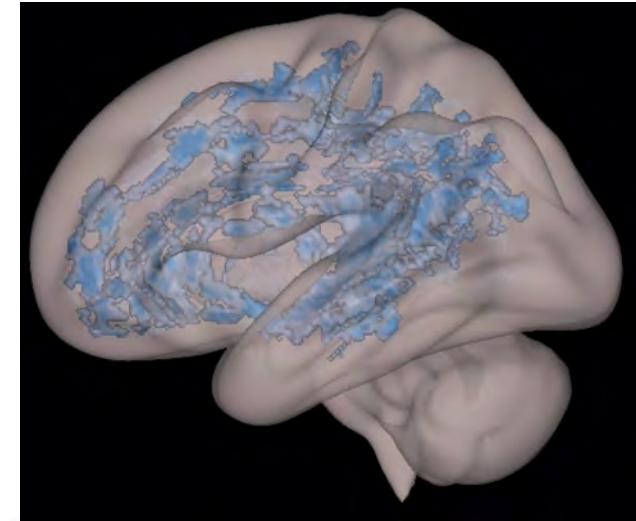
Scatter Diagram (Predicted Y, EVT Standard vs. StimQ_READ)



Left
Hemisphere
Tracts

Language
&
Literacy
Skills

More Screens

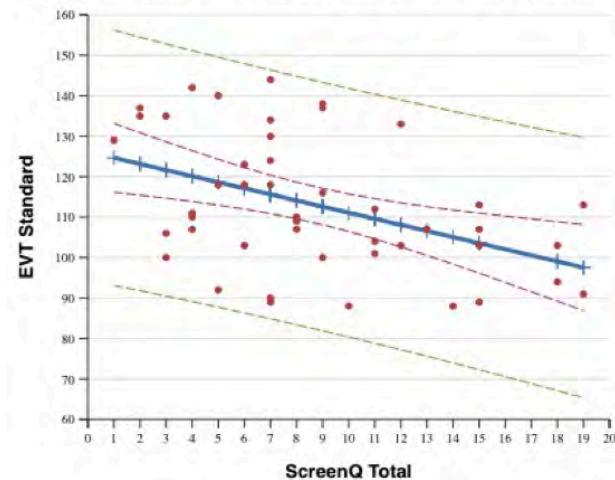


Less
Developed



Lower
Skills

Scatter Diagram (Predicted Y, EVT Standard vs. ScreenQ Total)



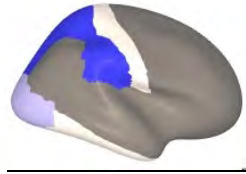
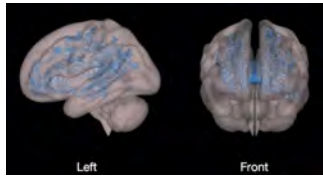
Reading Builds Better Brains!

Home Literacy Environment

- “Shared” Reading
- Age 0-5 years old

Screen time

Screen Time Not So Sure...



Quantity

Quality



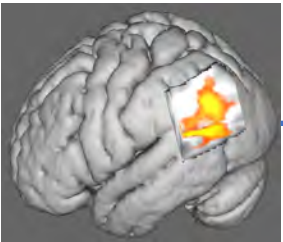
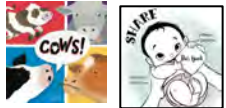
Access to books

Reading Frequency

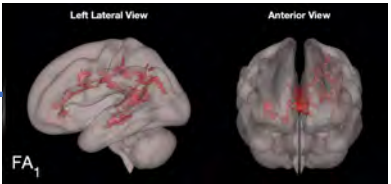
Story Format

Child Interest

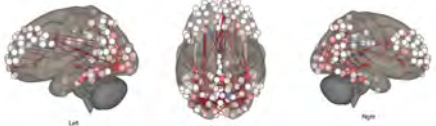
Interactivity (Dialogic)



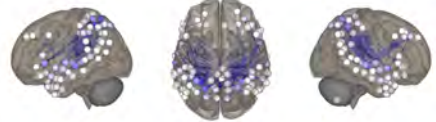
Functional (fMRI)



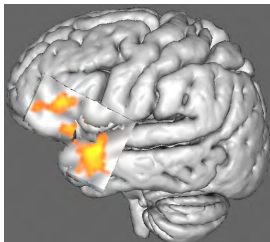
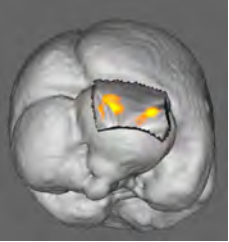
Structural (DTI)



Imagery-language networks

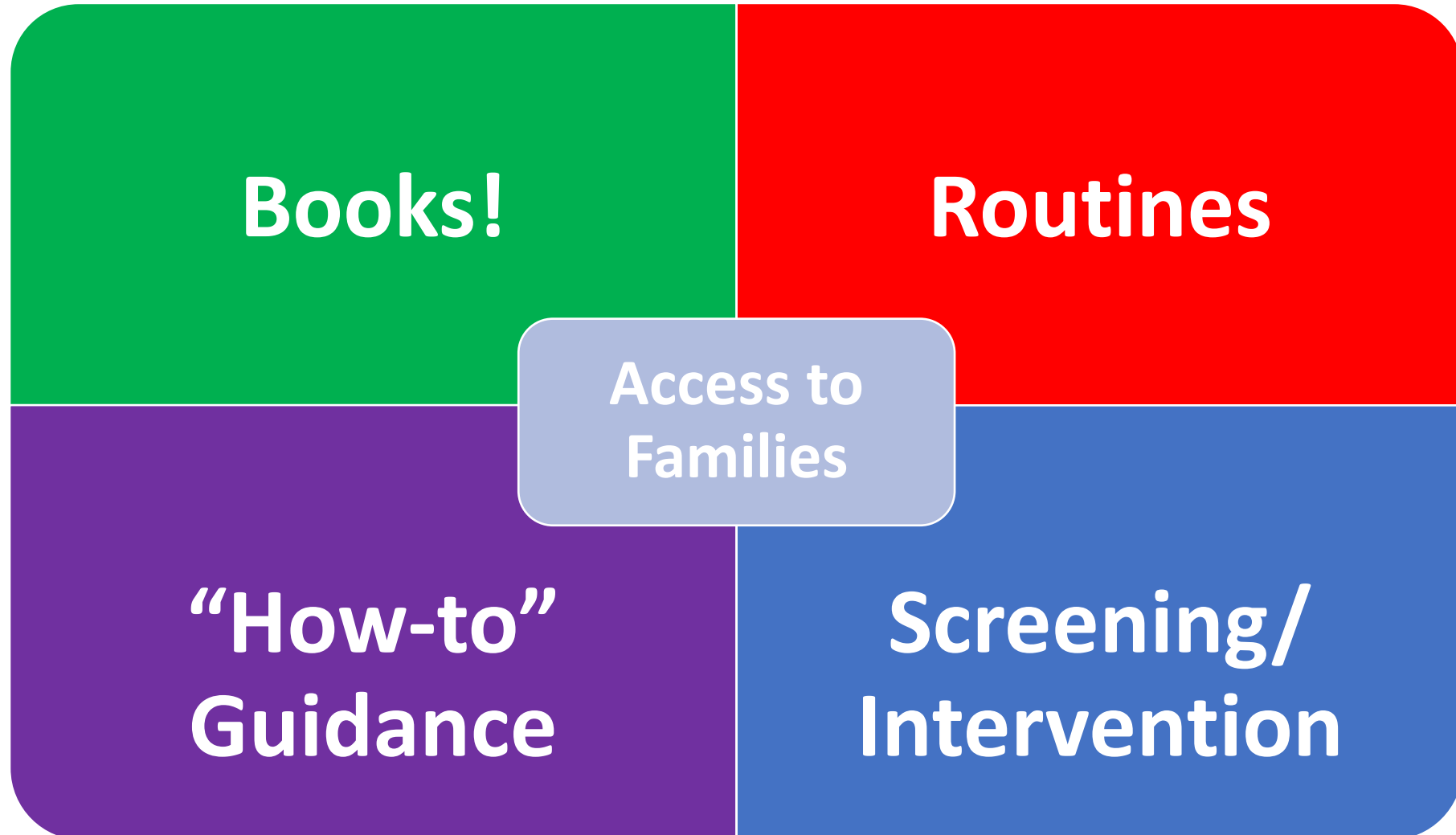


Attention networks



Source: Hutton, et al., 2015-2020.

Early Reading Intervention: A Puzzle

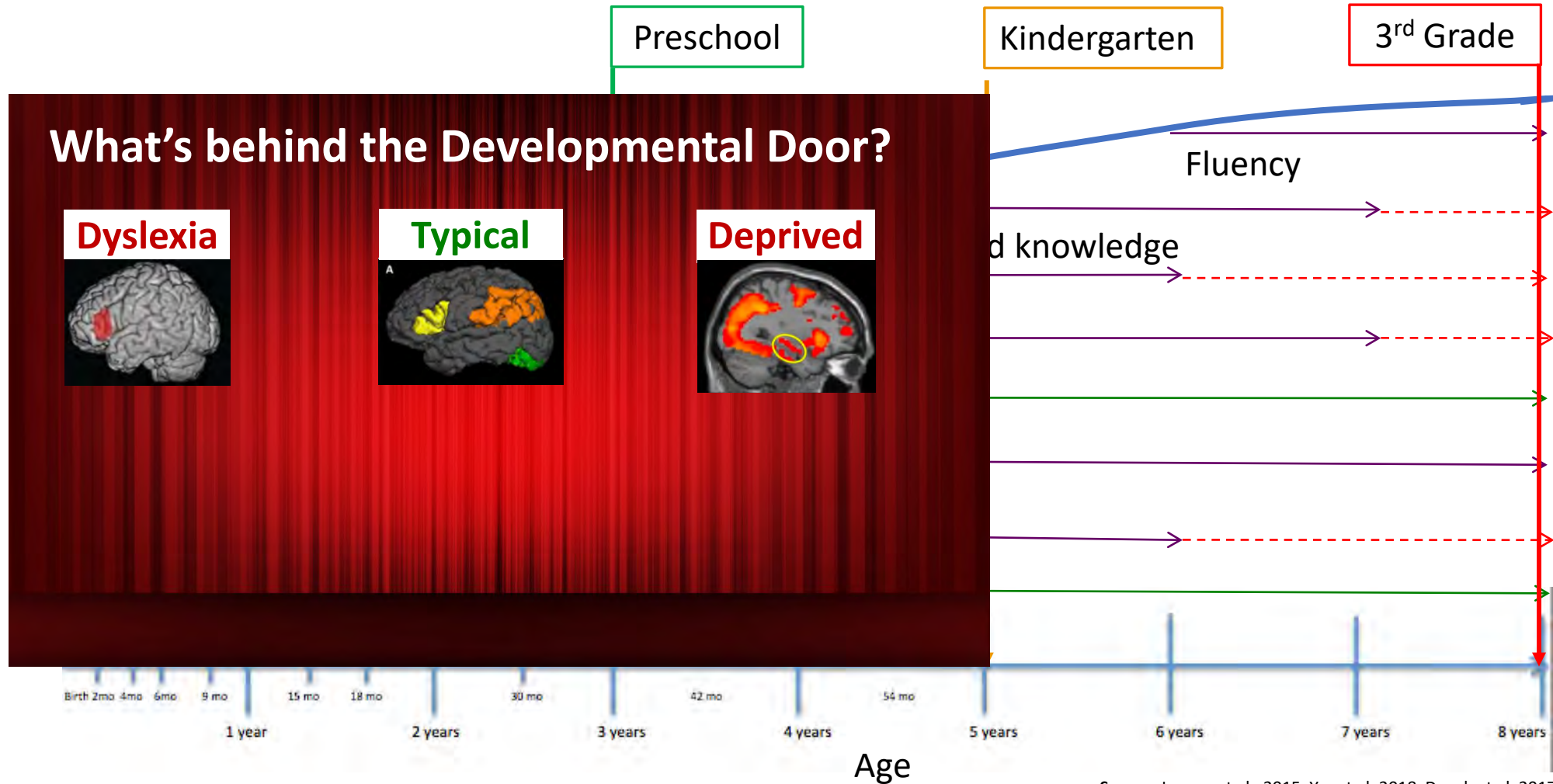


Getting Our Hands Dirty

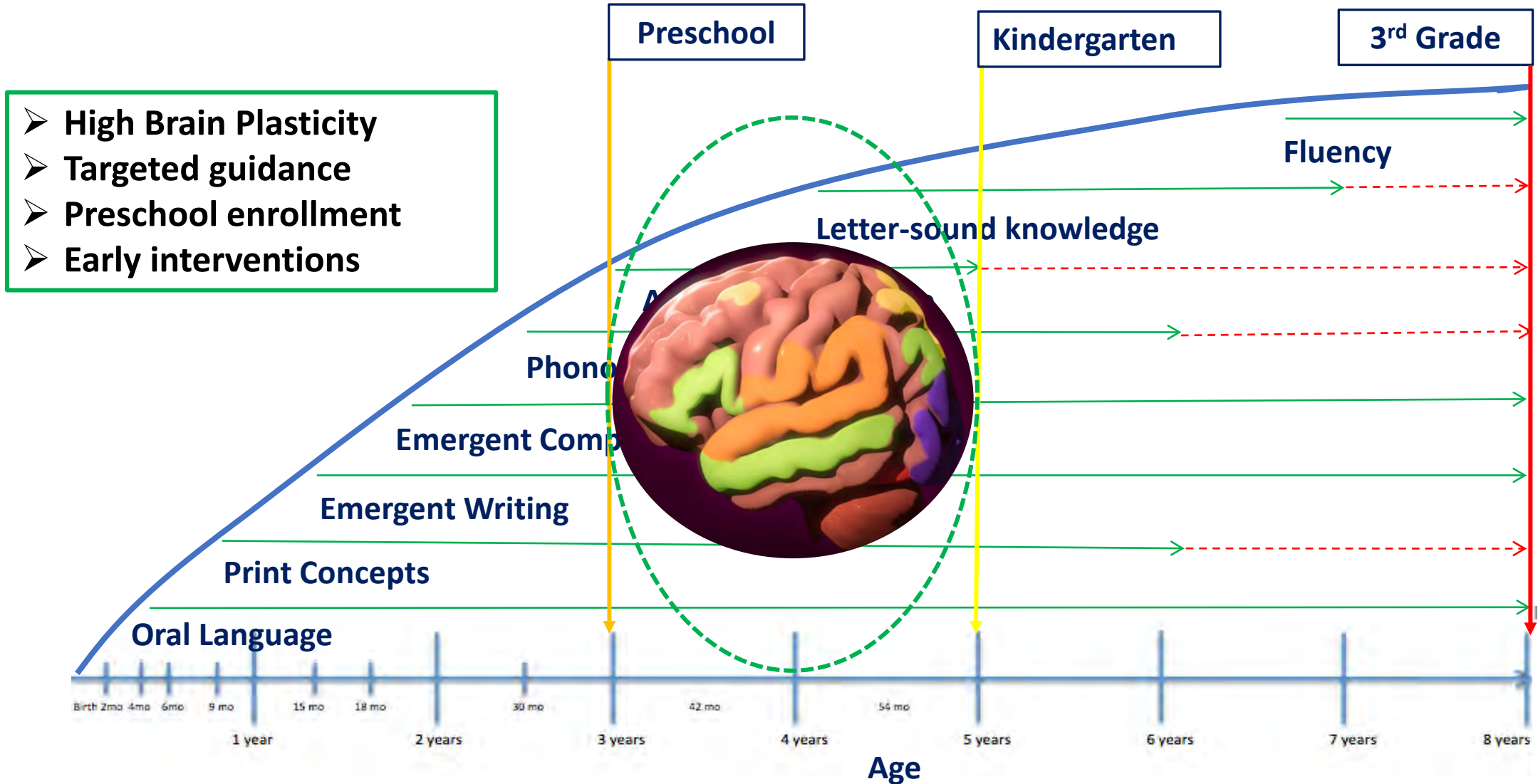


Are the Seeds Sprouting?

“Wait to Fail”



Opportunity!



Approaches to Screening

My child's
vision is
fantastic...

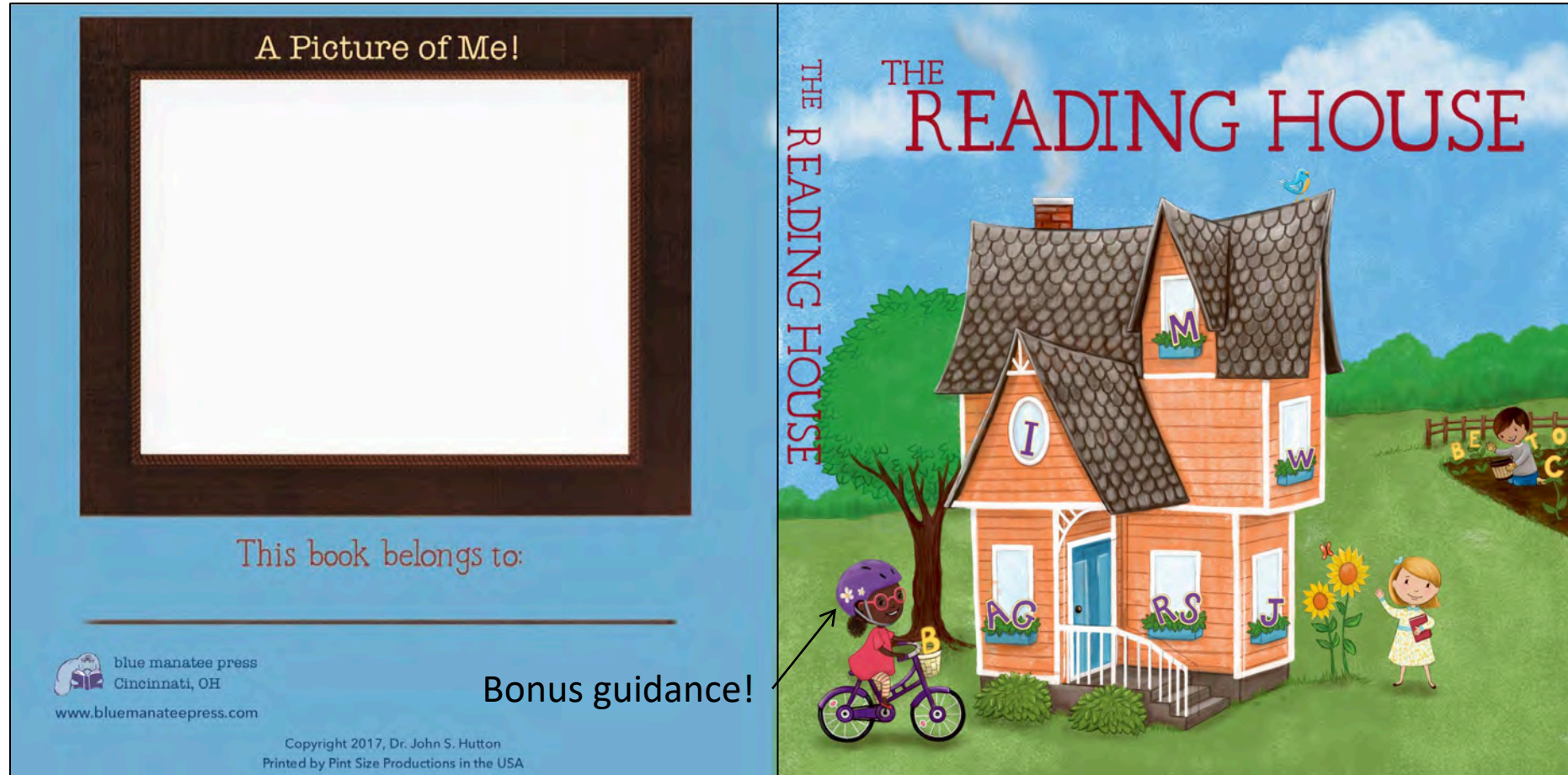


Parent Report...



Direct Screening!

A “Novel” Screening Tool



- Children’s board book + 9-item scripted assessment
- Pre/Kindergarten reading level
- Validated (n=279 children, 36-52 m/o, 7 clinics)

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Hutton JS, Justice L, Huang G, Kerr A, DeWitt T, Ittenbach RF. The Reading House: a Children’s Book for Emergent Literacy Screening During Well-Child Visits. Pediatrics. June 2019;143(6).



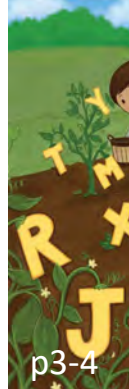
Print Knowledge



Phonological—Alliteration



Expressive Vocabulary



"The Reading House"

Emergent Literacy Screening Measure
Recommended Age: 3-4 years old
©Dr. John S. Hutton, MD
Cincinnati Children's Hospital Reading and Literacy Discovery Center
Presentation & Scoring Form

	Points	
1) "I have a book to share with you. Show me the <i>front cover</i> of the book." Identifies front cover of book	___ Y ___ N	(0-1) ___
2) "This bookshelf has lots of things on it. Show me some <i>words</i> you can read." Identifies shelf with words on it	___ Y ___ N	(0-1) ___
3) "This garden has lots of <i>letters</i> . Show me the ones that you know." (Stop once names 8 correctly, or names 2 in a row incorrectly) Number correctly named: _____ Number incorrectly named: _____ (Correct-incorrect; 8+: 2 points; 4-7: 1 point; 0-3: 0 points)		(0-2) ___
4) "These birds have letters on them. This letter is an <i>M</i> . What sound does M make? ___ Y ___ N This letter is a <i>B</i> . What sound does B make? ___ Y ___ N This letter is a <i>P</i> . What sound does P make? ___ Y ___ N (3 correct: 2 points; 2 correct: 1 point; 0-1: 0 points)		(0-2) ___
5) "This is a <i>sun</i> . Sun starts with /s/. Do any of these start with /s/? <i>Ball, sand, pail?</i> " ___ Y ___ N "This slide is <i>red</i> . Red starts with /r/. Do any of these start with /r/? <i>Cat, boy, rock?</i> " ___ Y ___ N (both correct: 1 point; 0-1 correct: 0 points)		(0-1) ___ (0-1) ___
6) "These are <i>blocks</i> . Which of these rhymes with <i>blocks</i> ? <i>Drum. Cat. Green. Socks.</i> " ___ Y ___ N "This is a <i>truck</i> . Which of these rhymes with <i>truck</i> ? <i>Frog. Duck. Hat. Boat.</i> " ___ Y ___ N (both correct: 1 point; 0-1 correct: 0 points)		(0-1) ___ (0-1) ___
7) "It's snack time in The Reading House. Show me the picture of what you get when you put these sounds together: <i>Ap-ple.</i> " (apple) ___ Y ___ N (0-1) ___ <i>Wa-ter.</i> " (water) ___ Y ___ N (0-1) ___ (both correct: 1 point; 0-1 correct: 0 points)		(0-1) ___ (0-1) ___



Letter-Sound Knowledge



Phonological – Syllable Blending

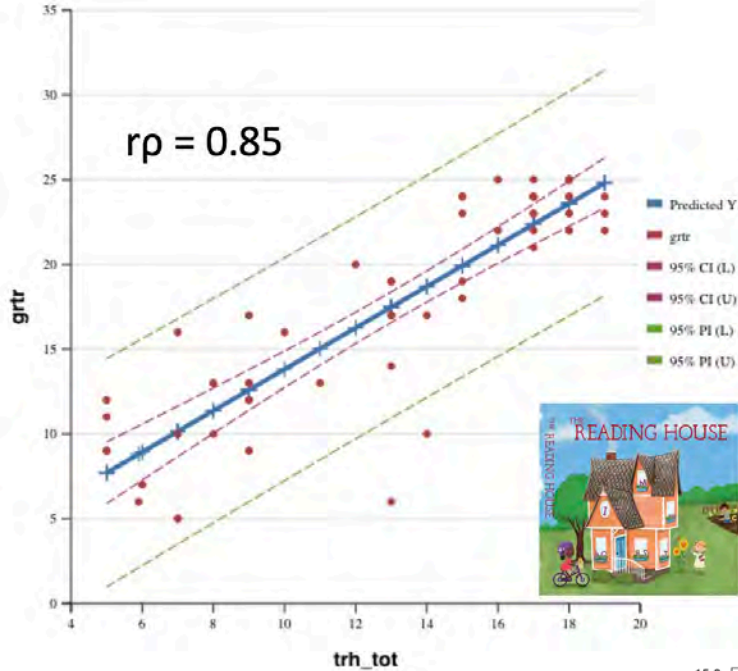
*Scripted screening form is based on the book yet distinct from the text

The Intro

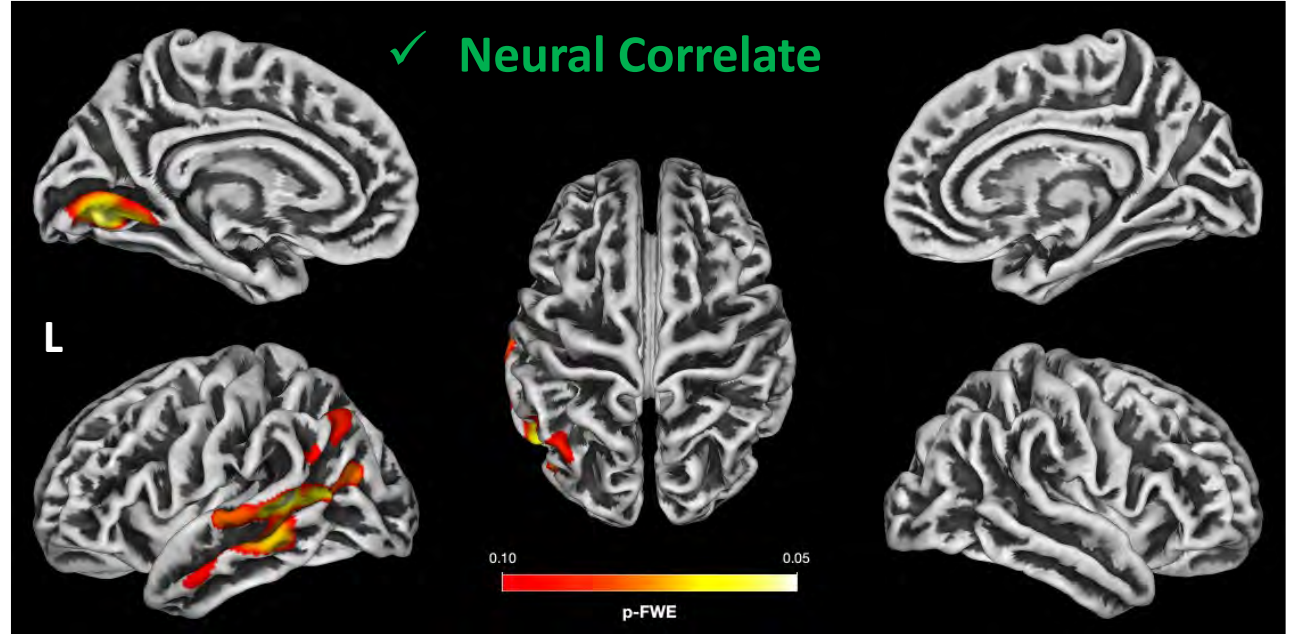
- ✓ **Score 0-14 points**
- ✓ **3 Performance Levels for Age 3-3.9 and 4+**
- ✓ **Training manual and demonstration video**

Brain-Behavior Evidence

✓ Test-retest reliability
($r=0.94$)



“Gold Standard” Composite

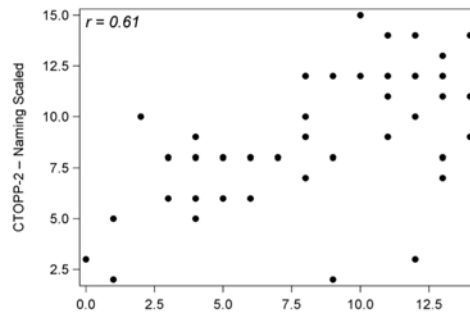


Cortical thickness → “Reading Network”

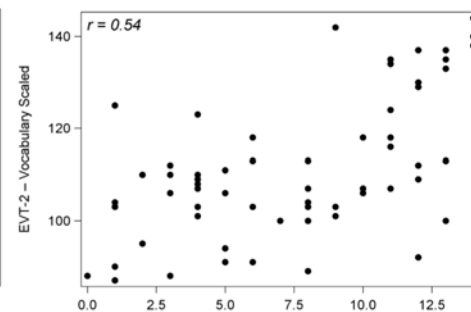
✓ Validity

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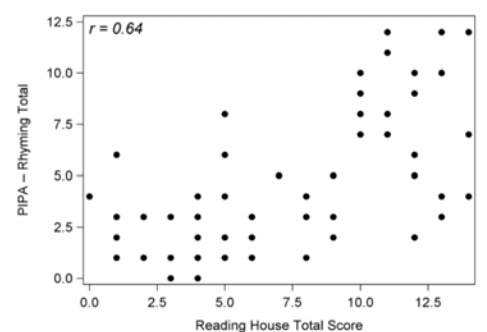
Hutton JS, Dudley J, Huang G, et al. Validation of The Reading House and Association With Cortical Thickness. Pediatrics. Feb 4, 2021.



Rapid naming (RAN)



Vocabulary



Rhyming

Sure, The Reading House is Cozy... ...but is it Feasible and/or Worthwhile?



Literacy Screening in the Primary Care Setting: Data from 2022-2024



1,529 unique patients supported by Kindergarten Readiness Coordinators



1,063 completed Reading House screenings



30% flagged **at-risk**
~**25%** of these not flagged by parent report



1,239 referrals to early childhood services

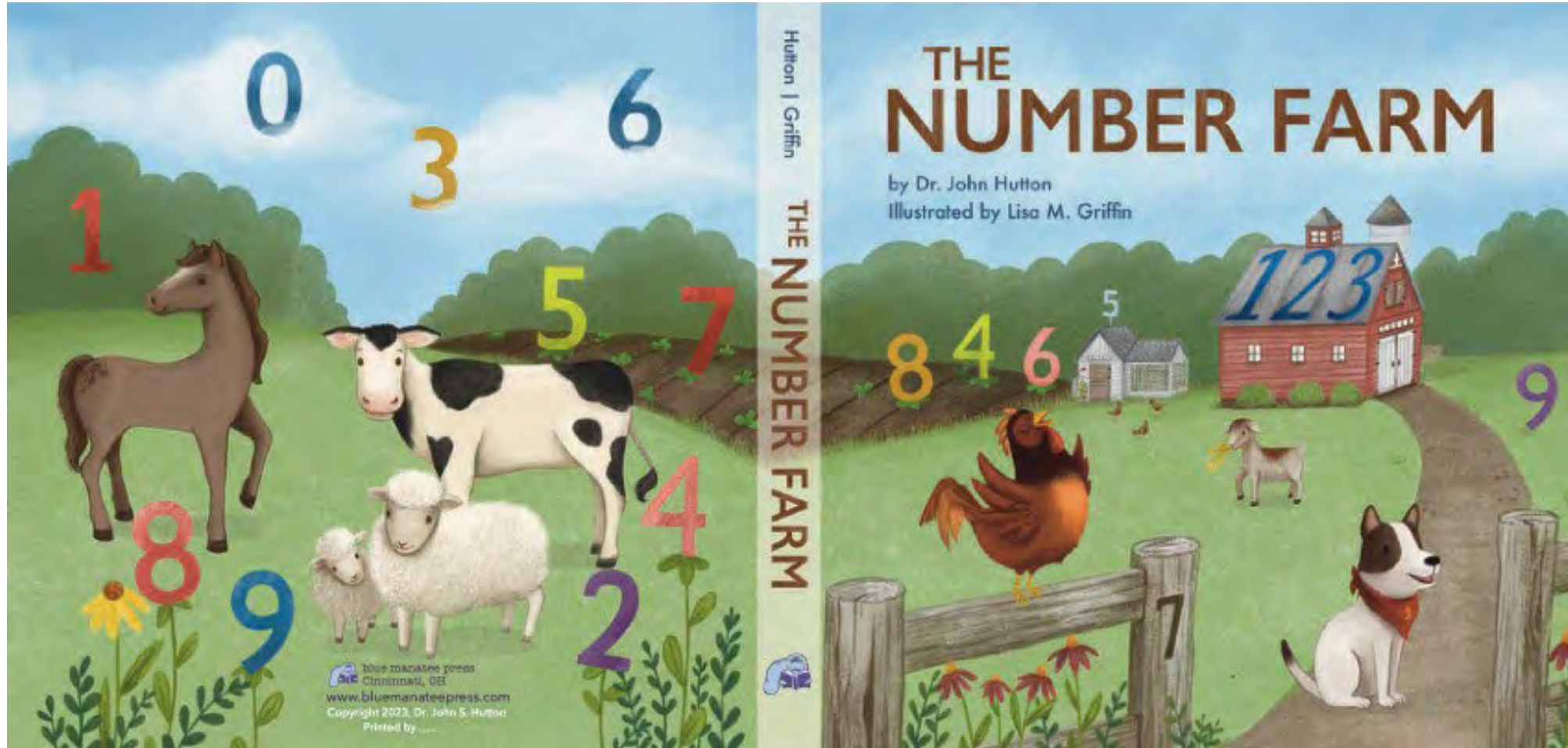


456 confirmed family linkage to services
~**43%**



1,248 at home literacy kits provided

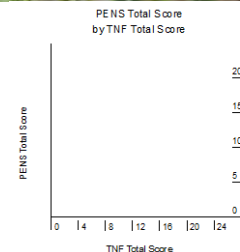
1, 2, 3...Numeracy!



Back Cover

Front Cover

- Children's board book + 11-item scripted assessment
- Pre/Kindergarten reading level
- Early Stages of Validation



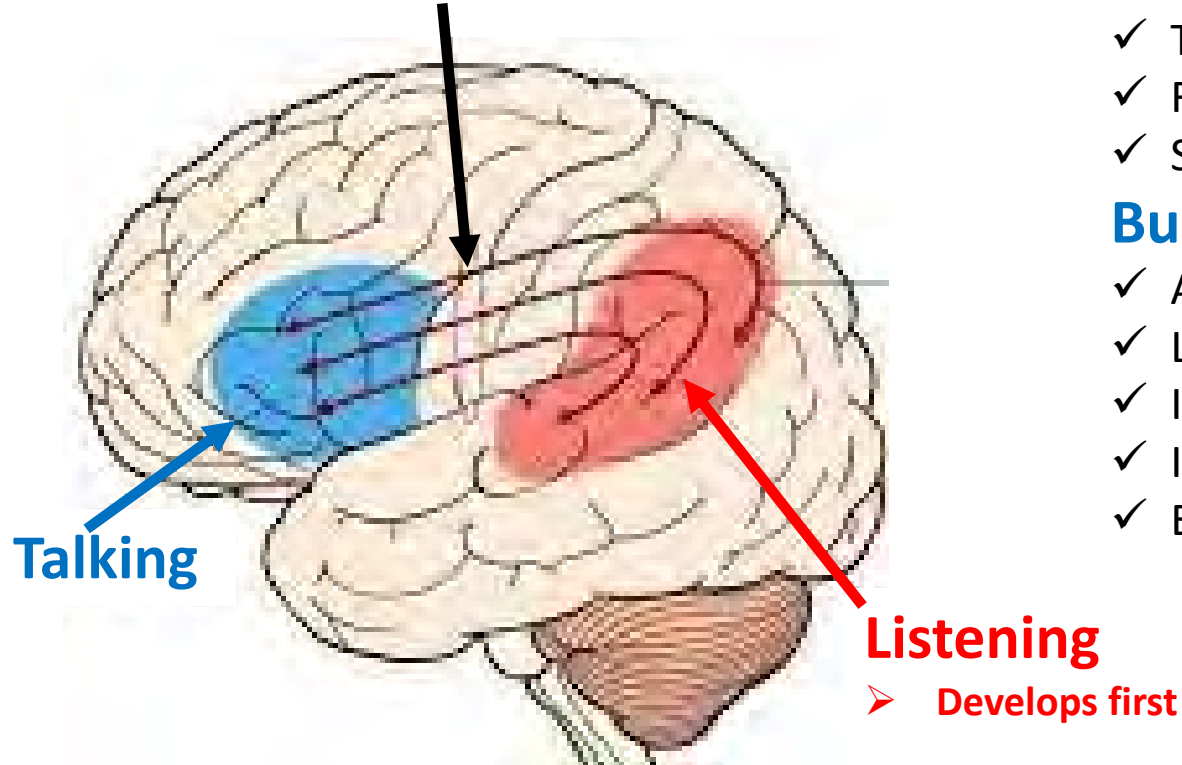
“How-to” Guidance & Empowerment



Language and Literacy Live on in Left side of the brain

White matter fiber tracts (“wires”)

- Mature 18-24 months (language “explosion”)

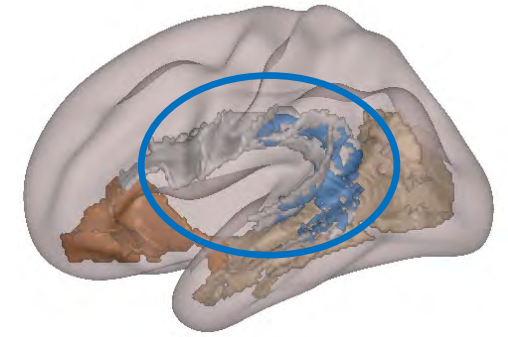


Build listening areas!

- ✓ Talking
- ✓ Reading
- ✓ Singing

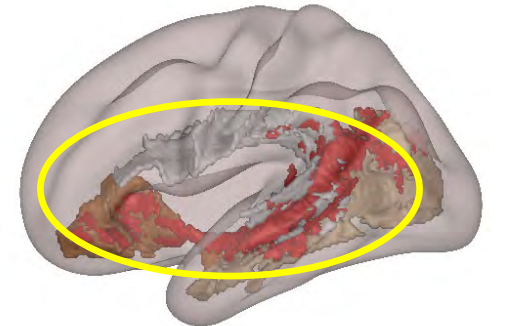
Build talking areas!

- ✓ Ask questions
- ✓ Let the child “read” pictures
- ✓ Invite the child to try new words
- ✓ Invite the child to sing songs
- ✓ Encouragement!



More Reading: More Developed

- ✓ Encourages talk



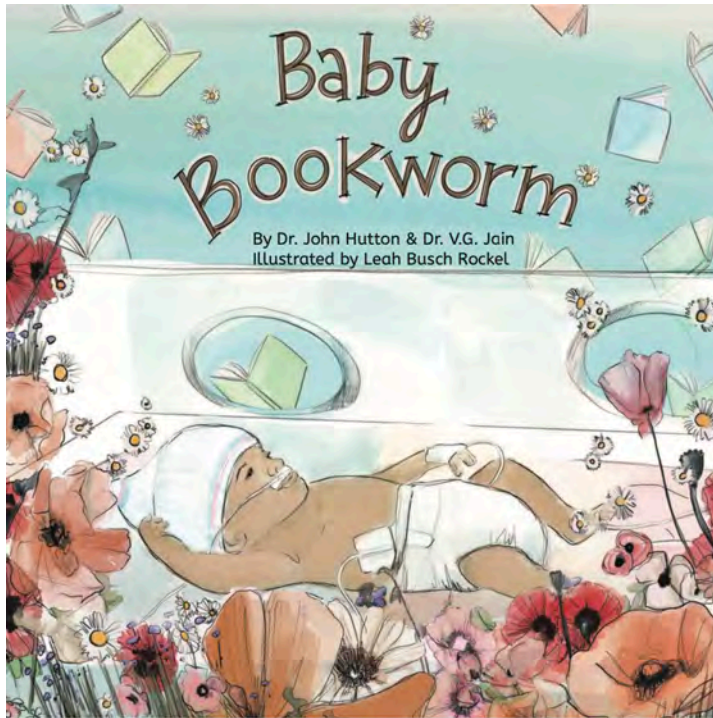
More Screen Time:

Less Developed

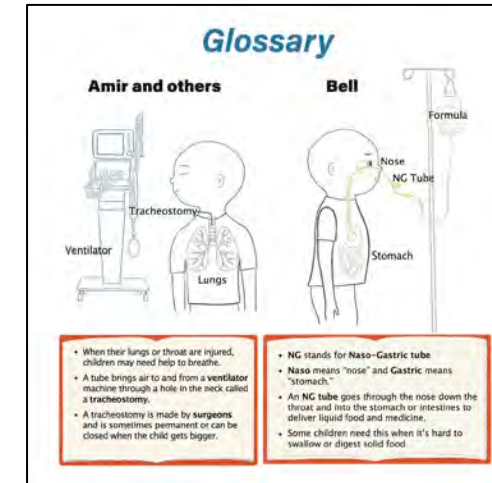
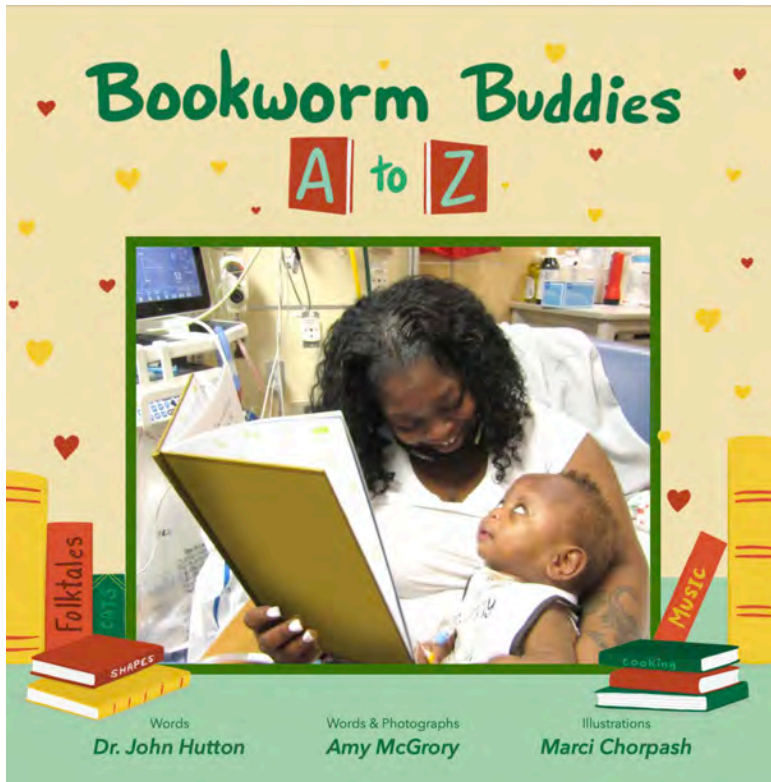
- Replaces talk

“Neurons that fire together, wire together.”

Shared Reading in the NICU



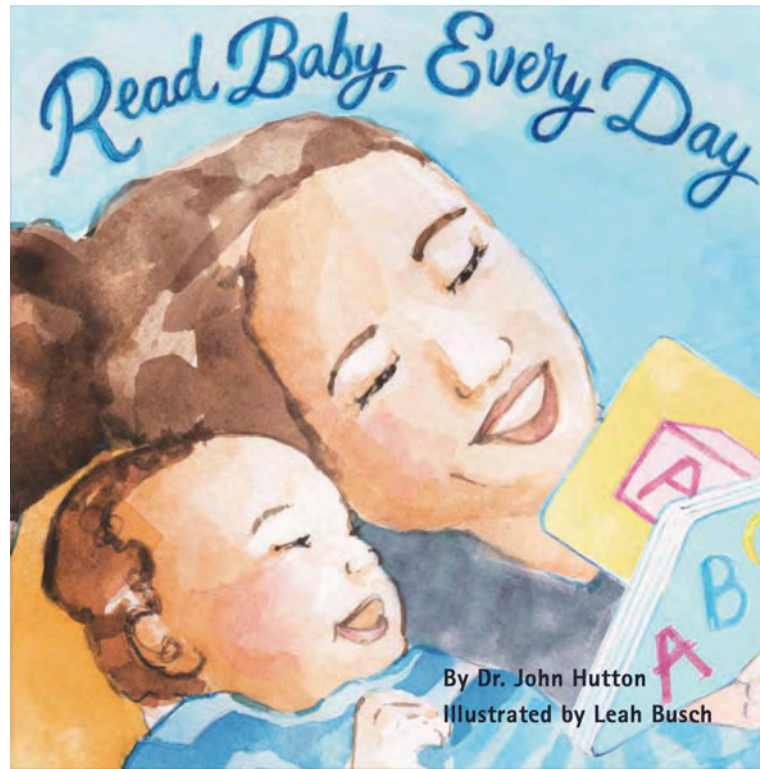
Complex Care: Books to Share



Empowerment: “Beginning at Birth”



where great stories begin™



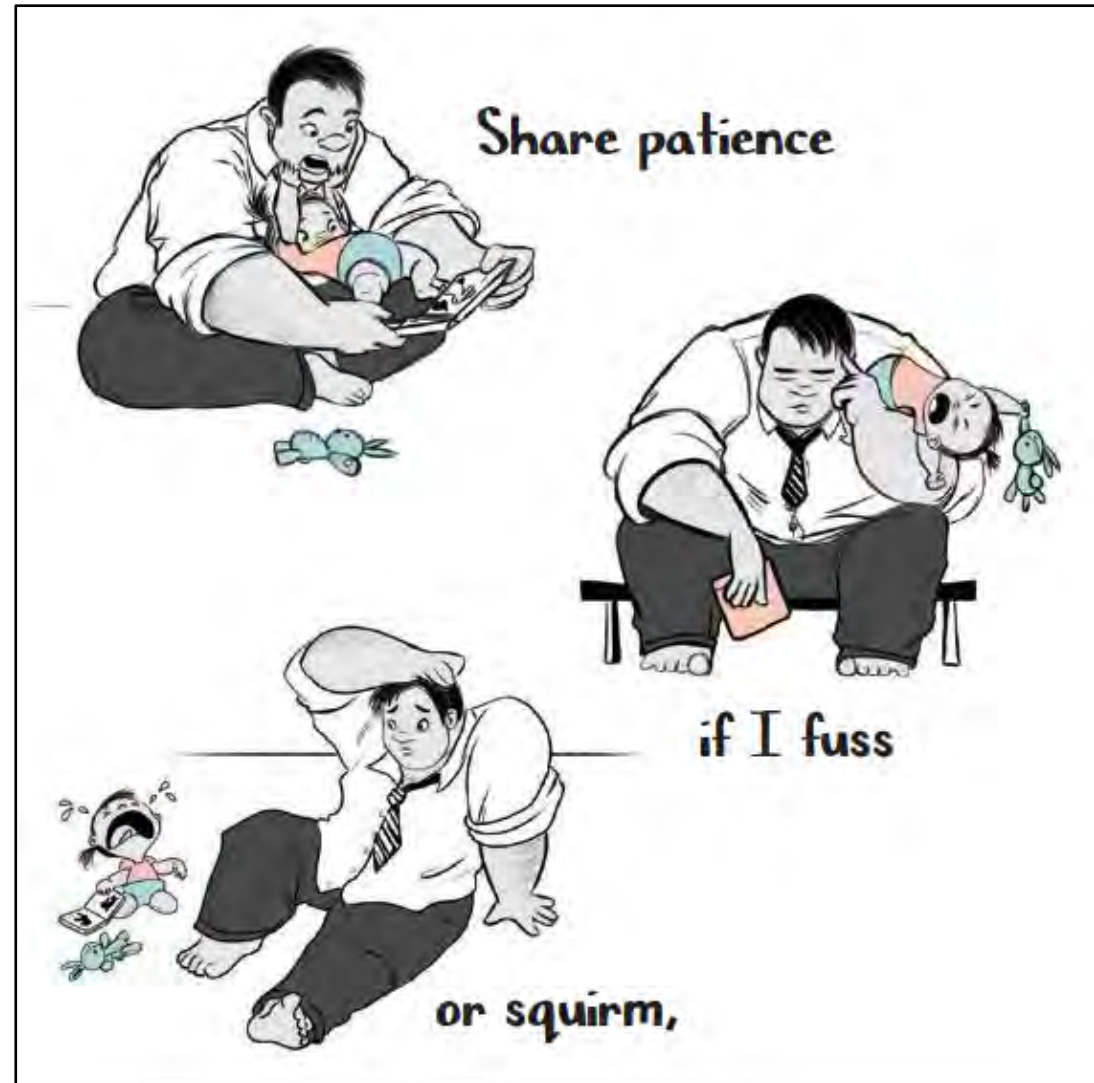
SURE, BUT.....

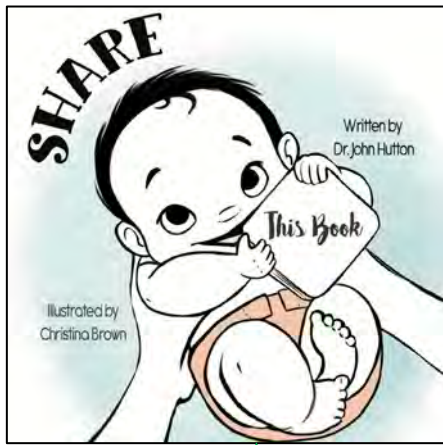
...HOW Do I Read “Right” with a Baby??

“My baby’s...”

- not interested
- not ready
- not a reader
- not smart
- more interested in TV

- “I don’t read well.”
- “I wasn’t good in school.”
- “My family doesn’t read.”
- “No one read to me.”
- “I don’t want to do it wrong...”





↑
Training Manual



Snuggle



Hold

Hold



Affection

Affection



Respond

Respond



Enjoy!

Reading With Babies

Stretch



Talk



Explore



Patience



En Español!

¡COMPARTIR libros es un paso importante para los bebés!

La Academia Estadounidense de Pediatría recomienda que los padres comiencen a leer con sus bebés tan pronto sea posible después del nacimiento, cuando su cerebro está en rápido crecimiento. Compartir libros es una manera perfecta de establecer conexiones emocionales y desarrollar habilidades tempranas del lenguaje y una rutina saludable de lectura. El método "**COMPARTIR**", basado en la evidencia y desarrollado por un pediatra, muestra cómo aprovechar al máximo cada oportunidad maravillosa.

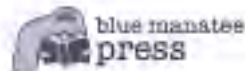
- **C**arga a tu bebé en el regazo.
- **O**frécele un libro; deja que lo sostenga y aprenda cómo funciona.
- **M**uéstrale afecto a tu bebé y que leer juntos es algo maravilloso.
- **P**resta atención y responde a lo que hace tu bebé.
- **A**-l-a-r-g-a los sonidos de las palabras para que tu bebé pueda aprenderlos.
- **R**elata a tu bebé lo que dicen las imágenes.
- **T**rata de explorar nuevos sonidos de palabras de maneras divertidas.
- **I**ntenta permanecer en calma y ten paciencia si tu bebé se frustra.
- **R**íete, disfruta y diviértete con tu bebé.

Dr. John S. Hutton

Pediatra y autor de Cincinnati, OH. Sus intereses de investigación incluyen la lectura, el tiempo frente a la pantalla y el desarrollo temprano del cerebro. Le apasiona el poder de los libros para ayudar a los niños a comprender, imaginar, aprender y crecer.

Christina Brown

Ilustradora de Lafayette, Louisiana. Le encantan todo lo que tenga que ver con bebés, las galletas hechas en casa, y dormir hasta tarde los sábados. **COMPARTIR** este libro es su primer libro para niños.



www.blumanateepress.com

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HUTTON/BROWN

COMPARTIR

COMPARTIR

Escrito por
el Dr. John Hutton

Ilustrado por
Christina Brown



Why “Early” Shared Reading?

Themes

Barriers:

- Time
- Resources
- Parental mental health
- It’s too early/baby is not ready



Benefits

- ✓ Parents as child’s first teachers
- ✓ Reading promotes development
- ✓ Building routines
- ✓ Bonding
- ✓ “It works”
- ✓ “Two-for-one” reading



HOW Do I Read “Right” with an Older Child??

- Is it rude for them to to ask questions?
- Can I talk about the pictures?
- Can I ask questions that aren't in the book?
- Can we talk about things not in the book?
- Do I have to read the words?
- What are the *right* books?

Dia-*what* Reading?



Dialogic Reading: PEER/CROWD

PEER Sequence



P_{rompt}¹



CROWD: Types of Prompts



Completion



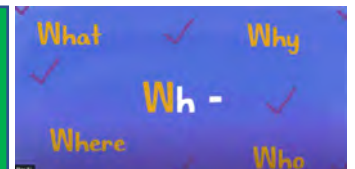
Recall



Open-ended question



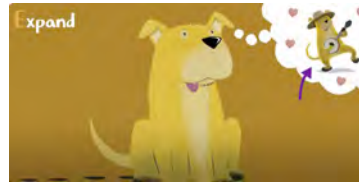
Wh-question



Distancing



Evaluate²

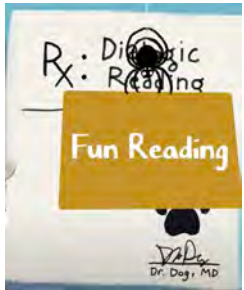


Expand³



Repeat⁴

Conversation!



Dia-what??

Stealthy Training Manuals



Training Manual



Demonstration Video

PEER/CROWD...



p9-10: Wh-/Open-ended question

- → Evaluation → Expansion



p11-12: Wh- question

- Evaluation → Expansion



p13-14: Distancing

“Dialogic Doctor” Training Community-based Empowerment



- ### Group Session 1 (90 min)
- 10 attendees recruited from communities
 - Led by RLDC Staff +/- Doctor-Trainer
 - Pre-test/survey
 - Introduction to “why” & “how”
 - Practice with “how to” book & to share at home



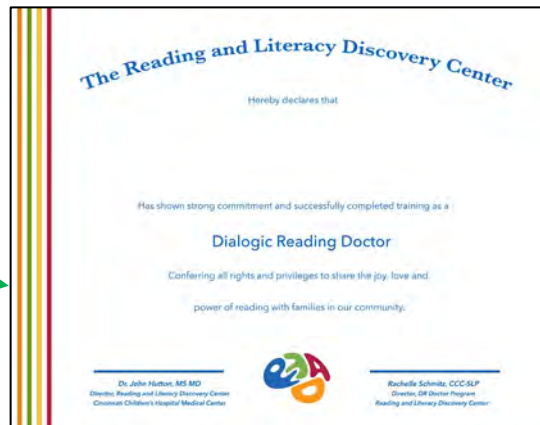
- ### Group Session 2 (90 min; 1 week later)
- Led by RLDC Staff +/- Doctor-Trainer
 - Review “why” and “how”
 - Discussion: experience sharing books at home
 - 1:1 practice with new books
 - Provide books to share with 2 other families



- ### Graduation Session 3 (90 min; 1 week later)
- Led by attendees, supervised by Trainer
 - Discussion: experience sharing books with families
 - Present and discuss plans for outreach/training
 - Post-test of knowledge/attitudes, course evaluation
 - Present Dialogic Diplomas & celebrate!

- ✓ 11 courses over 9 months
 - 2 neighborhoods
 - Library/Comm center
- ✓ 10 trainees/course
- ✓ ~110 DDs trained
- ✓ Each DD trains 4 families

Recruit/sign up to be Doctor-Trainers (co-lead sessions)



Dialogic Diploma

The Reading and Literacy Discovery Center

Hereby declares that

Has shown strong commitment and successfully completed training as a

Dialogic Reading Doctor

Conferring all rights and privileges to share the joy, love and

power of reading with families in our community.

Dr. John Hutton, MS MD

*Director, Reading and Literacy Discovery Center
Cincinnati Children's Hospital Medical Center*



Rachelle Schmitz, CCC-SLP

*Director, DR Doctor Program
Reading and Literacy Discovery Center*



Final Entreaty

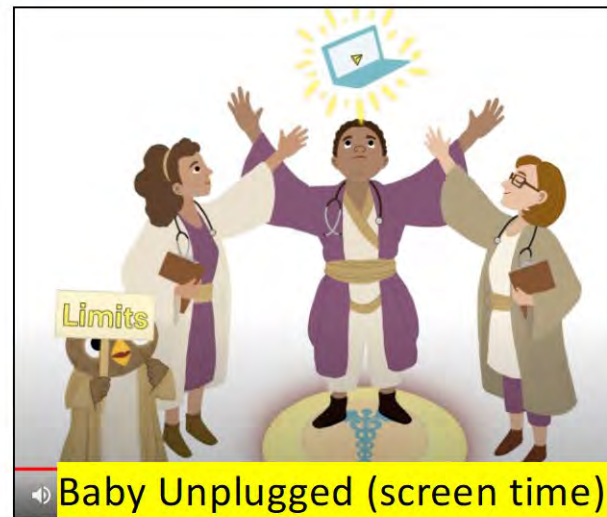
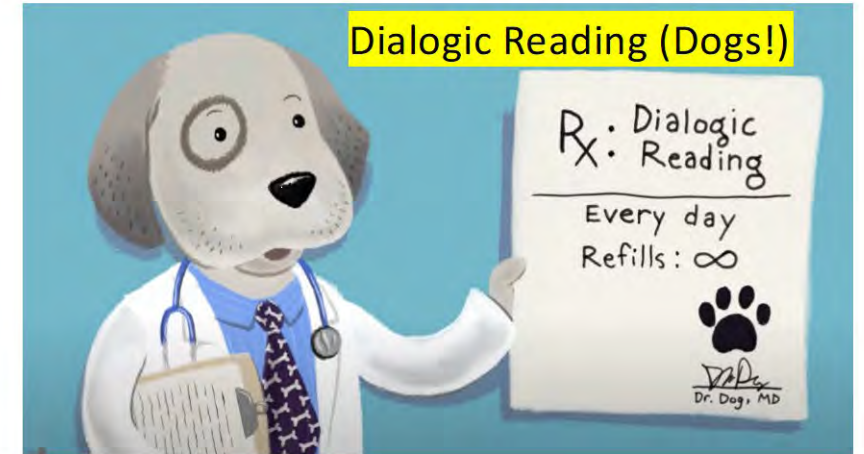
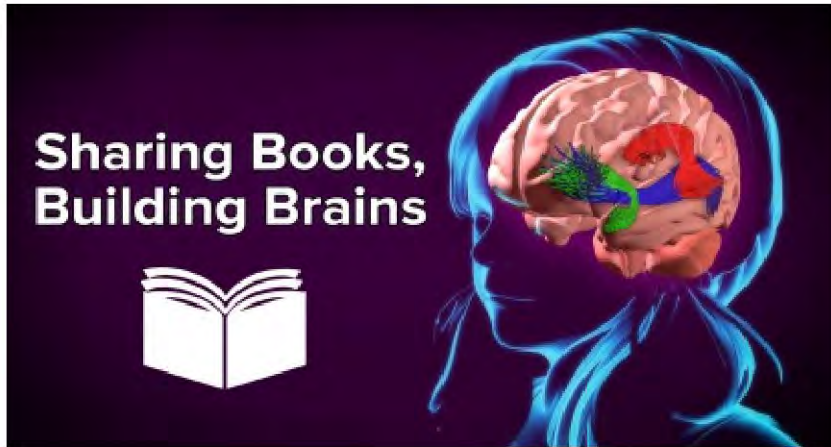




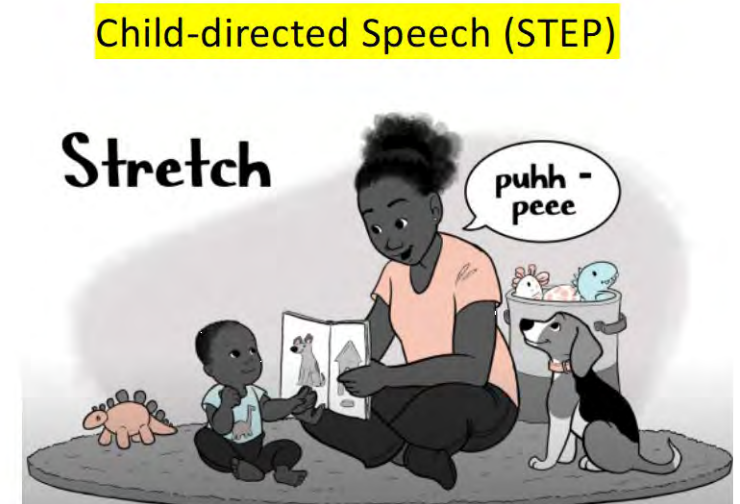
“How-to” Videos

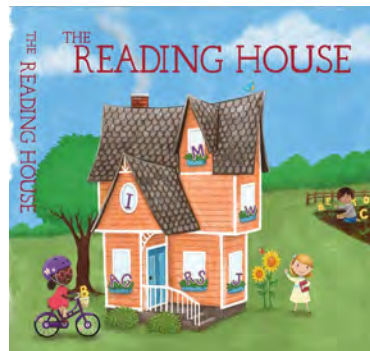
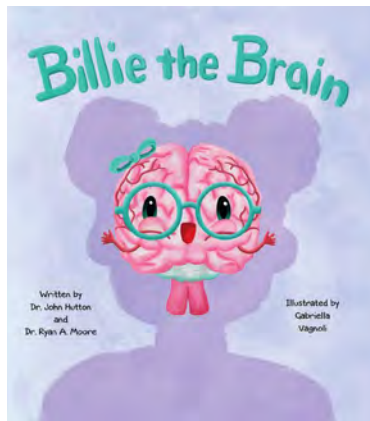
(Cincinnati Children’s YouTube Channel)

Example: <https://youtu.be/iCDMKSZwrps?si=TvdkhyjsrmYFWzuh>



Source: Hutton, et al. CCHMC MediaLab





Thank You!



WISCONSIN



“Questions?”

- Contact:
- John.Hutton@utsouthwestern.edu
 - [@DrJohnHutton](#)
 - <http://www.blueanateepress.com/>

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