

Stories and Synapses: The neurobiology of shared reading during early childhood and “novel” approaches to screening and guidance

2023 Symposium on Children



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Division of General & Community Pediatrics
Director, Reading & Literacy Discovery Center



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Disclosures



- Dr. Hutton is the founder of blue manatee press, a children's book publisher whose books are featured here.



- Dr. Hutton is the author of *The Reading House* screener and other books featured here.

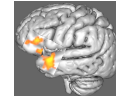


- Dr. Hutton has received, currently receives, and expects to receive no direct financial compensation in these roles.

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Objectives

- ✓ What is “Emergent Literacy”?
- ✓ Risk Factors for Reading Difficulties
- ✓ “Recycling” brain networks for reading
- ✓ MRI Evidence: Shared Reading and Screen Time
- ✓ Call to Action/Getting Our Hands Dirty
- ✓ Early Reading Intervention Puzzle
 1. “Novel” approach to screening
 2. Books for “How-to” Guidance (Stealthy Training Manuals)
 3. Tech-enhanced Guidance?



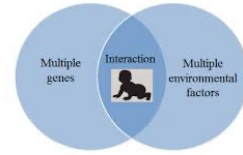
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Flash Poll: Risk Factors for Reading Difficulties Include...

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

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Risk Factors for Reading Difficulties



- **Genetics/Family History**
 - Dyslexia ~ 40-80% heritable (≥ 9 genes)
- **Home Literacy Environment (HLE)**
 - Oral language, print concepts, interest (~ 15% variance)
 - 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!

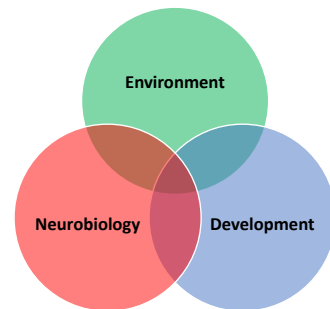
$$\sum_{i=1}^n a_i \quad \text{Additive!}$$

5

Bonus: Common Links Among These Are...



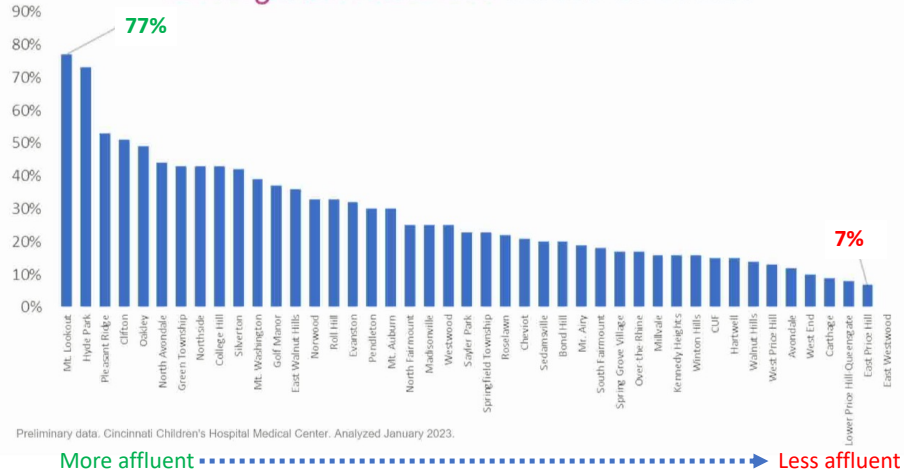
- A) Differences in home reading routines
- B) Differences in basic skills
- C) Differences in brain development
- D) Differences in attitudes toward reading
- E) Differences in school experiences
- F) All of the above**



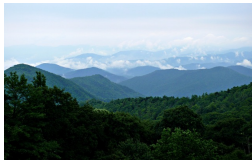
6

Different City, Similar Problem

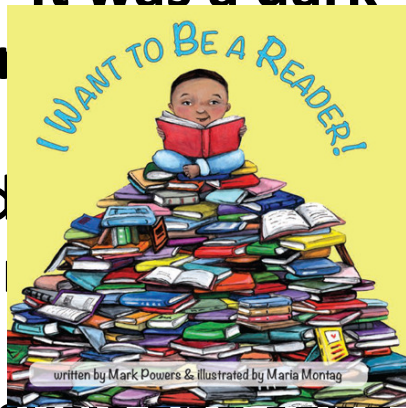
Massive inequities in rates of kindergarten readiness across Cincinnati



7



It was a dark
 and
 acad
 mou
 music and song...



8

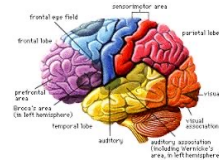
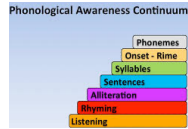
Key Concept: “Emergent Literacy”

➤ Developmental precursors to reading & writing

✓ Skills

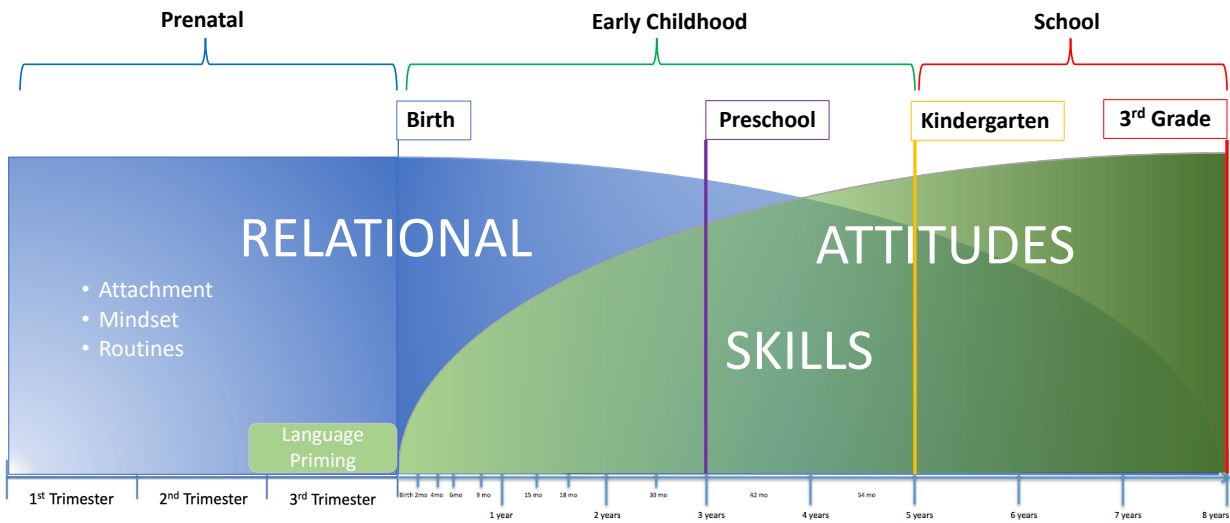
✓ Knowledge

✓ Attitudes



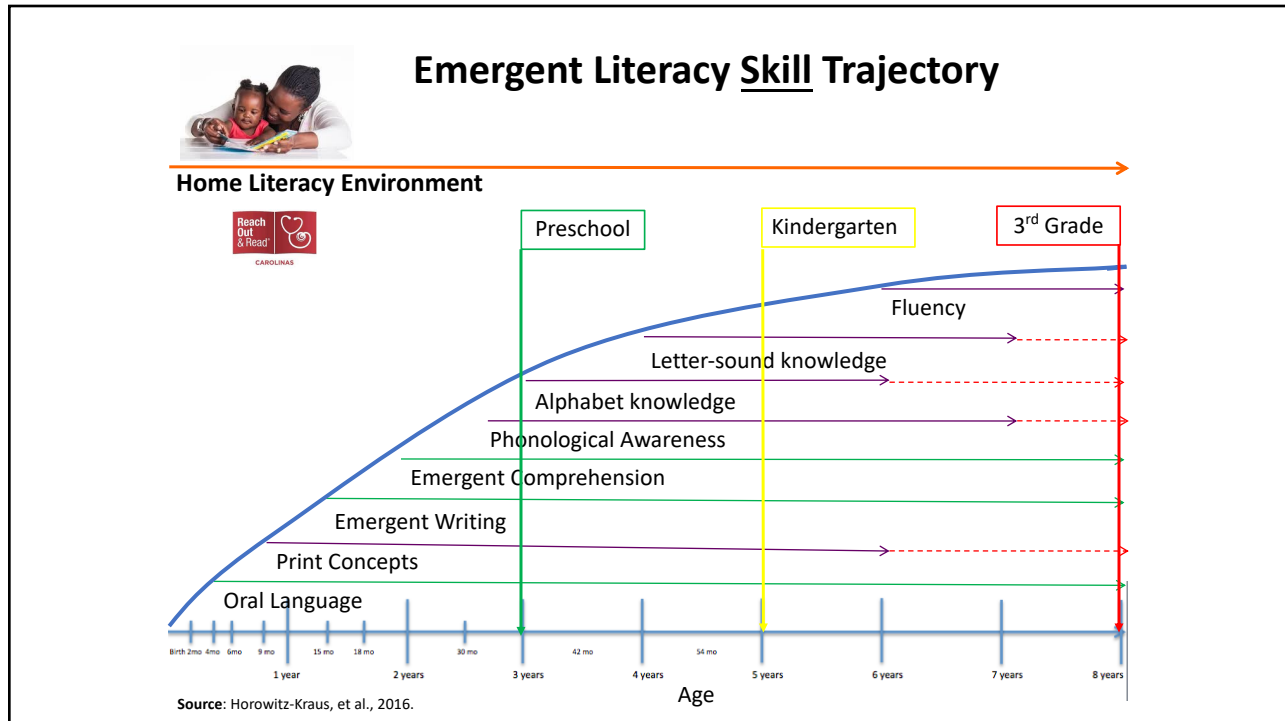
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Contributors to Emergent Literacy by Age

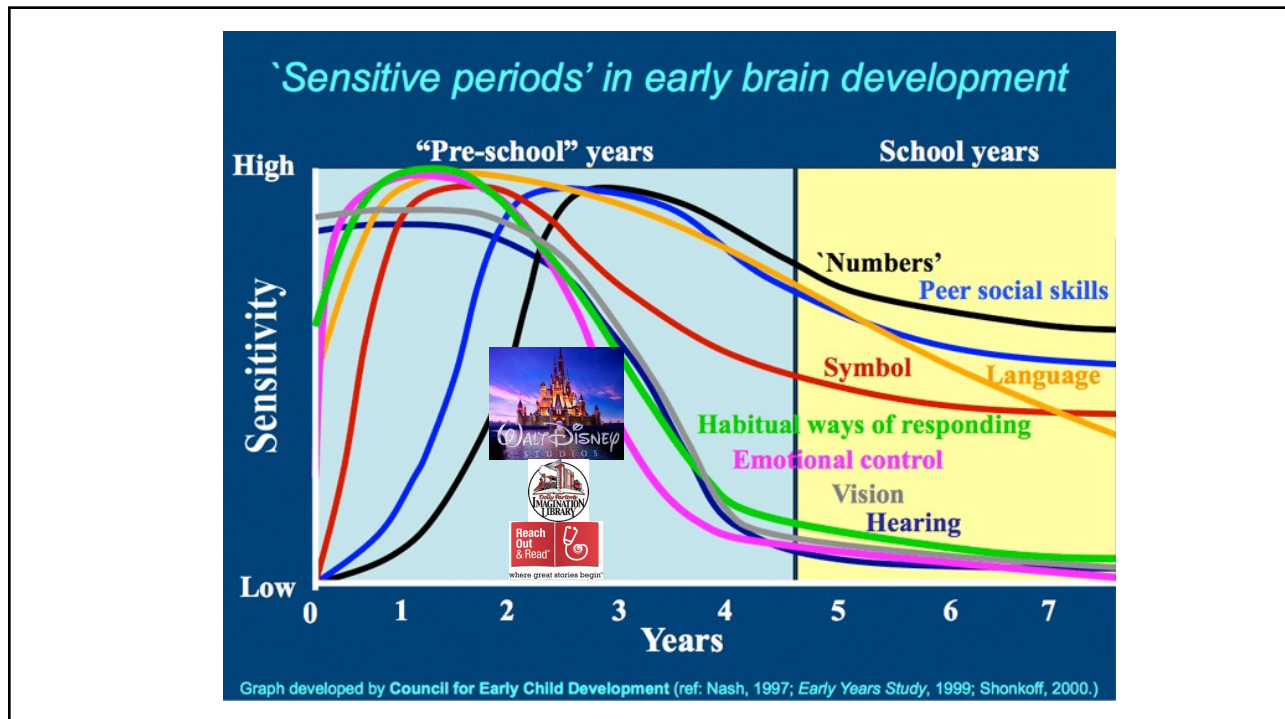


Graphic: JS Hutton, 2020.

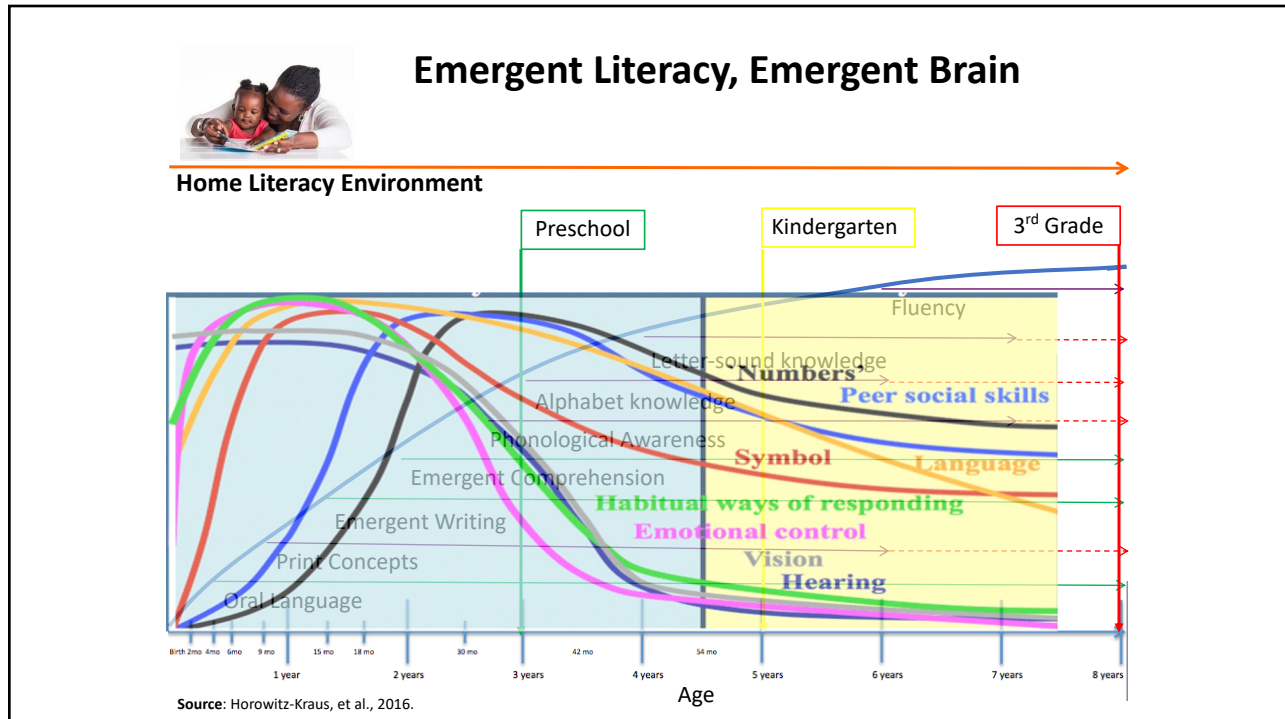
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11




12




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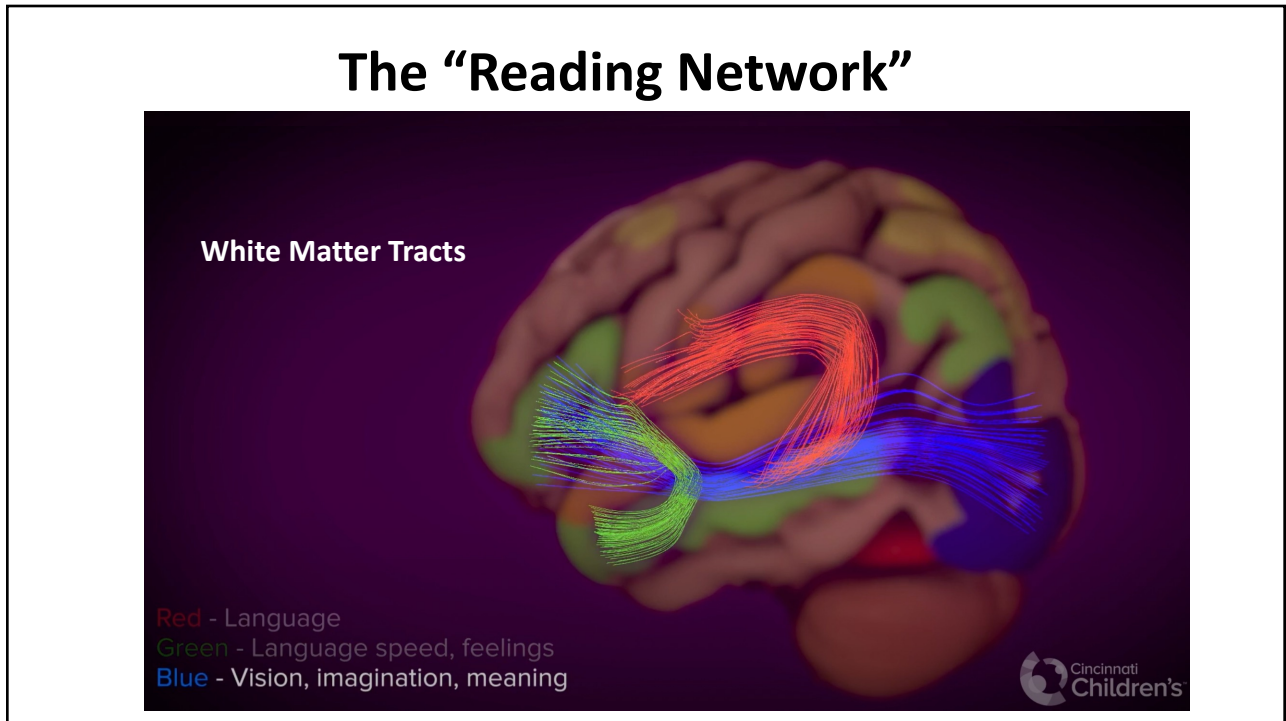
Recycling the Brain



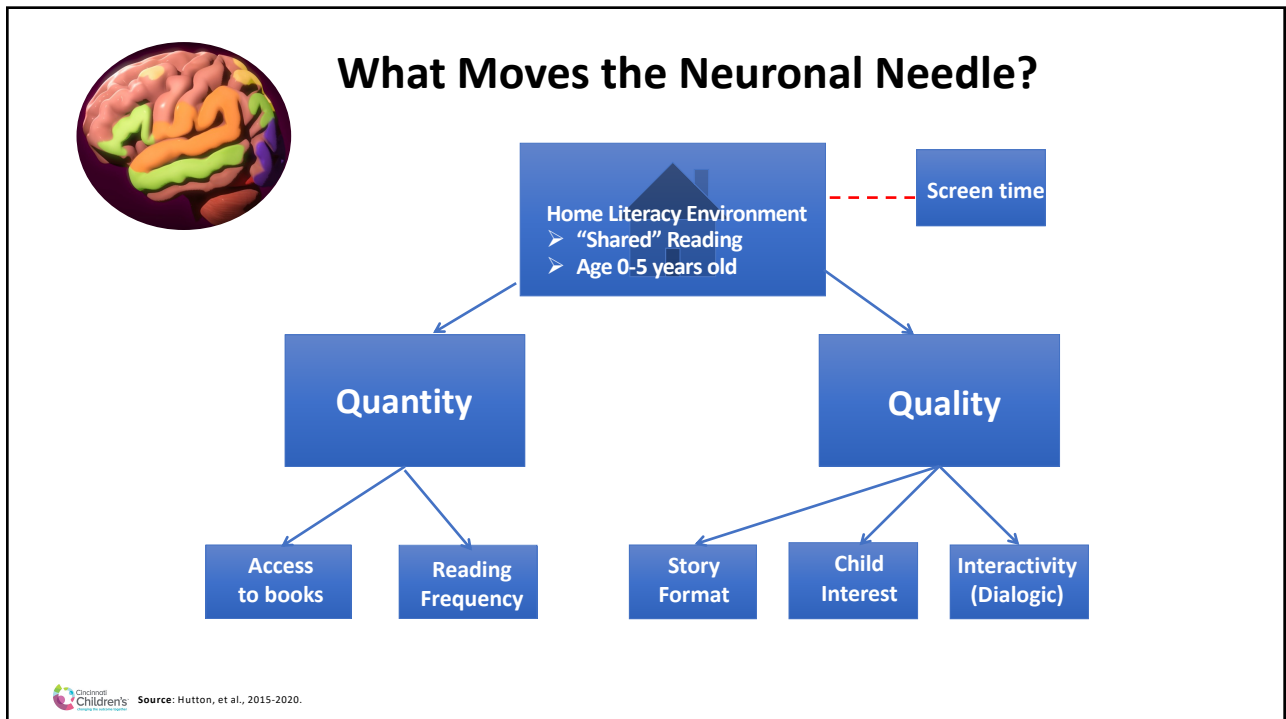
- ✓ Reading = cultural invention (~ 6000 years)
- ✓ **No hardwired brain network**
- ✓ “Recycle” visual, language, other brain networks
 - Must be adequately developed + effectively integrated
 - **Emergent network!**
- ✓ Predictable sequence in typically developing readers
 - Books with pictures → no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



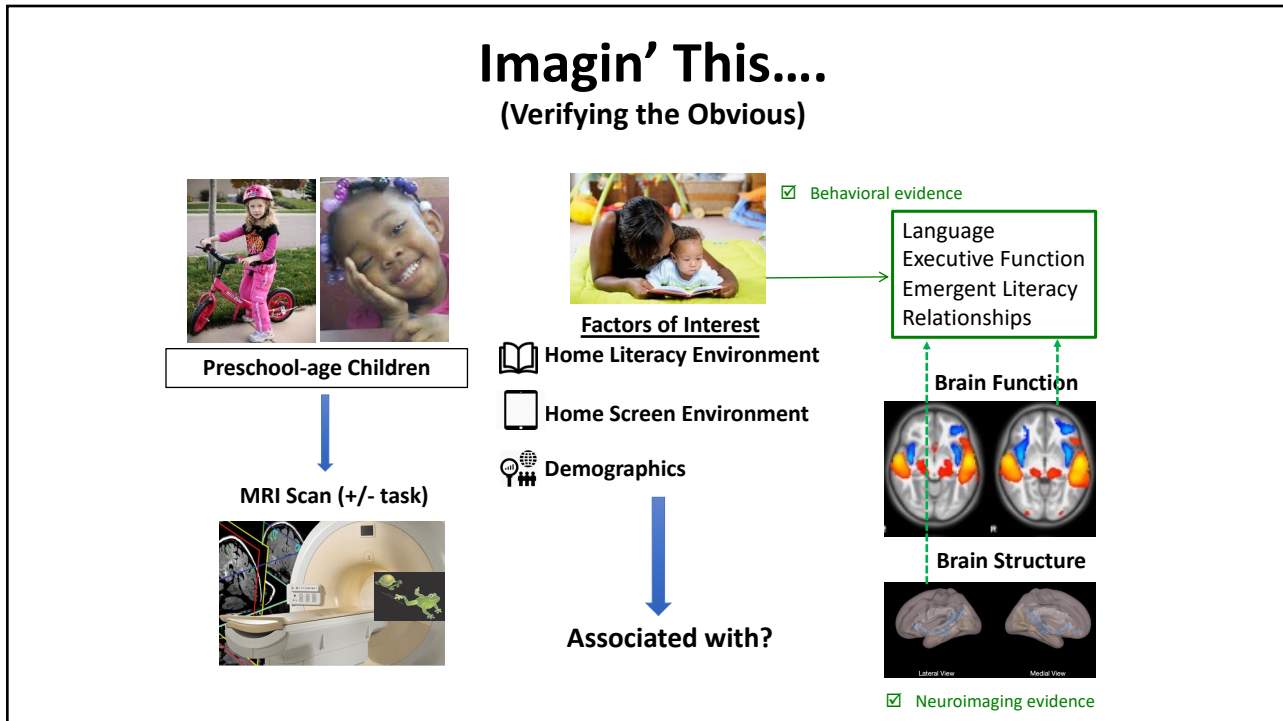
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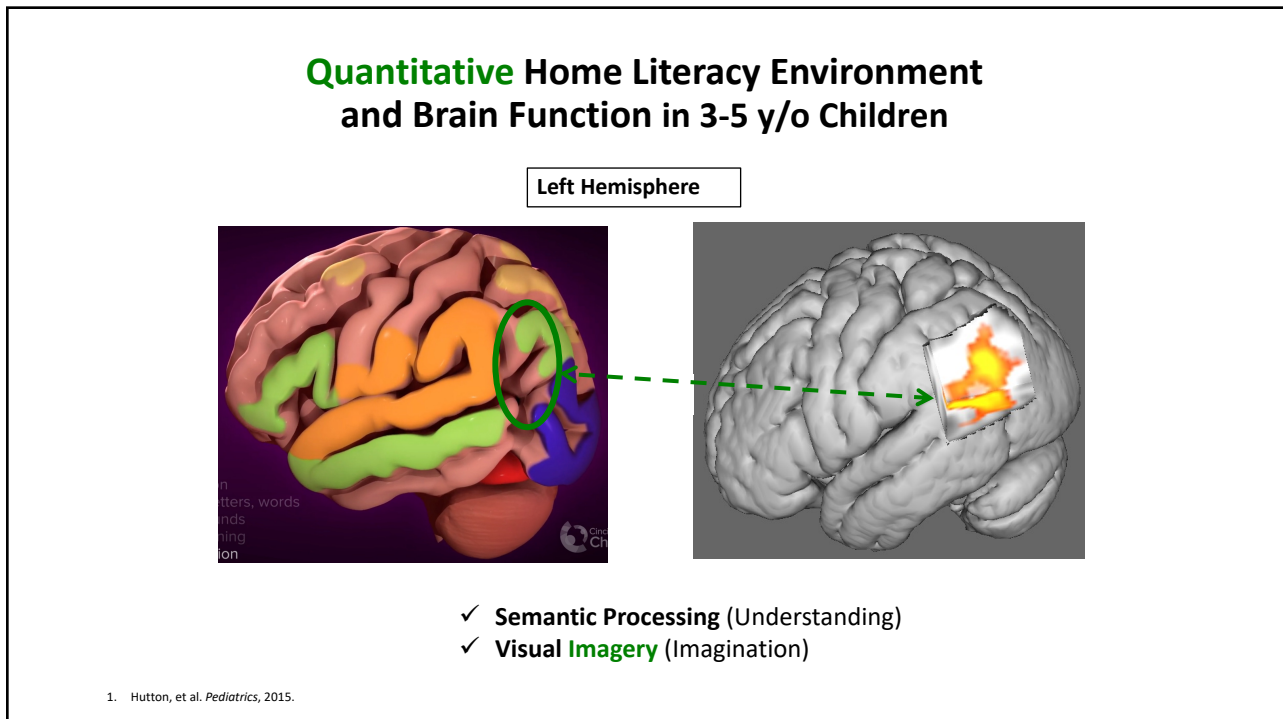
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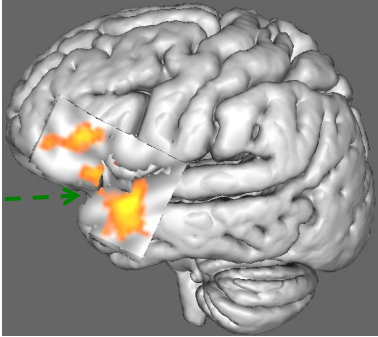
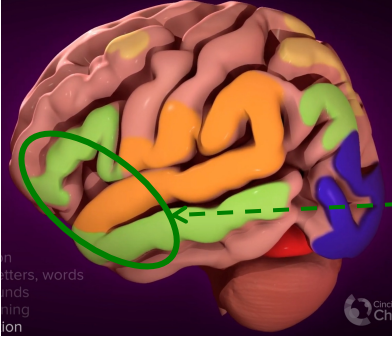
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Shared (Dialogic) Reading **Quality** and Brain Function in 4 y/o children

Left Hemisphere



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

1. Hutton, et al. The Journal of Pediatrics, 2017; presented at PAS 2016.

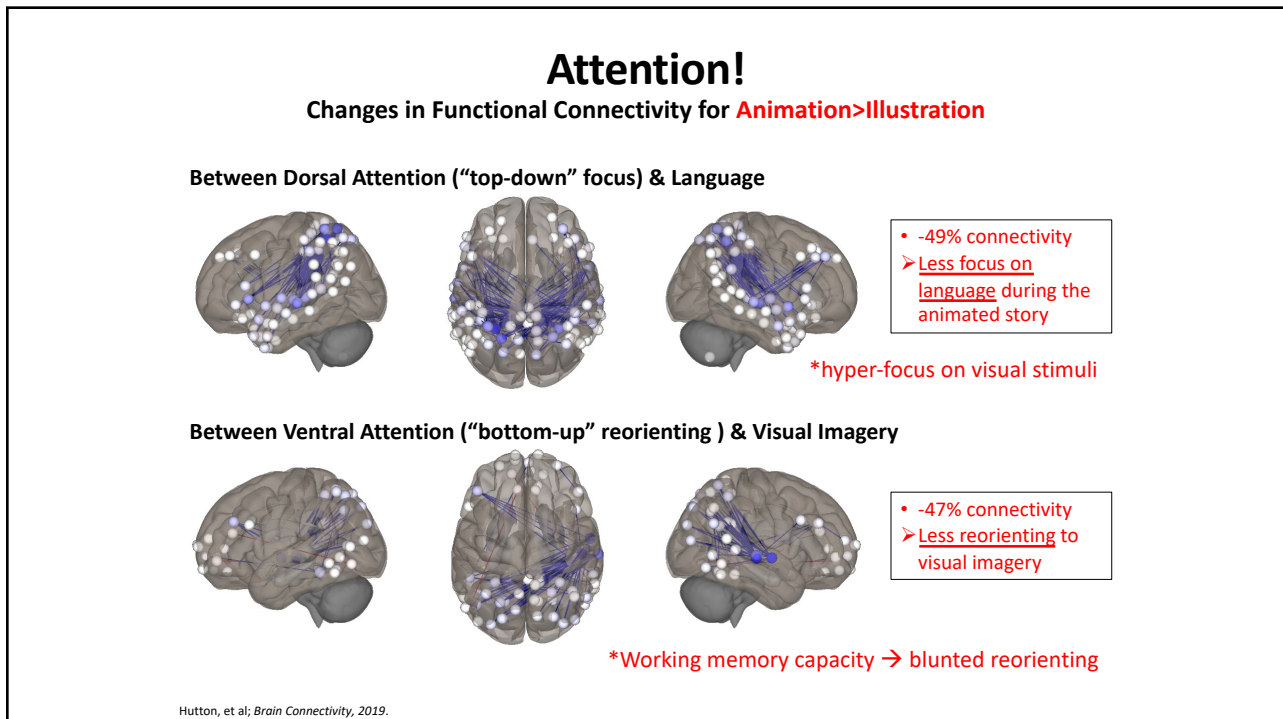
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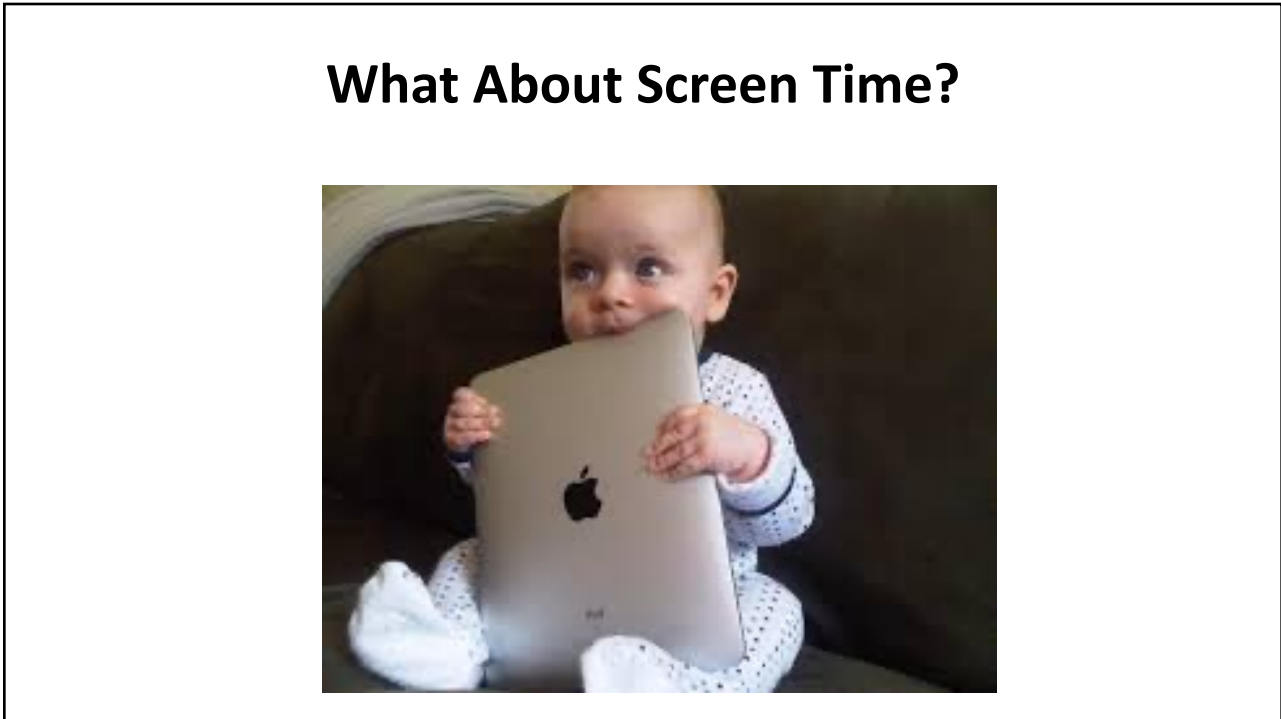
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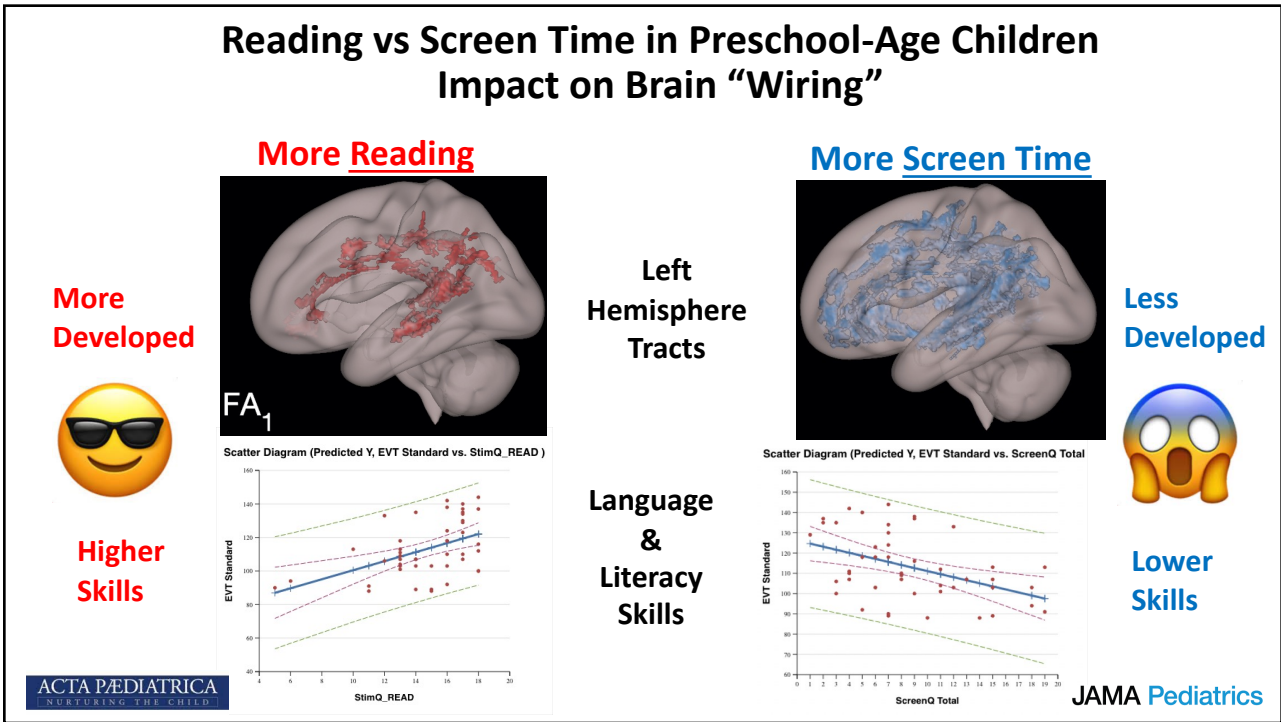
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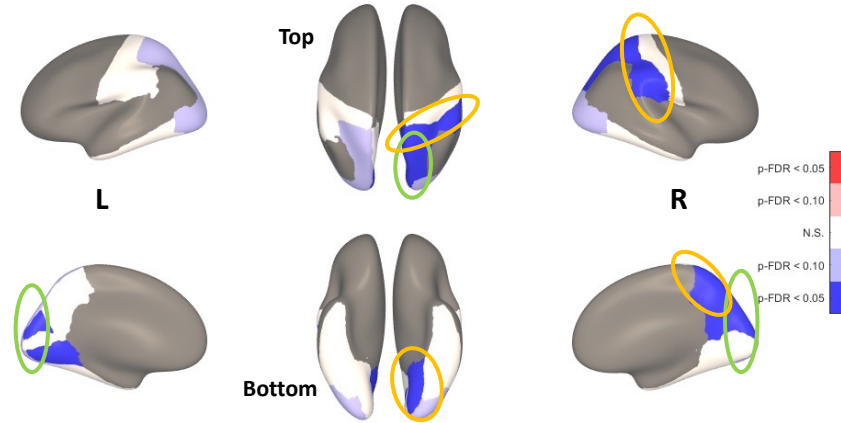


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Screen Time and Gray Matter Thickness

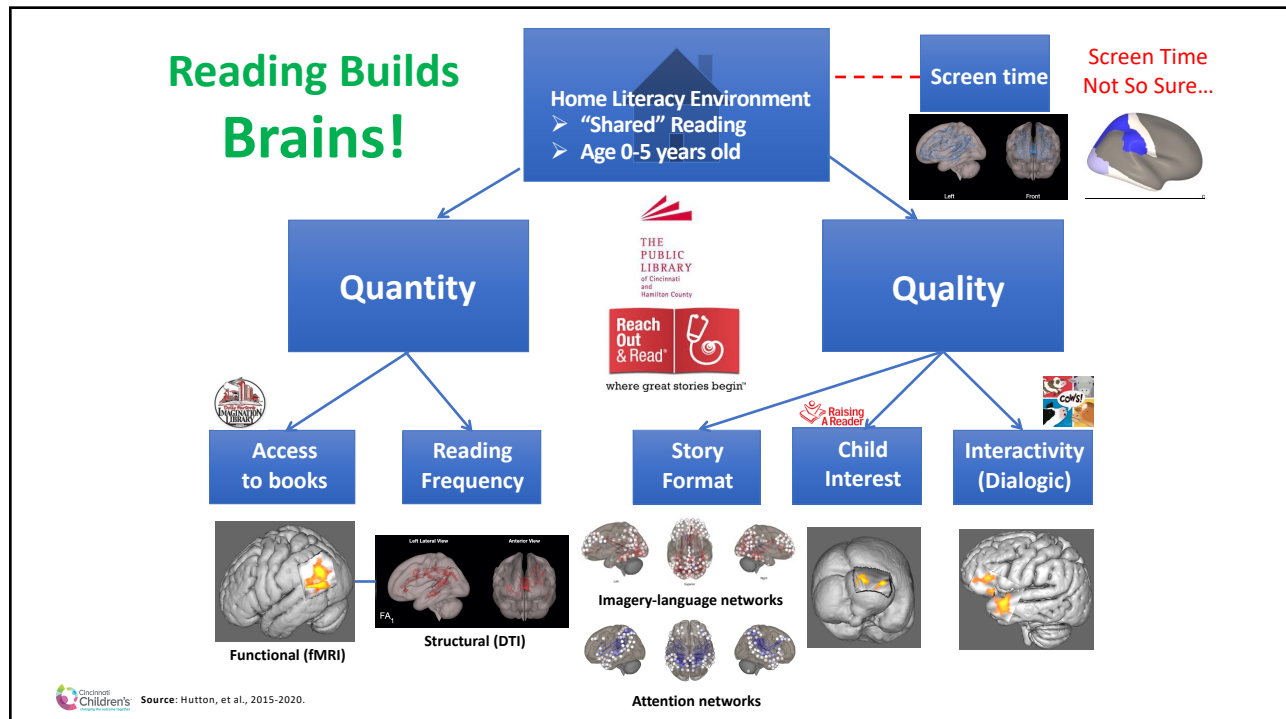


Non-Uniform Impacts at Preschool Age

- ✓ **Primary Visual (matures early)**: thinner reflects greater efficiency (video exposure)
- **Higher-Order Association (matures slowly)**: thinner reflects under-developed
 - Right parietal-temporal: Social cognition and empathy

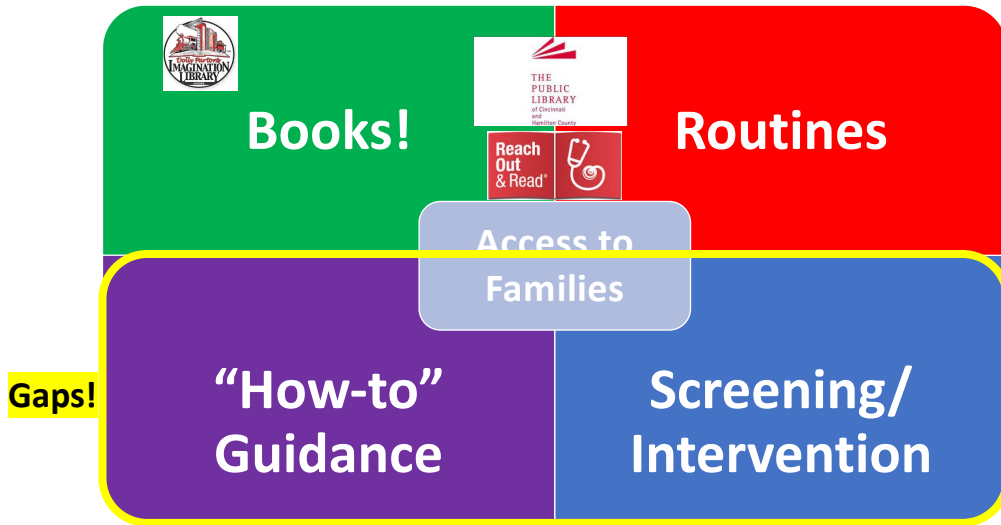
Hutton, et al. *Scientific Reports*, 2023.

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Early Reading Intervention: A Puzzle

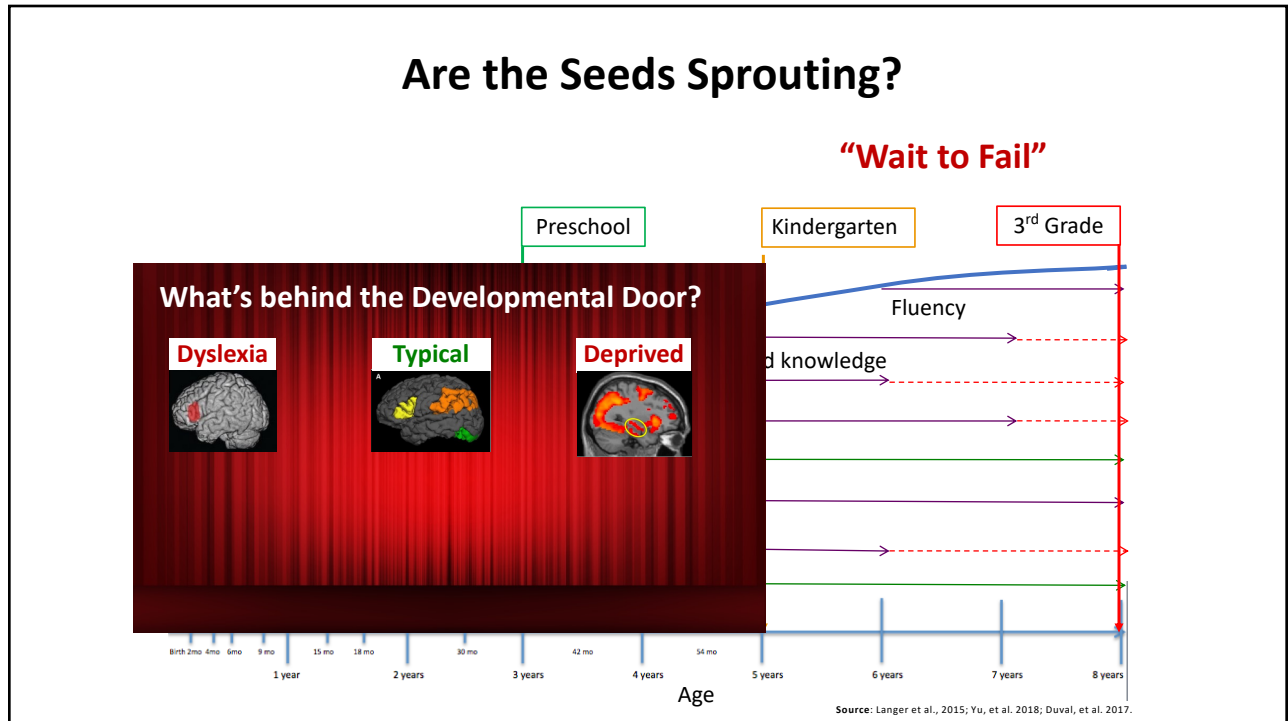


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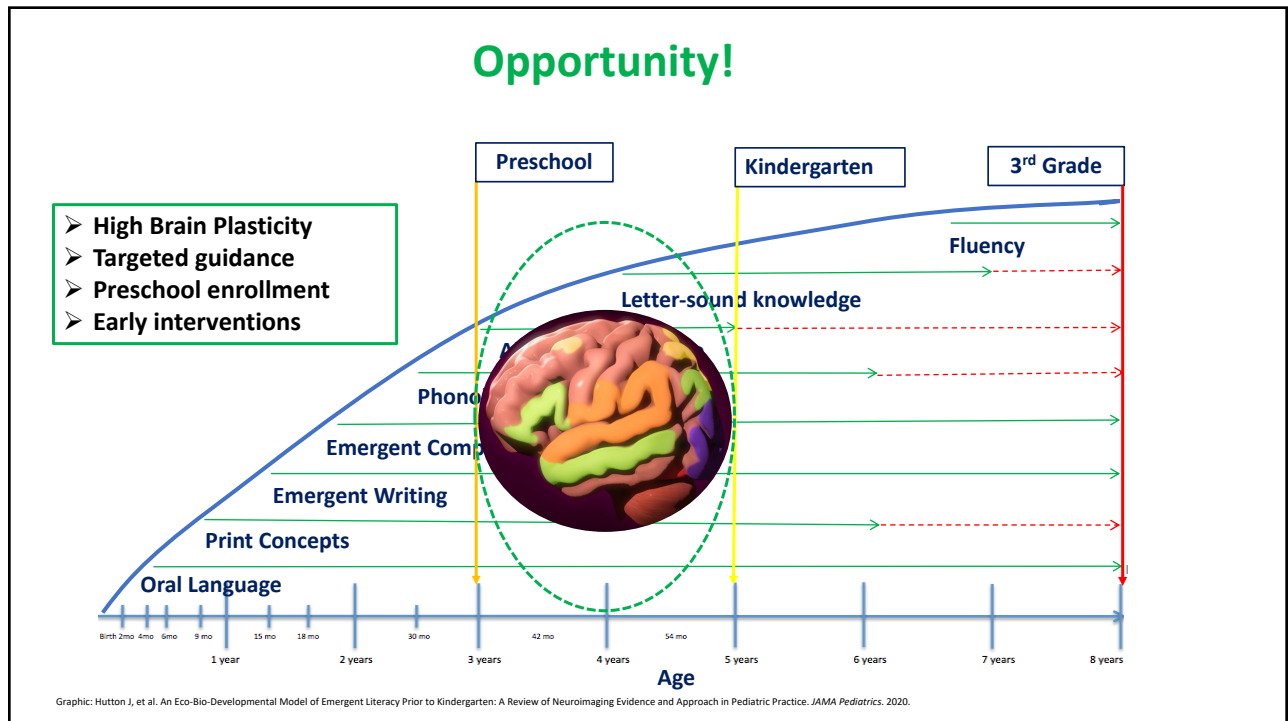
Getting Our Hands Dirty



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Approaches to Screening

My child's vision is fantastic...



Parent Report...



Direct Screening!

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A "Novel" Screening Tool

A Picture of Me!

This book belongs to:

blue manatee press
Cincinnati, OH
www.blumaneatypress.com

Bonus guidance!


Copyright 2017, Dr. John S. Hutton
Printed by First Size Productions in the USA

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

PEDIATRICS
OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS


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).

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P1-2

Print Knowledge



P7-8

Phonological—Alliteration




P13-14

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 front cover of the book." Identifies front cover of book | ___ Y ___ N (0-1) ___ |
| 2) "This bookshelf has lots of things on it. Show me some words you can read." Identifies shelf with words on it | ___ Y ___ N (0-1) ___ |
| 3) "This garden has lots of letters. Show me the ones that you know." (Show once names 0 correctly, or names 2 in a row incorrectly) Number correctly named: _____ (0-2) ___ Number incorrectly named: _____ (Correct=incorrect: 0-2 points; 4-7: 1 point; 0-3: 0 points) | (0-2) ___ |
| 4) "These birds have letters on them. This letter is an M. What sound does M make?" ___ Y ___ N "This letter is a B. What sound does B make?" ___ Y ___ N "This letter is a P. 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 sun. Sun starts with /s/. Do any of these start with /s/? Ball, sand, paint?" ___ Y ___ N "This slide is red. Red starts with /r/. Do any of these start with /r/? Cat, boy, truck?" ___ Y ___ N (both correct: 1 point; 0-1 correct: 0 points) | (0-1) ___ (0-1) ___ |
| 6) "These are blocks. Which of these rhymes with blocks? Drum. Cat. Green. Socks." ___ Y ___ N "This is a truck. Which of these rhymes with truck? Frog. Black. Hat. Boat." ___ 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: /a/ /p/ /l/. (apple) ___ Y ___ N (0-1) ___ /m/ /e/. (meme) ___ Y ___ N (0-1) ___ (both correct: 1 point; 0-1 correct: 0 points) | (0-1) ___ (0-1) ___ |



Letter-Sound Knowledge

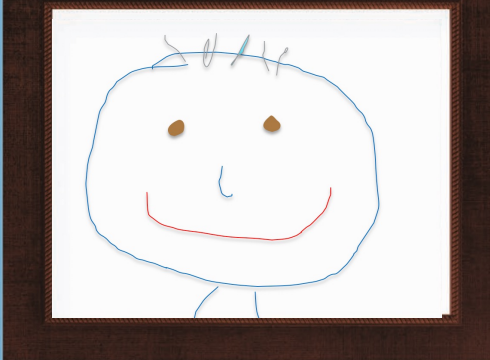
Phonological – Syllable Blending

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

Ordering/info:
 blue manatee press
<http://www.blue-manatee-press.com/>

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A Picture of Me!



This book belongs to: **ME!** ← (Emergent Writing)

blue manatee press
Cincinnati, OH
www.blue-manatee-press.com


Copyright 2017, Dr. John S. Hutton
Printed by Pint Size Productions in the USA

✓ A gift to share and practice at home!

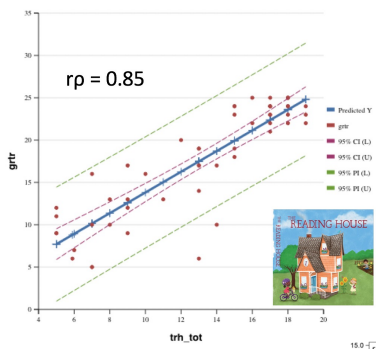
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Brain-Behavior Evidence

✓ **Test-retest reliability**
($r=0.94$)



“Gold Standard” Composite

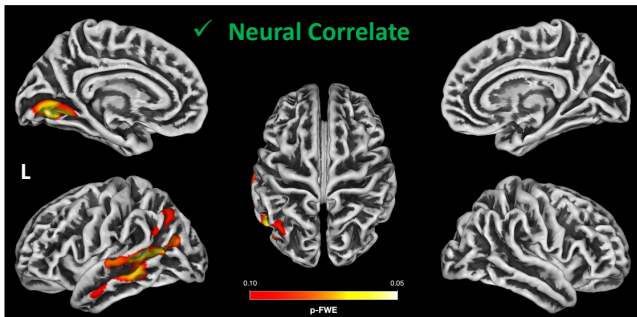


Validity

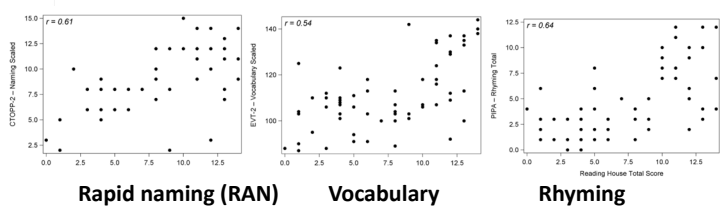
PEDIATRICS
OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

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

✓ **Neural Correlate**



Cortical thickness → “Reading Network”

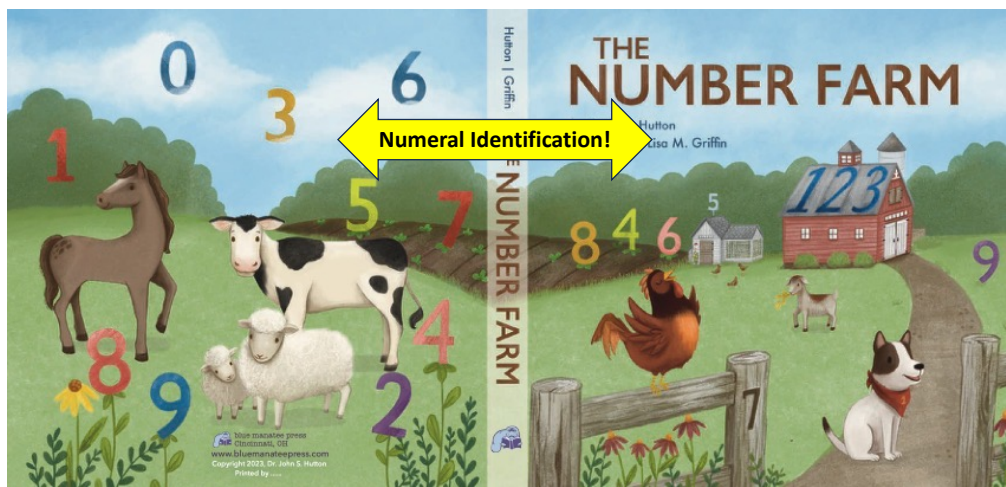


Rapid naming (RAN) Vocabulary Rhyming

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1, 2, 3...Numeracy!

Back Cover



Numerical Identification!

Front Cover

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

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Verbal Counting
P1-2

1-1 Counting/Subset
p3-4

Set Comparison - Most
P7-8

Number Order
p9-10

Basic Addition/Story Problem
P13-14

The Number Farm
Emergent Numeracy Screening Measure
Recommended Age: 3-5 years
Presentation Script & Scoring Form

Points

1. (Point to cows) "I have a book for you. What are those on the farm?"
(Point to numbers) "Call it 'numbers.'" Y ___ N ___ (0-1)
2. (No matter if correct) "Those are numbers. Show me the ones that you know."
Correctly named: ___ Incorrectly named: ___ (0-2)
(Correct - Incorrect; 0-3: 0 points; 4-8: 1 point; 9: 2 points)
3. "Point to the number one. Now, how about the number four?"
(Correctly points to neither: 0 points; 1 or 4: 1 point; 1 and 4: 2 points) (0-2)
4. (Scenes 1) "The animals are playing hide and seek. Can you help Farmer Dog count so she can find her friends? Count as high as you can!" (Stop once over 11)
(Counts none: 0 points; 1-3: 1 point; 4-10: 2 points; over 10: 3 points) (0-3)
5. (Scenes 2) "These are groups of different kinds of animals."
This is a horse. How many horses are there? (3) ___ Y ___ N ___
This is a pig. How many pigs are there? (1) ___ Y ___ N ___
This is a cow. How many cows are there? (2) ___ Y ___ N ___
This is a sheep. How many sheep are there? (4) ___ Y ___ N ___
(None correct: 0 points; 1: 1 point; 2: 2 points; 3: 3 points; 4: 4 points) (0-4)
6. (Scenes 3) "These animals are in groups and playing different games."
Match the number to the group with that number of animals in it."
(Matches none: 0 points; 1: 1 point; 2: 2 points; 3: 3 points; 4: 4 points) (0-4)
7. (Scenes 4) "The animals are ready for a snack. I see corn, apples and carrots. Yummy!
Which snack is the biggest? (corn) ___ Y ___ N ___
Which snack is the smallest? (apple) ___ Y ___ N ___
Are there more apples or carrots?" (carrots) ___ Y ___ N ___
(None correct: 0 points; 1: 1 point; 2: 2 points; 3: 3 points) (0-3)
8. (Scenes 5) "These noisy chickens have numbers on them!
Help Farmer Dog line them up in order."
Which number comes after 1 when counting? (2) ___ Y ___ N ___
Which number comes before 5 when counting? (4) ___ Y ___ N ___
(None correct: 0 points; 1: 1 point; 2: 2 points) (0-2)

Continued on Next Page -

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Numberals
p5-6

The Number Farm

Interior Page Spreads

- ✓ Score 0-28 points
- ✓ 11 items

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

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Preliminary Evidence

- N=31 children - mean age 50 months
 - 17 boys, 14 girls
 - Low-SES backgrounds
 - Administered during pediatric well-visits
 - Admin time: 8-10 minutes
- ✓ Strong psychometric properties
 - ✓ Cronbach's alpha = 0.89

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PAS 2023
WASHINGTON, D.C., APRIL 27 - MAY 1, 2023

Helpful to screen math skills in a doctor's office?

| | |
|----------------|----|
| No, not at all | 1 |
| Yes, somewhat | 15 |
| Yes, very | 15 |

Time required for screening

| | |
|------------|----|
| Too Much | 2 |
| A Bit Much | 3 |
| Just Right | 24 |
| Not Enough | 2 |

Helped learn about your child's early math skills?

| | |
|----------------|----|
| No, not at all | 1 |
| Yes, somewhat | 15 |
| Yes, a lot | 15 |

Want to work more with the child in numbers and math at home?

| | |
|----------------|----|
| No, not at all | 1 |
| Yes, somewhat | 12 |
| Yes, a lot | 18 |

“Gold Standard”

PENS Total Score by TNF Total Score

Concurrent Validity

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Intervention



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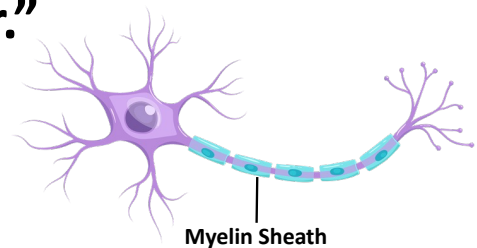


Donald Hebb

“Neurons that fire together, wire together.”

Whatever Is Practiced → Brain Wiring

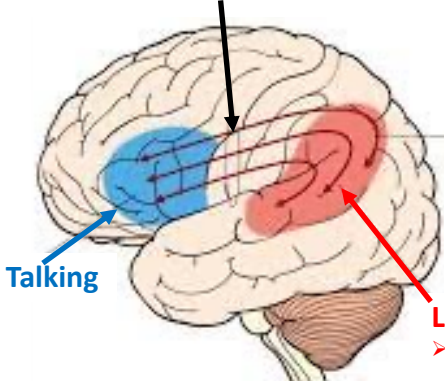
- ✓ Reading!
 - Listening
 - Talking (human vs. device reader)
- ✓ Math
- ✓ Art
- Watching videos
- Playing video games
- Singing “Baby Shark”
- Being handed a device to calm down...



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Language and Literacy Live on in Left side of the brain

White matter fiber tracts (“wires”)
 ➤ Mature 18-24 months (language “explosion”)



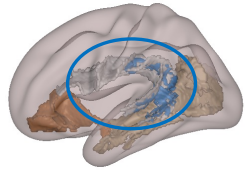
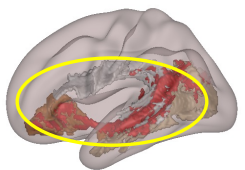
Build listening areas!

- ✓ 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

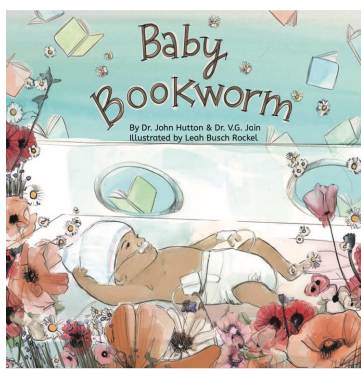
**More Screen Time:
Less Developed**
 ➤ Replaces talk

“Neurons that fire together, wire together.”


Source: Dr. John S. Hutton, Cincinnati Children’s Reading and Literacy Discovery Center, 2021.

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Shared Reading in the NICU



Soon we’ll go home,
and this will be true...



one day I’ll be the one
reading to you.

The JOURNAL of PEDIATRICS

Jain V, Kessler C, Lacinia L, Szumlas G, Crosh C, Hutton J, Neediman R, Dewitt T. Increasing parental reading behaviors in high-risk NICU infants. *J Pediatr.* Jan 13 2021.

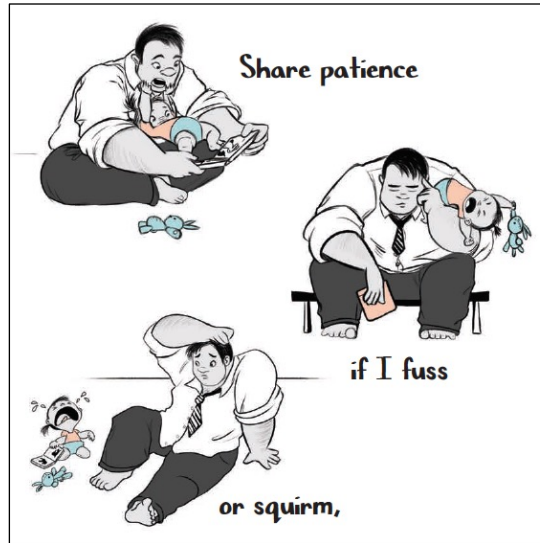
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HOW Do I Read “Right” with a Baby?

“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...”



43

SHARE Training Manual

Source: Hutton, et al.

| | |
|--|-------------------|
| | S nuggle |
| | H old |
| | A ffection |
| | R espond |
| | E njoy! |

Reading With Babies

| | |
|------------------|--|
| S tretch | |
| T alk | |
| E xplore | |
| P atience | |

Hutton JS, Huang G, Crosh C, DeWitt T, Ittenbach RF. Shared reading with infants: SharePR a novel measure of shared reading quality. *Pediatr Res.* 2022 Jul 19.

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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.

- Carga a tu bebé en el regazo.
- Ofrecele un libro; deja que lo sostenga y aprenda cómo funciona.
- Muéstrale afecto a tu bebé y que leer juntos es algo maravilloso.
- Presta 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.
- Relata a tu bebé lo que dicen las imágenes.
- Trata de explorar nuevos sonidos de palabras de maneras divertidas.
- Intenta permanecer en calma y ten paciencia si tu bebé se frustra.
- Ríete, 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.




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\$0.99




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Escrito por
el Dr. John Hutton

Este libro

Ilustrado por
Christina Brown



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HOW Do I Read "Right" with an Older Child?

- Is it rude for them 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?



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Stealthy Training Materials



Training Manuals




Demonstration Videos

Source: Hutton, et al. CCHMC MediaLab, 2021

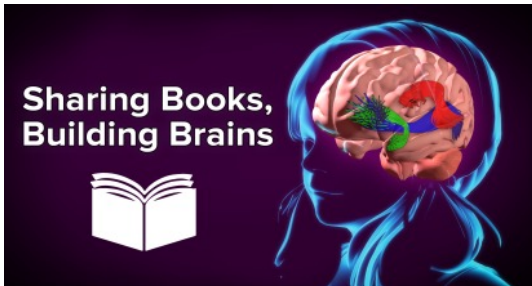
47

| | | |
|---|---|---|
| <p>PEER/CROWD...</p> | <p>p1-2: Completion</p> | <p>p3-4: Recall</p> |
| <p>p9-10: Wh-/Open-ended question • → Evaluation → Expansion</p> | <p>p5-6: Open-ended question</p> | <p>p7-8: Wh- question → Evaluation → Expansion</p> |
| | <p>p11-12: Wh- question → Evaluation → Expansion</p> | <p>p13-14: Distancing</p> |


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YouTube 


“How-to” Videos




Sharing Books,
Building Brains




Rx: Dialogic
X: Reading
Every day
Refills: ∞



SHARE
This book



Limite

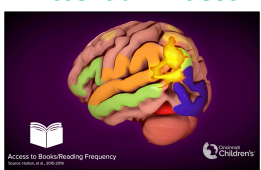
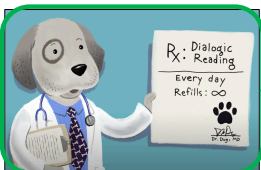



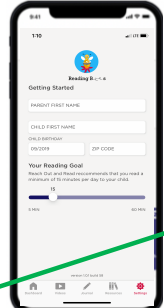
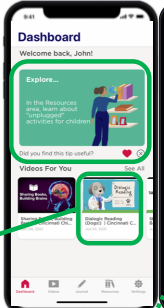
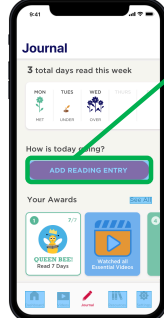
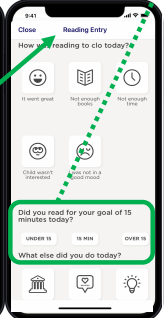

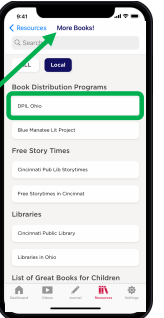
Stretch
puhh -
pee

Source: Hutton, et al. CCHMC MediaLab

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“Essential” Videos

















Reading Bees

“Books Build Brains and Bonds, Before Birth and Beyond!”

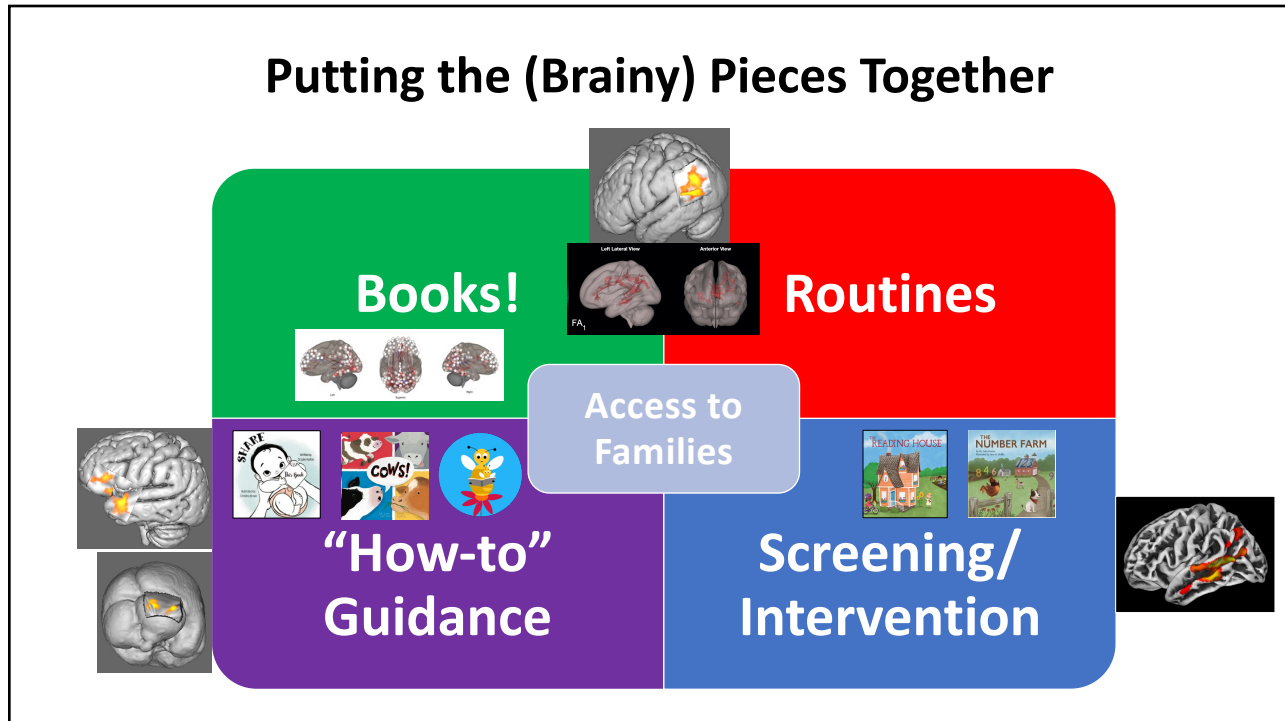
✓ Free iOS, Android



LitCoin!

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Thank You!

"Questions?"

children'shealth
UT Southwestern Medical Center

THE OHIO STATE UNIVERSITY
CRANE CENTER FOR EARLY CHILDHOOD RESEARCH AND POLICY

Read Baby Every Day

By Dr. John Hutton
Illustrated by Leah Busch

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