Research To Action Campaign

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Jason D. Yeatman, PhD, jyeatman@uw.edu
Assistant Professor
Institute for Learning & Brain Science
Department of Speech and Hearing Sciences
Director of UW Reading & Dyslexia Research Program
http://BrainAndEducation.com
Learning to read is at the foundation of academic success

• Learning to read -> Reading to learn
  – Reading skills in kindergarten are a strong predictor of academic achievement (and long-term health outcomes).

• Dyslexia, an impairment in accurate and fluent word recognition, is the most common learning disability (10-15% prevalence rate).

New legislation in Washington mandates early screening!

Measures of brain structure/function

Understanding the mechanisms of learning

The Virtuous Cycle Between Education and Neuroscience

Predict, personalize and improve education.

Reading instruction/intervention
Research to Action Campaign: Long-term goal

Establish a year-round clinic to facilitate the virtuous cycle between research and practice

UW Reading Disabilities Clinic
Research to Action Campaign: Short-term goal

Sustain and expand summer program

What have we learned in the past two years?

What will we do in the next two years?
What is different about the dyslexic brain?

• Efficient brain wiring is critical for skilled reading.
  – Brain regions specialized for processing visual, auditory and language information must rapidly communicate.
• Children with dyslexia show differences in brain connectivity.

*NASA – Super Computer*  
*Human Brain – Reading Circuitry*
Reading skills improve substantially and systematically during the intervention

- On average children go from the 10\textsuperscript{th} to 30\textsuperscript{th} percentile on measures of reading skills (~1 Grade level change).
- Some children increase 2-3 grade levels.
**Seeing Stars** intervention improves reading accuracy, speed and fluency

- Intervention prompts steady growth in reading **accuracy** and **speed**.
- Not just memorizing sight words -> learning to read.
- Improvements in **reading fluency**.
- No change over 3 months of “**business as usual**”.

![Graph showing population average and intervention score improvement over baseline and intervention periods for WJ BRS, WJ RF, and TOWRE metrics.](image-url)
Does the learning process reshape the brain’s reading circuitry?

Not just pictures:
New methods to measure and quantify brain connections.

http://yeatmanlab.github.io/AFQBrowser-demo

Measuring brain connections with diffusion MRI

- **An increase** in the density of brain wiring → **decrease** in diffusion.
Intervention induces significant and systematic changes in brain connectivity

• Changing the circuit not just teaching a new strategy.
Growth throughout an extensive network of brain connections

- Brain changes are widespread, not just localized to a single isolated brain region.
- These changes in brain anatomy track the learning process.
Research to Action Campaign: Short-term goal

Sustain and expand summer program

What have we learned in the past two years?

• Struggling readers show differences in brain connectivity compared to strong readers.
• Even in children with severe dyslexia, intensive interventions are highly effective.
• Reading intervention rapidly changes the underlying wiring of the brain’s reading circuitry.
  – Changing the brain not just teaching a compensatory strategy.
• Growth in brain connections occurs in synchrony with the learning process.
Struggling readers show differences in brain connectivity compared to strong readers.

Even in children with severe dyslexia, intensive interventions are highly effective.

Reading intervention changes the underlying wiring of the brain's reading circuitry.

– Changing the brain not just teaching a compensatory strategy!

These changes occur over an incredibly rapid time-scale.

Growth in brain connections occurs in synchrony with the learning process.

https://magazine.washington.edu/feature/dyslexia/
Research to Action Campaign: Short-term goal

Sustain and expand summer program

What will we do in the next two years?

What is the long-term growth potential after a short-term intervention?

Over time, do children catch up to their peers or need additional support?

What about children who struggle with reading comprehension?
Research to Action Campaign: Short-term goal

Sustain and expand summer program

What will we do in the next two years?

Can we scale this up to larger groups of students?

What are the critical components of the intervention for stimulating brain plasticity?

Can the brain data predict the optimal intervention dosage and detect neural signatures of remediation?
Thank you!