

Building Better Brains for Reading

What does the research offer classrooms?

(...following Dehaene's *Reading in the Brain* (2009))

Steve Wilkins
Carroll School
swilkins@carrollschool.org

OUTLINE FOR TODAY'S TALK:

1. This is your child.
2. Neuroscience reveals how typical brains read.
3. Neuroscience also shows us how the brains of dyslexics function for reading.
4. BUT! There is neuroplasticity!!
5. Good teaching restructures the reading brain.
6. HOW? Specific types of programs are shown to be more effective.

Four Essential Questions

Dr. John Gabrieli, MIT Neuro-imaging

1. What is dyslexia and what causes it?
2. What is the brain basis of dyslexia?
3. Can dyslexia be treated?
4. Can dyslexia be predicted and prevented?



Label the 4 lobes with their functions.

HOW DO WE READ?

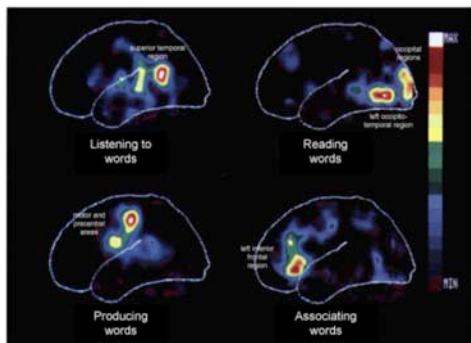


1. Initially, reading is a visual task.
2. Reading is a highly focused task in which our fovea can only focus on one or two words at a time.
3. The visual system extracts graphemes, syllables, prefixes, suffixes, and roots.
4. Information then heads in two directions, simultaneously: the phonological route and the semantic/lexical route.

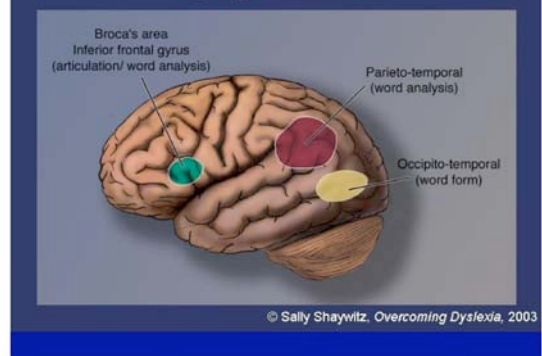
THE BRAIN'S LETTER BOX

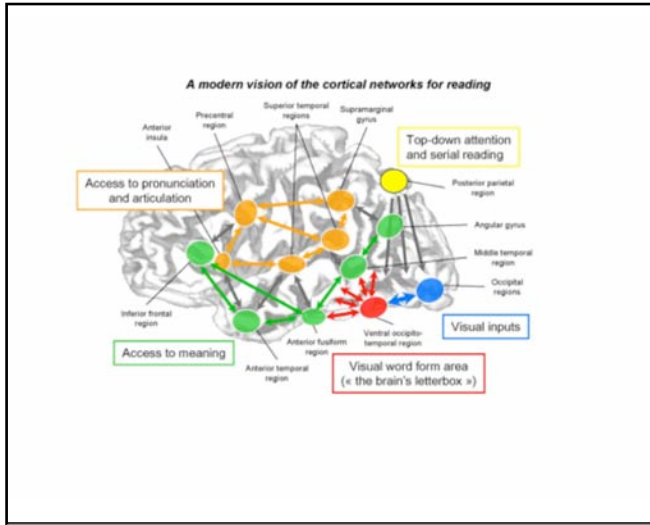
1. Dejerine- 1892- stroke affects reading system LH Visual
2. Modern Neuroimaging reveals this area is essential in reading that it may be called "The Brain's Letter Box"
3. Is that squiggle a letter or not???
4. VWFA (Occipito-Temporal) responds to the visual component of a letter or a word
5. Sends information to the temporal and frontal lobes which encode sound patterns and meaning

PET Scan- 1989 Raichle



Reading Systems in Brain





LEARNING TO READ

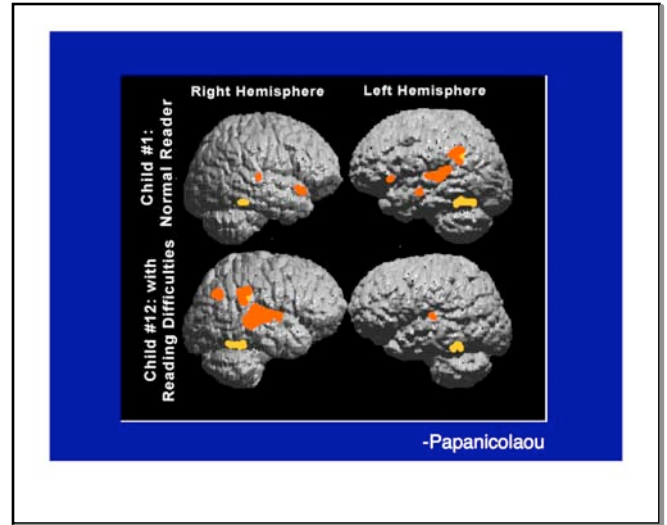
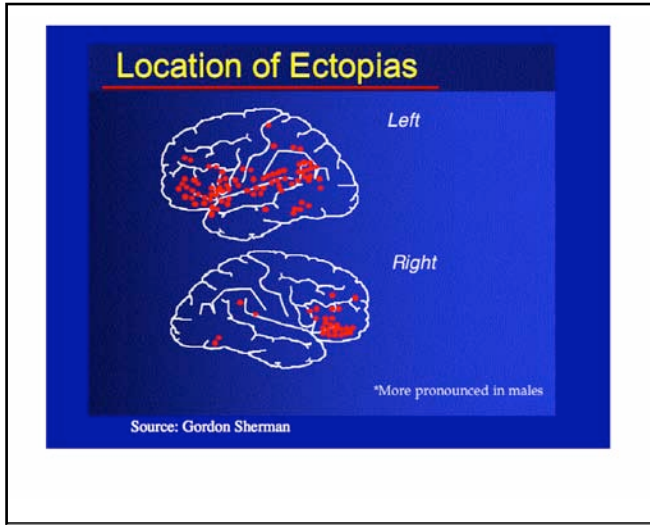
1. Two circuits must function in harmony: the object recognition system and the language system.
2. As we become good readers, brain activity changes, particularly in the Left Occipito-Temporal area.
3. We now understand two important elements of teaching reading:
 - (a) why whole language was so seductive
 - (b) why whole word approaches are so ineffective for students with LBLD.

THE DYSLEXIC BRAIN

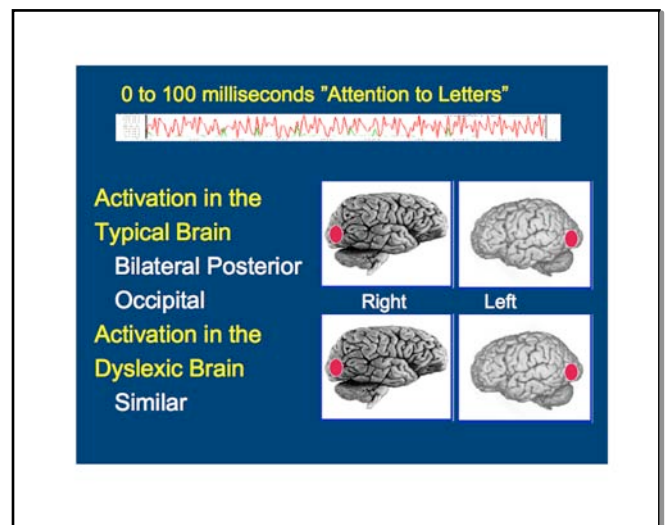
1. In most cases, dyslexia is the result of an inability to easily process phonemes.
2. An entire causal chain from gene to behavior is being described:
 - a. the anatomy of the temporal lobe is differently organized
 - b. its connectivity is altered
 - c. several regions are inadequately activated during reading
3. New remedial strategies are bringing new hope to the process of teaching children with dyslexia to read.

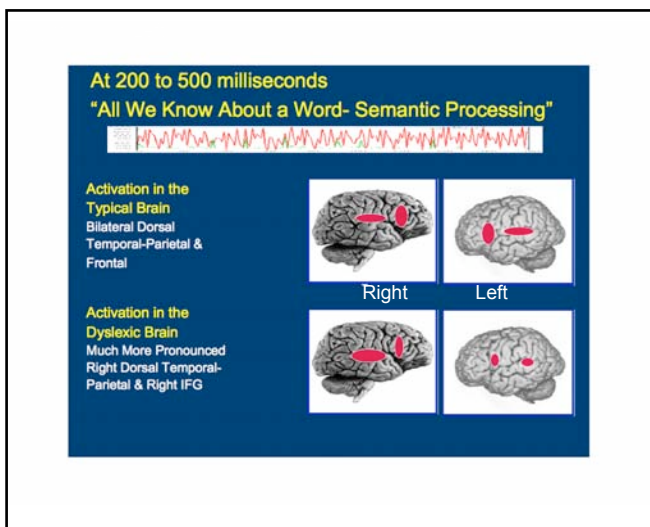
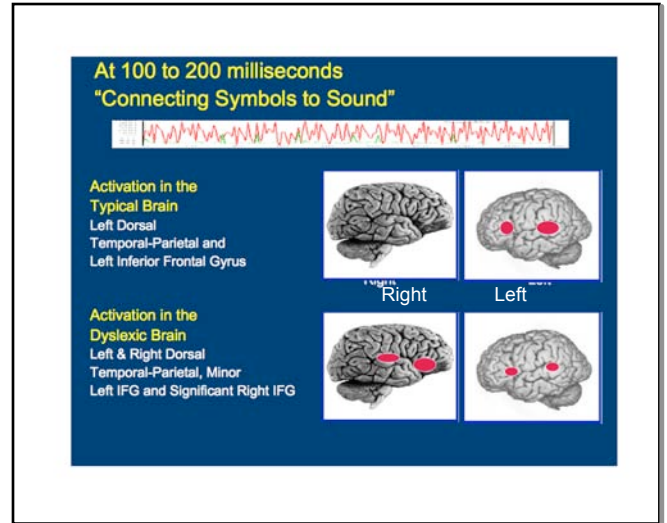
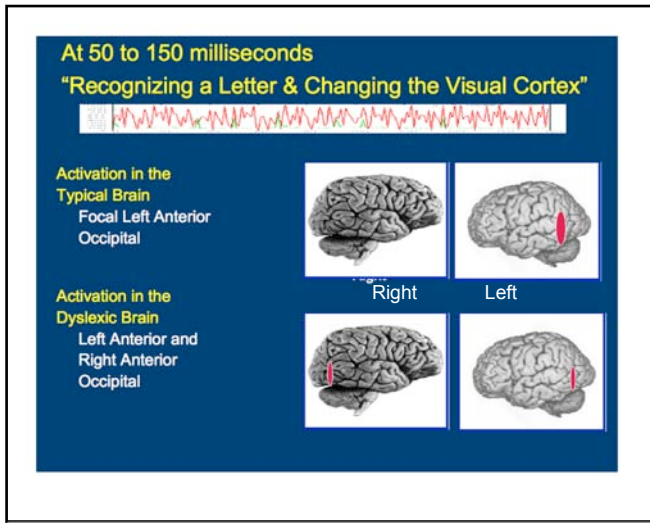
Neural Signature for Dyslexia: Disruption of Posterior Reading Systems

© Sally Shaywitz, *Overcoming Dyslexia*, 2003

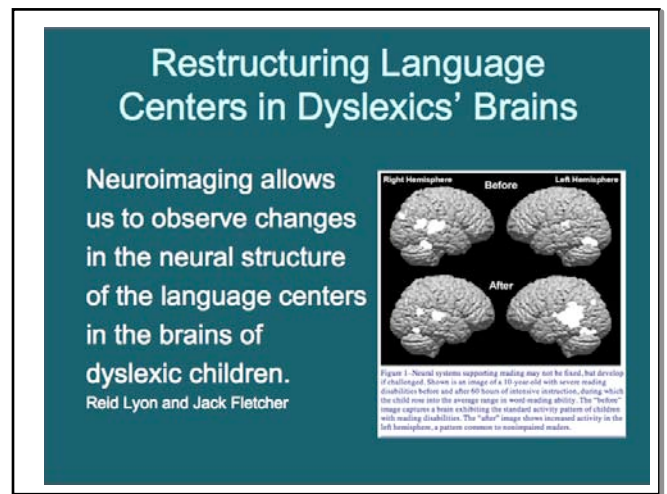
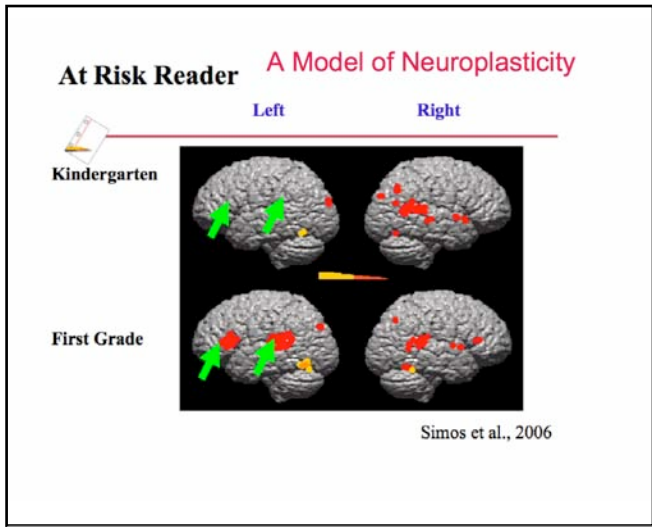


- ## PRIME SUSPECT: Lt Temporal
1. All brain imaging reveals under-activation in the left temporal region
 2. Over-activation in left frontal (compensation?)
 3. Occipito-temporal implicated down the road (letter box)
 4. No evidence whether VWFA is the cause or the result
 5. Magneto-encephalography reveals the nature of the double deficit in phonological and visual processing





- "Overcoming" Dyslexia**
1. No real cure
 2. Plasticity- genetics is not a life sentence
 3. Cognitive equivalent to reading glasses- possible?
 4. Rx-
 - a. increase phonemic awareness
 - b. intense and prolonged interventions
 - c. work to keep motivation to learn to read high
 - d. zone of proximal development
 - e. read!
 - f. active left temporal
 5. Brain imaging reveals radical compensation effects
 6. Research bears a significant message of hope



A good intervention will not just induce a child to respond.
 A good intervention will stabilize the behavior.
 Maintained.
 Generalized.

Interventions of Promise

Detailed description: This is a collage of images related to dyslexia and brain research. At the top left is a magazine cover for 'TIME Dyslexia'. Next to it is a brain scan. To the right is a group of people. Further right is a circular diagram with the text 'DYSLEXIA CAN AFFECT'. Below these are four smaller images: a colorful word cloud, a diagram of a brain with letters, a close-up of a person's face, and four brain scans labeled 'HEARING WORDS', 'SEEING WORDS', 'SPEAKING WORDS', and 'GENERATING WORDS'. The central text 'Interventions of Promise' is in a purple box.

Key Components of a K-8 Language Arts Program **Pre-Readers**

What should we do?

Key Components of a K-8 Language Arts Program **Beginning Readers**

What should we do?



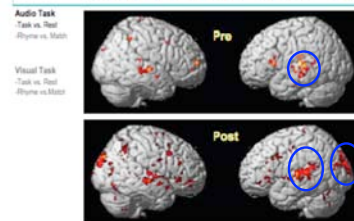
THE CENTER FOR **READING**
AND **LANGUAGE** RESEARCH

OG & RAVE-O

- Blended approach of conscientious phonics with a program dedicated to all the other features of language
- In the moment of a child's learning, put these four components of a child's learning to read:
 - Continuum of knowledge of every word
 - Multiplicity of meanings
 - Semantic Neighborhoods
 - Syntactic Flexibility

CARROLL SCHOOL OG/RAVE-O STUDY Maryanne Wolf, Tufts University

Auditory Rhyme > Rest $p < .005$
 $k > 5$



Key Components of a K-8 Language Arts Program

Off and Running Readers

What should we do?



Vertical & Horizontal Curricular Connectedness

Day to Day, Week to Week, Year to Year

Systematic, Diagnostic-Prescriptive Phonics

Fluency, Automaticity, Visual Cuing to Code

Literature, Expository Text, Comprehension, Vocabulary

Strategies- activate, search, question, structure, summarize