

## I Ain't Got My ABCs

*Early Reading Screening for Dyslexia & Literacy*

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 Courage to Risk Conference  
 Colorado

## Disclosures

- Dr. Tridas is a speaker for:
  - Eli Lilly
  - McNeil
  - Novartis
  - Shire
- Dr. Tridas is a consultant for:
  - Eli Lilly
  - McNeil
  - Novartis
- Dr. Tridas does research for:
  - Eli Lilly

## What Is Dyslexia?

*Definition & Neurobiology*

## What is Dyslexia?

- From the Greek
  - *dys* – difficulty, *lexia* – words
- Hereditary - Neurological
- Chronic
- Problems with reading and spelling
- Comprehension is better than expected
- Basic deficit is phonemic awareness
- Often accompanied by other challenges

## Dyslexia: Definition

- One of several distinct learning disabilities
- Neurobiological in origin
- Symptoms
  - Poor decoding and spelling abilities
  - Problems with accurate and/or fluent word recognition
  - Inconsistent with age and/or cognitive ability

## Dyslexia: Definition

- Etiology
  - Deficits in phonological processing
- Consequences
  - Poor reading comprehension
  - Poor vocabulary and general knowledge development

## Dyslexia: Facts

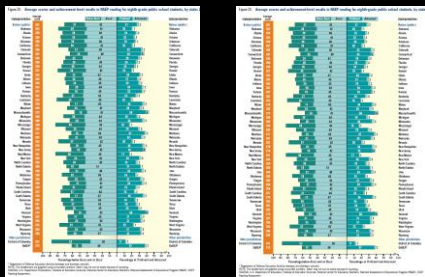
- Most common of the learning disabilities
- Affects 80% of the LD population
- Comorbidities
  - Attention (14-24%)
  - Mathematics
  - Written expression

## Dyslexia: Prevalence

- 13–14% of the school population qualifies for special education
  - 6-7 % are classified as learning disabled
    - 85% of LD students
- 2007: National Assessment of Educational Progress
  - 34% 4<sup>th</sup> graders read < basic and 68% < proficient levels
  - 27% 8<sup>th</sup> graders read < basic and 70% < proficient levels

[http://nces.ed.gov/nationsreportcard/pdf/main/2007/2007496\\_2.pdf](http://nces.ed.gov/nationsreportcard/pdf/main/2007/2007496_2.pdf)

## NAEP: Reading Report Card: 4<sup>th</sup> and 8<sup>th</sup> Graders



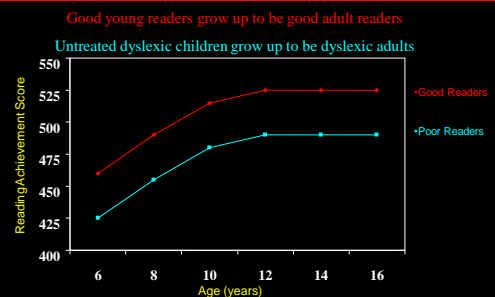
## Dyslexia: Myths

- Dyslexia is *not* a visual problem
  - Children see letters backwards
  - Children show mirror writing
- Dyslexia is *not* responsive to standard classroom teaching

## Poor Readers vs. Dyslexics

- Poor Readers
  - Do not have an atypical brain
  - Problems due to:
    - Lack of experience
    - Poor environmental stimulation
      - Causes poor vocabulary and phonological processing
  - Weak phonological system affects decoding
  - Poor vocabulary affects comprehension
  - Respond quickly to intervention

## Dyslexia: The Obvious Outcome



## Early Intervention Is Urgent

- **10<sup>TH</sup> %ile 5<sup>th</sup> Grade reader**  
-50,000 words/year
- **50<sup>TH</sup> %ile 5<sup>th</sup> grade reader**  
-600,000 words/year
- **Average readers read 10 TIMES as much as poor readers in a year**

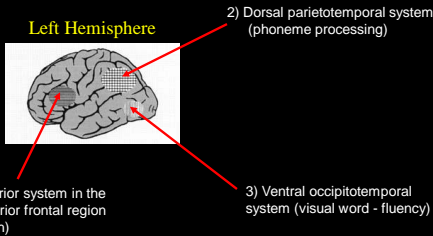
Percentile Rank	Minutes Per Day		Words Read Per Year	
	Books	Text	Books	Text
98	65.0	67.3	4,358,000	4,733,000
90	21.2	33.4	1,823,000	2,357,000
80	14.2	24.6	1,146,000	1,697,000
70	9.6	16.9	622,000	1,168,000
60	6.5	13.1	432,000	722,000
50	4.6	9.2	282,000	601,000
40	3.2	6.2	200,000	421,000
30	1.8	4.3	106,000	251,000
20	0.7	2.4	21,000	134,000
10	0.1	1.0	8,000	51,000
2	0	0	0	8,000

Anderson, Wilson & Fielding 1988

## Neurobiology of Dyslexia

What happens in the brain?

## Dyslexia: Neurobiology



Shaywitz (1998)

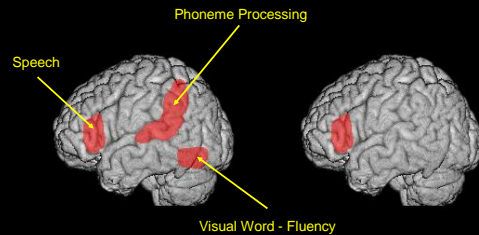
## Dyslexia: Neurobiology

- **Failure of left hemisphere posterior brain systems**
  - **Language system**
    - Word analysis system: *Parieto-temporal region*
      - Phoneme processing (individual units)
      - Requires attention
      - Slow processing
    - **Visual System**
      - Whole word system: *Occipito-temporal area*
        - Whole word processing
        - Fast processing

## Dyslexia: Neurobiology

- **Occipito-temporal area**
  - Visual word
  - Rapid/automatic
  - Engaged when the word is not consciously perceived
  - Predominates in skilled readers
  - **Binds together as a unit orthographic, phonologic and semantic features of a word**
  - *Controls fluency*

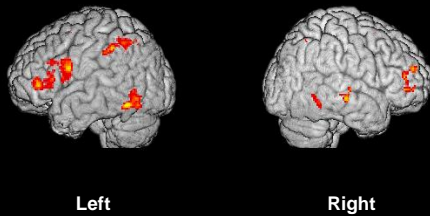
## Dyslexia: Neurobiology



Typical Readers

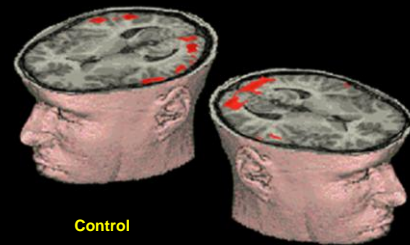
Dyslexic Readers

## Typical Readers: Elision versus Repetition



Eden et al., 2004

## Dyslexia: Neurobiology



Eden et al., Nature 1996

## Neurofunctional Impairment

## Dyslexia: Etiology

- Language problem specific to the *Phonologic Module*
  - Functional part of the brain where
    - Sounds of language (phonemes) are put together to form words
    - Words are broken down into their elemental sounds (phonemes)
    - Words are discriminated from noise
  - Learning to read is not natural

## Phoneme: Definition

- The basic units of sound in a language by which morphemes, words, and sentences are constructed
- The 40 - 52 phonemes of the English language can combine to form thousands of words
- Words must be broken into their phonemes before they can be recognized by the language system
- *Deficits in phonology strongly correlate with reading problems*

## The Particulate Principle and Phonemes

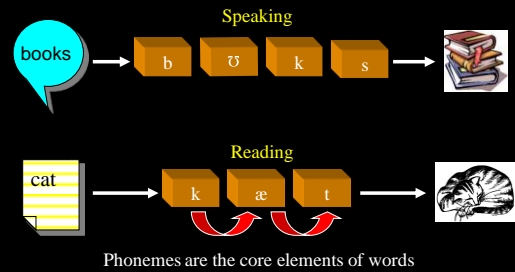
- Particles create open ended hierarchical systems
  - i.e. nucleotides in DNA, atoms in elements
- Particles don't change
- Particles combine to create new elements but maintain their original properties
  - Phonemes combine into morphemes
- Elements blend

Shaywitz (2003)

## Co-articulation

- The ability to compress and overlap several phonemes into a single sound burst
  - Speech sounds are unsegmented
- Allows sound to be compatible with the capacity of the auditory system (working memory)
  - 1 to 2 secs. (5 – 7 words before it leaves short term memory)
- Brain
  - Distinguishes speech from noise
  - Attends to meaning not specific sounds in words

## Dyslexia: Phonology



## Language Development

- Essential elements for *Reading, Spelling & Writing*
  - Phonology
  - Semantics
  - Syntax

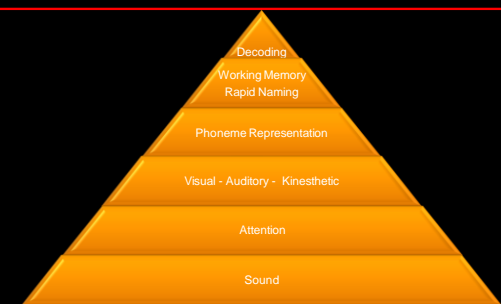
## Phonologic System

- Processing and production of speech sounds
- Earliest language system to develop
- It is natural – does not have to be taught
- It is the foundation of language

## Phonologic System

- Requires attention – arousal
- Each sound combines essential sensory features
  - Auditory
  - Visual
  - Kinesthetic

## Phonologic System



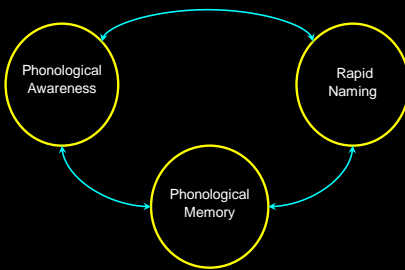
## Other “PHON” Words

- Phonological Awareness
  - Recognition that language is comprised of sound chunks
- Phonemic Awareness
  - Ability to appreciate and manipulate individual sounds in words
    - e.g., blending - segmenting
- Phonics
  - A skill that must be taught
  - It is not phonemic awareness

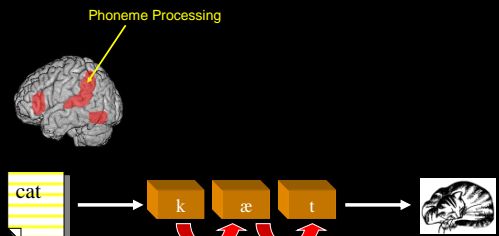
## Working Memory

- Requires holding data while doing something else
  - Sounding out a word
  - Reading a paragraph

## Phonological Processing Deficits



## Reading: Neurobiology Phonological processing



## Retrieval Fluency and Reading

- Rapid naming = precision
- Compensatory strategies
  - Circumlocution
  - Word substitution - synonym

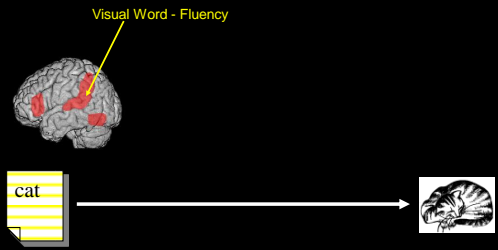
## Rapid Naming

- Efficient retrieval of phonological long-term memory
  - Phonemes of word pairs
  - Pronunciation of word segments
  - Pronunciation of whole words
- Affects reading fluency
- Requires processing of visual and phonological information

### Fluency

- The ability to read text
  - Quickly
  - Accurately
  - With good understanding
- The hallmark of a good reader

### Reading: Neurobiology Visual - Fluency



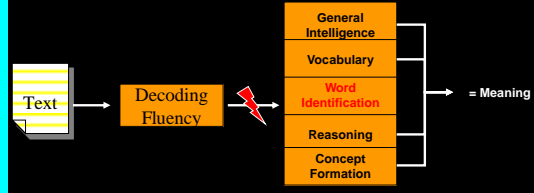
### Reading Disability

$$(D \times F) + C = \text{Reading}$$

- D = Decoding
- F = Fluency
- C = Comprehension

M. Jash; IDA National Conference November 2004

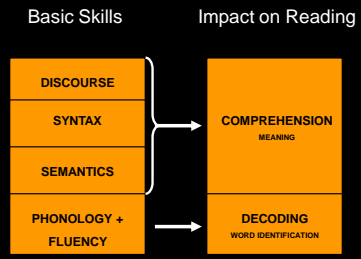
### Reading Disability



### Reading Process: Basic elements



### Reading Process



## Early Identification

What to look for

## Early Signs of Dyslexia

- By age of onset:
  - Delay in speaking
  - Difficulty in pronunciation
  - Insensitivity to rhyme
  - Poor word retrieval or word finding
  - Naming the letters and their sounds

## Early Signs of Dyslexia

- **Infants and toddlers**
  - Delay in speaking
    - *First word by 1 year*
    - *Phrases by 18 - 24 months*
    - *Parents may ascribe it to family history*
      - Speech delay *and* dyslexia are familial

## Early Signs of Dyslexia

- **Preschool years**
  - Difficulty in pronunciation
    - No "baby talk" by 5 or 6 years of age
    - Typical problems:
      - *What to listen for*
        - » Omission of initial sounds: *lephant for elephant*
        - » Inverting sounds: *aminal for animal*

## Early Signs of Dyslexia

- **Preschool years**
  - Insensitivity to rhyme
    - Unable to recite nursery rhymes
      - *Children that remember nursery rhymes tend to be good readers*
    - Unable to differentiate between similar and different words
      - Can not focus on parts of the words
        - » What rhymes with: *food, talk*

## Early Signs of Dyslexia

- Poor word retrieval or word finding
  - *Talking around a word (circumlocution)*
  - *Uses words like "stuff" or "things"*

### Early Signs of Dyslexia

- Naming the letters and their sounds
  - Before entering Kindergarten
    - Knows the names of upper and lower case letters
  - Before entering 1<sup>st</sup> grade
    - Knows the names and sounds of letters
    - Alphabetic principle
      - Sequence of letters = number and sequence of sounds
    - Matches beginning sounds of words
    - Pronounces beginning sounds of words
    - Counts phonemes in small words

### Early Signs of Dyslexia

- Typical development
  - 4 – 6 y/o aware that words come apart
  - 6 y/o 70% can count phonemes in small words
- Early signs of dyslexia
  - After 1 year of reading instruction (end of 1<sup>st</sup> grade) can't separate sounds of spoken word

### Common Signs of Dyslexia

- Problems with:
  - Phoneme segmentation
  - Phoneme deletion
  - Specific word retrieval (i.e. tornado for volcano, prostitute for prosecute)
  - Rapid word retrieval

### History Screening: Infancy

	Y	N
• Single words by 1 yr	<input type="checkbox"/>	<input type="checkbox"/>
• Phrases by 2 yrs	<input type="checkbox"/>	<input type="checkbox"/>
• Family history of language or reading problems	<input type="checkbox"/>	<input type="checkbox"/>

### History Screening: Preschool

End of K – 4	Y	N
• Omission of sounds <ul style="list-style-type: none"> <li>– Eliminates initial sounds (i.e., -lephant for elephant, chi-en for chicken)</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>
• Inverts sounds (aminal for animal)	<input type="checkbox"/>	<input type="checkbox"/>
• Insensitivity to rhyme <ul style="list-style-type: none"> <li>– Can't tell if words rhyme</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>
• Does not know lower case alphabet	<input type="checkbox"/>	<input type="checkbox"/>

### History Screening: Kindergarten

By the end of year <b>CAN NOT:</b>	Y	N
• Name upper and lower case alphabet	<input type="checkbox"/>	<input type="checkbox"/>
• Name most letter sounds	<input type="checkbox"/>	<input type="checkbox"/>
• Match beginning sounds to words	<input type="checkbox"/>	<input type="checkbox"/>
• Pronounce beginning sounds of words	<input type="checkbox"/>	<input type="checkbox"/>

## History Screening: 1<sup>st</sup> Grade

- By the end of year **CAN NOT**:*
- |  | Y                        | N                        |
|--|--------------------------|--------------------------|
| • Can separate and / or count sounds in a word | <input type="checkbox"/> | <input type="checkbox"/> |
| • Find the right words                         | <input type="checkbox"/> | <input type="checkbox"/> |

## Screening Test: End of 1<sup>st</sup> Grade

- |                                    | P                     | F                     |
|------------------------------------|-----------------------|-----------------------|
| • Alphabetic principle             |                       |                       |
| – Reads the words accurately       | <input type="radio"/> | <input type="radio"/> |
| – Names beginning letters of words | <input type="radio"/> | <input type="radio"/> |
| – Names beginning sounds of words  | <input type="radio"/> | <input type="radio"/> |
| – Names ending letters of words    | <input type="radio"/> | <input type="radio"/> |
| – Names ending sounds of words     | <input type="radio"/> | <input type="radio"/> |
| – Can tell # of sounds in a word   | <input type="radio"/> | <input type="radio"/> |

## Screening Test: K.5 and 1<sup>st</sup> Grade

- |                               | P                     | F                     |
|-------------------------------|-----------------------|-----------------------|
| • Rhyming                     |                       |                       |
| – Say a word that rhymes with |                       |                       |
| • Food                        | <input type="radio"/> | <input type="radio"/> |
| • Walk                        | <input type="radio"/> | <input type="radio"/> |

## Evaluation Process

*Where do I refer?*

## Referral for Evaluation K – 1<sup>st</sup> Professionals

- School Psychologist
- Speech and Language Pathologist
- Clinical Psychologist
- Tutor – Educational / Reading Specialist
- Physician experienced in the field

## Referral for Evaluation K – 1<sup>st</sup> Phonological Processing

- Comprehensive Test of Phonological Processing (CTOPP: 5y/o – Adults)
- Lindamood Auditory Conceptualization Test (LAC: K – 6<sup>th</sup>)
- Test of Phonological Awareness (TOPA: K – 2<sup>nd</sup> grade)
- Phonological Awareness Test (PAT: 5y/o – 7y/o)

## Referral for Evaluation K – 1<sup>st</sup> Reading Readiness

- Reading Words
  - Woodcock – Johnson Achievement (W-J III-A)
  - Weschler Individual Achievement Test (WIAT)

## Referral for Evaluation After K and 1<sup>st</sup> Grade

- Reading Fluency
  - Gray Oral Reading Test (GORT-IV, Oral Reading)
- Reading Comprehension
  - GORT-IV (Oral Reading)
  - W-J III-A (Silent Reading, Cloze procedure)
  - WIAT-II (Silent Reading)
  - KTEA (Silent Reading)

## Intervention

What to do about it.

## Teaching the Dyslexic Child

- Systematic and direct instruction in:
  - Phonemic Awareness: identifying and manipulating the sounds
  - Phonics: sound – symbol association
  - Fluency Training
  - Enriched Language Experience
  - How to apply these skills in reading and writing

## Dyslexia: Management

- Critical to start before 3<sup>rd</sup> grade
- It is almost impossible to remediate after 4<sup>th</sup> grade

## Dyslexia: Phonological-Based Management

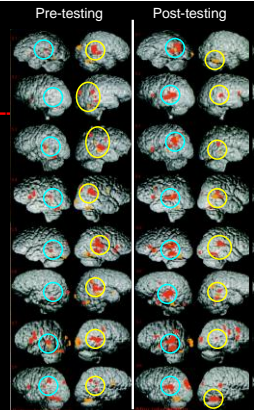
- Frequently delivered using a “multisensory approach”
- **Examples:**
  - Lindamood-Bell
  - Phono-Graphix
  - Orton-Gillingham
  - Slingerland
  - Wilson
  - Language!

## Fluency Intervention

- Home
  - Great Leaps Reading ([www.greatleaps.com](http://www.greatleaps.com))
  - Reading Naturally
  - ReadIt ([www.readingassistant.com](http://www.readingassistant.com))
  - Practices for Developing Accuracy and Fluency ([www.nehaus.org](http://www.nehaus.org))

## Dyslexia: Management

Dyslexia-specific  
brain activation  
profile becomes  
normal following  
successful remedial  
training



Simos, Fletcher, et al. Neurology, 2002

The ~~dnE~~ ~~nEd~~ ~~bnf~~

We're DONE !