DYSLEXIA 101: IDENTIFICATION AND TREATMENT
Dyslexia 101: Overview

- Relevance
- Identification
  - Definition
  - Cognitive Profile
  - Neuroanatomy
- Assessment
  - School Based
  - Outpatient Psychological
  - Cultural & Linguistic Considerations
- Intervention
Prevalence

- Dyslexia is the most common of learning disabilities (Fletcher et al., 2007)
- Estimated to be as high as 17.4% in the school-age population (Shaywitz, 2004)
- 80-90% of children in special education receive services for reading problems (Lerner, 1979)
Psychiatric Comorbidity

Figure 1. Prevalence of comorbid diagnoses in females and males with and without RD.

(Willcutt & Pennington, 2000)
Effects on Parental Well-being

“Higher parental distress" when compared to other parents due to “...the perception of having a ‘difficult' child” (Bonifacci, Montuschi, Lami, and Snowling, 2014)

- Time spent on homework
- Negative feedback from teachers
- Resources on remediation
- Resistance from child
Identification
Common Myths About Dyslexia

- Letter/number reversal
- Parents are not providing high interest books, time to read, or a quiet environment
- Parents are not reading to children at home
- Children will “catch up” with standard teaching methods
Definition of dyslexia

“Dyslexia is a specific learning disability that is...

- Neurobiological in origin,
- Characterized by difficulties with accurate and/or fluent word recognition and by poor spelling and decoding abilities,
- Typically result from a deficit in the phonological component of language, and;
- Unexpected in relation other cognitive abilities and the provision of effective classroom instruction.”

G. Reid Lyon (1995) & later revised by the International Dyslexia Association
Reading Skill Deficits

- **Word recognition:**
  - Deficit in single-word reading/decoding
  - Involves difficulties with phonological processing
  - Synonymous with dyslexia
- **Fluency:** reading rate-deficit
- **Comprehension:** deficits in the ability to understand sentences and passages, identify themes
Key Cognitive Correlate: Phonological Processing

- A metacognitive understanding that words have internal structures based on sounds
- Characterized by difficulties applying phonological rules that relate graphemes to phonemes
  - **Grapheme**: a fundamental unit in a written language
  - **Phoneme**: the smallest segmental unit of sound
Phonological Processing

- Phonological Awareness
  - Blending
  - Segmentation
  - Substitution
  - Syllable awareness
  - Rhyming
Phonological Processing

- Rapid automatized naming of letters and digits
  - Predictive of word recognition skills at the end of first grade
- Phonological memory, working memory for verbal and/or acoustic information

![Fig. 9](image)

![Fig. 10](image)

![Fig. 11](image)
Cognitive Profile of Children with Dyslexia

Shaywitz, 2004 (left); Fletcher et al., 1999; Wood, Felton, Flowers, & Naylor, 1991 (right)
Phonemes are organized and integrated into complex patterns (words) anterior to the auditory cortex.
Neural Correlates of Dyslexia

- Cortical regions associated with reading
  - Temporoparietal region
  - Occipitotemporal region
  - Inferior frontal gyrus
- Subcortical regions
  - Corpus callosum

Pugh et al., 2010; Fletcher, Lyon, Fuchs, & Barnes, 2007

Demonet, Taylor, & Chaix, 2004
Cerebellar Anatomy in Children with Dyslexia

- Reduced volume bilaterally in the anterior lobe of the cerebellum relative to typical readers (Fernandez, Juranek, Stuebing, & Fletcher, 2013)

Figure 1a-c

Parcellation Units

1a: Coronal plane  
1b: Sagittal plane  
1c: Axial plane

- Green: Anterior Lobe  
- Blue: Posterior/ Superior Lobe  
- Red: Posterior/ Inferior Lobe  
- Pink: Corpus Medullare Lobe
Probabilistic Tractography

- Greater FA:
  - Cerebellar-IFG
  - Cerebellar-TP
- Cerebellar-OT tracts divergent in children with dyslexia
  - Younger = decreased FA
  - Older = increased FA
- Changes driven by decreases in RD

Fernandez, Juranek, Romanowska-Pawliczek, Stuebing, Williams, & Fletcher, 2015)
Assessment
Assessment Models

- **Aptitude-Achievement Discrepancy**
  - Significant discrepancy between achievement and intellectual ability

- **Intraindividual Differences Model**

- **Response to Intervention (RTI)**
  - Struggling students should receive intervention and monitoring before considered LD
  - Aim is for all students to be monitored from start
Outpatient Assessment

- Necessary when school-based assessment and intervention is insufficient

Comprehensive approach:
- Integrates:
  - Normative deficits
  - Strengths and weaknesses
  - Cognitive correlates
- Provides individualized remediation strategies
- Takes into account cultural and linguistic factors
Diagnostic and Statistical Manual of Mental Disorders, 5th Ed. (DSM-5): Specific Learning Disorder

A. Difficulties learning and using academic skills… for at least 6 months, despite provision of interventions.
   1. Inaccurate or slow word reading
   2. Difficulty with reading comprehension
   3. Difficulty with spelling, etc.
DSM-V Criteria

B. Academic skills are substantially and quantifiably below those expected for individual’s chronological age, and cause interference with academic or occupational functioning

C. Difficulties begin during school age years (but may not be evident until demands surpass capacities)
DSM-V Criteria

D. Not better accounted for by intellectual disability, uncorrected visual or auditory acuity, other mental or neurological disorder, psychological adversity, lack of proficiency in language of instruction, or inadequate instruction.

…to rule out these causes, assessment must be comprehensive.
Linguistic Considerations

- 73% of Hispanic children over the age of 5 speak Spanish at home despite speaking English "very well"
  
  US Census, Profile America Facts for Features: CB16-FF.18  October 12, 2016

- As of 2014, 74% of LAUSD students are Latino

- Of students that are English learners, more than 93 percent speak Spanish as their primary language
Linguistic Considerations

○ Similarities
  • Phonological awareness associated with reading skill in both monolingual English and bilingual readers (Riches & Genesee, 2006; Lesaux et al., 2008; Erdos et al., 2010)
Linguistic Considerations

- Differences
  - English learners draw from their native language when learning to read
    - Transfer errors in single-word reading are normative (e.g. “have” is pronounced as “av-vey”) (Langer, Bartolome, Vasquez, & Lucas, 1990)
  - Reading comprehension is influenced by:
    - “Funds of knowledge” (Gonzalez, Moll, & Amanti, 2005)
    - Oral language abilities in target language (August & Shanahan, 2008)
Intervention
Intervention

- **Structured, explicit and intensive interventions** have shown significant improvement in word recognition
- **Strategies should be provided**
  - One-on-one
  - Small group
- **For reading fluency,** oral reading > silent
- **Intervention for word recognition** shows transfer to comprehension and fluency (although gains are often smaller)
Intervention Programs

- Lindamood-Bell Instruction for Reading and Comprehension: https://lindamoodbell.com/

- IMSE Orton-Gillingham Certified Providers: https://www.orton-gillingham.com/

Individualized Intervention

- Association of Educational Therapists: https://aetonline.org/find-et-home
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