

## **Demystifying Dyslexia: Hints for the Ophthalmologist**

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**Purpose/Relevance:** Response to a recent AAPOS member survey demonstrated that many members are not entirely comfortable evaluating a child with learning disabilities/dyslexia. A majority felt they did not receive specific education regarding learning disabilities in their training. Appropriate concern/recognition, evaluation and referral for learning disabilities should be an integral part of the ophthalmologist's regiment.

**Target Audience:** Medical students, residents, fellows, ophthalmologists, orthoptists

**Current Practice:** Pediatric ophthalmologists have varied experience and training in evaluating/recognizing those children at risk for learning disabilities/dyslexia, though we are often referred these patients for a vision assessment. Though pediatric ophthalmologists are aware that dyslexia is a learning disorder and not a visual disorder, more specific information and evaluation must be provided to patients and families.

**Best Practice:** Learning Disorders/dyslexia can be recognized in young children while there is still brain plasticity and when interventions are more likely to be effective. Pediatric ophthalmologists should be aware of the tools and diagnostics available to enable them to best evaluate these children at risk for dyslexia. They should provide appropriate referrals and references for the children at risk and be aware of the associated comorbidities.

**Expected Outcomes:** Clinicians will become familiar with:

1. Better understanding of dyslexia and recent advances in dyslexia research
2. Evidence based and practical strategies for identification of learning disorders
3. Increased awareness of learning disabilities and their comorbidities so as to better evaluate and advocate for patients and families.

**Format:** Completely revamped/reformatted didactic lecture with question/answer forum and panel discussion.

**Summary:** This workshop will aid the provider with a better understanding of dyslexia, its comorbidities and social implications and provide helpful clinical hints for identification and evaluation for those at risk. Recent advances in dyslexia research will be discussed as well as updated resources and references.

- 1) Case scenario
  - a) How to approach child and family
    - i) History
      - (1) General: how is school going?
      - (2) Specific History
        - (a) Any family hx of reading or vision problems
        - (b) Speech delay
        - (c) Speech articulation problems
        - (d) Trouble hearing sounds
        - (e) Difficulty with rhymes
        - (f) Confusing words that sound alike
        - (g) Difficulty learning names/sounds of letters
        - (h) Separating & blending the sounds
        - (i) Sounding out words
        - (j) "Talk around a word"
        - (k) Sight word recognition
- 2) What is Reading
  - a) Reading is the complex process of extracting meaning from written symbolic characters
- 3) Oral Language Development
  - a) The ability to speak is pre-wired into human brain development
  - b) Speaking develops naturally
  - c) Foundation for reading
- 4) Reading is not Innate
  - a) Reading is a process that requires ACTIVE learning
    - i) NOT pre-wired into human brain
  - b) Reading is more difficult than speaking
- 5) Eye Movements
  - a) Smooth Pursuit
    - i) Slow eye movements
    - ii) Smooth pursuit is not involved in reading
  - b) Saccades
    - i) Small jumping eye movements used in reading
- 6) Saccades
- 7) Saccades and Fixations
- 8) Reading is a sequence of
  - a) Saccades
    - i) Move eyes to next point of fixation
  - b) Fixations
    - i) Gather information during fixations
    - ii) Fixations are 90% of reading time
    - iii) Short words are read with one fixation

- iv) Longer words with multiple fixations
  - v) Variable depending on reading skill level
- 9) Mature reader:
- a) Forward saccades - 85% of saccades
  - b) Average length of adult saccade is eight letters
  - c) Backward saccades - 15% of saccades
  - d) Half the distance of forward saccades
  - e) Used for verification & comprehension
  - f) Increase with difficulty of text
  - g) Used to jump to next line
- 10) Children, early or dyslexic readers
- a) Show similar saccadic eye movement and fixation patterns
  - b) Saccades - 1/2 length of adult
  - c) More backward saccades than adult
  - d) Fixation is twice as long and twice as often
- 11) Eye movement differences between dyslexic and typical readers are the result, not the cause, of their dyslexia
- a) As reading ability improves their movements become more typical
  - b) Training saccades does not improve reading
- 12) "tracking problem"
- a) Many parents are fixated on "tracking problem"
  - b) Common concern from school nurses, teachers, parents
  - c) Observation of skipping words or lines, searching page for familiar sight words
  - d) We do not "track" when we read
  - e) Fluent reading is NOT based on "eye tracking"
- 13) Reading
- a) Two major components of reading: decoding and comprehension
    - i) Phonological weakness interferes with decoding
    - ii) Higher abilities necessary for comprehension are intact
  - b) Reading requires very specific skills
  - c) Oral language comprehension
    - i) Phonologic awareness
      - (1) Phonics
      - (2) Phonemes
      - (3) Rapid Automatic Naming
  - d) Orthographic processing
    - i) Recognizing features of letters and words
- 14) True vision problems in children
- a) Refractive errors
  - b) Symptomatic convergence insufficiency
  - c) True accommodative insufficiency
- 15) Necessity of Ocular Exam

- a) VA Distance & Near
  - b) Stereopsis
  - c) Convergence:
    - i) NPC (near point of convergence)
    - ii) Convergence Amplitude
    - iii) Ability to sustain convergence
  - d) Accommodation
    - i) NPA (near point of accommodation)
    - ii) Dynamic Retinoscopy
      - (1) Critical: must be done prior to dilation
    - iii) Accommodative Amplitude
    - iv) Accommodative Facility
  - e) Ocular Alignment & Motility
  - f) External Ocular & Dilated Retinal examination
  - g) Cycloplegic Refraction
    - i) Cannot simply autorefract dry, risk of missing high hyperope
- 16) Dyslexia and Learning Disabilities
- a) Neurologically-based processing problems with producing, processing and storing information
  - b) Life-long conditions
  - c) Goal is to support, not cure
- 17) Specific Learning Disabilities
- a) Reading: Dyslexia and/or specific reading comprehension deficit
  - b) Math: Dyscalculia
  - c) Writing: Dysgraphia
  - d) Specific learning disabilities may be in conjunction with other behavioral, comprehension, social, motor, listening, and/or organizational skills
- 18) Definition of Dyslexia: Public Law No 115-391. signed 12/21/2018
- a) "Dyslexia" means an unexpected difficulty in reading for an individual who has the intelligence to be a much better reader, most commonly caused by a difficulty in the phonological processing (the appreciation of the individual sounds of spoken language), which affects the ability of an individual to speak, read, and spell
- 19) Dyslexia
- a) Language Based Learning Disability
  - b) Difficulty acquiring and using written language
  - c) Characterized by poor decoding, problems with accurate word recognition, and poor spelling
  - d) Trouble identifying separate speech sounds within a word and/or learning how letters represent those sounds (phonemic awareness)
  - e) Do not see or read words "backwards"
  - f) Reversing letters is not a sign of dyslexia
- 20) Range of Dyslexia
- a) All racial, ethnic, socio-economic groups and intellectual levels
  - b) Affects boys and girls equally

- c) Heritable
  - i) Occurring in 55-70% of identical twins of individuals with dyslexia
  - ii) Up to 50% of individuals with 1<sup>st</sup> degree relative with dyslexia
  - iii) Candidate genes, but none definitive to date
- d) Dyslexia can vary from mild to severe
- e) Dyslexia is a lifelong condition

#### 21) Prevalence of Dyslexia

- a) 15-20% of the population have symptoms of dyslexia

#### 22) Neurobiology of Dyslexia

- a) Neural signature for dyslexia, confirmed by functional brain imaging
  - i) Inefficient functioning/hypoactivation of posterior reading system in brain of dyslexics
- b) Differences in brain function evident even before child begins to read
- c) Dyslexic readers use different brain pathways than typical readers
- d) Left hemisphere occipitotemporal region acts as an interactive nidus for reading, orthography, phonology and semantics
  - i) Inefficient functioning of left hemispheric posterior systems in those with dyslexia
  - ii) fMRI are universal, occurring in all languages and regardless of native language
- e) two distinct pathways comprise the posterior reading system
  - i) upper pathway is in parieto-temporal region (PT region)
    - (1) for beginner readers (analyzing word, breaking it down, and linking letters to sound)
  - ii) lower path is in occipito-temporal region: (OT) “word form area”
    - (1) used by skilled readers
    - (2) “express” pathway to reading
- f) Unimpaired reader activates neural systems in left posterior region of brain
- g) Dyslexic readers activate systems on the right side and the left frontal region
  - i) Use of this alternate pathway is laborious
- h) Two types of network organizations involved in reading
  - i) Dense intra-connected modules (resting state networks)
  - ii) Hub areas: relay information between resting state networks

#### 23) Imperative for early diagnosis and treatment

- a) Achievement gap between dyslexic and typical readers is evident at 1<sup>st</sup> grade and persists
- b) Efficient, evidence based screening tools available to identify child at risk as young as at least first grade
  - i) Early literacy skill deficits can be measured at preschool age and may be indicators for children at risk for dyslexia
- c) Of those Dyslexic children who receive effective phonologic and phonemic training by 1<sup>st</sup> grade, 75-90% will learn to read grade level
- d) If not identified until >3<sup>rd</sup> grade, ~25% will achieve grade level reading

#### 24) Diagnosis

- a) Based upon history, observation and psychological assessment
- b) Primary care provider's expertise, and unique clinical perspective contribute critical role in identification and evaluation of children with LD

- c) Observation
- d) Obtain comprehensive history
  - i) Medical
  - ii) Developmental
  - iii) Behavioral
  - iv) Educational
  - v) Age appropriate educational testing
- e) Diagnosis established by educators, psychologists, neuro/developmental pediatricians
- f) Testing focused on phonological processing as well as word decoding, comprehension and fluency

25) Management

- i) Treatment is educational
- b) Evidence based: phonologic and phonemic instruction
- c) Accommodations may include
  - i) Extra time for assignments/testing and frequent breaks
  - ii) Separate quiet room
  - iii) Verbal instructions/repetition of instructions
  - iv) Testing alternatives
    - (1) Oral instead of written tests
  - v) Preferential seating
  - vi) Lecture notes transcribed
  - vii) Assistive technology
  - viii) Spell and grammar checkers
  - ix) Recorded books
  - x) Computer assisted reading programs

26) Unproven Treatment Modalities: to date no scientific evidence to support

- a) Vision therapy
- b) Tinted lenses
- c) Training glasses
- d) "training exercises"

27) Communication with parents of a "struggling reader"

- a)** You may suggest your concern that the child may have reading issue and clarify that there no clinical identifiable ocular issues, (unless of course documented abnormality) therefore recommend referral to a specialist for further evaluation and diagnosis (Neuropsychologists, developmental pediatricians, speech-language pathologists and/or educational psychologists) and/or educational evaluation in local school district
- b)** Reading or educational Specialists for Reading instruction/intervention
- c)** Be positive
- d)** May wish to direct to parent resources, advocacy partners

28) Comorbidities with Dyslexia

- a)** Anxiety
- b)** ADHD

- c) Depression
- d) Behavioral issues (defiant/hostile)
- e) Dysgraphia
- f) dyspraxia

### **Parents Resources**

#### **AAPOS Learning Disabilities Package**

Available at [www.aapos.org](http://www.aapos.org)

1. A Parents Guide to Dyslexia
2. Learning Disabilities Brochure
3. Resource List for Parents

#### **The Learning Disabilities, Dyslexia and Vision Policy Statement:**

<http://pediatrics.aappublications.org/content/124/2/837>

<https://www.aao.org/clinical-statement/joint-statement-learning-disabilities-dyslexia-vis>

#### **The Learning Disabilities, Dyslexia and Vision Technical Report:**

<http://pediatrics.aappublications.org/content/127/3/e818.full.pdf+html>

- **State Dyslexia Laws**
  - <https://www.dyslexia.com/state-dyslexia-laws>
- **IEP Process for Dyslexia**
  - <http://dyslexiahelp.umich.edu/parents.living-with-dyslexia/school/iep-process-everything-you-need-to-know>

### **Websites on Learning Disabilities & Dyslexia**

#### **International Dyslexia Association**

[www.dyslexiaida.org](http://www.dyslexiaida.org)

#### **National Center for Learning Disabilities**

[www.nclid.org](http://www.nclid.org)

#### **Learning Disabilities On-Line**

[www.ldonline.com](http://www.ldonline.com)

#### **Learning Disabilities Association of America**

[www.lidaamerica.org](http://www.lidaamerica.org)

#### **Reading Rockets**

[www.readingrockets.org](http://www.readingrockets.org)

#### **Understood**

[www.Understood.org](http://www.Understood.org)

**Great Schools**

[www. https://www.greatschools.org](https://www.greatschools.org)

**Association of Educational Therapists:** [www.aetonling.org](http://www.aetonling.org)

**Certified Academic Language Therapists:** [www.altaread.org](http://www.altaread.org)

**Free tutoring:** [www.childrendyslexiacenters.org](http://www.childrendyslexiacenters.org)

**Internet Tutors:** [www.lexercise.com](http://www.lexercise.com)

**AVAILABLE TECHNOLOGY**

*Note Taking*

**One Note** (free, packaged with Microsoft)

**Immersive Reader** (text to speech)

**Dictate** (speech to text)

**Evernote** (Evernote.com)

Accessible on any device

**Notability**

Apple app

**Livescribe Smartpen**

Text-to Speech

**Voice dream reader**

**Read & Write Gold**

**Read Aloud**

**Natural Reader**

Speech-to -Text

**Dictate**

**Dragon**

**Rav**

**Descript**

Apps

**Quizlet**

Electronic version of flash cards

### **Cliff Notes**

Text that is downloaded is already digitized

### **SensusAccess**

Converts documents into audiobooks, ebooks, and digital Braille

### **Fry words and Fry Word Ninje**

To learn common words, Ninje is more advanced

### **Sight Words by Photo Touch**

**NOTE:** Dyslexic students who have an IEP are eligible to apply for digitized books through **Bookshare**

## **BOOKS**

**The Dyslexia Empowerment Plan**, Ben Foss, 2013

**Overcoming Dyslexia: 2<sup>nd</sup> edition**, Sally Shaywitz, 2020

**Dyslexia Wonders, Understanding the daily life of a dyslexic from a child's point of view**; Jennifer Smith, 2009

**Dyslexia: understanding and overcoming dyslexia, tips for parenting children with Dyslexia**, Oliver Lewis, 2019

**Teaching a Struggling Reader; One mom's experience with dyslexia, A guide for struggling parents and teachers**, Pamela Brooks, 2019

**Fish in a Tree**, Lynda Hunt

**Learn to Read with Kids with Dyslexia; Vol 2**, Hannah Braun

**Dyslexia, Revisiting Etiology, Diagnosis, treatment, and policy**; Washington JA, Compton D, McCardle P, 2019

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