Overview

- Broad overview of learning disabilities
  - Dyslexia
  - Dysgraphia
  - Dyscalculia
- Broad overview of executive functions
- Interventions and strategies
- Q and A

How does the brain learn to read?

The brain is plastic and changeable
The brain can make new connections to accommodate inventiveness
The brain recycles older neuronal circuits used in oral language to accommodate written language
What Does It Take To Be A Reader?

**Word Recognition**
- Phonemic Awareness
- Phonics: Decoding (print to speech correspondences)
- Sight Word Recognition
- Automaticity

**Vocabulary**
- Background knowledge
- Inference

Development of the Reading Brain: POSSM

**Phonology** — sound structure of the language

**Orthographic parts** — visual recognition of letters

**Semantic** — the meaning of words

**Syntax** — how words combine in connected text (subject/verb, sentences/paragraphs)

**Morphemes** — word roots, prefixes and suffixes

How the Non-Dyslexic Brain Processes Language and Reading

- **Broca’s Area**
  - Processing the sounds of language to create speech
- **Wernicke’s Area**
  - Processing meanings of sounds and words to understand what is being heard
- **Occipital Lobe**
  - Visual letter identification

The Strands of Reading

- **Language Comprehension**
  - Decoding
  - Fluency
  - Vocabulary
  - Background knowledge
  - Inference
- **Word Recognition**
  - Decoding
  - Automaticity
  - Orthographic parts
  - Phonology
- **Spelling**
  - Automated writing
  - Orthographic parts
  - Phonology

Dyslexia
- A brain-based disorder that results from difficulty processing sounds in language
- Affects ability to learn to read, write, and spell
- Dyslexia accounts for 80% of all LDs
- Clinical criteria
  - Deficits in word reading, decoding, and spelling
  - Intervention prior to diagnosis
  - Difference with public school's Specific Learning Disability (SLD) category
  - Developmental and on a continuum
- Changes in reading disorders and prevalence

"Unexpected weakness in a sea of strength" – Sally Shaywitz, Overcoming Dyslexia, 2003

Brain Glitch
- Brain regions important for reading have atypical structure or function
- Several genes are linked to dyslexia and play a role in early brain development (prenatal)
- Atypical brain development (postnatal) can affect the connections in the neural networks of the brain
- Vision, hearing, and/or perceptual development affects reading/language development
- Environmental factors – low home literacy, low parental educational background, and adverse cultural influences negatively affect reading development
Scientifically-Based Reading Instruction (SBRI)

Should be:
- Direct
- Explicit
- Sequential
- Multi-sensory
- For older students, analytical

And, ideally, SBRI should be diagnostic/prescriptive

Misconceptions about Dyslexia

- Related to IQ
- Uncommon
- Rare in females
- Related to motivation
- Letters are reversed
- Caused by visual impairments
- Can be outgrown or cured
  - Developmental course

Dyslexia Across a Spectrum

Core deficit: Phonological Processing
- Letter/sound correspondence is slow and effortful
- Spelling tends to be more difficult than reading
  - Letter reversals are common: b/d, p/q
  - Vowel sound confusion: e/i, a/o, o/u

Cognitive factors may affect learning to read and spell
- Slow processing and information retrieval
- Poor working memory

Language processing
- Expressive language deficit
- Receptive language deficit

Psychoeducational Evaluation
- IQ test (measures cognitive function)
- Achievement tests (measures reading, spelling, math, writing, etc.)
- Additional tests (phonological processing, processing speed, etc.)
- Provides a diagnosis and recommendations for treatment

Follow Diagnostic Recommendations
- Tutoring
- Recommended treatment programs

Communicate/Partner with School
- IEP?
- Learning specialist?

What Can Parents Do to Help?

Psychoeducational Evaluation
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Reading/Spelling Programs for Student with Dyslexia

Orton-Gillingham Based Programs
- The Wilson Reading System® (grades 2-adult)
- Preventing Academic Failure® (young children)
- The Sonday System®

Other Research-Validated Word Study and Spelling Programs
- Spell-Links Word Study and Spelling® (Created by SLPs)
- Lindamood-Bell (Seeing Stars® and LIPS®)

Building Reading Fluency
- Students should have consistent and regular oral reading practice
- Older students can benefit from oral reading practice as well as younger students
- Oral reading support does not require complicated strategies
- Oral reading practice does not need to be timed
- Decoding and vocabulary should be taught explicitly

Oral Reading: Best Practices
- Reading aloud is crucial to fluency growth
- Practice should be frequent and consistent
- Wide reading is preferable to repeated reading
- Students should be able to read 80% of the text
- Students need support for decoding unfamiliar words and understanding vocabulary
- Prosody is more important than speed

Reading at Home
- Choose text that child can read 80% accurately
- Child reads aloud for 15 minutes per day (at least)
- Support the reader:
  - Pronounce words that child cannot
  - Give a simple definition of words that child does not know
- Let child read with minimal interruption until he/she has finished reading
When Should We Intervene?

**As soon as possible!**

Remediation takes less time if you start when the child is in early elementary school...

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**Dysgraphia**

- A child with dysgraphia may have trouble with:
  - Forming letters, numbers, and words
  - Spelling words correctly
  - Organizing thoughts and ideas into written expression

- Dysgraphia often occurs with dyslexia

**Clinical criteria**

- Often coded as either:
  - Developmental coordination disorder
  - Specific learning disorder with impairment in written expression

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**Symptoms of Dysgraphia**

- A tight or awkward pencil grip
- Tires quickly while writing
- Writing is illegible, inconsistent, and has poorly formed letters and numbers
- Writing is slow and labored
- Complete avoidance of writing

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**Symptoms of Dysgraphia**

- Difficulty organizing thoughts on paper
- Trouble with tasks that require concurrent thinking and writing
- Difficulty following spelling and grammar rules
- Incorrect spacing and positioning of letters, words, and lines of written text
- Trouble aligning columns in math problems
Handwriting Instruction

Rationale for Handwriting Instruction
- Keyboarding is also important, but it doesn’t help students with writing tasks until Middle School at the earliest
- High stakes tests that require writing tasks don’t allow students to use laptops and keyboarding
- Note taking is more effective when notes are taken by hand

Handwriting Instruction Programs
- Preventing Academic Failure® Cursive Handwriting
- Wilson Language® Cursive Writing

Spelling instruction is part of reading instruction!
- Develops phonological awareness
- Builds knowledge of orthographic patterns

Whatever the Program, students must use it!
- Hold students accountable for using what they’ve been taught.

Importance of Handwriting

Direct and explicit handwriting instruction engages multiple brain systems
- Grapho-motor: skill development
- Sensory: kinesthetic sensation plays an important role in learning to form letters
- Language: handwriting supports and strengthens the letter/sound connection necessary for reading and spelling
- Cognition: without handwriting instruction linked to spelling, writers may have trouble translating ideas into written language
- Attention and Executive Systems: brief but daily handwriting lessons lead to automaticity – frees up attention for higher order demands

Accommodations
- Assistive Technology
  - Text-readers (Kurzweil 3000, Snap and Read)
  - Audio Books (Learning Ally, Bookshare, Audible)
  - Voice recognition (Dragon, e.g.)
  - Keyboarding
  - Spell Predict
  - Spell-Check
  - Grammar Check (Grammarly)
- Extended Time on Tests
- Tests Read Orally
- Class Note-Takers
**Why do students struggle with math?**

Dehaene (1999)
- Exact calculation is language dependent
- Approximation relies on non-verbal visuo-spatial networks of the left and right parietal lobes
- Innate ability for approximation conflicts with requirements for calculation and problem solving, and both are mediated by language
- Calculation and higher level math more difficult than other cognitive processes

**Dyscalculia and Math Disorders**

- Math disorders can include difficulties with
  - Applied reasoning
  - Computation
  - Basic facts

- **Dyscalculia**
  - Associated with a breakdown in computation and fluent/accurate application of math facts
  - Often, this will affect higher-level applications (i.e., applied reasoning)

**Relationship between innate and learned mathematical ability**

- Number sense is genetic
- Exact calculation requires cultural tools
  - Symbols
  - Algorithms
- Calculation accomplished by parts of the brain that have evolved for other purposes
- **Nature** provides number sense, and **culture** provides numerals and number words
  
  Stanislas Dehaene
Challenge of Memory, Language, and Working Memory

- Human memory is associative
  - Associations cause bits of knowledge to interfere with each other
  - $7 \times 6 \ OR \ 7 \ + 6$?
  - Multiplication facts have to be stored in a form that doesn’t fit well with how human memory is organized
  - Adults make errors in single digit multiplication $10 - 25\%$ of the time
- Language
  - English has special words for the numbers from 11-19 and for the decades 20-90
- Working Memory
  - Simple arithmetic depends on speedy and efficient retrieval from long-term memory
  - Temporary storage of numbers when attempting to solve a problem is crucial
  - Poor recall of facts leads to difficulties executing calculation procedures and immature problem-solving strategies

Why do students struggle with math?

- Semantic memory deficits
  - Difficulty with math fact retrieval
- Procedural memory
  - Errors carrying out procedures
  - Difficulty sequencing multi-step procedures
  - Delays understanding concepts
- Visual-spatial deficits
  - Misalignment of numbers
  - Misinterpretation of place value
  - Great difficulty learning geometry

Memory problems may reflect poor coordination of information in the executive system

Working memory system is either:
- Not accessing numerical information from the phonological system
- Failing to provide adequate capacity for processing information

Supporting Students with Math Difficulties

- Intervention
  - Mastery should follow this order of operations:
    - Addition, subtraction, multiplication, division
  - Scaffold, progressive approach
- Accommodations
  - Calculators
  - Extended Time to Complete Problems
  - Graph paper to keep columns straight
  - Break problem solving into steps
- Modifications
  - Reduce the number of problems in class and for homework
  - Teach error analysis

Social–Emotional Effects of LD

Students with LDs are at risk for
- Anxiety
- Depression and suicide
- Low self-esteem
- Inability to read social cues of others
- Learned helplessness
- Social isolation
- Poor ability to manage life tasks

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Working Memory

Executive Functions

Misunderstood
- NOT behavior disorders

Affects self-regulation
- Writing: ability to plan
- Reading: ability to comprehend

Extensive secondary impacts
- Conduct disorders
- Mood disorders

Brown's Model of Executive Functions

Activation

Poor organizational skills
- Inability to organize and store notes and handouts
- Lost papers, assignments, books, etc.

Difficulty prioritizing and activating
- Managing assignments
- Deciding what’s most important
- Starting and finishing assignments
Focus

Difficulty sustaining attention
• Papers and projects have inconsistent quality
• Distractions interfere with learning
• Gaps in learning

Difficulty shifting attention
• Inconsistent performance from course to course
• Inconsistent quality within assignments requiring multiple steps

Managing Emotions

Low threshold for frustration
• Irritability
• Angry outbursts
• Constant arguing

Difficulty regulating emotions
• Insensitivity to others
• Moodiness
• Disproportionate emotional response to comments or actions of others

Effort

Difficulty sustaining effort and alertness
• Incomplete assignments
• Poor study habits
• Frequently drowsy when not engaged
• Poor sleep hygiene
• Lack of motivation

Slow processing
• Tasks take longer
• Poor written output

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Working Memory

Chronic difficulty holding and processing current information
- Holding onto relevant thoughts during discussion
- Interrupting others for fear of losing a thought
- Poor test performance
- Reading comprehension gaps
- Writing tasks prove excessively difficult

Self-Regulation

Impaired ability to monitor behavior
- Inappropriate comments in social situations
- Inability to monitor how others perceive them
- Difficulty slowing down
- Difficulty following directions
- Impulsive acts

Classroom Supports for Students with Executive Function Challenges
EF Struggles

- Perfectionism, blocks, avoidance, late work or no work
- No actual writing – only conceptualization in head
- Freezes up when faced with large amounts of work
- Easily overwhelmed emotionally, which affects academics
- Fidgety and restless – unable to focus on what the teacher says
- Spacing out a lot in class – looking out the window or door – thinking of other things

Supportive Classroom Practices

Offer Support
- scaffolding, check-ins: remain objective = don’t judge

Provide Structure
- establish and maintain routines, patterns

Incorporate Novelty
- something new, change of pace

Identify Expectations
- what is flexible, what is absolute (non-negotiable)

Support Metacognition and a Growth Mindset Culture
- use mistakes and problem-solving as part of the teaching/learning

Give Feedback
- frequent, constructive and elaborative

Multisensory Instruction

Visual, Auditory, Tactile, Kinesthetic
- Promotes more activity and engagement through the use of multiple senses
- Include a visual component with lecture
- Promote innovative note taking through student collaboration and modeling

Provide multiple learning activities that engage students actively
- Discussions
- Varied questioning
- Graphic organizers
- Manipulatives

Establish Routines

Morning
- What comes first, next, and last
- Prep for morning the night before

Homework
- When? Where? How long?

Free time
- How much screen time?

Bedtime
- When, what happens
Set Clear Expectations

- Use a matter-of-fact, non-judgmental tone
- Break chores down into steps
- Create a checklist and a timeline for chores
- Provide frequent and timely feedback on how your child is doing
- Reward your child for his/her accomplishments

Task Planning and Execution

- **Three Questions**
  - GET READY
  - DO
  - DONE
  
  1
  2
  3

Transitions

- Shifting from one activity to another is difficult
- Allow time for transitions
- Give warnings
  - “In five minutes…..”
  - “Two more minutes”
  - Countdowns: “Give Daddy the phone in 5, 4, 3…..”
- Avoid last minute, hurried transitions

Feedback

- Feedback can be positive or negative
- Must occur “at the point of performance”
- Rewards should be immediate for young children
- Older children and adolescents can work toward a reward
- Make the reward something that is achievable in a reasonable period of time
- Deliver constructive feedback in a neutral, non-judgmental tone
Chores

Grandma Rules

- Sleep
  - 9 to 11 hours for elementary-aged children
  - 8 to 9 for teenagers
  - 7 to 8 for adults
- Proper Diet
- Exercise
- Meditation

ADHD/EF and Sleep

Lack of sleep can have a profound effect on executive function

Poor sleep results in
- Inattention
- Hyperactivity
- Impulsivity
- Oppositional behavior

Sometimes poor executive function behaviors are really sleep deprivation
  - (National Sleep Institute)

Physical Activity

Physical activity has a significant effect on ADHD symptoms
- "Physical activity is a tool to manage symptoms and benefit cognitive performance and academic achievement"

Physical activity promotes good sleep ‘hygiene’

Physical activity can boost the effect of medicine or provide an alternate way of managing ADHD symptoms
The Importance of Nutrition

Good nutrition reduces susceptibility to stress and anxiety
1. Monitor Caffeine
2. Reduce Sugar
3. Emphasize fresh produce
4. Eat whole foods

John Ratey, Harvard University

- Author of Driven to Distraction and other books about ADHD
- SPARK: the revolutionary new science of exercise and the brain

Dr. John Ratey, in his own words…

"I like to say that exercise is like taking a little Prozac or a little Ritalin at just the right moment… Exercise is really for the brain, not the body. It affects mood, vitality, alertness, and feelings of well-being."

"Moving is almost more important than anything else … there is no better way to build resilience than challenging yourself through exercise."

Advice from Dr. Ratey

Involve children in a physical activity that they like and that will be sustaining
- Consider doing it with them!

Activities such as yoga, Tae Kwon Do, Karate, and Pilates turn on the prefrontal cortex and interact with the attention system
Supporting Executive Function

Students who believe that intelligence & the ability to learn can be experienced & enhanced through effort & experience over time are more likely to use strategies of:

- effort regulation
- managing time and study environment
- peer learning
- help-seeking behavior

(Paulsen & Feldman, 2007)

Effective Listening is Listening for:

- Accuracy
- Empathy
- Discovery
- Learning
- Action

Listening to Children and Teenagers

Effective Listening is Listening:

- To reassure
- To blame
- To fix
- To tell your opinion

Talking to Children and Adolescents

External Process Questions

How are you doing in your classes?
Why didn’t you start/complete…? What happened?
Why didn’t you just….?
Why don’t you…?
What will you do next time?

Internal Process Questions

What is due right now?
Where am I going now?
Why didn’t I just….?
How was I supposed to know?
Why can’t I get things done?
Why can’t I be like….?
What’s wrong with me?

Right Questions

External Process Questions

• What will you do if …?
• What materials do you need?
• When will you start…?
• What might prevent you from …?
• Who could help you with that?
• What will your completed task look like?
• How will you know you have finished?

Internal Process Questions

• What is my most important activity next week/tomorrow?
• What is due first?
• What information do I need?
• How long will it take me to…?
• When will I start?
• What things could prevent me from starting/finishing?
Talking to Children and Adolescents

**External Process Questions**
- What will you do if ….? 
- What materials do you need? 
- When will you start ….? 
- What might prevent you from ….? 
- Who could help you with that? 
- What will your completed task look like? 
- How will you know you have finished?

**Internal Process Questions**
- What is my most important activity next week/tomorrow? 
- What is due first? 
- What information do I need? 
- How long will it take me to ….? 
- When will I start? 
- What things could prevent me from starting/finishing?

Elements of Coaching

**Establish a goal**
- Daily 
- Weekly 
- Long term (older children)

**Identify obstacles to achieving the goal and how to avoid them**

**Write down a plan for achieving the goal**

Elements of Coaching (2)

**Review plans**
- Did you complete the tasks you said you would do? 
- Were you satisfied with the time and effort you spent?

**Make a new plan**
- What do you have for today? (make list) 
- When will you do these tasks? 
- What might prevent you from completing these tasks? 
- Do you have any long term projects to plan for? 
- Are you on target to achieve your goal?

References & Resources


