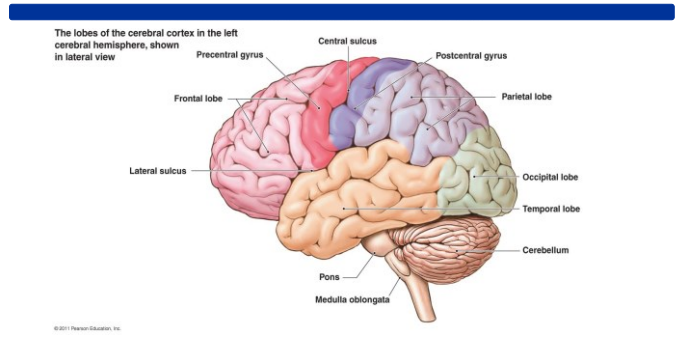
Reading and Writing Disorders: Brain Based Interventions for Students



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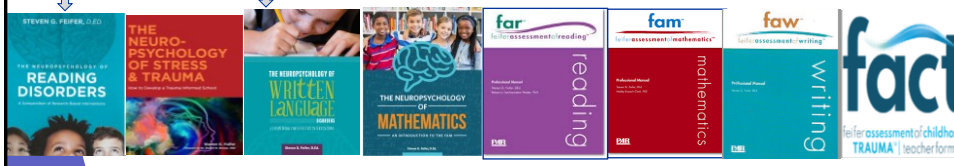
Dr. Feifer's Journey

www.schoolneuropsychpress.com



- Nationally certified school psychologist 20+ years
- Diplomate in **pediatric** and **school** neuropsychology
- 2008 **Maryland School Psychologist of the Year**
- 2009 **National School Psychologist of the Year**
- Author: **8 books** on learning and emotional disorders
- Test Author: **FAR-FAM-FAW-FACT**
- Currently in private practice at Monocacy Neurodevelopmental Center in Frederick, Maryland.

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Presentation Outline

- **Why Literacy Matters**
- Defining Dyslexia
- Four Universal Truths of Reading
- Subtypes of Reading Disorders & Interventions
- Defining Dysgraphia
- Cognitive Constructs and Writing
- 3 Subtypes of Written Language Disorders
- Strategies for Success

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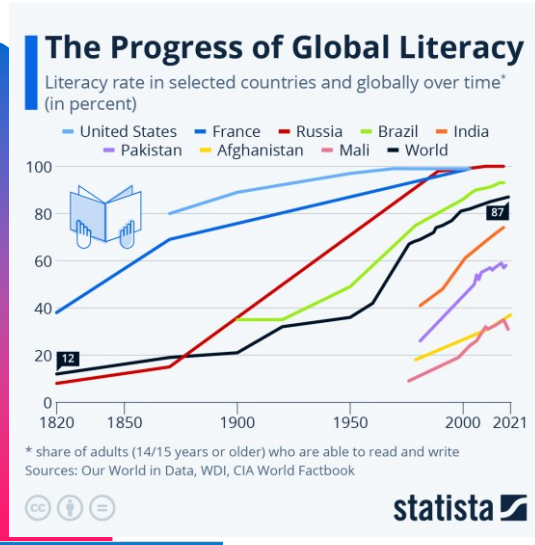
Global Literacy at a Glance
(Statista, 2022)



- 1820 - **12%** literacy rate
- 1900 - **20%** literacy rate
- 1960 - **42%** literacy rate
- 1983 – **70%** literacy rate

- Today – **87%** literacy rate

- Canada - **81%** literacy rate (10th among OECD & **99** percent overall)

- 19% of adults had literacy rates at Level 1 on a scale between 1-5.

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Global Literacy at a Glance

United Nations Education, Scientific, and Cultural Organization (UNESCO)

- ***'Literacy'*** *is the ability to identify, understand, interpret, create, communicate and compute, using printed and written materials associated with varying contexts (UNESCO).*
- ***'Literacy'*** *is a* ***human right.*** *It reflects both the openness and economic stability of a culture to prioritize education for ALL its citizens.*

- **773 million** adults and children do not have basic literacy abilities with illiteracy highest in South Asia and sub-Saharan Africa.
- The COVID-19 epidemic affected the education of 62.3% of the world's **1.1 billion** students.

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Literacy in Canada: Post Pandemic

Program for International Student Assessment (2022)

Table 3.16

Canadian and provincial average scores in reading over time, 2018–2022

	2018		2022	
	Average score	Standard error	Average score	Standard error
Newfoundland and Labrador	512	(4.3)	478*	(7.2)
Prince Edward Island	503	(8.3)	496	(10.4)
Nova Scotia	516	(3.9)	489*	(6.4)
New Brunswick	489	(3.5)	469*	(4.3)
Quebec	519	(3.5)	501*	(4.9)
Ontario	524	(3.5)	512*	(4.1)
Manitoba	494	(3.4)	486	(4.1)
Saskatchewan	499	(3.0)	484*	(4.3)
Alberta	532	(4.3)	525	(6.4)
British Columbia	519	(4.5)	511	(6.0)
Canada	**520**	**(1.8)**	507*	**(2.5)**

- Reading scores in Canada **(507)** declined **13** points.
- Average decline among 81 countries **10** points (**476** avg/**U.S. 504**).
- Newfoundland and Nova Scotia biggest decline.
- More than 23,000 15 yr old students in Canada from 850 schools.

Organisation for Economic Cooperation and Development (OECD)

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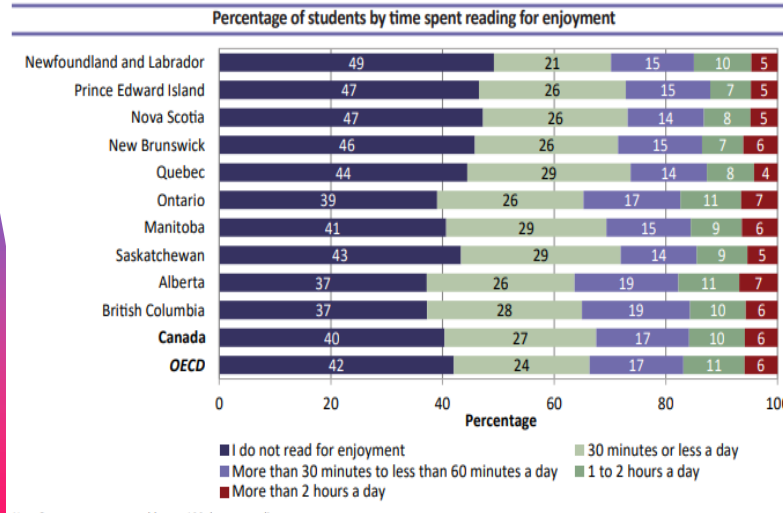
Literacy in Canada

Program for International Student Assessment (2018)



Note: Percentages may not add up to 100 due to rounding.

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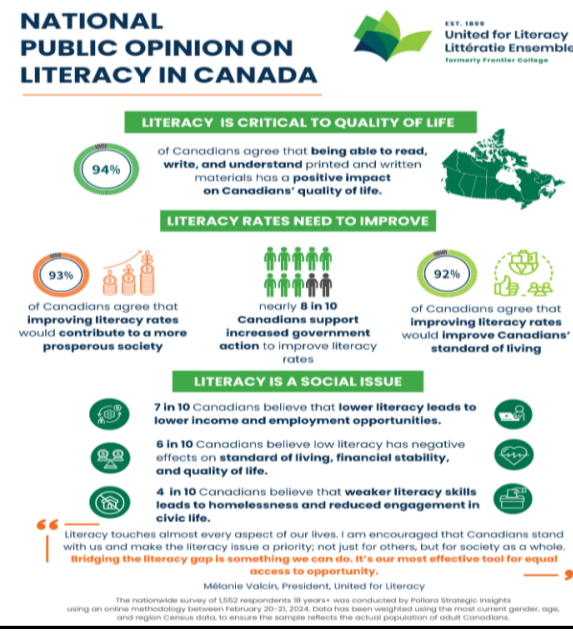
Literacy in Canada: Public Opinion Survey (2024)



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Defining Dyslexia

- *"Dyslexia is characterized by difficulties with **accurate** and / or **fluent** word recognition and by poor spelling and decoding abilities. These difficulties typically result from a deficit in the p**honological component** of language that is often unexpected in relation to other cognitive abilities and the provision of effective classroom instruction. **Secondary consequences** may include problems in reading comprehension and reduced reading experience that can impede growth of vocabulary and background knowledge."*

  - International Dyslexia Association (2002)

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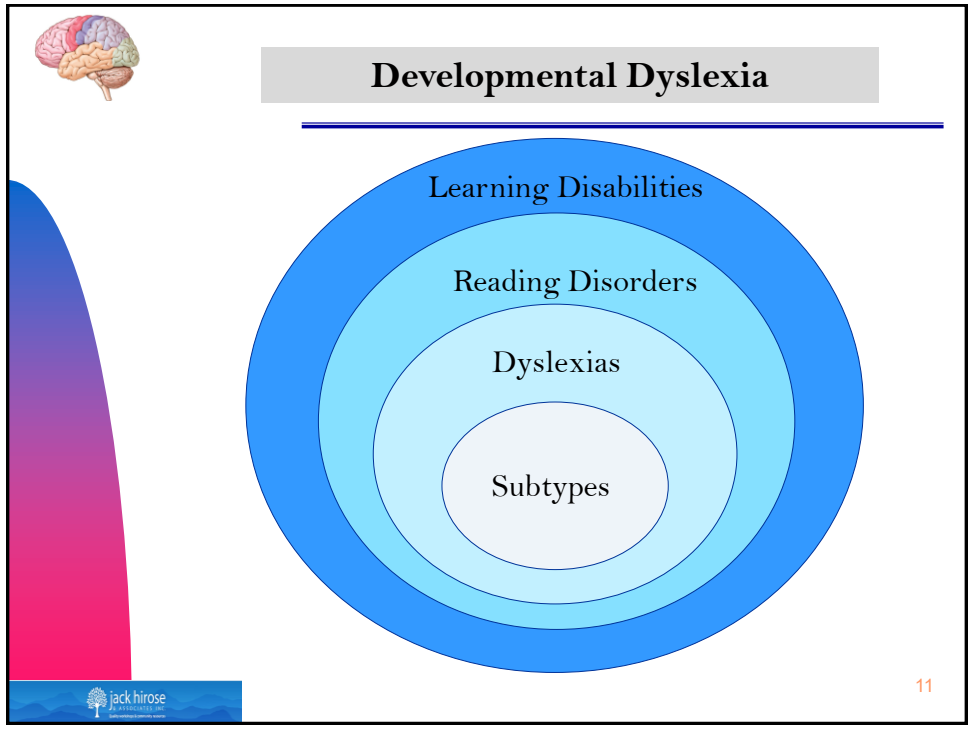
Developmental Dyslexia
Learning Disabilities
Reading Disorders
Dyslexias
Subtypes
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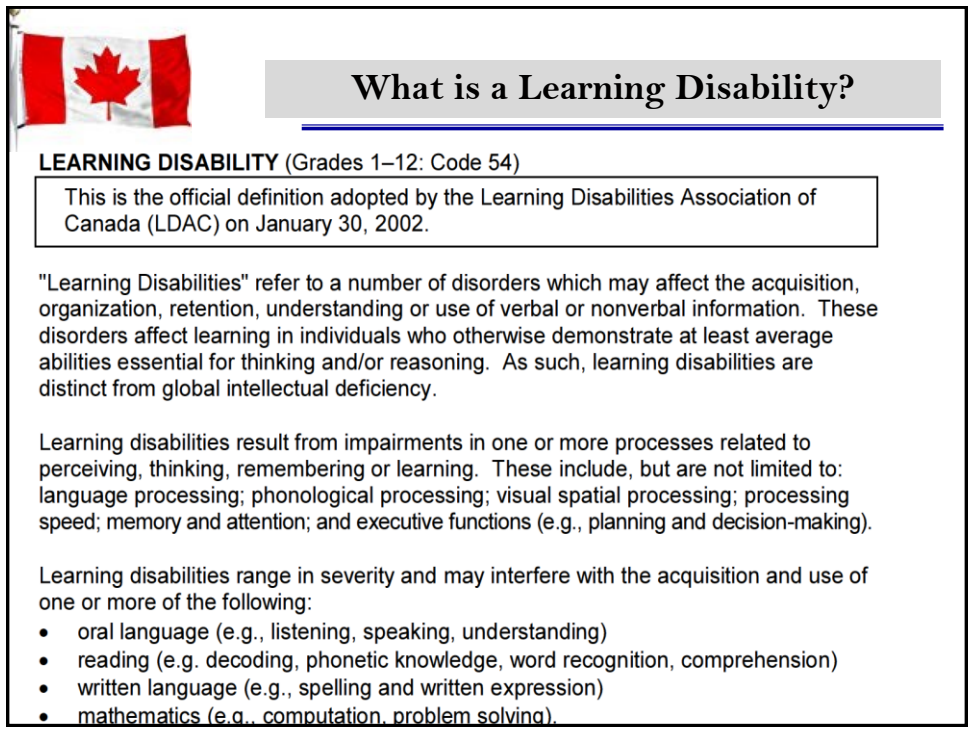
What is a Learning Disability?
LEARNING DISABILITY (Grades 1–12: Code 54)
This is the official definition adopted by the Learning Disabilities Association of Canada (LDAC) on January 30, 2002.
"Learning Disabilities" refer to a number of disorders which may affect the acquisition, organization, retention, understanding or use of verbal or nonverbal information. These disorders affect learning in individuals who otherwise demonstrate at least average abilities essential for thinking and/or reasoning. As such, learning disabilities are distinct from global intellectual deficiency.
Learning disabilities result from impairments in one or more processes related to perceiving, thinking, remembering or learning. These include, but are not limited to: language processing; phonological processing; visual spatial processing; processing speed; memory and attention; and executive functions (e.g., planning and decision-making).
Learning disabilities range in severity and may interfere with the acquisition and use of one or more of the following:
oral language (e.g., listening, speaking, understanding)
reading (e.g. decoding, phonetic knowledge, word recognition, comprehension)
written language (e.g., spelling and written expression)
mathematics (e.g., computation, problem solving).

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Four Universal Truths of Reading

1. In all word languages studied to date, children with developmental reading disorders (dyslexia) primarily have difficulties in identifying, recognizing, categorizing, and/or manipulating phonological units at all linguistic levels (Goswami, 2007).

Screening for Success (Hulme & Snowling, 2016)

1. Phonological awareness skills.
2. Ability to link sounds with letters.
*3. Rapid letter-naming skills?
   a) Rapid naming of letters better than objects (Kilpatrick, 2015)
   b) Rapid naming of letters is moderately correlated with reading performance (.28-.57%) and explains some ofthe reading variance independent of phonological awareness (Truong et al., 2019).

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Four Universal Truths of Reading

2. The English language *is not* a purely phonological!

- 1 letter grapheme: c a t. The sounds **/k/** is represented by the letter **'c'.**
- 2 letter grapheme: l ea f. The sound **/ee/** is represented by by the letters **'e a'.**
- 3 letter grapheme: n igh t. The sound **/ie/** is represented by the letters **'i g h'.**
- 4 letter grapheme: th r ough. The sound **/oo/** is represented by the letters **'o u g h'.**

- The English language includes over **300** ways of representing **44** sounds using a series of different letter combinations (Uhry & Clark, 2005). In Italian there is no such ambiguity as just **33** graphemes are sufficient to represent the **25** phonemes.
- Therefore, **25%** of words are phonologically irregular (i.e. "debt", "yacht", "onion", etc..) or have one spelling but multiple meanings –*homonyms*- (i.e. "tear", "bass", "wind", etc.)

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Summary: We need to develop **orthography!!**

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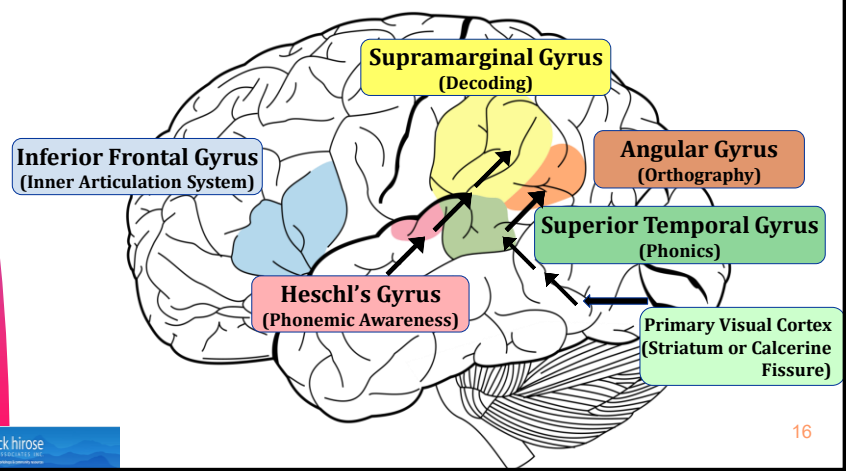
The Reading Brain: How Words are Assembled

3. Neuroimaging techniques have demonstrated that **phonological** processing and **orthographic** processing are a by-product of the *temporal-parietal* junctures in the left hemisphere of the brain (Paz-Alonso et al., 2018; Glezer et al., 2016;Sandak et al., 2004; McCandliss & Noble, 2003).



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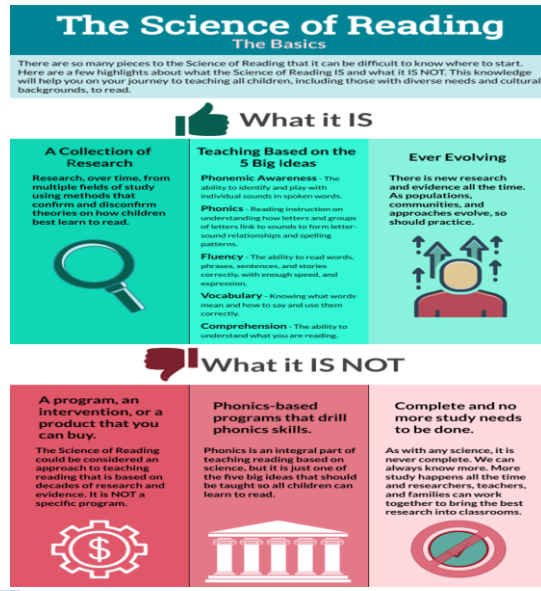
4. Embrace the Science of Reading



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Subtypes of Dyslexia

1. **Dysphonetic Subtype** - great difficulty using phonological route in reading, so visual route to lexicon is used. These readers do not rely in letter to sound conversions, but rather over-rely on visual cues to determine meaning from print.

Neuropsychological Significance: Left temporal-parietal gradient *(supramarginal gyrus)*.

Target Word:	Read As:
cat	*couch*
balloon	*ball*
jump	*gym*
ghost	*goat*

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1. Remediation Strategies for Dysphonetic Dyslexia

Over Age 12:	Wilson Reading System
	SRA Corrective Reading & REACH System
(Top- Down)	Read 180
	HOSTS
	Kaplan Spell/Read
	LEXIA Strategies for Older Students
Ages 7 - 12:	ASDEC Language Foundations (Orton-Gillingham)
	SRA Corrective Reading
	Earobics II
	LiPS
	LEXIA Primary Reading
(Bottom-Up)	Horizons
Under Age 7:	Fast Forword II(Tallal)
	Earobics I
	Phono-Graphix
	Saxon Phonics Program
	Readwell
	Ladders to Literacy
	Fundations
	Road to the Code
	SIPPS
	Scott Foresman Early Intervention Reading

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Subtypes of Dyslexia

2. Surface dyslexia - an over-reliance on sound symbol relationships as the process of reading never becomes automatic. These children break every word down to its phonological base, and read slowly due to poor **orthographic** perception and processing.

WORD		READ AS
island	→	izland
grind	→	grinned
listen	→	liston
begin	→	beggin
lace	→	lake

- Extreme difficulty reading words where phonemes and graphemes are not in 1 to 1 correspondence: **yacht**
  debt

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Remediation Strategies for Surface Dyslexia

Over Age 12:
Academy of Reading
Wilson Reading System
Laubauch Reading Series
Read 180

Ages 7 - 12:
Read Naturally
Great Leaps Reading
Quick Read
RAVE-O
Fast Track Reading

Under Age 7:
Destination Reading
Reading Recovery
Early Success
Fluency Formula

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Subtypes of Dyslexia

3. Mixed Dyslexia - severely impaired readers with characteristics of both **phonological** deficits, as well as **orthographical** deficits. These readers have no usable key to unlocking the reading and spelling code. Very bizarre error patterns observed.

WORD	READ AS:
Advice	**Exvices**
Correct	**Corex**
Violin	**Vilen**
Museum	**Musune**
Possession	**Persessive**
Material	**Mitear**

* Multiple breakdowns along many reading pathways. 23

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4 Remediation Strategies for Mixed Dyslexia

(1) **Multiple Programs** - An eclectic and approach capitalizing on the particular strengths of the child. Consider using a multi-sensory type of **Orton-Gillingham** program, coupled with a fluency model such as **Read Naturally,** and the computerized models of **Read 180**.

(2) **Top Down Strategies** – Often atypical development mapping individual sounds to the visual word form association areas.

(3) **Socioeconomic Status** - is a very strong predictor of reading skills due primarily to the home literacy environment. Therefore, schools need to provide more reading opportunities.

(4) **Motivation and Confidence** –Great Leaps, Read Naturally, etc. tend to give immediate feedback.

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4 Components of Reading Comprehension

1. **Content Affinity** - attitude and interest toward specific material.

2. **Working Memory** - the ability to temporarily suspend information while simultaneously learning new information. The amount of memory needed to execute a cognitive task.

3. **Executive Functioning** - the ability to self-organize verbal information to facilitate recall.

4. **Language Foundation** – vocabulary knowledge is vital for passage comprehension.

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Reading Comprehension Interventions

1. **Stop & Start Technique** – student reads a passage out loud and every 30 seconds "stop" to ask questions.
2. **Directional Questions** – ask questions at the beginning of the text instead of the end.

3. **Read Aloud** – reading out loud allows student to hear their own voices and facilitates working memory.

4. **Story Maps** – pre-reading activity where graphic organizers are used to outline and organize the information.

5. **Active Engagement** – encourage active, not passive reading, by having children take notes or putting an asterisk next to important information. Also, multiple colors for highlighting.

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far™ feiferassessmentofreading™

Steven G. Feifer, D.Ed., ABPdN

- A **neurodevelopmental** assessment of reading
- Pre-K to College (Ages 4-21)
- Normative sample included 1,074 students
- 15 subtests in complete battery
- Diagnoses **4 subtypes** of reading disorders
- Includes the FAR-S dyslexia **screening** battery
- Total Far index score and 4 Reading index scores

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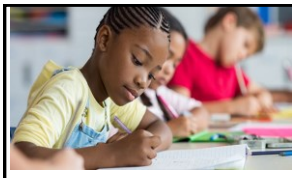

What is Dysgraphia?

Dysgraphia is a broad-based term that refers to a specific learning disability in written expression. The term can include problems with letter formation, legibility, letter spacing, spelling, fine motor coordination, rate of writing, grammar and overall sentence production (Chung et al., 2020).

Developmental Dysgraphia refers to difficulty acquiring writing skills despite adequate learning opportunities and cognitive skills.

- Younger children tend to have deficits with the motoric aspects of the written stroke, whereas older children struggle with more cognitive-linguistic elements of writing (Biotteau et al., 2019).

Acquired Dysgraphia refers to a learned skill (writing) being disrupted by a specific injury or degenerative condition.

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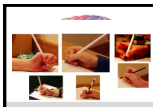

Warning Signs of Developmental Dysgraphia

Age Group	Signs of Dysgraphia
Preschool aged children	• Awkward pencil grasp • Lack of hand dominance • Fatigues quickly when writing • Letters poorly formed or inversed • Difficulty writing within margins • Overflow motor movements • Does not anchor paper with opposite hand.
Elementary aged students	• Illegible or messy handwriting • Letter transpositions • Mirror writing • Switching between cursive and print • Slower paced writing • Poor spelling impacts legibility. • Frequent erasures
Secondary school students	• Poor planning and organizational skills. • Discrepancy between verbal output and • written output. • Difficulty keeping pace when note-taking. • Does not separate ideas by paragraph. • Paragraphs do not flow from general to • specific. • Grammar impacts legibility.

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Types of Writing Genres

- **Persuasive** - change the reader's point of view in order to affect the reader's action.
- **Expository**- explaining objective information to enhance the reader's overall understanding.
- **Experiential** - to describe a personal experience or narrative to others.
- **Prosaic** – to convey a particular sentiment or emotion from a personal experience. Often written in a metaphoric style inclusive of poem, lyric, or sonnet.
- **Analytical** – heavily structured style of writing where scientific scrutiny involved.

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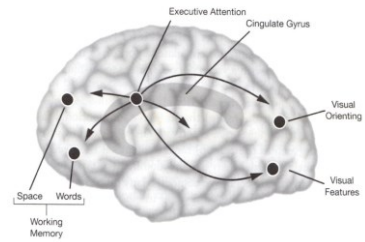
Cognitive Constructs and Written Language

Attention: (Selective & Sustained)

- Poor planning
- Uneven tempo
- Erratic legibility
- Inconsistent spelling
- Poor self monitoring
- Impersistence



BRAIN REGION **- Anterior Cingulate Gyrus**
****Effort control and top-down attention***

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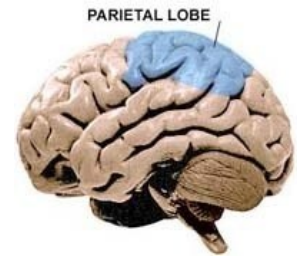
Cognitive Constructs and Written Language

Spatial Production

- Poor spatial production
- Poor visualization
- Poor margination
- Organization problems
- Uneven spacing
- Poor use of lines



BRAIN REGION –Right Parietal Lobe

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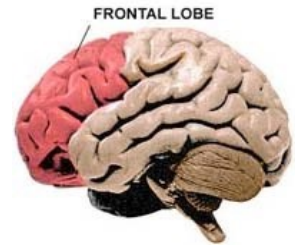
Cognitive Constructs and Written Language

Sequential Production

- Poor connected writing
- Letter reversals
- Organizational deficits
- Lack of cohesive ties
- Deficits in working memory, especially with ADHD kids, leads to sequential dysfunction.



BRAIN REGION – Left Prefrontal Cortex

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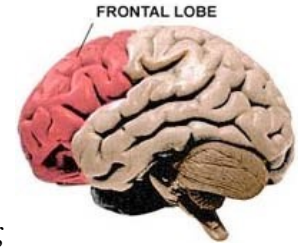
Cognitive Constructs and Written Language

Working Memory Skills

- Poor *word retrieval* skills
- Poor spelling
- Poor grammar rules
- Loss of train of thought
- Deterioration of continuous writing
- Poor elaboration of ideas
- Cortical mapping of language is *distributed* throughout brain *(i.e. nouns vs. verbs)*



BRAIN REGION – Semantic memories stored in temporal lobes. Retrieved by frontal lobes

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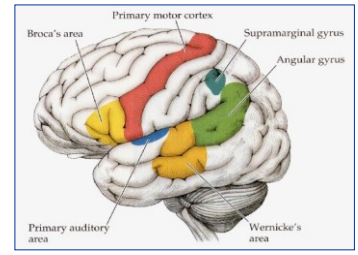
Cognitive Constructs and Written Language

Language:

- Poor vocabulary
- Lack of cohesive ties
- Poor grammar
- Simplistic sentence structure



- Left hemisphere stores language by converging words into semantic baskets; right hemisphere excels in more divergent linguistic skills (simile and metaphor).
- Writing genre impacts retrieval!

BRAIN REGION – Temporal Lobes

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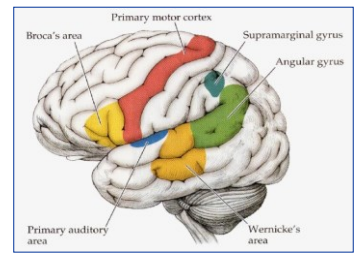
Cognitive Constructs and Written Language

Intelligence

- Concrete ideation
- Poor development of ideas
- Poor audience awareness
- Weak opinion development
- Simplistic sentence structure



BRAIN REGION – Inferior Parietal Lobes

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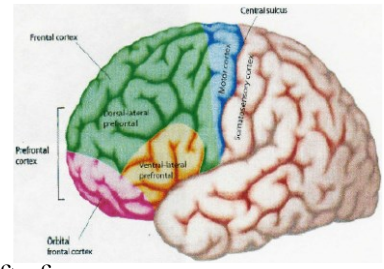
Cognitive Constructs and Written Language

Executive Functioning

- Organize and plan ideas
- Self monitor
- Task initiation
- Sustain attention to task
- Difficulty making cognitive shifts from one topical area to another.



BRAIN REGION – Dorsolateral Prefrontal Cortex

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Cognitive Constructs and Written Language: Motor Output Speed (Pollock et al, 2009)

Grade Levels	Handwriting Speed
Grade 1	15 - 32 letters per minute
Grade 2	20 - 35 letters per minute
Grade 3	25 - 47 letters per minute
Grade 4	34 - 70 letters per minute
Grade 5	38 - 83 letters per minute
Grade 6	46 - 91 letters per minute

BRAIN REGION – Basal Ganglia

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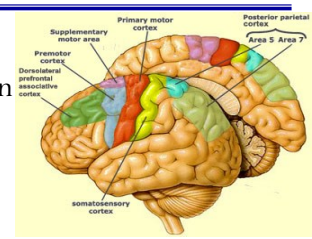
3 Subtypes of Written Language Disorders

(1) **Graphomotor Dysgraphia** - apraxia refers to a wide variety of motor skill deficits in which the voluntary execution of a skilled motor movement is impaired.



a) **Premotor cortex** - plans the execution of a motor response.

b) **Supplementary motor area** – guides motor movement.

c) **Cerebellum** - physical act of sequencing fine motor movements becomes less effortful and more reflexive.

d) **Basal Ganglia** – procedural memory and automaticity of handwriting and gross motor movements.

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3 Subtypes of Written Language Disorders

(2) Dyslexic Dysgraphias: (Spelling Miscues)

a) Dysphonetic dysgraphia - the hallmark feature of this disorder is an inability to spell by *sound* due to poor *phonological* skills. There is often an over-reliance on the visual features of words when spelling *(i.e " sommr" for "summer")* .

b) Surface dysgraphia - a breakdown in the *orthographic* representation of words. Miscues made primarily on phonologically irregular words *(i.e. "laf" for "laugh"; "juse" for "juice"; "mite" for "mighty").*

c) Mixed Dysgraphia - characterized by a combination of both *phonological* errors and *orthographical* errors depicting faulty arrangement of letters and words *(i.e "ceshinte" for "kitchen")* .

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3 Subtypes of Written Language Disorders

(3) Executive Dysgraphia – poor production and difficulty with the implicit rules for grammar which dictate how words and phrases can be combined. Deficits in *working memory* and *executive* functioning in frontal lobes hinders output.

- Word omissions
- Word ordering errors
- Incorrect verb usage
- Word ending errors
- Poor punctuation
- Lack of capitalization
- Oral vs. written language discrepancy

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Features of Executive Dysgraphia

a) **Verbal Retrieval Skills** – the frontal lobes are critical in retrieving words stored throughout the cortex, often stored by semantic categories.

b) **Working Memory Skills** – helps to recall spelling rules and boundaries, grammar rules, punctuation, and maintaining information in mind long enough for motoric output.

c) **Organization & Planning** – syntactical arrangement of thought needed to sequence mental representations.

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➡ **Strategies for Success**

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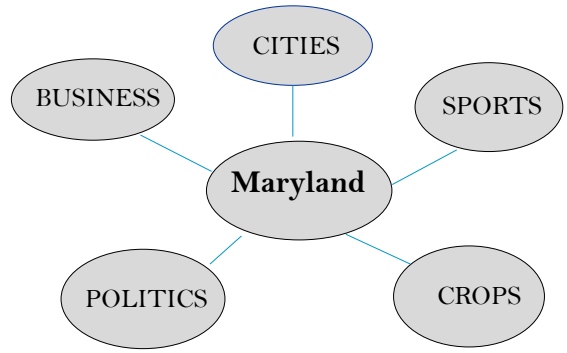
Graphic Organizers

Graphic Organizers – this involves a pre-writing activity whereby the student simply lists a word or phrase pertaining to the topic. An example may include a brainstorming a web:



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Self Monitoring Strategies

COPS *strategy* – a directional proof-reading strategy where the student re-reads a passage four times prior to completion.

1) **C**apitalize the first word of each sentence.

2) **O**rganize the information by reviewing topic sentences and double check paragraph breaks.

3) **P**unctuation miscues must be reviewed.

4) **S**pelling miscues must be reviewed.

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Strategies for Secondary Students

- **Inspirations** – teaches how to craft concept maps, idea maps, and other visual webbing techniques to assist in planning, organizing, and outlining. Very effective word predictive software.
- **Kurzweil Technology** - adaptive technology to further practice grammar, spelling, and punctuation. Voice activated software also an option.
- **Journal or Diary** – can be a fun and effortless way to practice writing on a daily basis.
- **Keyboarding** - speed up output to reduce pressure from working memory skills to retain information over longer periods of time.
- **Livescribe** - a *"smart"* pen which would both record lecture information in the class, as well as transcribe notes to a computer screen. Smart pens allow students to better organize their notes.

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10 Research Based Strategies (Graham & Perin, 2007)

(1) Writing Strategies *(effect size .82)*
(2) Summarization (*effect size .82)*
(3) Collaborative Writing *(effect size .75)*
(4) Specific Product Goals *(effect size .70)*
(5) Word Processing *(effect size .55)*
(6) Sentence Combining *(effect size .50)*
(7) Prewriting *(effect size .32)*
(8) Inquiry activities *(effect size .32)*
(9) Process Writing Approach *(effect size .32)*
(10) Study of Models *(effect size .25)*

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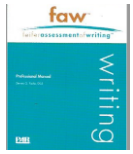

Feifer Assessment of Writing (FAW)

- A neurodevelopmental assessment of written language disorders.
- Pre-K to College (Ages 4-21)
- 12 subtests in complete battery/10 subtests core
- Diagnoses 3 subtypes of writing disorders:
  - **1) Graphomotor Dysgraphia**
  - **2) Dysexic-Dysgraphia**
  - **3) Executive Dysgraphia**
- Includes the FAW-S dysgraphia screening battery
- Yields a Compositional Writing Index (CWI)

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