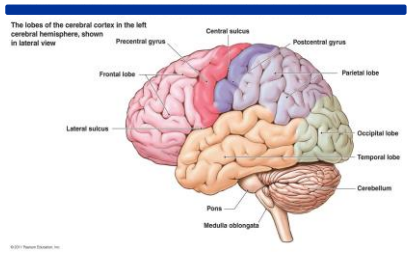
The Neuropsychology of Written Language Disorders: A Framework for Effective Interventions



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Course Outline: Module #2

- Six part webinar series on reading, writing, & math disabilities sponsored by Jack Hirose & Associates.
- Introduce a brain-based educational model of dyslexia, dysgraphia, and dyscalculia and classify each disability into distinct subtypes.
- Discuss targeted interventions for all students with academic learning issues.
- Questions and Comments?

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  - 2008 MD School Psych of Year
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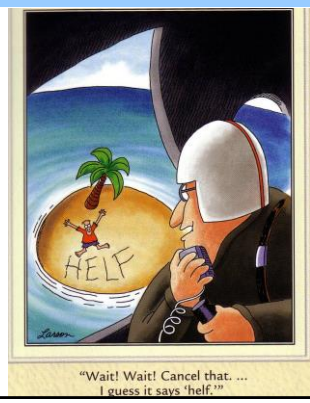
WRITTEN LANGUAGE: A Survival Skill!!



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Presentation Goals

1. Discuss national trends in written language, and the need for educators and psychologists to explore writing from a brain-based educational perspective.

2. Discuss the neural architecture of language development in children and learn key frontal lobe brain processes responsible for the organization and production of written language.

3. Introduce a *brain-based* educational model of diagnosing written language disorders by classifying into three distinct subtypes, with specific remediation strategies linked to each subtype.

4. Introduce a comprehensive dysgraphia evaluation to assess *seven* core cognitive constructs associated with learning disorders in children.

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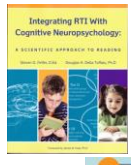
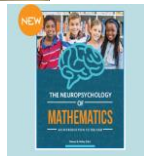
Further Reading Materials





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Learning Disabilities in Canada

- According to Statistics Canada, 42% of people with LD are currently unemployed, which is 6 times more than the general population.
- Canadians with LD are up to three times more likely to report high levels of stress, depression, anxiety, suicidal thoughts and visits to a mental health professional, and also report poorer physical health as well.
- 1 in 4 inmates in Canadian prisons have LD.
- LD youth in Manitoba are at-risk for higher incidence of drug use, alcoholism, and school drop out.

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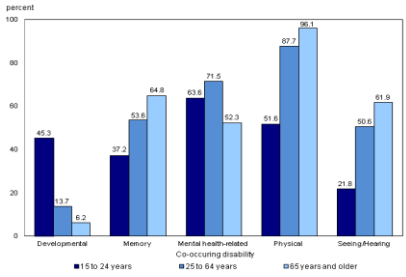
Co-occurring Disability Types in Canada

Chart 2
Prevalence of co-occurring disability types among adults with a learning disability, by age group, aged 15 years and older, Canada, 2012



Note: Physical disability includes mobility, flexibility, dexterity, and pain-related disability types.
Source: Statistics Canada, Canadian Survey on Disability, 2012.

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Measuring Written Language

- The National Assessment for Educational Progress (NAEP) administered the first computer based assessment in writing in 2011.
- In this new national writing assessment sample, *24,100* 8th graders and *28,100* 12th graders participated and composed their responses on a computer. The assessment tasks reflected writing situations common to both academic and workplace settings including:

1. PERSUADE
2. EXPLAIN
3. CONVEY EXPERIENCE

- Scored as Basic, Proficient, or Advanced.

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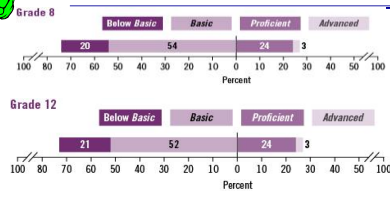
NAEP Writing Results for 8th & 12th grades (2011)



- 24% of students at both grades 8 and 12 performed at the ***Proficient*** level in writing in 2011.
- 54% of eighth-graders and 52% of twelfth-graders performed at the ***Basic*** level in writing in 2011.

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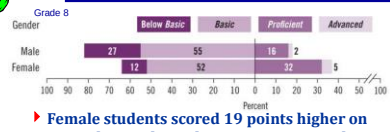
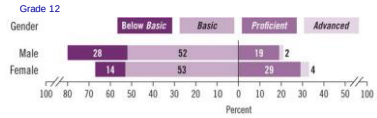
NAEP Writing Results for 8th & 12th grades Gender Differences (2011)



- Female students scored 19 points higher on average than male students in 2011 at grade 8.



- Female students scored 14 points higher on average than male students in 2011 at grade 12.

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Why the disconcerting trend?

- Most students rely on writing, either e-mail, text messages, word processing, or other computerized technology to communicate.

- Downward extension of our curriculum whereby reading and written language are skills emphasized in kindergarten.

- Most state assessments require written language responses, short answers, and brief constructed responses even in subjects such as mathematics. Therefore, most school curriculums readjusted to emphasize state testing requirements.

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Case Review

Cole: 3rd grade…Attention issues…no interventions

WISC V Composites	COMPOSITE SCORE	CONFIDENCE INTERVAL	RANGE	PERCENTILE RANK
Verbal Comprehension Index	85	78- 92	Low Average	16%
Perceptual Reasoning Index	100	92 - 108	Average	50%
Fluid Reasoning Index	90	83 - 97	Average	25%
Working Memory Index	77	71 – 86	Very Low	6%
Processing Speed Index	78	72 – 90	Very Low	7%
Full Scale Score	83	79 – 88	Low Average	13%

WIAT-III WRITING SUBTESTS	SCORE	PERCENTILE	RANGE
Spelling – the student writes words dictated by the examiner from a word list.	86	18%	Below Average
Sentence Composition – this subtest has two separate parts. First, the student combines two or more sentences into a single sentence that maintains meaning, and also uses correct punctuation and grammar skills (*Sentence Combining*). In the second part, the student constructs a sentence from a stimulus word provided (*Sentence Building*).	95	37%	Average
Essay Composition – the student has ten minutes to construct an essay about a favorite game or activity, and must list specific reasons for liking the game or activity.	80	9%	Below Average
WRITTEN EXPRESSION SCORE	85	16%	Below Average

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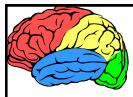

How Do You View a Learning Disability?

Discrepancy Psychologist – There is no discrepancy between his overall ability and achievement. Therefore, Cole has no learning issues, and no interventions are warranted.

RtI Psychologist – There is no indication that Cole has been exposed to a tiered level of evidence based interventions. Therefore, let's wait and see how he responds (trial and error approach).

PSW Psychologist – More testing is needed to determine if there is a pattern of cognitive strengths and weaknesses that justify an LD label. However, confusion remains as to which processes should be tested??

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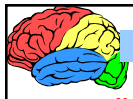

School Neuropsychological Assessment

Neuropsychology: **An analysis of learning and behavior that examines *brain-behavior* relationships. The underlying assumption is that the brain is the seat of ALL learning; therefore, knowledge of cerebral organization should be the key to unlocking the mystery behind most cognitive tasks.**

- **Reports based upon a brain-behavioral paradigm which attempts to describe how a child learns and processes information…not label…by surveying underlying cognitive processes.**
- **Why the need to survey cognitive processes??**

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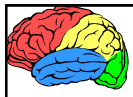
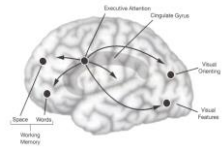


Cognitive Constructs Involved with Written Language

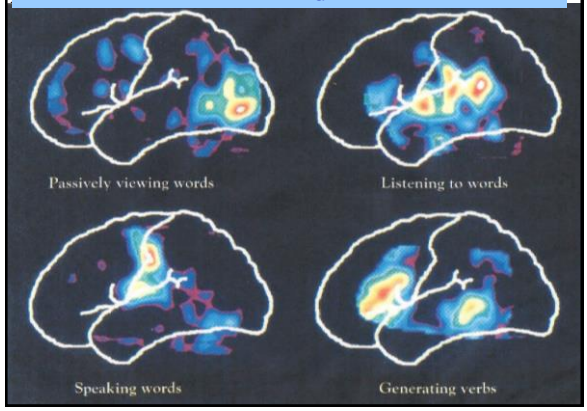
Attention

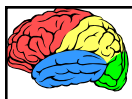
- **Poor planning**
- **Uneven tempo**
- **Erratic legibility**
- **Inconsistent spelling**
- **Poor self monitoring**
- **Impersistence**



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

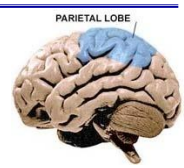
THE WRITING BRAIN





Cognitive Constructs Involved with 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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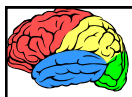
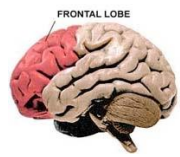


Cognitive Constructs Involved with Written Language

Sequential Production



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

BRAIN REGION **- Left Prefrontal Cortex**

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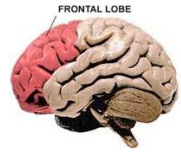
Cognitive Constructs Involved with Written Language

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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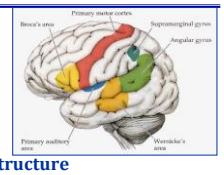
Cognitive Constructs Involved with Written Language

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)

BRAIN REGION **- Left Temporal Lobe**

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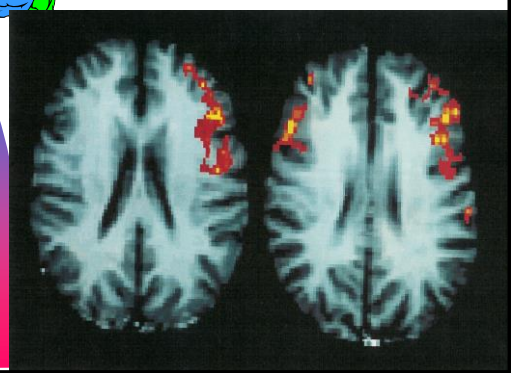
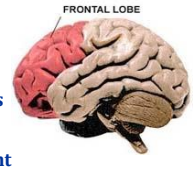
Male vs. Female Brain in Phonological Processing



Cognitive Constructs Involved with 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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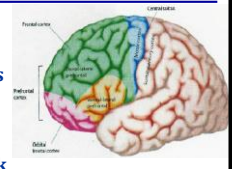
Cognitive Constructs Involved with Written Language



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 Involved with Written Language

Motor Output Speed

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** (Pollack et al., 2009)

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Summary of Brain Regions: Anterior/Posterior Differences

Anterior (Front)

- Organizes and arranges information leaving the brain.
- Modulates executive functioning processes.
- Involved with syntactical arrangement of words.

Posterior (Back)

- Basic psychological processes converge for higher level thinking.
- Key centers for deficits in auditory or linguistic processing deficits.

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Cerebral Orchestra of Writing
(8th grade response)

I am against changing the school schedule. It would take away time that students have to spend with their family and friends. Students would be sleeping in the morning, doing homework after school. This leaves no time for themselves.
This would also interfer with other activities like after school sports programs. It would also disrupt parents schedule and keep them up later than needed.

Cerebral Orchestra of Writing

- *Reticular Activating System* - Basic level of arousal and orientation.
- *Wernicke's Area* – auditory association area in temporal lobes to comprehend linguistic directions.
- *Temporal Lobes-* silently read directions for written language assignment.
- *Limbic System* – emotional connectivity to subject matter.
- *Anterior Cingulate Gyrus* – Focus our attention inward toward internal resources, thoughts, and ideas.

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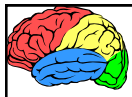

Cerebral Orchestra of Writing

- ***Hippocampus*** – retrieval of memories stored throughout the cortex in sense of space and time.
- ***Inferior Parietal Lobes*** – seat of higher level thinking and tertiary problem solving zones.
- ***Frontal Lobes*** – syntactical arrangement of thoughts and ideas in a linguistic manner.
- ***Dorsolateral Prefrontal Cortex***
  - Organization and planning of thoughts.
  - Working memory to hold ideas in mind.
  - Shift attention between ideas.
  - Inhibit distracting thoughts.
  - Initiate task and maintain cognitive set.

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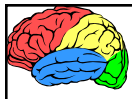

Cerebral Orchestra of Writing

- Premotor Cortex – planning of sequential motor response
- Motor Cortex - execution of motoric act of writing.
- Basal Ganglia – automaticity of handwriting
- Dorsolateral Prefrontal Cortex – self monitors response.

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