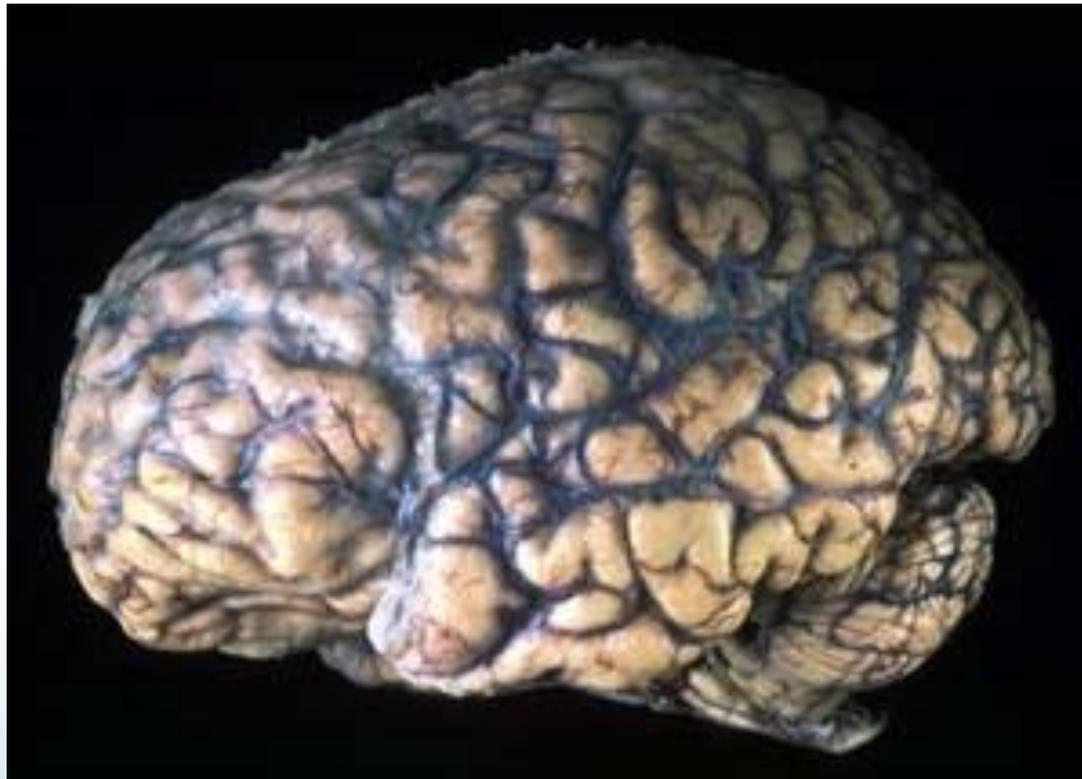


# Cognitive and Behavioral Consequences of Brain Injury

Resource Facilitation Regional Conference  
2016

Lance E. Trexler, PhD, FACRM

# The Biological Basis of Our Identity, Consciousness, and Adaptability

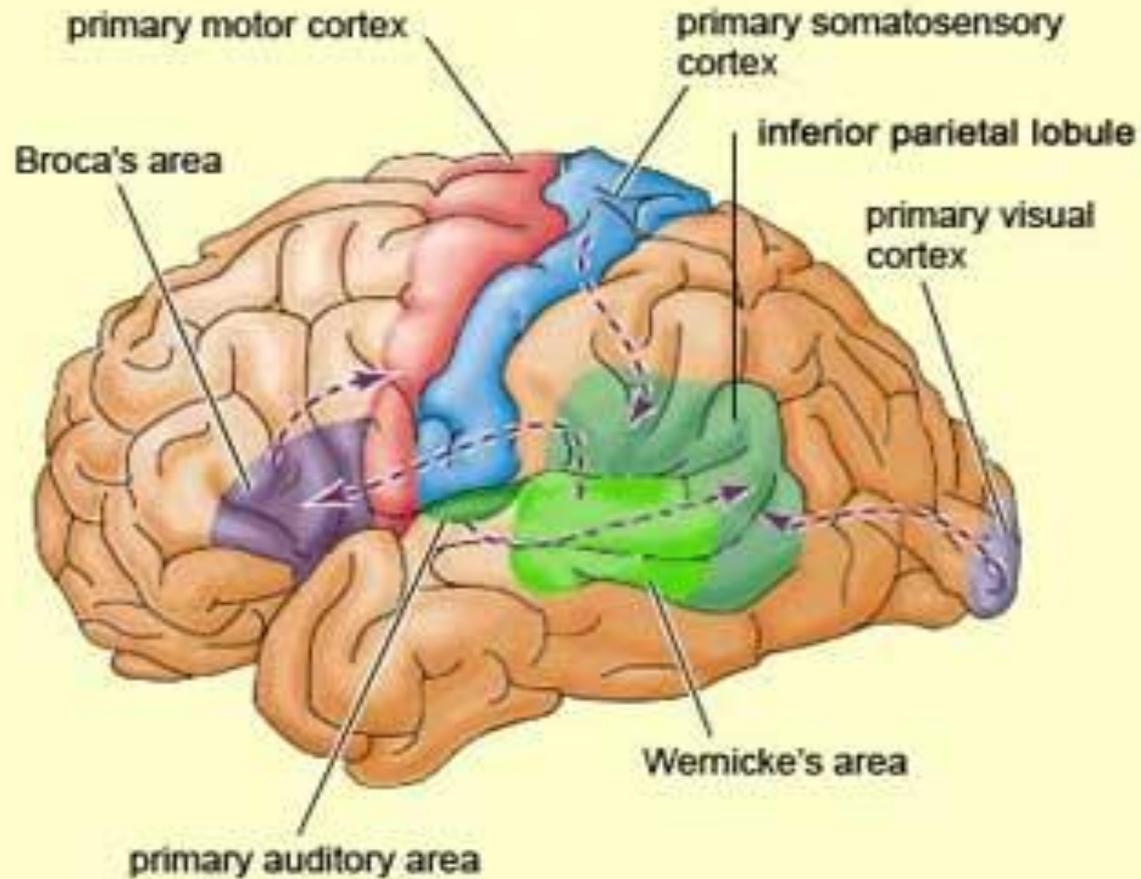


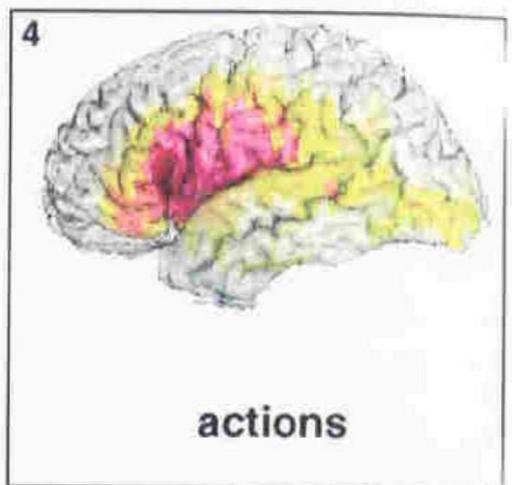
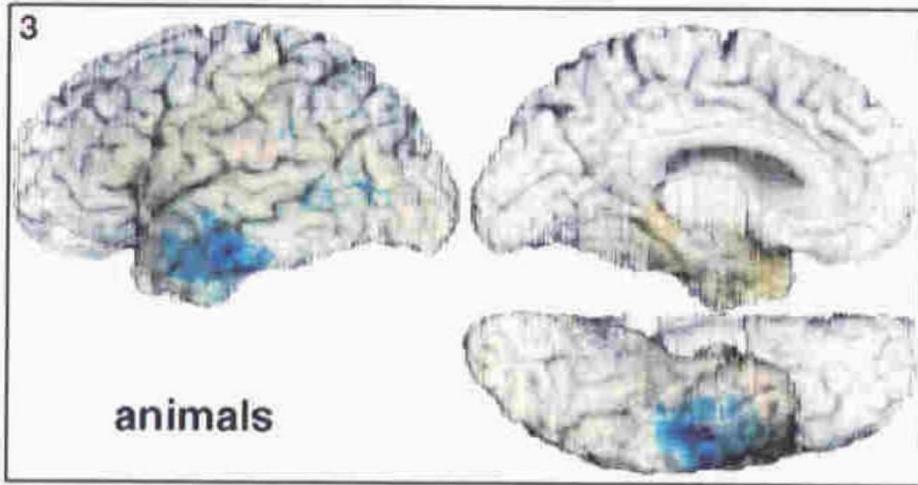
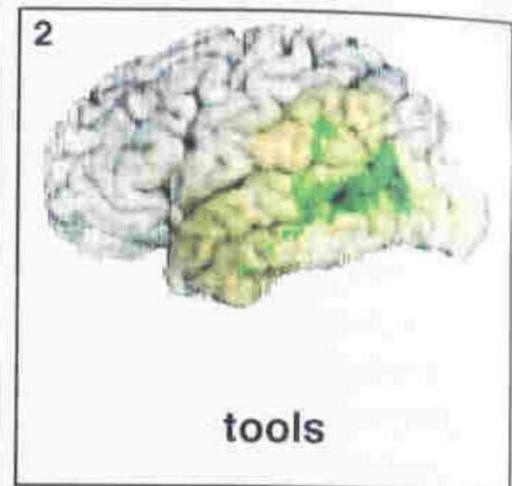
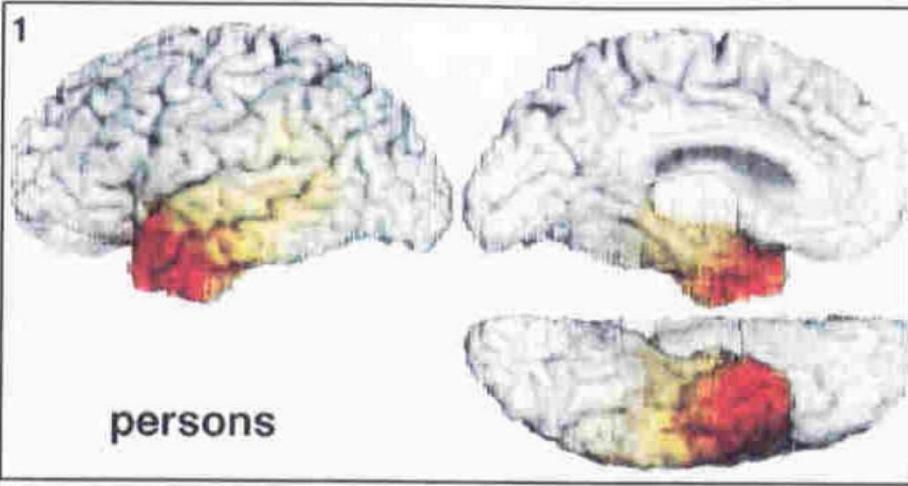
Men ought to know that from nothing else but the brain come joys, delights, laughter and sports, and sorrows, griefs, despondency, and lamentations. And by this, in an especial manner, we acquire wisdom and knowledge, and see and hear and know what are foul and what are fair, what are bad and what are good, what are sweet and what are unsavory... And by the same organ we become mad and delirious, and fears and terrors assail us...All these things we endure from the brain when it is not healthy...In these ways I am of the opinion that the brain exercises the greatest power in man.

-Hippocrates, *On the Sacred Disease* (Fourth century B.C.)

# Language, Visuoperceptual and Visuoconstructive Functions

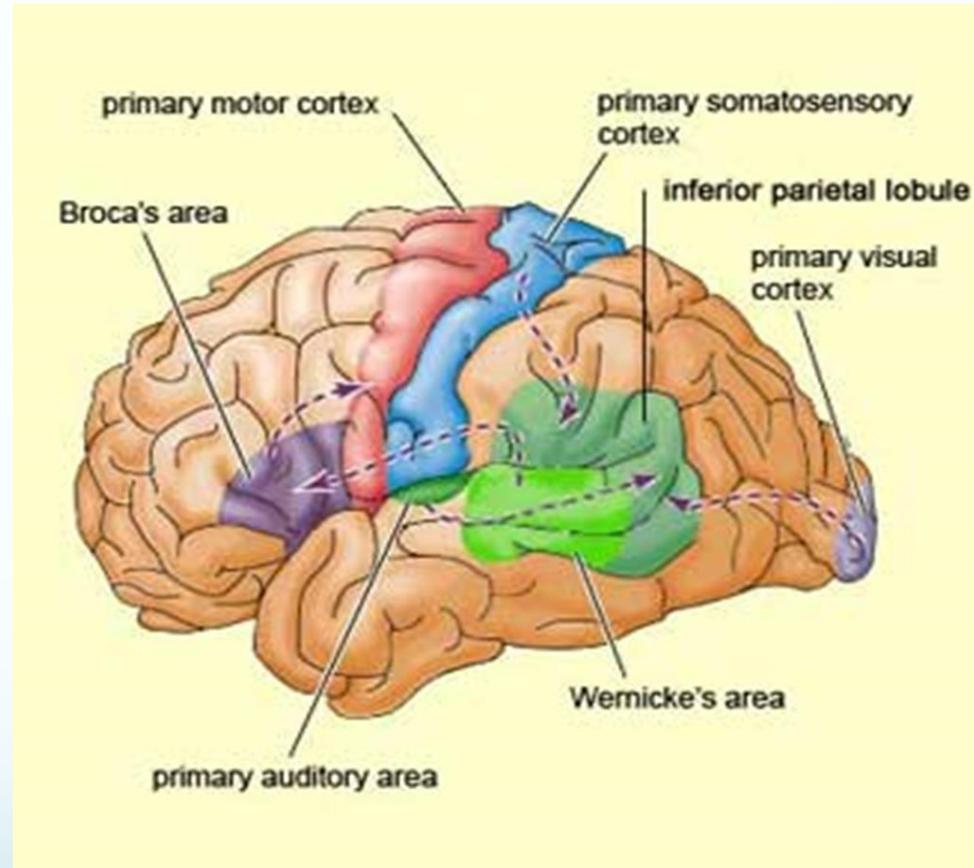
# Language





# Language

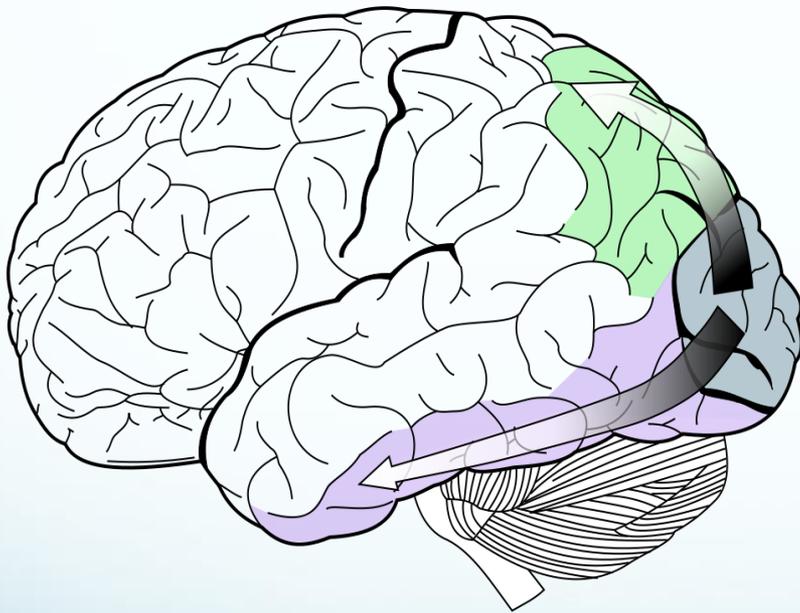
- Auditory & Visual (Alexia & Dyslexia)  
Verbal Comprehension Deficits
- Apraxia
- Dysgraphia
- Verbal Expression



# Language

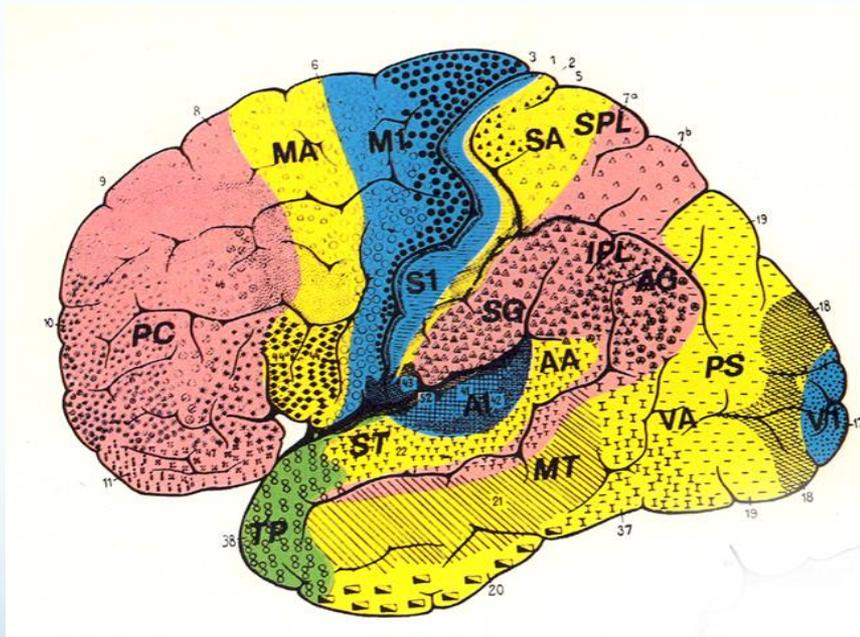
- Auditory & Visual (Alexia & Dyslexia) Comprehension Deficits
- Apraxia
- Dysgraphia
- Verbal Expression
- Use the other modality
- Verbally-mediated task guidance systems
- Dictation systems
- AT compensations

# Two Dimensions of Visual Processing



Factor	Ventral system (purple) What	Dorsal system (green) Where
Function	Recognition - identification	Visually guided behavior
Sensitivity	High spatial frequencies - details	High temporal frequencies - motion
Memory	Long term stored representations	Only very short-term storage
Speed	Relatively slow	Relatively fast
Consciousness	Typically high	Typically low

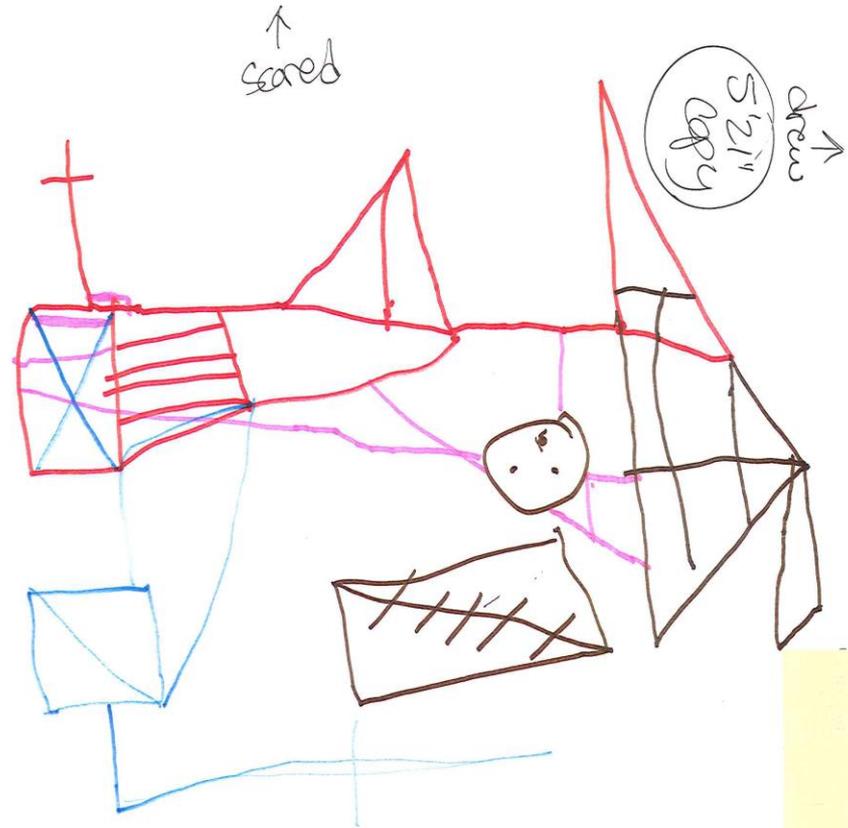
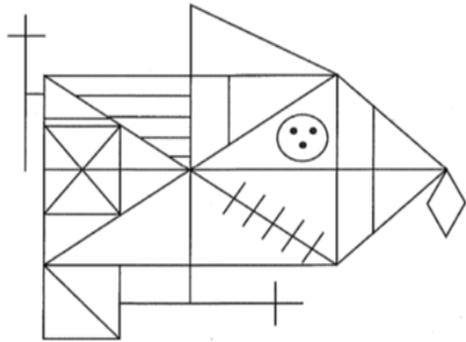
# Visuoperceptual and Visuoconstructive Functions



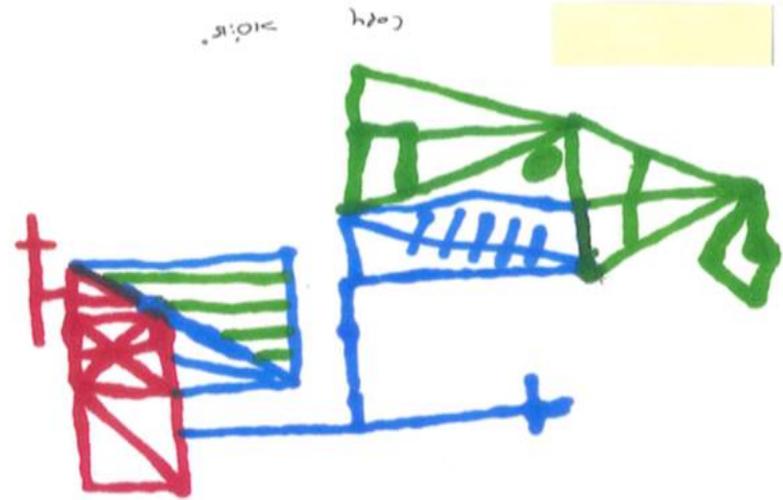
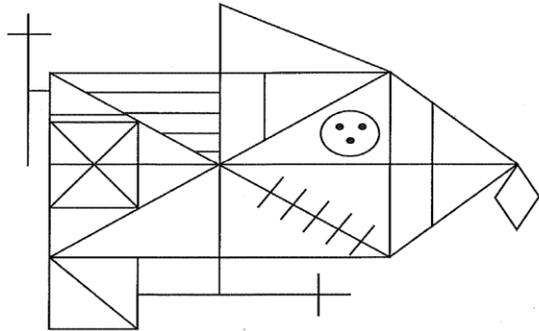
- Visuoperceptual Discrimination Deficit
- Neglect
- Visuomotor Deficit
- Receptive & Expressive Dysprosodia



# Visuoperceptual Impairment



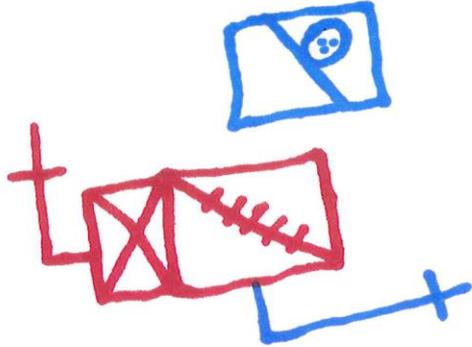
# Visuoperceptual Impairment



27

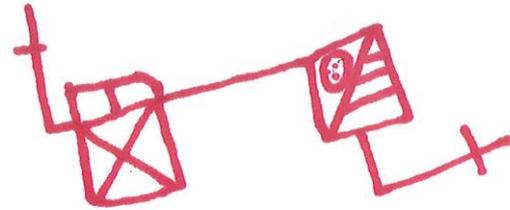
# Visual Memory Impairment

...  
"20,5" mmJ



6.5

...  
"19" mmJ



5.5

# New RF RTC Fact Sheets

- 25 Fact Sheets
- What is .....? (e.g., attention)
- How does brain injury affect ...?
- Common examples of .. difficulties.
- Recommended strategies.
- Available soon!!!!



## FACT SHEET

*Brain Injury and Awareness*

**What does this mean?**

An extremely important area of cognition, associated with the frontal lobes, is awareness of self and others. After brain injury, many individuals are unaware of the effect their words and actions may have on others and so do not see the need to amend their behavior. Individuals with brain injuries may lack self-awareness, and as a result they may behave inappropriately or impulsively (without thinking it through) in social situations.

**How might my BI impact affect awareness?**

There is also a lack of insight regarding difficulties. The type and degree of insight varies from person to person as time passes post-injury. Many people with a brain injury have a tacit understanding that they are not the people they used to be. They experience difficulties at work and in social situations but may have minimal insight into their own contribution to these, perhaps tending to blame external factors. Lack of insight could prove potentially dangerous. It is, of course, important to remain aware of such situations, for example, driving or working with potentially dangerous machinery. Self-awareness requires complex thinking skills that are often weakened after brain injury.

**Common examples of awareness:**

- ◆ They may deny they have cognitive problems, even if these are obvious to others.
- ◆ They may say hurtful or insensitive things, act out of place, or behave in inconsiderate ways.
- ◆ They may lack awareness of social boundaries and others' feelings, such as being too personal with people they don't know well or not realizing when they have made someone uncomfortable.

**Recommended strategies:**

- ◆ Ask your rehabilitation team to advise on safety issues.
- ◆ Be patient. It is also possibly difficult in a rehabilitation context because you might not take onboard compensatory strategies that would help you function more efficiently.
  - Insight usually develops over time but some people may never fully regain their awareness of self and others and may, as a result, continue to misread social and professional situations, displaying poor interpersonal and social skills.

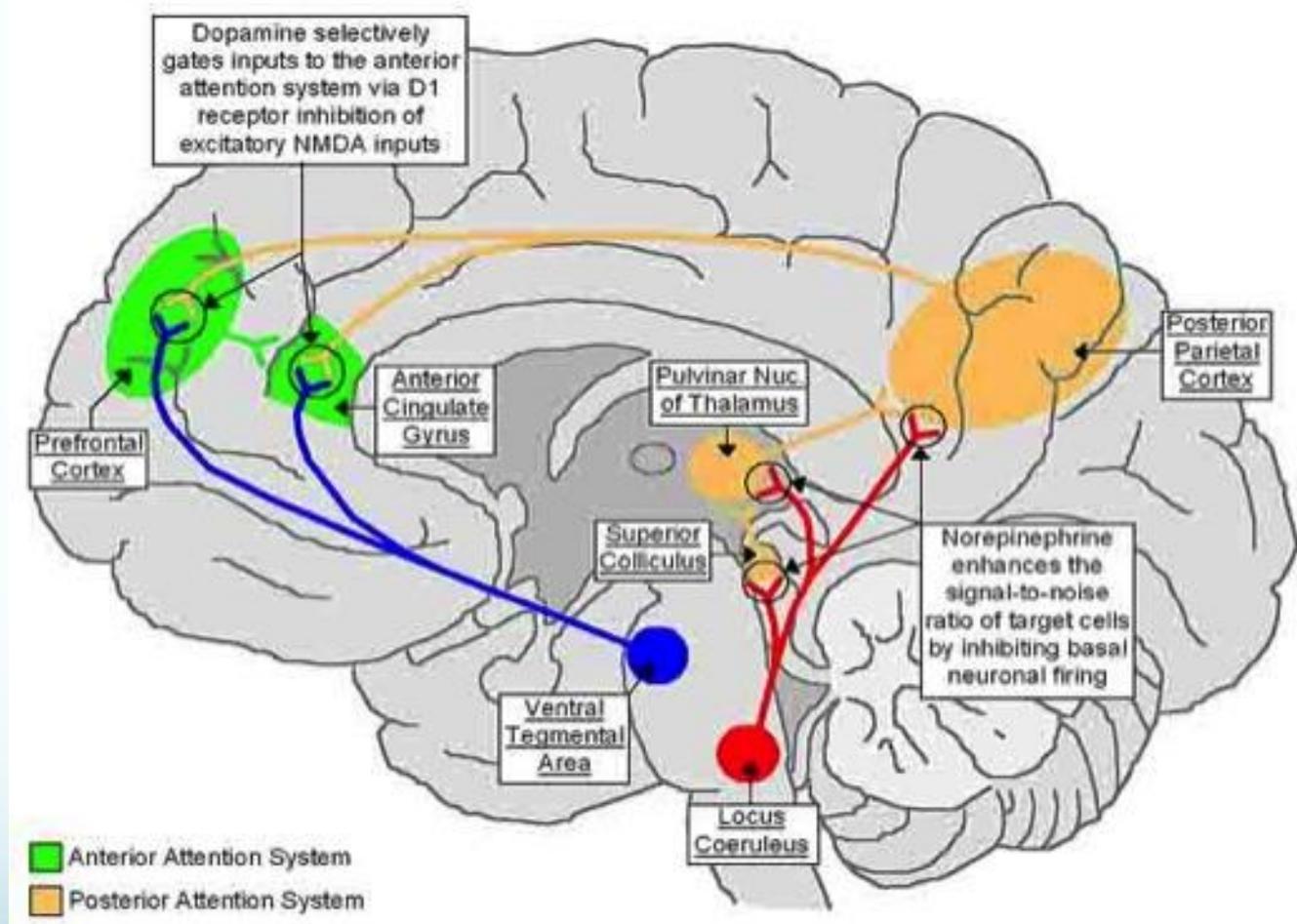
*Do you have trouble with awareness since your brain injury?*

**RHI Resource Facilitation Department**  
9531 Valparaiso Court • Indianapolis, Indiana 46268  
Tel: (317) 735-1203 Fax: (317) 735-1254  
ResourceFacilitation@rhin.com

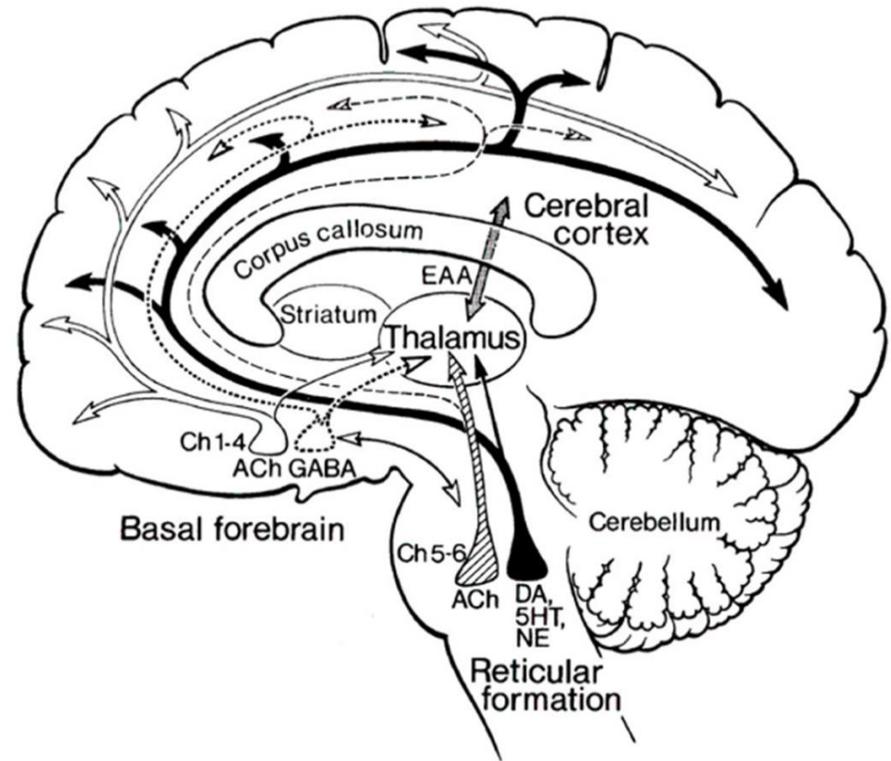
# Attention, Memory, and Executive Functions

# Anterior and Posterior Attention Functional System



# Types of “Attention”

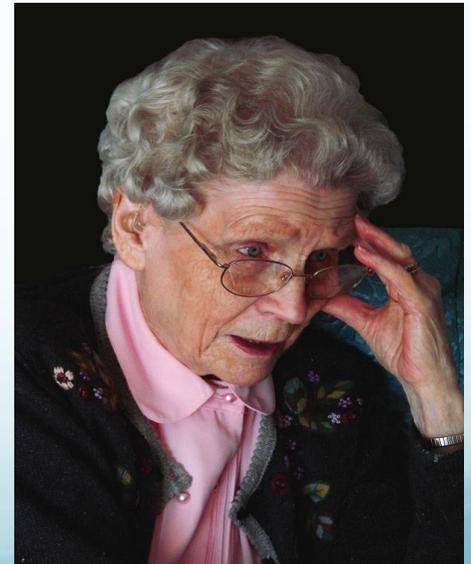
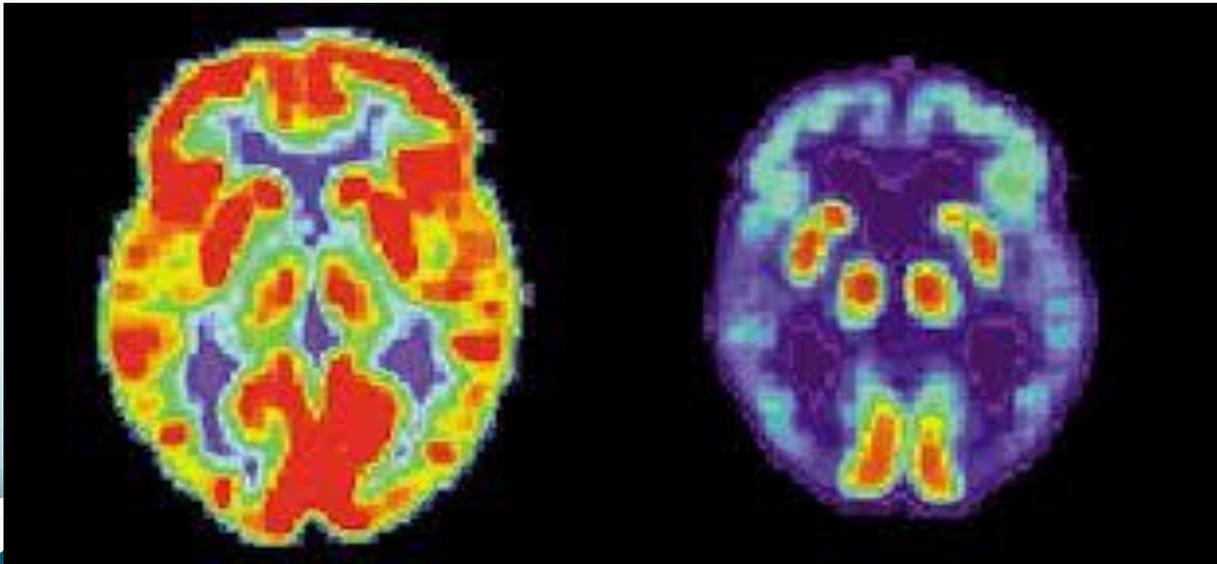
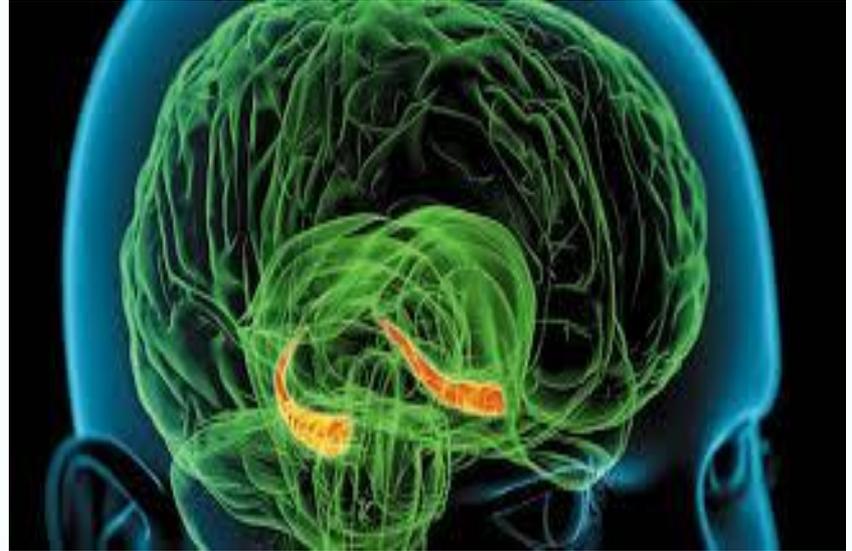
- Alertness and Arousal
- Focused Attention: focus on one stimulus and inhibition of another
- Sustained Attention: capacity to maintain attention over a period of time or vigilance
- Divided Attention: ‘multi-tasking’ or responding to more than one stimulus at a time



# Impairments of Attention and Vocational Implications

- Alertness and Arousal
- Focused Attention: focus on one stimulus and inhibition of another
- Sustained Attention: capacity to maintain attention over a period of time or vigilance
- Divided Attention: 'multi-tasking' or responding to more than one stimulus at a time
- Pharmacological treatment & fatigue management
- Distraction-free environment
- Breaks, one task at a time
- Keep a list of tasks, prioritize

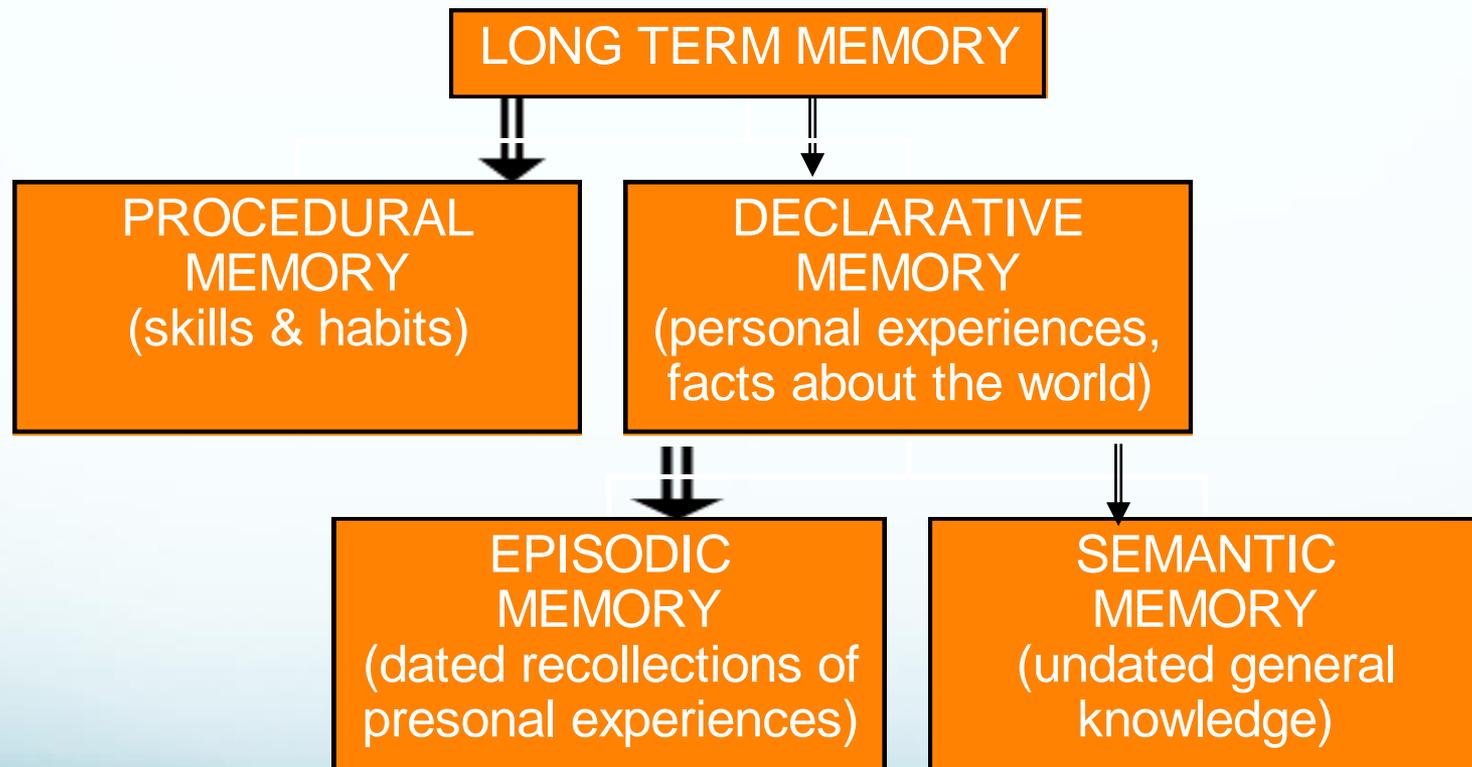
# Memory



# Types of Memory

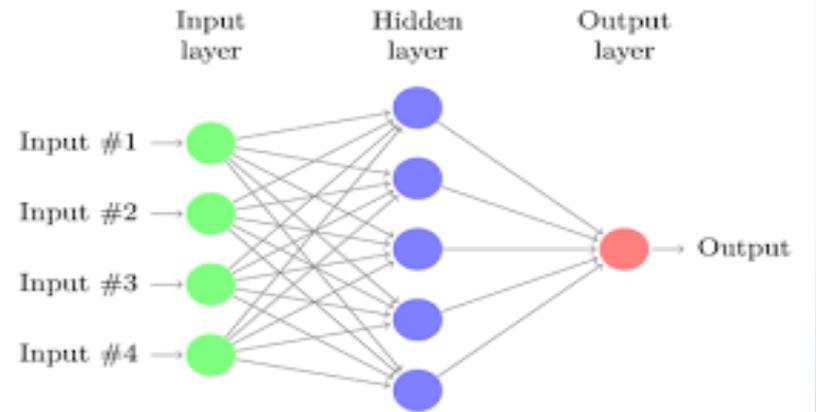
- Declarative: memory for “conscious” facts & experiences
  - Semantic: memory for factual information
  - Episodic: memory for events in your life
- Modality-specific memory (e.g., visual, olfactory)
- Procedural: memory about how to do things
- Autobiographical: personal facts & events
- Working memory: short-term storage and management of information
- Prospective: remembering according to intent or plan

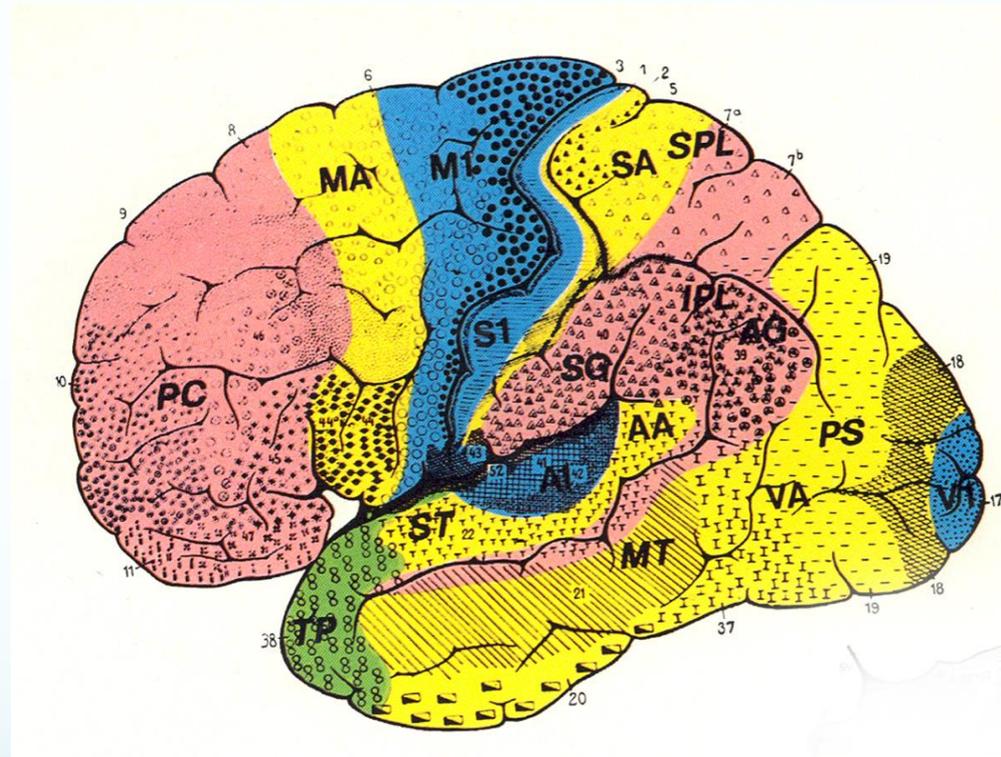
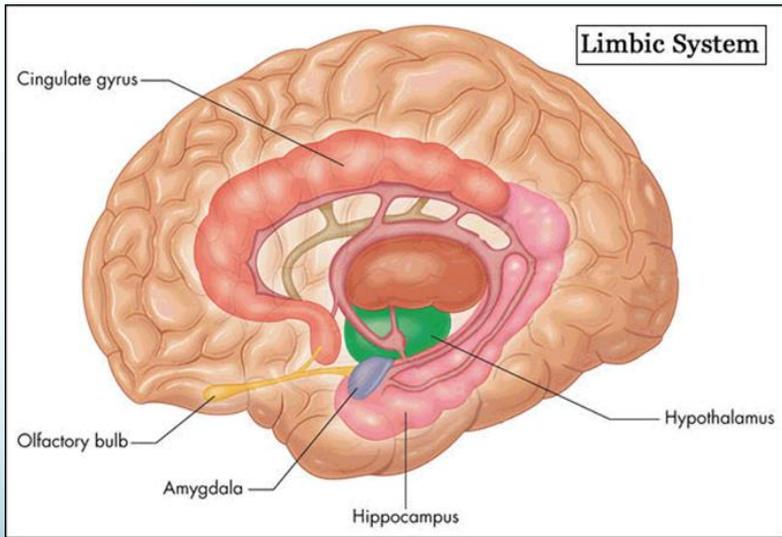
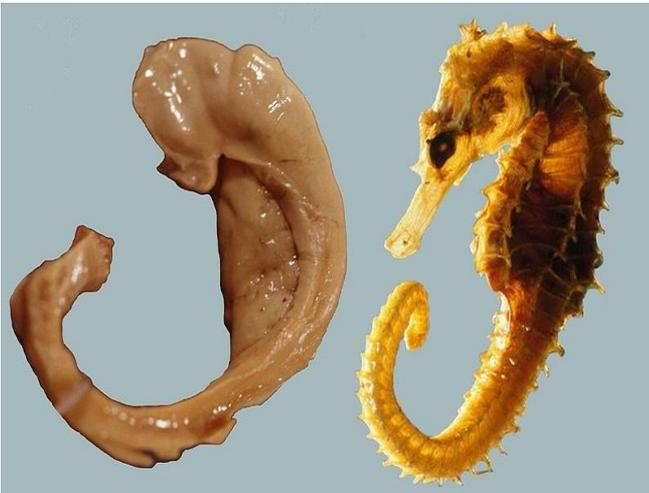
# Organization of Long Term Memory



# Neural Networks and Memory

- memory depends on synaptic changes in a distributed ensemble of neurons
- the simultaneous activation of this ensemble subserves the memory
- this ensemble is resculptured according to a variety of dynamic experiences, including rehearsal, relearning, & normal forgetting





# Impairments of Episodic Memory and Vocational Implications

- Caused by hippocampal-temporal lobe injury
- Impaired storage of information into long-term memory
- Repetition with consistent rehearsal strategies (procedural memory)
- Memory notebooks
- Task guidance systems (written, digital)
- Structured cueing

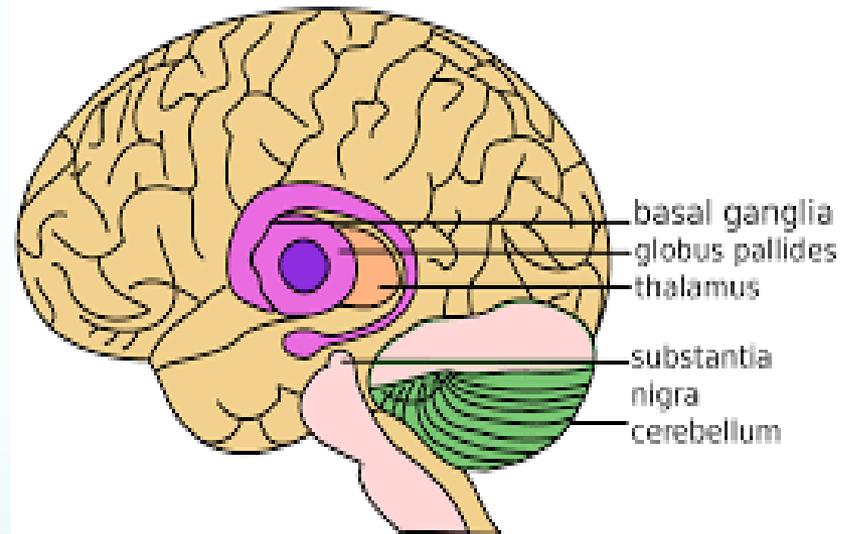
# Impairments of Semantic Memory and Vocational Implications

- Caused by diffuse injury
- Loss of learned knowledge
- Previous job knowledge may be impaired
- Re-learning may be possible
- Same strategies as applicable to episodic memory

# Impairments of Procedural Memory

- Caused by especially by hypoxic encephalopathy (purkinje cells), but others
- Basal ganglia, cerebellum, frontal cortex
- “Unconscious” storage of sequence of procedures

Basal Ganglia and Related Structures of the Brain



# Impairments of Procedural Memory and Vocational Implications

- Loss of learned especially motor and cognitive sequences/switching
- E.g., riding a bicycle, knitting, tool and dye
- Previous job knowledge may be impaired
- Re-learning may be possible
- Same strategies as applicable to episodic memory

# Working memory:

Holds and pays attention to information that is sensed, or that is triggered from old memories.

Holds and switches between bits of information when they are needed. Ignores information that isn't.

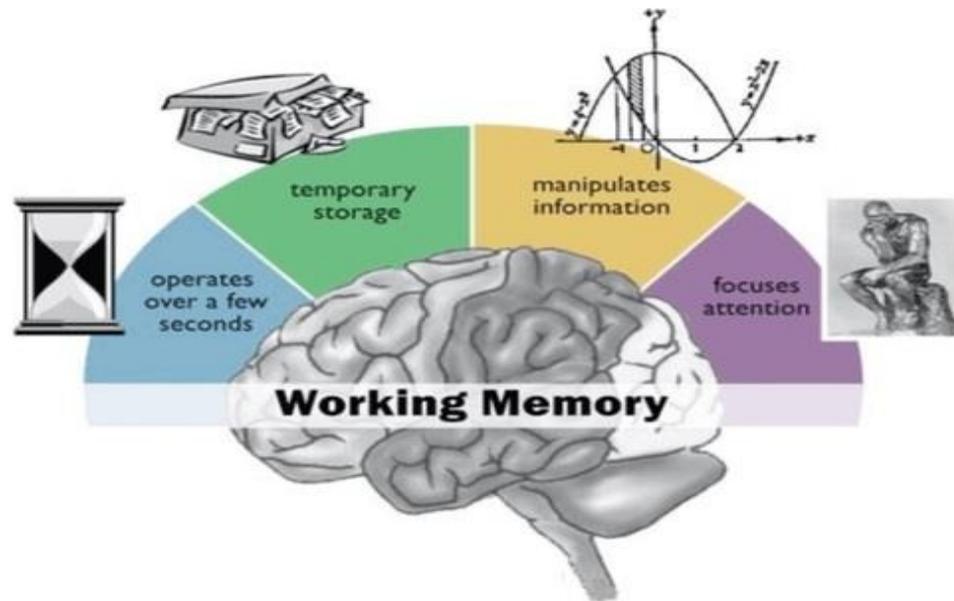
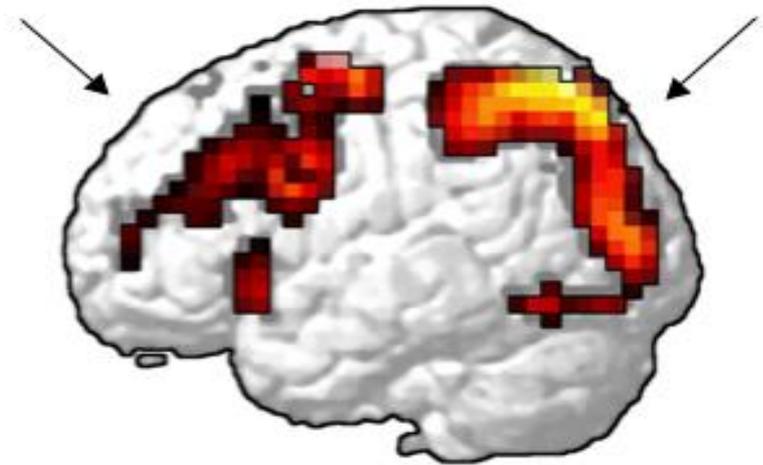
Holds options in mind while working out what needs to be done. Then holds details to plan then start activity.

Holds goals in mind to check if the plan is working.

Processing speed

Frontal lobe

Parietal lobe

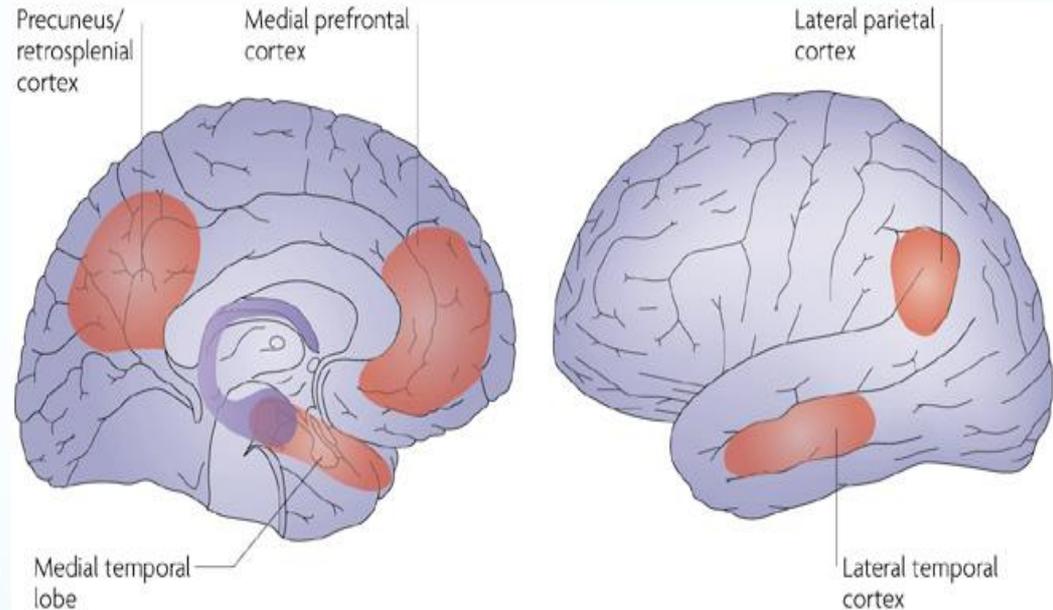


# Impairments of Working Memory and Vocational Implications

- External and internal management of distractions
- Verbal or visual mediation and rehearsal
- Task guidance systems
- External and internal pacing (e.g., one task at a time)

# Prospective Memory

- Remember content and action
- Time and event based
- Involves planning and problem-solving
- Anticipation of what could or might happen: “what if?”



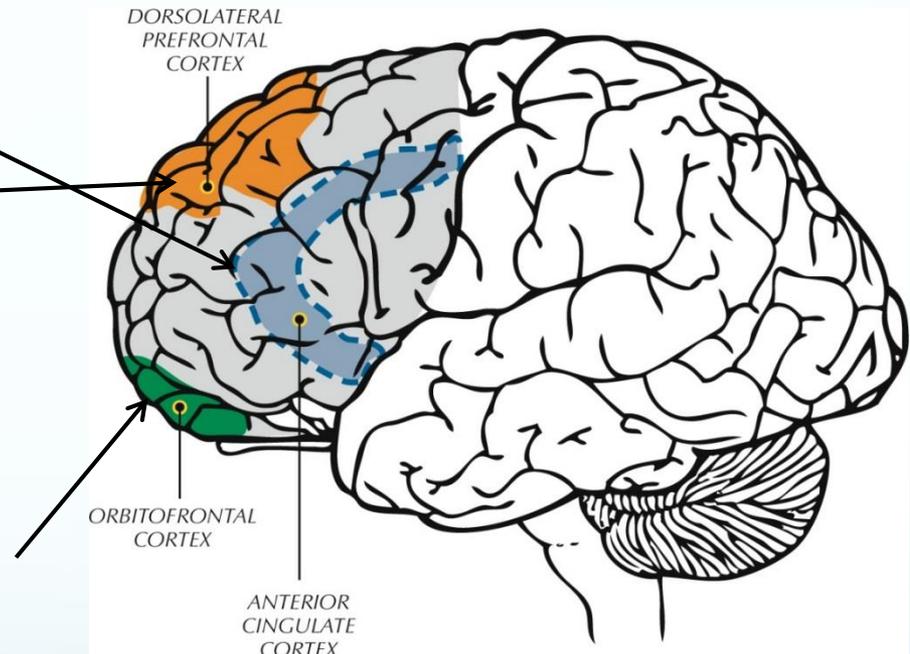
Nature Reviews | Neuroscience

# Impairments of Prospective Memory and Vocational Implications

- Forgetting to:
  - plan for event (appointment with VRC)
  - The next task to complete
  - To ask for a day off
- External cueing (e.g., alarm)
- Memory notebooks (e.g., calendar)
- Task guidance system

# Executive Functions

- Intention & initiation
- Organization-planning, strategy selection, sequencing, execution, self-monitoring, modification of strategy
- Regulation of affect and drive



# Dorsolateral Frontal Convexity Syndrome

- impaired control, regulation and integration of cognitive activities
- dissociation of intent and behavior
- impaired initiation & apathy
- flat and “pseudo-depressed”
- cognitively slow and impaired generation of cognitive set/strategy

# Orbital-Basilar Frontal Syndrome

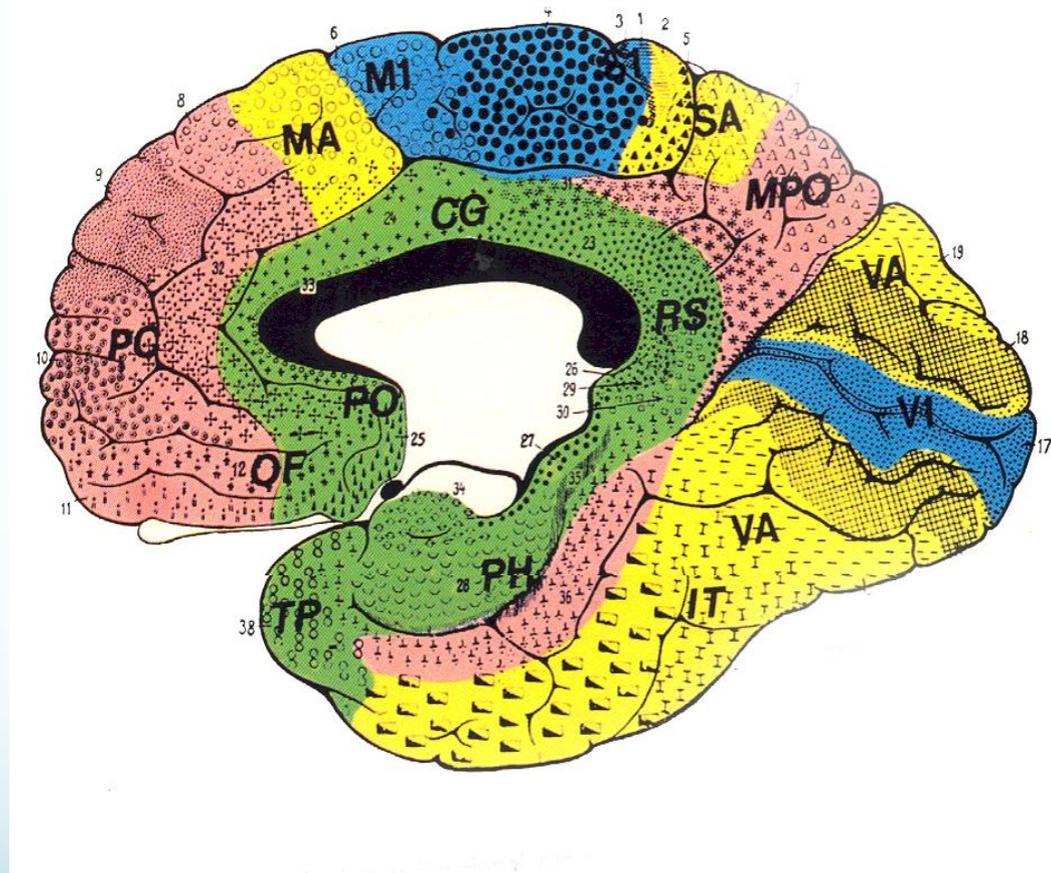
- disinhibition and impulsivity (“pseudo-psychopathic”)
- hyperkinetic & jocularity
- euphoric & irritability
- impaired maintenance of cognitive set/strategy

# Frontal Lobe Anatomy and Executive Functions

	<b>Functions</b>	<b>Impairments</b>	<b>Impact on Work</b>
<b>Dorsolateral Convexity</b>	Initiation, organizing, planning, strategy selection, self-monitoring, and strategy modification	Difficulty developing goals and executing goals, impaired sequencing and problem-solving (cannot find a strategy to solve the problem), poor awareness, results $\neq$ intention	Difficulty generating or staying consistent with vocational goals, not following through with stated goals, poor awareness of errors on the job, can't adjust to change in how to perform tasks, slow to learn new steps or procedures, frustration and disappointment with the discrepancy between goal (performance on the job) and actual performance, difficulties learning from mistakes on the job
<b>Orbitofrontal Cortex</b>	Regulation of mood and behavior according to socially appropriate standards or environmental context	Impulsivity, disinhibition, motor and verbal hyperactivity, indifferent attitude, jocular, irritability and inability to stay with a strategy to solve a problem (inconsistent	Distractible on the job (intrusive thoughts of feelings and external distractions), impulsive actions or statements to co-workers, veers off task, inconsistent performance on the same task, appears indifferent to job errors or constructive feedback, makes inappropriate jokes, appears to over-react emotionally

# Medial-Cingulate Frontal Syndrome

- decreased drive and motivation
- decreased emotional experience
- usually associated with dense amnesias



# Vocational Strategies in Impairments of Executive Functions

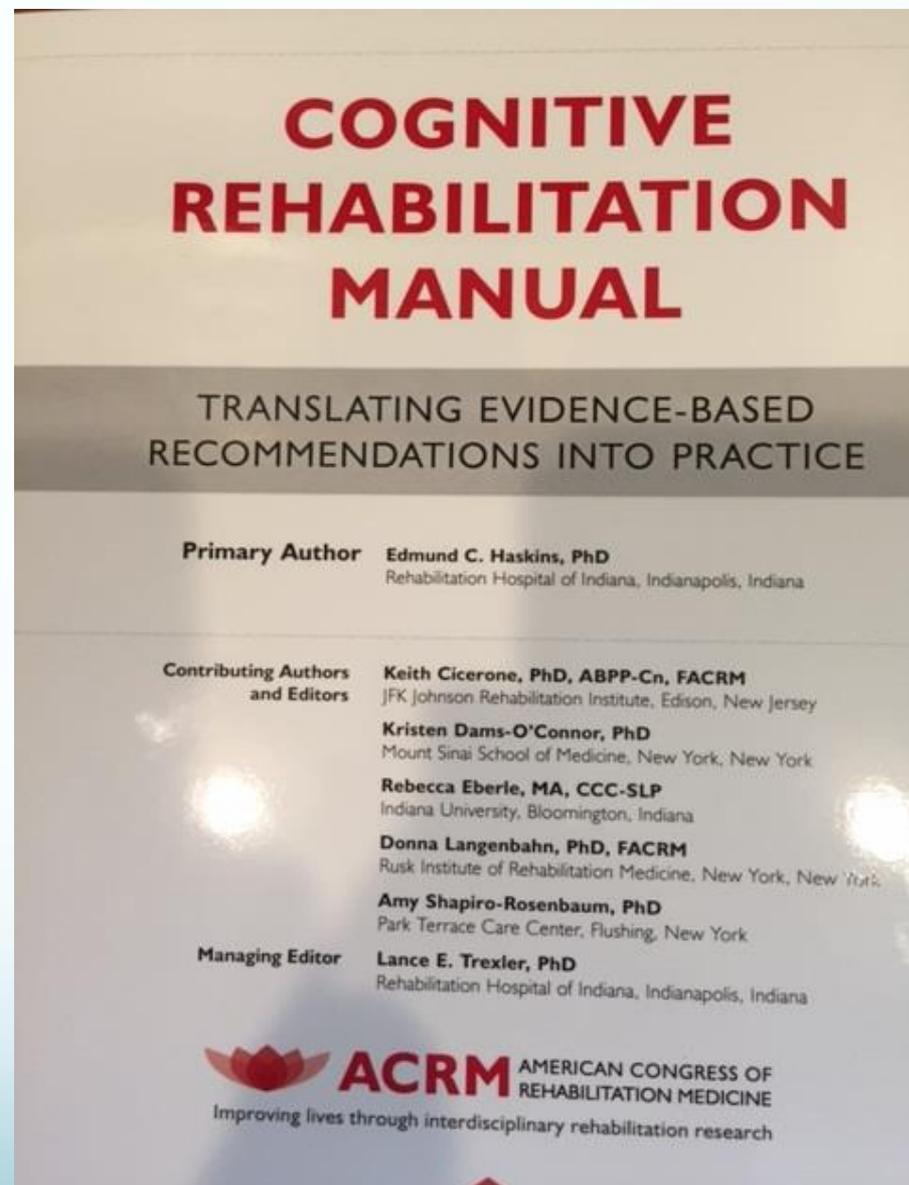
- Intention & initiation
- External cueing strategies, to do lists, break into steps
- Organization-planning, strategy selection, sequencing, execution, self-monitoring, modification of strategy
- Structure, consistency, prepare for change, consistent feedback, checklists for task completion, task guidance systems

# Vocational Strategies in Impairments of Executive Functions

- Regulation of affect and drive
- “Stop and think” strategies, anticipate with external cues and strategies, breaks to decrease fatigue and irritability associated with being overwhelmed

# American Congress of Rehabilitation Medicine

- Evidence-based cognitive rehabilitation
- Manual for therapists
- Two-day workshops
- <http://www.acrm.org/publications/cognitive-rehab-manual/>



# Brain Injury takes a Village

