**Unit 5. Biology:** 17, Chapter 2, 213-215

**Introduction.** 17: The Neuroscience Perspective

**THE BRAIN (CEREBRUM)**



**The brain weighs about 3 pounds and consists of approximately 100 billion neurons (which, if I calculated correctly, means that a neuron weighs approximately 5 billionths of an ounce). The brain consists of two hemispheres, the Left Cerebral Hemisphere and the Right Cerebral Hemisphere.**



**Neural Plasticity and Neurogenesis:** 77-78



Neuroplasticity: The brain changes with experience. One part of the brain can take over functions of a damaged part of the brain.

**The Organization of the Nervous System:** 60-62

NERVOUS SYSTEM

CENTRAL PERIPHERAL

BRAIN SPINAL CORD SOMATIC AUTONONOMIC

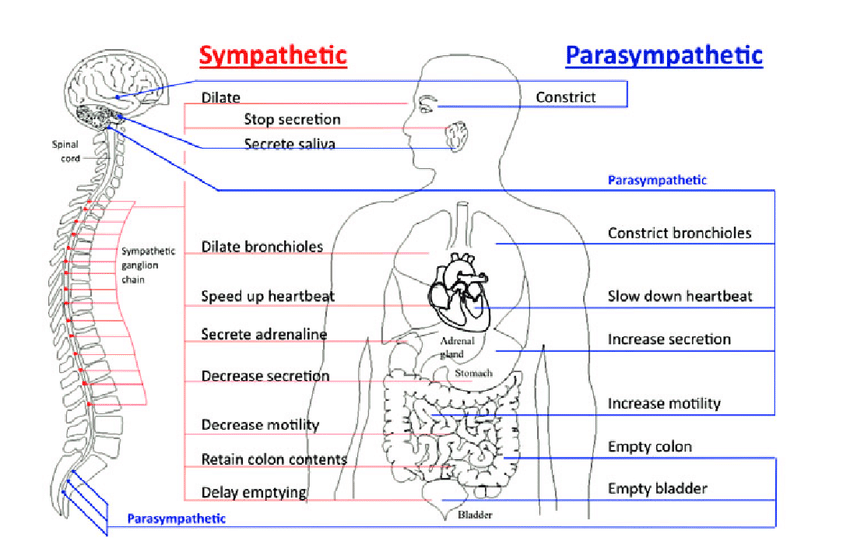
AFFERENT EFFERENT SYMPATHETIC PARASYMP

ATHETIC

Central NS: Brain, Spinal Cord

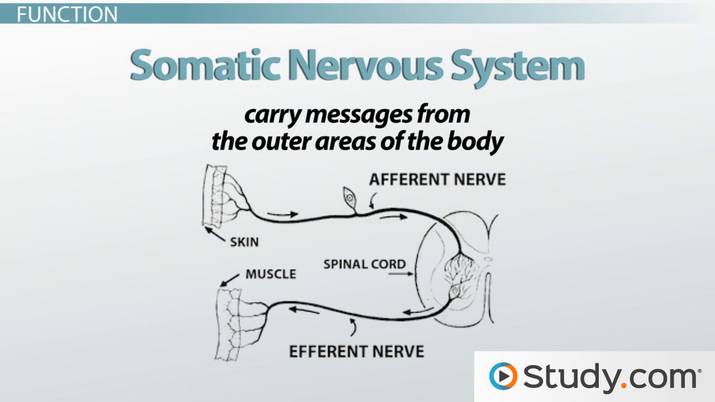
Peripheral NS:

Autonomic NS. Sympathetic, Parasympathetic62-63



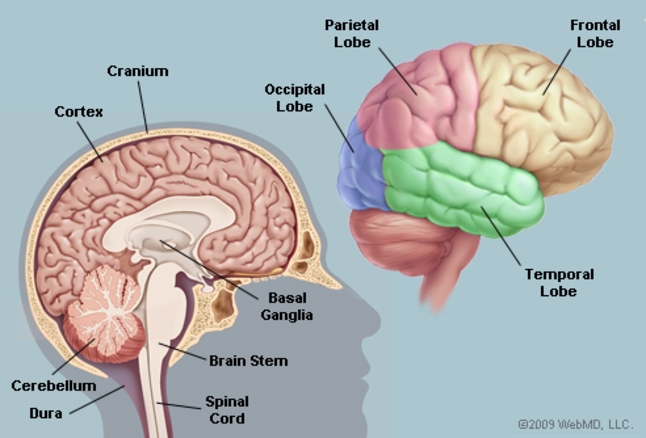
**The Somatic Nervous System is divided in two: Afferent or sensory nerves and Efferent or motor nerves.**

**The autonomic nervous system plays an important role in the human stress response and in our fear and anger, and in pleasure as well. This subject will come up again in Unit 7.**



**The Somatic Nervous System is divided in two: Afferent or sensory nerves and Efferent or motor nerves.**

**Spinal Reflexes. Some of our reflex behavior occurs so rapidly that it is impossible for the brain to be involved. For example, when I touch a hot pan handle, my hand jumps off so quickly that the brain could not have been involved. What is involved is the Somatic Nervous System and the Spinal Cord: As soon as I touch that hot pan handle, Afferent Nerves under the skin of my hand are activated, sending a message to neurons in the spinal cord, which then sends messages to the associated efferent nerves of the hand and arm, causing my hand to jump off the hot pan handle. The brain IS involved in my saying to myself, “Ouch, that hurts and that was goofy of you!**



**The Cerebral Cortex:** 73-77

**Association Areas. 76**

Frontal/Prefrontal: memory, personality, planning the future; speech production, motor functioning

Temporal: Hearing, speech comprehension

Parietal: Spatial abilities, somatic sensory functioning

Occipital: vision

**The Central Core:** 70-73

Corpus Callosum: connects left and right cerebral hemispheres

Cerebellum: balance, motor coordination

Reticular Formation: sleep, wakefulness, attention, level of alertness

Thalamus: sensory relay station, memory

Hypothalamus: reproduction, stress, anger, fear, feeding behavior, pain and pleasure centers

**Limbic system. See Figure 4, Page 73**

**Motivation, Emotion, Memory**

1. **Hippocampus: Learning and short term memory**
2. **Amygdala: Fear, aggression, emotional memory. When recalling a fearful experience, fear can be as intense as when experience occurred. SURVIVAL!**

**Memory: 213 – 215. Frontal Lobes, thalamus, hippocampus, amygdala.**

**Hemispheric Specialization:** 78-81

**HEMISPHERIC SPECIALIZATION: 78-81**

**PLEASE NOTE THAT ALL AREAS OF THE NORMAL BRAIN ARE ACTIVE. When we talk about specific functions, for example of the Left Brain and the Right Brain, we are talking about relative amounts of activity, or number of brain cells fired in that area. For example, to say that the Left Brain is more involved than the Right Brain in step-by-step problem solving means the Left Brain is more active than the Right Brain.**

**Left Brain Right Brain**

**Major Speech Area Simple Speech**

**Math Music**

**Logic Emotion**

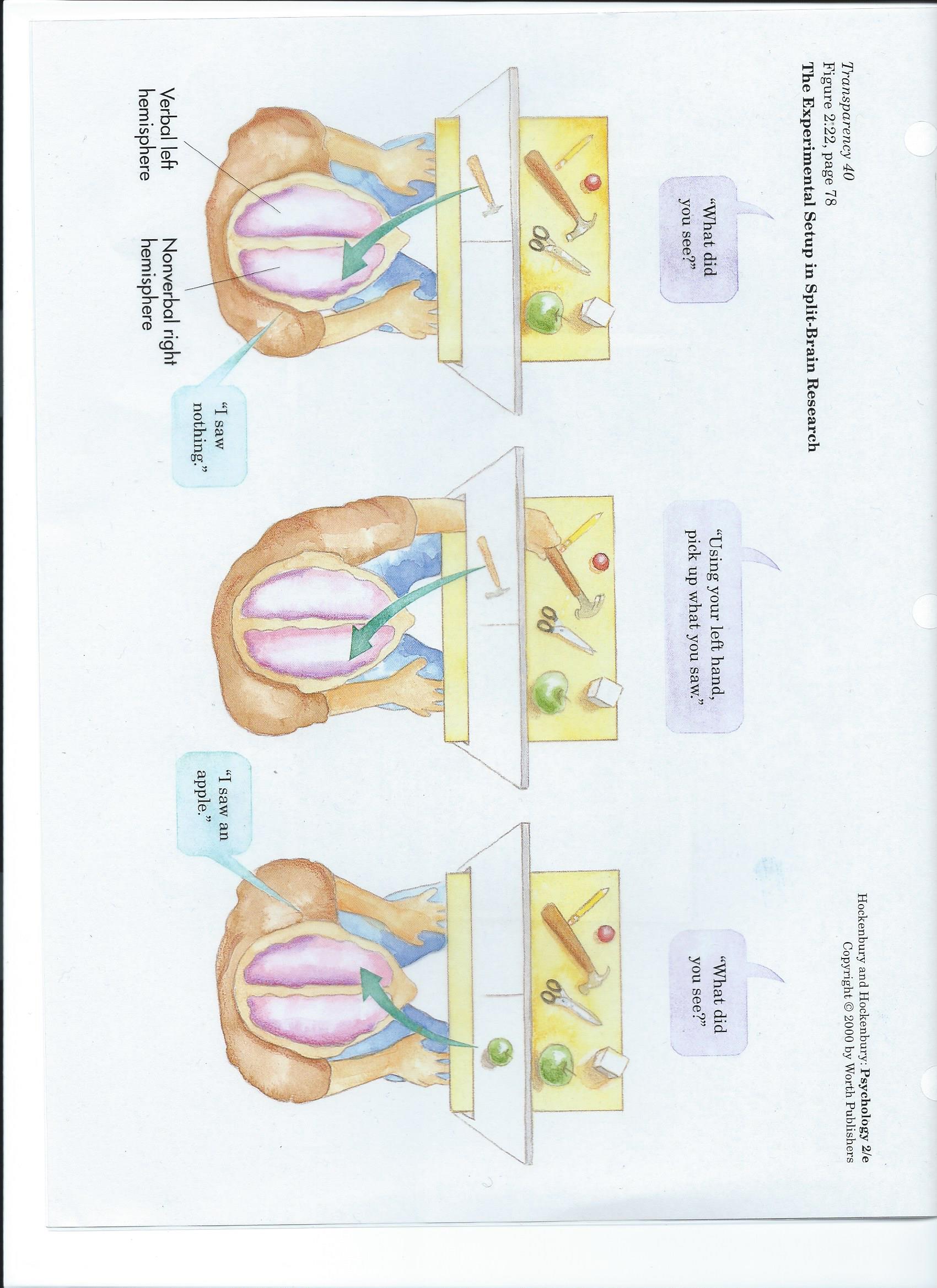
**Analytic Reasoning/ Step by step Intuition; Creativity**

**Problem Solving**

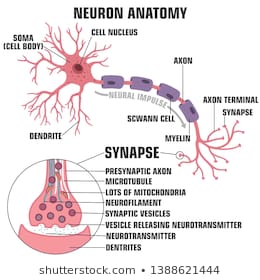
**Details of Picture Whole Picture**

**Convergent Thinking Divergent Thinking**

**Gender differences: In problem solving, females tend to use both sides of the brain; males tend to use the Left Brain.**



**Neurons and Neurotransmitters:** 51-58



**THE NEURON**

**Structure. See Figure 1, Page 52**

**How Neurons Fire.**

**Electrical Transmission of nerve impulse within the neuron. The impulse starts at the dendrite end and travels through the cell to the terminal buttons.**

**Chemical Transmission of nerve impulse from one cell to another across the Synapse.**

**Neurotransmitters. SEE FIGURE 5, PAGE 57**

**Two general categories: excitatory and Inhibitory**

**5 Major Neurotransmitters:**

**GamaAminoButyric Acid. Main Inhibitory**

**Glutamate: Main Excitatory**

**Serotonin: depression associated with deficiency**

**Dopamine: excess associated with schizophrenia**

**Endorphins. Body’s natural opiates; pleasure; runners high**

**All of our mental processes- thinking, feeling, sensation, perception – involve brain corcuits that pass electrical and chemical signals along chains of thousands of neurons. In neurons frequently used, dendrites proliferate, speeding neural transmission. If unused, dendrites are pruned. USE IT OR LOSE IT!**

**Tools for Studying the Brain.Pages 68 to 70. See Figure 1, Page 69**

**Damage/ Lesions**

**EEG. Measures electrical activity in large area of the brain, e.g., temporal lobe. Epilepsy**

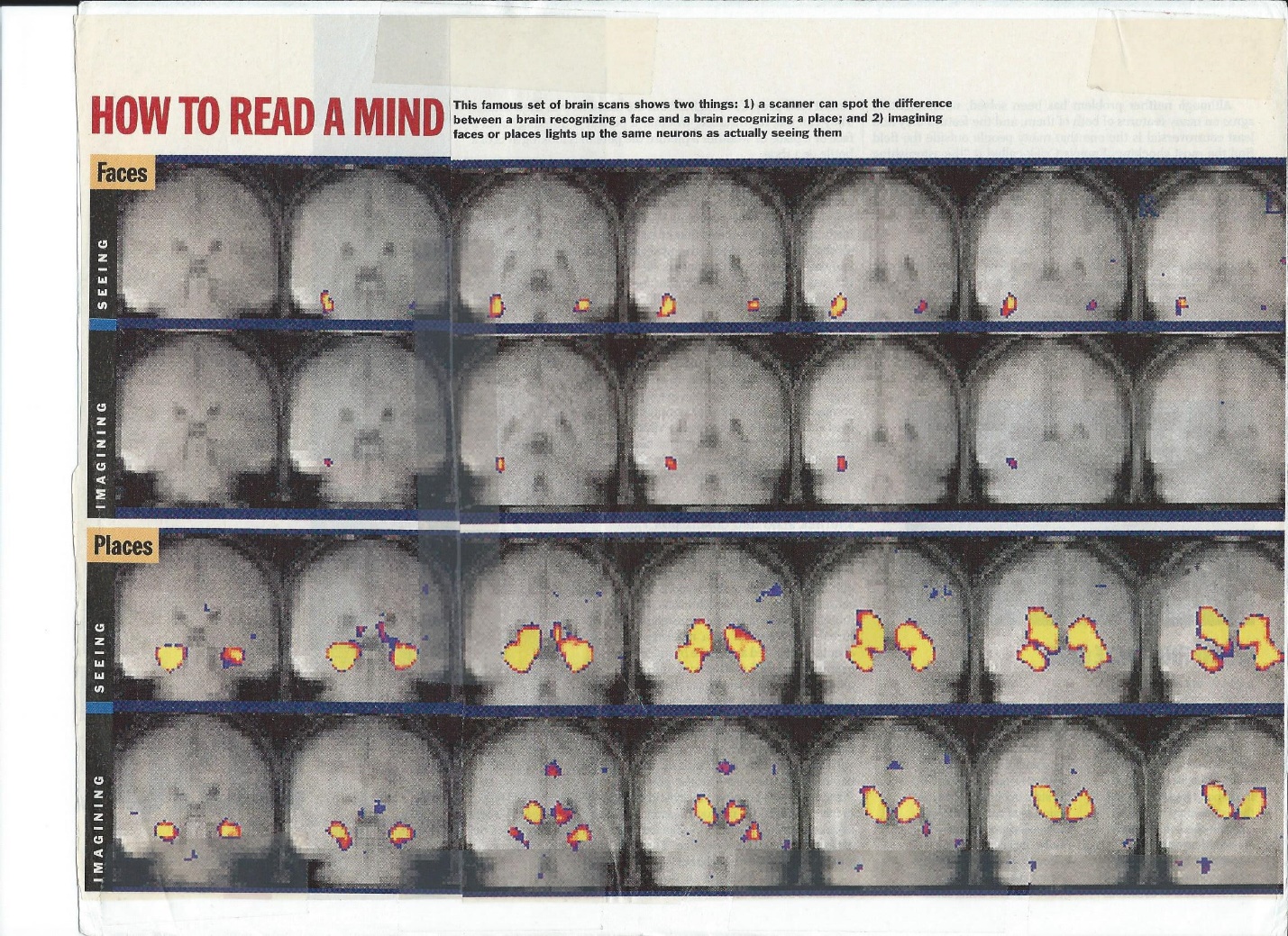
**PET scan. Physiology and anatomy**

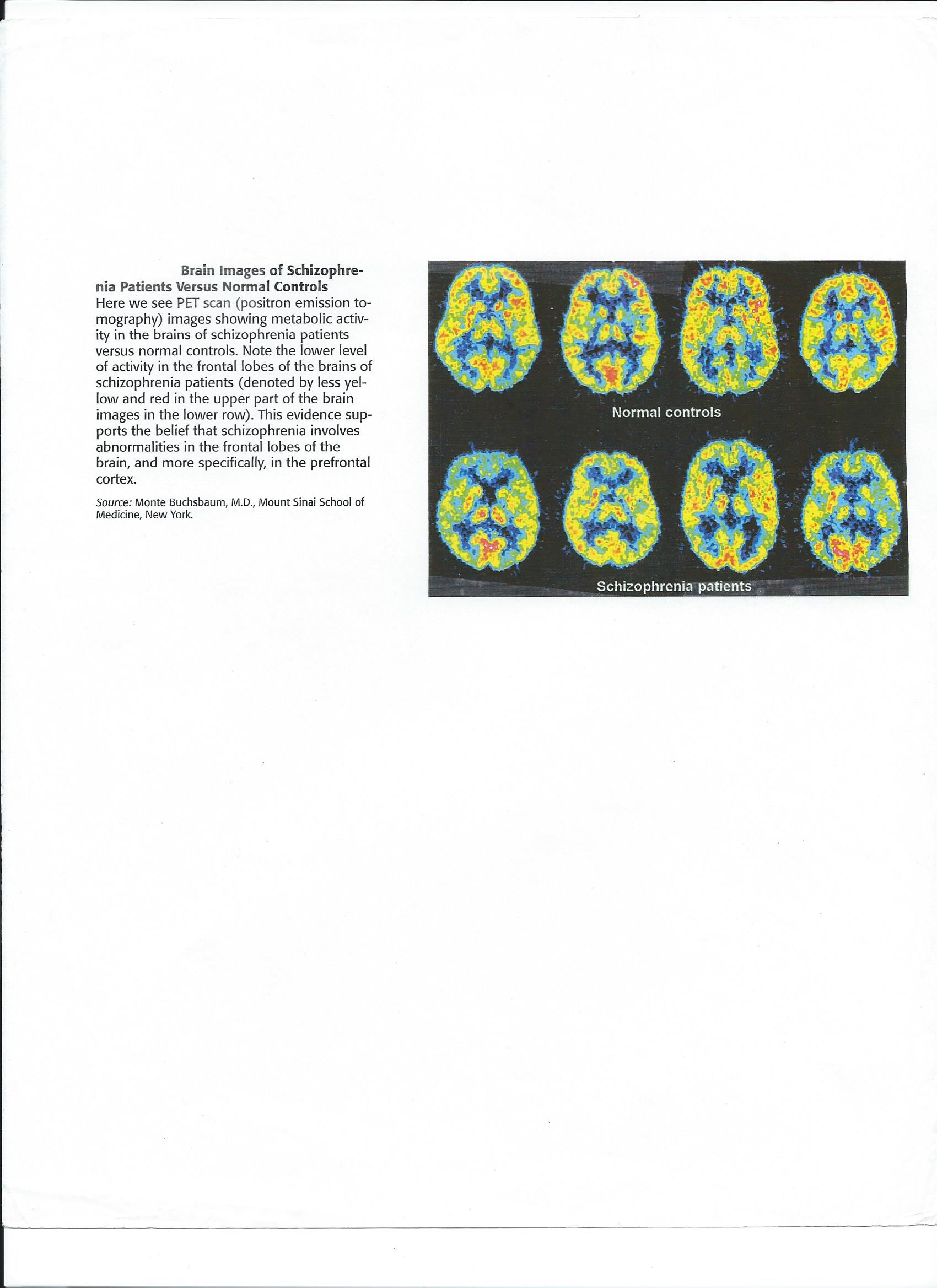
**fMRI. Physiology and anatomy**

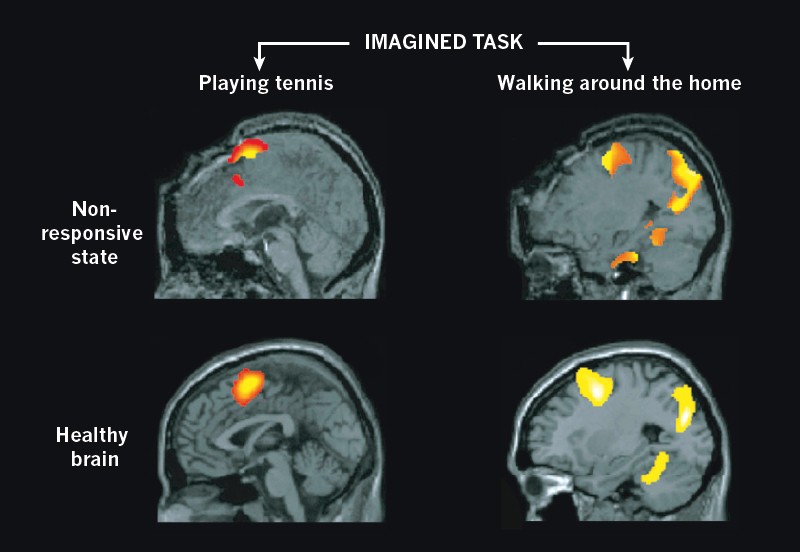
**TMS. Virtual lesion**

**ON THE FOREFRONT**

1. **Mirror Neurons. Page 54. Observational Learning? Empathy?**
2. **Thoughts produce communication/action. Page 71**
3. **Consciousness and the brain**







OUTLOOK

24 July 2019

**Decoding the neuroscience of consciousness**

A growing understanding of consciousness could lead to fresh treatments for brain injuries and phobias.

[**Emily Sohn**](javascript:;)

**Unit 5 Exercises. Psychology 1A. Milligan, PhD.**

1. For this exercise, assume that you play cards in your leisure time – perhaps poker (or any other card game). For each of the following brain sites, state: 1) the general function of the brain site, and, 2) how that part of the brain is involved in card playing.

Hypothalamus, Occipital Lobe, Reticular Formation, Cerebellum, Temporal Lobe, Frontal Lobe, Thalamus, Corpus Callosum, Amygdala, Hippocampus.

1. Label each of the following activities with an R if it is primarily a right brain activity, with an L if it is primarily a left brain activity and with RL if the activity involves both sides of the brain equally:

Studying concepts from Psychology, Drawing a map of your campus, Daydreaming about your next holiday trip, Listening to a piano concert, Listening to rap music, Thinking about your next “night out”, Reading junk mail, 6x4-2+5, Redecorating your room, Doodling, Completing this form.