Announcements

- Check Attendance/Grade Query Tool on class website (psy150a1.org) for:
  - Attendance tracking
  - Syllabus Quiz
- Chapter 2 Aplia Homework due next Monday (Feb 10)
  - Aplia deadline for purchase extended to Feb 18
- Exam #1 NEXT Wednesday (Feb 12)
  - Review session Monday Feb 10, 5:30 pm, here
  - Test your computer/tablet on D2L
Returning to Lecture…
C. Correlation

1. Correlated = related

2. Coefficient of correlation ($r$)
   a) Positive
   b) Negative
   c) None

3. Correlation does not imply causality
A Strong Positive Correlation

College GPA

SAT verbal score
A Strong Negative Correlation

Hours of sleep vs. Age in years
An Approximately Zero Correlation

Number of house plants

Number of times brushing teeth
C. Correlation

1. Correlated = related

2. Coefficient of correlation (r)
   a) Positive
   b) Negative
   c) None

3. Correlation does not imply causality
Figure 1.4 Three possible cause-effect relationships

1. Low self-esteem could cause Depression

2. Depression could cause Low self-esteem

3. Distressing events or biological predisposition could cause Depression and Low self-esteem

Causality

Reverse Causality

Third Variable
"Correlation doesn't imply causation, but it does waggle its eyebrows suggestively and gesture furtively while mouthing 'look over there'."
Cause or Correlation:

- As reported by Reuters:

  WASHINGTON - People who literally cannot sit still may have inborn behavior that keeps them slim even if they overeat a little, researchers said Thursday.

  Tests on slim and overweight people who all described themselves as "couch potatoes" showed the main difference between the two groups was how long they spent sitting still.

  "Our study shows that the calories that people burn in their everyday activities are far, far more important in obesity than we previously imagined," said Dr. James Levine of the Mayo Clinic in Rochester, Minn., who helped lead the study.

Graph from Levine et al, *Science*, 2005
Correlation or Causal?!

ALCOHOL USE & ACADEMIC PERFORMANCE

This table below describes the relationship between the average number of drinks consumed per week and grade point average.

- **A** - 3.6 drinks
- **B** - 5.5 drinks
- **C** - 7.6 drinks
- **D/F** - 10.6 drinks

Average Number of Drinks per Week Listed by Grade Average

(National CORE - N = 41,845)
Biological Bases of Psychology

Behavior and experience are embodied phenomena

The mind depends on the brain

The mind influences the brain
Roadmap....

Neural Communication

- Neurons
- How Neurons Communicate
- How Neurotransmitters Influence Us

The Nervous System

- The Peripheral Nervous System
- The Central Nervous System (especially the brain)
I. The common household neuron

Purpose

Variations
I. The common household neuron

A. Anatomy of a neuron

1. **Cell body (soma)**
2. Dendrites
3. Axon
4. Terminal buttons
5. Myelin sheath on many neurons to speed conduction
Figure 2.2  A motor neuron

- **Dendrites** (receive messages from other cells)
- **Axon** (passes messages away from the cell body to other neurons, muscles, or glands)
- **Terminal branches of axon** (form junctions with other cells)
- **Cell body** (the cell’s life-support center)
- **Neural impulse** (action potential) (electrical signal traveling down the axon)
- **Myelin sheath** (covers the axon of some neurons and helps speed neural impulses)
I. The common household neuron

A. Anatomy of a neuron

1. Cell body (soma)
2. Dendrites
3. Axon
4. Terminal buttons
5. Myelin sheath on many neurons to speed conduction
Myelin Sheath
I. The common household neuron

B. Three types
   1. Sensory
   2. Motor
   3. Interneuron

C. Nerve = a bundle of axons from hundreds or thousands of neurons
Figure 2.10 A simple reflex
Myers: Psychology, Ninth Edition
Copyright © 2010 by Worth Publishers
I. The common household neuron

B. Three types
   1. Sensory
   2. Motor
   3. Interneuron

C. Nerve = a bundle of axons from hundreds or thousands of neurons
I. The common household neuron

D. Two types of signal transmission
   1. Axonal – within neurons
   2. Synaptic – between neurons
II. Axonal conduction; an electrochemical process

A. Resting potential
B. Depolarization and threshold
C. Action potential
D. Propagation
E. Refractory period
The diagram illustrates the membrane potential (Em) over time. It shows the resting state (A) and the action potential phases:

1. **Depolarizing phase (B)**: The membrane potential starts to decrease, moving towards the threshold of excitation.
2. **Repolarizing phase (C)**: The membrane potential rapidly decreases further to a value below the resting state, known as the undershoot (D).
3. **Resting state (A)**: The membrane potential returns to its resting state.

Inset graph shows the membrane potential (y-axis) in millivolts (mV) over time (x-axis) with a threshold of excitation indicated.
Action Potential

A neural impulse. A brief electrical charge that travels down an axon.

**Figure 2.3** Action potential

Myers: Psychology, Ninth Edition
Copyright © 2010 by Worth Publishers
II. Axonal conduction; an electrochemical process
A. Resting potential
B. Depolarization and threshold
C. Action potential
D. Propagation
E. Refractory period
Action Potential

1. Sodium channels open; sodium rushes in.
2. Potassium channels open; potassium starts to leave cell.
3. Sodium channels close.
4. Potassium channels close.
Action Potential Properties

**All-or-None Response:** When the depolarizing current exceeds the threshold, a neuron will fire. If the depolarizing current fails to exceed the threshold, a neuron will *not* fire.

**Intensity** of an action potential remains the same throughout the length of the axon.
III. Synaptic transmission

A. **Synaptic gap** or cleft at the synaptic junction

B. Within terminal button, **synaptic vesicles** containing neurotransmitters

C. As action potential arrives
   1. synaptic vesicles migrate to cell membrane, fuse, and release
   2. Neurotransmitters diffuse across the synaptic cleft
   3. Neurotransmitters combine with **post synaptic receptor cells** (on dendrites or soma)
Figure 2.4 How neurons communicate
Myers: Psychology, Ninth Edition
Copyright © 2010 by Worth Publishers
Figure 2.6, Cacioppo & Freberg
III. Synaptic transmission

A. Synaptic gap or cleft at the synaptic junction
B. Within terminal button, synaptic vesicles containing neurotransmitters
C. As action potential arrives
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Lock & Key Mechanism

Neurotransmitters bind to the receptors of the receiving neuron in a key-lock mechanism.
Neurotransmitter Binds

Agonist Mimics

Antagonist Blocks

Neurotransmitters carry a message from a sending neuron across a synapse to receptor sites on a receiving neuron.
<table>
<thead>
<tr>
<th>Neurotransmitter</th>
<th>Behaviors influenced by the neurotransmitter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylcholine (ACh)</td>
<td>• Movement</td>
</tr>
<tr>
<td></td>
<td>• Memory</td>
</tr>
<tr>
<td></td>
<td>• Autonomic nervous system function</td>
</tr>
<tr>
<td>Epinephrine (Adrenalin)</td>
<td>• Arousal</td>
</tr>
<tr>
<td>Norepinephrine (Noradrenalin)</td>
<td>• Arousal</td>
</tr>
<tr>
<td></td>
<td>• Vigilance</td>
</tr>
<tr>
<td>Dopamine</td>
<td>• Movement</td>
</tr>
<tr>
<td></td>
<td>• Planning</td>
</tr>
<tr>
<td></td>
<td>• Reward</td>
</tr>
<tr>
<td>Serotonin</td>
<td>• Mood</td>
</tr>
<tr>
<td></td>
<td>• Appetite</td>
</tr>
<tr>
<td></td>
<td>• Sleep</td>
</tr>
<tr>
<td>Glutamate</td>
<td>• Excitation of brain activity</td>
</tr>
<tr>
<td>GABA</td>
<td>• Inhibition of brain activity</td>
</tr>
<tr>
<td>Endorphins</td>
<td>• Pain</td>
</tr>
</tbody>
</table>

Table 2.2, Cacioppo & Freberg
Botox as ACh Antagonist

Cacioppo & Freberg
III. Synaptic transmission

A. Synaptic gap or cleft at the synaptic junction
B. Within terminal button, synaptic vesicles containing neurotransmitters
C. As action potential arrives
   1. Synaptic vesicles migrate to cell membrane, fuse, and release
   2. Neurotransmitters diffuse across the synaptic cleft
   3. Neurotransmitters combine with post synaptic receptor cells (on dendrites or soma)
Synaptic transmission

D. Types of Postsynaptic Potentials (PSP's)

1. Excitatory (EPSP)  Depolarizes
2. Inhibitory (IPSP)   Hyperpolarizes
Neurotransmitters That Excite or Inhibit... Neurons
Synaptic transmission

D. Types of Postsynaptic Potentials (PSP's)
   1. Excitatory (EPSP)          Depolarizes
   2. Inhibitory (IPSP)          Hyperpolarizes

E. After release,
   1. reuptake
   2. degradation
Synaptic Transmission

Figure 2.4 How neurons communicate
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V. Organization of the nervous system

A. Central nervous system
   1. Brain
   2. Spinal cord
V. Organization of the nervous system

B. Peripheral nervous system
   1. Somatic system
   2. Autonomic system; two branches work in generally antagonistic fashion
Autonomic Nervous System (ANS)

Sympathetic NS  
"Arouses"  
(fight-or-flight)

Parasympathetic NS  
"Calms"  
(rest and digest)
V. Organization of the nervous system

B. Peripheral nervous system

2. Autonomic system

   a. Sympathetic nervous system
      1. tends to have system-wide effects
      2. flight or flight; activity

   b. Parasympathetic nervous system
      1. tends to affect one organ at a time
      2. quiescent processes--digestion, protects and conserves energy