2016-11-28

Sensation and Perception

What is Sensation?

- **Sensation** = the process by which action potentials that originate from sensory neurons are delivered to the brain
- **Perception** = the process by which sense data is processed and interpretted by the brain
- **Bottom-Up** = term that describes how **sensation** occurs
  - Low-level processing occurs early on in the transmission
  - The more high-level, pattern-recognition processing is done in the brain
- **Top-Down** = term that describes how **perception** occurs
  - Tasks are centrally organized by the brain

Psychophysics

- **Psychophysics** = the study of physical stimuli and how it affects behavior and mental processes
- **Stimuli** = any information that can be detected and interpretted by the brain
  - Light
  - Sound waves
  - Temperature
  - Pressure
- Thresholds
  - **Absolute Threshold** = the amplitude a stimuli must exhibit to be detected **50%** of the time
  - **Difference Threshold** = the difference in amplitude two stimuli must exhibit for people to perceive a **just noticeable difference** between them
    - **Just Noticeable Difference(JND)** = the perception of a slight difference in magnitude of two stimuli

Signal Detection Theory

- **Signal Detection Theory** = a theory that attempts to explain how stimuli are reliably perceived in the presence of lots of background stimuli

  - People's likelihood of perceiving faint stimuli in noisy backgrounds depends on
    * Experience
    * Expectation
    * Motivation
    * Fatigue

- **Subliminal** = a term that describes stimuli that are lower in amplitude than the **absolute threshold** needed to reliably perceive them
- **Weber's Law** = a law that states that the **difference threshold** depends on which *type* of stimuli you test
  - Light intensity must vary by 8% to be noticeable
  - Weight must vary by 2% to be noticeable
  - Tone frequency must vary by 0.3%
- **Sensory Adaptation** = the increased threshold of perception that comes with repeated exposure to a certain stimuli
  - Rather similar to **habituation**
- **Transduction** = the transformation of one form of energy to another
  - *eg.* Electromagnetic waves turning into action potentials
  - **Sensation** is the process of transduction from various media to action potentials

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Vision

- **Hue** = basically the color that the light is
  - Determined by **frequency/wavelength**
- **Intensity** = amplitude of EM wave
  - Associated with how **bright** the color is
- **Wavelength** = distance between the crests of the wave
  - Larger wavelength is associated with lower frequency
- **Frequency** = the amount of oscillations the wave undergoes per second
  - Measured in Hertz(Hz)
- **Cornea** = the outer protective layer that covers the eye

- **Pupil** opening of the eye that is adjustable in size when **iris** contracts or relaxes
  - Acts similar to camera shutter
    - If pupil is open, more light will make its way in
  - Pupil helps to adjust vision to changing light conditions
- **Iris** = a colored ring of muscle that contracts and relaxes to adjust the size of the pupil
- **Lens** = transparent structure that is behind the pupil that contorts to adjust the path of incoming light
  - Lens also inverts the image
    - We don't see the world as upside down because the brain flips the image
- **Retina** = a layer of light-sensitive cells that start an action potential if hit by certain kinds of light
  - **Rods** = detect the outline of shape
    - Cannot distinguish color
  - **Cones** = detect the color of objects
    - Cannot distinguish movement
  - **Transduction** = converting of electromagnetic energy into chemical potential energy
- **Fovea** = area of the **retina** that the lens focuses the image onto
  - Where all fine details are made out
- **Accommodation** = the process of the lens contorting in order to focus the image on the **fovea**
- **Acuity** = the accuracy and sharpness of vision
  - Typically deteriorates with age
- **Nearsightedness** = a condition in which it is easier for objects near to the eyes to be seen
- **Farsightedness** = a condition in which it is easier for objects far from the eyes to be seen