

## INTRODUCTION TO PERCEPTION CHAPTER 1

- Purpose of Perception
  - Inform us about features of our environment that are important for our survival. This is done by creating a likeness to the environment in our minds.
  - Help us act in relation to our environment.

### WHY STUDY PERCEPTION?

- Future careers
  - Graduate school work in perception
- Medical applications
  - Devices to assist people with vision and hearing losses
- Understanding how you perceive the world
  - Language processing
  - Color vision
  - Depth perception

### THE PERCEPTUAL PROCESS

- Perception does not just happen, but is the result of many complex processes, many of which we are not aware of.
  - **Question:** What are you aware of when you perceive? What is going on inside your head right now that is enabling you to perceive this lecture?
- **Attended Stimulus (Distal stimulus):**
- **Proximal Stimulus:**
- **Transduction:**
- **Transmission:**
- **Neural Processing**
- **Perception:**
- **Recognition:**
  - Dr. P & Dissociations
- **Action:** includes motor actions (e.g., moving head & eyes) and moving through the environment.

- **Knowledge:**

### **Top-Down & Bottom-Up Processing**

- **Bottom-up:** \_\_\_\_\_  
and send this raw data to the brain for processing.
- **Top-Down:**
- **Perception** involves both types of processing working together.

### **Approaches to the Study of Perception**

- Observing perceptual processes at different stages in the system:
- Psychophysical approach (PP) - the stimulus-perception relationship
- Physiological approach (PH1) - the stimulus-physiology relationship
- Physiological approach (PH2) - the physiology and perception relationship
- These stages are interconnected and communicate with one another.

### **PSYCHOPHYSICAL APPROACH**

- There is a journal that focuses on Psychophysics
  - <http://app.psychonomic-journals.org/>
  - It is published by the Psychonomic Society.
  - Many physiological psychologists are members of this society.

### **PSYCHOPHYSICS - OVERVIEW OF METHODS OF MEASUREMENT**

- Qualitative Methods
  - Describing
  - Recognizing
- Quantitative Methods
  - Detecting
  - Perceiving Magnitude
  - Searching
- The Psychophysical approach focuses on the relationship between the physical properties of stimuli and the perceptual responses to these stimuli.
- Ways of Measuring this experience:
  - Description: “It’s white, small, and fluffy.”
  - Recognition: “It’s a dog.”
  - Detection: “It’s just barely moving.”
  - Magnitude: “It’s about the size of a poodle.”

- Search: “It’s under a towel.”

### **Description: Phenomenological Method**

- This is the first step in studying perception.
  - Procedure:

### **Recognition**

- Procedure: Stimulus is presented and person indicates what it is.

### **Searching**

- Procedure: **Visual search experiments** – reaction time is important.
  - Where’s Waldo: search for a certain letter or figure among other letters or figures.

### **Detection**

- **Gustav Fechner**: Described 3 classical psycho-physical methods to measure the \_\_\_\_\_, which is the smallest amount of stimulus energy necessary to detect a stimulus.
- Demonstrating that mental activity could be measure \_\_\_\_\_.

### **Methods to Measure the Absolute Threshold**

- **Method of Limits**: Stimuli are presented in ascending or descending order and the person indicates whether she sees the light or hears the tone.
  - **Crossover point**:
  - **Threshold**:
  - **Demo** on Lab DVD
- **Method of Adjustment**: the experimenter adjusts the stimulus intensity in a continuous manner until the observer \_\_\_\_\_. \_\_\_\_\_ is the absolute threshold.
  - This is the fastest, \_\_\_\_\_
- **Method of constant stimuli**: Experimenter presents 5 to 9 stimuli in \_\_\_\_\_.
  - The % of times each stimulus is detected is recorded.
  - The threshold = the intensity that results in detection on \_\_\_\_\_ of the trials.
  - This is the \_\_\_\_\_, but takes the \_\_\_\_\_.

### Ernst Weber - The difference Threshold (DL)

- **Difference Threshold (Difference Limen):** Is the \_\_\_\_\_ difference between 2 stimuli that a person can detect.
  - The size of the DL depends on the \_\_\_\_\_.
  - **Weber's Law:**  $DL/S = K$ 
    - $K$  is a constant called the Weber Fraction (0.05)
    - $S$  is the value of the standard
    - $0.05 \times 200 = 10$  and  $.05 \times 100 = 5$

### Perceiving Magnitude

- **S.S. Stevens' Magnitude Estimation Procedure:**
  - The experimenter presents a "standard" stimulus to the observer and assigns a value.
  - Stimuli of other intensities are then presented and the observer assigns them values too.
- **The type of Stimuli matters: survival value.**
  - **Electric Shock:** Doubling the strength of the shock \_\_\_\_\_ the sensation of being shocked – \_\_\_\_\_.
  - **Perceived brightness:** Doubling intensity causes \_\_\_\_\_ in perceived brightness particularly at higher intensities - \_\_\_\_\_.
  - **Stevens's Power Law:**  $P = KS^n$ 
    - $P$  = Perceived Magnitude
    - $K$  = a constant
    - $S$  = Stimulus intensity - Psychological reaction
    - $n$  = slope of the line - the size of this has a major effect on the nature and relationship between the intensity of the stimulus and the magnitude of the psychological response.
  - **If the exponent ( $n$ ) is exactly 1** an increase in the stimulus is accompanied by a \_\_\_\_\_ increase in the magnitude of the psychological reaction (**length**).
  - **If the exponent is greater than 1 (shock)**, increases in the intensity of the stimulus are accompanied by increasingly \_\_\_\_\_ psychological reactions – **the graph curves** \_\_\_\_\_.
  - **If the exponent is less than 1 (brightness)**, increases in intensity of the stimulus are accompanied by increasingly \_\_\_\_\_ psychological reactions – **the graph curves** \_\_\_\_\_.

## SIGNAL DETECTION THEORY

- **Signal detection theory** It was developed to explain a number of factors that influence one's ability to **distinguish the signal from the noise**.
- **SDT considers the following when determining thresholds:**
  - Conditions under which stimulus is perceived
  - Nature of perceiver
  - Nature of the stimulus
  - Importance or lack of importance of detecting a signal – cost of misses & benefits of hits.
  - Knowledge – how often the signal occurs.
- **2 types of trials:**
  - No signal (NS) = noise only → there is no such thing as nothing
  - 2 types of noise
    - Internal noise → neural firing, blood pulsing through your body
    - External noise → buzz of florescent lights, hum of A/C, etc.
  - Signal (S) = signal + noise
- Researchers examine people responses to trials that contain the signal and those that only contain noise.

### Example for SDT

- Phone ringing
- Sensitivity: signal-to-noise ratio
- Criterion
  - Expectancies

### Signal Detection Theory

- More than the stimulus alone determines detection/accuracy – the following determine where your **CRITERION** for detection lies:
  - Knowledge → how often the signal occurs
  - Cost of misses vs. false alarms.
    - Conservative Criterion: False alarms are more problematic than misses.
    - Liberal Criterion: Misses more problematic than false alarms for hurricanes or tornadoes.
  - The **Criterion** does not affect accuracy, but the types of errors made.
  - **Sensitivity ( $d'$ )**: w/ more sensitivity the overall accuracy of response increases, w/ less it will decrease (more FAs and Misses).

## REAL WORLD APPLICATIONS OF SDT

- **Government to Provide Dogs to Sniff Bombs at Airports**
  - Fails to detect bomb = \_\_\_\_\_
  - Signals there is a bomb when there is no bomb = \_\_\_\_\_
  
- **Air Traffic Control**: Would changing how information is presented on a computer screen decrease the number of errors made by air traffic control personnel?
  
- Types of errors?
  - See a plane that is not there.
  - Failure to see a plane that is there.
  
- **New Product Testing**: Do people prefer our new cola over those already on the market?
  - Failure to find preference for our new cola when people actually do prefer it.
  - We conclude that people prefer our cola when in fact they don't.

### Other Measurement Methods

- **Searching For Stimuli**
  - **Visual search** - observers look for one stimulus in a set of many stimuli
  - **Reaction time (RT)** - time from presentation of stimulus to observer's response is measured