

Lecture 1:

What is sensation and what is perception?

Sensation: ability to detect a stimulus, and, perhaps, turn that detection into a private experience [detect pressure of finger]

- Ex. Electromagnetic energy with a wavelength of 650 nm; "red"

Perception: act of giving meaning or purpose to a detected sensation

- Ex. Red light=stop
- Can depend on context, previous knowledge/experience, and emotions [individual differences also]
 - [context]
- Sometimes depends on "guesses" by brain
 - [illusory contours; Necker cube...filling in of blind spot]
- "guesses" by brain based on "mental set"
 - [mental set; backward music demo]

Sensation and perception are central to mental life

- Could not gain knowledge of the world without
- No sensation, no perception=no world

Lecture 2: Methods: thresholds and birth of psychophysics

Psychophysics: science of defining quantitative relationships between physical and psychological [subjective] events

- Founded by Gustav Fechner [mid 1800s]
- Methods Fechner developed are still used

Psychophysics & Concept of Thresholds

Two-point threshold: minimum distance at which two stimuli [two simultaneous touches] can be distinguished

Absolute threshold: minimum amount of stimulation necessary to detect a stimulus 50% of the time

- Ex. [hearing test]

Just noticeable difference [JND]: smallest detectable difference between two stimuli, or the minimum change in a stimulus that can be correctly judged as different from a reference stimulus; also known as difference threshold

- Ratio of JND to standard weight= $\frac{1}{40}$; multiply by other weights to find JND
 - Ex. 400 oz weight, what JND? $400 \times \frac{1}{40} = 10$

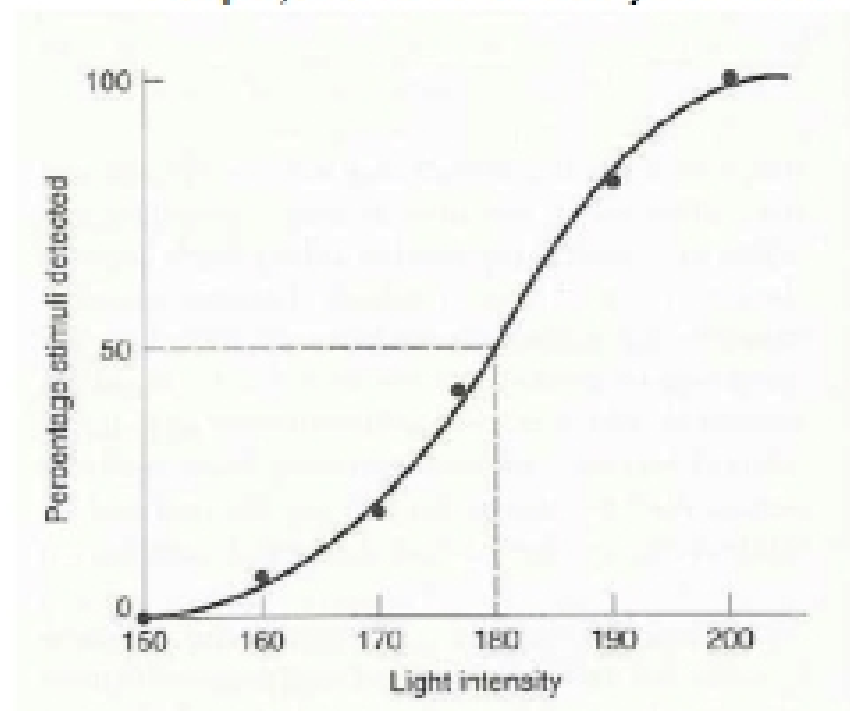
- **Weber's law:** the principle describing the relationship between stimulus and resulting sensation that says the JND is a constant fraction of the comparison stimulus [1/40]
 - Thus, larger stimulus values have larger JND's & smaller stimulus have smaller JND's
 - Ex. 40 oz, 80 oz, 400 oz= JND 1, 2, 10
- Fechner mathematically extended Weber's law to make it more universal
- **Fechner's Law:** a principle describing the relationship between stimulus magnitude and resulting sensation magnitude such that the magnitude of subjective sensation increases proportionally to the logarithm of the stimulus intensity
 - $S=k\log R \rightarrow$ our psychological experience of the intensity of light, sound, smell, taste or touch increases less quickly than the actual physical stimulus increases

Psychophysical Methods [thresholds]

- Method of constant stimuli
- Method of limits
- Method of adjustment [similar to method of limits]

Method of constant stimuli: many stimuli, ranging from rarely to almost always perceivable, are selected before the experiment and are presented one at a time in a random order

- Hearing test
- Need to measure over and over and then average responses
- "I don't hear it, I hear it" example
- Stimulus would be detected 50% of the time would be chosen at threshold
- Simple, but inefficient way to conduct experiment



Method of limits: the magnitude of a single stimulus or the difference between two stimuli is varied incrementally until the participant responds differently

- Ex. Tone [playing tones of various volumes & asking participants to report whether or not they hear each tone]
 - Presented in order of increasing or decreasing intensity
 - "crossover value"

Stimulus Intensity	A	D	A	D	A	D	A	D
8		Y				Y		Y
7		Y		Y		Y		Y
6		Y		Y		Y		Y
5		Y		Y		Y		Y
4	Y	Y		Y		Y		Y
3	N	Y	Y	Y	Y	Y		Y
2	N	N	N	Y	N	N	Y	Y
1	N	N	N	N	N	N	N	N
0	N	N	N	N	N	N	N	N
-1	N	N	N	N	N	N	N	N
-2	N	N	N	N	N	N	N	N
-3	N	N	N	N	N	N	N	N
-4	N	N	N	N	N	N	N	N
-5	N	N	N	N	N	N	N	N
Transition Points	3.5	2.5	2.5	1.5	2.5	2.5	1.5	1.5

Mean Threshold = 2.25

Figure 11. Threshold determination using the method of limits. A = Ascending limits, D = Descending limits, Y = Yes, the stimulus is seen and N = No, the stimulus cannot be seen.

Method of adjustment: similar to the method of limits, but the participant controls the stimulus directly

- Not usually used to measure thresholds
 - Adjusting volume dial on stereo

Scaling Methods:

Steven's power law: $S=al^b$

- Sensation S is related to the stimulus I by an exponent b
- For exponents > 1 [electric shock] → fechners cannot be used
- If less than 1; means sensation grows less rapidly than the stimulus

Signal Detection Theory: a psychophysical theory that quantifies the response of an observer to the presentation of a signal in the presence of noise

- How decisions of this sort can be studied scientifically
- Many real-world problems can be conceptualized as a search for a signal amidst noise
- Ex.
- Four possible stimulus/response situations [response "yes"= stimulus present; response "no"=stimulus absent]
 - HIT → stimulus is present and observer responds "yes" [center is misaligned + is misaligned]
 - MISS → stimulus is present and observer responds "no" [center line misaligned but you say the lines are identical]
 - FALSE ALARM → stimulus is not present and observer responds "yes" [identical & say its misaligned but wrong]
 - CORRECT REJECTION → stimulus is not present and observer responds "no" [all lines identical and correctly answer]
- A distinction is made between an observers' ability to perceive a signal and their willingness to report it. These are two separate concepts: