Sensation and Perception

Unit	4
Rev 1	@11/20/2021
Rate	⭐⭐⭐
Vocab 1	https://docs.google.com/document/d/1k8kIAT1RVlzltLRQ_lXZb6Lkpwd2I0rYE-NVYekIIWY/edit
Vocab 2	

3.1 - Sensation and Perception Intro

▼ **Sensation**

To represent the world, we must detect physical energy (a stimulus) from the environment and convert it into neural signals. (brain)

▼ **Perception**

When we select, organize, and interpret our sensations (mind)

▼ **Bottom-up Processing**

Analysis of the stimulus begins with the sense receptors and works up to the level of the brain and mind.

(brain/sensation)

Letter "A" is really a black blotch broken down into 3 parts

▼ **Top-down Processing**

Information processing guided by higher-level mental processes as we construct perceptions, drawing on our experience and expectations.

(mind/perception)

filling in info that isn't there

context, experience, motivation

- **Complexity**

  Our sensory and perceptual processes work together to help us sort out complex images.

- **Psychophysics**

  A study of the relationship between physical characteristics of stimuli and our psychological experience with them.

  - Detection

    - Absolute Threshold

      Minimum stimulation needed to detect a particular stimulus 50% of the time.

    - Difference Threshold

      Minimum difference between two stimuli required for detection 50% of the time, also called just noticeable difference (JND).

      - Weber's Law

        Two stimuli must differ by a constant minimum percentage (rather than a constant amount), to be perceived as different

3.2- Vision

- **Signal Detection Theory (SDT)**

  Predicts how and when we detect the presence of a faint stimulus (signal) amid background noise (other stimulation). SDT assumes that there is no single absolute threshold and detection depends on:

  Person's experience

  Experience

Motivation

Level of fatigue

Different people focus on different things and perceive the world differently

If you look out for something, the more obvious it becomes

▼ **Sensory Adaptation**

Diminished sensitivity as a consequence of constant stimulation.

Put a band-aid on your arm and after a while you don't sense it

▼ **Transduction**

In sensation, the transformation of stimulus energy into neural impulses

Phototransduction: Conversion of light energy into neural impulses the brain can understand

▼ **Light Characteristics**

🌊 Wavelength

Intensity

Purity (Saturation)

▼ **The Eye**

The Lens

Lens: Transparent structure behind the pupil that changes shape to focus images on retina

Accomodation: The process by which the eye's lens changes shape to help focus near or far objects

Nearsightedness: A condition in which nearby objects are seen more clearly than distant objects

Farsightedness: A condition in which faraway objects are seen more clearly than near objects

Retina

Where transduction happens

Retina: The light-sensitive inner surface of the eye, containing receptor rods and cones in addition to layers of other neurons (bipolar, ganglion cells) that process visual information.

Bipolar & Ganglion Cells (retina)

Bipolar cells receive messages from photoreceptors and transmit them to ganglion cells, which form the optic nerve.

Optic Nerve, Blind Spot & Fovea

Optic nerve: Carries neural impulses from the eye to the brain

Blind spot: Point where the optic nerve leaves the eye because there are no receptor cells located there. This creates a blind spot.

Fovea: Central point in the retina around which the eye's cones cluster.

3.3 - Visual Information Processing

▼ ***Visual Information Processing***

Optic nerves connect to the thalamus in the middle of the brain, and the thalamus connects to the visual cortex.

▼ Parallel Processing

Processing of several aspects of the stimulus simultaneously is called parallel processing. The brain divides a visual scene into subdivisions such as color, depth, form and movement etc.

- **Perception in Brain**

  Our perception are a combination of sensory (bottom-up) and cognitive (top-down) processes.

- **Theories of Color Vision**

  - *Trichromatic theory*

    Based on behaviorial experiments, Helmholtz suggested that the retina should contain three receptors that are sensitive to red, blue and green colors.

  - Subtraction of Colors

    If three primary colors (pigments) are mixed, subtraction of all wavelengths occurs and the color black is the result.

  - Addition of Colors

    If three primary colors (lights) are mixed, the wavelengths are added and the color white is the result

- **Photoreceptors**

  MacNichol, Wald and Brown (1967) measured directly the absorbtion spectra of visual pigments of single cones obtained from the retinas of humans.

- **Color Blindness**

  Genetic disorder in which people are blind to green or red colors. This supports the Trichromatic theory

- **Opponent Process Theory**

  Hering proposed that we process four primary colors combined in pairs of red-green, blue-yellow, and black-white

3.4 - Sound

- **Sound Waves**

  Sound Waves are composed of compression and rarefaction of air molecules

  - *Acoustical transduction*

    Conversion of sound waves into neural impulses in the hair cells of the inner ear

- **Sound Characteristics**
  1. Frequency (pitch)
  2. Intensity (loudness)
  3. Quality (timbre)
  - *Overtones*

    Makes the distinction among musical instruments possible
- **The Ear**
  - *Cochlea*

    Coiled, bony, fluid-filled tube in the inner ear that transforms sound vibrations to auditory signals.
  - Theories of Audition
    - *Place Theory*

      Suggests that sound frequencies stimulate the basilar membrane at specific places resulting in perceived pitch. Explains hearing high pitched sounds.
    - *Frequency Theory*

      States that the rate of nerve impulses traveling up the auditory nerve matches the frequency of a tone, thus enabling us to sense it's pitch. Explains hearing low-pitched sounds.
  - Localization of Sounds

    Because we have two ears, sounds that reach one ear faster than the other ear cause us to localize the sound.

    1. Intensity Differences
    2. Time differences

    Time differences as small as 1/100,000 of a second can cause us to localize sound. The head acts as a "shadow" or partial sound barrier.
  - Hearing Loss
    - *Conduction Hearing Loss*

Hearing loss caused by damage to the mechanical system that conducts sound waves to the cochlea.

▼ *Sensorineural Hearing Loss*

More common hearing loss caused by damage to the cochlea's receptor cells or to the auditory nerve, also called nerve deafness

3.5 - Senses

▼ **Skin Senses**

Only pressure has identifiable receptors. All other skin sensations are variations of pressure, warmth, cold, and pain.

▼ **Pain**

Pain tells the body that something has gone wrong. Usually pain results from damage to the skin and other tissues. A rare disease exists in which the afflicted person feels no pain.

▼ *Gate Control*

Pain gates block or let pain through. Pain control by activating "blocking" gates.

▼ *Substance P*

Pain neurotransmitter, inflammatory disease

▼ Pain Control

- Pain and memory study

Pain can be controlled by a number of therapies including drugs, surgery, acupuncture, exercise, hypnosis, and even thought distraction.

▼ **Taste**

Traditionally, taste sensations consisted of sweet, salty, sour, and bitter tastes. Recently, receptors for a fifth taste have been discovered called "*Umami*".

▼ **Smell**

Like taste, smell is a chemical sense. Odorants enter the nasal cavity to stimulate 5 million receptors to sense smell. Unlike taste, there are many different forms of smell.

The brain region for smell is closely connected with the brain regions involved with memory (limbic system). That is why strong memories are made through the sense of smell.

- **Kinesthetics**

  The sense of our body parts' position and movement

  - *Vestibular sense*

    Monitors the head (and body's) position.

3.6 - Perception

- **Perception**

  The process of selecting, organizing, and interpreting sensory information, which enables us to recognize meaningful objects and ideas

  - **Selective Attention**

    Perceptions about objects change from moment to moment. We can perceive different forms of the Necker cube; however, we can only pay attention to one aspect of the object at a time

  - **Inattentional Blindness**

    Refers to the ability to see an object or a person in our midst. Simons and Chabris (1999) showed that half of the observers failed to see the gorilla-suited assistant in a ball passing game.

    - Change Blindness

      Change Blindness is a form of inattentional blindness in which two-thirds of individuals giving directions failed to notice a change in the individual asking for directions

- **Perceptual Illusions**

Illusions provide good examples in understanding how perception is organized. Studying faulty perception is as important as ... (finish)

- **Perceptual Organization**
  - *Visual capture*

    When vision competes with our other senses, vision usually wins

  finish
- **Form Perception**

  Organization of the visual field into objects (figures) that stand out from their surroundings (ground).
- **Grouping**

  After distinguishing the figure from the ground, our perception needs to organize the figure into a meaningful form using grouping rules.
  - *Closure*

    Filling in missing information

  finish
- **Depth Perception**
  - *Depth Perception*

    Enables us to judge distances

  Gibson and Walk (1960) suggested that human infants have depth perception. Even newborn...(finish)
  - Binocular Cues
    - *Retinal disparity*

      Images from the two eyes differ. Each eye is receiving a slightly different image
    - *Convergence*

      Neuromuscular cues. When two eyes move inward (towards the nose) to see near objects and outward (away from the nose) to see faraway objects.
  - Monocular Cues

- *Relative size*

  If two objects are similar in size, we perceive the one that casts a smaller retinal image to be further away

- *Interposition*

  Objects that occlude (block) other objects tend to be perceived as closer

- *Relative Clarity*

  Because light from distant objects passes through more light than closer objects, we perceive hazy objects to be farther away than those objects that appear sharp and clear.

- *Texture Gradient*

  Indistinct (fine) texture signals an increasing distance

- *Relative Height*

  We perceive objects that are higher in our field of vision to be farther away than those that are lower.

- *Relative Motion*

  Objects closer to a fixation point move faster and in opposing direction to those objects that are farther away from a fixation point, moving slower and in the same direction

- *Linear Perspective*

  Parallel lines, such as railroad tracks, appear to converge in the distance. The more the lines converge, the greater their perceived distance.

- *Light and Shadow*

  Nearby objects reflect more light into our eyes than more distant objects. Given two identical objects, the dimmer one appears to be farther away.

- Apparent Motion
  - Phi Phenomenon

    When lights flash at a certain speed they tend to present a sense of motion

3.7 - Perceptual Constancy

▼ *Perceptual Constancy*

Perceiving objects as unchanging even as illumination and retinal images change. Perceptual constancies include constancies of shape and size.

- If you keep in mind that the door is the same size, as the door closes, the shape of the door changes

▼ **Size Constancy**

Stable size perception amid changing size of the stimuli.

- Car doesn't get bigger or smaller, rather closer/further away

▼ **Lightness Constancy**

The color and brightness are the same

▼ **Color Constancy**

Perceiving familiar objects as having consistent color even when changing illumination filters the light reflected by the object.

▼ **Perceptual Adaptation**

▼ **ESP**

Perception without sensory input is called extrasensory perception (ESP). A large percentage of scientists do not believe in ESP.

▼ Claims of ESP

Paranormal phenomena include astrological predictions, psychic healing, communication with the dead (finish)

▼ Telepathy

Mind-to-mind communication. One person sending thoughts and the other receiving them

▼ Clairvoyance

Perception of remote events, such as sensing a friend's house on fire

▼ Precognition

Perceiving future events, such as a political leader's death

▼ **Perceptual Set**

▼ Priming

A mental predisposition to perceive one thing and not another

- Similar to stereotypes