

Sensation and Perception

PSY 1000:
Introduction to Psychology

Basic Terms

- **Sensation**: the activation of receptors in the various sense organs
- **Perception**: the method by which the brain takes all the sensations that we experience and interprets them in a meaningful way
- **Sensory receptors**: specialized forms of neurons
- Sense organs:
 - eyes
 - ears
 - nose
 - skin
 - taste buds

Sensory Thresholds

- **Absolute threshold**: the smallest amount of energy needed for a person to consciously detect a stimulus 50 percent of the time it is present
- **Just noticeable difference** (jnd or the difference threshold): the smallest difference between two stimuli that is detectable 50 percent of the time

Table 3.1
Examples of Absolute Thresholds

| SENSE | THRESHOLD |
|---------|--|
| Sight | A candle flame at 30 miles on a clear, dark night |
| Hearing | The tick of a watch 20 feet away in a quiet room |
| Smell | One drop of perfume diffused throughout a three-room apartment |
| Taste | 1 teaspoon of sugar in 2 gallons of water |
| Touch | A bee's wing falling on the cheek from 1 centimeter above |

Subliminal Sensation

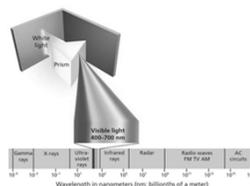
- **Subliminal stimuli:** stimuli that are below the level of conscious awareness
 - Just strong enough to activate the sensory receptors but not strong enough for people to be consciously aware of them
 - Limin – “threshold”
 - Subliminal – “below the threshold”
 - Supraliminal – “above the threshold”
- **Subliminal perception:** process by which subliminal stimuli act upon the unconscious mind and influence behavior

Sensory Adaptation and Habituation

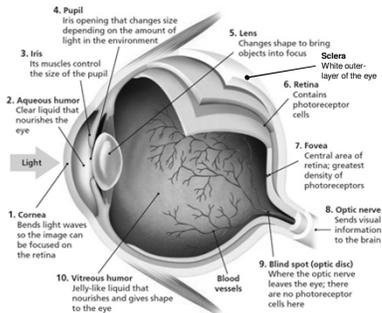
- **Sensory adaptation:** tendency of sensory receptor cells to become less responsive to a stimulus that is unchanging
 - **Microsaccades:** constant movement of the eyes that people do not notice which prevents sensory adaptation to visual stimuli
- **Habituation:** tendency of the brain to stop attending to constant, unchanging information

The Psychology of Vision

- Brightness is determined by the amplitude (i.e., height) of the wave
 - Higher waves are brighter than lower waves
- Color is determined by the length of the wave
 - Long wavelengths are found at the red end of the visible spectrum, whereas shorter wavelengths are found at the blue end
- The wavelengths that we can see are only a small part of the entire electromagnetic spectrum



Structure of the Eye

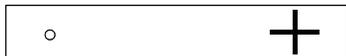


Structure of the Eye

- Retina is the final stop for light in the eye and it contains photoreceptors that respond to various light waves
 - **Rods:** visual sensory receptors responsible for noncolor sensitivity to low levels of light
 - Located everywhere except the center of the retina and they see only in black-and-white
 - Responsible for peripheral vision (which is fuzzy)
 - **Cones:** visual sensory receptors responsible for color vision and sharpness of vision
 - **Blind spot:** area in the retina where the axons of the retinal cells exit the eye to form the optic nerve
 - Insensitive to light because there are no receptors

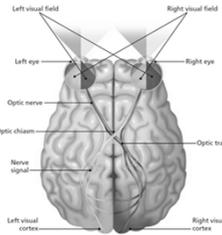
Blind Spot Demonstration

- On a sheet of paper, make a small dot on the left side separated by about 6-8 inches from a small + on the right side
- Close your right eye
- Hold the paper at arms length and focus your left eye on the +
- Slowly move the paper toward your face while focusing on the +
- At a certain distance, the dot will disappear from sight...this is when the dot falls on the blind spot of your retina.
 - You can reverse the process for your right eye (just rotate the paper 180°)



Crossing of the Optic Nerve

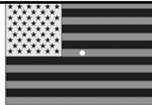
- Light falling on the left side of each eye's retina (from the right visual field, shown in yellow) will stimulate a neural message that will travel along the optic nerve to the visual cortex in the occipital lobe of the left hemisphere
- Notice that some of the messages cross each other at the optic chiasm
- The optic nerve tissue from both eyes joins together to form the left optic tract before going on to the left occipital lobe
- For the left visual field (shown in blue), the messages from both right sides of the retinas will travel along the right optic tract to the right visual cortex in the same manner



How the Eyes Work

- **Dark adaptation:** the recovery of the eye's sensitivity to visual stimuli in darkness after exposure to bright lights
 - Ex. Change in vision after oncoming headlights
 - Rods are responsible for night vision
 - Takes longer as we age (e.g., night blindness)
- **Light adaptation:** the recovery of the eye's sensitivity to visual stimuli in light after exposure to darkness
 - Ex. Walking out of a dark movie theater
 - Cones are responsible
 - Faster than dark adaptation

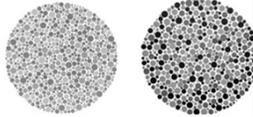
Color Vision



- **Trichromatic theory:** theory of color vision that proposes three types of cones: red, blue, and green
 - Combining red, blue, and green lights produce a white light
 - Red, yellow, and blue are primary paint colors (reflect light)
- Trichromatic theory does not account for **afterimages** (miscoloring images that occur when a visual sensation persists for a brief time even after the original stimulus is removed)
- **Opponent-process theory:** theory of color vision that proposes four primary colors with cones arranged in pairs: red and green, blue and yellow
 - Looking at one color for a long time weakens the ability to inhibit the opposing color
 - Staring at this American flag for a minute and then looking at a white surface will cause you to see a correctly colored afterimage
- Both theories explain part of what happens during color perception
 - Trichromatic theory deals with basic receptors and opponent-process deals with more complex integration of visual information

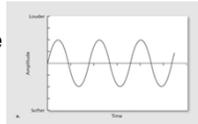
Three Types of Color Blindness

- Colorblindness is a recessive characteristic that is more common in men
- **Monochrome colorblindness:** either have no cones or have cones that are not working at all (very rare)
- **Red-green colorblindness:** either the red or the green cones are not working
 - See the world in blues, yellows, and shades of gray
- **Blue colorblindness:** the blue cones are not working (less common than red-green)
 - See the world in reds, greens, and shades of gray



The Psychology of Sound

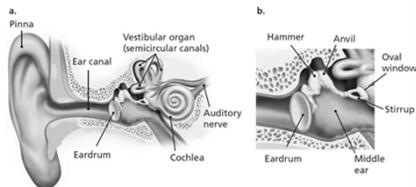
- **Wavelength:** interpreted as frequency or pitch (high, medium, or low)
- **Amplitude:** interpreted as volume (how soft or loud a sound is)
- **Purity:** interpreted as timbre (a richness in the tone of the sound)
- **Hertz (Hz):** cycles or waves per second (a measure of frequency)
- **Decibel:** a unit of measure for loudness



| Sound Level (dB) | Description |
|------------------|--|
| 130 | Headphones turned to highest volume |
| 120 | Rock concert, 300 ft away |
| 110 | Live rock concert |
| 100 | Chain saw or subway train going by, 20 feet away |
| 90 | Rock concert, 100 ft away |
| 80 | Normal conversation |
| 70 | Normal conversation |
| 60 | Normal conversation |
| 50 | Quiet office |
| 40 | Library |
| 30 | Normal breathing |

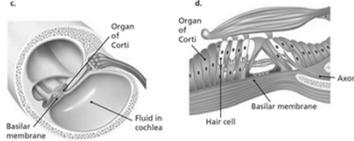
Structure of the Ear

- Sound waves enter the ear canal and cause the eardrum to vibrate which causes each of the three bones of the middle ear (i.e., hammer, anvil, and stirrup) to vibrate and amplify the sound
- These vibrations reach the fluid located in the inner ear



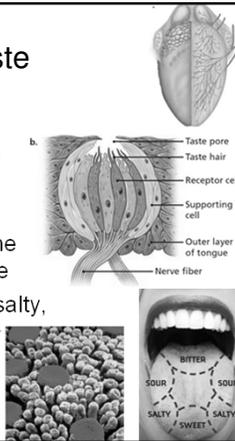
Structure of the Ear

- The inner ear contains large spaces filled with fluid (shown in purple) that vibrate
- A thin membrane suspended in this fluid is called the basilar membrane which contains the organ of Corti (composed of the hairlike cells that send signals to the auditory cortex)
- Louder sounds cause more compression of the hair cells
- Sounds are differentiated by the placement, frequency, and pattern of the hair cells they vibrate



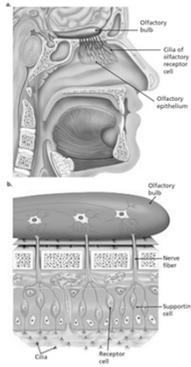
The Psychology of Taste

- Gustation is the sense of taste
- Taste buds are receptor cells in the mouth that are responsible for sense of taste
- Taste buds are located under the surface of the larger red papillae
- Five basic tastes: sweet, sour, salty, bitter, and "umami" (brothy)



The Psychology of Smell

- Olfaction is our sense of smell
- Olfactory bulbs are areas of the brain located just above the sinus cavity and just below the frontal lobes that receive information from the olfactory receptor cells
- At least 1,000 olfactory receptors



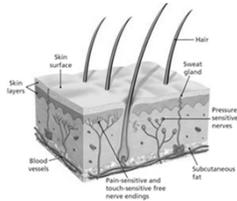
The Psychology of Touch

- Somesthetic senses refer to the bodily senses

- **Skin senses:** the sensations of touch, pressure, temperature, and pain

- **Kinesthetic sense:** sense of the location of body parts in relation to the ground and each other

- **Vestibular senses:** the sensations of movement, balance, and body position



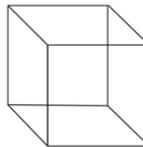
Gestalt Principles

- Figure-ground

- The tendency to perceive objects, or figures, as existing on a background

- Reversible figures

- Visual illusions in which the figure and ground can be reversed

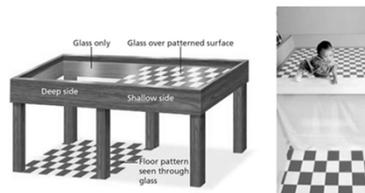


Development of Perception

- Depth perception is the ability to perceive the world in three dimensions

- Studies of depth perception

- Visual cliff experiment



Monocular Depth Cues

- **Linear perspective:** parallel lines appear to converge
- **Relative size:** objects are assumed to be far away when they are small
- **Interposition:** object that appears to block another object is closer
- **Aerial perspective:** far objects appear hazy
- **Texture gradient:** textured surfaces appear smaller and finer when farther away
- **Motion parallax:** close objects appear to move more quickly than objects that are farther away
- **Accommodation:** the brain uses information about the changing thickness of the lens of the eye to determine closeness of objects

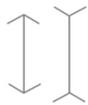
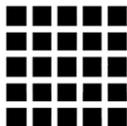


Binocular Cues

- Binocular cues perceive depth based on both eyes
 - **Convergence:** the rotation of the two eyes in their sockets to focus on a single object which results in greater convergence for closer objects and lesser convergence if objects are distant
 - **Binocular disparity:** the difference in images between the two eyes which is greater for objects that are close and smaller for distant objects

Perceptual Illusions

- **Herman grid:** seeing gray squares at intersections
- **Müller-Lyer illusion:** illusion of line length that is distorted by inward-turning or outward-turning corners on the ends of the lines which causes lines of equal length to appear to be different
- **Moon illusion:** the moon on the horizon appears to be larger than the moon in the sky



Perceptual Illusions

● Illusions of Motion

- **Autokinetic effect:** a small, stationary light in a darkened room will appear to move or drift because there are no surrounding cues to indicate that the light is not moving
- **Stroboscopic motion:** seen in motion pictures, in which a rapid series of still pictures will appear to be in motion
- **Phi phenomenon:** lights turned on in a sequence appear to move



Factors that Influence Perception

- **Perceptual set** (perceptual expectancy): the tendency to perceive things a certain way because previous experiences or expectations influence those perceptions
- **Top-down processing:** the use of preexisting knowledge to organize individual features into a unified whole
- **Bottom-up processing:** the analysis of the smaller features to build up to a complete perception