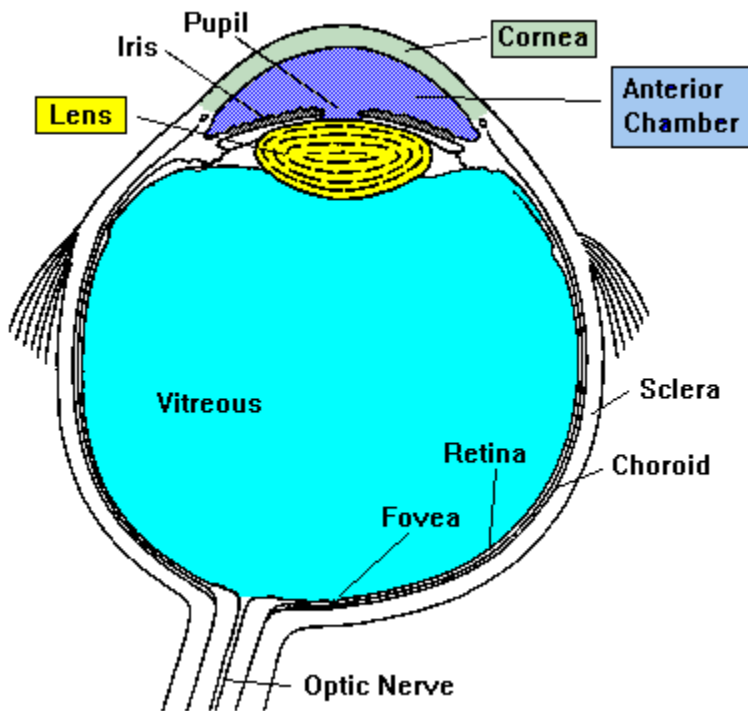


SENSATION AND PERCEPTION



Sensation -Experience of sensory stimulation, the activation of our senses

Perception -Process of creating meaningful patterns from raw sensory information

ENERGY SENSES

VISION

Vision is the dominant sense in human beings. Sighted people use vision to gather information about their environment more than any other sense. The process of vision involves several steps.

Step 1: Gathering light

Step 2: Within the eye

Cornea -The transparent protective coating over the front part of the eye

Pupil -small opening in the iris through which light enters the eye.

Iris -colored part of the eye.

Lens -transparent part of the eye inside the pupil that focuses light onto the retina

Retina -lining of the eye containing receptor cells that are sensitive to light

Step 3: Transduction

Transduction -process by which sensory signals are transformed into neural impulses

Receptor cell -Specialized cell that responds to a particular type of energy.

Rods -Receptor cells in the retina responsible for night vision and perception of brightness.

Cones -Receptor cells in the retina responsible for color vision

Fovea -Area of the retina that is the center of the visual field

Optic nerve - The bundle of axons of ganglion cells that carries neural messages from each eye to the brain.

Blind spot - Place on the retina where the axons of all the ganglion cells leave the eye and where there are no receptors
Optic chiasm -Point near the base of the brain where some fibers in the optic nerve from each eye cross to the other side of the brain

Step 4: In the Brain

Theories of color vision-

Trichromatic theory -Theory of color vision that holds that all color perception derives from three different color receptors in the retina

Opponent-process theory - Theory of color vision that holds that three sets of color receptors respond in an either/or fashion to determine the color you experience

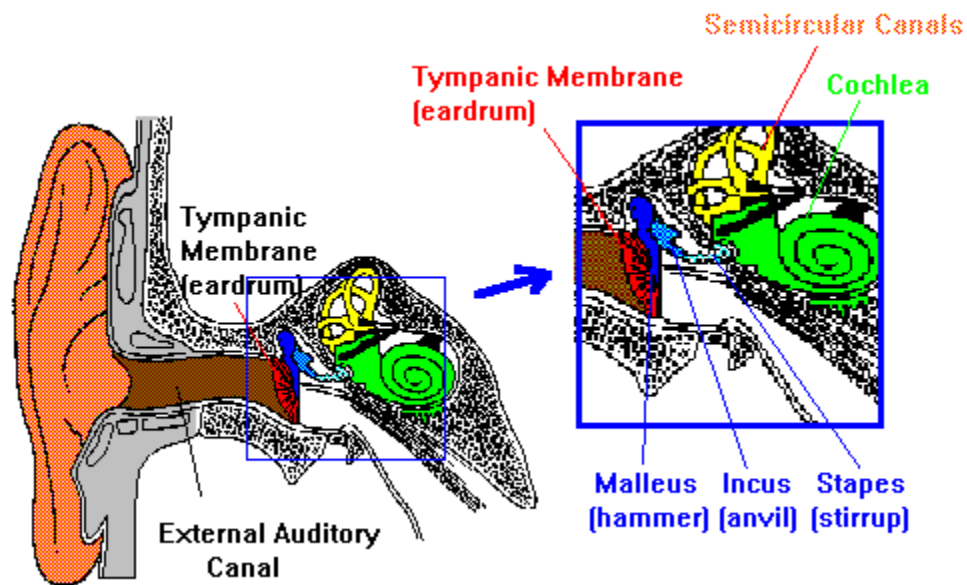
Colorblindness -Partial or total inability to perceive hues.

Trichromats -People who have normal color vision

Monochromats -People who are totally color blind

Dichromats - People who are blind to either red-green or yellow-blue

HEARING



The ears contain structures for both the sense of hearing and the sense of balance. The eighth cranial nerve (vestibulocochlear nerve made up of the auditory and vestibular nerves) carries nerve impulses for both hearing and balance from the ear to the brain.

Amplitude – the height of the wave , determines the loudness of the sound, measured in decibels

Frequency - The number of cycles per second in a wave; in sound, the primary determinant of pitch

Hertz (Hz) - Cycles per second; unit of measurement for the frequency of waves

Pitch - Auditory experience corresponding primarily to frequency of sound vibrations, resulting in a higher or lower tone

Decibel -The magnitude of a wave; in sound the primary determinant of loudness of sounds

Parts of the ear-

Ear canal – also called the auditory canal

Eardrum-

Hammer, anvil, stirrup - The three small bones in the middle ear that relay vibrations of the eardrum to the inner ear

Oval window - Membrane across the opening between the middle ear and inner ear that conducts vibrations to the cochlea

Round window - Membrane between the middle ear and inner ear that equalizes pressure in the inner ear.

Cochlea - Part of the inner ear containing fluid that vibrates which in turn causes the basilar membrane to vibrate.

Basilar membrane -Vibrating membrane in the cochlea of the inner ear; it contains sense receptors for sound

Organ of Corti -Structure on the surface of the basilar membrane that contains the receptors cells for hearing

Auditory nerve -The bundle of neurons that carries signals from each ear to the brain

PITCH THEORIES- As with color vision, two different theories describe the two processes involved in hearing pitch: place theory and frequency theory.

Place theory -Theory that pitch is determined by the location of greatest vibration of the basilar membrane

Frequency theory -Theory that pitch is determined by the frequency with which hair cells in the cochlea fire

DEAFNESS

Hearing Loss

People can lose all or some of their ability to hear because of loud noises, infections, head injuries, brain damage and genetic diseases. Hearing loss is common in older people. There are several types of hearing loss:

- **Conductive Hearing Loss**: occurs when sound vibrations from the tympanic membrane to the inner ear are blocked. This may be caused by ear wax in the auditory canal, fluid buildup in the middle ear, ear infections or abnormal bone growth.
- **Sensorineural Hearing Loss**: occurs when there is damage to the vestibulocochlear (auditory) nerve. This type of hearing loss may be caused by head injury, birth defects, high blood pressure or stroke.
- **Presbycusis**: occurs because of changes in the inner ear. This is a very common type of hearing loss that happens gradually in older age.
- **Tinnitus**: people with tinnitus hear a constant ringing or roaring sound. The cause of this ringing cannot always be found. Some cases of tinnitus are caused by ear wax, ear infections or a reaction to antibiotics, but there are many other possible causes of this disorder.

TOUCH

When our skin is indented, pierced, or experiences a change in temperature, our sense of touch is activated by this energy.

Gate control theory - Theory that a 'neurological gate in the spinal cord controls the transmission of pain messages to the brain

CHEMICAL SENSES

TASTE (GUSTATION)

Taste buds
Papillae-

Humans sense four different tastes: sweet, salty, sour, and bitter

All other tastes come from a combination of these four basic tastes. Actually, a fifth basic taste called "Umami" has recently been discovered. Umami is a taste that occurs when foods with glutamate (like MSG) are eaten. Different parts of the tongue can detect all types of tastes. Moreover, the simple tongue "taste map" that is found in many textbooks has been criticized for several reasons.

The actual organ of taste is called the "taste bud". Each taste bud (and there about 1 about 10,000 taste buds in humans) is made up of many (between 50-150) receptor cells. Receptor cells live for only 1 to 2 weeks and then are replaced by new receptor cells. Each receptor in a taste bud responds best to one of the basic tastes. A receptor can respond to the other tastes, but it responds strongest to a particular taste.

SMELL (OLFACTION)

The Nose Knows

The smells of a rose, perfume, freshly baked bread and cookies...these smells are all made possible because of your nose and brain. The sense of smell, called **olfaction**, involves the detection and perception of chemicals floating in the air. Chemical molecules enter the nose and dissolve in mucous within a membrane called the **olfactory epithelium**. In humans, the olfactory epithelium is located about 7 cm up and into the nose from the nostrils.

Olfactory epithelium - Nasal membranes containing receptor cells sensitive to odors

Pheromone - Chemical that communicates information to other organisms through smell

VESTIBULAR SENSE – tells us about how our body is oriented in space.

Semicircular canals - Structure in the inner ear particularly sensitive to body rotation.

Vestibular sacs - Sacs in the inner ear that are responsible for sensing gravitation and forward, backward, and vertical movement

KINESTHETIC SENSES -Senses of forces and movement of muscles

Stretch receptors -Receptors that sense muscle stretch and contraction

Golgi tendon organs -Receptors that sense movement of the tendons, which connect muscle to bone.

PERCEPTION

THRESHOLDS

Absolute threshold -The least amount of energy that can be detected as a stimulation 50 percent of the time

Subliminal- stimuli below our absolute threshold

Difference threshold -The smallest change in stimulation that can be detected 50 percent of the time

just-noticeable difference – the smallest amount of change needed in a stimulus before we detect a change

Weber's Law -The principle that the just noticeable difference for any given sense is a constant proportion of the stimulation being judged.

PERCEPTUAL THEORIES

Psychologists use several theories to describe how we perceive the world.

Signal detection theory- investigates the effects of the distractions and interference we experience while perceiving the world.

Response criteria

False positive

Top-Down Processing – we perceive by filling in gaps in what we sense

Schemata

Perceptual set

Backmasking

Bottom-up Processing, also *called feature analysis* – we use only the features of the object itself to build a complete perception

GESTALT RULES

Proximity

Similarity

Continuity

Closure

CONSTANCY- Tendency to perceive objects as stable and unchanging despite changes in sensory stimulation

Size constancy - Perception of an object as the same size regardless of the distance from which it is viewed

Shape constancy - Tendency to see an object as the same shape no matter what angle it is viewed from

Brightness constancy - Perception of brightness as the same, even though the amount of light reaching the retina changes

DEPTH CUES

Visual cliff experiment-

Monocular cues - Visual cues requiring the use of one eye

Interposition - Monocular distance cue in which one object, by partly blocking a second object, is perceived as being closer.

Linear perspective - Monocular cue to distance and depth based on the fact that two parallel lines seem to come together at the horizon

Relative size-Monocular cue in which closer objects seem larger than distant objects

Texture gradient-Course objects appear closer than smooth objects

Shadowing-

Binocular cues - Visual cues requiring the use of both eyes

Retinal disparity - Binocular distance cue based on the difference between the images

Convergence- cast on the two retinas when both eyes are focused on the same object

Stereoscopic vision - Combination of two retinal images to give a three-dimensional perceptual experience.

SENSATION AND PERCEPTION QUIZ

1. Our sense of smell may be a powerful trigger for memories because
 - A. we are conditioned from birth to make strong connections between smells and events.
 - B. The nerve connecting the olfactory bulb sends impulses directly to the limbic system
 - C. The receptors at the top of each nostril connect with the cortex
 - D. Smell is a powerful cue for encoding memories into long-term memory
 - E. Strong smells encourage us to process events deeply so they will most likely be remembered
2. The cochlea is responsible for
 - A. protecting the surface of the eye
 - B. transmitting vibrations received by the eardrum to the hammer, anvil, and stirrup.
 - C. The receptors at the top of each nostril connect with the cortex
 - D. Smell is a powerful cue for encoding memories into long-term memory
 - E. Strong smells encourage us to process events deeply so they will most likely be remembered.
3. In a perception research lab, you are asked to describe the shape of the top of a box as the box is slowly rotated. Which concept are the researchers most likely investigating?
 - A. feature detectors in the retina
 - B. feature detectors in the occipital lobe
 - C. placement of rods and cones in the retina
 - D. binocular depth cues
 - E. shape constancy
4. The blind spot in our eye results from
 - A. the lack of receptors at the spot where the optic nerve connects to the retina
 - B. the shadow the pupil makes on the retina
 - C. competing processing between the visual cortices in the left and right hemisphere
 - D. floating debris in the space between the lens and the retina
 - E. retinal damage from bright light
5. Smell and taste are called _____ because
 - A. energy senses; they send impulses to the brain in the form of electric energy
 - B. chemical senses; they detect chemicals in what we taste and smell
 - C. flavor senses; smell and taste combine to create flavor.
 - D. Chemical senses; they send impulses to the brain in the form of chemicals.
 - E. Memory senses; they both have powerful connections to memory
6. What is the principal difference between amplitude and frequency in the context of sound waves ?
 - A. Amplitude is the tone or timbre of a sound, while frequency is the pitch.
 - B. Amplitude is detected in the cochlea, while frequency is detected in the auditory cortex.
 - C. Amplitude is the height of the sound wave, while frequency is a measure of how frequently the sound waves pass a given point.
 - D. Both measure qualities of sound, but frequency is a more accurate measure since it measures the shapes of the waves rather than the strength of the waves.
 - E. Frequency is a measure for light waves, while amplitude is a measure for sound waves.

7. Weber's law determines
- A. absolute threshold.
 - B. Focal length of the eye.
 - C. Level of subliminal messages.
 - D. Amplitude of sound waves.
 - E. Just-noticeable difference.
8. Gate control theory refers to
- A. which sensory impulses are transmitted first from each sense
 - B. which pain messages are perceived
 - C. interfering sound waves, causing some waves to be undetected
 - D. the gate at the optic chiasm controlling the destination hemisphere for visual information from each eye.
 - E. How our minds choose to use either bottom-up or top-down processing.
9. If you had sight in only one eye, which of the following depth cues could you NOT use?
- A. texture gradient
 - B. convergence
 - C. linear perspective
 - D. interposition
 - E. shading
10. Which of the following sentences best describes the relationship between sensation and perception?
- A. Sensation is a strictly mechanical process, while perception is a cognitive process.
 - B. Perception is an advanced form of sensation.
 - C. Sensation happens in the senses, while perception happens in the brain.
 - D. Sensation is detecting stimuli, perception is interpreting stimuli detected.
 - E. Sensation involves learning and expectations, and perception does not.
11. What function does the retina serve?
- A. The retina contains the visual receptor cells
 - B. The retina focuses light coming in the eye through the lens.
 - C. The retina determines how much light is let into the eye.
 - D. The retina determines which rods and cones will be activated by incoming light
 - E. The retina connects the two optic nerves and sends impulses to the left and right visual cortices.
12. Color blindness and color afterimages are best explained by what theory of color vision?
- A. trichromatic theory
 - B. Visible hue theory
 - C. Opponent-process theory
 - D. Dichromatic theory
 - E. Binocular disparity theory
13. You are shown a picture of your grandfather's face, but the eyes and mouth are blocked out. You still recognize it as a picture of your grandfather. Which type of processing best explains this example of perception?
- A. bottom-up processing

- B. signal detection theory
- C. top-down processing
- D. opponent-process theory

14. What behavior would be difficult without our vestibular sense ?

- A. integrating what we see and hear
- B. writing our name
- C. repeating a list of digits
- D. walking a straight line with our eyes closed
- E. reporting to a researcher the exact position and orientation of our limbs