

Course Title: PSYC 1 - Introduction to Psychology

Institution: Saddleback College

Textbook used: *Ciccarelli, S. K., & White, J. N. (2017). Psychology (5th ed.).*

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1. History, Subfields of Psychology and Research Methods

- **Dualism**: View that the mind and body both exist as separate entities.
- **Monism**: Belief that the mind and the body are symmetrical.
- **Nature-nurture controversy**: Whether human behavior is determined by the environment, either prenatal or during a person's life, or by a person's genes (innate, inborn).
- **Empirical Method**: Method for acquiring knowledge based on observation, including experimentation, rather than a method based only on forms of logical argument or previous authorities
- **Introspection**: Process by which someone examines their own conscious experience in an attempt to break it into its component parts
- **Structuralism**: Understanding the conscious experience through introspection.
 - Wilhelm Wundt was a structuralist, who believed that our cognitive experience was best understood by breaking that experience into its component parts. He thought it was best accomplished by introspection.
 - Wundt, Hall and Titchener studied the basic elements of consciousness.
- **Functionalism**: Focused on how mental activities helped an organism adapt to its environment
 - William James was an advocate of functionalism, focusing on how mental activities served as adaptive responses to an organism's environment. He also relied on introspection.
 - Wundt and James helped create psychology as a distinct scientific discipline.
- Gestalt psychology takes a holistic, entire view of an individual and experiences. In the U.S it was introduced by Wertheimer, Koffka, and Kohler, three German psychologists.
- **Psychoanalytic Theory**: Focus on the role of the unconscious in affecting conscious behavior.
 - Sigmund Freud believed that understanding the unconscious mind was absolutely critical to understand conscious behavior (their goal).
 - Psychoanalytic theory remained a dominant force in clinical psychology for several decades

- **Behaviorism (behavioral approach)**: Focus on observing and controlling behavior. Behaviorists think behavior results from learning, and explain human thought and behavior as a result of past conditioning
 - John Watson is considered the father of behaviorism, which is focused on making psychology an objective science by studying overt behavior and deemphasizing the importance of unobservable mental processes. He relied on the works of Ivan Pavlov
 - B.F. Skinner contributed to our understanding of principles of operant (instrumental) conditioning, a method of employing rewards and punishments for behavior. He expanded the basic ideas of behaviorism to include the idea of reinforcement; environmental stimuli that either encourage or discourage certain responses
- **Humanism**: Perspective within psychology that emphasizes the potential for good that is innate to all humans.
 - Abraham Maslow and Carl Rogers were influential in shaping humanistic psychology which emerged when some were dissatisfied with behaviorism and psychoanalytic theory taking hold of so many aspects of psychology.
 - Humanists believe that we choose most of our behaviors and these choices are guided by physiological, emotional, or spiritual needs

2. Biological Psychology

- **Lesions**: Precise destruction (injury, interruptions) of brain tissue, enables more systematic study of the loss of function resulting from surgical removal (also called ablation), cutting of neural connections, or destruction by chemical applications
- **Aphasia**: impairment of the ability to understand or use language
- **Computerized axial tomography (CAT or CT)**: Creates a computerized image using x-rays passed through the brain to show structure and/or the extent of a lesion
- **Magnetic resonance imaging (MRI)**: Creates more detailed computerized images using a magnetic field and pulses of radio waves that cause emission of signals that depend upon the density of tissue
- **EEG (electroencephalogram)**: Test used to evaluate the electrical activity in the brain. Brain cells communicate with each other through electrical impulses and EEG can be used to help detect potential problems associated with an activity by tracking and recording brain wave patterns.
- **Evoked potentials**: Electrical potential (resulting EEG) in a specific pattern recorded from a specific part of the nervous system, especially the brain, following presentation of a stimulus (such as a light flash).
- **Magnetic source image (MSI)**: It is produced by magnetoencephalography (MEG scan), and it is similar to an EEG, but the MEG scans are able to detect the slight magnetic field caused by the electric potentials in the brain. The images can pinpoint locations of seizures.
- **Positron emission tomography (PET)**: shows brain activity when radioactively tagged glucose rushes to active neurons and emits positrons (metabolic activities). Combination of nuclear medicine and biochemical analysis.

- **Functional MRI (fMRI)**: Combines elements of the MRI and PET scans; an fMRI scan can show details of brain structure with information about blood flow in the brain, tying brain structure to brain activity during cognitive tasks.
- **Central nervous system (CNS)**: brain and spinal cord
 - **Spinal cord**: Portion of the central nervous system below the level of the medulla
 - **Brain**: Portion of the central nervous system above the spinal cord
- **Peripheral nervous system (PNS)**: portion of the nervous system outside the brain and spinal cord; includes all of the sensory and motor neurons. Because this nervous system is not protected (in contrast to CNS which is protected by vertebrae and skull) it is more susceptible to trauma.
 - **Autonomic nervous system (ANS)**: subdivision of PNS that acts largely unconsciously and regulates bodily functions, heart rate, digestion, respiratory rate, etc. Primary mechanism in control of the fight-or-flight response (physiological reaction that occurs in response to a harm or attack).
 - **Sympathetic nervous system**: subdivision of PNS and ANS whose stimulation results in responses that help your body deal with dangerous or stressful events.
 - **Parasympathetic nervous system**: subdivision of PNS and ANS whose stimulation calms your body following sympathetic stimulation by slowing the heart rate, restoring normal processes; responsible for response when the body is relaxed and undoing the work of sympathetic division after a stressful situation.
 - **Somatic nervous system**: subdivision of PNS associated with the voluntary control of body movements through skeletal muscles. It carries nerve impulses back and forth between the CNS, and connects it to the organs, muscles and skin.
- According to the evolutionary model, brain consists of three sections: reptilian brain (medulla, pons, cerebellum); old mammalian brain (limbic system, hypothalamus, thalamus); and the new mammalian brain (cerebral cortex)
- According to the developmental model, it consists of three slightly different sections: the hindbrain (medulla, pons, cerebellum), the midbrain (small regions with parts involved in eye reflexes and movements), and the forebrain (including the limbic system, hypothalamus, thalamus, cerebral cortex).
- **Convolutions**: folding-in and out of the cerebral cortex that increases surface area of the brain
- **Association Areas**: Parts of the cerebral cortex that aren't responsible for sensory or motor/muscle functions, but involved in higher mental functions, such as thinking, planning, remembering, and communicating
- **Contralaterality**: control of one side of your body by the other side of your brain (each hemisphere is responsible for the movements or sensation of the opposite of the body).
- **(Neuro) Plasticity**: Brain's ability to reorganize and take over a function when one region is damaged.

The Brain

- **Hindbrain**: Brain region responsible for most of the survival functions, such as heart rate, breathing, etc. It is located at the base of the brain and includes the cerebellum and brainstem
 - **Cerebellum**: The area of the brain in charge of balance, motor (function) coordination, and procedural memories
 - **Brain stem**

- **Medulla (oblongata)**: A structure located on the brain stem that controls involuntary actions and reflexes such as sneezing, coughing, or blinking. Also controls our blood pressure, heart rate, and breathing
- **Pons**: The bridge connecting the cerebellum to the cortex (connects hindbrain with the midbrain and forebrain). It coordinates voluntary movement, sleep and facial expressions. Includes portion of reticular activating system or reticular formation critical for arousal and wakefulness; sends information to and from medulla, cerebellum, and cerebral cortex
- **Reticular formation**: A structure related to arousal (being awoken). If someone's reticular formation was not working, that person would be in a coma
- **Midbrain**: Located between the hindbrain and the forebrain, and integrates types of sensory information and muscle movements, as well as reticular formation that controls general body arousal and the ability to focus our attention
- **Forebrain**: The largest area of the brain that includes the cortex and subcortical structures, such as the limbic system
 - **Thalamus**: A structure located in the frontal lobe that is the sensory relay station of the brain. Information from all the senses, except for olfaction (smelling), are sent through the thalamus and sorted and directed to different cortices of the brain
 - **Limbic system**: Set of structures in the brain that deal with emotions and memory
 - **Hippocampus**: the brain region responsible for processing and integrating memories and sent to the frontal lobe for storage and further processing. Memories are not permanently stored in this area, and are sent to other locations in the cerebral cortex; Still, it must first pass through Hippocampus.
 - **Amygdala**: Almond shaped structures located at the end of each hippocampal arm. Related to strong emotions such as fear and aggression (coordinates fight-or-flight)
 - **Hypothalamus**
 - **Pituitary gland (master gland)**

Cerebrum & Lobes

- **Cerebrum**: Largest structure located upmost part, containing the cortex and subcortical structures. It can be divided into the following four lobes. Cerebrum is part of the forebrain
 - **Frontal lobe**: located right behind the eyes, it is responsible for interpreting, controlling emotional behaviors, making decisions, and carrying out plans. Smell is processed in the lower portion
 - **Prefrontal cortex**: A structure located in the frontal lobe that is responsible for thinking, planning, language use, and other higher cognitive functions
 - **Motor cortex**: A structure located at the back of the frontal lobe responsible for voluntary motor movement and control
 - **Broca's area**: Located in the left frontal lobe controls production of speech. It interprets and controls emotional behaviors, makes decisions and carries out plans.
 - **Basal ganglia**: Regulates initiation of movements, balance, eye movements, and posture.
 - **Parietal lobe**: Responsible for processing sensory information related to somatic senses. It is a contralateral representation of all body parts

- **Somatosensory cortex**: A structure in the parietal lobe that controls the perception of how things feel to the touch; pain, pressure and temperature.
- **Sensory cortex**: Thin vertical strip that receives sensations from the bottom of the body, progressing down the cortex to the bottom, which processes signals from our face and head
- **Occipital lobe**: A structure located in the back of the brain that contains the areas of visual processing
 - **Visual cortex**: Receives and processes visual information from the eyes
- **Temporal lobe**: A structure located in the back of the brain, primary area for hearing, understanding language (Wernicke's area), understanding music/tonality, recognizing faces and processing smell
 - **Auditory cortex**: A structure located in the temporal lobe that receives and processes sound information from the ears
 - **Wernicke's area**: in the left temporal lobe plays a role in understanding language and making meaningful sentences.
 - Right temporal lobe is important for understanding music/tonality
 - Smell is processed near front of temporal lobes

Structure and Function of the Neuron

- **Glial cells**: Supportive cells of the nervous system that guide the growth of developing neurons, help provide nutrition for and get rid of wastes of neurons, and form an insulating sheath around neurons that speeds conduction. They don't carry an action potential, unlike neurons.
- **Neuron**: Basic unit of structure and function of the nervous system that performs three major functions: receive information, process it, and transmit it to the rest of your body.
 - **Cell body**: also called the cyton or soma; the part of the neuron that contains cytoplasm and the nucleus, which directs synthesis of such substances as neurotransmitters.
 - **Dendrites**: branching tubular processes of a neuron that have receptor sites for receiving information. They grow to make synaptic connections with other neurons
 - **Terminal buttons** (axon terminals, end bulbs, or synaptic knobs): tips at the end of axons that secrete neurotransmitters when stimulated by the action potential
 - **Axon**: a long, single conducting fiber extending from the cell body of a neuron that transmits an action potential and that branches and ends in tips called terminal buttons, which secrete neurotransmitters.
 - **Myelin sheath**: a fatty covering of the axon made by glial cells, which speeds up conduction of the action potential (neural impulses)
- **Neurogenesis**: The growth of new neurons, which takes place throughout life
- **Neurotransmitters**: Chemical messengers released by the terminal buttons of the presynaptic neuron into the synapse. Different neurotransmitters have different chemical structures and perform different tasks. They fit into receptor sites on the dendrites of neurons like a key fits in a lock
 - **Acetylcholine (ACh)**: A neurotransmitter that causes contraction of skeletal muscles, helps regulate heart muscles, is involved in memory, and also transmits messages between the brain and spinal cord. Lack of ACh is associated with Alzheimer's disease

- **Dopamine**: A neurotransmitter that stimulates the hypothalamus to synthesize hormones and affects alertness, attention, and movement. Lack of dopamine is associated with Parkinson's disease; too much is associated with schizophrenia.
- **Glutamate**: a neurotransmitter that stimulates cells throughout the brain, but especially in the hypothalamus, and is associated with memory formation and information processing.
- **Serotonin**: a neurotransmitter associated with sexual activity, arousal, sleep, appetite, moods, and emotions. Lack of serotonin is associated with depression.
- **Endorphin**: a neurotransmitter similar to the opiate morphine that relieves pain and may induce feelings of pleasure.
- **Gamma-aminobutyric acid (GABA)**: a neurotransmitter that inhibits firing of postsynaptic neurons. Huntington's disease and seizures are associated with malfunctioning GABA systems.
- **Norepinephrine**: Acts as both a stress hormone and neurotransmitter. It's released into the blood as a stress hormone when the brain perceives that a stressful event has occurred. Lack of norepinephrine may cause depression
- **Action potential**: Also called an impulse, the "firing" of a neuron; a net flow of sodium ions into the cell that causes a rapid change in potential across the membrane when stimulation reaches threshold
- **All-or-none principle**: The law that the neuron either generates an action potential when the stimulation reaches threshold or doesn't fire when stimulation is below threshold. The strength of the action potential is constant whenever it occurs; there is no "weak" or "strong" action potential
- **Nodes of Ranvier**: Spaces between segments of myelin on the axons of neurons.
- **Saltatory conduction**: Rapid conduction of impulses when the axon is myelinated since depolarizations jump from node (of Ranvier) to node
- **Synapse**: Region of communication between the transmitting presynaptic neuron and receiving postsynaptic neuron, muscle or gland, consisting of the presynaptic terminal buttons, a tiny space, and receptor sites typically on the postsynaptic dendrites.
- **Excitatory neurotransmitter**: Chemical secreted at terminal button that causes the neuron on the other side of the synapse to generate an action potential (to fire)
- **Inhibitory neurotransmitter**: Chemical secreted at terminal button that reduces or prevents neural impulses in the postsynaptic dendrites
- **Reflex**: The simplest form of behavior
- **Reflex arc**: The path over which the reflex travels, which typically includes the following
 - **Sensory (Simulus) receptor**: Cell typically in sense organs that initiates action potentials, which then travel along sensory/afferent neurons to the CNS
 - **Afferent (sensory) neuron**: Nerve cell in your PNS that take information from the senses to the brain
 - **Interneuron**: Nerve cell in the CNS that transmits impulses between sensory and motor neurons. Neural impulses travel one way along the neuron from dendrites to axons to terminal buttons, and among neurons from the receptor to the effector. Located in the brain and spinal cord only
 - **Efferent (motor) neuron**: Nerve cell in your PNS that transmits impulses from sensory or interneurons to muscle cells (effector) that contract or gland cells that secrete
 - **Effector**: muscle cell that contracts or gland cell that secretes

The Endocrine System

- **Endocrine system**: Endocrine system interacts with the nervous system to regulate behavior and body functions. It consists of glands that secrete chemical messengers called hormones into blood.
 - **Hormone**: Chemical messenger that travels through the blood to a receptor site on a target organ
 - **Pineal gland**: Endocrine gland in brain that produces melatonin that helps regulate circadian rhythms and is associated with seasonal affective disorder
 - **Hypothalamus**: A structure related to maintenance functions, regulating hunger thirst, and maintaining a stable body temperature, and also controlling the pituitary gland. Acts as endocrine gland and produces hormones that stimulate (releasing factors) or inhibit secretion of hormones by the pituitary
 - **Pituitary gland (master gland)**: A structure part of the endocrine system that releases hormones controlling hormonal release by many other glands. It is an endocrine gland that produces stimulating hormones, promoting secretion by other glands including TSH-thyroid-stimulating hormone; ACTH-adrenocorticotrophic hormone, which stimulates the adrenal glands; FSH, which stimulates egg or sperm production; ADH (antidi-urectic hormone) to help retain water in your bod
 - **Thyroid gland**: Endocrine gland in neck that produces thyroxine, which stimulates and maintains metabolic activities
 - **Parathyroids**: Endocrine glands in the neck that produce parathyroid hormone, which helps maintain calcium ion level in blood necessary for normal functioning of neurons.
 - **Adrenal glands**: Endocrine glands atop kidneys. Adrenal cortex (outer layer) produces steroid hormones such as cortisol, which is a stress hormone. Adrenal medulla (the core) secretes adrenaline (epinephrine) and noradrenaline (norepinephrine), which prepare the body for “fight-or-flight” like the sympathetic nervous system.
 - **Pancreas**: Gland near stomach that secretes the hormones insulin and glucagon, which regulate blood sugar that fuels all behavioral processes. Imbalances result in diabetes and hypoglycemia.
 - **Ovaries and Testes**: Gonads in females and males, respectively, that produce hormones necessary for reproduction and development of secondary sex characteristics

Genetics and Behavior

- **Zygote**: Fertilized egg
- **Identical twins**: Also called monozygotic twins; two individuals who share all of the same genes/heredity because they develop from the same zygote
- **Fraternal twins**: Also called dizygotic twins; siblings that share about half of the same genes because they develop from two different zygotes
- **Heritability**: The proportion of variation among individuals in a population that is due to genetic causes
- **Gene**: Each DNA segment of a chromosome that determines a trait
- **Chromosome**: Structure in the nucleus of cells that contains genes determined by DNA sequence
- Errors during fertilization can result in the wrong number of chromosomes in cells of a baby, resulting in

- **Turner syndrome**: Females with only one X sex chromosome who are short, often sterile, and have difficulty calculating
- **Klinefelter's syndrome**: Males with XXY sex chromosomes
- **Down syndrome**: Usually with three copies of chromosome-21 in their cells, individuals who are typically mentally retarded
- **Genotype**: The genetic makeup of an individual
- **Phenotype**: The expression of genes
- **Epigenetics**: Changes in phenotype caused by any means other than changes in the underlying DNA sequence (such as DNA methylation, or histone modifications)
- **Homozygous**: The condition when both genes for a trait are the same
- **Heterozygous**: Also called hybrid; the condition when the genes for a trait are different
- **Dominant gene**: The gene expressed when the genes for a trait are different
- **Recessive gene**: The gene that is hidden or not expressed when the genes for a trait are different
- **Tay-Sachs syndrome**: Recessive trait that produces progressive loss of nervous function and death in a baby
- **Albinism**: Recessive trait that produces lack of pigment and involves quivering eyes and inability to perceive depth with both eyes
- **Phenylketonuria (PKU)**: Recessive trait that results in severe, irreversible brain damage unless the baby is fed a special diet low in phenylalanine
- **Huntington's disease**: Dominant gene defect that involves degeneration of the nervous system, characterized by tremors, jerky motions, blindness, and death
- **Sex-linked traits**: Recessive genes located on the X chromosomes with no corresponding gene on the Y chromosome, which result in expression of recessive trait, more frequently in males

3. Sensation and Perception

- **Sensation**: The process by which you detect physical energy from your environment and encode it as neural signals
- **Psychophysics**: The study of the relationship between physical energy and psychological experiences
- **Stimulus**: A change in the environment that can be detected by sensory receptors
- **Absolute Threshold**: The weakest level of a stimulus that can be correctly detected at least half the time
- **Signal detection theory**: Maintains that minimum threshold varies with fatigue, attention, expectations, motivation, emotional distress, and from one person to another
 - In a signal detection experiment, a person needs to decide whether a signal is present or not
- **Subliminal stimulation**: Receiving messages below one's absolute threshold for conscious awareness.
- **Difference threshold**: Minimum difference between any two stimuli that a person can detect 50% of the time
- **Just noticeable difference (jnd)**: Experience of the difference threshold
- **Weber's law**: Difference thresholds increase in proportion to the size of the stimulus

- **Sensory adaptation**: Permits you to focus your attention on informative changes in your environment without being distracted by irrelevant data
- **Transduction**: Transformations of stimulus energy to the electrochemical energy of neural impulses.
- **Perception**: The process of selecting, organizing, and interpreting sensations, enabling you to recognize meaningful objects and events

Vision and the Human Eye & Visual Pathway

- Initial visual sensation and perception take place in three areas
 - Cones and rods of the retina located at the back inner surface of your eye
 - Pathways through your brain
 - In occipital lobes, also called the visual cortex
- **Near-sighted**: Too much curvature of the cornea and/or lens focuses an image in front of the retina
- **Far-sighted**: Too little curvature of the cornea and/or lens focuses the image behind the retina
- **Astigmatism**: Caused by an irregularity in the shape of the cornea and/or the lens. It distorts and blurs the image at the retina, causing blurred vision
- **Cornea**: Transparent, curved layer in the front of the eye that bends incoming light rays
- **Iris**: Colored muscle surrounding the pupil that regulate the size of the pupil opening
- **Pupil**: Small adjustable opening in the iris that is smaller in bright light and larger in darkness
- **Lens**: Structure behind the pupil that changes shape, becoming more spherical or flatter to focus incoming rays into an image on the light-sensitive retina
- **Accommodation**: Process of changing the curvature of the lens to focus light rays on the retina
- **Retina**: Light-sensitive surface in the back of the eye containing photoreceptors that transduce light energy. Also has layers of bipolar cells and ganglion cells that transmit visual information to the brain. Images formed on retina is upside down and incomplete
- **Photoreceptors**: Modified neurons that convert light energy to electrochemical neural impulses.
 - **Rods**: Photoreceptors that detect black, white, and gray and that detect movement. Necessary for peripheral and dim-light vision when cones do not respond. Distributed throughout the retina, except none are in the fovea.
 - **Cones**: Photoreceptors that detect color and fine detail in daylight or bright-light conditions. Most concentrated at the fovea of the retina; none are in the periphery
- **Bipolar cells**: Second layer of neurons in the retina that transmit. Rods and cones both synapse
- **Ganglion cells**: Third layer of neurons in the retina, whose axons converge to form the optic nerve. Bipolar cells transmit impulses to this layer of neurons
- **Optic nerve**: Nerve formed by ganglion cell axons; carries the neural impulses from the eye to the thalamus of the brain
- **Blind spot**: Region of the retina where the optic nerve leaves the eye so there are no receptor cells; creates an area with no vision
- **Acuity**: Ability to detect fine details; sharpness of vision. Can be affected by distortions in the shape of eye
- **Dark adaptation**: Increased visual sensitivity that gradually develops when it gets dark
- **Feature detectors**: Individual neurons in the primary visual cortex/occipital lobes that respond to specific features of a visual stimulus (such as lines, angles, even a letter or face)
- **Parallel processing**: Simultaneously analyzing different elements of sensory information, such as color, brightness, shape, etc

Color Vision

- A wavelength is the distance from the top of one wave to the top of the next wave. When light hits an object, different wavelengths of light can be reflected, transmitted, or absorbed. The more lightwaves your eyes receive, the brighter an object appears, meaning that the wavelengths of light that reach your eye from the object determine the color, or hue
- **Trichromatic theory**: Proposed mechanism for color vision with cones that are differentially sensitive to different wavelengths of light; each color you see results from a specific ratio of activation among the three types of receptors
 - Trichromats: People with three different types of cones
 - Dichromats: People with two different types of cones
 - Monochromats: People with one type of cone
- **Opponent-process theory**: Proposed mechanism for color vision with opposing retinal processes for red-green, yellow-blue, white-black. Certain neurons can be either excited or inhibited, depending on the wavelength of light, and complementary wavelengths have opposite effects.
- **Sensory adaptation**: Temporary decrease in sensitivity to a stimulus that occurs when stimulation is unchanging
- **Attention**: The set of processes from which you choose among the various stimuli bombarding your senses at any instant, allowing some to be further processed by your senses and brain

Hearing (Audition)

- **Audition**: The sense of hearing. The loudness is determined by the amplitude or height of the sound wave
- **Frequency**: The number of complete wavelengths that pass a point in a given amount of time. The wavelength is inversely proportional to the frequency. Frequency or wavelength determines the hue of a light wave and the pitch of a sound
- **Pitch**: The highness or lowness of a sound. The shorter the wavelength, the higher the frequency, the higher the pitch. The longer the wavelength, the lower the frequency, the lower the pitch
- **Amplitude**: Height of the sound wave (?), measured in units of pressure, decibels (dB)
- **Timbre**: The quality of a sound determined by the purity of a waveform. The purity of the wave form or mixture of sound waves (timbre) is different for different musical instruments
- **Sound localization**: The process by which you determine the location of a sound
- **Place theory**: The position on the basilar membrane (which is inside cochlea) at which waves reach their peak depends on the frequency of a tone. Accounts well for high-pitched sounds.
- **Frequency theory**: The rate of the neural impulses traveling up the auditory nerve matches the frequency of a tone, enabling you to sense its pitch. Frequency theory explains well how you hear low-pitched sounds.
- Parts of the ear
 - **Outer ear**: Includes the **pinna** (visible portion), the **auditory canal** (opening into the head), and the **eardrum** (tympanum)
 - **Middle ear**: Includes three tiny bones (**ossicles**): the **hammer**, **anvil**, and **stirrup**. Sound waves channeled from outer ear cause these ossicles to vibrate
 - **Inner ear**: Includes the **cochlea** (**basilar membrane** with **hair cells** within), **semicircular canals**, and **vestibular sacs**. Contains compartments filled with fluid and specialized sensory cells.

- When sound waves vibrate the eardrum (outer or middle ear), the hearing bones (middle ear) transmit this to the fluids (inner ear), ultimately creating a nerve impulse that travels through the hearing nerve to the brain
- **Cochlea**: Snail-shaped fluid-filled tube in the inner ear with hair cells on the basilar membrane that transduce mechanical energy of vibrating molecules to the electrochemical energy of neural impulses. Hair cell movement triggers impulses in adjacent nerve fibers.
- **Auditory nerve**: Axons of neurons in the cochlea converge transmitting sound messages through the medulla, pons, and thalamus to the auditory cortex of the temporal lobes.
- **Conduction deafness**: loss of hearing that results when the eardrum is punctured or any of the ossicles lose their ability to vibrate. A hearing aid may restore hearing.
- **Nerve (sensorineural) deafness**: loss of hearing that results from damage to the cochlea, hair cells, or auditory neurons. Cochlear implants may restore some hearing.

Touch (Somatosensation)

- **Somatosensation**: The skin sensations: touch/pressure, warmth, cold, and pain
- **Gate-control theory**: Pain is experienced only if the pain messages can pass through a gate in the spinal cord on their route to the brain. The gate is opened by small nerve fibers that carry pain signals and closed by neural activity of larger nerve fibers, which conduct most other sensory signals, or by information coming from the brain

Body Senses

- **Kinesthesia**: Body sense that provides information about the position and movement of individual parts of your body with receptors in muscles, tendons, and joints
- **Vestibular sense**: Body sense of equilibrium with hairlike receptors in semicircular canals and vestibular sac in the inner ear

Chemical Senses

- **Gustation**: The chemical sense of taste with receptor cells in taste buds in fungiform papillae on the tongue, on the roof of the mouth, and in the throat. Molecules must dissolve to be sensed. The five basic taste sensations are sweet, sour, salty, bitter, and newly added to the list, umami or glutamate. Flavor is the interaction of sensations of taste and odor with contributions by temperature, etc
- **Olfaction**: The chemical sense of smell with receptors in a mucous membrane (olfactory epithelium) on the roof of the nasal cavity. Molecules must reach the membrane and dissolve to be sensed. Olfactory receptors synapse immediately with neurons of the olfactory bulbs in the brain. Does NOT get transmitted to the thalamus, unlike other senses

Perceptual Processes

- **Selective attention**: Focused awareness of only a limited aspect of all you are capable of experiencing
- **Bottom-up processing**: Information processing that begins with sensory receptors and works up to the brain's integration of sensory information to construct perceptions; data-driven
- **Top-down processing**: Information processing guided by your preexisting knowledge or expectations to construct perceptions; concept-driven
- **Visual capture**: Vision usually dominates when there is a conflict among senses. Gestalt psychologists proposed organizing principles by which we perceive as a whole rather than combinations of features
- **Phi Phenomenon**: Illusion of movement created by presenting visual stimuli in rapid succession

- **Figure-ground relationship**: The figure is the dominant object, and the ground is the natural and formless setting for the figure. Proposed by Gestaltists
- **Depth perception**: The ability to judge the distance of objects
- **Monocular cues**: Clues about distance based on the image of one eye.
 - **Interposition**: overlap can be seen when a closer object cuts off the view of part or all of a more distant one
 - **Relative size**: Provides a cue of distance (of familiar objects) when the close of two same-size objects cast a larger image on your retina than the farther one
 - **Relative clarity**: Can be seen when closer objects appear sharper than more distant, hazy objects
 - **Texture gradient**: Provides a cue to distance when closer objects have a coarser, more distinct texture than far away objects that appear more densely packed or smooth
 - **Linear perspective**: Provides a cue to distance when parallel lines, such as edges of sidewalks, seem to converge in the distance
 - **Relative brightness**: Can be seen when the closer of two identical objects reflects more light to your eyes.
 - **Optical illusions**: May occur because distance cues lead one line to be judged as farther away than the other. Similarly, the moon illusion may occur because the moon, when near the horizon, is judged to be farther away than when it is high in the sky, although in both positions it casts the same image on the retina.
- **Binocular cues**: Clues about distance requiring two eyes. They include the more important retinal disparity and less important convergence (inward turning of eyes that occurs when looking at an object that is close to you; the closer an object, the more convergence)
- **Optical or visual illusions**: Discrepancies between the appearance of a visual stimulus and its physical reality. Common examples of visual illusions include reversible figures, illusory contours, the Muller-Lyer illusion, Ponzo illusion, and moon illusion
- **Perceptual constancy**
 - **Size constancy**: Object appears to maintain its normal shape regardless of the angle from which it is viewed
 - **Shape constancy**: Object appears to maintain its normal shape regardless of the angle from which it is viewed
 - **Brightness constancy**: Object maintains a particular level of brightness regardless of the amount of light reflected from it
- **Schemas**: Concepts or frameworks that organize and interpret information
- **ESP (extrasensory perception or sixth sense)**: The controversial claim that perception can occur apart from sensory input
- **Parapsychology**: The study of paranormal events that investigates claims of ESP includes:
 - **Telepathy**: Mind-to-mind communication
 - **Clairvoyance**: Perception of remote events
 - **Precognition**: Perception of future events
 - **Telekinesis** or **psychokinesis**: Moving remote objects through mental processes

4. Consciousness and Stress & Health

- **Consciousness**
 - A person's awareness of everything that is going on around him or her at any given moment
 - Generated by set of action potentials in communication among neurons
- **Waking states of consciousness**
 - Waking consciousness: State in which thoughts, feelings, and sensations are clear and organized, and the person feels alert
 - Altered states of consciousness: State in which there is a shift in the quality or pattern of mental activity as compared to waking consciousness
- **Biology of Sleep**
 - Circadian rhythm: A cycle of bodily rhythm that occurs over a 24 hour period
 - Hypothalamus: Tiny section of the brain that influences the glandular system
 - Suprachiasmatic nucleus
 - Hypothalamus tells pineal gland to secrete melatonin
- **Sleep**
 - Microsleeps: Brief sidesteps into sleeping lasting only a few seconds
 - Sleep deprivation: Any significant loss of sleep
 - Results in irritability and problems with concentration
 - Adaptive theory: Theory of sleep proposing that animals and humans evolved sleep patterns to avoid predators by sleeping when predators are more active
 - Restorative theory: Theory of sleep proposing that sleep is necessary to the physical health of the body and serves to replenish chemicals and repair cellular damage
- **Stages of Sleep**
 - Rapid eye movement (REM): Stage of sleep in which the eyes move rapidly under the eyelids and the person is typically experiencing a dream
 - NREME (non-REM) sleep: Any of the stages of sleep that do not include REM
 - Electroencephalograph (EEG)
 - Allows scientists to see the brain wave activity as a person passes through the various stages of sleep and to determine what type of sleep the person has entered
 - Alpha waves: brain waves that indicate a state of relaxation or light sleep
 - Theta waves: brain waves indicating the early stages of sleep
 - Delta waves: Long, slow waves that indicate the deepest stage of sleep
 - N1: Light sleep
 - May experience hypnagogic images (hallucinations or vivid visual events) or hypnic jerk (knees, legs, or whole body jerks)
 - N2: Sleep Spindles
 - Brief bursts of activity only lasting a second or two
 - N3: Delta waves
 - Deepest stage of sleep: 50% percent or more of waves are delta waves
 - Body at lowest level of functioning
 - Time at which growth occurs
 - R: Rapid Eye Movement
 - REM sleep is paradoxical sleep (high level of brain activity)

- Vivid, more detailed and longer dreams
- REM rebound: increased amounts of REM sleep after being deprived of REM sleep on earlier nights
- **Brain activity during sleep**
 - The EEG reflects brain activity during both waking and sleep. This activity varies according to level of alertness while waking and the stage of sleep.
 - Stage N3 of sleep is characterized by the presence of delta activity, which is much slower and accounts for the larger, slower waves on the graphs.
 - REM sleep has activity that resembles alert wakefulness but has relatively no muscle activity except rapid eye movement. REM sleep periods occur about every 90 minutes throughout the night
- **Nightmares**
 - Bad dreams occurring during REM sleep
 - More common in children
- **REM Behavior Disorder**
 - Mechanism that blocks movement of the voluntary muscle fails
 - Allows person to thrash around, or even get up and act out nightmares
- **Night Terrors**
 - Person experiences extreme fear and screams or runs around during deep sleep
 - Doesn't wake fully
 - Occurs in up to 56 percent of young children, decreases with age
- **Sleepwalking (somnambulism)**
 - Episode of moving around or walking around in one's sleep
 - Occurs during deep sleep
 - More common among children than adults
 - Sleepwalking can be a defense against criminal charges
- **Insomnia**: The inability to get sleep, stay asleep, or get a good quality of sleep
- **Sleep apnea**: disorder in which the person stops breathing for nearly half a minute or more
 - Continuous positive airway pressure device (CPAP)
- **Narcolepsy**: Sleep disorder in which a person falls immediately into REM sleep during the day without warning
 - Cataplexy: Sudden loss of muscle tone
- **Dependence**
 - Psychoactive drugs; Drugs that alter thinking, perception, and memory
 - Physical dependence
 - Tolerance: More and more of the drug is needed to achieve the same effect
 - Withdrawal: Physical symptoms resulting from a lack of an addictive drug in the body systems (Nausea, pain, tremors, crankiness, and high blood pressure)
 - Brain plays important role in dependency
 - Drug enters brain's reward pathway, causing release of dopamine and intense pleasure
 - Brain tries to adapt by decreasing synaptic receptors for dopamine

- More drugs now needed to achieve same pleasure response → (drug tolerance)
- A pleasure center has been discovered in the mesotelencephalic dopamine pathway. The cells in the thesis pathway communicate via the neurotransmitter dopamine. The pathway between the ventral tegmental area and the nucleus accumbens is most likely the site for the rewarding effects of natural rewards (eating, drinking, sex) and drug effects (euphoria, pleasure)
- Psychological dependence: feeling that a drug is needed to continue a feeling of emotional or psychological well-being
 - Any drug can cause psychological dependence
- **Stimulants**
 - Drugs that increase the functioning of the nervous system
 - Amphetamines: Drugs that are synthesized (made in labs) rather than found in nature. Risk of addiction, stroke, fatal heart problems, psychosis.
 - **Cocaine**: Natural drug; produces euphoria, energy, power, and pleasure. Risk of addiction, stroke, fatal heart problems, psychosis.
 - **Nicotine**: Active ingredient in tobacco. Risk of addiction, cancer
 - **Caffeine**: Stimulant found in coffee, tea, most sodas, chocolate, and even many over-the-counter drugs. Risk of addiction, high blood pressure
- **Depressants**
 - Drugs that decrease the functioning of the nervous system
 - **Barbiturates**: Depressant drugs with sedative effect. Addiction, brain damage, death
 - **Benzodiazepine**: Drugs that lower anxiety and reduce stress. Lower risk of overdose and addiction when taken alone
 - **Rohypnol**: The “date rape” drug
- **Alcohol**
 - The chemical resulting from fermentation or distillation of various kinds of vegetable matter
 - Often mistaken for a stimulant, alcohol is actually a CNS depressant
 - Most commonly used and abused depressant
- **Opiates**
 - Suppress sensation of pain by binding to and stimulating the nervous system’s natural receptor sites for endorphins
 - **Opium**: Substance made from the opium poppy and from which all narcotic drugs are derived
 - **Morphine**: Narcotic drug derived from opium; used to treat severe pain
 - **Heroin**: Narcotic drug derived from opium that is extremely addictive
- **Hallucinogens**
 - Drugs that cause false sensory messages, altering the perception of reality
 - **LSD** (lysergic acid diethylamide): Powerful synthetic hallucinogen
 - **PCP**: Synthesized drug now used as an animal tranquilizer that can cause stimulant, depressant, narcotic, or hallucinogenic effects
 - **MDMA**: Designer drug that can have both stimulant and hallucinatory effects

- **Simulatory Hallucinogen**: Drugs producing mixture of psychomotor stimulant and hallucinogenic effects

5. Learning

- **Learning**: A relatively permanent change in behavior brought by experience or practice
- **Classical Conditioning**: Learning to link two stimuli in a way that helps us anticipate an event to which we have a reaction
- **Operant Conditioning**: Changing behavior choices in response to consequences
- **Cognitive Learning**: Acquiring new behaviors and information through observation and information, rather than by direct experience
- **Neutral Stimulus**: A stimulus which does not trigger a response
- **Unconditioned stimulus and response**: A stimulus which triggers a response naturally, before/without any conditioning
- **Generalization**: Tendency to have conditioned responses triggered by related stimuli
- **Discrimination**: Learned ability to only respond to a specific stimuli, preventing generalization
- **Reinforcement**: Any feedback from the environment that makes a behavior more likely to recur
 - **Positive Reinforcement**: Adding something desirable
 - **Negative Reinforcement**: Ending something pleasant
- **Intrinsic motivation**: Desire to perform a behavior well for its own sake
- **Extrinsic motivation**: Doing a behavior to receive rewards from others
- **Prosocial behavior**: Actions which benefit others, contribute value to groups, and follow moral codes and social norms