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| Neuroscience | A branch of the life sciences that deals with the structure and function of neurons, nerves, and nervous tissue |
| Santiago Ramon y Cajal | The first person to theorize that the nervous system was made up of individual cells. He came to this conclusion after studying slides of brain tissue. |
| Nervous System | An extensive network of specialized cells that carries information to and from all parts of the body. |
| The Nervous System is made up of what two parts that are then further divided. | Central Nervous System and Peripheral Nervous System |
| The Central Nervous System is made up of what two components | Brain and Spinal Cord |
| The peripheral nervous system is made up of what two further divisions | Autonomic nervous system and somatic nervous system |
| The autonomic nervous system is made up of what two divisions | Parasympathetic division and sympathetic division |
| The defining feature of the central nervous system | The components are encased in bone |
| Plasticity | The remarkable property of the central nervous system whereby neurons have the ability to strengthen neural connections at synapses as well as establish new connections |
| The gray matter of the brain is made of | Nuclei (clusters of soma) |
| The white matter of the brain is made of | Fiber tracts (axons) |
| Three functions of the nervous system are | 1. Input, 2) processing, 3) output   Or 1) receive information, 2) integrate information, 3) guide actions |
| Input into the nervous system is accomplished by | Sensory neurons/ afferent neurons |
| Processing in the nervous system is accomplished by | Interneurons/ association neurons |
| Output in the nervous system is accomplished by | Motor neurons/ efferent neurons |
| Sensory neurons are sometimes called | Afferent neurons |
| Motor neurons are sometimes called | Efferent neurons |
| Interneurons are sometimes called | Association neurons |
| What dictates the structure of a cell | The purpose of the cell |
| Function of the brain | Interprets and stores information and sends orders to muscles, glands, organs |
| Function of the spinal cord | Pathway connecting the brain and the peripheral nervous system; receives signals such as pain and touch from the senses and passes those signals to the brain |
| Most cells have these three parts in common | 1. Nucleus, 2) cell body, 3) cell membrane |
| Neurons | The basic cell that makes up the nervous system and that receives and sends messages within that system |
| Task of Sensory/ Afferent Neurons | Carry messages from the senses to the spinal cord |
| Cluster of cells bodies of the sensory neurons found next to the spinal cord | ganglia |
| Where are interneurons found | Exclusively in the spinal cord and brain |
| Interneurons are stimulated by | Sensory neurons, other interneurons, or both |
| How many interneurons does the human brain contain | Approximately 100 billion |
| There are estimated to be how many different kinds of interneurons | At least hundreds |
| Task of motor/ efferent Neurons | Carry messages from the central nervous system to muscles and glands |
| Motor neurons are stimulated by | Interneurons but sometimes rarely they are stimulated directly by sensory neurons |
| Neurons accessing the spinal cord | Afferent neurons |
| Neurons exiting the spinal cord | Efferent Neurons |
| Three parts to a neuron | 1. Soma, 2) dendrites, 3) axons |
| Soma | The part of the neuron called the cell body that keeps the entire cell alive and functioning |
| Dendrites | Branchlike structures that receive messages from other neurons |
| Axon | Tube-like structure that carries the neural message to other cells |
| Neurons make up what percent of cells in the brain | 10% |
| Thin membranous covering of neurons found in the body | neurilemma |
| Why is neurilemma important | It can repair nerve fibers |
| Where is neurilemma not found | Brain and spinal cord |
| Glial cells | Grey fatty cells that provide support for the neurons to grow on and around, deliver nutrients to neurons, produce myelin to coat axons, clean up waste products and dead neurons, influence information processing, and during prenatal development, influence the generation of new neurons. |
| Make up 90% of the brain | Glial cells |
| Four types of glial cells | 1. Oligodendrocyes, 2) schwann cells, 3) astrocytes, 4) microglia |
| Two types of glial cells that produce myelin | Oligodendrocytes and Schwann cells |
| Produces myelin for neurons in brain and spinal cord (CNS) | oligodendrocytes |
| Produces myelin for neurons in the body (PNS) | Schwann cells |
| Glial cells that provide physical support to neurons and clean up debris | astrocytes |
| The smallest of glial cells that engulf and break down dead and dying neurons | microglia |
| Nerves | Bundles of axons coated in myelin that travel together through the body. |
| Biological psychology or behavioral neuroscience | Branch of neuroscience that focuses on the biological bases of psychological processes, behavior, and learning. |
| Function of the parasympathetic division of Autonomic nervous system | Maintains body functions under ordinary conditions; saves energy |
| Function of the sympathetic division | Prepares the body to react and expend energy in times of stress |
| Function of the autonomic nervous system | Automatically regulates glands, internal organs, blood vessels, pupils, digestion, and blood pressure |
| Reflex Arc | The connection of the sensory neuron to the interneurons to the motor neurons which results in a reflex action |
| Why is it important that the reflex arc occurs without the direction of the brain | The process occurs much more quickly |
| Diffusion | Process of molecules moving from areas of high concentration to areas of low concentration |
| Resting potential | The state of the neuron when not firing a neural impulse |
| Action potential | The release of the neural impulse consisting of a reversal of the electrical charge within the axon |
| True or False: Neurons at rest are still electrically charged | True |
| Neurons either fire at full strength or don’t fire at all | All or none principle |
| Synaptic knob (or terminal button) | Rounded area on the end of the axon terminal |
| Axon terminal | Branches at the end of the axon |
| Synaptic vesicle | Saclike structures found inside the synaptic knob containing chemicals |
| Neurotransmitter | Chemical found in the synaptic vesicles that when released has an effect on the next cell |
| Synapse (synaptic gap) | Microscopic fluid-filled space between the synaptic know of one cell and the dendrites or surface of the next cell |
| Receptor sites | 3-D proteins on the surface of the dendrites or certain cells of the muscles and glands, which are shaped to fit only certain neurotransmitters. |
| Excitatory synapse | Synapse at which a neurotransmitter causes the receiving cell to fire |
| Inhibitory synapse | Synapse at which a neurotransmitter causes the receiving cell to stop firing |
| Reuptake | Process by which neurotransmitters are taken back into the synaptic vesicles |
| Enzymatic degradation | Process by which structure of neurotransmitter is altered so it can no longer act on a receptor. |
| Antagonists | Chemical substances that block or reduce a cell’s response to the action of other chemicals or neurotransmitters |
| Agonists | Chemical substances that mimic or enhance the effects of a neurotransmitter on the receptor sites of the next cell, increasing or decreasing the activity of that cell |
| The number of identified neurotransmitters | At least 100 |
| The first neurotransmitter to be identified | acetylcholine |
| Function of acetylcholine | Excitatory or inhibitory; involved in arousal, attention, memory, and controls muscle contractions |
| Where is acetylcholine found | In the synapse between neurons and muscle cells |
| What muscles are impacted by acetylcholine | Skeletal muscles are stimulated; cardiac muscle is slowed |
| Function of serotonin | Excitatory or inhibitory; involved in mood, sleep, and appetite |
| Function of GABA | Major inhibitory neurotransmitter; involved in sleep and inhibits movement |
| Function of Glutamate | Major excitatory neurotransmitter; involved in learning, memory formation, nervous system development, and synaptic plasticity |
| Function of Norepinephrine | Mainly excitatory; involved in arousal and mood |
| Function of Dopamine | Excitatory or inhibitory; involved in control of movement and sensations of pleasure |
| Endorphins | Inhibitory neural regulators; involved in pain relief |
| Neural regulators, neural peptides, endorphins | Control the release of other neurotransmitters |
| Reuptake | Process by which neurotransmitters are taken back into the synaptic vesicles |
| Enzymatic degradation | Process by which structure of neurotransmitter is altered so it can no longer act on a receptor |
| Neuroplasticity | The ability within the brain to constantly change both the structure and function of many cells in response to experience or trauma |
| Stem cells | Special cells found in all the tissues of the body that are capable of becoming other cell types when those cells need to be replaced due to damage or wear and tear |
| SSRI | Selective Serotonin Reuptake Inhibitor |
| Deep lesioning | Insertion of a thin, insulated wire into the brain through which an electrical current is sent that destroys the brain cells at the tip of the wire |
| Electrical Stimulation of the Brain | A milder current is sent through a wire that does not kill the cells; can be used to assess for seizure risk prior to surgery |
| Computed tomography (CT) | Brain imaging method using computer controlled x-rays of the brain |
| Magnetic resonance imaging (MRI) | Brain-imaging method using radio waves and magnetic fields of the body to produce detailed images of the brain |
| Electroencephalogram (EEG) | A recording of the electrical activity of large groups of cortical neurons just below the skull, most often using scalp electrodes. |
| Positron emission tomography | Brain-imaging method in which a radioactive sugar is injected into the subject and a computer compiles a color-coded image of the activity of the brain |
| Single photon emission computed tomography (SPECT) | Neuroimaging method that is similar to PET but uses a different radioactive tracer and can be used to examine brain blood flow |
| Functional magnetic resonance imaging (fMRI) | MRI-based brain imaging method that allows for functional examination of brain areas through changes in brain oxygenation |
| Medulla | The first large swelling at the top of the spinal cord, forming the lowest part of the brain, which is responsible for life-sustaining functions such as breathing, swallowing, and heart rate. |
| Pons | The larger swelling above the medulla that connects the top of the brain to the bottom and that plays a part in sleep, dreaming, left-right body coordination, and arousal |
| Reticular formation | An area of neurons running through the middle of the medulla and pons and slightly beyond that is responsible for general attention, alertness, and arousal. |
| Cerebellum | Part of the lower brain located behind the pons that controls and coordinates involuntary, rapid, fine motor movement. |
| Limbic system | A group of several brain structures located under the cortex and involved in learning, emotion, memory, and motivation |
| Thalamus | Part of the limbic system located in the center of the brain, this structure relays sensory information from the lower part of the brain to the proper areas of the cortex and processes some sensory information before sending it to the proper areas. |
| Peripheral nervous system | All nerves and neurons that are not contained in the brain and spinal cord but that run through the body itself |
| Somatic nervous system | Division of the PNS consisting of nerves that carry information from the senses to the CNS and from the CNS to the voluntary muscles of the body |
| Autonomic nervous system | Division of the PNS consisting of nerves that control all the involuntary muscles, organs, and glands. |
| Sensory pathway | Nerves coming from the sensory organs to the CNS consisting of afferent neurons |
| Motor Pathway | Nerves coming from the CNS to the voluntary muscles, consisting of efferent neurons |
| Sympathetic divisions (fight or flight) | Part of the ANS that is responsible for reacting to stressful evens and bodily arousal |
| Parasympathetic division | Part of the ANS that restores the body to normal functioning after arousal and is responsible for the day to day functioning of the organs and glands. |
| Endocrine glands | Glands that secrete chemicals called hormones directly into bloodstream |
| Hormones | Chemicals released into the bloodstream by endocrine glands |
| Pituitary gland | Gland located in the brain that secretes human growth hormone and influences all other hormone-secreting glands (also known as the master gland) |
| Pineal gland | Endocrine gland located near the base of the cerebrum, secretes melatonin |
| Thyroid gland | Endocrine gland found in the neck, regulates metabolism |
| Pancreas | Endocrine gland; controls the levels of sugar in the blood |
| Olfactory bulb | Two bulb-like projections just under the front of the brain that receive information from the receptors near the nose |
| Hypothalamus | Small structure in the brain located below the thalamus and directly above the pituitary gland, responsible for motivational behavior such as sleep, hunger, thirst, and sex |
| Hippocampus | Curved structure located within each temporal lobe, responsible for the formation of long-term memories and the storage of memory for location of objects |
| Amygdala | Brain structure located near the hippocampus, responsible for fear responses and memory of fear |
| Cortex | Outermost covering of the brain consisting of densely packed neurons, responsible for higher thought processes and interpretation of sensory input. |
| Cerebral hemispheres | The two sections of the cortex on the left and right sides of the brain |
| Corpus callosum | Thick band of neurons that connects the right and left hemispheres |
| Occipital lobe | Section of the brain located at the rear and bottom of each cerebral hemisphere containing the visual centers of the brain |
| Parietal lobes | Sections of the brain located at the top and back of each cerebral hemisphere containing the centers for touch, taste, and temperature sensations. |
| Temporal lobes | Areas of the cortex located just behind the temples containing the neurons responsible for the sense of hearing and meaningful speech. |
| Frontal lobes | Areas of the cortex located in the front and top of the brain, responsible for higher mental processes and decision making as well as the production of fluent speech |
| Motor cortex | Section of the frontal lobe located at the back, responsible for sending motor commands to the muscles of the somatic nervous system |
| Mirror neurons | Neurons that fire when an animal or person performs an action and also when an animal or person observes the same action being performed by another |
| Association areas | Areas within each lobe of the cortex responsible for the coordination and interpretation of information as well as higher mental processing |
| Broca’s aphasia | Condition resulting from damage to Broca’s area, causing the affected person to be unable to speak fluently, to mispronounce words, and to speak haltingly. |
| Wernicke’s aphasia | Condition resulting from damage to Wernicke’s area, causing the affected person to be unable to understand or produce meaningful language |
| Spatial neglect | Condition produced by damage to the association areas of the right hemisphere resulting in an inability to recognize objects or bod parts in the left visual field. |
| Cerebrum | The upper part of the brain consisting of the two hemispheres and the structures that connect them. |