DOWNLOAD PDF THE BRAIN (THE HUMAN BODY)

Chapter 1 : Human brain - Wikipedia

The brain is an organ that's made up of a large mass of nerve tissue that's protected within the skull. It plays a role in just about every major body system. The cerebrum is the largest part.

Anatomy of the Brain There are different ways of dividing the brain anatomically into regions. The forebrain or prosencephalon is made up of our incredible cerebrum, thalamus, hypothalamus and pineal gland among other features. Neuroanatomists call the cerebral area the telencephalon and use the term diencephalon or interbrain to refer to the area where our thalamus, hypothalamus and pineal gland reside. The midbrain or mesencephalon , located near the very center of the brain between the interbrain and the hindbrain, is composed of a portion of the brainstem. The hindbrain or rhombencephalon consists of the remaining brainstem as well as our cerebellum and pons. Neuroanatomists have a word to describe the brainstem sub-region of our hindbrain, calling it the myelencephalon, while they use the word metencephalon in reference to our cerebellum and pons collectively. Histology Brain cells can be broken into two groups: Neurons, or nerve cells, are the cells that perform all of the communication and processing within the brain. Sensory neurons entering the brain from the peripheral nervous system deliver information about the condition of the body and its surroundings. Interneurons send signals to motor neurons, which carry signals to muscles and glands. Neuroglia, or glial cells, act as the helper cells of the brain; they support and protect the neurons. In the brain there are four types of glial cells: Astrocytes protect neurons by filtering nutrients out of the blood and preventing chemicals and pathogens from leaving the capillaries of the brain. Oligodendrocytes wrap the axons of neurons in the brain to produce the insulation known as myelin. Myelinated axons transmit nerve signals much faster than unmyelinated axons, so oligodendrocytes accelerate the communication speed of the brain. Microglia act much like white blood cells by attacking and destroying pathogens that invade the brain. Ependymal cells line the capillaries of the choroid plexuses and filter blood plasma to produce cerebrospinal fluid. The tissue of the brain can be broken down into two major classes: Gray matter is made of mostly unmyelinated neurons, most of which are interneurons. The gray matter regions are the areas of nerve connections and processing. White matter is made of mostly myelinated neurons that connect the regions of gray matter to each other and to the rest of the body. Myelinated neurons transmit nerve signals much faster than unmyelinated axons do. The white matter acts as the information highway of the brain to speed the connections between distant parts of the brain and body. Hindbrain Rhombencephalon Brainstem Connecting the brain to the spinal cord, the brainstem is the most inferior portion of our brain. Many of the most basic survival functions of the brain are controlled by the brainstem. The brainstem is made of three regions: A net-like structure of mixed gray and white matter known as the reticular formation is found in all three regions of the brainstem. The reticular formation controls muscle tone in the body and acts as the switch between consciousness and sleep in the brain. The medulla oblongata is a roughly cylindrical mass of nervous tissue that connects to the spinal cord on its inferior border and to the pons on its superior border. The medulla contains mostly white matter that carries nerve signals ascending into the brain and descending into the spinal cord. Within the medulla are several regions of gray matter that process involuntary body functions related to homeostasis. The medullary rhythmicity center controls the rate of breathing to provide oxygen to the body. Vomiting, sneezing, coughing, and swallowing reflexes are coordinated in this region of the brain as well. The pons is the region of the brainstem found superior to the medulla oblongata, inferior to the midbrain, and anterior to the cerebellum. Together with the cerebellum, it forms what is called the metencephalon. About an inch long and somewhat larger and wider than the medulla, the pons acts as the bridge for nerve signals traveling to and from the cerebellum and carries signals between the superior regions of the brain and the medulla and spinal cord. Cerebellum The cerebellum is a wrinkled, hemispherical region of the brain located posterior to the brainstem and inferior to the cerebrum. The outer layer of the cerebellum, known as the cerebellar cortex, is made of tightly folded gray matter that provides the processing power of the cerebellum. The arbor vitae connects the processing regions of cerebellar cortex to the rest of the brain and body. The cerebellum helps to control motor functions such as balance, posture, and coordination of complex muscle activities. The cerebellum receives sensory inputs from the muscles and joints of the body and uses this information to keep the body balanced and to maintain posture. The cerebellum also controls the timing and finesse of complex motor actions such as walking, writing, and speech. Midbrain Mesencephalon The midbrain, also known as the mesencephalon, is the most superior region of the brainstem. Found between the pons and the diencephalon, the midbrain can be further subdivided into 2 main regions: The tectum is the posterior region of the midbrain, containing relays for reflexes that involve auditory and visual information. The pupillary reflex adjustment for light intensity , accommodation reflex focus on near or far away objects , and startle reflexes are among the many reflexes relayed through this region. Forming the anterior region of the midbrain, the cerebral peduncles contain many nerve tracts and the substantia nigra. Nerve tracts passing through the cerebral peduncles connect regions of the cerebrum and thalamus to the spinal cord and lower regions of the brainstem. The substantia nigra is a region of dark melanin-containing neurons that is involved in the inhibition of movement. Forebrain Prosencephalon Diencephalon Superior and anterior to the midbrain is the region known as the interbrain, or diencephalon. The thalamus, hypothalamus, and pineal glands make up the major regions of the diencephalon. The thalamus consists of a pair of oval masses of gray matter inferior to the lateral ventricles and surrounding the third ventricle. Sensory neurons entering the brain from the peripheral nervous system form relays with neurons in the thalamus that continue on to the cerebral cortex. In this way the thalamus acts like the switchboard operator of the brain by routing sensory inputs to the correct regions of the cerebral cortex. The thalamus has an important role in learning by routing sensory information into processing and memory centers of the cerebrum. The hypothalamus is a region of the brain located inferior to the thalamus and superior to the pituitary gland. In response to changes in the condition of the body detected by sensory receptors, the hypothalamus sends signals to glands, smooth muscles, and the heart to counteract these changes. For example, in response to increases in body temperature, the hypothalamus stimulates the secretion of sweat by sweat glands in the skin. The hypothalamus also sends signals to the cerebral cortex to produce the feelings of hunger and thirst when the body is lacking food or water. These signals stimulate the conscious mind to seek out food or water to correct this situation. The hypothalamus also directly controls the pituitary gland by producing hormones. Some of these hormones, such as oxytocin and antidiuretic hormone, are produced in the hypothalamus and stored in the posterior pituitary gland. Other hormones, such as releasing and inhibiting hormones, are secreted into the blood to stimulate or inhibit hormone production in the anterior pituitary gland. The pineal gland is a small gland located posterior to the thalamus in a sub-region called the epithalamus. The pineal gland produces the hormone melatonin. Light striking the retina of the eyes sends signals to inhibit the function of the pineal gland. In the dark, the pineal gland secretes melatonin, which has a sedative effect on the brain and helps to induce sleep. This function of the pineal gland helps to explain why darkness is sleep-inducing and light tends to disturb sleep. Babies produce large amounts of melatonin, allowing them to sleep as long as 16 hours per day. The pineal gland produces less melatonin as people age, resulting in difficulty sleeping during adulthood. Cerebrum The largest region of the human brain, our cerebrum controls higher brain functions such as language, logic, reasoning, and creativity. The cerebrum surrounds the diencephalon and is located superior to the cerebellum and brainstem. A deep furrow known as the longitudinal fissure runs midsagittally down the center of the cerebrum, dividing the cerebrum into the left and right hemispheres. Each hemisphere can be further divided into 4 lobes: The lobes are named for the skull bones that cover them. The surface of the cerebrum is a convoluted layer of gray matter known as the cerebral cortex. Most of the processing of the cerebrum takes place within the cerebral cortex. The bulges of cortex are called gyri singular: Deep to the cerebral cortex is a layer of cerebral white matter. White matter contains the connections between the regions of the cerebrum as well as between the cerebrum and the rest of the body. A band of white matter called the corpus callosum connects the left and right hemispheres of the cerebrum and allows the hemispheres to communicate with each other. Deep within the cerebral white matter are several regions of gray matter that make up the basal nuclei and the limbic system. The basal nuclei, including the globus pallidus, striatum, and subthalamic nucleus, work together with the substantia nigra of the midbrain to regulate and control muscle movements. Specifically, these regions help to control muscle tone, posture, and subconscious skeletal muscle. The limbic system is another group of deep gray matter regions, including the hippocampus and amygdala, which are involved in memory, survival, and emotions. The limbic system helps the body to react to emergency and highly emotional situations with fast, almost involuntary actions. With so many vital functions under the control of a single incredible organ - and so many important functions carried out in its outer layers - how does our body protect the brain from damage? Our skull clearly offers quite a bit of protection, but what protects the brain from the skull itself? Meninges Three layers of tissue, collectively known as the meninges, surround and protect the brain and spinal cord. The dura mater forms the leathery, outermost layer of the meninges. Dense irregular connective tissue made of tough collagen fibers gives the dura mater its strength. The dura mater forms a pocket around the brain and spinal cord to hold the cerebrospinal fluid and prevent mechanical damage to the soft nervous tissue. The arachnoid mater is found lining the inside of the dura mater. Much thinner and more delicate than the dura mater, it contains many thin fibers that connect the dura mater and pia mater. Beneath the arachnoid mater is a fluid-filled region known as the subarachnoid space. As the innermost of the meningeal layers, the pia mater rests directly on the surface of the brain and spinal cord. The pia mater also helps to regulate the flow of materials from the bloodstream and cerebrospinal fluid into nervous tissue. Cerebrospinal Fluid Cerebrospinal fluid CSF â€” a clear fluid that surrounds the brain and spinal cord â€” provides many important functions to the central nervous system. Rather than being firmly anchored to their surrounding bones, the brain and spinal cord float within the CSF.

Chapter 2 : Your Brain & Nervous System

The human brain is the command center for the human nervous system. It receives signals from the body's sensory organs and outputs information to the muscles.

More than one-third of adults report that their stress increased over the past year. Twenty-four percent of adults report experiencing extreme stress, up from 18 percent the year before. It is simply a response. How harmful it is ultimately depends on its intensity, duration and treatment. Stress takes a variety of forms. Some stress happens as the result of a single, short-term event â€" having an argument with a loved one, for example. Other stress happens due to recurring conditions, such as managing a long-term illness or a demanding job. While all stress triggers physiological reactions, chronic stress is specifically problematic because of the significant harm it can do to the functioning of the body and the brain. Leading Causes of Stress Stress occurs for a number of reasons. The Stress in America survey reported that money and work were the top two sources of stress for adults in the United States for the eighth year in a row. Other common contributors included family responsibilities, personal health concerns, health problems affecting the family and the economy. The study found that women consistently struggle with more stress than men. Millennials and Generation Xers deal with more stress than baby boomers. And those who face discrimination based on characteristics such as race, disability status or LGBT identification struggle with more stress than their counterparts who do not regularly encounter such societal biases. Physiological Effects of Stress on the Brain Stress is a chain reaction. Finally, a hormone called cortisol is released, which helps to restore the energy lost in the response. When the stressful event is over, cortisol levels fall and the body returns to stasis. Effects of Chronic Stress on the Brain While stress itself is not necessarily problematic, the buildup of cortisol in the brain can have long-term effects. Thus, chronic stress can lead to health problems. In moderation, the hormone is perfectly normal and healthy. Its functions are multiple, explains the Dartmouth Undergraduate Journal of Science. In addition to restoring balance to the body after a stress event, cortisol helps regulate blood sugar levels in cells and has utilitarian value in the hippocampus, where memories are stored and processed. But when chronic stress is experienced, the body makes more cortisol than it has a chance to release. This is when cortisol and stress can lead to trouble. According to several studies, chronic stress impairs brain function in multiple ways. It can disrupt synapse regulation , resulting in the loss of sociability and the avoidance of interactions with others. Stress can kill brain cells and even reduce the size of the brain. Chronic stress has a shrinking effect on the prefrontal cortex, the area of the brain responsible for memory and learning. While stress can shrink the prefrontal cortex, it can increase the size of the amygdala, which can make the brain more receptive to stress. It can also lead to other significant problems, such as increased risk of heart disease, high blood pressure and diabetes. Other systems of the body stop working properly too, including the digestive, excretory and reproductive structures. Plasticity and the Brain: While stress can negatively affect the brain, the brain and body can recover. Age has a direct correlation with the reversibility of stress-related damage. Interventions including activities like exercising regularly, socializing and finding purpose in life enable plasticity. It can seem like stress is an inevitable part of life, but chronic stress can have real and significant consequences on the brain. Understanding these effects and how to combat them can help promote overall health.

Chapter 3 : Body & Brain | Science News

The brain constitutes only about 2 percent of the human body, yet it is responsible for all of the body's functions. Learn about the parts of the human brain, as well as its unique defenses, like.

Neuroscience of sex differences The adult human brain weighs on average about 1. Each hemisphere is divided into four main lobes , [8] although Terminologia Anatomica and Terminologia Neuroanatomica also include a limbic lobe and treat the insular cortex as a lobe. The brainstem includes the midbrain, the pons , and the medulla oblongata. Behind the brainstem is the cerebellum Latin: The membranes are the tough dura mater ; the middle arachnoid mater and the more delicate inner pia mater. Between the arachnoid mater and the pia mater is the subarachnoid space , which contains the cerebrospinal fluid. Dashed areas shown are commonly left hemisphere dominant Main articles: Cerebrum and Cerebral cortex Major gyri and sulci on the lateral surface of the cortex Lobes of the brain The cerebrum is the largest part of the human brain, and is divided into nearly symmetrical left and right hemispheres by a deep groove, the longitudinal fissure. It is 2 to 4 millimetres 0. The largest part of the cerebral cortex is the neocortex , which has six neuronal layers. The rest of the cortex is of allocortex , which has three or four layers. The hemispheres are connected by five commissures that span the longitudinal fissure , the largest of these is the corpus callosum. There are many small variations in the secondary and tertiary folds. These areas are distinctly different when seen under a microscope. The primary sensory areas receive signals from the sensory nerves and tracts by way of relay nuclei in the thalamus. Primary sensory areas include the visual cortex of the occipital lobe , the auditory cortex in parts of the temporal lobe and insular cortex , and the somatosensory cortex in the parietal lobe. The remaining parts of the cortex, are called the association areas. These areas receive input from the sensory areas and lower parts of the brain and are involved in the complex cognitive processes of perception , thought , and decision-making. The temporal lobe controls auditory and visual memories , language , and some hearing and speech. Below the corpus callosum is the septum pellucidum , a membrane that separates the lateral ventricles. Beneath the lateral ventricles is the thalamus and to the front and below this is the hypothalamus. The hypothalamus leads on to the pituitary gland. At the back of the thalamus is the brainstem. Below and in front of the striatum are a number of basal forebrain structures. These include the nucleus accumbens , nucleus basalis , diagonal band of Broca , substantia innominata , and the medial septal nucleus. These structures are important in producing the neurotransmitter , acetylcholine , which is then distributed widely throughout the brain. The basal forebrain, in particular the nucleus basalis, is considered to be the major cholinergic output of the central nervous system to the striatum and neocortex. Cerebellum Human brain viewed from below, showing cerebellum and brainstem The cerebellum is divided into an anterior lobe , a posterior lobe , and the flocculonodular lobe. Brainstem The brainstem lies beneath the cerebrum and consists of the midbrain , pons and medulla. It lies in the back part of the skull , resting on the part of the base known as the clivus , and ends at the foramen magnum , a large opening in the occipital bone. The brainstem continues below this as the spinal cord , [35] protected by the vertebral column. Ten of the twelve pairs of cranial nerves [a] emerge directly from the brainstem. Types of neuron include interneurons , pyramidal cells including Betz cells , motor neurons upper and lower motor neurons , and cerebellar Purkinje cells. Betz cells are the largest cells by size of cell body in the nervous system. Astrocytes are the largest of the glial cells. They are stellate cells with many processes radiating from their cell bodies. Some of these processes end as perivascular end-feet on capillary walls. Myelin basic protein , and the transcription factor, OLIG2 are expressed in oligodendrocytes.

Chapter 4 : DNA, the Brain & The Human Body | Wake Up World

The brain is one of the largest and most complex organs in the human body. It is made up of more than billion nerves that communicate in trillions of connections called synapses. The brain is.

Oxytocin Antidiuretic hormone ADH All of the releasing and inhibiting hormones affect the function of the anterior pituitary gland. TRH stimulates the anterior pituitary gland to release thyroid-stimulating hormone. GnRH stimulates the release of follicle stimulating hormone and luteinizing hormone while CRH stimulates the release of adrenocorticotropic hormone. The last two hormonesâ€"oxytocin and antidiuretic hormoneâ€"are produced by the hypothalamus and transported to the posterior pituitary, where they are stored and later released. Pituitary Gland The pituitary gland , also known as the hypophysis, is a small pea-sized lump of tissue connected to the inferior portion of the hypothalamus of the brain. Many blood vessels surround the pituitary gland to carry the hormones it releases throughout the body. Situated in a small depression in the sphenoid bone called the sella turcica, the pituitary gland is actually made of 2 completely separate structures: Posterior Pituitary The posterior pituitary gland is actually not glandular tissue at all, but nervous tissue instead. The posterior pituitary is a small extension of the hypothalamus through which the axons of some of the neurosecretory cells of the hypothalamus extend. These neurosecretory cells create 2 hormones in the hypothalamus that are stored and released by the posterior pituitary: Oxytocin triggers uterine contractions during childbirth and the release of milk during breastfeeding. Antidiuretic hormone ADH prevents water loss in the body by increasing the re-uptake of water in the kidneys and reducing blood flow to sweat glands. Anterior Pituitary The anterior pituitary gland is the true glandular part of the pituitary gland. The function of the anterior pituitary gland is controlled by the releasing and inhibiting hormones of the hypothalamus. The anterior pituitary produces 6 important hormones: Thyroid stimulating hormone TSH , as its name suggests, is a tropic hormone responsible for the stimulation of the thyroid gland. Adrenocorticotropic hormone ACTH stimulates the adrenal cortex, the outer part of the adrenal gland, to produce its hormones. Follicle stimulating hormone FSH stimulates the follicle cells of the gonads to produce gametesâ€"ova in females and sperm in males. Luteinizing hormone LH stimulates the gonads to produce the sex hormonesâ€"estrogens in females and testosterone in males. Human growth hormone HGH affects many target cells throughout the body by stimulating their growth, repair, and reproduction. Prolactin PRL has many effects on the body, chief of which is that it stimulates the mammary glands of the breast to produce milk. Pineal Gland The pineal gland is a small pinecone-shaped mass of glandular tissue found just posterior to the thalamus of the brain. The pineal gland produces the hormone melatonin that helps to regulate the human sleep-wake cycle known as the circadian rhythm. The activity of the pineal gland is inhibited by stimulation from the photoreceptors of the retina. This light sensitivity causes melatonin to be produced only in low light or darkness. Increased melatonin production causes humans to feel drowsy at nighttime when the pineal gland is active. Thyroid Gland The thyroid gland is a butterfly-shaped gland located at the base of the neck and wrapped around the lateral sides of the trachea. The thyroid gland produces 3 major hormones: Calcitonin Triiodothyronine T3 Thyroxine T4 Calcitonin is released when calcium ion levels in the blood rise above a certain set point. Calcitonin functions to reduce the concentration of calcium ions in the blood by aiding the absorption of calcium into the matrix of bones. Increased levels of T3 and T4 lead to increased cellular activity and energy usage in the body. Parathyroid Glands The parathyroid glands are 4 small masses of glandular tissue found on the posterior side of the thyroid gland. The parathyroid glands produce the hormone parathyroid hormone PTH , which is involved in calcium ion homeostasis. PTH is released from the parathyroid glands when calcium ion levels in the blood drop below a set point. PTH stimulates the osteoclasts to break down the calcium containing bone matrix to release free calcium ions into the bloodstream. PTH also triggers the kidneys to return calcium ions filtered out of the blood back to the bloodstream so that it is conserved. Adrenal Glands The adrenal glands are a pair of roughly triangular glands found immediately superior to the kidneys. The adrenal glands are each made of 2 distinct layers, each with their own unique functions: Adrenal cortex The adrenal cortex produces many cortical hormones in 3 classes: Glucocorticoids have many diverse functions, including the breakdown of proteins and lipids to produce glucose. Glucocorticoids also function to reduce inflammation and immune response. Mineralocorticoids, as their name suggests, are a group of hormones that help to regulate the concentration of mineral ions in the body. Androgens, such as testosterone, are produced at low levels in the adrenal cortex to regulate the growth and activity of cells that are receptive to male hormones. In adult males, the amount of androgens produced by the testes is many times greater than the amount produced by the adrenal cortex, leading to the appearance of male secondary sex characteristics. Adrenal medulla The adrenal medulla produces the hormones epinephrine and norepinephrine under stimulation by the sympathetic division of the autonomic nervous system. These hormones also work to increase heart rate, breathing rate, and blood pressure while decreasing the flow of blood to and function of organs that are not involved in responding to emergencies. Pancreas The pancreas is a large gland located in the abdominal cavity just inferior and posterior to the stomach. The pancreas is considered to be a heterocrine gland as it contains both endocrine and exocrine tissue. Within these islets are 2 types of cellsâ€"alpha and beta cells. The alpha cells produce the hormone glucagon, which is responsible for raising blood glucose levels. Glucagon triggers muscle and liver cells to break down the polysaccharide glycogen to release glucose into the bloodstream. The beta cells produce the hormone insulin, which is responsible for lowering blood glucose levels after a meal. Insulin triggers the absorption of glucose from the blood into cells, where it is added to glycogen molecules for storage. Gonads The gonadsâ€"ovaries in females and testes in malesâ€"are responsible for producing the sex hormones of the body. These sex hormones determine the secondary sex characteristics of adult females and adult males. The testes are a pair of ellipsoid organs found in the scrotum of males that produce the androgen testosterone in males after the start of puberty. Testosterone has effects on many parts of the body, including the muscles, bones, sex organs, and hair follicles. This hormone causes growth and increases in strength of the bones and muscles, including the accelerated growth of long bones during adolescence. During puberty, testosterone controls the growth and development of the sex organs and body hair of males, including pubic, chest, and facial hair. In men who have inherited genes for baldness testosterone triggers the onset of androgenic alopecia, commonly known as male pattern baldness. The ovaries are a pair of almond-shaped glands located in the pelvic body cavity lateral and superior to the uterus in females. The ovaries produce the female sex hormones progesterone and estrogens. Progesterone is most active in females during ovulation and pregnancy where it maintains appropriate conditions in the human body to support a developing fetus. Estrogens are a group of related hormones that function as the primary female sex hormones. The release of estrogen during puberty triggers the development of female secondary sex characteristics such as uterine development, breast development, and the growth of pubic hair. Estrogen also triggers the increased growth of bones during adolescence that lead to adult height and proportions. Thymus The thymus is a soft, triangular-shaped organ found in the chest posterior to the sternum. The thymus produces hormones called thymosins that help to train and develop T-lymphocytes during fetal development and childhood. Other Hormone Producing Organs In addition to the glands of the endocrine system, many other non-glandular organs and tissues in the body produce hormones as well. The cardiac muscle tissue of the heart is capable of producing the hormone atrial natriuretic peptide ANP in response to high blood pressure levels. ANP works to reduce blood pressure by triggering vasodilation to provide more space for the blood to travel through. ANP also reduces blood volume and pressure by causing water and salt to be excreted out of the blood by the kidneys. The kidneys produce the hormone erythropoietin EPO in response to low levels of oxygen in the blood. EPO released by the kidneys travels to the red bone marrow where it stimulates an increased production of red blood cells. The number of red blood cells increases the oxygen carrying capacity of the blood, eventually ending the production of EPO. The hormones cholecystokinin CCK , secretin, and gastrin are all produced by the organs of the gastrointestinal tract. CCK, secretin, and gastrin all help to regulate the secretion of pancreatic juice, bile, and gastric juice in response to the presence of food in the stomach. Adipose tissue produces the hormone leptin that is involved in the management of appetite and energy usage by the body. When the body contains a sufficient level of adipose for energy storage, the level of leptin in the blood tells the brain that the body is not starving and may work normally. If the level of adipose or leptin decreases below a certain threshold, the body enters starvation mode and attempts to conserve energy through increased hunger and food intake and decreased energy usage. Adipose tissue also produces very low levels of estrogens in both men and women. In obese people the large volume of adipose tissue may lead to abnormal estrogen levels. In pregnant women, the placenta produces several hormones that help to maintain pregnancy. Human chorionic gonadotropin HCG assists progesterone by signaling the ovaries to maintain the production of estrogen and progesterone throughout pregnancy. Prostaglandins and leukotrienes are produced by every tissue in the body except for blood tissue in response to damaging stimuli. These two hormones mainly affect the cells that are local to the source of damage, leaving the rest of the body free to function normally. Prostaglandins cause swelling, inflammation, increased pain sensitivity, and increased local body temperature to help block damaged regions of the body from infection or further damage. Leukotrienes help the body heal after prostaglandins have taken effect by reducing inflammation while helping white blood cells to move into the region to clean up pathogens and damaged tissues. Physiology of the Endocrine System Endocrine System vs. Nervous System Function The endocrine system works alongside of the nervous system to form the control systems of the body. The nervous system provides a very fast and narrowly targeted system to turn on specific glands and muscles throughout the body. The endocrine system, on the other hand, is much slower acting, but has very widespread, long lasting, and powerful effects. Hormones are distributed by glands through the bloodstream to the entire body, affecting any cell with a receptor for a particular hormone. Most hormones affect cells in several organs or throughout the entire body, leading to many diverse and powerful responses. Hormone Properties Once hormones have been produced by glands, they are distributed through the body via the bloodstream. As hormones travel through the body, they pass through cells or along the plasma membranes of cells until they encounter a receptor for that particular hormone. Hormones can only affect target cells that have the appropriate receptors. This property of hormones is known as specificity. Hormone specificity explains how each hormone can have specific effects in widespread parts of the body.

Chapter 5 : Understanding Brain, Mind and Soul: Contributions from Neurology and Neurosurgery

The human brain structure can also be divided into several different types of lobes, including parietal, occipital, frontal and temporal lobes. The management of body position, handwriting and sensation falls under the domain of parietal lobes.

Outline of human anatomy and Anatomy Human anatomy is the study of the shape and form of the human body. The human body has four limbs two arms and two legs , a head and a neck which connect to the torso. The spine at the back of the skeleton contains the flexible vertebral column which surrounds the spinal cord , which is a collection of nerve fibres connecting the brain to the rest of the body. Nerves connect the spinal cord and brain to the rest of the body. All major bones, muscles, and nerves in the body are named, with the exception of anatomical variations such as sesamoid bones and accessory muscles. Blood vessels carry blood throughout the body, which moves because of the beating of the heart. Venules and veins collect blood low in oxygen from tissues throughout the body. From here, the blood is pumped into the lungs where it receives oxygen and drains back into the left side of the heart. Here blood passes from small arteries into capillaries , then small veins and the process begins again. Blood carries oxygen , waste products, and hormones from one place in the body to another. Blood is filtered at the kidneys and liver. The body consists of a number of different cavities, separated areas which house different organ systems. The brain and central nervous system reside in an area protected from the rest of the body by the blood brain barrier. The lungs sit in the pleural cavity. The intestines , liver , and spleen sit in the abdominal cavity Height, weight, shape and other body proportions vary individually and with age and sex. Body shape is influenced by the distribution of muscle and fat tissue. Outline of physiology and Physiology Human physiology is the study of how the human body functions. This includes the mechanical, physical, bioelectrical , and biochemical functions of humans in good health, from organs to the cells of which they are composed. The human body consists of many interacting systems of organs. These interact to maintain homeostasis , keeping the body in a stable state with safe levels of substances such as sugar and oxygen in the blood. Some combined systems are referred to by joint names. For example, the nervous system and the endocrine system operate together as the neuroendocrine system. The nervous system receives information from the body, and transmits this to the brain via nerve impulses and neurotransmitters. At the same time, the endocrine system releases hormones, such as to help regulate blood pressure and volume. Together, these systems regulate the internal environment of the body, maintaining blood flow, posture, energy supply, temperature, and acid balance pH.

Chapter 6 : BBC Science & Nature - Human Body and Mind - Organ Layer

The brain is important in the human body because it allows a person to think, feel and store memories, and it controls and coordinates the body's actions and reactions, states the Atlanta Brain and Spine Care. The brain is an incredibly complex organ composed of many parts, including the cranium.

While many people smoke or vape it, you can also consume marijuana as an ingredient in food, brewed tea, or oils. Different methods of taking the drug may affect your body differently. When you inhale marijuana smoke into your lungs, the drug is quickly released into your bloodstream and makes its way to your brain and other organs. It takes a little longer to feel the effects if you eat or drink marijuana. There is ongoing controversy around the effects of marijuana on the body. People report various physical and psychological effects, from harm and discomfort to pain relief and relaxation. Share on Pinterest Marijuana can be used in some states for medical reasons, and in some areas, recreational use is legal as well. No matter how you use marijuana, the drug can cause immediate and long-term effects, such as changes in perception and increased heart rate. Over time, smoking marijuana may cause chronic cough and other health issues. The effects of marijuana on the body are often immediate. Longer-term effects may depend on how you take it, how much you use, and how often you use it. The exact effects are hard to determine because marijuana has been illegal in the U. But in recent years, the medicinal properties of marijuana are gaining public acceptance. As of , 29 states plus the District of Columbia have legalized medical marijuana to some extent. With the potential for increased recreational use, knowing the effects that marijuana can have on your body is as important as ever. Read on to see how it affects each system in your body. Respiratory system Much like tobacco smoke, marijuana smoke is made up of a variety of toxic chemicals, including ammonia and hydrogen cyanide, which can irritate your bronchial passages and lungs. Marijuana may aggravate existing respiratory illnesses, such as asthma and cystic fibrosis. Is there a link? However, studies on the subject have had mixed results. More research is needed. Circulatory system THC moves from your lungs into your bloodstream and throughout your body. Within minutes, your heart rate may increase by 20 to 50 beats per minute. That rapid heartbeat can continue for up to three hours. If you have heart disease, this could raise your risk of heart attack. One of the telltale signs of recent marijuana use is bloodshot eyes. The eyes look red because marijuana causes blood vessels in the eyes to expand. THC can also lower pressure in the eyes, which can ease symptoms of glaucoma for a few hours. Opportunities exist in both cancer treatment and prevention, but more research is needed. Central nervous system The effects of marijuana extend throughout the central nervous system CNS. Marijuana is thought to ease pain and inflammation and help control spasms and seizures. Still, there are some long-term negative effects on the CNS to consider. It may heighten your sensory perception and your perception of time. In the hippocampus , THC changes the way you process information, so your judgment may be impaired. Changes also take place in the cerebellum and basal ganglia, brain areas that play roles in movement and balance. Marijuana may alter your balance, coordination, and reflex response. Very large doses of marijuana or high concentrations of THC can cause hallucinations or delusions. According to the NIDA, there may be an association between marijuana use and some mental health disorders like depression and anxiety. More research is needed to understand the connection. You may want to avoid marijuana if you have schizophrenia, as it may make symptoms worse. When you come down from the high, you may feel tired or a bit depressed. In some people, marijuana can cause anxiety. About 30 percent of marijuana users develop a marijuana use disorder. Addiction is considered rare, but very real. Symptoms of withdrawal may include irritability, insomnia , and loss of appetite. In people younger than 25 years, whose brains have not yet fully developed, marijuana can have a lasting impact on thinking and memory processes. Using marijuana while pregnant can also affect the brain of your unborn baby. Your child may have trouble with memory, concentration, and problem-solving skills. Marijuana can cause digestive issues when taken orally. It may also damage your liver. Conversely, marijuana has also been used to ease symptoms of nausea or upset stomach. For others who are looking to lose weight, this effect could be considered a disadvantage. Immune system THC may adversely affect your immune system. Studies involving animals showed that THC might damage the immune system, making you more vulnerable to illnesses. Further research is needed to fully understand the effects. Medically reviewed by Timothy J.

Chapter 7 : The Mind and Mental Health: How Stress Affects the Brain

Learn about the anatomy of the human Brain with this fun educational music video for children and parents. Brought to you by Kids Learning Tube. Don't forget to sing along. https.

The cerebrum is the thinking part of the brain and it controls your voluntary muscles â€” the ones that move when you want them to. You need it to solve math problems, figure out a video game, and draw a picture. Your memory lives in the cerebrum â€” both short-term memory what you ate for dinner last night and long-term memory the name of that roller-coaster you rode on two summers ago. The cerebrum has two halves, with one on either side of the head. Scientists think that the right half helps you think about abstract things like music, colors, and shapes. The left half is said to be more analytical, helping you with math, logic, and speech. Scientists do know for sure that the right half of the cerebrum controls the left side of your body, and the left half controls the right side. The cerebellum is at the back of the brain, below the cerebrum. It controls balance, movement, and coordination how your muscles work together. Because of your cerebellum, you can stand upright, keep your balance, and move around. Think about a surfer riding the waves on his board. What does he need most to stay balanced? Nope â€” he needs his cerebellum! The brain stem sits beneath the cerebrum and in front of the cerebellum. It connects the rest of the brain to the spinal cord, which runs down your neck and back. The brain stem is in charge of all the functions your body needs to stay alive, like breathing air, digesting food, and circulating blood. The brain stem also sorts through the millions of messages that the brain and the rest of the body send back and forth. Pituitary Gland Controls Growth The pituitary gland is very small â€” only about the size of a pea! Its job is to produce and release hormones into your body. This gland is a big player in puberty too. This little gland also plays a role with lots of other hormones, like ones that control the amount of sugars and water in your body. And it helps keep your metabolism say: Your metabolism is everything that goes on in your body to keep it alive and growing and supplied with energy, like breathing, digesting food, and moving your blood around. The hypothalamus knows what temperature your body should be about If your body is too hot, the hypothalamus tells it to sweat. You Have Some Nerve! It needs some nerves â€” actually a lot of them. And it needs the spinal cord, which is a long bundle of nerves inside your spinal column, the vertebrae that protect it. If a spiky cactus falls off a shelf headed right for your best friend, your nerves and brain communicate so that you jump up and yell for your friend to get out of the way. What are they anyway? The nervous system is made up of millions and millions of neurons say: NUR-onz , which are microscopic cells. Each neuron has tiny branches coming off it that let it connect to many other neurons. When you were born, your brain came with all the neurons it will ever have, but many of them were not connected to each other. When you learn things, the messages travel from one neuron to another, over and over. Eventually, the brain starts to create connections or pathways between the neurons, so things become easier and you can do them better and better. Think back to the first time you rode a bike. Your brain had to think about pedaling, staying balanced, steering with the handlebars, watching the road, and maybe even hitting the brakes â€” all at once. But eventually, as you got more practice, the neurons sent messages back and forth until a pathway was created in your brain. Now you can ride your bike without thinking about it because the neurons have successfully created a "bike riding" pathway. Emotion Location With all the other things it does, is it any surprise that the brain runs your emotions? Maybe you got the exact toy you wanted for your birthday and you were really happy. Or your friend is sick and you feel sad. Where do those feelings come from? Your brain, of course. Your brain has a little bunch of cells on each side called the amygdala say: Scientists believe that the amygdala is responsible for emotion. Sometimes you might feel a little sad, and other times you might feel scared, or silly, or glad. Be Good to Your Brain So what can you do for your brain? They contain potassium and calcium, two minerals that are important for the nervous system. Get a lot of playtime exercise. Wear a helmet when you ride your bike or play other sports that require head protection. Use your brain by doing challenging activities, such as puzzles, reading, playing music, making art, or anything else that gives your brain a workout!

Chapter 8 : How Your Brain Works | HowStuffWorks

The brain is one of the most complex and magnificent organs in the human body. Our brain gives us awareness of ourselves and of our environment, processing a constant stream of sensory data. It controls our muscle movements, the secretions of our glands, and even our breathing and internal temperature.

Brain Structures and Their Functions Brain Structures and Their Functions The human brain is a specialized organ that is responsible for all thought and movement that the body produces. Learn which part plays what role. The human brain allows humans to successfully interact with their environment, by communicating with others and interacting with inanimate objects near their position. If the brain is not functioning properly, the ability to move, generate accurate sensory information or speak and understand language can be damaged as well. The brain is made up of nerve cells which interact with the rest of the body through the spinal cord and nervous system. These cells relate information back to specific centers of the brain where it can be processed and an appropriate reaction can be generated. Several chemicals are also located in the brain, which help the body maintain homeostasis, or a sense of overall comfort and calm as its basic needs are met. Keeping these chemicals balanced and the nerve cells firing properly are essential to healthy brain function. It is divided into four sections: The cerebrum is divided into a right and left hemisphere which are connected by axons that relay messages from one to the other. This matter is made of nerve cells which carry signals between the organ and the nerve cells which run through the body. The frontal lobe is one of four lobes in the cerebral hemisphere. This lobe controls a several elements including creative thought, problem solving, intellect, judgment, behavior, attention, abstract thinking, physical reactions, muscle movements, coordinated movements, smell and personality. Located in the cerebral hemisphere, this lobe focuses on comprehension. Visual functions, language, reading, internal stimuli, tactile sensation and sensory comprehension will be monitored here. Sensory Cortex- The sensory cortex, located in the front portion of the parietal lobe, receives information relayed from the spinal cord regarding the position of various body parts and how they are moving. This middle area of the brain can also be used to relay information from the sense of touch, including pain or pressure which is affecting different portions of the body. Motor Cortex- This helps the brain monitor and control movement throughout the body. It is located in the top, middle portion of the brain. The temporal lobe controls visual and auditory memories. It includes areas that help manage some speech and hearing capabilities, behavioral elements, and language. It is located in the cerebral hemisphere. While scientists have a limited understanding of the function of this area, it is known that it helps the body formulate or understand speech. The optical lobe is located in the cerebral hemisphere in the back of the head. It helps to control vision. It is located in the triangular and opercular section of the inferior frontal gyrus. Cerebellum This is commonly referred to as "the little brain," and is considered to be older than the cerebrum on the evolutionary scale. The cerebellum controls essential body functions such as balance, posture and coordination, allowing humans to move properly and maintain their structure. Limbic System The limbic system contains glands which help relay emotions. Many hormonal responses that the body generates are initiated in this area. The limbic system includes the amygdala, hippocampus, hypothalamus and thalamus. The amygdala helps the body responds to emotions, memories and fear. It is a large portion of the telencephalon, located within the temporal lobe which can be seen from the surface of the brain. This visible bulge is known as the uncus. This portion of the brain is used for learning memory, specifically converting temporary memories into permanent memories which can be stored within the brain. The hippocampus also helps people analyze and remember spatial relationships, allowing for accurate movements. This portion of the brain is located in the cerebral hemisphere. The hypothalamus region of the brain controls mood, thirst, hunger and temperature. It also contains glands which control the hormonal processes throughout the body. The Thalamus is located in the center of the brain. It helps to control the attention span, sensing pain and monitors input that moves in and out of the brain to keep track of the sensations the body is feeling. Brain Stem All basic life functions originate in the brain stem, including heartbeat, blood pressure and breathing. In humans, this area contains the medulla, midbrain and pons. This is commonly referred to as the simplest part of the brain, as most creatures on the evolutionary scale have some form of brain creation that resembles the brain stem. The brain stem consists of midbrain, pons and medulla. The midbrain, also known as the mesencephalon is made up of the tegmentum and tectum. These parts of the brain help regulate body movement, vision and hearing. The anterior portion of the midbrain contains the cerebral peduncle which contains the axons that transfer messages from the cerebral cortex down the brain stem, which allows voluntary motor function to take place. This portion of the metencephalon is located in the hindbrain, and links to the cerebellum to help with posture and movement. It interprets information that is used in sensory analysis or motor control. The pons also creates the level of consciousness necessary for sleep. The medulla or medulla oblongata is an essential portion of the brain stem which maintains vital body functions such as the heart rate and breathing. Hope this guide on parts of the brain and their functions help you understand the issue more clearly.

Chapter 9 : Brain Anatomy, Anatomy of the Human Brain

By Helen Philips. The brain is the most complex organ in the human body. It produces our every thought, action, memory, feeling and experience of the world. This jelly-like mass of tissue.

Pale grey, the size of a small cauliflower and the texture of pate Function: To control your body and house your mind Body and mind Information, in the form of nerve impulses, travels to and from your brain along your spinal cord. This allows your brain to monitor and regulate unconscious body processes, such as digestion and breathing and to coordinate most voluntary movements of your body. It is also the site of your consciousness, allowing you to think, learn and create. Your brain is made of many parts, each of which has a specific function. It can be divided into four areas: Cerebrum The cerebrum is the largest part of your brain. It sits on top of the rest of your brain, rather like a mushroom cap covering its stalk. It has a heavily folded grey surface, the pattern of which is different from one person to the next. Some of the grooves in its surface mark out different functional regions. The front section of your cerebrum, the frontal lobe, is involved in speech, thought, emotion, and skilled movements. Behind this is the parietal lobe which perceives and interprets sensations like touch, temperature and pain. Behind this, at the centre back of your cerebrum, is a region called the occipital lobe which detects and interprets visual images. Either side of the cerebrum are the temporal lobes which are involved in hearing and storing memory. The cerebrum is split down the middle into two halves called hemispheres that communicate with each other. Cerebellum Your cerebellum is the second largest part of your brain. It sits underneath the back of your cerebrum and is shown in brown in the diagram above. It is involved in coordinating your muscles to allow precise movements and control of balance and posture. Diencephalon Your diencephalon sits beneath the middle of your cerebrum and on top of your brain stem. It contains two important structures called the thalamus and the hypothalamus. Your thalamus acts as a relay station for incoming sensory nerve impulses, sending them on to appropriate regions of your brain for processing. Your hypothalamus plays a vital role in keeping conditions inside your body constant. It does this by regulating your body temperature, thirst and hunger, amongst other things. And by controlling the release of hormones from the nearby pituitary gland. Brain stem Your brain stem is responsible for regulating many life support mechanisms, such as your heart rate, blood pressure, digestion and breathing. It also regulates when you sleep and wake. Brain protection Your brain is arguably your most important organ, but it is made of soft delicate tissue that would be injured by even the slightest pressure. As a result, it is well protected: Three tough membranes called meninges surround your brain The space between your brain and the meninges is filled with a clear fluid, which cushions your brain, provides it with energy and protects it against infection Your skull encases your brain in a bony shell, cerebrospinal fluid and meninges.