

The roles of the nervous system biology essay



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The nervous system plays an important role in the smooth functioning of the body and is a complex network of cells which transmits signals through the body. The signals are transmitted by the brain, so if someone wanted to catch a ball their brain would transmit a signal to their hands to reach and catch the ball and are specialized in certain function. These cells communicate with each other through electrochemical waves. The neurons and glial cells are the important components of the nervous system. The two parts in which the nervous system is divided are the central nervous system and peripheral nervous system. The spinal cord and brain form the central nervous system and neural tissues lying to the exterior of the central nervous system compose the peripheral nervous system. The main function of the nervous system is to keep a control over the systems of the body through these following processes.

Sensory receptors of the nervous system are useful for the extraction of information from the environment and sending it to the central nervous system. The sensory neurons carry the information from sensory receptors to the central nervous system. The central nervous system collects information from the sensory receptors and carries out the processing. The task of transferring and interpreting the information is carried out by the interneurons. The peripheral nervous system sends information processed in the central nervous system to the glands and muscles of the body. An appropriate response is then activated by these glands or muscles. The motor neurons carry out the function of sending instructions to muscles or glands. The autonomous nervous system responds involuntarily. The involuntary processes of the body such as breathing, digestion, body

temperature regulation and etc, are carried out by the autonomous nervous system. The autonomous nervous system is sub-divided into sympathetic and parasympathetic nervous systems. Coordination of body movements and homeostasis is carried out by the hind brain. Hind brain consists of different parts such as medulla, cerebellum and pons. The receptors are classified as exteroceptors, interoceptors and proprioceptors. The exteroceptors are used by the nervous system in smelling, listening, looking, touching, tasting and feeling. The signals associated with blood pressure, alimentary canal, bladder and osmotic pressure of blood plasma are received by the interoceptors. The movement and position of body parts is tracked by the proprioceptors.

This kind of stimulus received by receptors is also one of the modes of classifying the receptors. Chemical receptors, mechanoreceptors and thermoreceptors are different types of receptors classified on the basis of the above-mentioned criteria. Thermoreceptors which consist of warm and cold fibers are excited by rising and falling temperatures respectively. The mechanoreceptors carry information about the mechanical stimulation to the central nervous system. The chemical receptors are sub-divided into olfactory, gustatory and glucose detectors, which are responsible for detecting smell, taste and glucose respectively. The glucose detectors are also responsible for providing information about the acid-base balance in the body

Endocrine System

The endocrine system is a collection of glands that secrete different hormones for the various functions and chemical reactions occurring within

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the body. The main function is to maintain a stable environment within the body or homeostasis. For example, maintaining the blood sugar levels according to changes occurring in the body is homeostasis. The other function of it is promoting the structural changes of the body which are the permanent changes occurring in the body over time such as height, development of sexual organs, and etc.

There are 8 major glands that help in the functioning of this vital system. These major endocrine glands are as follows, Hypothalamus, Pituitary gland, Parathyroid gland, Thyroid gland, Adrenal glands, Pancreas, Ovaries and Testes.

Hypothalamus, a collection of specialized cells that are located in the lower central part of the brain is called the hypothalamus. The hypothalamus is the main link between the endocrine and the nervous systems. The nerve cells of the hypothalamus control the pituitary gland by stimulating or suppressing the hormone secretions.

Pituitary Gland, the pituitary gland is located at the base of the brain just below the hypothalamus. The pituitary gland is the most important part in the endocrine system. The pituitary gland secretes hormones on the basis of the emotional and seasonal changes. The hypothalamus sends information that is sensed by the brain to pituitary triggering production hormones. The pituitary gland is divided into two parts: the anterior lobe and the posterior lobe. The anterior lobe of the pituitary gland regulated the activity of the thyroid, adrenals, and the reproductive glands. The anterior lobe also produces hormones such as Growth Hormone, to stimulate the growth of the

bones and tissues. It also plays a role in the body's absorption of nutrients and minerals. Prolactin, activate the production of milk in lactating mothers. Thyrotropin, stimulate the thyroid gland to produce thyroid hormones. Corticotropin, stimulate the adrenal glands to produce certain hormones. Endorphins, reduces the feeling of pain. The pituitary glands produces hormones that signal the reproductive organs to secrete sex hormones. The menstrual cycle and ovulation in women is also controlled by the pituitary gland. The posterior lobe of the pituitary gland produces anti-diuretic hormone that helps to control the water balance in the body. Oxytoxins that trigger the contractions of the uterus in a woman who is in labour is secreted by the posterior lobe.

Thyroid Gland, the thyroid gland is situated in the front part of the lower neck that is shaped like a bow tie or butterfly. The production and secretions of the hormones of the thyroid glands are controlled by thyrotropin secreted by the pituitary gland. Thyroid produces thyroxine and triiodothyronine, that controls the rate at which the cells use up energy from food for production of energy. The thyroid hormones are very important as they help in growth of bones and the development and growth of the brain and nervous system in children. Over or under secretion of thyroid hormones lead to a number of thyroid problems in the body.

Parathyroids, these are four tiny glands that are attached to the thyroid gland. They release the parathyroid hormone that helps in regulating the level of calcium in blood along with another hormone produced by thyroid known as calcitonin.

Adrenal Glands, there are two triangular adrenal glands situated on each of the two kidneys. The adrenal gland is divided into two parts. The outer part called the adrenal cortex produces corticosteroids, which influence and regulate the salt and water levels. They are also helpful in the body's response to stress, metabolism, immune system and the function and development of sexual organs. The inner part called the adrenal medulla, secretes catecholamine like epinephrine. This hormone is also called the adrenaline, which increases the blood pressure and heart rate when the body is under stress.

Reproductive Glands or Gonads, the gonads are present in males and females and are the main organs producing sex hormones. In men, the gonads are related to testes. The testes are located in the scrotum and secrete androgens. The most important hormone for men testosterone is secreted from the testes. In women, ovaries are the gonads that are located in the pelvis region. They produce estrogen and progesterone hormones. Estrogen is involved during the sexual maturation of the girl, that is, puberty. Progesterone along with estrogen is involved in the regulation of menstruation cycle. These hormones are also involved during pregnancy.

Pancreas, these glands are associated with the digestive system of the human body. They secrete digestive enzymes and two important hormones insulin and glucagon. These hormones work together to maintain the level of glucose in the blood. If these hormones are not secreted in the required levels, it leads to development of diabetes.

Pineal, the pineal gland is located in the center of the brain. Melatonin is secreted by this gland that helps regulate the sleeping cycle of a person.

Genetic System

Genes are the basic units of hereditary transmission of characteristics.

Heredity is the passing of traits to offspring (from its parent or ancestors).

This is the process by which an offspring cell or organism acquires or becomes predisposed to the characteristics of its parent cell or organism.

Through heredity, variations exhibited by individuals can accumulate and cause some species to evolve. In humans there are 23 pairs of Chromosomes which are located in the cell nucleus. Each person has 46 chromosomes, half from our mother and the other half from our father. The difference in the sex hormones is that Females have XX chromosomes while Males have XY chromosomes. This full set of genes in any organism is known as the Genome. No single gene determines a particular behaviour due to its complex traits involving multiple genes that are affected by a variety of other factors. But it share traits such as nurturing, cooperation, and altruism. These behavioural characteristics enhance the survivorship of each species.

Raquel Deering (2002) stated that a study performed by Harvard and MIT scientists involved the silencing of the gene responsible for coding of an important enzyme, CAMKII, in lab mice. Mutated mice were found to be unusually aggressive and daring. When placed in an open field, a mutated mouse would dawdle. However, when under the same conditions, a normal mouse would immediately run to the perimeter for cover. The atypical brazen attitude of a mutant mouse would make it much more susceptible to

attack by prey in nature. Therefore, this trait is not frequently observed among mouse populations because it has been naturally selected against.

A genetically influenced trait tends to be polygenic in characters involving many genes acting in concert to produce a certain response and also depends on the interaction of multiple gene sequences with environmental influences. These multiple gene systems are referred to as “ quantitative trait loci” (QTL), reflecting their ability to quantitatively distribute phenotypic characteristics. The recently completed human genome sequence has greatly assisted the detection of QTLs and polymorphisms It must also be emphasized that genes do not directly dictate action, but rather are mediated by the proteins that they code for (Peter McGuffin, Brien Riley and Robert Plamin, 2001). It is necessary to examine not only the genes but also the assortment of proteins responsible for expression of particular traits (Joseph D. McInerney, 1999). It is anticipated that detailed analysis of the human genome will contribute to understandings about gene organization and transcription, and hence regulatory elements that control expression. By utilizing genomic and proteomic tools, the relationship between gene/protein and behaviour may be more accurately described. (Deering, 2002)

Traditional research strategies in behavioural genetics include studies of twins and adoptees, techniques designed to sort biological from environmental influences. More recently, investigators have added the search for pieces of DNA associated with particular behaviours, an approach that has been most productive to date in identifying potential locations for genes associated with major mental illnesses such as schizophrenia and bipolar disorder. Genetics and molecular biology have provided some

significant insights into behaviours associated with inherited disorders. For example, we know that an extra chromosome 21 is associated with the mental retardation that accompanies Down's syndrome, although the processes that disrupt brain function are not yet clear. We also know the steps from gene to effect for a number of single-gene disorders that result in mental retardation, including phenylketonuria (PKU), a treatable metabolic disorder for which all newborns in the United States are tested. (McInerney, 2008)

The importance of biological perspective in achieving the goals of psychology

The field of Psychology is the study of the mind, how it works, and its impact on thinking, behaviours, and our abilities to relate to our environment.

Psychologists practice their craft based on different theoretical beliefs of behavioural causes but they all share similar primary goals which are Goals, Description, Explanation, Prediction, Change, Considerations and others have also recognised Observing and Improving as part of the primary goals.

Biology has brought in brain and body structural understandings of typical and different types of people for understanding and brought about solutions in how to cure and treat the disorder.

Researchers in biological psychology draw techniques and theories from related fields to identify the relationships between the activity of the nervous system and observable behaviour. Example high levels of testorones are associated with increased aggression (Dabbs, 1990 cited in Laura A. Freberg, 2006, pg. 3). Biology in this case appears to be driving the behaviour and have helped in achieving goals in psychology through case studies,

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correlation studies, surveys, laboratory test and others to find the cause and solution for such problems. Researchers have also have brought about Imaging method to watch and identify the differences between how typical people and people with disorders/serial killers brain function by using Magnetic Resonance Imaging (MRI), Functional Magnetic Resonance Imaging (fMRI) and etc . There's also Recording method whereby it records electrical charges across their membrane using electrodes on the surface of the skull such as Single-Cell recordings and Magneto encephalography (MEG). There's also medicine prescribed to help control the fluids, hormones and etc in our body to maintain stability for future health reason. These methods are used to explain to the world how are person's behaviour is determined and what makes their thinking and character unique from others. Since the most important part of psychology is the brain, they must look for the help of biology, which is a sub-field that focuses on the brain movements.

They also have found out the ancient histories of human bodies and how it has changed since then and also how will it change further in the further, also known as evolution, was all found out and brought to the world's recognition and understanding through these biology. It's been stated that single cell organism appeared about 3. 5 billion years ago and animals with very simple nerve nets developed about 700 million years ago. More complex animals with the first rudimentary brains, appeared about 250 million years ago and the first human brain probably appeared about seven million years ago (Calvin, 2004, cited in Freberg pg. 54) and are using the samples of the ancient body parts to study, refer and relate to the present humans of biological factors and behaviours. Through many studies it has

brought about cure and proper treatment plan for disorders or severe illness such as migraine, bipolar disorder, tumour, autism and etc also have predicted what may happen to a person in the future and are also still doing more research to study about learned and instinctual behaviours which are still are underlying questions in the world.

Biology is the study of life. Without biology, we would have no idea about an organism's makeup or the most basic unit of life, a cell. It plays a very important role in our lives by teaching a person about body functions and how to take care of it. You have a better overall view when you know all areas of academic study. Likewise, you get to know the scientific method. Biology influences a person in many ways. Such as teaching why should we take care of the environment, why of our body, and a better overall view. As mentioned above environmental factors, body factors (genes and bodily functions), food all plays a role in determining and developing a person's behaviour and sometimes explanation is required to the world. Through these fundamentals brought in from biological perspective, it helped in achieving goals in psychology.

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