

Chapter 3

As seen from the different branches in Psychology, behaviors can stem from a variety of perspectives. The field of Biopsychology studies psychological behaviors from a more genealogical standpoint, focusing on how inherited genes can affect not just the physiological, but psychological traits of a person.

- Charles Darwin further explored the concept of inheritance of traits throughout generations in his theory of evolution through natural selection. In this Darwin explains that organisms with stronger traits and more durability within their environments will have a higher survivability rate in that those who are strong will live, leaving the weak to die.
- Borrowing Darwin's core concept, Evolutionary Psychology takes an introspective look on how behaviors and cognitive processes have evolved over time through inherited traits. Within the field, behavioral geneticists focus their research on the appearance on individual traits or differences within genes and the environment.
- To further study the origin of these differences, genetic variations in humans can be traced back to stages of egg, sperm and fertilization. Each person comprises of their genetic makeup known as their genotype. The genes in our genetic makeup are made up of DNA, which are responsible for our traits. Inherited physical characteristics through traits are called phenotypes. The majority inheritable traits are delegated or controlled by more than just one gene in such cases, they are known as polygenic traits.
- Genes are not the sole influence to trait acquisition however, environmental interactions can prove to be just as impactful as inherent properties and play a pivotal role in not only the creation of traits or behaviors but demonstrate the malleability of innate behaviors as well.

Other than trait inheritance, Biopsychology is not limited genealogical research. The study of cells and organs provide a more introspective look at our inherent properties as well as a better understanding of psychology from a more biological perspective.

- Our nervous system is responsible for processing the information received by the brain and consists of two parts: neurons and glial cells.
- Glial cells also referred to as neuroglia, assist neurons in communication between neuron cells. Neuroglia are not only responsible for supporting nerve tissue structure but help nourish neurons and protect them as well.
- Neurons are the basic units of the nervous system and are responsible for conducting nerve impulses needed for tasks throughout the nervous system. A neuron consists of an outer membrane, or semipermeable membrane, that allows uncharged molecules to move freely through it. The cell body called the soma includes a nucleus that is the general center of command within a neuron. Outer root like structures known as dendrites branch out, taking in information from other nerve cells. A longer branch called the axon has terminal buttons containing neurotransmitters at the tips allow communication within the nervous system. Between these are a small space called the synapse, an important site where communication between neurons occurs. Located at the nerve endings are receptors that respond to neurotransmitters. The axon servers are covered in fatty layer called the myelin sheath that acts as an insulator and aids in the speed of electrical impulse transfer.
- Communications between neurons are made up of a system of signals sent. Neurons exist in a fluid environment consisting extracellular and intracellular fluids. The fluids are kept separate by the neuronal membrane due to the two fluids being electrically different. The difference in charge between membranes is called the membrane potential, which provides energy for the signal. When inactive the neuron's membrane potential readies itself, a state called the resting potential. A shift occurs when cells become positively charged to a point, this state is known

- as the threshold of excitation. Signals created during the threshold of excitation are called action potentials.
- Regarding behaviors, specific types of neurotransmitters are responsible for certain behaviors even psychological disorders. Because of this, psychotropic medications can be used to manipulate and treat some of these disorders by restoring balance between neurotransmitters.

In a broader perspective, the nervous system as a whole consists of two major subdivisions: the central and peripheral nervous systems.

- The peripheral nervous system is a network of thick bundled axons also called nerves. These nerves are responsible for relaying messages back and forth between the central nervous system as well as muscles, organs, as well as different senses within the periphery of the body. The peripheral nervous system is divided between the somatic nervous system and automatic nervous system.
- The somatic nervous system is responsible for conscious or voluntary actions and involves sensory and motor information messages sent to and from the central nervous system.
- The automatic nervous system holds control over internal organs and glands and controls our involuntary actions. Through sympathetic and parasympathetic nervous systems, involuntary functions are regulated and a state of equilibrium known as homeostasis is maintained.

The central nervous system consists of the brain and spinal cord and is the general command center of the entire body. Covered in a layer called the cerebral cortex, the brain is separated into two hemispheres: the left and right hemispheres and are separated by a bridge of neural fibers called the corpus callosum.

The brain itself is divided into 4 different lobes, each responsible for different body functions.

- The frontal lobe is responsible for higher thinking skills such as reasoning, language acquisition, emotions, and motor control.
- The parietal lobe controls responses related to touch, temperature, pain, and felt change.
- The temporal lobe contains the auditory cortex and is responsible for hearing as well as memory and emotion.
- The occipital lobe is responsible for taking in visual information through the primary visual cortex.

The brain can also be categorized into 3 different parts: the forebrain, midbrain, and hindbrain.

- The forebrain covers the general outer hemispheres consists of the thalamus and limbic system.
- The midbrain, which is on the inside, is composed of the reticular formation, substantia nigra, and ventral tegmental areas.
- The hindbrain is located on the back of the head and contains the medulla, pons, and cerebellum.

To get a more accurate look within the brain as well as representation of brain activity, different methods of brain scanning can be utilized.

- CT or computerized tomography involves x-rays and creates an image through x-rays passing through varied densities within the brain.
- PET or positron emission tomography creates an image by tracing an injected substance called a tracer. Tracers flow into the bloodstream and eventually into the brain allowing it to be specifically scanned and monitored.
- MRI or magnetic resonance imaging utilizes a strong magnetic field in which body cells react and emit electrical signals to provide a scannable image. An fMRI or functional magnetic resonance imaging can be used to track brain activity.

- EEG or electroencephalography provides a measure of the brain's electrical activity. The process requires placement of electrodes around the individual's head to track frequency and amplitude of brainwaves.

Neurotransmitters are not the only things responsible for relaying messages throughout the body. The endocrine system consists of a series of glands that produce hormones that, like neurotransmitters, send signals throughout the body. However, unlike neurotransmitters, hormones are secreted into the bloodstream and released at a much closer proximity to the cells near their receptors. Hormones also regulate a variety of bodily functions and like neurotransmitters, can be the reason of psychological disorders due to imbalances. The major glands of the endocrine system include:

- Pituitary glands – control all glands and are responsible for growth of hormones.
- Thyroid glands – responsible for metabolism, appetite, and growth.
- Adrenal glands – delegates secretion of the hormones epinephrine and norepinephrine.
- Pancreas – releases hormones that control blood sugar levels.
- Gonads – releases hormones required for reproduction.