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Nice! Some errors in APA –

Bipolar Disorder's Effect on the Human Brain

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Bipolar Disorder's Effect on the Human Brain

While we have come to further understand the diverse impact of the human brain on our actions and thoughts, it is still to this day a closed book to modern science, as we are unable to find what differentiates it from the rest of the animal kingdom. It is here that a distinction amongst the brain and the mind must be made. While these two words may refer to the same organ, they allude to two different aspects of the organ; the brain denotes to the genetic makeup of the organ, while the mind denotes to the inner workings of the organ which is dependent upon the organism. Philologically there is little difference between the brain of a rat and a human's; however there is a significant transformation between the mind of a rat and the mind of a human. Psychologically on the other hand, a human's mind is able to string together complex thoughts and form far more complex connections within its-self and the rest of the human body, whereas the mind of the rat fails to do so. This complexity is both a gift and a curse because like a coin there are always two sides to it. The complexity of the human mind gives its advantages in the form of meaning; as we are able to find a deeper meaning to life, a belief that sustains us and makes it possible of us to do the impossible, whereas the rat lives only to live unable to examine the finer points in life before its inevitable passing. There are also disadvantages to this level of complexity, like the saying ignorance is bliss and without this bliss the question of why will always reign supreme. With the constant questioning why, some are unable to find an answer resulting in instability of the mind making them far more likely to sub come to a mental illness, such as Bipolar disorder. Yet we are still left wondering how exactly a disease like Bipolar disorder ravages both the brain and mind.

The Nervous System

In 2012, Mandal stated that the nervous system is a complex network of cells and nerves that transmit a message from the brain through the spinal cord and from there the entire body in order to carry out or continue an action weather it is physical or chemical. It was also included that their where two types of nervous systems; the first being the central nervous system and the second being the peripheral nervous system. The Central nervous system is composed of the brain and spinal cord whereas the Peripheral nervous system is made up of the Somatic and the Autonomic nervous systems. It is important to note the workings of a normal nervous system because it allows for a comparison, resulting in the detection of what parts of the brain have been affect by Bipolar disorder.

The Brian

As amazing as the human brain is with its ability to control everything from the breath a person takes to sensing an imbalance in the body and going through the process of creating a chemical to fix the imbalance, its composition is relatively simple. A normal human brain is composed of three parts and a subcategory and each part of the brain has several different structures that attribute to their differentiated functions. These parts include the forebrain, midbrain, the hindbrain and the lobes. In addition to this information Mandal (2012) states that the entire brain is composed of:

> "Two types of matter: grey matter and white matter. Grey matter receives and stores impulses. Cell bodies of neurons and neuroglia are in the grey matter. White matter in the brain carries impulses to and from grey matter. It consists of the nerve fibers (axons)." (The Brain section, para. 3)

Forebrain. The forebrain is the largest section of the brain and is composed of four sections ("Brain Atlas" 2011). The first being the cerebrum (which makes up the most of the forebrain) and is responsible for things like perception, imagination, thought, judgment, and decision making. The next part of the forebrain and maybe the most important is the hypothalamus which is the control center of all autonomic regulatory activities of the body. According to Allerton (n.d.) the hypothalamus is:

> The hub for automatic and endocrine homeostatic systems such as cardiovascular, temperature, and abdominal visceral regulation. It manages all endocrine hormonal levels, sensory processing, and organizing body metabolism, as well as ingestive behaviors. It appears that almost everything the Hypothalamus does is related in some way to the management of brain and body connection, linking the psyche (mind) to the body. (What is the Hypothalamus section, ~~para. 1~~)

Another section of the forebrain is the thalamus which relays sensory and motor signals to the cerebral cortex, along with the regulation of consciousness, sleep, and alertness. The final part of the forebrain is the limbic system which serves to make us experience emotion both the subjective experience and the objective experience to create the response we have to anger, sadness, happiness, and so on (Patton and Thibodeau, 1999, p. 395 ~~para. 4~~).

Midbrain. The midbrain or mesencephalon is the region of developing vertebrates and contains cranial nerves that are responsible for eye movement and controlling the muscles with in it, lens shape, and pupil diameter. These masses of nerves connect the oculomotor nerve and the trochlear nerve via the nuclear complex. The midbrain is also located between the forebrain and hindbrain and is composed of; the pituitary gland, pons, medulla and the reticular activating

system (Midbrain, 2012). In a recent study by the University of Pittsburg (2012), it was stated that the pituitary gland was "the master gland" as it controls most hormone secretion and functions such as body temperature, thyroid activity, growth during childhood, urine production, testosterone construction in males and ovulation and the creation of estrogen in females (What is the Pituitary Gland?, 2012, para. 2). In an additional study on the midbrain by McCaffrey (2008) which resulted in a deeper understanding of the remaining sections of the midbrain. It was noted that the pons relays signals from the cerebellum to the cerebrum (connects spinal cord to brain) and in addition deals with deep sleep, respiratory regulation. The research also revealed that medulla (which is located below the pons) forms major pathway for nerve impulses entering and leaving the skull, regulates the reflex responses that control breathing, heartbeat, blood pressure, and other essential involuntary functions. And that the reticular activating system (RAS), or extrathalamic control modulatory system, is a set of connected nuclei in the brains and vertebrates that is responsible for regulating arousal and sleep-wake transitions (The Pons section, The Medulla section, The Reticular Formation section).

Hindbrain. The hindbrain is the rear lower portion of the brain includes the cerebellum, the pons and the medulla oblongata (the functions of the pons and medulla oblongata are the same as in the midbrain), which function collectively to support vital bodily processes. The best layout/description of the hindbrain is seen in the words of Anonymous (2011):

> The medulla is joined to the spinal cord and controls unconscious, yet essential, body functions such as breathing, swallowing, blood circulation and muscle tone. Located above the medulla is the pons which serves as a bridge to connect the brainstem and the cerebellum. The pons receives information from visual areas to control eye and body movements and also plays a role in controlling patterns of sleep and arousal. Information

> is relayed from the pons to the cerebellum to control the co-ordination of muscular movements and maintain equilibrium. (Brain Atlas, 2011, para. 2)

Lobes of the Brain. What exactly does the phrase lobes of the brain refer too? Mandal (2012), answered this question with the following analysis, "The cerebrum is divided into two hemispheres. Each hemisphere controls the activities of the side of the body opposite that hemisphere. The hemispheres are further divided into four lobes: Frontal lobe, temporal lobes parietal lobe, occipital lobe." While this explanation may answer what exactly they are, it also raises the question of what exactly their functions are. According to Patton et al. (1999) each of these sections are similar to the specific parts of the brain, as they all have their own specialized function. The first lobe is the frontal lobe which is positioned anterior to (in front of) the parietal lobe and superior and anterior to the temporal lobes and contains the primary motor cortex and dopamine-sensitive neurons; which as a result allows for voluntary movement, attention, short-term memory tasks, planning, and motivation. The temporal lobe is the part of the brain that is present in the region of cerebral cortex and its basic function is to serve as the center for processing audio signals. The next lobe, the parietal lobe, is located directly above (superior to) the occipital lobe and behind (posterior to) the frontal lobe and is intended to integrates sensory information from different modalities, such as determining spatial sense and navigation. An example of this is how it comprises somatosensory cortex and the dorsal stream of the visual system, as a result the parietal cortex to map objects perceived visually into body coordinate positions. The last major lobe is the occipital lobe which is the visual processing center of the human brain containing most of the visual cortex and is positioned at the rear of the head behind the parietal lobe (Patton et al., 1999, page 390, Cerebral Cortex section, para. 5).

Spinal Cord

The spinal cord is a long tube that stretches "The spinal cord is about 43 cm long in adult women and 45 cm long in adult men and weighs about 35-40 grams" according to Mandal (2012). The human spine lies between the vertebral column and is composed of a series of 31 segments which are categorized in four major sections which are defined by the number of vertebra (round circular bones that make up the spine and are commonly referred to as vertebral bodies) found within them (Mandal, 2012 and Verkuilen, 2005). The first major section of the spine is the cervical spine and is the neck region. This section is composed of 7 cervical vertebrae starting with the C1 vertebrae and ending with the C7. The next section is thoracic spine and is the upper back region, which is comprised of 12 thoracic vertebrae known as T1- T12 and is attached to both the ribcage and the sternum (the breast plate). The third major part of the spine is identified as lumbar spine or lower back and typically includes 5 vertebrae known as L1 to L5. The lumbar is recognized for its ability to support most of the body's weight and its great flexibility. The last spinal region is the sacral spine and is located directly below the lumbar and is identified with its composition of five vertebras that are fused together which are referred to as S1 to S5. These five vertebras construct a triangle shaped bone that functions as the base of the spine and makes up a section of the pelvis. (Verkuilen, 2005)

Other parts of the Central Nervous System

Another significant fragment of the central nervous system is the meninges which covers the brain and spinal cord and the cerebrospinal fluid (CSF). The Meninges can be broken down in to three membranes; the outside layer being the dura mater, the middle layer being the arachnoid and the innermost layer is known as the pia mater. All three of these membranes serve the same function, to protect the brain and or spinal cord against viruses', bacteria and other deadly

pathogens. The CSF on the other hand is the fluid that circulates around the brain and spinal cord and serves to protect and nourish. (Mandal, 2012)

Neurons

In 2012 Mandal referred to the neuron as:

> The basic unit in the nervous system. It is a specialized conductor cell that receives and transmits electrochemical nerve impulses. A typical neuron has a cell body and long arms that conduct impulses from one body part to another body part. (Neuron section, para. 1)

It is important note that without the neuron the brain would not be able to function rendering it as useful as a paper weight. And it is because of its anatomy and shear number of them that we are able to carry out complex motor functions that we chose to do.

Anatomy of a Neuron. A neuron is composed of a cell body like any other cell with a nuclear acting as the control center and three differentiated parts the Dendrites, Axons, and Myelin sheath. The cell body has several branching cable like extensions that are called dendrites. The exception is a sensory neuron that has a single, long dendrite instead of many dendrites. Motor neurons have multiple thick dendrites. The dendrite's function is to carry a nerve impulse into the cell body. The axon is a long, thin cable like extensions at the end of the neuron that carries the chemical signal away from the cell body to another neuron or tissue and there is only one axon per neuron. The last sections, the myelin sheath are these white segmented sections covering the area around the dendrites and axon. This covering is long and continuous and severs to speed up the slowed signal. (Mandal, 2012)

Types of Neurons. Neurons in the body are classified according to structure and function. According to structure, neurons may be multipolar neurons, bipolar neurons, and unipolar neurons. The multipolar neurons are characterized with one axon and several dendrites and they are commonly found in the brain and upper spinal region. Bipolar neurons have one axon and one dendrite. These are seen in the retina of the eye, the inner ear, and the olfactory (smell) area. Unipolar neurons have one process extending from the cell body. The one process divides with one part acting as an axon and the other part functioning as dendrite. These are seen in the spinal cord (Mandal 2012).

The Peripheral Nervous System

The central nervous system is not the only part of the nervous system there is one other; the peripheral nervous system which is made up of two parts: the first being the somatic nervous system and the second being the autonomic nervous system.

Somatic Nervous System. The somatic nervous system is comprised of peripheral fibers that recognize sensory information from organs that are distant from the brain and directs them to the central nervous system. This system also contains fine motor nerves that stretch from the brain to the skeletal muscles to make crucial movements. An example of this is, when a person touches a hot stove and it is form here that the somatic nervous system sends the signal for pain to the central nervous system (the brain) and from there to the body to induce an instinctive response for the person to move their hand via the fine motor nerves. Amazingly this complex process of sending and receiving signals occurs within a second (Mandal, 2012)

Autonomic Nervous System. The autonomic nervous system is made up of three parts; the sympathetic nervous system, the parasympathetic nervous system, and the enteric nervous

system. As Patton et al. (1999) emphasized that the sympathetic nervous system, "controls the nerves of the inner organs of the body on which humans have no conscious control. This includes the heartbeat, digestion, breathing (except conscious breathing)" (page 344, Somatic and Autonomic Nervous Systems section, para. 3). The sympathetic system is also involved in the preparations the body makes for the flight of fight response. The parasympathetic nervous system on the other hand contains the nerves that make up the smooth muscles such as the stomach muscles and other internal organs, glands and allows them to function and secrete specific enzymes (Patton et al., 1999). The final part of the autonomic nervous system is the enteric nervous system. This system is made of a complex network of nerve fibers that compose most organs in the abdomen region and according to Mandal (2012), "It contains nearly 100 million nerves" (Autonomic section, para. 4).

Neurons in the Peripheral Nervous System. It is important to note that not all neurons are the same and are different depending on the area and system they are working in. The neurons located in the autonomic nervous system are usually located around or in the brain and spinal cord region and are known as preganglionic neurons. And the other neurons in this system are called postganglionic and are in target organs. In the somatic nervous system there is only one neuron between the central nervous system and the target organ (Bailey, 2012).

Bipolar Disorder

Bipolar disorder or as it's commonly referred to as manic depression syndrome is a mental disorder that is characterized by constantly changing moods, energy levels, activity levels, and a person's inability to carry out simply tasks (Grohol, 2012). Bipolar disorder is a lifelong condition that affects how you feel, act, and view the world around you. It is a mood

disorder thought to be produced by chemical imbalances in the brain that will result in extreme swings in mood in most cases (What is Bipolar Disorder, 2012). A person with bipolar disorder experiences alternations of high or mania as doctors refer to it and lows which are also known as depression. Both the manic and depressive states of mind that a person is be in can vary depending on the person and severity of the attack, some lasting a few hours to a few days or a few weeks to a month and in rare cases even longer (Grohol, 2012). In a recent study Grohol (2012) asserted, "The periods of mania and depression vary from person to person — many people may only experience very brief periods of these intense moods, and may not even be aware that they have bipolar disorder" (para. 2). It is also possible for people who have this illness to suffer from hallucinations that reflect upon their mood. For example a person who is in a manic state may believe that they are famous or rich and the same person in a depressive state may believe that they are criminal or simply worthless. As a result, it is not that uncommon for a person who has bipolar disorder to be misdiagnosed with schizophrenia (U.S. Department of Health and Human Services National Institutes of Health, 2008).

The first part of this disorder is mania and a manic episode is characterized by hyperactivity, racing thoughts, sleeplessness, faster speech and extreme happiness. The second part of the illness is depression which is characterized by extreme sadness, a lack of energy or interest in areas that they once found solace in, being unable to enjoy normally pleasurable activities and feeling helpless and hopeless. However there is some good news that comes with this disease which is seen in Gohol's (2012) research when he stated, "On average, someone with bipolar disorder may have up to three years of normal mood between episodes of mania or depression"

Bipolar disorder seems to be a reoccurring illness, which is shown with more than 90% of the individuals who have a single manic episode will go on to experience future episodes. 70% of these of manic episodes in bipolar disorder occur instantaneously before or after a depressive episode. As a result of this constant cycling of high and low in emotions patients diagnosed with Bipolar disorder have described their lives like an emotional roller coaster (Gohol, 2012).

Types of Bipolar Disorder

While Bipolar disorder may refer to sever mood changes that can occur rapidly there are different types of this disorder that have been broken down and characterized. The first being Bipolar disorder I, which is the most severe case and is defined by either manic or mixed episodes that last at least seven days, or manic symptoms that are so serious that the person needs to be taken to a medical facility. Also the person has depressive episodes that typically last for least two weeks. Bipolar disorder II is characterized by a pattern of depressive episodes that can turn hypomanic (slightly manic but not full blown). The next type is Bipolar Disorder Not Otherwise Specified (BP-NOS) is diagnosed when a person has symptoms of the illness that do not meet diagnostic criteria for either bipolar I or II however this does not mean they do not have share symptoms but rather they do not share a majority of them resulting in this category. Yet another subcategory of Bipolar disorder is Cyclothymic disorder, or Cyclothymia which is a mild case of the illness and causes the person to have hypomanic episodes that shift back and forth with mild depressive states and last at least two years. The final type of this illness is Rapid-Cycling bipolar disorder and appears to affect more women than men. A person is diagnosed with Rapid-Cycling Bipolar disorder when they have four or more episodes of severe depression, mania, hypomania, or mixed symptoms within a year. This form of the illness usually presents itself with younger patients that have more serious cases of Bipolar disorder (U.S. Department of

Health and Human Services National Institutes of Health, 2008). In a study by the U.S. Department of Health and Human Services National Institutes of Health (2008), they found that "people with rapid cycling had their first episode about four years earlier, during mid to late teen years, than people without rapid cycling bipolar disorder" (How does bipolar disorder affect someone over time section, para. 6).

Effects of Bipolar Disorder on the Brian

The brain plays an important role in controlling emotions, thoughts, and other important functions. Consequently, having a brain disorder/illness like bipolar I can affect these functions. Yet bipolar disorder doesn't affect the entire brain but rather parts of it and regardless of the type it appears to affect the same areas (What Part of the Brain Does Bipolar II Disorder Affect, n.d.). The main brain areas that are affected by bipolar disorder include; the frontal and temporal lobes of the forebrain, the prefrontal cortex, the basal ganglia and parts of the limbic system. In some cases the hippocampus can play a role in the disorder, as structural changes to these regions of the brain have been related with the disorder in some cases. Also the cerebral cortex is involved in thought processes which has resulted in hypothesis that states abnormalities in this region of the brain (the forebrain) are responsible for the negative thoughts that are associated with the depressive episodes of bipolar disorder (Bipolar Disorder Aetiology, 2011). The association was further verified when What Parts of the Brain Does Bipolar Disorder II Affect (n.d) pointed out:

> In a study conducted in 2009 by the Department of Psychiatry of the Seoul National University College of Medicine and Institute for Human Behavioral Medicine the brains of individuals with bipolar disorder I and II were viewed using MRI technology. The results of the study showed gray brain matter abnormalities in various regions of the brain

> for bipolar II, as well as bipolar I participants, although bipolar II had fewer abnormalities. Those with bipolar II had gray matter deficits in the ventromedial prefrontal regions of the brain (located in the rear of the front part of the brain, inside the cortex and atop the orbits of the eyes), and also in the anterior limbic cortices of the brain. (Areas of the Brain Affected section, para. 1)

Chemistry of Bipolar Disorder

No matter the function, task or importance of a specific region of the brain it would be unable to carry them out without the help of neurotransmitters such as, noradrenaline, serotonin and dopamine and acetylcholine especially when talking about a mood disorder. This includes the limbic system, forebrain and other affected areas of the brain (Bipolar Disorder Aetiology, 2011). This relationship between neurotransmitters and Bipolar disorder is clearly shown when Brain Atlas (2011) asserts:

> Simplistic theories suggested that an excess of neurotransmitters occurred during a manic episode and a decrease occurred during depression, this is clearly not the case. Instead, it is the effectiveness of the cell functioning under the modification and control of neurotransmitters that underlies the patho-aetiology of mood disorders. (Biochemistry section, para. 1)

This biochemical factor has now been mapped into three system; the first being the Cholinergic system, then the Monoamine system, and last but not least the Signaling system.

The Cholinergic System. In patients diagnosed with Bipolar disorder it was discover that lower than normal levels of choline where present, resulting in research that led to the assertion that choline and catecholaminergic are in important in regards to the pathophysiology

of bipolar disorder. Further research in to this matter implicating that the cholinergic system has antimanic properties of cholinergic agonists and the variation of manic symptoms was a result of the cholinesterase inhibitor phygostigmine (Brain Atlas, 2011).

The Monoamine System. The Monoamine system is a hypothesis of depression that states the fundamental cause of depression is a reduction in the levels of serotonin, norepinephrine, and dopamine in the central nervous system. This hypothesis is supported in the workings of antidepressants, which are agents that elevate the levels of neurotransmitters in the brain and result in the strong alleviation of depressive symptoms; however research has failed to find convincing evidence of a primary dysfunction of a specific monoamine system in patients with major depressive disorders (Delgado, 2000).

In the hypothesis the first transmitter, serotonin, is argued to cause an, "Increase in the density of serotonin 2 receptors in the platelets and brain of depression patients" as Brain Atlas (2011) wrote. This means that an increase may be due to an adaptive regulation response to the decreased synaptic serotonin and a decrease in the concentration of serotonin receptors (1A) has also been found in several areas of the brain in depressed patients, mainly those who have been diagnosed with bipolar disorder. Additional studies depict a reduced concentration of the serotonin metabolite 5-hydroxyindoleacetic acid (5-HIAA), which appears in patients with cases so severe they have tried to commit suicide to escape the agony. And when a patient was prescribed Tryptophan (a crucial amino acid in serotonin) they body happily absorbed it and combated the depression until its affects wore off (Delgado, 2000).

The second transmitter, norepinephrine, is presented in low levels in patients that are suffering a depression related attack and is presented in high levels when the same patients are in

a manic state. It was also found that cerebrospinal fluid suggest that noradrenaline and hydroxyphenylglyco (MHPG) output is higher in mania than in depression and there may be higher values in unipolar versus bipolar depression after studying cerebrospinal fluid. According to Brain Atlas (2001), "Research also suggests that an altered sensitivity of the a2- and b2adrenergic receptors may play a role in the aetiology of mood disorders, possibly through enhanced a2-autoreceptor activity leading to a decrease in noradrenaline release" (Monoamine System section, para. 2). This research also yielded that the density of a2 receptors are also increased in the following regions; hypothalamus, amygdala, hippocampus and cerebellum of depressed and often suicidal patients (Brain Atlas, 2011).

The third transmitter, Dopamine, which is believed to have a significant impact on Bipolar patients and has many functions in the brain, including important roles in behavior and cognition, voluntary movement, motivation and reward, inhibition of prolactin production (involved in lactation), sleep, mood, attention, and learning. Dopaminergic neurons are present chiefly in the ventral tegmental area (VTA) of the midbrain, the substantia nigra pars compacta, and the arcuate nucleus of the hypothalamus (WebMD, 2012). This transmitter comprises the biochemical finding in depression is the reduced concentrations of homovanillic acid, a major dopamine metabolite, in the cerebrospinal fluid and it has been assumed that dopamine abnormalities are involved in the hyperactivity associated with the severe stages of mania (Brain Atlas, 2011).

The Signaling System. According to Brain Atlas (2011), "To date, studies have failed to identify a common action of antidepressants at the level of the monoamines and their receptors. An emerging hypothesis suggests that antidepressants modify a pathway that occurs following monoamine release and receptor binding" (Systems section, para. 1). This means that the

following neurotransmitters were they then bind to a membrane in the brain and a secondary messenger signal transpires that ultimately provokes a cellular response. It is the complex secondary messengers that malfunction and have been implicated in the pathoetiology bipolar disorder (Brain Atlas, 2011).

Causes of Bipolar Disorder

The causes of bipolar disorder are not entirely known. Genetic, neurochemical and environmental factors may interact at different levels to play a role in bipolar disorder ultimately leading to its activation. Current thoughts on this issue state that it is a predominantly biological disorder that occurs in a specific part of the brain and is a result of a malfunction of the neurotransmitters. As a biological disorder, it may lie dormant for years and be activated spontaneously or it may be triggered by stressful situations in life (Grohol, 2012).

Treatment for Bipolar Disorder

The purpose of treatment in this disorder is not to cure but manage, as it they have yet to identify 100% of what causes it. As a result the main goals are to reduce symptoms of depressive episodes, reduce symptoms of manic episodes, reduce the likelihood of future episodes/relapse, and reduce the severity of the disease (WebMD, 2012). The main treatments for Bipolar disorder include; mood stabilizers, atypical antipsychotics, antidepressants, psychotherapy, and electroconvulsive therapy (ECT). Mood stabilizers are commonly a drug known as lithium and functions as it names suggests. It locks the user's mood and attitude in an "acceptable" zone so manic and depressive will be unable to take over. Common side effects of this drug are; restlessness, dry mouth, bloating or indigestion, acne, unusual discomfort to cold temperatures, joint or muscle pain, and brittle nails or hair. Atypical antipsychotics are another way to lock the

person's mood but may cause; drowsiness, dizziness when changing positions, blurred vision, rapid heartbeat, sensitivity to the sun, skin rashes, menstrual problems for women, and weight gain. The next types of treatment are antidepressants and unlike the other two they only target depression which is they are only prescribed to Bipolar disorder patients who have serious depression attacks. Side effects of antidepressants are different depending on the type but main effects are; nausea, headaches, and drowsiness. Yet another type of treatment is psychotherapy and is not a drug but rather a life style change, as it gives a chance for patients to decompress and share their feelings while giving them feedback on how to go about their lives so they are as normal as possible. The final well recognized treatment for Bipolar disorder is ECT, which is surrounded with controversy because it is a form of shock therapy. It is important to note that ECT is not an everyday treatment and can only be administered by a trained professional and is only considered for patients who don't respond to any other form of medication major or not (U.S. Department of Health And Human Services National Institutes of Health, 2008). However a relatively new treatment that has emerged quite successful is SEROQUEL XR (WebMD, 2012).

SEROQUEL XR. Because of its breakthrough formula SEROQUEL XR is able to treat more people with varying levels of mania and depression. This drug is FDA approved to specifically treat the depressive moods of bipolar disorder and has proven to effectively work alone to treat three of the episodes of bipolar disorder mania, mixed (highs and lows), and depression for the short term. And is one of the drugs that are approved for long-term maintenance treatment of bipolar disorder when added to lithium or divalproex. The appeal of SEROQUEL XR is also how only one dose a day is needed and compared to the time consumption of other drugs and therapy is quite manageable. The main side effects of this drug

are; feeling very thirsty, needing to urinate more than usual, feeling very hungry, feeling weak or tired, feeling sick to your stomach, feeling confused, or having your breath smell fruity (WebMD, 2012).

Urinary System

The Urinary system is often thought of as only a urine producer which is true but yet false because the system also balances the plasma in a person's blood. The major organs of the urinary system include; the ureters, urinary bladder, urethra, and the kidneys. The kidneys however is the most crucial of all the organs in the system, as it controls what the other organs will do from process incoming blood plasma, adjust water content so the body does not have excess or is deficient in it, controls potassium levels/sodium levels or even allow the PH level of the blood is altered to set point via another organ or itself (Patton et al., 1999).

The Nephron

What exactly makes the kidney function is so many ways? Well the answer to this is the nephron and it composes the bulk of the kidneys as 1.25 million nephrons are in each kidney. The shape of the nephron is unusual (resembles tiny funnel with a long winding stem) and specially designed for it function of blood plasma processing center and urine formation. Each nephron is comprised of four parts; the renal corpuscle, loop of henle, distal convoluted tubule, and connection duct (Patton et al., 1999).

Renal Corpuscle. The renal corpuscle is broken down it to two subcategories; Bowman's capsule and proximal convoluted tubule. Bowman's capsule is a cup shaped structure that is engulfed with nephrons and is formed by two layers (the partial or outer wall and the visceral or inner) with space between them. The partial wall is composed of squamous

epithelium, whereas the visceral is composed of podocytes. In Patton et al.'s (1999) research they reported that the rest of Bowman's capsule is full of narrow slits called Filtration slits and, "This is a mesh of connective tissue fibers called the slit diaphragm that prevents the slits from enlarging under pressure while still maintaining the permeability of the slit" (Renal Corpuscle section, page 829, para. 1). The proximal convoluted tubule on the other hand is the segment that follows a winding, convoluted course that consists of one layer of epithelial cells. Thousands of microvilli form the brush border and greatly increase its luminal surface area an attribute that greatly influences its function (Patton et al., 1999).

Loop of Henle. The loop of Henle's main function is to create a concentration gradient in the medulla of the kidney and is a segment of renal tubule and consists of descending and ascending limb loops. The few nephrons that make up this loop dip far into the medulla and as a result are called juxtamedullary nephron. The nephrons that don't dip in the medulla are called cortical nephrons (Patton et al., 1999).

Distal Tubule. This fragments function is the regulation of potassium, sodium, calcium, and PH levels. It is also the primary site for the kidneys' hormone based regulation of calcium. On its apical surface cells of the DCT have a thiazide-sensitive Na-Cl cotransporter and are permeable to calcium, via TRPV5 channel. On the basolateral surface (blood) there is an ATP dependent Na/K antiport pump, a secondary active Na/Ca transporter-- antiport, and an ATP dependent calcium transporter. The basolateral ATP dependent Na/K pump produces the gradient for Na to be absorbed from the apical surface via the Na/Cl synport and for calcium to be reclaimed into the blood by the Na/Ca basolateral antiport. While this process is ongoing, renin is released only if blood pressure drops (Patton et al., 1999).

Collecting Duct. The collecting duct is a relatively straight tubule joined to the distal tubules via several nephrons. Collecting ducts join all ducts until they converge to form one tube that opens are a renal papilla into the small calyces and extend into the medulla.

Hormone of the Volume Regulation

One of the mechanisms that the body uses to control the action of hormones, chemical messengers that travel through the blood system and act as regulators of many of the body's internal activities. Hormones are secreted by specialized glands in the body. The body is comprised of two types of glands, classified according to the way they secrete. One type is the exocrine gland, which has secretions move outward, usually by way of ducts, to some body surface, such as through the skin itself. Among the exocrines are the sweat and sebaceous glands, whose respective secretions of water and oil are evident on the skin; the mucus glands, whose mucus moisturizes the digestive and respiratory tract; the salivary glands, which softens food when it enters the mouth; and the mammary glands, which provide milk for a newborn. The second type is the endocrine gland which secretes into the bloodstream. The endocrines are chemical regulators of bodily function. The substances which they secrete serve as chemical messengers which are hormones. They are bits of tissue hidden away in obscure corners of the body all of them together weigh no more than about five ounces. But in the widespread control they exercise over the body. The two endocrine glands that are concerned with the regulation of fluid balance within the body are the adrenal glands and the pituitary gland. Some of the hormones are oxytocin (a hormone responsible for stimulating labor at the end of pregnancy), and anti-diuretic hormone (ADH), which helps the body retain its fluids (Patton et al., 1999).

Removal of a Hormone in Volume Regulation

If anti-diuretic hormone was at any point in time removed it would almost certainly result in death because it is used to retain bodily fluids and without it would be unable to regulate what needed to stay and what need to go. As a result there are three ways that the body would handle this; the first by letting all fluids go which results in death. The second being we keep all the fluid which also results in death. And finally the option were we keep unneeded fluids and dispose of useful fluids which could result in death or living in constant illness.

Conclusion

While we have come to further understand the diverse impact of the human brain on our actions and thoughts, it is still to this day a closed book to modern science, as we are unable to find what differentiates it from the rest of the animal kingdom. As we appear to suffer from the same diseases both genetic and psychological. Even though we have superior intellect we are unable to as content as a feeble rat because the rat lives in the moment happy with what it receives, while we think and become discontent. With this complexity we constantly question why, some are unable to find an answer resulting in instability of the mind making them far more likely to sub come to a mental illness, such as Bipolar disorder. Yet we are still left wondering how exactly a disease like Bipolar disorder ravages both the brain and mind.

References

Bailey, R. (n.d). Central Nervous System. Retrieved September 27 from http://biology.about.com/od/organsystems/ss/central-nervous-system.htm

Brain Atlas.(2011, December). Forebrain. Brain exploer. Retrieved September 27 from http://www.brainexplorer.org/brain_atlas/brainatlas_forebrain.shtml

Brain Atlas.(2011, December). Forebrain. Brain exploer. Retrieved September 27 from http://www.brainexplorer.org/bipolar_disorder/Bipolar_Disorder_Aetiology.shtml

Delgado, P. (2000) ABSTRACT. Retrieved September 27 from http://biopsychiatry.com/mono.htm

eHow. (2012) What Part of the Brain Does Bipolar II Disorder Affect?, Retrieved September 27 from http://www.ehow.com/about_5642046_part-bipolar-ii-disorder-affect_.html

Encyclopedia Britannica, (2012), midbrain. Retrieved September 27 from http://www.britannica.com/EBchecked/topic/380850/midbrain

Groghol, J. (January 2012). Coping with Bipolar. Retrieved September 27 from http://psychcentral.com/disorders/bipolar/

Hypothalamus Functions (n.d), incrediblehorizons. Retrieved September 27 from http://www.incrediblehorizons.com/balance-Hypo%20function.htm

Mandal, A.,(2012, October). What is the Nervous System? News medical. Retrieved September 27 from http://www.news-medical.net/health/What-is-the-Nervous-System.aspx

McCaffrey, P. (2008). Chapter 6. The Midbrain, Pons, Medulla and Reticular Formation Retrieved September 27 from http://www.csuchico.edu/~pmccaffrey/syllabi/CMSD%20320/362unit6.html

National Institute of Mental Health. (2008). Bipolar Disorder, Retrieved September 27 from http://www.nimh.nih.gov/health/publications/bipolar-disorder/complete-index.shtml

Patton, K and THibodeau, G. (1999) Anatomy and Physiology. St. Louis, Missouri, Sally Schrefer

University of Pittsburg. (2001). Minimally Invasive Cranial Base Center. Retrieved September 27 from http://www.neurosurgery.pitt.edu/minc/skullbase/pituitary/index.html

WebMD. (2012) What Is Bipolar Disorder?, Retrieved September 27 from http://www.webmd.com/treating-bipolar/what-is-bipolar-disorder