COURSERA

Understanding the Brain: The Neurobiology of Everyday Life

By The University Of Chicago

Peer-graded Assignment: Final Project

TOPIC: Neurobiology of Emotions

Brain is a very complex organ. It controls and coordinates everything like the movement of your fingers to heart beat. The brain also plays a crucial role in controlling and processing emotions.

Emotions are complex programs of actions triggered by the presence of certain stimuli, these stimuli can be external to the body or from within the body. Emotions are necessary for survival and well-being of individuals. The emotions are as ubiquitous in daily life such as vision, or hearing, or touch. The range of emotions is wide but finite. In humans it includes fear, disgust, sadness, joy, anger, and surprise, Background emotions like enthusiasm or discouragement, social emotions such as embarrassment, shame, guilt, contempt, compassion, and admiration.

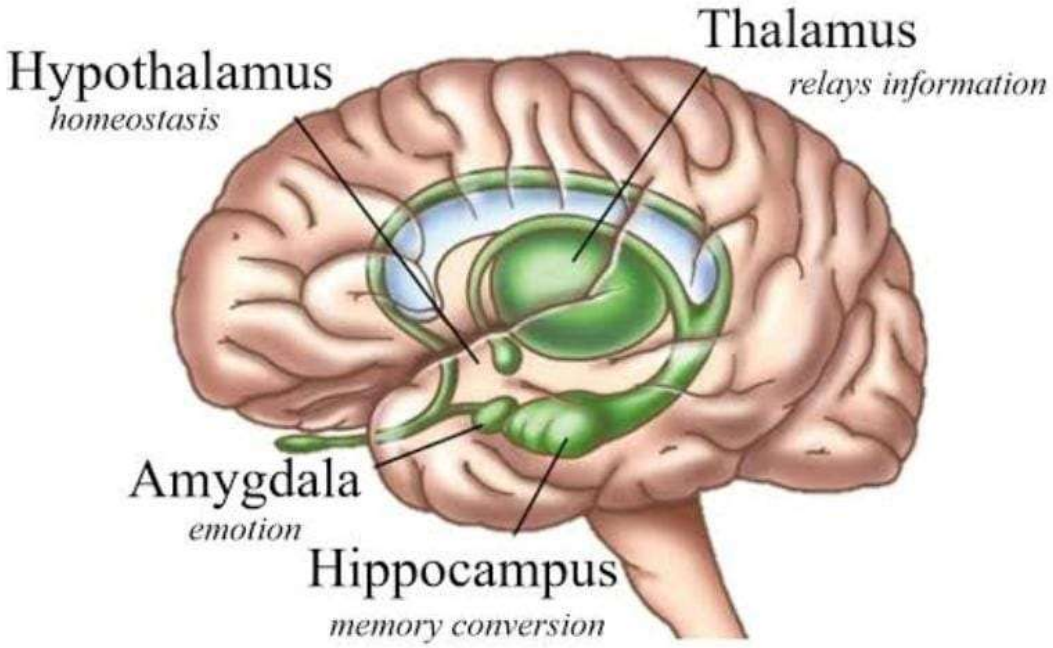
The triggering of each emotion requires the presence of an appropriate stimulus, an emotionally-competent stimulus, which initiates the execution of the actions in the program. The execution of each emotion is quickly followed by the respective feeling state provided the brain is complex enough to permit the mapping of internal states and a minimal level of consciousness.

PART OF NERVOUS SYSTEM THAT ARE ACTIVE DURING EMOTIONS

The limbic system, autonomic nervous system, and reticular activating system interact in the processing of emotion. The limbic system is a collection of structures involved in processing emotion and memory, including the hippocampus, the amygdala, and the hypothalamus.

The limbic system is located within the cerebrum of the brain, immediately below the temporal lobes, and buried under the cerebral cortex.

The Limbic System



The hypothalamus plays a role in the activation of the sympathetic nervous system, which is a part of any emotional reaction. The thalamus serves as a sensory relay center; its neurons project signals to both the amygdala and the higher cortical regions for further processing. The amygdala plays a role in processing emotional information and sending that information on to cortical structures. The hippocampus integrates emotional experience with cognition.

Other parts of the limbic system include the olfactory bulbs, anterior nuclei, fornix, column of fornix, mammillary body, septum pellucidum, habenular commissure, cingulate gyrus, Para hippocampal gyrus, limbic cortex, and limbic midbrain areas.

The processes of the limbic system control our physical and emotional responses to environmental stimuli. This system categorizes the experience of an emotion as a pleasant or unpleasant mental state. Based on this categorization, neurochemicals such as dopamine, noradrenaline, and serotonin increase or decrease, causing the brain's activity level to fluctuate and resulting in changes in body movement, gestures, and poses.

Part Of the Brain That Controls Fear

fear is a very important emotion. This response is generated by stimulation of the amygdala, followed by the hypothalamus. When the amygdala stimulates the hypothalamus, it initiates the fight-or-flight response. The hypothalamus sends signals to the adrenal glands to produce hormones, such as adrenaline and cortisol. As these hormones enter the bloodstream, some physical changes take place, such as an increase in: heart rate, breathing rate, blood sugar, perspiration.

Part Of the Brain Controlling Anger

anger is a response to threats or stress. Anger starts with the amygdala stimulating the hypothalamus, much like in the fear response. In addition, parts of the prefrontal cortex may also play a role in anger. Parts of the prefrontal cortex of the brain may also contribute to the regulation of an anger response.

Part Of the Brain Controlling Happiness

Happiness refers to an overall state of well-being. happiness response originates partly in the limbic cortex. Another area called the praecuneus also plays a role.

IMPAIRMENT OF LIMBIC SYSTEM

Damage to the limbic system is dependent on which region is affected. Amygdala damage could affect a person's fear processing (especially in being unable to recognize fearful situations), which could result in more risk-taking behaviours and putting themselves in dangerous situations.

Damage to the hippocampus could lead to deficits in being able to learn anything new, as well as affecting memory.

Hypothalamus damage can affect the production of certain hormones, including those which can affect mood and emotion.

List of symptoms associated with limbic system damage:

- Uncontrolled emotions – more aggression, anxiety, and agitation.
- Olfactory impairments
- Memory impairments
- Abnormal sexual behaviour – high/low sex drive
- Abnormal biological rhythm

Cognitive disorders which have shown to be connected to the limbic system:

- Depression
- Olfactory impairments
- Obsessive compulsive disorder
- Anxiety
- Posttraumatic stress disorder
- Schizophrenia
- Bipolar disorder
- Autism spectrum conditions

Ways In Which This Course Has Allowed Me to Better Analyze the Events and Phenomenon Around Me

This course has allowed me to have a better and deeper understanding of the inner workings of the mind which regulate behaviour, emotions, and all the traits characteristic of not just human beings but all living organisms.

I now understand better the biological origin of the signals we are measuring in MRI in patient database and how to relate them to future motor outcome.

Above all, this course allows me to broaden my perspectives on how brain imaging techniques (such as MRI and DTI) can be used to study other pathologies by knowing their biological mechanisms and properties.