Module 5: Psychobiology

Lecture 30: Psychobiology of emotion

The Lecture Contains:

- Psychobiology of Emotion
- Personality: Recapitulation

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Psychobiology of Emotion

Right in the beginning of this unit we extensively discussed the concept of conditioning. The procedures of classical and instrumental conditioning create multiple representations of the value of the stimuli in the brain. Motivational and emotional states are determined by the assessment of this value. Nucleus accumbens mediates the motivational effect of emotionally significant stimuli. Amygdala plays significant role in human emotional responses. Conditioning studies of emotional responses have examined freezing and fear-potentiated startle in rats. Freezing is considered a species-specific response to threat that makes the animal motionless. In fear-potentiated startle the presence of threat stimuli increases startle reflex. Central nucleus and basolateral amygdala (BLA) are the two functional units of amygdala that regulates emotional processes. BLA has reciprocal projections with polysensory neocortex and frontal lobe. It projects to the ventral striatum and the central nucleus. BLA is supposed to store the association that allows CS to retrieve the affective or motivational value of the US. This, in turn, controls central nucleus, hypothalamus, midbrain and brainstem to induce affective response. Freezing and fear-potentiated startle are examples of such affective response.

Brain damage and lesion studies also confirm these findings. A lesion of central nucleus impairs freezing conditioning. Damage to amygdala in human beings increases the threshold of perception and expression of emotion. Lesions in amygdala adversely affect emotional learning and memory of emotional events. Human beings with damaged orbito-frontal cortex damage resemble those with amygdala-lesion. They have impairment of reactions to emotional stimuli and decision making.

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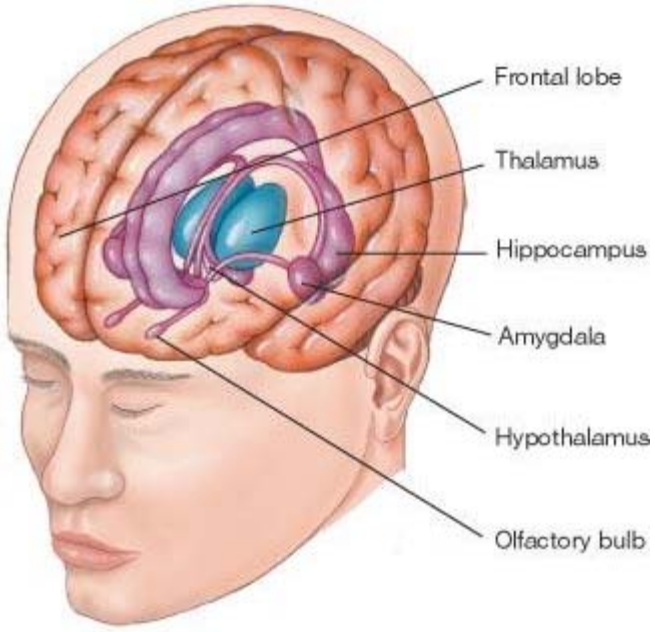
The illustration given below shows the brain structures responsible for emotions.



Another set of studies of emotional states primarily banks on the changes in the autonomic nervous system (ANS) functions. A large number of studies have measured ANS functions such as heart rate, pulse rate, blood pressure, and galvanic skin conductance to infer emotional state of an individual. Such studies are based on the premise that different emotions elicit distinctive patterns of physiological response. In an interesting study Hubert and Jong-Meyer (1991) screened cartoon film and recorded changes in the ANS functions. Cartoons inducing pleasant and amused state elicited very few changes in bodily sensations, temporary decrease in heart rate, and a rapid decrease in skin conductance. On the other hand, suspense film elicited marked changes in bodily sensations, increase in skin conductance and a temporary decrease in heart rate. Changes in heart rate are influenced by the sympathetic as well as the parasympathetic systems. Hence, psychological states determine the heart rate, which is otherwise a physiological process. On the other hand, skin conductance is entirely influenced by the sympathetic system. It reflects primary arousal in human beings.

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Our emotional experiences as well as expressions are heavily influenced by bodily chemicals. For example, hormones secreted by various endocrine glands mixes-up with blood and travel to distant locations within the body. Although this is a relatively slow process to immediately affect the emotional state, it does play crucial role when one has to respond in similar situation in the future. Certain hormones, such as norepinephrine, epinephrine, cortisol, and thyroid hormones, increase during stress, whereas others, such as insulin and testosterone, decreases. We have different types of neurotransmitters that are instrumental in communicating signals across synaptic junctions. They act as chemical messengers. Catecholamines (such as epinephrine, norepinephrine, and dopamine) are involved in extreme emotional reactions. They have been considered potential factors for psychiatric symptoms such as schizophrenia and depression. Similarly, corticosteroids, endogenous opioid peptides and neuromodulators such as prostaglandins are associated with shyness, distress, aggression and fear. The other group of chemicals is the enzymes that are instrumental in m etabolism of endogenous chemicals or exogenous materials, thus indirectly altering mood states.

Emotional experiences also affect changes in the endocrine secretions. Contrarily, such secretions are relatively slow processes and might not directly influence emotional experiences. However, they are likely to predispose an individual to respond in a specific pattern in similar emotion eliciting situations in the future. For instance, elevation of cortisol is associated with anxiety, bereavement and sadness, whereas decrease in cortisol is associated with relaxation and meditation. The table given below highlights the emotional states such as lust, care and distress and the chemical bases of such states.

Endocrine secretions	Emotional states
Vasopressinergic and oxytocinergic system	Lust
Peripheral estrogen, progesterone, prolactin, and brain oxytocin [through subneocortical system]	Motherly care
Corticotrophin Releasing Factor, brain opioids, oxytocin, and prolactin	Panic/ distress

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Personality: Recapitulation

Allport has defined personality as “the dynamic organization within the individual of those psychophysical systems that determine his unique adjustments to his environment.” We have discussed the different theories of personality in the *Basic Psychological Processes* course. You may refer to it for ready reference. Instead of looking at respective theories, here we will look at the summary and then explore the psychobiology of personality. The theories of personality can be classified into four major approaches— type and trait approaches, dynamic approach, learning and behavioural approach, and humanistic approach.

Type Approach: Hippocrates proposed sanguine, melancholic, choleric and phlegmetic types of personality. Sheldon classified people as endomorphs, ectomorphs and mesomorphs. Eyesenck developed inventory to classify people on three dimensions— extovert and introvert, stable and neurotic, and psychotic. Myer Friedman and Ray Rosenman came forward with Type A and B classification.

Trait Approach : Allport talked about cardinal, central and secondary traits. According to him, all these three traits constitute one's psychological life histories. Julian Rotter proposed single trait, locus of control whereas Cattell identified 16 factors to describe personality.

Dynamic Approach : Sigmund Freud proposed the concepts of id, ego and superego. He also gave the concepts of unconscious, preconscious and conscious states and also talked about the stages of psychosexual development. Later, Carl Gustav Jung gave the concepts of collective unconscious and archetypes. Erik Erikson talked about the stages of development suggesting that a ll stages deals with psychosexual as well as psychosocial aspects of growth. Alfred Adler gave the concept of inferiority and compensation.

Learning and Behavioural Approach : Dollard and Miller attempted testing Freudian concept of neurotic behaviour in rats in laboratory. Skinner considered that ‘what most people call personality is actually a collection of reinforced responses'. Bandura and Walters emphasized on social learning wherein the focus was on observation and imitation.

Having relooked the personality theories, let us now talk about the psychobiology of personality.

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