

Psychology of Emotion: Theory and Applications
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Module 3, Lecture 6: Emotions and the Body

I welcome you all to the third module of the course titled Psychology of Emotion Theory and Applications. So the third module is about the Physiology of Emotions. So in this module, we will have two lectures and both lectures will deal with what are the physiological changes that are associated with the concept of emotion or when we experience diverse emotions. So today's lecture is lecture number 6 overall and the first lecture of module 3. So today we will more specifically talk about how emotion influences our body. So before we talk about today's lecture let me give you a brief recap of what we have discussed in the last lecture that is lecture 5.

In lecture 5, we have discussed more specifically how cultural belief systems or cultural experiences shape emotional experiences or in the expression of emotion, understanding of emotion. In that context, we have discussed diverse research, and empirical evidence associated with culture-specific expression of emotion where we have found that although there are universal expressions of some basic emotions, still there are subtle cultural differences, and culture can influence the expression of emotions in the context of facial expression as well as the intensity in which we express emotion. The frequency of certain emotions is higher in certain cultures as compared to others. Also, we have found that some research also showed that antecedents of events associated with emotions can also differ across cultures.

So we have discussed the major reason why there are cultural differences in the expression of emotion, one of the primary reasons was the display rule that we have talked about, where the norms of the society or norms of the culture shape how we express emotions, how we interpret an emotion, our surroundings, people around us, we see and learn how to express, how to suppress an emotion, in what proportion we need to express emotion and so on. So the display rule is one of the reasons why there are a lot of differences in the cultural expression of emotion. There are also theories that talk about basically the concept of dialect theory of expression of emotion that shows just like languages also differ, the same language can differ in terms of how we pronounce certain words, a little bit of differences, similarly, the expression of emotion even though the overall basic prototype of expression of emotion could be the same for the basic emotions but subtle ways a lot of emotions can differ in terms of expression of emotion. There may be differences here and there in Facial muscles.

So we have seen evidence of all these things in the last lecture. Another explanatory model that talks about why there are differences across cultures is the dimension of individualism and collectivism of cultures. So cultures can be broadly defined in terms of their characteristics or traits. So one way of looking at it is that some cultures are very individualistic where the focus is more on the independent self, more focus on your own life, achievement, and so on. Whereas some cultures are more collectivist in nature where the focus is more on societal, cohesion, life in the group, and so on.

So the focus is given to the other's aspect of life, there are interdependent aspects of one's life. So that can also explain why those broad characteristics of culture can kind of influence how you express emotions or how you interpret emotions. So people in the individualistic culture may be prone to express emotions more intensely. They may be more comfortable in expressing certain emotions like pride and so on. Whereas, people in the collectivist culture may be less prone or less likely to express emotions such as pride and so on because of the how collective nature of or the norms of the culture shapes the way you express emotions.

In the end, we have discussed an integrative theory which talks about why there are universal similarities as well as differences through the model of Heckman's neuro-cultural theory. Which basically says that there are universal aspects to basic emotions. In every culture, these basic emotions are experienced. However, display rules of culture can sometimes suppress or override certain expressions, because of practicing it again and again according to the norms of the culture, due to which we see all these varied cultural differences.

So these are some of the things that we have discussed. So today we will be talking about how emotion influences your body particularly. And the next lecture we will talk about how emotion influences your brain particularly. So in today's lecture, we will be focusing more on the autonomic nervous system and how it is related to emotions.

We will also talk about some of the hormones that are very significantly associated with the experience of emotions. More specifically we will talk about hormones like adrenaline, cortisol, dopamine, serotonin, estrogen and testosterone. So let's start today's lecture. So emotions and the body are very strongly associated. Can you think of any strong emotions that did not involve your body at all? So if you think about it, whenever you have experienced any emotion, particularly strong emotions like anger, fear, you might have noticed that certain changes happen in your body immediately.

So it is not like you experience emotion now and after half an hour you experience certain changes in the body. Immediately there is a change in the body, certain changes you

experience. So generally every emotion will have some impact on your body. What kind of changes could happen? For example, your heartbeat may increase, your skin temperature may change, your breathing pattern may change. So these are some of the indications that certain impacts have happened in the body also.

So every strong emotion will have its kind of impact on certain physiological changes and associated indicators in the body. So we will see what are those important changes. Emotion theorists have stressed the central role of the body in emotional feeling. So you cannot avoid body or bodily experiences when we talk about emotions. William James, one of the first proponents of the theories of emotion, or the first theorist in the context of emotion said that physiological and behavioral changes are the feelings of emotions.

He gave so much importance to the physiological and behavioral changes that he defined emotions based on that only. He said emotion is nothing but those physiological changes. So another researcher, Damasio wrote that emotion uses the body as their theatre. So body is like their foundation where all the expression of emotion happens. Emotions prepare the body for appropriate action.

Why do these changes happen? One of the signals or one of the indications of these changes is that it is preparing the body to take certain actions. So when you are fearful or afraid, sudden changes happen in the body, like heartbeats become faster. So it gives you more energy to prepare for the situation, either to run away, if it is a dangerous situation or to fight. So the body is getting more energy, more activated. These changes are preparing your body to tackle the situation.

The Autonomic Nervous System as well as the hormones that circulate in our bloodstream controls the physical changes linked with emotions. We will be talking in a little bit more detail about the autonomic nervous system. Some of the aspects of it we have already discussed. The part of the nervous system which is most responsible for the activation of the body or which controls all the aspects of the body that are beyond our control such as heartbeat, breathing, etc, basically the bodily functions that happen automatically, without conscious intervention, is controlled by the autonomic nervous system.

Many hormones released from the glands in the bloodstream, also cause physiological changes in the body. So let us have a brief understanding of the nervous system to understand how the nervous system is associated with emotions. So if you see this is the division of the nervous system. The nervous system broadly is categorized as the central nervous system and peripheral nervous system. The central nervous system primarily consists of the brain and the spinal cord.

So this is called the central nervous system. Your brain and the spinal cord, which is the long thread that goes from the brain to the spine. All the other aspects of the nervous system are called the peripheral nervous system. So anything beyond the brain and spinal cord is called the peripheral nervous system. Again this peripheral nervous system is categorized under two major categories.

One is the somatic nervous system, one is the autonomic nervous system. Now this somatic nervous system conducts nerve impulses from the central nervous system (spinal cord and the brain) to the skeletal muscles. For example, I can move my hand, I can walk, move my legs, all these are done by the somatic nervous system.

The autonomic nervous system, as the name suggests controls all the internal organs and glands. So it conducts nerve impulses from the central nervous system like the brain and spinal cord to organs and glands. So all the internal organs are kind of controlled by the autonomic nervous system. This autonomic nervous system is again divided into two major categories. One is called the sympathetic nervous system, and one is called as parasympathetic nervous system.

So sympathetic nervous system is most important in the context of emotions because it is associated with all the emotions and responses, particularly whenever we get some physiological activation in the body. So sympathetic nervous system acts during emergencies. So whenever there is a danger in the situation, whenever we get nervous, panic and so on. During stressful experiences, this is the system that activates the body and mobilizes the body's resources. So it mediates fight or flight response.

So it prepares the body to fight or run away(flight). So you can immediately feel sudden changes in the body because of this sympathetic nervous system activation. Parasympathetic part of nervous system does the opposite of sympathetic nervous system. It tries to cool down or relax the body, because if sympathetic nervous system remains active for long time, the body will run out of energy and it will exhaust itself. So parasympathetic nervous system helps the body to cool down and come back to the normal position and controls the non-emergency functions and conserves body's resources by slowing heart rate and so on.

So sympathetic nervous system will arouse or increase the heart beat, parasympathetic will decrease. So both sympathetic and parasympathetic nervous system works in coordination. Without parasympathetic nervous system probably we will not be able to come back to the normal position. So both are very significant. So as we have already seen, almost all emotions are associated with this activation of sympathetic nervous system.

So it activates the body and prepares the body to deal with the situation. So let us look more into this autonomic nervous system because this is central to understanding emotions. So it's a component of peripheral nervous system. as we have already seen. It regulates all the involuntary physiological processes such as heart rate, blood pressure, respiration, digestion, sexual arousal, etc. So all the automatic functions of the body, which does not require your conscious intervention are all influenced by or controlled by autonomic nervous system.

So autonomic nervous system has two main divisions, sympathetic and parasympathetic, as we have already discussed. This system is made up of neurons, means nerve cells that stretch from the spinal cord to organs such as heart, lungs, stomach, intestines, genitals and even the smooth muscles around your arteries. It goes as a branch from the spinal cord to the different vital organs of the body and this is how it controls various bodily functions. Then it passes messages from the brain to different organs.

So this is how it is positioned. Sympathetic part, as we have already discussed, it activates the body system. It activates and helps the body prepare for intense activity by shifting the resources away from digestion, reproduction and maintenance. So whenever there is an intense arousal in the body, all the energy will go away from some of the vital functions. For example, whenever you get highly physiologically activated or you are very nervous or you are very fearful, one thing we all might have noticed is that there will be problems in your digestion. For example, the energy that is going into the digestion in the stomach area, will be put into some other places to deal with the emergency situation. So reproductive function, sexual arousal and so on, will decrease whenever you are in a very emotional situation. So the body's energy is diverted to other aspects of the bodily functions that are required to deal with an emotional situation. So sympathetic nervous system controls fight or flight response, as we have seen. Whenever there is a danger in the situation, our body gets more energy and it becomes more activated.

Either to fight with the situation or run away, whatever you decide according to the situation. So fight or flight response is primarily done because of the sympathetic nervous system. So the effects of sympathetic nervous system arousal prepares the body for intense muscular activity, especially during dangerous stressful situation. This was defined by Walter Cannon. We have already discussed a theory of emotion by Walter Cannon.

He used this term first time called fight or flight response in 1930s to refer this effect of sympathetic nervous system which prepares the body for fight with the enemy or run for life. So this is primarily this is what happens. Sympathetic nervous system also helps the body to provide necessary resources for fight and flight.

You will get a lot of extra energy by the sympathetic nervous system to deal with the dangerous situation. So you might have noticed whenever there is a danger in the situation, suddenly your energy level goes up. Suppose you are feeling very sleepy at a certain moment, and suddenly some danger arises, you will notice the body is flooded with energy. From where does this energy come? This energy is provided by the sympathetic nervous system. So because of the activity of the sympathetic nervous system, there is more blood circulation, providing more oxygen and glucose to the muscles to generate more energy, increasing heartbeat rate, respiration rate and sweating to cool the body, all these are happening to prepare you to fight with the situation.

The parasympathetic nervous system just does the opposite function but in a complementary effect. It opposite but complementary because without the parasympathetic nervous system, the sympathetic nervous system will exhaust you. So the parasympathetic nervous system helps you to cool down, relax and come back to the normal position. So the function is opposite but it is complementary because it is necessary, otherwise human beings or animals will not be able to function. Sympathetic increases the body's activities, whereas parasympathetic decreases their activity.

So parasympathetic nervous system is a network of nerves that relaxes your body after a stressful and dangerous situation. So generally after some type of stress, your body will come down to the normal position and it is basically done by this parasympathetic nervous system. It also aids in the operation of life sustaining function such as digestion. The parasympathetic nervous system is necessary for digestion when you are safe and comfortable. This system's informal description include “relax and digest” or “feed and breed”.

So the parasympathetic nervous system helps you with all the other important functions (like digestion of the food) when you are relaxed and comfortable. When you are very nervous, digestion suffers. Your body cannot digest food. You all might have noticed whenever you are very stressed, you don't feel like eating.

One of the reason for this is that all the energies are going into some other places. So when you are relaxed and in a peaceful state, you can digest much better way as your body is functioning at its best, and all the energies are going for all these vital function of digestion. So parasympathetic nervous system helps in all these life-sustaining important functions. So it is also associated with the phrases such as “relax and digest”, “feed and breed”.

Parasympathetic nervous system balances sympathetic nervous system., and therefore, it performs a complementary function. While sympathetic nervous system controls fight and flight response, parasympathetic nervous system controls body's response during the time

of rest. When you are restful, all the other important functions are controlled by the parasympathetic nervous system.

Sympathetic nervous system sends message that alerts your body system while parasympathetic nervous system sends signal that restores those system to normal activity level. So the signals of both the system are very different. When safety and survival are threatened, sympathetic nervous system takes over. If the sympathetic nervous system is activated for a very long time, it can strain the body systems, it can exhaust you and it can be very dangerous for your system.

So these two systems (sympathetic and parasympathetic nervous systems) counteract one another and help to restore the body's balance. In this diagram, you can see some of the different functions. You can see most of these functions are opposite to each other. In the diagram you can see, this is your spinal cord, this is your brain, from the spinal cord, different nerves go to different vital organs and this is how the signal goes from the brain to different parts of body.

So sympathetic nervous system performs the following functions, dilation of pupils, so your eyes will become much more wide open; inhibition of saliva, so your mouth becomes dry when you are very stressed; increased heart rate, inhibition of digestion in stomach; release of glucose from liver to increase energy, inhibition of digestion in intestines, release of more adrenaline from kidneys to give you more energy, decrease of blood flow in the reproductive system leading to decrease in sexual arousal when you are very stressful.

Similarly, the opposite functions are done by the parasympathetic divisions where the pupil constricts, saliva production in the mouth increases, heart rate slows, digestion in the stomach and intestines gets much better, and blood flow to the reproductive system increases. Therefore, the sympathetic and parasympathetic nervous system performs opposite functions.

Let us see how some of the important hormones that are associated with emotions. Hormones are a very important component for controlling the body's activity and these are also very strongly associated with mental experiences and emotions. So hormones play a very vital role in controlling the body's activity and emotions.

Hormones are chemicals that are secreted by various glands of our body. Examples of some glands are the pancreas, thyroid glands, adrenal glands etc. These different glands which perform very important vital functions in the body. If any of these glands become malfunctional you can have a lot of problems. For example, the pancreas secretes a hormone named insulin. So if there are problems in the pancreas it can result in diabetes, as insulin is related to controlling the body's sugar level. Therefore, all these glands play

very important vital functions in the body and they control all these vital functions through the secretion of hormones in the blood, these hormones are carried through the bloodstream and communicate with the other organs in the body. So these hormones are released in the blood and then they communicate with the different parts of the body and this is how holistically the body functions. The endocrine system includes glands such as the hypothalamus, pituitary gland, thyroid gland, adrenal gland, pancreas and gonads. All these glands secrete hormones in the blood and these are all important for the functioning of the body.

This hormone influences diverse physiological functions. The pancreas produces and releases the hormone insulin which causes cells throughout the body to take more glucose as a source of energy. So the sugar level of the body is also connected to the pancreas. The Hypothalamus is located in the brain, and is responsible for releasing hormones that regulate hunger, thirst, body temperature, and emotional responses such as aggression and pleasure. Therefore, it controls very vital functions of the body. If the hypothalamus is not functioning well, we will probably not be able to experience hunger, thirst etc.

The pituitary gland which is also called the master gland is also located in the brain and releases hormones that control growth and metabolism. Therefore, your growth of the body and metabolism of the body is controlled by the pituitary gland. It is also important for emotions such as stress and anxiety. Whenever we experience these emotions, the pituitary gland releases hormones. In the diagram, you can see the positioning of some of these glands. You can see the hypothalamus is somewhere in the central part of the brain,

There are two sections of the brain, the left brain and the right brain. Many of these organs are bilateral, meaning that they are present on both sides of the brain. In the diagram you can see that the hypothalamus is somewhere at the center of the brain, the pituitary gland is just below that, the thyroid gland is somewhere in the throat part of your body, the adrenal glands are just above the kidneys. Renal means kidney. As the adrenal gland is connected to the kidneys, therefore, it is named adrenal. There are two adrenal glands on both sides of the kidney. The pancreas is somewhere here. Here testis, ovaries and so on. So these are some of the important glands and their positions in the body.

There are some hormones that are very strongly associated with emotions. One of them is called adrenaline. We all might have heard this term, adrenaline rush. People use this in the layman's context also when people are very active and want to do some of the high-energy activities. When people perform this kind of high energy demanding activities, we say that this person is under an adrenaline rush. The adrenaline is a hormone which is secreted by the adrenal gland. It is a hormone that is released during very stressful situations where your body requires a lot of extra energy. Whenever you go through a lot

of stressful situations, adrenaline is released. It increases heart rate, blood pressure, muscle tension, causes dilation of bronchia and pupil.

Along with high levels of dopamine and norepinephrine, adrenaline is responsible for feelings associated with love. Thus, adrenaline also has some association with the experience of love as an emotion. The adrenaline is secreted by the central nervous system. The central nervous system sends the signals to the adrenal gland and it has a short duration of about 2 minutes. So within 2 minutes, it gets secreted in the body. An adrenaline rush may manifest as a sense of anxiety, nervousness or an intense excitement as both your body and mind get ready for an upcoming event. So adrenaline is released in the body when we are performing highly exciting activities.

There is another hormone which is called cortisol, which is also connected to stress or anxiety. So cortisol is a steroid hormone that is released during times of stress to provide energy. The functions of cortisol and adrenaline are very similar but the difference lies in their release mechanism. When a person experiences stress, their cortisol level increases and this hormone has been linked to negative emotions. So particularly whenever we experience a lot of negative emotions including a lot of stress, and anxiety, generally cortisol gets released.

Cortisol is again connected to the adrenal gland. We will see the mechanisms of its release. People with Cushing's syndrome, a condition characterized by excessive cortisol secretion, often suffer from depressed mood, which can improve when their elevated cortisol levels are treated. So the treatment includes decreasing the elevated cortisol level. With the decrease in cortisol level, many symptoms of Cushing's syndrome get treated.

The physiological mechanisms are very complex so we will not go into all the details. The primary function of cortisol is to increase energy availability in the body by raising blood glucose levels. Glucose is for energy. It raises the glucose level to give you more energy. So this is the main function of the adrenalin.

The hypothalamic pituitary adrenal axis, which regulates cortisol production, responds to a range of physiological and psychological challenges, some of which may not result in negative emotions such as waking up in the morning or physical exercise.

Conversely, many experiences that are associated with negative emotions do not lead to an increase in cortisol. Therefore, the relationship between cortisol release and negative emotion is not so simple, it depends on a lot of context. For example, viewing highly unpleasant pictures can elicit negative emotions, but it may not typically lead to cortisol release. Similarly, experiencing panic, which is characterized by intense negative emotion, may or may not be accompanied by elevated cortisol levels. Therefore, it depends on many factors and the relationship is very complex. In the diagram, you can see the pathway

depicting how adrenaline and cortisol are related to stressful situations or negative emotions.

So whenever we experience stress or very high intense negative emotions, there are two pathways of body action. One pathway is when we experience stress and very negative emotions, it will lead to activation of the hypothalamus, a small organ located at the center of the brain. This hypothalamus then activates the sympathetic part of the autonomic nervous system, which leads to arousal of the body as we have already discussed.

This sympathetic nervous system activates the medulla part of the adrenal gland, located at the top of the kidneys. Medulla means the central part. Every gland has an outer part, called the cortex, and an inner part called the medulla. So this sympathetic nervous system activates this inner part called the adrenal medulla and this inner part secretes the hormone adrenalin.

These are collectively also called as catecholamines. So this central or medulla part releases adrenalin. After the release of adrenalin in the blood it performs various functions, such as an increase in cardiovascular responses, respiration, blood flow to the active muscles etc. So the adrenaline hormone activates the body and performs all the typical symptoms of the sympathetic nervous system.

The mechanism of the sympathetic nervous system includes activation of the adrenal medulla part that ultimately releases the adrenalin hormone which ultimately causes all the symptoms required for the body's arousal. So this is one pathway.

Another pathway that takes place simultaneously is that when we experience stress and negative emotions, it also activates the pituitary gland, located at the central part of the brain.

This pituitary gland releases a hormone called ACTH, adrenocorticotrophic hormone. The ACTH then activates the adrenal cortex, which is the outer layer of the adrenal gland. This outer layer secretes cortisol. The inner layer of the adrenal gland secretes adrenalin. So both these hormones are released by the adrenal gland.

One is released by the cortex part, which is why it is named cortisol. Adrenal is secreted by the medulla or inner part of the adrenal gland. Cortisol increases mobilization of protein and fat, increases access to energy storage, and decreases inflammation. So it helps to activate the body in certain ways. So these two pathways simultaneously occur when we experience stress and negative emotions, and it leads to all these physiological changes in the body.

The hypothalamus is somewhere in the center of the brain. In the context of stress response, it activates two pathways we have already discussed. One pathway is called the SAM pathway, the sympathetic adrenal medullary system. Another pathway is called the hypothalamic pituitary adrenocortical (HPA) system. These two pathways are responsible for all kinds of changes. So one pathway releases cortisol and another pathway leads to adrenaline or non-adrenaline (another hormone with a similar function).

The SAM pathway does whatever we have seen. It leads to the release of catecholamine, such as adrenalin, in the bloodstream, it increases heartbeat, blood pressure and so on. The HPA pathway also leads to the release of cortisol which influences metabolism, storage of fats, immune functions and so on.

Generally, the HPA pathway is slower. It may take around 30 minutes. The SAM pathway is fast. The hormones are released within a minute. So this happens very fast. HPA may take some time. So if stress remains for a long time, the HPA pathway is more active. If stress is for a very short duration, the SAM pathway becomes more active. So, this is how these two hormones are related to particularly stress and negative emotions.

We will also discuss Dopamine and serotonin in detail in the next lecture, but we will just have some introduction in this lecture.

Serotonin is mostly released in the body itself, whereas dopamine is mostly released in the brain. These are called as happy hormones. Our happiness depends on dopamine and serotonin as hormones.

They enhance our sense of mental wellness or positive emotional experiences. Dopamine is related to the brain's reward function mechanisms. It induces pleasurable sensations. So whenever we experience pleasure and happiness, mostly it is connected to the release of dopamine. On the other hand, serotonin can mitigate feelings of depression and anxiety.

So generally lack of optimal levels of serotonin causes depression. So in many depression cases, serotonin levels are very low. The presence of serotonin enhances your mood leading to increased happiness and so on. So both dopamine and serotonin function in a similar way, with little differences. Both are the happy hormones that contribute to our positive emotions and happiness. More specifically, serotonin is linked to feelings of happiness, focus, and calmness, whereas dopamine is linked to more motivation and rewards. Whenever we get some positive reward system, it activates certain pleasurable sensations. So dopamine and serotonin both play roles in mental health issues such as depression and mood disorders. In both of these, hormones have very strong roles to play. Mostly, the release is somehow restricted in the case of major depressive patients or people with mood disorders. So the imbalances of these two hormones can be one of the major reasons for mood disorders and depression.

So dopamine and serotonin have distinct functions. Dopamine regulates movement and coordination. Serotonin aids in the regulation of digestive functions such as bowel functions and hunger.

These are additional functions along with that of happiness or positive emotions. Dopamine stimulates appetite but serotonin decreases it. These are some of the differences in the subtle functions of the two happy hormones. So dopamine increases appetite but serotonin decreases. Dopamine generally is present in the brain mostly whereas serotonin is mostly present in the gut or intestine. So these are some differences between the two hormones.

We will talk more about dopamine and serotonin when we talk in the context of the brain.

The estrogen and testosterone are also very important hormones in the body, which have some connection with different emotional experiences. So according to research estrogen levels have a positive impact on mood, with higher levels particularly beneficial. Thus, with higher levels of estrogen, people generally experience better mood. Conversely, a sudden drop in estrogen levels can lead to symptoms of depression. So if the level of these hormones suddenly decreases or decreases for whatever reasons one may experience depression-like symptoms. Now estrogen is mostly present or more functional in the female body. Some research indicates that fluctuations in the estrogen level rather than the absolute level of estrogen, affect mood. So lot of mood swings can occur if there are fluctuations in the estrogen level.

This explains why women experience mood swings during puberty and menopause, when estrogen levels vary dramatically, and why mood disorders are less common during times when estrogen levels are consistently low such as childhood and post-menopause. When the estrogen hormone is not very prevalent, then mood swings are also not prevalent. So when estrogen is present and it fluctuates, then it causes a lot of mood swings.

Testosterone is another hormone that is released by the testes. So testosterone is typically the male hormone, released by the testes, which is the male reproductive organ. It also affects emotion in many ways. It is important for the promotion of sexual desire in both men and women but the presence is less in women and more in male. It also has a mood-enhancing effect for men. When the testosterone level is high it can also have a positive impact on the mood similar to estrogen for women.

So whatever estrogen does to women similarly testosterone does to the men. But these effects are not yet fully understood. Research is ongoing on people. Physiologic is very complex, with the ongoing research, we kind of understand more and more but still, we do not understand completely. Furthermore, testosterone has been suggested as a possible

contributor to anger and aggression. So this hormone has also been linked to anger and aggression. So people who have probably higher quantity of testosterone may be more aggressive.

So some research connects testosterone to aggression. Although the evidence is not always consistent. So these are basically some of the hormones which are significantly associated with emotions in the body and they play a major role in the shifting of mental experiences and emotions. So with this, I will end here and tomorrow we will talk about what changes happen in the brain, particularly the brain chemistry, we will look at it in the context of emotions. So with this, I will stop here. Thank you.