Cognition and its Computation
Prof. Rajlakshmi Guha
Prof. Sharba Bandyopadhyay
Biotechnology and Bioengineering
Indian Institute of Technology, Kharagpur

Lecture - 51
Theories of Emotion

Hello and welcome back to this eleventh week of Cognition and its Computation.

(Refer Slide Time: 00:36)

In this week, we are going to cover Emotion problem solving and decision making; we are going to look into the theory and we are also going to look into the neuroscience of emotion and the (Refer Time: 00:47) cortex and decision making.

So, when we talk of emotion one very common thing is that, do not do things with emotions; if you want to do something effectively keep your emotions at bay, but as human beings is not that the flavor of being human. In every situation that we engage in, we have a feeling tone or an emotion attached to it.

Even when we talk of past events, when we talk of when we imagine or when we think of a memory from the past; it has a pleasant or unpleasant tone attached to it and along with that we have an emotional weightage. Think about a happy day in your life; how do you know that it you think of an imagery, but how do you know it is a happy day,

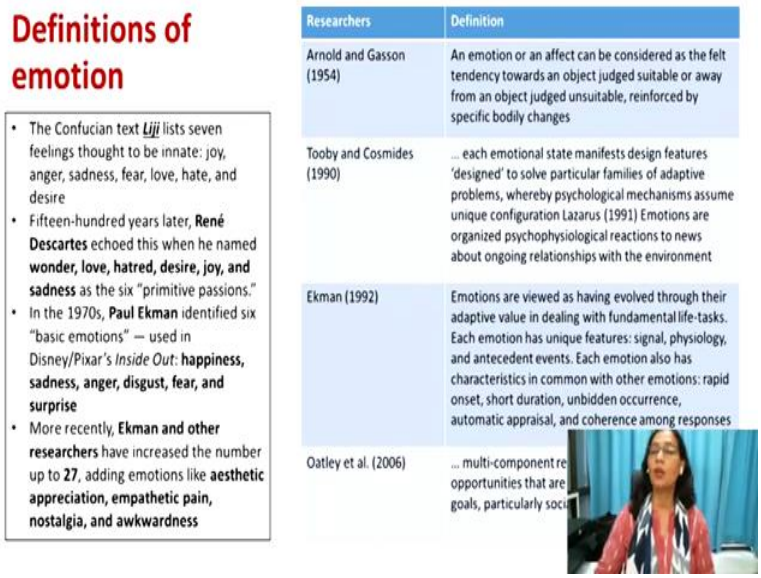
because the imagery is of is a on a two dimensional perspective that you are imagining you know on a plane.

But this too has an emotional tone and as it is mapped with each episode in our lives as we have mapped it with some emotional tone, emotional weightage; we when we recall them, we joined them together. So, if I tell you instead that think of 5 happy days in your life, you can relate it connecting it to that concept of happiness, to the emotion of happiness, so similarly with other emotions too.

And you know as we know that you know emotions set the tone of our experiences and it gives us gives life its vitality; that is why we have an approach or avoidance towards certain things, certain images or certain episodes or events in life, because they may be predisposed, we may be predisposed to having an emotion for a similar kind of concept.

Now, emotions are internal factors that can energize, direct and sustain behavior. So, now, let us if we when we talk of emotions, there are multiple explanations and multiple theories of emotions.

(Refer Slide Time: 03:31)



And emotions have been context within the context of study for years together. In fact, Confucian text one of them being Liji lists seven feelings or thought to be innate.

So, what are they joy, anger, sadness, fear, love, hate and desire. And 1500 years later, Rene Descartes; we know of Rene Descartes as the famous philosopher and

mathematician who spoke about the mind body dualism. And Rene Descartes said that emotions he echoed the same concept of emotions and thought with the six primitive passion that is what he called them and these were wonder, love, hatred, desire, joy and sadness.

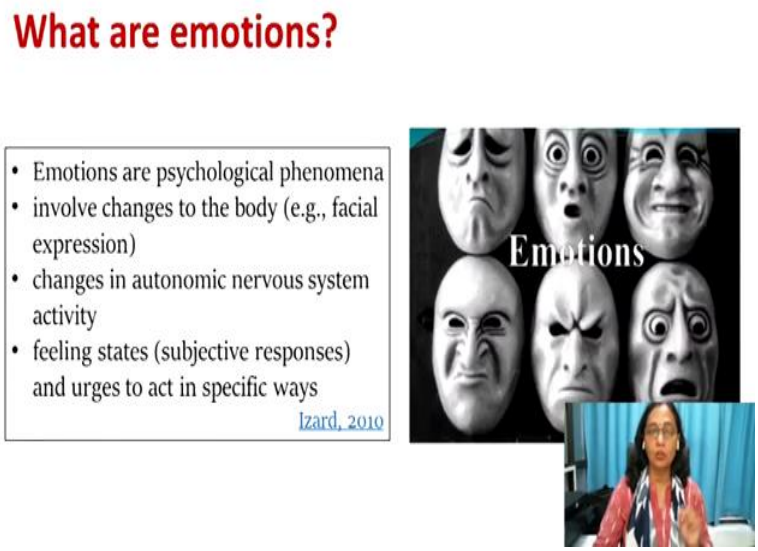
In the 70s, Paul Ekman identified 6 basic emotions and of happiness, sadness, anger, disgust, fear and surprise. And you might be familiar with Paul Ekman theory if you watch the Disney's Disney picture movie of inside out.

So, there he is the one who has given inputs for that community and you will see different emotions, how different emotions are at play and interact with one another in one's life. And recently Ekman and his associates have increased the number of emotions 'from 6 to 27 and in that list they have added aesthetic appreciation, empathetic pain, nostalgia and awkwardness.

So, now looking at emotions, there are as I said there are multiple definitions and in this slide you can see that emotions have been defined by Arnold and Gasson in 1954 as an effect as an affect and that can be considered as the felt tendency towards an object judged suitable or away from an object judged unsuitable. So, he is more talking about the approach avoidance interaction with emotion with an emotional state.

And it goes down to Oatley in 2006, where Oatley speaks about emotions as multi component responses to challenges or opportunities that are important to the individual goals, particularly social ones. So, here the emphasis is on original and if you look at this you will realize that the emotions are either seen as study of emotions over the years have either been focused on individualistic or on the social interpersonal connect.

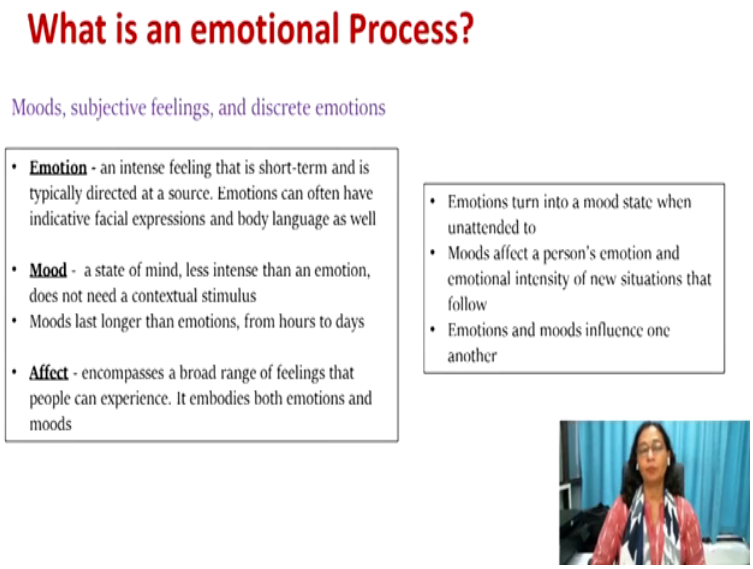
(Refer Slide Time: 06:31)



My favorite is Izard's definition of emotions, where he says that emotions are psychological phenomena that involves changes to the body and changes in the autonomic nervous system and also in the feeling state and that these are urges to behave differently in different situations.

And in fact, this is what brings out the differences between individuals in their responses to emotions. So, when we talk of emotions, there are one or two things that we must be aware of.

(Refer Slide Time: 07:02)



And these are very very intermingling terms of emotion, mood and affect. So, you often if you looking at disorders, you will often see it mentioned in the textbooks of psychiatry and mental health as mood disorders or in fact affective disorders and sometimes also emotional disorders; but what are they the same, are they different just to look at the subtle differences between these three.

So, emotion is an intense feeling that is short term. So, and is typically directed at a source. So, it is it arises for a brief period and time and it can have its manifestations in facial expressions and body language, gestures, verbal expressions as well. Mood on the contrary is a state of mind which is less intense than emotion and does not need a contextual stimulus.

So, many times when we talk of these disorders of depression or say of euphoric state like mania or you know as I said right now major depressive disorder; the state is pervasive for a longer duration, but and it is not the mood or the emotional state has not arisen due to a contextual stimulus, it has prevailed for a longer period and time.

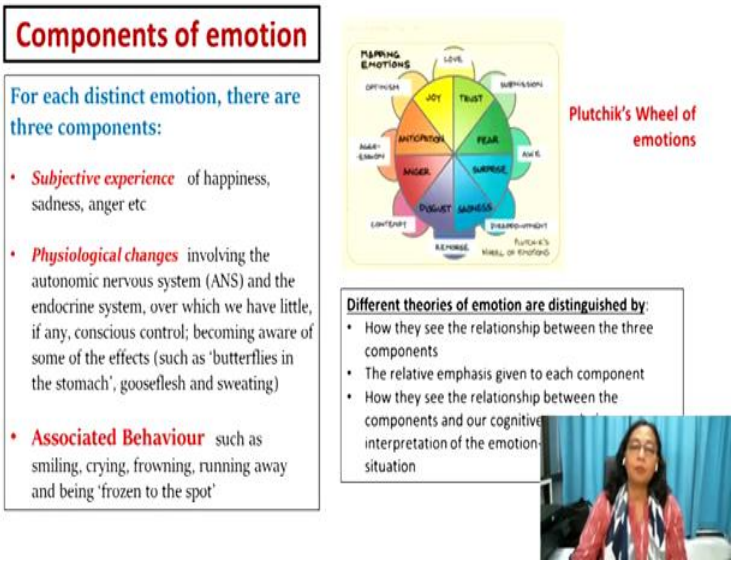
And moods as you know in a continuation I must mention, moods last longer than emotions from hours to days. So, you in major depressive disorder you may find somebody suffering from depression for several months unless left, if left untreated.

After it on the other hand, encompasses a broad range of feelings that people can experience and it embodies both emotions and moods. So, when we are talking of the affect, we are actually talking about the range of emotions and moods that an individual can feel. So, in a mood disorder, this range is restricted, in fact the intensity is also restricted or skewed.

So, emotions turn into a mood state when unattended to. So, gradually the intensity lowers and moods affect the person's emotion and emotional intensity of the new situations. So, if a person has depression and then there is an emotional stimulus of sadness, definitely this persons responses to the sad emotion will be different from somebody who is not having a mood state of who is not having a low mood or a mood state of sadness. Emotions and moods as you can well understand influence one another.

So, what are the components of emotion?

(Refer Slide Time: 10:02)



As just going back to Izard's definition, you will see that each distinct emotion has three components. So, one is a subjective experience. So, of happiness, sadness, anger, disgust, joy, surprise; physiological changes or autonomic changes, mostly these are sympathetic activation and many times also is related with the endocrine system and these are not within our conscious control.

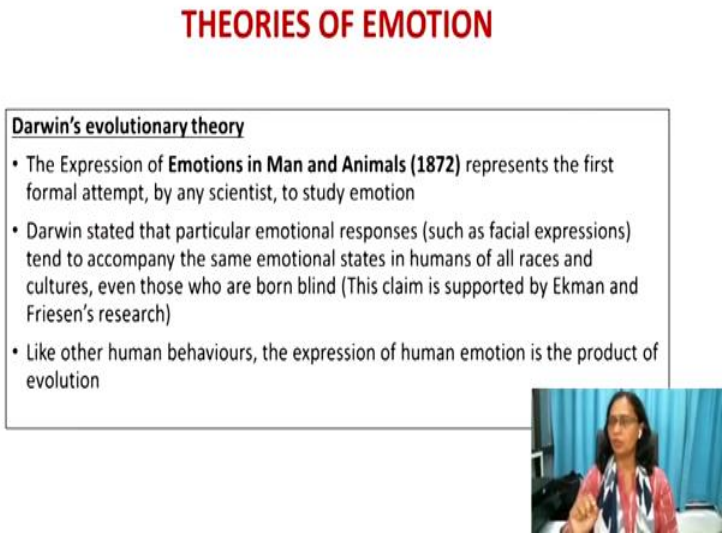
So, it could be like butterflies in the stomach, gooseflesh or sweating. So, these are papillary dilation these are not within our conscious control and associated behavior like crying, laughing, frowning running away or being frozen to the spot. So, earlier theories of emotion would speak about fight or flight response; I mean in fact, another one just thinking about this is freeze response.

So, these have over evolution, these have served to save us or to prevent us in or to help us in threatening situations. So, these emotion is a very important factor in evolution, because it helps it has helped us to survive. And now when we look into the different theories of emotions, mostly these theories are distinguished by how they see the relationship between these three components of subjective experiences, physiological changes, and associated behaviours.

And on the relative emphasis they give on the component, so which they hold a priori. So, there are some theories which hold the physiological arousal as primary, while others look at the appraisal of it or the cognitive aspects as more important. And how they see

the relationship between the components; so whether what comes first what comes second or do they come in parallel and you know. So, these are how the theories of emotion have been categorized.

(Refer Slide Time: 12:14)



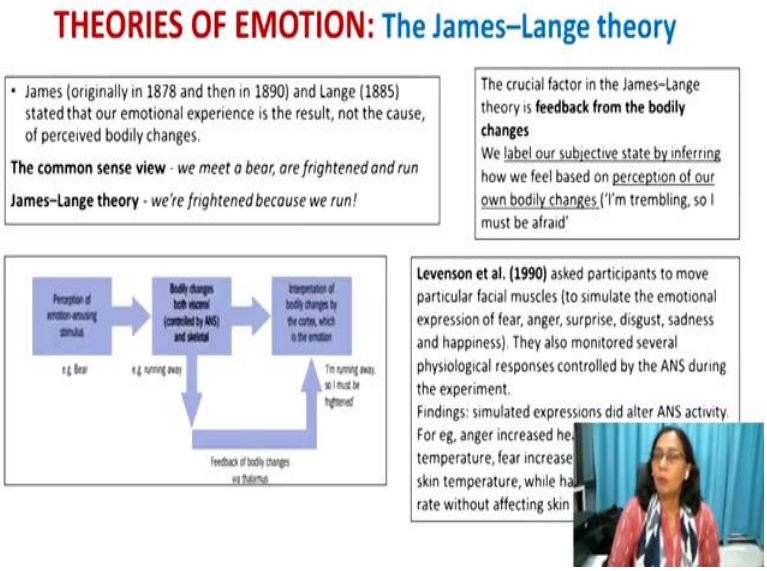
So, there are multiple theories of emotions and we are going to cover very few of them, just to give you a brief idea about emotions and its theories. So, we will start with the age old theory of Darwin or evolutionary theory. And in his book in 1872 that emotions in man and animals, Darwin spoke about that was the first formal attempt of a scientist to talk about emotions or to study emotions. And Darwin stated that, emotional responses like facial expressions are generally accompany emotional states and these are irrespective of cultural differences.

So, it and it will be it is genetically embed and it will be the same for all people; so the linking of an emotion and an expression of emotion. So, he gave the example of people born blind. So, they did not get a congenital blindness, people suffering from congenital blindness have not got the opportunity to learn an expression by visualizing it; but nevertheless these people also express similar emotions. And this idea was actually supported well way later by Ekman and Friesen's research on emotions.

And they show that it is true that the facial expressions are budding a few cultural prototypes, facial expressions are multicultural or I should say it are irrespective or culture free irrespective of whichever human ways one belongs to. And Darwin also

stated that like other human behaviors, emotion human emotion is an expression or is the expression of human emotion is a product of evolution.

(Refer Slide Time: 14:25)



So, this brings us to the most common and most studied theory of emotion that James Lange theory of emotion. And William James in 18 between 1878 to 1890 along with Lange and Lange actually parallelly gave this theory irrespective of James and these two gentlemen they; these two researchers of psychology they stated that, our emotional experience is the result not the cause of bodily changes.

So, what is the common sense view? If you are afraid of something, then you are frightened or rather I should say you are frightened and so comes the expression or when you are frightened, you run or you shout or you are scared; you are happy, so you express that happiness through a smile or through a jubilant shout.

James Lange theory is just the contrary, so it is reversed. So, James Lange theory suggest that, we run because we are frightened. So, the interpretation of running is the visceral changes in the body is, what brings about the emotion. So, if you look at this image, I borrowed this image from Gross in ah Gross's book on introduction to psychology of 2013 and here you see that perception of emotion arousing stimulus.

So, if there is a stimulus that can arouse some bodily changes, you know that image that stimulus brings about some visceral changes and skeletal changes. And what other

visceral changes maybe you know sweating, maybe you know papillary dilation, increased heart rate and skeletal changes of say actions, so the running away.

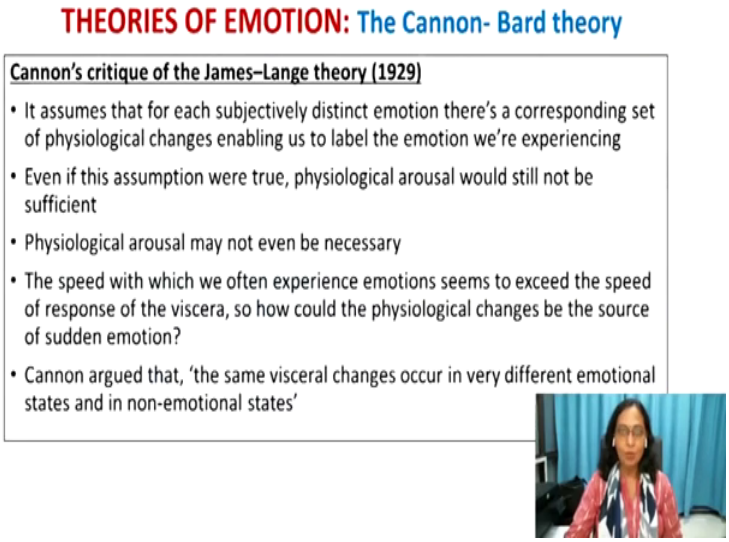
And this feedback goes directly to the interpretation. So, visceral changes and the skeletal changes, this inputs go to the cortex. So, that is the seat of thought, where it is interpreted that I must I am running away, so I must be frightened. So, the fright happens later; so the emotion happens later because of the bodily changes.

Now, so the crucial factor in James Lange theory is that, feedback from the bodily changes makes us label that subjective state. So, I must I am trembling, so I must be afraid. And this was you know actually looked at much later, almost a century later by Levenson et al who asked participants to move their particular facial muscles and to simulate expressions of fear at multiple emotions like fear, anger, surprise, disgust, sadness and happiness.

And they were monitored for their physiological responses, you know to check out whether there were any synaptic activation and it Levenson and his associates found that simulated expressions did alter autonomic activity. So, for example, simulated anger increase heart rate and skin temperature and fear increase heart rate, but decrease skin temperature ok and while happiness decrease heart rate without affecting skin temperature.

If you know if you know about the laughter club, the laughing clubs that you know generally; you might have wondered what is the fundamental tenet behind the laughter club or the laughing club. So, it is actually the same that if you simulate or if you create even the expression of happiness or smile or laughter; you will be feeling, you will be bringing about certain changes, physiological changes in your body and then your the feedback from your body to the cortex or to the brain in this case will be that is well your feeling, your smiling, so you are feeling good. So, you must be feeling good.

(Refer Slide Time: 19:17)



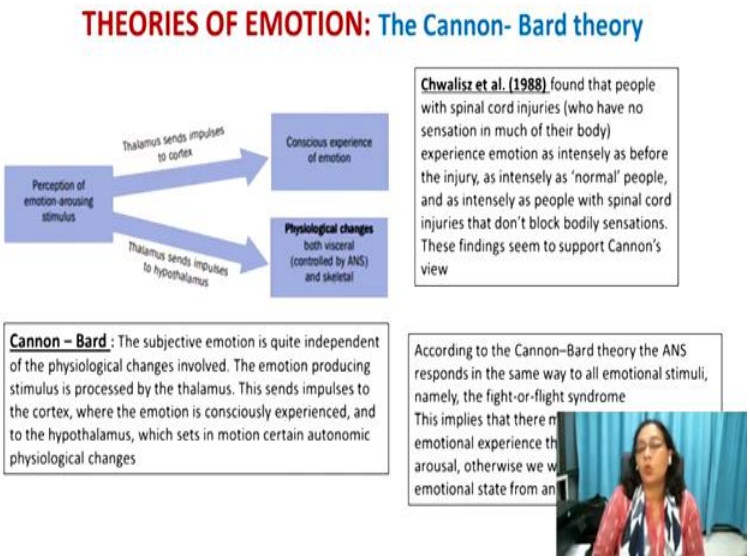
Well this theory as a happy as it sounds was very very critically you know visualized by many theorist. And primarily among them were Cannon and Bard and cannon was well verbose about his critique of James Lange theory. So, Cannon say stated that, this implies that James Lange theory implies that each emotion must be having a corresponding set of physiological changes to label the emotion.

So, every time you smile it means, so the it corresponds to happiness; but then we do come across people who are also smile when they are sad or the other way around after you know a tennis player has won the after federal has won the Wimbledon, if he cries and are we to take it that he is sad for winning the Wimbledon.

So, this does not correspond. So, this implies that this each physiological state need not necessarily correspond to a set of emotion or vice versa the emotion does not corresponds to a set of physiological changes to label it. And even if this assumption were true, physiological arousal would still not be sufficient.

So, many times also another Canon's criticism was that, the speed with which we experience emotions is faster than the speed of the viscera. So, before the bodily changes occur, so then how would the physiological changes explain the sudden emotion and you know. So, this these were the criticism of Cannon and they came up Cannon and Bard they came up with their theory of emotion.

(Refer Slide Time: 21:38)



And here they said that the subjective emotion is quite independent of the physiological changes involved.

And the emotion producing stimulus is processed by the thalamus. So, there is the thalamus sends impulses to the cortex for the conscious experience of emotions. So, this is the conscious awareness. So, this is the cognitive awareness of emotion, while the thalamus sends impulses to the hypothalamus for the physiological changes and schedule changes in the emotions during an emotion.

So, these inputs are sent parallelly through both systems or rather to both systems. So, this would explain that you know. So, it is not like a series connection that after the visceral changes have happened, then the emotion labeling is done. So, that would also account. So, a parallel set of inputs sent to different parts of the brain for a physiological change and action, on the other hand of the felt emotion; this would explain for the temporal relationship.

And Chwalisz and his associates in 1988 showed that this perhaps could be true through their experiments and they found that people with spiral cord injuries, who have less sensations in the body. So, where even the inputs from the viscera are not going to the cortex, these people could still feel the emotion intensely as other normal people.

So, if it was a series connection, then if the inputs from the viscera are not going to the cortex, then the emotion would not be fell; but these paralyzed people who could not feel who did not have input from the viscera to the cortex still can feel. So, there must be a parallel part for emotion and according to Cannon Bar, the ANS autonomic nervous system responds in the same way to all emotional stimuli.

So, basically it is more of a fight or flight response; but and this implies that there must be more to our emotional experience than just the visceral changes or than just the physiological arousal.

(Refer Slide Time: 24:22)

So, this brings us to another very very popular theory of emotion, in fact the most research theory of him on emotion is that is also known as the cognitive labelling theory, Schachter singers cognitive labelling theory; also it is the first cognitive theory, where an explanation to emotion is sought from cognition, where or you know where dominance or is given to the thought processes for the felt emotion.

So, Schachter in 64 states that the decision of which particular emotion one is feeling is most important. So, it is quite a conscious decision and this depends on how we label the arousal. So, there is an arousal, when there is a stimulus that is emotion provoking and how we label that arousal actually determines what emotion we are feeling.

So, according to Schachter, there is a physiological arousal which is factor 1 and this is necessary for emotion; but the nature of the arousal is immaterial. So, it is important as to how we interpret that arousal.

So, that is the factor 2. So, how Schachter and Singer they in 1962, they actually conducted an experiment and on a group of students. And so, what they did was they gave the participants an injection of adrenaline; but they were told, the participants were divided into groups and they were most three groups, they were told that they were being given a vitamin of sup proxy, which is a fictitious vitamin. And this to in order to see its effect on vision and they were tested on one of the four conditions. So, there were four groups made.

So, the group 1 or group A had participants who were given accuracy information, that well this is a drop called adrenaline and this will bring about certain changes in your physiology like palpitations, tightness in the throat, tremors and sweating. Group B were given false information; they were told that it would bring about itchiness and headache and group C were either given no information or given false information, true or false information about the side effects.

And group D that is the control group were given a saline injection and otherwise treated as group C; that is either they given true or false information about the side effects. So, before giving being given a vision test; so after this injection was given of adrenaline or saline as in the control group, each participant was put in a waiting room with a stooge. A stooge is an assistant of the experimenters and which we participant actually does not know; the participant feels that the stooge is also a part of the experiments, you know also a participants like him or her.

So, for half of the participants in each condition, the stooge the experimental stooge this individual either behaves frivolously like being happy or you know exuberant laughing out loud, making paper airplanes etcetera and in the other half of the group. So, each group were divided into two halves, where one group got one subgroup got a stooge who was happy and then the other sub group got a stooge that was who was sad, so who was angry.

So, he was tearing up paper and whatever tasks they were given a filling up the questionnaire, tore up the paper and crumple the paper and throw it away. So, these, so

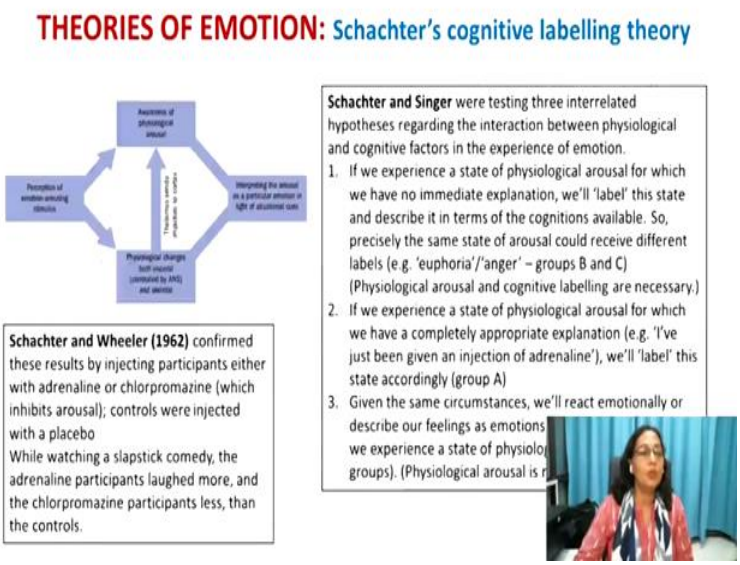
this will be angry condition or the angry stooge. And after the experiment, so the participants were; so after this sitting they were given a vision test which was not really relevant for the experiment, but after that they were the participants were asked about their emotional experience.

And this was assessed in two ways; one by observers rating to the degree to which they interacted with the stooge and joined in with the stooge's behaviour and two the self-report scales.

And as was hypothesized, group A and D group A that is the individual who got accurate information and group D that is the control group were much less likely to join in with the stooge and you know be too happy or be too angry. So, they did not report as much of anger and audiophoria; while group B and C that individuals who are given either false information or people who were given you know no information or false information about the side effects, these this these two groups were more influenced by the stooge's behaviour.

So, and the interpretation of their changes, of their physiological changes were based on the environment. So, based on the stooge's behaviour.

(Refer Slide Time: 30:21)



So, Schachter singer what they said is if you look at this diagram, again I have borrowed it from Gross. So, says that, there is a perception of an emotion arousing stimulus and

there is an. So, from that perception of an emotional arousing stimulus, there is an awareness of the physiological arousal and physiological changes.

So, the perception of the emotional arousing stimulus also brings about physiological changes and this physiological changes adds to the awareness of the physiological arousal and this these two. So, the visceral changes or the physiological changes sends inputs or sends feedback to the awareness of the arousal and this is interpreted as a particular emotion with respect to the situation.

So, if I know that I have been given a drug and my changes in my body, my palpitation rate is because of the, is an effect of the drug, it is under the influence of the drug; then I will interpret it as per the drug. But if I am not aware, then I will interpret it as per the situation and that is why people who were not aware, explained it by the situational behavior of the stooge.

So, if they got angry, if their heartbeat increased; they explained it as anger, because of the stooge's behavior or joy as per the stooge's behavior; as they did not know that it was the drug adrenaline that had brought about the change. And Schachter and Wheeler in 62 confirmed these results by injecting participants with either adrenaline, which would activate the syntactic arousal or chlorpromazine, which would inhibit the arousal. And again even during the inhibition experiments it was seen that, the lower response rate was explained situationally if the participants were not aware.

And while watching in this, while watching a slapstick comedy; this was another set of experiments that Schachter-Singer did; while watching a slapstick comedy, the adrenaline participants laughed more and the chlorpromazine participants less than the control.

So, again they the responses as if were situational. So, they laugh, they thought they laugh because of the situation and not because of the drug. So, it is more of the interpretation of the physiological arousal and awareness of the arousal and this and the inputs from the physiological system, that is in conjointly interpreted by the individual as per the situation.

So, Schachter singer tested three interrelated hypothesis. So, one is if we experience a state of physiological arousal for which we do not have an immediate explanation; they

said that we label this state to the in terms of the cognitions available. So, cognitions available means interpretations of the situation.

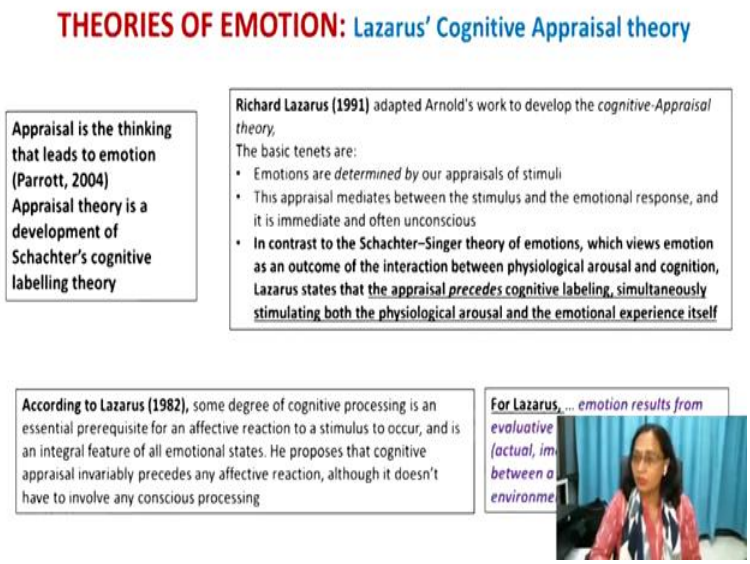
So, being the conscious acknowledgement of situational features that may explain my physiological changes. So, the precisely the same state of arousal could receive different labels in different groups; but somebody it was euphoria for group, so group A it would be different and group B it would be different.

Now, if we experience a state of physiological arousal for which we have a completely appropriate explanation, like group A had; that well I have this change, because I have been given this drug sorry. So, then it will be labeled accordingly. So, the situation will not have an influence on it.

So, I can explain it through again another aspect, another factor, in this case the drug. And given the same circumstances, we will react emotionally or describe our feelings as emotions only to the extent that we experience a state of physiological arousal.

So, that physiological arousal has to be there for a labelling of the emotion, otherwise it will not happen. So, this was Schachter's cognitive labeling theory.

(Refer Slide Time: 35:33)



This brings us to another cognitive theory that the cognitive appraisal theory of Lazarus and this theory is a development of Schachter's cognitive labelling theory.

So, in contrast to Schachter-Singer's theory of emotions, this which is a view of emotion as an outcome of an interaction between physiological arousal and cognition. Lazarus is a little different, so he states that the appraisal precedes cognitive labeling, appraisal has to come before.

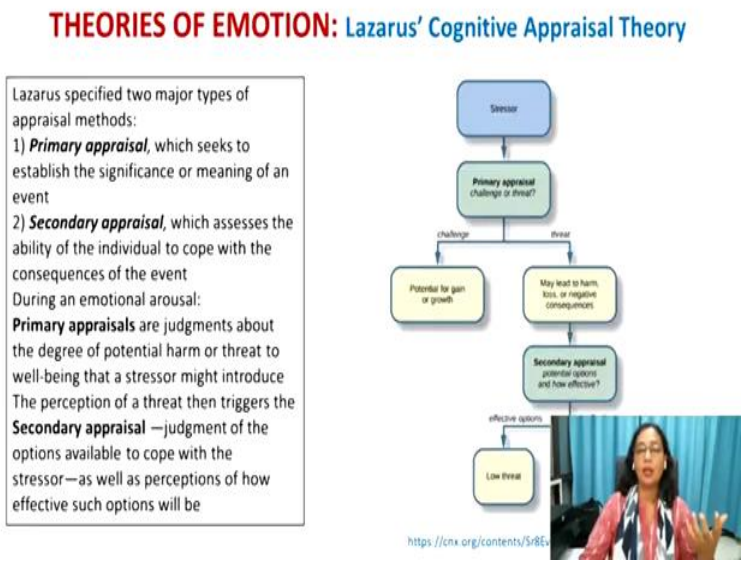
Now, you look at this, so that is the cognition Schachter said that arousal and cognition; labelling of the arousal is cognition, it is quite similar to James Lange theory. But Lazarus says that no appraisal, so that is the cognition has to precedes the labelling ok and appraisal of what; appraisal of the physiological arousal, appraisal of the situation. So, simultaneously that appraisal precedes cognitive labeling, simultaneously stimulating both the physiological arousal and the emotional experience.

And according to Lazarus, some degree of cognitive processing is an essential prerequisite for an effective reaction to a stimulus. So, again you see hence the cognition comes first in Lazarus appraisal theory for an effect to be elicited at least to start and is an integral feature of all emotional states. He proposes that cognitive appraisal invariably precedes any effective reaction, although it does not have to involves any conscious processing.

So, a part of this appraisal as per Lazarus may be you know not conscious; I will not a consciously not use the word unconscious, because you know many confuse it with the psychoanalytic aspects of unconscious. But what Lazarus tries to say is that, we may not be aware of that appraisal system working underlying our effective reaction.

So, the before the awareness of the effect before the awareness of the physiological arousal, there has to be or before even the starting of the physiological arousal, there has to be some underlying appraisal, cognitive appraisal. And so, for Lazarus' he states emotion results from evaluative perception of a relationship; it actual imagine or anticipated between a person or an animal and the environment.

(Refer Slide Time: 38:35)



And this you know, this can be developed over time. So, it is not. So, the underlying appraisal may also be learned over time. Now, here Lazarus' specifies two major types of appraisal methods. So, one is a primary appraisal, you will see this is very familiar to or very similar to the evolutionary aspect; evolutionary theories, but I am not talking specifically about Darwin, but too survival.

So, secondary, so primary appraisal is which seeks to establish the significance or meaning of an event and secondary appraisal is which assesses the ability of the individual to cope with the consequence of an event. So, during an emotional arousal, the primary appraisals are judgments about threat or challenge. So, it is more like the first underlying appraisal of whether this is hazardous for me, whether this is a threat and the secondary appraisal is the judgment or option to do what to do.

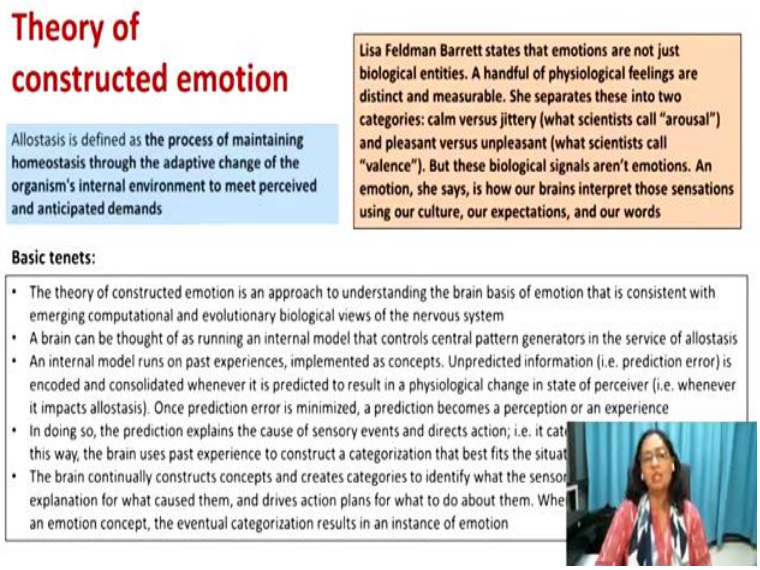
So, whether this is a high threat, this is a low threat. So, if it is a if the first stimulus is a dog with its teeth out coming towards me, so the first is how is it a is it a threat or a challenge. The challenge would be for gain or growth and threat would be whether it is a lot or harm to self. So, harm to survival and the secondary appraisal is that if it is a threat well is it a low threat.

So, is this dog really going to be very harmful for me, can I kick it and run away or is it you know too strong that it is going to overpower me. So, is it a high threat or a low threat. And for every stressful situation, this is how the appraisal coming that is what

Lazarus' says and based on these appraisals, the physiological system response. So, actually the fight or the flight mechanism comes to play or the freeze mechanism comes to play.

Freeze mechanism is something that humans use less as compared to animals, ok. So, specially for animals that are not predatory animals; so for them they often use the freeze response.

(Refer Slide Time: 41:28)



Now, this brings us to the last theory that we will cover today and this is one of the latest theories very recent theories of emotion given by Lisa Feldman Barrett and in 2017. Lisa Feldman Barrett is a neuroscientist and a psychologist and she states that emotions are not just biological entities.

So, this is a brain based theory of emotion and with the development of electro physiological methods and other blood parameters or you know for understanding the different methodology with imaging and electrophysiological methods being able to give us more information about our functioning an anatomical structures.

The theories are more objective and you know organic based. So, emotions neuroscientists generally are trying to explain emotion through brain based theories now. And Barrett says that emotions are not such biological entities, a handful of physiological feelings are distinct and measurable. And she separates these into two

categories. So, one is she says calm versus jittery and pleasant, which is you know the arousal, which we generally measure through various electrophysiological instruments like e g s r; we measure the electro dermal response or the arousals, cognitive arousal and the valance.

So, this is generally pleasant versus unpleasant, which we see through subjective scaling. Now, these are not emotions; these are correlated with emotions, but these are not emotions. So, what is an emotion? She says that, this is how our brain interprets these sensations as per our culture, our expectations and our words that would be emotion.

So, he brings on the context of cultures over here. So, she explains brain based signals with an interpretation of these signals based on cultural parameters and cognitive parameters. So, the basic tenets of her theory are she this theory of constructed emotion is an approach to understanding the brain basis of emotion, that is consistent with the emerging computational evolutionary biological view of the nervous system.

And the brain here is thought of as an internal model that controls certain pattern generators for allostatsis and which is the process of maintaining homeostasis through an adaptive change, when there is a change in the environment, internal environment and or to meet perceived demands.

So, the bodily changes, so here the brain is the controlling mechanism of these you know these changes and it says that she says that an internal model runs on past experiences. So, this mechanism of the brain has some learning. So, as per the computational theories also, so this is you know it learns by itself. So, it is more like unsupervised learning that happens with feedback that is generated from it event experiences.

And this model learns through past experiences, by which it brings on categorizations or concepts. And so, unpredicted information that is you know if there is a prediction error; I assume this would be good, but it turned out to be unpleasant for me, this input is encoded and consolidated.

And whenever there is an interpretation which is successful, so which is predict where there were whenever there is a prediction with higher accuracy; it brings about the change physiological change and this is when it impacts the adaptive internal change or brings about the allostasis.

So, I am anticipating certain changes and my body behaves to bring about a homeostasis and this when it is correct, this is recorded in my brain and categorized. And once this error is minimized, that is as with time, with experiences our accuracy increases; this prediction becomes a perception or an experience and we categorize it with a sensory event. In this way, the brain learns through categorization or brain learns through concept formation about the best fit guided action.

So, what is the best fit action in this case? And the brain is dynamic, the environment is dynamic; so with every experience that we have, these concepts are fine-tuned and new categories are created new constructs are made and where we come through, we bring about causal explanations for them we infer causal explanations. And these causal explanations along with the causal explanations, we infer or we how to act on them and henceforth our, we anticipate anticipating that call, we will also plan our actions lightly.

So, this so when this internal model creates an emotion concept this way. So, this is say something as happy, something this situation being giving a positive feeling and with experiences; this construct is created and this activates certain changes anticipating it, it activates certain changes in our bodily systems for adjustment.

So, thinking about something scary, brings about changes in our body. So, the body is trying to adapt maintain allostasis. So, adapt to the new changes and this is how Feldman says, Feldman Barrett says that an emotion is created.

So, this is a this is very interesting and in fact, it gives an explanation to how our you know biological markers are may be interpreted and this also brings about a very very important notion that many people when they study emotions; they talk of this biological markers, electrophysiological changes and you know electro dermal changes for study emotions.

It is important to understand whether it is bringing about this that by itself is not emotion. So, the interpretation of the situation that brings about those changes is the emotion. So, this is also important to record the subjective evaluation of the situation, while explaining it through brain based mechanisms.

So, in summary we covered quite a handful of theories; there are many more that could be covered, but these being the primary theory of emotions that we have discussed. In the

next class, we will talk about the neurophysiology of emotions and we will discuss the limbic system in detail.

Thank you.