Affective Computing
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Week - 02
Lecture - 03
Brain and Asymmetry

So, having understood the specificity of the emotions, now let us try to see that how different emotions are experienced by an user among different modalities right.

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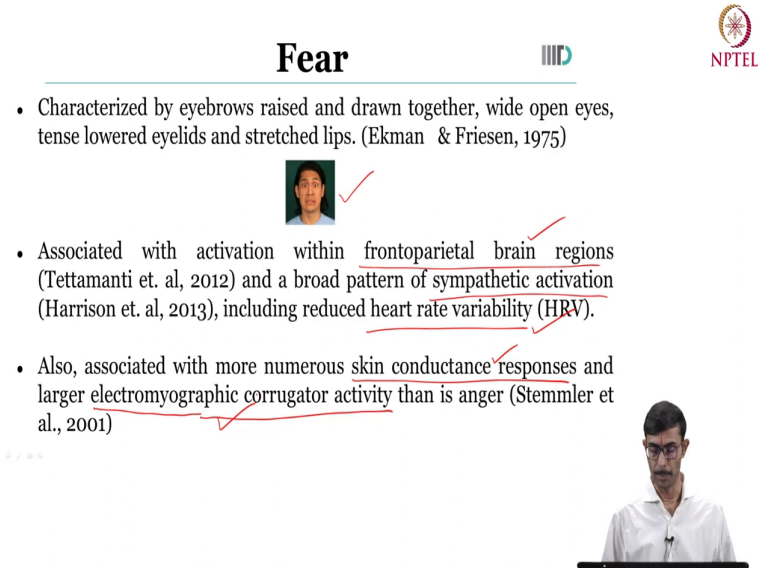

So, let us take the example of this fear emotion. In case of the fear emotion as you can see in the image itself that it is characterized by the eyebrows are already raised right and they are

drawn together and then eyes are widely open and then you have lower eyelids right if you look visualize that and then you have stretched lips.

So, for example, Paul Ekman and his team they worked a lot on identifying these different set of facial action you needs which characterizes a different set of emotions, but these different set of emotions are not only experienced or expressed in one particular modality that is the facial expression modality, but definitely they are also experienced and expressed in different modalities and here we will be talking about a bit about how different emotions are experienced or discriminated among the different modalities as well.

So, for example, if we talk about the fear. Fear is also associated with the activation in the fronto parietal brain region. What do you mean the fronto parietal brain regions? So, basically this is your frontal region this is your parietal region. So, where they meet that is the place which is known as the fronto parietal brain region.

So, this is also associated with the higher activity in the fronto parietal brain region and it is also represented as a higher sympathetic activation. Sympathetic activation basically it consists of higher cardiovascular activities which may also include the heart rate variability. So, for example, reduced heart.

So, basically heart rate variability what it means, we will be talking about all those things in when we will be talking about the emotions and the physiological signals, but basically the heart rate variability is basically the variance that we have among the different heart rates right. So, basically what happens that in the case of the fear emotion, we experience it is also expressed by the reduced heart rate variability.

Similarly, when you talk about the fear we can also look at the skin conductance response and what has been found that in the case of the fear a higher skin conductance response has been found among the users. And similarly the facial expressions when you have this fear emotions, it is also indicated by larger EMG or electromyographic corrugator activity that is in the facial muscles for example, somewhere here then that is in the anger.

So, these are the different ways in which the same emotion that is the fear emotion can be expressed in the facial expressions, can be expressed in the brain activity, can be expressed for example, in case in the cardiovascular activity, can be expressed in the skin conductance responses and can also be expressed in the EMG activity right. So, you can see that since different emotions are different they are also experienced or expressed in different moralities in a different way.

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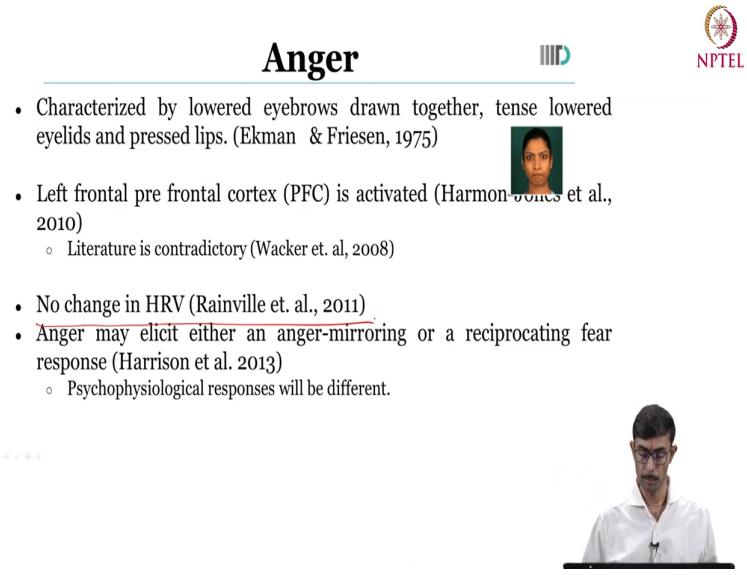

So, similarly after having understood the fear emotion, let us try to look at the anger emotion. Now if you look at the anger emotion in the case of the anger emotion just like we have in the fear emotion, we also have widely open eyes here right and in this case also the eyebrows if you look at the eyebrows here. So, for example, the eyebrows are also drawn together and

then the eyelids for example, they are lowered and then you have the pressed lips kind of a situation.

So, this is how the facial expressions express characterize the anger emotion. Now of course, not to say that that these are the only things that are there a bit of individual variability can be there right. So, similarly for example, if you look at the anger emotion and then the brain activity that is corresponding in the with respect to the anger emotion, then what we see that we have more left frontal prefrontal cortex.

So, basically this is what you have the pre frontal cortex. So, in the pre frontal cortex you have more activity in the case of the anger emotion and, but in this case for example, a literature is a bit contradictory as well. So, Harmons Jones for example, whereas, he has been saying where he and the other researchers have been saying that the left frontal pre frontal cortex is activated the literature is a bit contradictory where it is said that maybe the right pre frontal cortex is more activated right.

Interestingly, when we analyze the heart rate variability the one that we saw in the case of the fear emotion, we observe no change in the case of the heart rate variability while if you recall in the case of the fear emotion, we observed a reduced heart rate variability. So, it clearly shows that among the different modalities, different types of discrimination can be possible.

So, for example, while if you are only looking at the whether the eyes are widely open or not you may not be able to differentiate between the anger and the fear emotion, but for example, if you are looking at other modalities such as in this case if you are looking at the heart rate variability so, while in the case of the anger emotion we are not going to observe any change in the heart rate variability, but in the case of the fear emotion we will be observing a reduced heart rate variability right.

So, that is how different modalities they help you to characterize a particular emotion right. Similarly, for example, in the case of the anger what happen? Anger can be different types of angers as well right. So, it can be an anger where you are just someone is angry in front of

you and you are responding with an angerness or for example, you are it can also the response that you get in the fear response you may also have similar kind of responses in the anger.

For example, that we just saw in the case of the facial emotions right facial expressions so, but nevertheless we have already seen the psycho physiological responses will always be different in both the cases and that is what is going to help you to discriminate among the these two different emotions perfect.

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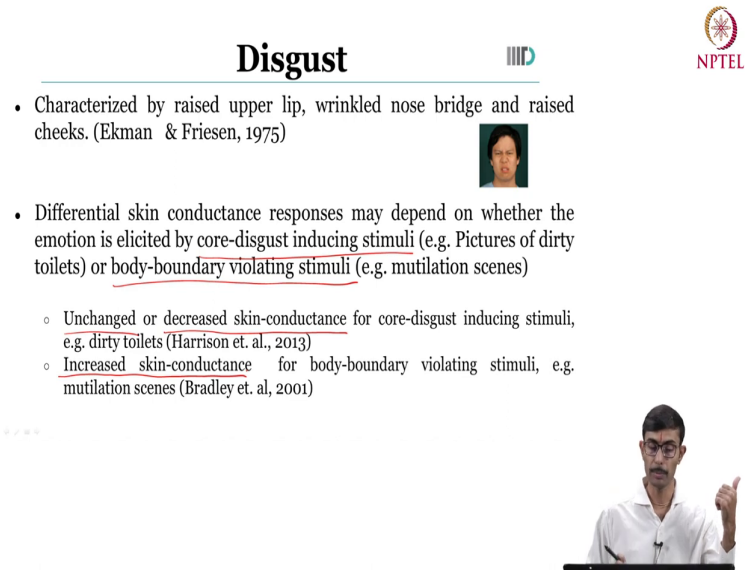

So, with that now let us look at the similar let us look at the similar type of analysis of the disgust and the other emotions. So, this is a very simple picture of the disgust emotion now if you look at the disgust emotion what we have? We have for example, this is probably characterized by the wrinkled nose bridge here and raised cheeks here right for example, you have this kind of emotion and then we have raised upper lip.

So, for example, upper lip is a bit raised of course, again not to mention that all these behaviours that have been characterized by Paul Ekman and his team there is a good amount of individual variability and depending upon depending from one individual to another this particular behaviour may change a bit here and there.

But largely this is how the discussed emotion for example, could be perceived in the facial expressions right. Now if you look at the skin conductance responses it depends on what type of stimuli is causing the disgust emotion that is very interesting here. So, for example, what is happening that if you have a core-discussed inducing stimuli right.

So, you may have different types of skin conductance response or ok in comparison to for example, if you have body boundary violating stimuli where you may be experience looking at some mutilation scene, then the skin conductance responses could be different. So, for example, in the case of the core discussed inducing stimuli which is such as the pictures of dirty toilets.

For example, you have either unchanged or you have either or decreased kind of skin conductance response. On the other hand, if you look at the this mutilation scenes kind of a stimuli then what you have? You will have increased skin conductance response. So, this is also very interesting thing to observe and very important to note as well that it may also happen that depending upon the stimuli your response may also change even if it belongs to the same emotional category right.

So, this is where you have to be a bit careful again perfect.

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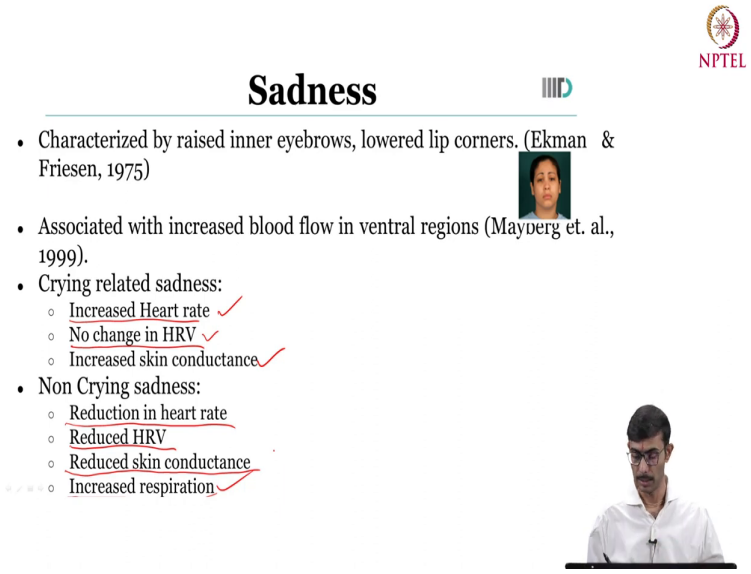

So, now, having looked at the disgust now let us look at the sadness emotion. Now in the case of the sadness emotion as you can see here this is broadly characterized by the lowered lip corners for example, and then the raised inner eyebrows right I hope that you can look into the image here broadly and then if you look at the cardiovascular activity, it is associated with the increased blood flow right.

And then at the same time there are two different types of sadness where we would like to differentiate the physiological responses one is the crying related sadness. So, in the crying related sadness where you are literally crying when you are sad then increased heart rate is observed while we do not observe any change in the heart rate variability please pay attention that heart rate and the heart rate variability these two are different things right.

So, increased heart rate, but may be no change in the heart rate variability and then you also have the increased skin conductance. Now, in the case of the non crying sadness when you are sad, but you are not crying please pay attention that where earlier you were observing a increased heart rate now you are observing a reduction in the heart rate. Earlier when you are not observing any change in the heart rate variability now you are also observing a reduced heart rate variability.

Similarly, where earlier you were observing an increased skin conductance now you are observing a reduced skin conductance and similarly your respiration also it is increased right. So, then there is a difference in the sadness also when whether the individual is crying or when the whether the individual is not crying.

Now, why these different types of changes are important? These different types of changes are important because now imagine that if you want to understand a particular emotional response then you will have to understand these different types of behaviours in order to know that what exactly is the modality to look for number 1. Number 2 what exactly is the type of change that you can expect in that particular type of modality right.

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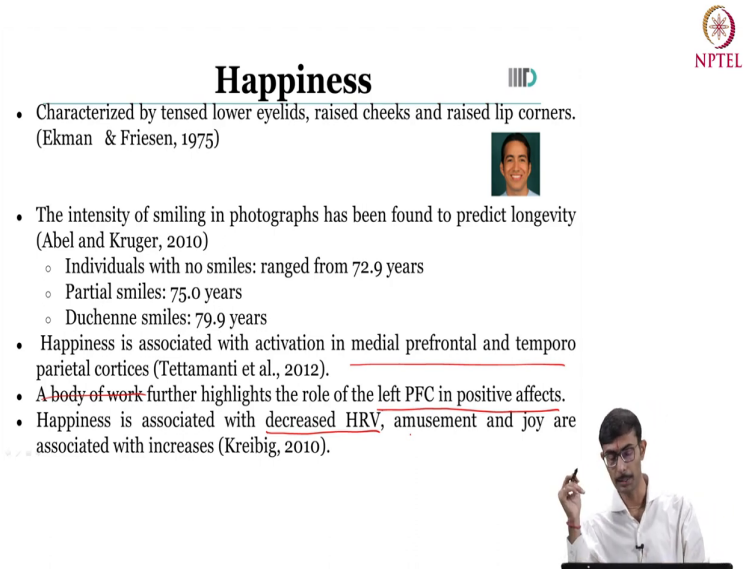

So, that is why it is important for us to understand that how different emotions are being characterized or expressed in different modalities. So, let us take the last example which is of the happiness now in the case of the happiness as hypothesized as given by Ekman Paul Ekman and his team for example, you have again you have raised cheeks, you have raised lip corners and you have tense lower eyelids right.

So, this is broad characterization in terms of the facial expressions now other thing that you need to look at that in a very interesting study Abel and Kruger found that the intensity of the smiling of an individual in the photographs has also been found to predict longevity right.

So, for example, what they found what they showed in their this interesting study that individuals with no smile their age has been found to be ranged from 72.9 years. Similarly the individuals those who showed partial smiles in the photographs their longevity ranged around

75 years similarly those who had the tertiary smiles like very broad smiles their longevity has been found to be around 80 years right.

So, this was another very interesting study that Abel and Kruger performed. Now happiness of course, like the other emotions happiness can also be associated with the activation in the other physiological signals as well. So, for example, it is associated with the medial prefrontal and the temporal parietal cortices right and that is a more brain activity in these regions and then at the same time there are lots of literature which also highlights the role of the left pre frontal cortex in the positive effects.

So, what it says that in the case of the positive emotions such as happiness, there is an increased activity in the left free prefrontal cortex that is the in this side of the brain region right and if you look at the other physiological signals then happiness is also associated with the decreased heart rate variability and at the same time amusement with the decreased heart rate variability such as the case is the amusement and the joy are associated with the increased heart rate variability right.

So, basically the differentiation between the happiness and the amusement and the joy is that there is varying degree of positivity as well as the intensity there and by this experiment this in by this experiment by Kreibig what they showed that while there is a decreased heart rate variability in the happiness there is an increased heart rate variability in the case of the amusement and the joy among the users right, perfect.

So, now we talked about one very interesting point here that in the case of the positive effects left more activities found in the left prefrontal cortex.

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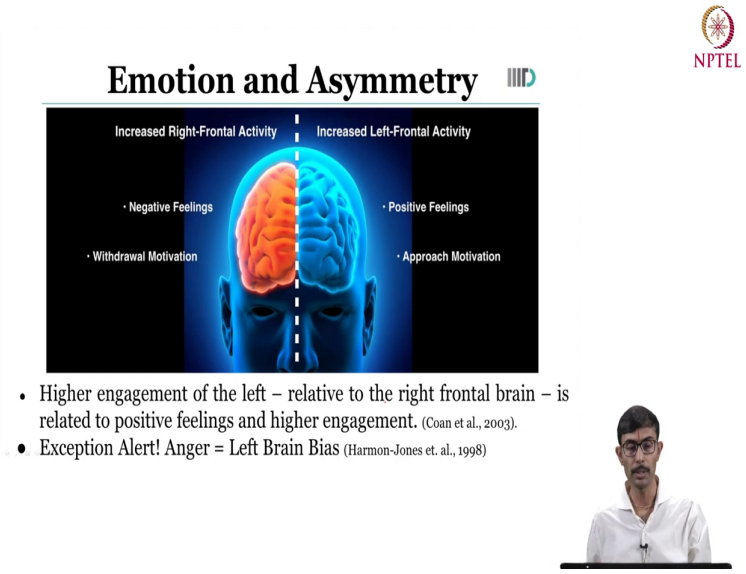

And building upon that we will be talking about one very interesting concept in the psychology of the emotion that is the emotion and the brain asymmetry. So, basically what happens in this case that, it is it has been found by the researchers that higher activation in the left region of the brain is found in relative to the right region of the brain when the individual is experiencing any positive feeling or experiencing higher engagement and this has been of course, given by Coan and the several other researchers the same thing.

So, what it means? So, for example, if you are feeling if you are experiencing a positive feeling if you are experiencing approach motivation you know more dominant motivation then you will have more brain activity in the left side of the hemisphere, but versus when you are experiencing let say some negative feeling such as let say you are experiencing sadness fear and all those kind of things or you are feeling less dominant when you are having a

withdrawal motivation then more increased right pre frontal activity can be observed in the brain.

So, that is what is the relation between the emotions and the brain asymmetry. But there is one exception to this thing which is the in case of the anger. In the case of the anger that we as we have seen before also and that in case of the anger even though anger is broadly characterized as a negative feeling, but more activity is found in the left frontal cortex of the brain.

So, this is where there is a single exception otherwise the science is very clear here that if you are experiencing a positive emotion you will have more brain activity in the left side of the hemisphere if you are experiencing a negative emotion you will have more activity, in the right side of the hemisphere and this simple test can be done to understand that which side of the brain is activated and accordingly what could be the type of the emotion that for example, an individual may be feeling or not right.

So, with that we today we finish at the emotion and the brain asymmetry and in the next session we will be talking about the emotional design right. So, let us look forward to the next session.