Social Behavior and the Brain: An Introduction to Social Neuroscience

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Week - 08
Lecture – 40

Hello and welcome to the course Social Behaviour in the Brain, an Introduction to Social Neuroscience. I am Dr. Ark Verma, an Associate Professor in the Department of Cognitive Science at IIT Kanpur. This is week 8 where we are trying to understand social effective processing and in this lecture we are basically going to understand about effect processing and some of its applications. Now so far we have seen that the right ventrolateral prefrontal cortex activity is associated with reduced activity in the limbic regions such as the amygdala and the dorsal anterior cingulate cortex and we have also seen that symbolic processing of effect is associated with both increased RVL-PFC activity and decreased limbic activity. So, what we have established so far is basically that this disruption of negative effect that we started this week with you know how does talking to others or expressive writing for that matter diminishes the feeling of negative affect, how does that really happen? It happens probably because of symbolic processing that is involved and that symbolic processing basically is linked to increased activity in the right ventrolateral prefrontal cortex and decreased activity in the limbic regions.

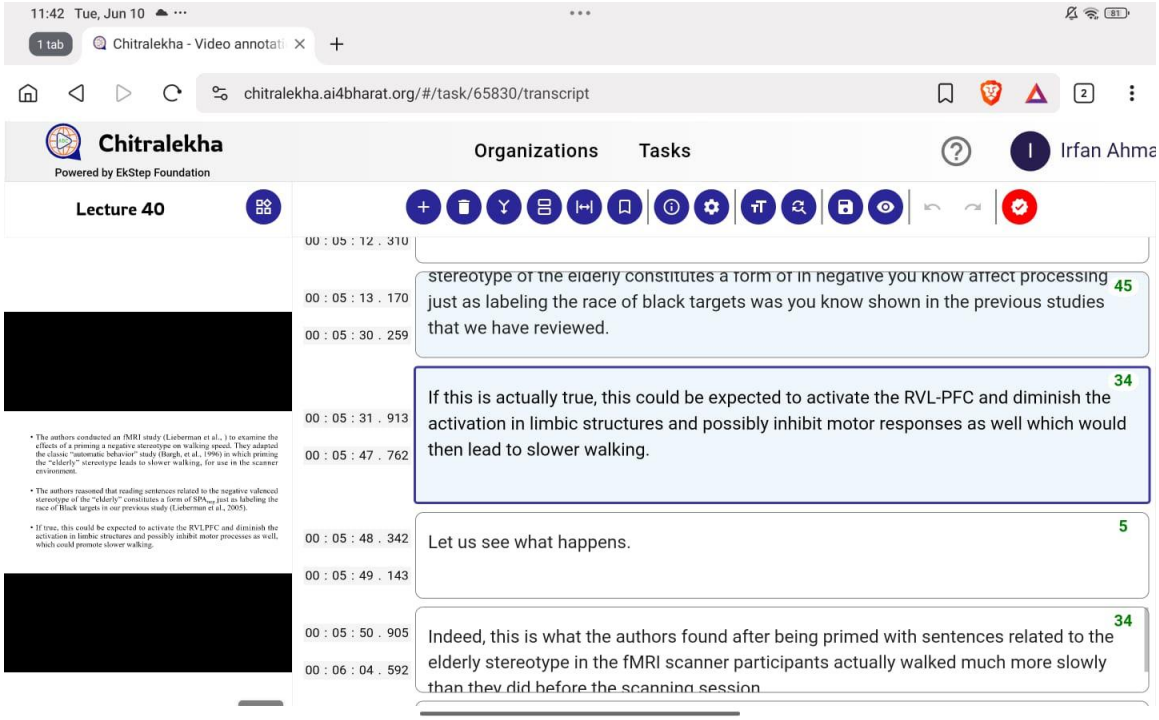
So, the insula, the amygdala and these other regions that are responsible for processing of affective or emotional information. We have also established so far in you know the previous lectures the role of the right ventrolateral prefrontal cortex in motor and behavioral inhibition. In light of these various effects a question that you know one could ask would be whether symbolic processing of effect which activates the RVL-PFC also has general inhibitory effects on behavior. So, let us try and ask this question.

It seems probable that the RVL-PFC produces different kinds of inhibition. Remember we have seen earlier that it is being shown to be involved in motor inhibition as well, in cognitive inhibition, inhibition of belief as well and we have seen in a bunch of studies that it is involved in the inhibition of affective responses. So, it is possible that the RVL-PFC produces various forms of inhibition simultaneously and perhaps symbolic processing of effect sets the various forms of inhibition in motion ok. So, it is probably what you know directs this. Now, this would certainly be consistent with claims of previous researchers that have opined that you know this kind of thought does paralyze action and the activity of the RVLPFC probably also leads to inhibition of certain kinds of actions as well.

For example, in a recent study Robinson and Wikowski found behavioral evidence indicating that symbolic processing of negative effect also leads to motor inhibition

observing that reading negatively valenced primes, but not neutral or positive prime words actually led to longer reaction times on a simple motor response task. Now, this is very interesting because if you look at a wide variety of you know mental disorders especially you know those linked with depression and anxiety. They are not only linked with feeling sad and they are not only linked with you know gloomy you know feeling and feeling low, but they are also linked with different kinds of motor profiles. And this is something that probably has you know not been explored in great detail that So, the amount of energy you know that is required to suppress this negative effect or the consequence of the negative effect that we are processing also and that we require to inhibit also inhibits motor action. So, people typically walk much more slowly, they will take longer to respond to say for example reaction time tasks such as the one that was explored in this particular study.

So, there seems to be a link between inhibition of effective processing as well as inhibition on motor tasks or motor activities. The authors Robinson and Wikowski you know or actually not Robinson and Wikowski the authors of this other study Lieberman and colleagues actually wanted to examine the effects of prime of priming a negative stereotype based on walking speed. So, we are talking about motor inhibition. So, they wanted to basically measure the effects of you know negative primes or negative stereotype priming on walking speed. So, what they did was they adapted the classic automatic behavior study you know Chen and Bark 1996 in which priming the elderly stereotype led to slower walking for use in the scanner environment.



So, they basically wanted to do the fMRI version of this task. Now authors reasoned that reading sentences related to the negatively valence stereotype of the elderly constitutes a form of in negative you know affect processing just as labeling the race of black targets was you know shown in the previous studies that we have reviewed. If this is actually true, this could be expected to activate the RVL-PFC and diminish the activation in limbic structures and possibly inhibit motor responses as well which would then lead to slower walking. Let us see what happens. Indeed, this is what the authors found after being primed with sentences related to the elderly stereotype in the fMRI scanner participants actually walked much more slowly than they did before the scanning session.

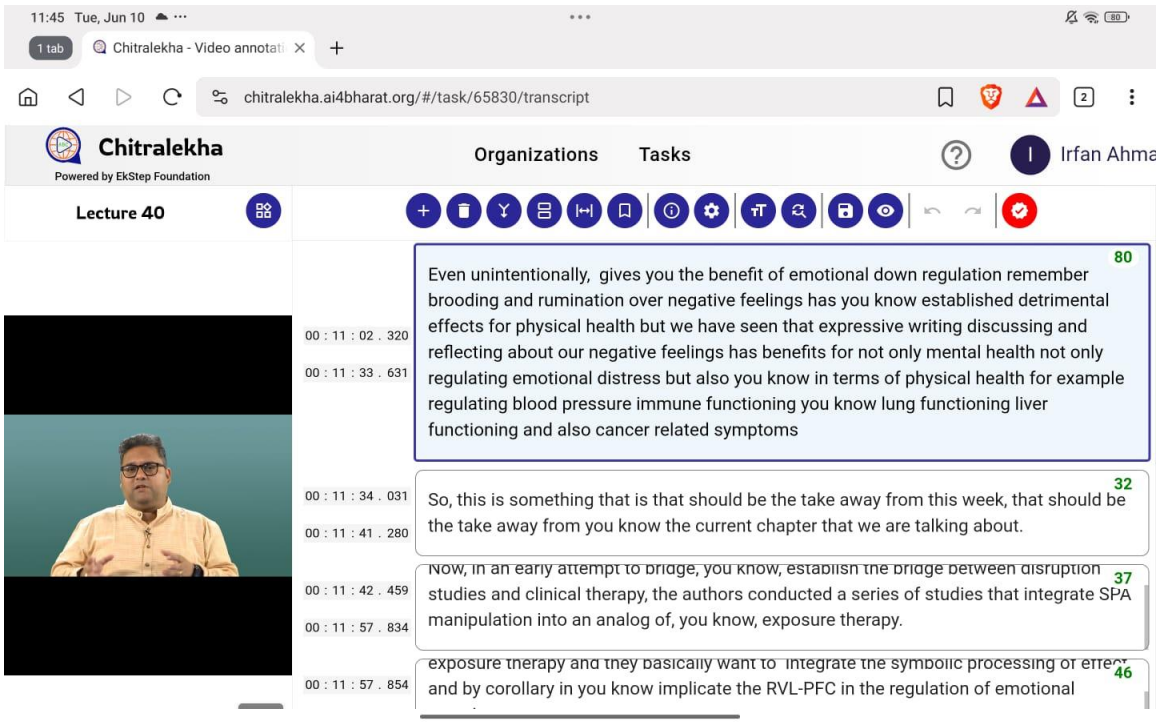
Although again part of this effect could have been just the result of general exhaustiveness or sluggishness that is typically felt after scanning sessions. The authors were interested to understand how neural activity during the sentence priming task related to changes in the walking speed from pre to post scanning you know performance. So, they wanted to sort of you know correlate what is happening in the brain with respect to how they how these people are walking after that. So, the authors found that the RVL-PFC was the only region of the brain for which greater activity during the priming of the elderly stereotype was associated with more slowing from pre to post scanning walking measurements. So, this again re-establishes what we have been saying so far in the previous four lectures of this week that the RVL-PFC seems to be important for inhibition not only of cognitive or affective responses but motor responses as well.

Now as in the previous studies, the authors also observed greater increases in RVL-PFC activity which was associated with reduction in the activity in the limbic areas including the amygdala and the dorsal anterior cingulate cortex. However, interestingly greater activity in the RVL-PFC was also associated with less activity in the cerebellar vermis which is a interesting region that has been associated with motor processes related to walking and lower limb control. So, it seems somehow that the RVL-PFC is modulating the activation in this cerebellar vermis region also which is linked with you know lower limb control and so on. So, this is again a very interesting sort of finding which or whose consequences may be pondered upon. Also during the presentation of sentences related to the elderly compared to the control sentences this same region the cerebellar vermis of was actually found to be less active.

So, in this study we can see that processing negative effect or symbolically processing negative effect not only activated the RVL-PFC and sort of decrease or attenuated the limbic responses but it also attenuated activity in a region linked to motor preparation and to walking behavior. So you can see how these three things are linked together, suggesting that symbolic processing of negative effect may actually produce motor inhibition as well as emotional regulation or regulation of cognitive processing. Also, it is notable that the RVL-PFC and limbic sort of interaction effects that are occurring in this study you know they they occurred in this study despite any plausible impetus for

subjects to intentionally engage in emotional regulation. So, again this is and we have talked about this earlier as well there is no conscious intention or you know active effort required for emotional down regulation for the you know recruitment of this RVLPFC area. Consequently, it appears that the desire to regulate one's emotional responses may not really be necessary to receive the regulatory benefits of activating the RVLPFC consistent with the previous research on the benefits of writing about imaginary traumas.

So again this is something that we started this whole week with where we are talking about you know the benefits of expressive writing, the benefits of reflecting and discussing about our negative feelings and even if the traumas are you know even imaginary in one of the studies we have seen that even when people were asked to think about and you know talk about imaginary traumas they still experience some kind of emotional down regulation. Now moving on to the clinical applications of what we have been discussing so far in this week. Now as symbolic processing of effect appears to regulate limbic responses without the intention even to do so this could actually provide a very interesting mechanism by which putting feelings into words will have benefits for regulating emotional distress and for mental health in in a general sense. So again something that I was saying in the beginning of this week talking to others about your negative feelings. maybe you know feelings of sadness or of anger or of frustration cynicism all of that talking to others about our feelings or maybe maintaining a diary where we are engaging in expressive writing actually has benefits even if you are not consciously wanting to down regulate even if you just do it say for example you feel angry over somebody and it happens again and again during several times during the day if you start writing that down you will see that there is a different perspective that emerges at sort of Even unintentionally, gives you the benefit of emotional down regulation remember brooding and rumination over negative feelings has you know established detrimental effects for physical health but we have seen that expressive writing discussing and reflecting about our negative feelings has benefits for not only mental health not only regulating emotional distress but also you know in terms of physical health for example regulating blood pressure immune functioning you know lung functioning liver functioning and also cancer related symptoms So, this is something that is that should be the take away from this week, that should be the take away from you know the current chapter that we are talking about.



Now, in an early attempt to bridge, you know, establish the bridge between disruption studies and clinical therapy, the authors conducted a series of studies that integrate SPA manipulation into an analog of, you know, exposure therapy. So, they sort of tried to develop a particular kind of a therapy which they are calling exposure therapy and they basically want to integrate the symbolic processing of effect and by corollary in you know implicate the RVL-PFC in the regulation of emotional experience. So, in one study, Tabibnia and colleagues 2008, they presented participants with a number of high arousal negative images from the IAPS database and on day 1, while the skin conductance response is being measured. So, this is something that will go across a few days, skin conductance response is being measured and the participants are seeing highly arousing negative images. Each of the pictures were presented for a total of 6 times throughout the session to mimic the repeated exposure involved in exposure therapy.

Some of the pictures were presented alone on each trial whereas others were presented and then followed by either a neutral or a negatively valence word on each trial. So, some pictures were presented just alone you will just see a picture or in some cases you will see a picture followed by a neutral word or a negatively valence word. Now, this exposure therapy I just want to sort of correct myself, it is not something that they have sort of developed themselves in this study, but it is a previously existing paradigm, they are sort of creating an adaptation of this particular therapy. Now, once a picture coming back once a picture was presented alone with a negative word or with a neutral word the picture was presented the same way for all the trials ok. So, if the picture was presented

followed by a word in all the trials the same picture will be presented with a negative or a neutral word.

However, the specific word, the specific negative or neutral word would be varied in different presentations. So, for example, you see a picture of somebody, you know, slitting somebody's throat and the word comes after it, the word can change. But every time this picture will come, it will be accompanied by a particular word, you know, just coming after it. So the specific words used varied with each presentation such that a picture presented with negative words would be presented with six different negative words across the six different presentations thus preventing strong associations to a particular word while this picture is being processed. Now exposure therapy is based on the premise that allowing individuals to fully experience an emotional response to let us say a feared stimulus on multiple occasions will allow that emotional response to subside over time.

Some kind of a habituation basically happens and if you are seeing that kind of stimulus again and again if you are seeing being exposed to that kind of stimulus again and again the automatic emotional response that comes through it whether that is of fear or of anger will eventually subside. So, in light of this, the temporal placement of the effect labels was deemed critical. Where do you place these effect labels? It was deemed critical. So, what did they do? The authors presented the words 3.5 seconds after the pictures to allow a full physiological response to emerge.

So, you know, they are measuring skin conductance response, probably other measures such as heart rate and other things as well. to basically interleave you know so there is this interleaving time between the picture and the word so that the full physiological response has emerged and then that word is read. Now since the disruption theory posits that this labeling could reduce these responses the simultaneous presentation of pictures and words might actually present the exposure effects from occurring. So, this is their you know rationale for why they have kept this gap of 3.5 seconds.

Now a week after the first session participants returned for a second session on day 8 which is participants were again shown the same pictures that was shown on the day 1 while SCR was again measured. However, on day 8 no words were shown for any of the conditions. So, in this second session there are no words only the pictures are being presented 6 times in 6 different presentations. By comparing the SCR to just pictures in each condition across the two sessions, so on day 8 versus day 1, the authors were hoping to determine the extent to which repeated exposures on day 1 led to diminished SCR a week later and also whether the addition of the effect labels actually enhanced this disruption. As expected, the pictures that had been presented alone on day 1 produced diminished SCRs on day 8.

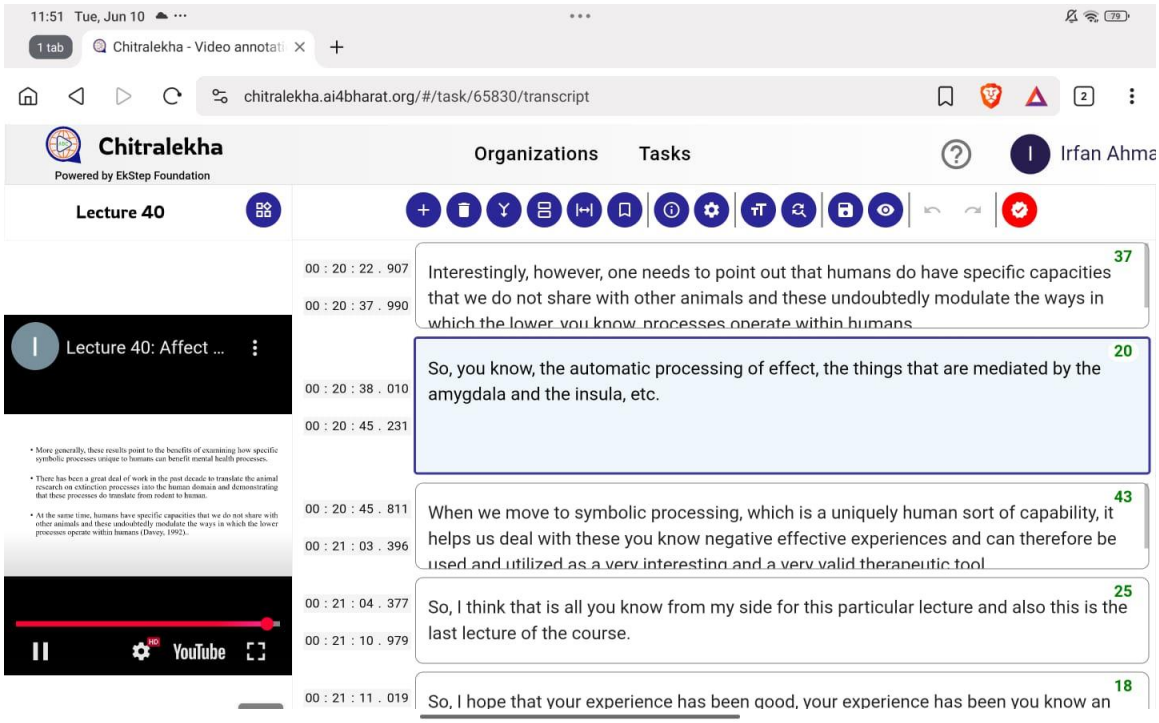
So, the pictures that were without presented without any words and they were repeatedly presented on day 1 actually you know ended or actually resulted in slightly diminished skin conductance responses on day 8. The same was also true for pictures that were presented with negative words on day 1. However, pictures presented with neutral words on day 1 only showed a trend in this direction. So, there was no significant difference that they found. Interestingly, critically although both the pictures that were shown alone and shown with negative words showed diminished SCRs on day 8, the reduction for the negative word condition was greater than the reduction for the no word condition.

So, the delta between how much by how much the SCR is reducing is more for the negative word condition where labeling is involved as opposed to the you know condition where no word was presented along with the picture. This same effect was observed in another study by the same authors examining the SCRs of individuals with spider fears to the pictures of spider. So it seems therefore that this affect labeling thing is actually working and it is actually helping in reducing the phenomenal feeling of negative effects of fear, anger, etc. across different days, across different sessions. In each condition in the second study participants produced smaller skin conductance responses to spider pictures on day 8 as compared to day 1 just replicating the first study and this effect was significantly greater in the negative words condition as opposed to the condition where no words were presented along with the picture.

Interestingly, the effects of the negative words shown on day 1 generalized to new pictures of spiders that were not shown day 1 as well and had never been paired with words. So, interestingly this effect of labeling actually generalizes to new pictures as well which is a very interesting and important finding. So, all in all these results can actually suggest that pairing effect labels with repeated exposures of fear stimuli can actually lead to long term reductions in the emotional responses to those stimuli. So, it basically tells us that indeed this idea of symbolic processing of effect recruiting the RVL-PFC and this whole idea of labeling can actually be combined with repeated exposures to actually alleviate you know negative affective experiences such as fear or anger in individuals and therefore can actually serve as a very important very interesting therapeutic tool. More generally you know if you sort of step back a little bit these results point to the benefits of examining how specific symbolic processes unique to humans can benefit mental health processing.

Mental health process again it tells us that how symbolic processing really can be used as a therapeutic tool to you know address a lot of mental health problems that people suffer from and and you know which are typically associated with heightened or you know more detailed processing of negative information. And therefore, in this direction there has been a great deal of work in the past decade to translate the animal research on extinction processes, fear extinction processes into the human domain and demonstrating that these processes do indeed you know translate from rodent animal models to human

models. So, it is that you know these things work in pretty much similar ways across animal species as well as humans. Interestingly, however, one needs to point out that humans do have specific capacities that we do not share with other animals and these undoubtedly modulate the ways in which the lower, you know, processes operate within humans. So, you know, the automatic processing of effect, the things that are mediated by the amygdala and the insula, etc.



When we move to symbolic processing, which is a uniquely human sort of capability, it helps us deal with these you know negative effective experiences and can therefore be used and utilized as a very interesting and a very valid therapeutic tool. So, I think that is all you know from my side for this particular lecture and also this is the last lecture of the course. So, I hope that your experience has been good, your experience has been you know an enriching one. getting familiar with the annals of social neuroscience and i hope you know a lot of you give the exams and sort of do well there and if there are any doubts you can leave them on the forum and we will be responding to them thank you