

Social Behavior and the Brain: An Introduction to Social Neuroscience
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Week - 07
Lecture – 32

Hello and welcome to the course Social Behaviour in the Brain and Introduction to Social Neuroscience. I am Dr. Ark Verma, an associate professor at the Department of Cognitive Science, IIT Kanpur. This is week 7 and in this lecture, we are going to talk about this concept of competing hypothesis, whether you know the emotions or the asymmetrical frontal cortical activity is being governed mainly by direction of motivation versus whether it is affected by the direction of valence. Now, as we mentioned in the end of the last lecture also there are two competing hypotheses which basically need to be separated the asymmetrical frontal cortical activity. So, for example, the higher frontal cortical activity in the left hemisphere relating to positive effect versus you know higher frontal cortical activity in the right hemisphere relating to negative effect.

Basically, how is this happening because frontal cortical activity is also linked to you know higher positive valence is also linked to approach motivation whereas, negative valence is also linked to withdrawal motivation. So, in this particular lecture we are going to try and see how these two can be you know teased apart and how can we basically understand the dynamics between motivational the dimension of motivation and the dimension of valence. Now, two independent research groups have observed that trait approach motivation was related to greater left than right frontal activity at resting baseline. So, remember left frontal activity is linked to both positive effect and greater approach motivation.

Now trait approach motivation was typically assessed in these studies using Carver and White's behavioral activation and behavioral inhibition scale which was based on Gray's theory of motivation that positions that a behavioral activation system and a behavioral inhibition system motivate and guide behavior. You may refer to Gray's theory of motivation where he talks about two things, he talks There is one behavior activation system which basically guides the approach behavior and then there is a behavioral inhibition system which guides the avoidance behavior things that you do not like things that you do not get enticed by they are basically governed by the behavioral inhibition system and it tells your you to take a step back and avoid those kind of stimuli. BAS the behavioral activation system is a motivational system that would be sensitive to signals of conditioned reward, non punishment and escape from punishment. So, whenever we are say for example, when you behave properly or say for example, when you are teaching

your children something or animal something for that matter I will you can switch between animal and human examples as far as conditioning is concerned to a certain degree although. So, where we are conditioned to get reward you smile to somebody you expect them to smile back or you behave properly you you know achieve good grades you expect your parents and your colleagues to you know reward you by positive behavior.

So, the behavioral activation system is a motivational system that is sensitive to detecting instances of conditioned reward, instances when where you are not going to be punished and instances where you just escaped punishment. all positive instances all instances that will basically activate your behavior or spur you on to doing something all right. So, its activation causes movement towards the goals. So, all of these you know instances where you have to move make a forward step towards your goals that is what is governed by the behavioral activation system. On the other hand, the behavioral inhibition system is hypothesized to be sensitive to signals of conditioned punishment, oh I have done this I am sure my mother is going to scold me or my class teacher is going to scold me or I am going to be fined by the government anything like that.

The screenshot shows a web browser window with the URL chitralekha.ai4bharat.org/#/task/65822/transcript. The page title is "Chitralekha" and it is powered by EkStep Foundation. The interface includes a navigation bar with "Organizations" and "Tasks" tabs, and a user profile for "Irfan Ahma". The main content area is titled "Lecture 32" and features a video player on the left and a transcript on the right. The video player shows a man speaking, and the transcript is displayed in a grid of text boxes with timestamps. The transcript includes the following text: "going to get any rewards, so it is not really you know enticing for you to engage in", "Things that are novel you know there is always a fear of novel people do not understand sometime new things and therefore, there is a basic tendency of avoiding them people are not very comfortable with the lot of changes and new things you know around them again it depends with personality", "But for the example that novelty and also innate fear say for example, you are you know going in a new place where you have not been before and suddenly it becomes dark and you are walking on the path, you do not know the path, you do not know you know where anybody in that area, it is let us say you know darker time of the evening.", and "Obviously, there will be these innate fear, innate fears will also be related to fear".

So, conditioned punishment you are not going to get any rewards, so it is not really you know enticing for you to engage in that behavior. Things that are novel you know there is always a fear of novel people do not understand sometime new things and therefore, there is an there is a basic tendency of avoiding them people are not very comfortable with the lot of changes and new things you know around them again it depends with personality

types and so on. But for the example that novelty and also innate fear say for example, you are you know going in a new place where you have not been before and suddenly it becomes dark and you are walking on the path, you do not know the path, you do not know you know where anybody in that area, it is let us say you know darker time of the evening. Obviously, there will be these innate fear, innate fear will also be related to for example, spiders and roaches and so many other things that you do not know and you do not understand. So, the behavioral inhibition system basically guides our behavior in these instances, it tells us to take a step back, it tells us to move away from these kind of stimuli or these kind of events or activities.

Now, so as I said the BIS inhibits behavior, it increases arousal for you know prepares for fight or flight kind of response, prepares for vigorous action and it increases magnifies our attention towards our systemically. Suppose you are you know walking somewhere in the dark and you know step on a rope, it is a rope. But, it is dark it is let us say that you know wet monsoonish season there is you know tall grass you know nearby and there is all possibilities that there might you might have stepped on the snake. So, it basically you know magnifies your attention towards the object that you stepped on. thinking that oh I might have stepped on the snake.

It might just be a rope or a pipe or anything, but in these kind of situations which evoke fear, which evoke avoidance, it magnifies your attention towards those stimuli. You are walking somewhere in the dark, you hear some noise, you do not know what that noise is, who is calling out your name or for example, if it is an animal noise you know it is a growl or it is a you know it is a uncomfortable animal noise that you are not sure of, then obviously you will totally you know totally orient and direct your attention towards understanding where that noise is coming from, resolving who that noise be from and so on. So, the behavioral activation system and the behavioral inhibition system are both very important in their own function. One spurs you on to moving towards the goal, acting projecting towards that goal and the other one spurs you on to taking a back step moving away from that goal. Now Carver and White Carver and White's 1994 you know BIS and BAS questionnaires they typically assess individual differences in sensitivity to you know these let us say pleasant or unpleasant stimuli or scenarios.

For instance let us look at some examples here sample items from the BIS scale include oh I worry about making mistakes because you know that when you make mistakes there is a conditioned punishment that you can expect. I have very few fears compared to my friends you know it is reverse code if you have very fears then obviously you will score reverse or low on the BIS scale in that sense. Similarly, sample items from the BAS include things like it would excite me to win a concept you know it is a approach motivation it is something that excites you leads to rewards and leads to you know moving a particular goal. or for example, I go out of my way to get things I want and I crave an excitement and new sensations both of these are motivational you know they are

approach motivational questions you want to approach these things you want to go towards these things this is how your behavior is being directed or governed. Now soon after observing the relationship between the trait approach motivation and relative frontal cortical activity, the authors notice that all past studies on asymmetrical frontal cortical activity and emotion had confounded emotional valence with motivational direction.

Again something that were briefly mentioning earlier that when they tried to you know when these authors tried to study the relationship between trait approach motivation and relative frontal cortical activity. The authors find that most of the studies that have actually looked at this difference they have actually confounded the asymmetrical frontal cortical activity and you know when they were studying that they have confounded emotion and approach motivation. So, they have not really been able to study these effects separately. So, far researchers have claimed that relatively greater left than right frontal cortical activity reflected approach motivation, higher approach motivation and positive effect whereas, relatively greater right than left frontal activity reflected greater withdrawal motivation and negative effect. So, now, what do we have higher left frontal activity indicates both approach motivation and positive effect higher right frontal cortical activity indicates what negative valence and avoidance or withdrawal motivation.

So, this is established by now. these claims typically fit well into dominant emotion theories that associated positive effect with approach motivation and negative effect with withdrawal motivations. So, far so good this is basically what we have been seeing you know in the research that has that we have reviewed so far. However, if you go back few years if you look at some of the older theories you will find that approach and positive effect were not always associated with each other it is probably more recent phenomena or recent bunch of findings that have indicated that. For example, anger is a negatively valence emotion that evokes behavioral tendencies for approach see anger is negative valence it should incite higher left front right frontal activity but it is also linked with tendencies of approach.

So, if you go by that standard it should actually incite higher left frontal cortical activity. What does it do? Why does it do so? Let us look at that. So, anger is associated with attack particularly offensive aggression. So, if you are very angry your you know prone to attacking somebody if either verbally attacking or physically attacking, but you saw anger spurs you on a lot of times to offensive aggression. Offensive aggression is you know different in the sense that it ask you to move toward the stimuli that is causing you that anger you know if there is somebody that is you know abusing you or mistreating you, you are prone or you are motivated to go and push them fight with them or verbally you know talk loudly to them and so on.

So, the offensive aggression that is associated with anger can be distinguished from defensive aggression, which is associated with fear. When you are afraid, then you have

defensive aggression, you move away aggressively, you move away rapidly from the stimulus that is causing fear. Now, here you can differentiate between offensive aggression and defensive aggression. Also, offensive aggression leads to attack without attempts to escape whereas, defensive or fear based aggression leads to attack only if escape is not possible. See if you put somebody in a corner while they are being defensively aggressive they are just trying to avoid interaction and so on, but if you put them in a corner there is no escape is possible then the person will anyways fight back.

So, that is not really the hallmark of offensive aggression that is basically defensive aggression sort of reacting in a particular way. Offensive aggression interestingly is basically linked to when you are trying to escape, when you are trying to attack without escaping all right. So, in demonstrating that organisms actually evident offensive aggression and that this is an approach behavior, Legerspetz actually found that under certain conditions mice would actually cross an electrified grid to attack another mouse. So, sometimes you know the organism is spurred on to act on this aggression, they how do they acted they act upon it by attacking other individuals, animals or humans does not matter. Now Lewis and colleagues conditioned infants to pull a string to receive a reward.

Let us study this experiment. So, they conditioned infants to pull a string to receive a reward. What did they find? They found that infants who displayed anger when the reward was withdrawn. So, they were shown something and they were not given it. demonstrated the highest levels of joy, interest and required arm pull whenever the learning portion of the task was reinstated.

So, they basically initially displayed anger, they actually expected the reward. So, when the reward was withdrawn, they demonstrated the highest levels of joy and interest and they required the arm pull when the learning portion of the task was reinstated. What do these results tell us? They tell us that subsequent to frustrating events you know the reward is being taken away, anger may maintain and increase task engagement. Oh this time I could not win it, next time I will come out with more practice, I will come out with more vengeance, I really badly want it. You know all of us experience that sometimes and it basically spurs on task engagement, it spurs on motivation, it basically puts you on the you know chart to achieve it.

Additional support for the idea that anger is associated with approach motivation also comes from research testing the conceptual model that integrated reactance theory with the learned helplessness theory. We have talked we can talk about these theories in more detail later, but the idea is that there is also support from other kinds of theories that say oh yes anger is actually an approach motivated you know concept rather than an avoidance of motivated concept. Now, according to this model how individuals response to uncontrollable outcomes depend upon their expectations of being able to control the outcome and the importance of the outcome. Suppose, you are competing you know you

are preparing for a particular exam, you are competing very hard, you are studying very hard, you are trying to sort of you know do everything that is in your power to win that. You will be able to do that only if you have a certain expectation or belief that you are able to or at least the outcome of your result, outcome of your exam is in your control and also how important that outcome is for you.

If that outcome is not very important for you, then your motivation will go away in some time and you will sort of give up. but if that you know outcome is very very important for you and you still have the belief that if you work hard if you study hard you can actually do that then anger or some kind of this you know some degree of this aggression can actually act as increasing your task engagement and increasing your approach motivation. Now, so this is basically what I was just explaining. So, when an individual expects to be able to control outcomes and those outcomes are important, those outcomes you know are found to be uncontrollable, psychological reactance should be aroused. So, in some cases when the outcomes are found uncontrollable, then certain kind of reactance should be aroused you know now I cannot do anything.

So, initially when you are expecting control, but after 4, 5 attempts, 10 attempts you found out that however hard I work I am not going to win this, I am not going to qualify. The first few bouts of uncontrollable outcomes should then arouse reactance that is a motivational state aimed at restoring control. Now, after several times this is happened after several exposures to uncontrollable outcomes these individuals should become convinced that they cannot control the outcomes and should show decrease motivation. You know if you if you doing it several times if you still not being able to control the then obviously the motivation comes down, they will show decreased motivation, they will show a kind of learned helplessness. Remember the learned helplessness experiments we have talked about in previous courses, when a rat was basically you know everything he was doing was not being able to avoid the shock, then the rat basically left it and just kept getting shocks without making any attempts to move away from the shock.

And this is again what happens to a lot of people who get dejected in life who gets for disappointed that in spite of them putting everything on the line, despite of them doing and trying everything that they can, if they are still not getting the outcome, then they sort of you know leave it on fate for example, and they basically get into a state of learned helplessness. So, in other words this kind of reactance will precede helplessness for individuals who initially expected control you know initially everybody starts thinking oh I will do this and I will attain this and it happens in most of the cases, but in fewer cases where it does not happen aspects like learned motivation might learned helplessness might kick in. In one of the studies that tested this model, individuals who expected angry feelings in response to let us say unsolvable problem had better performance and were presumably more approach motivated on a subsequent cognitive task than did participants who exhibited less anger. So, here you can also see that anger may

sometimes act as a fuel for motivation, it may act as a fuel for putting in more energy, more effort and basically you know engaging yourself continuously and for larger periods of time for a particular task. Also there has been different research as well.

The screenshot shows a web browser window displaying a video lecture titled "Lecture 32: Testing..." on the Chitrallekha platform. The interface includes a video player on the left with a progress bar and a list of annotations on the right. The annotations are numbered and contain text extracted from the video, such as "So, other research has revealed that state anger that is momentarily you know you are angry not really angry as a person, but you are angry in that specific state ok." The interface also shows the user's name "Irfan Ahma" and various navigation icons.

So, other research has revealed that state anger that is momentarily you know you are angry not really angry as a person, but you are angry in that specific state ok. State anger relates to high levels of self assurance physical strength and bravery you know if you are well built if you have you know some kind of power backing you have money you have position etcetera etcetera. Then, you know state anger will be more prevalent it will be more easy to come by and these are also inclinations associated with approach motivation. If you have everything you have the luxury of being angry and trying to hurt the other person. Lerner and Keltner actually found that anger both trait type and state type is associated also with optimistic expectations whereas fear is associated with pessimistic expectations see why do you why would you get angry you would get angry because anger would get you something you are getting angry at let us say your maid or your house help or somebody else scolding at them may be your siblings for example, or your parents for example, you know when I get angry on these people they will actually do the desired thing.

So, I am getting angry for them not paying for my trip if I get angry if I make a fuss they will be you know they will influence positively in a sense that they will allow me to go. I am getting angry on my student because I am hoping that getting angry on the student will put him on the right path and the student will work hard create better outcomes and

so on. So, anger is very interestingly therefore, you can see it is linked with optimistic expectations. When you have zero expectations you will not be angry there is no use for being angry anyways because however much angry I am at let us say person x and I know that person x is not going to give any you know better outcomes in the future however well they try then there is no use for getting angry then you will try and find other ways to express yourself ok. Fear on the other hand is associated with pessimistic expectations.

You are afraid of people events situations where you think that oh something bad is going to happen. You are afraid of people for example, when they can actually harm you in actual ways physical or non-physical. You are afraid of things say for example, oh there might be a snake that might bite me and it might be lethal for me. So, it is also very interesting that how anger is associated with optimistic whereas, fear is associated with pessimistic expectations. Similarly, happiness is also associated with optimism making anger and happiness appear actually more similar to each other than in their relationship than you know with the relationship between optimism and then the relationship between fear and anger ok.

So, happiness is associated with optimism, anger is associated with optimism and hence happiness and anger might be more similar to each other than for example, fear and anger. So, Lerner and Keltner interpreted these kind of findings as being the results of their appraisals of their appraisals associated with anger. it seems equally possible that anger could also be an approach motivational character that is causing the relationship between anger and optimism. See it is quite possible because optimism also leads to approach motivation, anger is also leading to some kind of approach motivation and it is because both of them provide approach motivation there can be a link, there can be a hypothetical relationship between anger and optimism. So, what we are trying to establish here is that anger is a very interesting candidate to study because it leads to approach motivation despite being a negatively valence emotion.

Now, also it seems that anger may create optimism because anger engages the approach motivational system which produces greater optimistic expectations. So, we sort of bringing the full circle here. Other evidence supporting the idea that anger is associated with an approach orientation comes from research on bipolar disorders. So, emotions of euphoria and anger that you see you know during many phases of bipolar disorder basically lead people on to do something they do not withdraw they rather act they will shout they will move things here and there they will act out that anger. So, here again you can see an evidence of the fact that anger might be associated with approach action and approach and action orientation.

And this is again what we are saying here. So, both euphoria and anger may be approach oriented processes and a dysregulated or a hyperactive approach system may basically

underlie mania. Now, moving slightly away research suggests that hypomania or mania involves increased left frontal brain activity and approach motivational tendency. So, in cases of bipolar disorder when there is increased mania it involves heightened left frontal brain activity and approach motivational tendencies. So, this research basically tells us that the individuals who suffered damage to the right frontal cortex are more likely to evidence mania. So, in that sense you will see there is a slight you know discourse, there is a slight detour to how the neural or how the brain regions are reacting to this.

So, this research is also consistent with the view that mania may be associated with increased left frontal activity and increased approach tendencies because the approach motivation function of the left frontal cortex are released and not restrained by the withdrawal system in the right frontal cortex. So, basically what they are saying is that while these approach tendencies are linked mainly to the left frontal cortex, they seem to be somehow controlled by the right frontal cortex. Now, if right frontal cortex is you know fine and it is working normally, it will inhibit the approach or the mania tendencies that may be manifested through the left frontal cortex. But in cases where the right frontal cortex is damaged, then the things are then these tendencies are released and they are not being able to restrained by the right frontal cortex and therefore, people who are suffering from right frontal cortex evidence mania. again I will just revise this for you what we are saying so far is anger is linked to higher approach motivation and positive effect to a certain degree or let us say anger is linked to higher approach motivation higher approach motivation is linked to higher left frontal cortical activity all right.

Now, higher left frontal cortical activity is also associated with positive outcome positive appraisal and so on. Alright, people who suffer from mania, people who suffer from the manic episodes in bipolar disorder, what they do is they act out on their manic tendencies, they act out, they shout, they throw things here and there and they are there you know violently acting out. Now, what they are saying is that when people are suffering from right frontal cortex damage that is when they actually you know experience more manic episodes, more manic symptoms. Why is this happening? This is happening because probably what the right frontal cortex is doing is it is curbing or you know controlling the manic urges, it is controlling the approach tendencies that are being manifested by the left frontal cortex. So, that is why when people suffer from right frontal cortical damage then they experience more manic episodes because the left frontal cortex you know approach motivations their acting out tendencies are not being restrained properly all right.

So, this is basically the connection between right frontal left frontal cortex approach and manic episodes. Also an interesting thing here is that lithium carbonate which is basically a treatment for bipolar disorders actually is been found to reduce aggression, suggesting that anger and aggression correlate with other symptoms of bipolar disorder both approach tendencies. In addition trait anger has also been found to relate to high levels of

assertiveness and competitiveness. People who are generally by nature see there are trait aspects and state aspects. State aspects are momentary aspects that happen in a given situation, trait aspects are aspects of more stable aspects of your personality.

So, people who are high on trait anger typically are also high on competitiveness and assertiveness they do not easily give way they are you know up for a fight they are up for a struggle at all times and when you are constantly you know prepared for a fight when you are constantly engaged for a fight then obviously, the trait anger will be higher and again the approach motivation will be higher the left frontal cortical activity is higher. Now, other studies have associated anger and with trait approach motivation or more specifically trait behavioral approach or BAS also. So, let us look at some of these studies. So, in two studies trait BAS behavior activation system as assessed by Carver and White's scale was positively related to trait anger at the simple correlational level as assessed by Buss and Perry is aggression questionnaire. So, anger approach and aggression are all supposed to be linked together.

The screenshot shows a web browser window displaying a video player for 'Lecture 32' on the Chitralekha platform. The video player is on the left, showing a man speaking. The transcript on the right is as follows:

Text	Start Time	End Time
So, in two studies trait BAS behavior activation system as assessed by Carver and White's scale was positively related to	00 : 26 : 44 . 106	00 : 26 : 58 . 209
12 So, anger approach and aggression are all supposed to be linked together.	00 : 26 : 58 . 489	00 : 27 : 02 . 470
15 Carver also found that trait BAS predicts state anger in response to situational anger manipulation	00 : 27 : 03 . 290	00 : 27 : 10 . 615
46 So, if you are having a high trait anger it basically also is able to predict you know state anger you know higher state anger in response to situational anger manipulation basically when situations are created such that the person is incited to be angry.	00 : 27 : 10 . 635	00 : 27 : 25 . 601
35 So, if you have a high trait of anger, it can also predict higher state anger in response to situational anger manipulation, which occurs when situations are created to incite the person to be angry.		

Carver also found that trait BAS predicts state anger in response to situational anger manipulation. So, if you are having a high trait anger it basically also is able to predict you know state anger you know higher state anger in response to situational anger manipulation basically when situations are created such that the person is incited to be angry. If the activation system is there if the activations if people are highly sensitive to you know activation symptoms then they will show higher situational anger manipulation. Again as we just saw previously these results support the hypothesis that

anger is related to approach motivation. So, all of this is just establishing that anger is related to approach motivation.

Now, given this large body of evidence that suggest that anger is often associated with approach motivation, the authors went on to examine the relationship between anger and the relative left frontal activation to test whether the frontal asymmetry left versus right basically is coming out from emotional valence or motivational direction or a combination of emotional valence and motivational directions. So, I leave you here I want you to sort of you know grasp whatever we have done so far and in the next lecture we will attack this question in more detail. Thank you.