Social Behavior and the Brain: An Introduction to Social Neuroscience
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Week - 01
Lecture – 03

Hello and welcome to the course Social Behavior in the Brain, an Introduction to Social Neuroscience. I am Dr. Ark Verma, an Associate Professor at the Department of Cognitive Science in the Indian Institute of Technology, Kanpur. This is week 1 where we are trying to understand the representations of self and the other and in this lecture we will try and move towards a more systematic, a more theoretically bound framework to observe how do we look at self-representations versus other representations. Remember in the previous lecture I mentioned in much detail that the whole point of self-awareness or at least an important component of self-awareness is has to be the ability to be able to discriminate one's own experiences and one's own mental states from those of others. To take this discussion forward I borrow from the social cognitive neuroscience approach that is propounded by Zaki and Ochsner in 2011 and I am basically going to talk a little bit about their theoretical framework in order to what social cognitive neuroscience approach has to offer to this question of self-awareness or the representation of self versus the representation of others.

Now as I have said previously several theoretical and philosophical positions have suggested that individuals understand about themselves or others by using one as a reference for other. For example if I see somebody feeling sad or if I see somebody feeling angry I would immediately you know put myself in their shoes or immediately put myself in that situation and try and figure out what that person might be feeling. by comparing it to what I might feel if I were in that position. This is again very loosely referred to as empathy but there are formal definitions of empathy that we will talk about but just understand this.

How do we understand or how do we infer others mental states? you know easy or it would be very easy if we were to be able to experience the same. How do we do it? We put ourselves in that same position. For example, if you see somebody being talked to in a rude manner, in an unkind manner, you are looking at the reaction on that other person's face who is being talked to in such a manner you will you know infer that oh this person must be sad or disappointed or annoyed because that is how I would feel if somebody would talk to me in that same manner So, what I am doing here is I am trying to infer the mental state of this other individual by using myself as a reference point. How will I feel if I am talked to in a rude manner? I will feel sad, disappointed, maybe angry and that is probably what this other person is also feeling. So, this is one way.

The other thing is say for example in perception of pain, if as I said in the previous class pain is something of a learned experience, so what happens is if let's say somebody gets you

know brushes against a wall or you know stops their toe against the door and so on and they give a particular kind of reaction as if they are pained and as if they are experiencing this physical discomfort next time we undergo that same experience at least as children this is how the learning of pain perception happens is we will start you know replicating almost mimicking that same behavior and that will basically be you know using the other as a reference point for self experience. So these are the two things that we are constantly doing and what we are basically doing is we using one our experience as a reference for other person's experience and in some cases using the other people's experience to you know understand or describe our own experience. So this is what I meant by you know see using one as reference for other. Now, it's a very interesting problem that comes in here. How do we distinguish between the fact that okay, this is our mental states and our experience that we are talking about and others mental state and how to distinguish them from others mental states or what others might be feeling.

So the boundary between perceiving oneself and perceiving others seems to sort of at one stroke be both things. It seems to be intuitive that you should know this is our feeling and this is somebody else's feeling. But if you are sort of putting both in the same basket then this distinction may seem artificial. Again you will see a lot of philosophical and theological approaches talk about you know people sharing their being and people sharing their identity, the whole world is full of the same person in you know manifested in different ways and there are a lot of philosophical approaches that talk about these things. Again, from a cognitive neuroscientist or a social cognitive neuroscience perspective, it is an interesting problem, how do we distinguish ourselves from others and others from ourselves from ourselves.
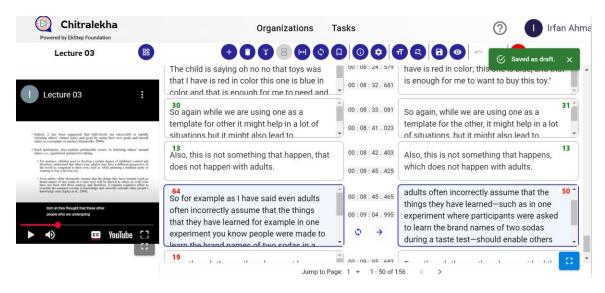
Obviously, if you look at these two examples that we are just talking about, there seems to be in fact a certain degree of overlap between the mental processes one experiences and the mental processes that we infer for others. Yes, it has been suggested that individuals are very successful at rapidly inferring others mental states and goals by using their own goals and mental states as a template or as an anchor. Again, remember the example that I just gave, you see somebody being talked to in a rude manner, somebody being treated badly or discriminatively and so on and you immediately put yourself that, Oh! how will I feel if somebody does that and there are so many of these things. do you know unto others as you want done to yourself something like that and it is not only you know colloquial wisdom but it is something of a principle of how we distinguish between others and ourselves. So it is and studies have shown that people are actually doing it.

Now these kind of tendencies also explain sometimes predictable errors that happens. So Chilean for example have this problem of perspective taking, they it takes some time to develop you know in them that they can you know for at least a few years in the beginning they are not able to take the other person's perspective you might refer to Jean Piaget's experiment on egocentrism and allocentrism where he discusses the development of these abilities in much detail but for the discussion here sometimes people make these errors in inferring you know others mental states because they use themselves as an anchor. Just

flipping the example that I just gave you, suppose you know the person who is talking to the other person in a bad way, those are both very good friends. So person A is talking badly to person B but those are very good friends and it is probably the way they talk to each other and person B is not really feeling bad, the person B is sort of understanding the context from where that particular behavior is coming in and is not really super worried or sad about it. but if I do not know that context I might barge into that you know exchange and say oh why are you talking to this person like that he must be feeling so sad and so annoyed and so you know mistreated at this point so, what I'm doing is I am making this error inferring this other person's perspective because I am aligning that or I am likening that to how I would feel so sometimes these things work sometimes they may lead to predictable errors so what we do is We start thinking that oh, everybody feels about certain things in the same way that we do, ok.

So there is an example from the book. Children sometimes you know as I said need to develop a certain degree of inhibitory control and therefore understand that others, let's say adults for example, may have a different perspective of the world as compared to their own. Such as for example when a child is planning a birthday party, you know 5 year old, 6 year the child , to the child it seems that that is the most important event in the house ,most important in the family's calendar and so on although that may or may not be the case or for example when a child is in a store and you want to buy a favorite toy and seems that oh this toy is absolutely necessary and absolutely pertinent for me to be able to buy this toy but the perspective of the mother or the pa or the father could be that oh you have two of two more of these toys at home you do not absolutely need to buy this toy. The child is saying oh no no that toys was that I have is red in color this one is blue in color and that is enough for me to need and want to buy this toy. So again while we are using one as a template for other it might help in a lot of situations but it might also lead to predictable errors in others.

Also, this is not something that happen, that does not happen with adults. So for example as I have said even adults often incorrectly assume that the things that they have learned for example in one experiment you know people were made to learn the brand names of two sodas in a taste set, taste test they thought that these other people who are undergoing that taste test after them should immediately be able to guess them. even though these others have not been you know have not had the luxury to be told the answers. So they are sort of they are not being able to guess this much also. So both of these things basically tell us that yes while it is productive sometimes to use you know oneself as an template or as an anchor for inferring others behavior it is not always the perfectly correct strategy.

Now, let's discuss a little bit of this social cognitive neuroscience approach that Zaki and Ochsner actually talk about. So, what do they say? They say that the aim of social cognitive neuroscience is to understand the abilities required to handle the social world effectively by bringing together different levels of explanation for social and emotional behavior and model their underlying psychological processes and respective neural basis. So, the idea is remember in the previous classes I said cognitive neuroscience you know tries to focus mainly on functions, mental functions at a sub personal level you know attention, perception, knowledge, decision making etcetera from the perspective of you know from the perspective where these things are happening in a more automated manner and do not need to consider the individual as a whole. Whereas when you are going from the social cognitive neuroscience of things you are bound to or you are encouraged to look at the context the overall you know social situation and analysis of certain behaviors happening in the ways they are happening. So not only understanding that but also understanding the underlying psychological processes how is a person making this decision, how is a person behaving in a particular group setting So, what are the you know underlying mental phenomena that are going on there and also understanding the respective neural basis.

So, for example, let us say when you are considering things at a sub at a sub personal level you may say areas A, B and C are involved in attention perception and memory respectively. Now when you try and develop a slightly higher level description of this you might be you know asked to consider or you might be required to consider that while A, B and C deal with attention, perception and memory their all of their action is moderated by an area D which basically processes context or situational context or embodied context and moderates the activity of both of all A, B of all these three areas A, B and C respectively. So, when you are talking about social cognitive neuroscience, you are encouraged, you are required to consider the operation of mental and cognitive functions in a social setting. Now in contrast to social psychology also Zakia and Oshinor talk about the fact that social cognitive neuroscience is slightly different from both its parent disciplines. So from social psychology it is different because in social psychology the level of explanation of these theories is sometimes rather broad, becomes vague and ambiguous at certain stages and becomes a lot

of theorizing but that theorizing in social cognitive neuroscience need to be constrained and informed with respect to neuroimaging data or neural basis and so on.

So for example if a social psychology theory talks about the fact that you know a particular phenomena X is underlined by mental processes A, B and C. A social cognitive neuroscience approach will basically say okay ,while you are saying A, B and C please map these A, B and C back to brain areas you know X, Y and Z and to that extent you can map these psychological processes to brain areas that should constrain the extent of the theory that you are offering or the extent of the thesis that you are willing to offer. Also another thing that is interesting here is that social cognitive neuroscience emphasizes the idea that situations or context actually play a very important role in determining our thought and decision making processes. You know our decision making processes, our thoughts do not happen in an isolated manner. They happen within a particular context, they happen in an embodied situation, they happen you know in a particular social situation.

So this idea was actually you know emphasized in an interesting manner by Matthew Liberman as he suggested that say for example a social psychologist were to be marooned in an island and was given a choice that you know there is only one social psychological principle that you can carry with yourself, the social psychologist would be inclined to carry this whole power of situation principle they are saying that you know in different situations the same individual can display several different kinds of sometimes exactly opposite times of behavior. So human behavior and the neural basis that underlie that behavior cannot be considered in isolation rather they need to be considered in context of a given social situation or a given context and it must be understood it must be accepted that the same person can behave at the same neural regions and actually behave differently in a different setting, ok. So, social cognitive neuroscience actually puts a lot of emphasis to this idea as I am saying again the two situation and context while you are inferring human behavior. Another very interesting thing about the social cognitive neuroscience practitioner that you know these guys talk about. And how this differs from a cognitive neuroscientist is that for example a cognitive neuroscientist might just be interested in the brain systems involved in let's say facial perception or facial emotion perception.

A social cognitive neuroscientist would be you know would want to delve a little bit deeper. By investigating how one's interactional goals or beliefs about this other person's intentions or similarity between the two people may influence the cognitive processes and the brain regions in perceiving the facial expression. Let me just simplify this for you. For example, you are doing a face perception study and you find that the fusiform face area in the right hemisphere lights up whenever you present faces as opposed to when you present houses. This is one simplistic setting which is you know devoid of all kinds of situational constraints and situational variables.
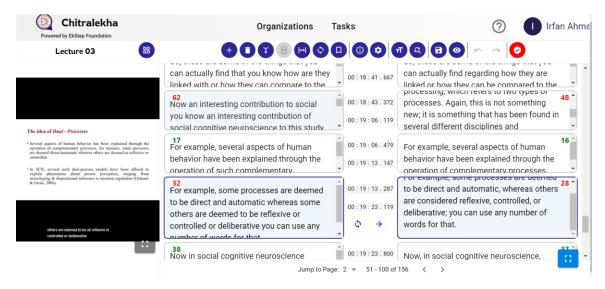
However if you are doing a study like for example you are asking people to evaluate phases of prospective members of the other gender with respect to choosing whether you know you are going to let us say marry this person or date this person or avoid this person completely. Now if you put the person, the individual participants of your experiment in

such a situation it is quite possible that in addition to the fusiform face area you will start finding activity in other brain regions who are involved in evaluating the likelihood of you marrying that person, involved in evaluating the likelihood of that person being desirable, likable you know etc or say for example other memories, other things associated with those people. So, the not only the level of explanation that a cognitive neuroscientist offers is different to what a social cognitive neuroscientist seeks to offer, the scope of inquiry is also you know quite different and this is one of the very significant ways in which social cognitive neuroscience differs from cognitive neuroscience. As I mentioned earlier the neuroimaging data you know neuroengineering data that we find can actually help make some of these theories more specific in at least one or two ways. You know for example by showing that two or more types of human social behavior that initially appeared similar would actually depend upon different information processing mechanisms.

So for example two things that seemed very similar such as explicit memory or implicit memory may actually be you know governed with different underlying functions rather than the same set of functions it is possible. Also, it could actually constrain theories like, you know, by showing that two types of behavior that were initially thought to be arising from, you know, different sources are actually coming from the same set of underlying mechanisms or same set of, you know, neural regions that are responsible for that. Finally, social cognitive neuroscience also seeks to aggregate the results of several studies allowing for a better estimate for the of the reliability of relevant findings such as consistent activation of a set of brain regions for a certain mental function for and in the context of a given task. So, because cognitive social cognitive neuroscience does this aggregation of studies there is a lot of meta-analysis involved. So, in the same situation you know several participants are actually tested, this aggregation of several studies allows for having a more you know global as you would say a bird's eye view about the reliability of these relevant findings, about the reliability of how these findings are associated and can be interpreted with a certain degree of confidence or not.

So, these are some of the things that you can actually find that you know how are they linked with or how they can compare to the levels of explanation that we see in cognitive neuroscience as opposed to social cognitive neuroscience. Now an interesting contribution to social you know an interesting contribution of social cognitive neuroscience to this study of self and other representations is this idea of dual processing is this idea of two types of processes and again this is not something new it is something that is being found in several you know different kinds of disciplines in several perspectives. For example, several aspects of human behavior have been explained through the operation of such complementary processes. For example, some processes are deemed to be direct and automatic whereas some others are deemed to be reflexive or controlled or deliberative you can use any number of words for that. Now in social cognitive neuroscience several such dual processes have been offered to explain phenomena about person perception ranging from stereotyping and dispositional inference to emotional regulation for example you know if social cognitive neuroscientist were to describe how does how do stereotypes emerge and how do stereotypes affect human behavior or human social behavior they would probably

do it using a component from the direct processes side and another component from the deliberative or reflexive processes side.

Similarly for emotion regulation or dispositional inference , say for example when you are trying to infer the intentions of another agent. to elaborate automatic and let's let's try and understand the difference between these two kind of processes and see whether it makes any sense. So automatic processes are hypothesized to operate without the need to bring mental contents into the awareness for deliberation. So things that are automatic like I'm producing speech it is an automatic phenomena not really deliberating on every sentence that I am speaking. If I were to do so the output of speed production will become extremely slow and I will constantly be you know checking myself correcting myself and this entire conversation will take several hours to complete instead of thatyou know allocated 30 minutes that are there for this particular course.

So, simply perceiving stimuli that activate mental representations of emotions let's say for stereotype outgroups you know and one's own self-concept these might be things that you know do not require a lot of deliberation or at least they have been evolutionally conditioned to be automatic responses when you see a person from the same gender or from a different gender or different race for example and you are doing let us say this face perception task, the computation of gender, the computation of this you know race etcetera happens in a very automatic manner. It is not something that you are thinking oh, whether I should evaluate that this person is let us say an Asian or a Caucasian or a African individual that will automatically happen while you are trying to recognize the face. So these are examples of automatic processes. And these automatic processes are actually said to be involved in several different you know social behaviors for example information of impressions and information to judgments and decisions you know let's say manifestations of prejudice, discrimination, motivated actions and so many things. These are some of the things that probably happen in a very automatic manner.
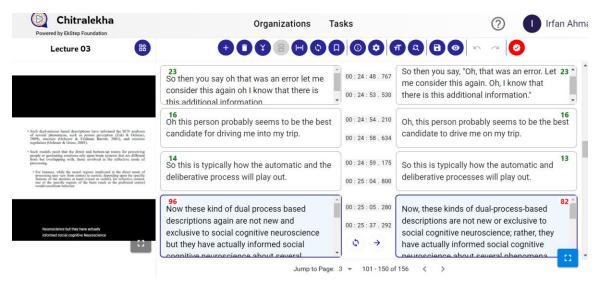
It is automatically if you have let us say a particular stereotype towards members of another gender that stereotype will manifest itself while you are interacting with the you know face or stimuli related to let us say the other gender. On the other hand this other kind of processes which are referred to as the reflective or deliberative processes are basically engaged when a person needs to you know evaluate the formed impressions, feelings, thoughts or actions that are generated by the aforementioned automatic processes. Now again , look at this, you are basically asked to you know do a task where you are seeing pictures of males and females and your task is very interesting. Your task is to basically say oh! which of these will be a good driver or say for example a person X is going for a trip, they need to be driven in an SUV in a slightly difficult terrain, there is a lot of traffic to begin with and so on and so forth. Once you start , you know establishing this kind of social context - two things will happen first computation of automatic responses will obviously happen , so when you see a girl's face you will say oh females are you know drawing on the stereotype, females are not supposed to be good drivers, I will not choose this person as driver for my trip although that person might be a very experienced driver, may be a accomplished driver and so on and so forth with several years of driving experience.

But the initial stereotype will basically kick in and will say oh!, let us not choose this person because you know this person is a female and stereotypes suggest that females are not good drivers. But is this a correct decision? No, you will need to deliberate upon this sometimes people deliberate because they are conscious of the way stereotypes are kicking in and they control themselves and clutch themselves out of the and you know steer themselves out of the clutches of stereotypes and sometimes they do it because they are just in a socially conscious let's say woke sort of a situation. So, what will happen then you will say oh, I my initial instinct is to reject this person as a driver for my trip, but I know that there is this additional information this is an experienced driver 30 years of driving experience owns her own car and so on and so forth. So, then this deliberative process will inform and in some cases. override the automatic processes or the outcome of the automatic processes and in that sense you will see a very interesting synergy, a very interesting sort of you know outcome of a combination of both automatic and deliberative processes in social decision making.

So as I said these processes will kick in when the individuals have been given an explicit goal to deliberate upon given situation or when one encounters an error produced by the direct process. So for example if you know the deliberation part I already said error can happen say you are rejecting this person but later you are pointed out by somebody oh this is the best driver among the 20 pictures I have given you. So then you say oh that was an error let me consider this again oh I know that there is this additional information. Oh this person probably seems to be the best candidate for driving me into my trip. So this is typically how the automatic and the deliberative process will play out.

Now these kind of dual process based descriptions again are not new and exclusive to social cognitive neuroscience but they have actually informed social cognitive neuroscience about several phenomena such as as I said person perception   , emotion, perception and

expression and emotion regulation and there are a bunch of studies some of which you can see on your screen which are there and which you sort of you know can look up if you want to understand how people have used this framework of deliberative and automatic processes to explain some of these phenomena. Now these models posit that the direct and the bottom up roots for perceiving people let's say or generating emotions rely upon brain systems that may be different from but slightly overlapping with those involved in the reflective mode of processing. So, not only we are talking about these controlled and automatic processes as different mechanisms, we are also saying that the brain regions underlying controlled and automatic processes might be different they might there might be a certain overlap but essentially these might be coming out of different neural regions different regions of the brain. For instance while the neural regions implicated in the direct mode of processing may vary from context to context depending upon the specific features of the stimulus at hand say for example visual or verbal sound or you know a picture for reflective control one of the specific regions of the brain let us say such as the prefrontal cortex would coordinate this behavior. So, you know this decision making that I was doing, Oh! the stereotypes suggest that this person should not be selected as my driver because she is a female, I know that stereotypes suggest females are not good drivers but then the prefrontal cortex will kick in, it will take into account more information and will try to come at an informed decision and therefore you are seeing, what you are seeing is that while the initial processing is probably happening in an you know because of a different set of regions The prefrontal cortex moderates and coordinates this activity and leads me to let's say a correct decision at that point in time.

Now this perception of self and other let us sort of move on to this I have laid the background for how we are going to be looking at the perception of self and other, the concerns of social cognitive neuroscience, the concern about dual processes. We have talked about all of that. Now let us move on to seeing how do these you know processes actually play out when you are talking about self and other representations. So, the social cognitive neuroscience approaches have you know sought to investigate this central question that whether judgments about one's own states and traits depend upon brain systems similar to

those involved in judging about mental states and traits of others. Are these the exactly the same regions? Are these different regions? What is really happening? okay and if you sort of look at this analysis two kinds of literature appears, first is conceptual representation.

So in one kind of studies you will see that there is there is been proposed an overlap in the underlying conceptual representations of the self and other, so for example the neural regions such as the medial peripheral cortex is supposed to play a central role in judgments about both self and the other and therefore you can see the underlying conceptual representation of both self and others is probably deriving from this specific region of the brain. Another kind of representation or another kind of literature that sort of speaks about this talks about the overlap not in the conceptual representations but about the motor representations of the self and the other and it implicates a certain set of neurons called the mirror neurons which were initially discovered in the primate premotor cortex. So, these mirror neurons are a very interesting set of neurons that fire when both in both cases when a primate is doing an action say for example I am waving my hand versus if a primate is observing action let us say the person standing next to me in front of me is also waving their hand. So, the same mirror neurons will activate when I am doing an action versus when I am observing an action. And this overlap in these motor representations , you know both performed and observed has actually also been reported in reproduced in humans not only the primate but also in humans and a growing number of studies have actually sought to explore the nature of these overlaps in sensory representations as well.

So, not only motor but there seems to be an overlap in sensory representations of self and other mental states and mental actions. Okay! So,for instance as I said pain is a learned behavior so people have found that in the perception of pain and other basic emotions the both the experience of pain or experience of happiness or sadness there is a degree of overlap while you are yourself experiencing these emotions whereas, when you are observing the other person going through these emotions and these motor theories of social cognition broadly you know and you put together empathy there mainly derive their insights from this mirror neuron literature and they basically suggest the social cognitive abilities are actually mediated by this fast automatic and bottom-up activations of the representations of internal states that are perceived in others. So ,basically what is happening is this mirror neuron system is generating fast descriptions of observed action and that is basically how a bunch of these you know insights about our social cognitive abilities is appearing. Now, since these representations the mirror neuron based representations of actions of yourself and others are overlapping and with or shared with others you can make an assumption or people have made this assumption that such theories according to which the bottom up or stimulus driven activation of shared effective responses it creates Or it is what is responsible for the empathy that people experience. So the whole concept of empathy seems to derive from these basic motor representations because it says that there are shared representations for experiencing of these emotions versus observing of these emotions.

Now interestingly while these theories can work when they are trying to explain perception of others feelings they do not perform very well when they are used to explain or you know understand the perception of one's own mental states. Remember we were discussing that we use ourselves as an anchor for others feelings or others as an anchor for our feelings. In one case these motor theories actually do a great job of explaining but when you are trying to explicitly analyze your own mental states sometimes these explanations do not really hold up. So, to offer a slightly different explanation researchers have proposed that individuals must use rule based or top down processing to distinguish between the representations of self and the other and thereby find this ability to infer their own mental representations. So, again this is something that we will discuss in a bit more detail in the next lecture.

I hope what we discussed today is clear to you and I will see you in the next lecture.