Social Behavior and the Brain: An Introduction to Social Neuroscience
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Week - 04
Lecture – 18

Hello and welcome to the course social behavior in the brain and introduction to social neuroscience. I am Dr. Ark Verma an associate professor at the department of cognitive science at IIT Kanpur. This is the fourth week of the course where we are talking about understanding and representing social groups and in this lecture we are going to be talking about regulation and control of racial stereotypes. So, we have seen by now in the previous lectures that racial biases are almost automatically activated and they start influencing social behavior sometimes even unintentionally. Whenever you see a face the information for race, gender, age all of that becomes instantly available to you and with that basically comes barrage of semantic knowledge, a barrage of knowledge about what you know.

The background, the demography, the stereotypes and the prejudices associated with these classes also come you know they start come into play and they can start influencing our behavior. For that reason an overarching question has been that how can we avoid these undue influences on our social behavior. We discussed in the previous lecture that not everybody wants to be or probably nobody wants to you know be a racist or at least been seen as one. We do not want to be perceived as people who discriminate against others on the basis of either race or religion or caste or gender or these kinds of things.

But if there is this baggage, if there is this stereotypical information that becomes activated as soon as we see a person's face and if it starts influencing our social behaviors, then obviously we need to have a way to keep them away and behave and regulate our behavior in particular ways. So, that we do not come across as people who are discriminatory, as people who may have a bias or prejudice reaction towards others. Also, you know a related question is how do we engage these you know regulatory behaviors, how can we at what extent we can engage the self regulation processes and processes that basically involve the aspects of cognitive control. You might remember from the course on brain and behavior that we talked about cognitive control in detail, cognitive control, executive functions. The areas in the frontal and the prefrontal cortex are mainly involved in these area in these activities, but how do they manifest in social cognition, how do they manifest in keeping away the situation, keeping away the context of our you know interactions, keeping away the context of the possible targets of

stereotypes, so that we can actually behave with them in an unbiased, unprejudiced manner.

So, previous models of control have focused on deliberative aspects of self-regulation. For example, these models assume that self-regulation is something that we do intentionally. It is initiated intentionally out of a person's conscious choice to take compensatory measures and avoid bias. Now, we will see in the next few lectures and we have seen so far that the aspect of stereotypical information, the aspect of baggage is unavoidable. It becomes available to us very rapidly.

You remember the Ito and Erlen studies. Now, if that information becomes available to us, if implicit bias becomes available to us, How do we sort of avoid that? How do we avoid those confounds in our general decision making? In last class I was talking about if you are a justice, if you are in a position of power, how does one avoid all of those influences in order to interact with people in an unbiased, in a just manner? So, this happens with a person's conscious choice, if you make this choice that I will take compensatory measures to avoid these you know influences on myself, then you will have to initiate and regulate these you know control behaviors that will allow you to regulate your behavior in such a way, it may not allow or it may not be able to avoid the activation of these implicit biases, but it can certainly allow the regulation of behavior avoiding those biases. So, that is basically what we are going to be talking about. Now, these models that you know we call deliberative and intentional models of regulatory processing they basically operate when a response is to be made deliberately and without any time constraint. So, just for example, if you are writing a report if you are describing something remember the example if you are a justice in a court and you have to give a decision you have all the time to do it.

And you can use all that time to carefully scrutinize what you are going to write, to carefully scrutinize what you are going to say in a manner that avoids any possible bias you know coming through, any possible prejudice coming through. These are you know very important positions for example, and even our in our day to day interactions you would not probably want to behave differently with somebody just because they belong to a different race or religion or caste or gender and so on. So, it is something that we are constantly doing, it is something that we most of us will try to do that we do not discriminate between people and it will happen only if we consciously decide to engage these regulatory processes. And it will happen once we have enough time to do this for example ah as i said if you are writing a report if you are pronouncing a verbal judgment and things like that however researchers pointed out that these self regulatory processes are also at least some of them are known to be non deliberative and are automatic And, these are can be enacted under time constraints as well for instance say for example, during a rapid exchange in an animated social interaction or when making snap judgments about an individual. You know this is something that happens all the time you

are talking to somebody you are giving some points you are giving some point and suddenly your you know attention may go to the person and their demographics and the group they belong to and you will start discounting their even valid points sometimes because they belong to a certain kind of a group, because they belong to a certain race or a certain gender or a certain age or a certain religion.
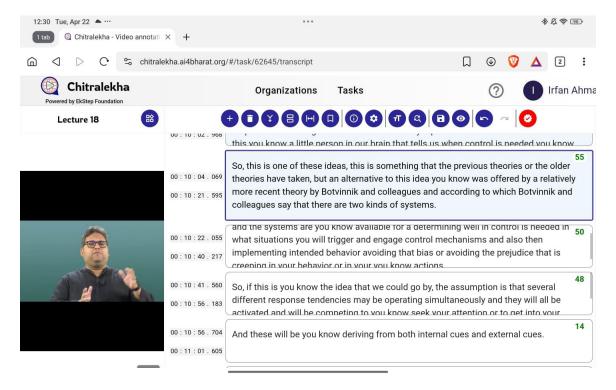
And in this case you will also need to regulate your behavior so that you are not judging, you are judging the person's argument on the basis of the validity of those arguments and rather than who is making those arguments. Also, for example, you know, when we are making snap judgments about an individual, you are sitting in a public transport, somebody enters, they board the bus or they board the train and they want to come and sit next to you and suddenly you have this feeling that, oh, I want to move away from this place. You want to avoid that, you want to not be discriminating, you want to be treating everybody as equal and this is where some of these non-deliberative rather automatic control processes need to kick in and need to regulate our behavior accordingly. And these models for example, basically say that these non-deliberative behaviors are driven by automatic processes. We will discuss them as we go ahead.

Now, the social neuroscience approach that we have been discussing so far in this course basically has been useful for teasing apart or at least trying to do that trying to keep away automatic and deliberative processes for control. And let us see how you know they have fared. So, let us start with the most basic question, when does control start, when do you start regulating yourself, does it happen automatically, do you make a choice, when do you sort of discover that oh this is a situation where I have to be very cautious, where I have to explicitly try and avoid any biases that are creeping in my judgment, that are creeping in my behavior. So, as for some of these early models of regulation, mechanisms of control will get engaged when an individual detects a bias in a social situation. In any given situation you are you know in a position of power and there are two students and you know favor one, like one a lot, like the other one a little bit less and there is this bias that is coming through.

This could happen because one student is part of a particular kind of a group and the other student is kind of a another kind of group and you still want as a teacher for example, in my situation you want to not be biased. So, as soon as you detect that oh you are behaving in some say for example, you are scolding somebody and part of that may be one percent of that is because of some other you know implicit prejudice that you may be harboring. Now, in these situations the system the regulatory system that we were talking about will detect a conflict and it will engage you know the regulatory system to wean away the conflict to wean away sorry to wean away the prejudice or the bias that is keeping in. Now, one of the even you know more fundamental questions here that people have asked that the you know writers of this chapter have asked that what is it that draws your attention to the presence of bias. See as we are saying that once the bias is detected

regulatory processes will kick in but what happens you know what leads to detection of that conflict in the first place.

So, if you look at you know the dual processes theories that we have been talking about and you know especially in social and cognitive psychology, they basically assume that there is some kind of a homuncular initiator of control. I do not know if you remember you seen you might have seen that particular homunculus map when we talking about the somatosensory representation in the brain that there is this you know a little person in our brain that tells us when control is needed you know you can think of that as your inner voice when you are saying something you are scolding somebody you are you know taking a decision of importance and so on and suddenly there is that little voice in your head which says oh I do not think you know the decision you are taking at this moment is correct or I do not think the way you are talking to person x or person y is correct you should probably rein yourself in a little bit and you should behave you know in a bit more just manner.

So, this is one of these ideas, this is something that the previous theories or the older theories have taken, but an alternative to this idea you know was offered by a relatively more recent theory by Botvinnik and colleagues and according to which Botvinnik and colleagues say that there are two kinds of systems. And the systems are you know available for a determining well in control is needed in what situations you will trigger and engage control mechanisms and also then implementing intended behavior avoiding that bias or avoiding the prejudice that is creeping in your behavior or in your you know

actions. So, if this is you know the idea that we could go by, the assumption is that several different response tendencies may be operating simultaneously and they will all be activated and will be competing to you know seek your attention or to get into your execution plan.

And these will be you know deriving from both internal cues and external cues. See, you can have internal motivations that oh I want to be just, I want to be unprejudiced, I want to be fair to everybody. These are your internal feelings, internal cues, the will to be to be perceived as fair and just and unbiased is a very important social motivation a lot of times, but then there is external cues possible also somebody is seeing. So, for example, if you are you know behaving in a particular manner and your child is observing or somebody else who you value is observing or let us say just that random 5, 6 people are there in the room. You want to be perceived by them as just and unbiased.

So, there are internal cues as well as there are external cues which you know basically will govern these response tendencies and on the basis of the net weightage of these cues you will basically decide oh how do I have to behave or how should I behave in a given situation. So, when two or more activated tendencies you know are promoting different responses, then you know they will be conflict in the system. For example, you know a lot of people and it is a bit sad, but a lot of people behave differently in different situations at their homes, in private, in you know in front of a bunch of very close friends they will behave in a certain manner and when they are outside they will explicitly state something else completely. So, for example, people you know who may be accused of being biased on the basis of you know race or gender or religion a lot of times you will say outside in the outside world in social situations they will profess egalitarianism, they will profess oh everybody is equal and this and that and so on, but as soon as they are in their private circles you will see a slightly different side of them. So, in those kind of cases you know that is where these social cues sort of you know are pushing you on two different sides.

Your implicit tendencies are asking you to move towards bias, your explicit behavior is asking you to not be biased and therefore, there is this conflict which needs to be resolved, which needs to be regulated in order to you know control your behavior. So, the first component of this you know theory or of this model of control basically monitors the degree of conflict that is there in the system. So, the degree of disparity between the implicit and explicit tendencies, if you are being pulled into extremely opposite directions like a 180 degree kind of split, then the degree of control that needs to be exercised will be much more as opposed to if you are slightly deviating from the internal tendency as opposed to your external you know as compared to your explicit behavior. So, as the degree of conflict increases, the second the regulatory system is engaged to orchestrate more deliberate forms of control. It basically kicks in, it says oh I do not think this is the correct situation for you to behave in this particular manner, let us rein ourselves in, let us

behave in a more you could say equal manner let us behave you know in a particular manner that presents a very fair image of us to others.

And in this case you know there is been various studies using fMRI using ERP and they have basically associated conflict monitoring with the activity of the dorsal anterior cingulate cortex. This is this region here, this is the frontal part of the brain you know just for reference. So, this is the dorsal anterior cingulate cortex and then the regulatory system has been linked to the rostral anterior cingulate cortex and the medial prefrontal cortex. So, these are the two regions in the frontal cortex that are responsible for the first component as well as the second component. Now social neuroscientists have you know been interested in prejudice and they have sort of applied the conflict monitoring model to address mechanisms of prejudice control as well.

Some of the early models proposed that this inability to respond without prejudice results from a person's failure to you know override a prejudice response. See, in most cases even if there is an implicit bias, even if there is an implicit prejudice, we do not act in that manner. We try and control it, we try and override those responses and try and initiate a behavior that is just and fair and unprejudiced. But sometimes you will fail to do that, sometimes there will be a failure to override this prejudice response and in that case people who are generally you know fair and just will also seem like you know that they have lost control and they have acted in a particular manner and this may happen because of various reasons, one of them being lack of motivation or the other being that oh you are so you know sometimes you will see people behave differently when they are too angry or too excited. Then, the degree of you know because your cognitive and mental resources are occupied, then the amount of resources available for exercising control are limited and a lot of times at those places particular kinds of behavior emerge which people are not very proud of, people do not want those things to happen and then they sort of in turn you know turn apologetic and they regret that oh why did I behave in this manner at that given situation.
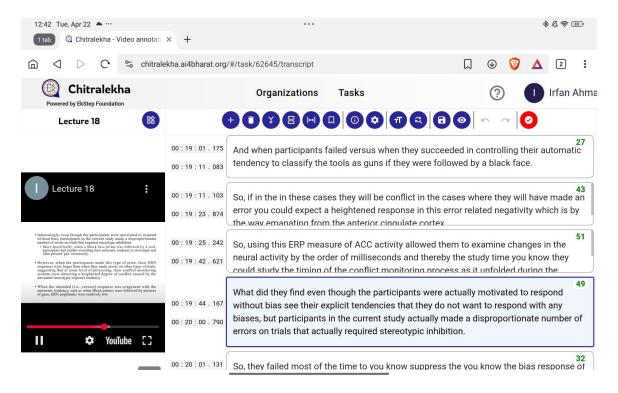
So, the current model suggests their failure to control bias might result from the fact that the conflict A could not be detected in the first place. And to test for this hypothesis Modi and colleagues they measured ERPs as the participants who are completing this weapons identification task. So, basically what they had to do in each of these trials a black or a white face prime is presented for a brief period of 200 milliseconds and then target picture was presented which was either a handgun or a hand tool. So, different kinds of handguns, different kind of hand tools like hammer, scissor, saw those kind of hand manipulated tools. Now, in this task participants were instructed to categorize the target at either a gun or a tool irrespective of the prime.

They do not have to regard the prime, they do not have to respond to the prime, but they basically have to just categorize these tools all right. And if you remember the priming

paradigm it is the relationship between the prime and the target that governs the responses to the targets ok. So, some of these studies had actually shown previous studies that the presentation of a black face facilitated the identification of guns and interfered with the identification of tools. So, if a black face came as prime it facilitated the identification of guns because remember they are stereotypically linked with each other. And, it interfered with the identification of tools because you are so you know the implicit tendencies is of bias and this is a time delimited task.

So, what happens is the first tendency is oh if you have registered the black phase that oh this object must be a weapon, must be a handgun, must be a tool all right. Black faces exactly in this task also activated a pre potent stereotypic association that I said with guns and therefore, a lot of times the participants failed to inhibit this automatic tendency and in that they erroneously lot of times identified the tools as guns when the same was preceded by a black face. So, you can see here that how this implicit biases, how these implicit stereotypes can actually color our behavior in even task where you are not really having that kind of time to think about. It is just your automatic tendency and this it is interesting that the automatic tendency is of bias coloring your behavior. So, the authors of this study sought to focus on the role of the anterior cingulate cortex in response control in this task.

So, they wanted to see how does the anterior cingulate cortex you know moderate when the participants are trying to control their responses in this task. A bit of a background, so previous research had shown that a specific component of the ERP called the error related negativity, indexes the activity of the anterior cingulate cortex on conflict monitoring. So, they basically have a reason to look at the anterior cingulate cortex and its activity is indexed by this error related negativity which is an ERP component. So, they measured the amplitude of this error related negativity wave. And when participants failed versus when they succeeded in controlling their automatic tendency to classify the tools as guns if they were followed by a black face.

So, if in the in these cases they will be conflict in the cases where they will have made an error you could expect a heightened response in this error related negativity which is by the way emanating from the anterior cingulate cortex. So, using this ERP measure of ACC activity allowed them to examine changes in the neural activity by the order of milliseconds and thereby the study time you know they could study the timing of the conflict monitoring process as it unfolded during the course of response making in this task. What did they find even though the participants were actually motivated to respond without bias see their explicit tendencies that they do not want to respond with any biases, but participants in the current study actually made a disproportionate number of errors on trials that actually required stereotypic inhibition. So, they failed most of the time to you know suppress the you know the bias response of classifying a tool as a gun if it was preceded by a black face. And that is basically you know something that happened for a lot of participants or a lot of trials.

But when the participants made this type of error the ERN component were actually the responses the ERN responses were found to be larger when they made errors larger than when they made errors on other type of trials. So, just saying that at some level of processing their conflict you know monitoring mechanisms were detecting the heightened degree of conflict you know So, even before they were giving these responses there was a conflict detected in the system oh this is a tool why am I you know categorizing this as a gun oh because this is followed by because this is preceded by a black face. So, there is a conflict their stated tendency is to respond without bias they are motivated to respond without bias, but somehow they are making these erroneous responses. So, there is this

you know presence of conflict that the system is detecting which is being indexed in this error related negativity wave. Now, in situations where the intended response was congruent with the automatic tendency, when the, when a gun actually followed a black face, there will be no conflict, there will be congruence, then the ERN amplitudes were found to be relatively low.

So, it seems that this ERN component that they are working with here actually is able to index, is actually able to detect the degree of conflict that the participants are experiencing when they are performing this weapons identification task. Now if you look at these findings together they actually show that there can be a dissociation between conflict monitoring and regulatory aspects of control in the context of race bias also it provides evidence that prejudice control is a multi component process, it has automatic components, it has deliberative components and the detection of bias does not require explicit or deliberate processing. So, it can happen automatically as well. Now, the pattern of these ERN responses was replicated by another ERP component which is also linked to the you know anterior cingulate cortex which is the N2, that happens around 100 to 200 milliseconds before a successfully controlled response. So, then there are two components that you can actually look at when you are trying to study conflict monitoring or conflict detection in this kind of a task.

The N2 results when they looked at it, the N2 results revealed that the conflict monitoring levels were also higher just prior to the successful control of the automatic stereotypical effects. So, you can see here that there is one ERN response when they are making the error and there is this N2 response when they are successfully controlling. Both of these together are being able to predict not only the detection of the conflict, but also if they were able to resolve the conflict correctly. Finally, the authors found that the magnitude of the participants error related negativity response on trials that required stereotypic inhibition was strongly correlated with the behavioral estimates of control processing as well as well as the behavioral accuracy on trials requiring stereotypic inhibition. So, again this is just convergent findings which basically tells that not only the ERP results, but the behavior results also converge and basically point out that when participants fail to control the implicit biases they behave in a certain manner.

When they successfully control the implicit biases then they behave in another way. Now, participants are also you know participants are also different you know they have different levels of sensitivity with respect to how they can detect and resolve their conflict. So, participants who are more sensitive or who had more sensitive conflict monitoring systems were found to be typically better you know at inhibiting these stereotypes throughout the task. And see this has to do with you know personal histories of people, this has to be with has to do with their general personalities, their traits and also sometimes that you know somebody in a given situation can put themselves under extreme control. So, typically people who had more sensitive conflict monitoring system

were found to be able to do this task better, they were found to be able to inhibit the stereotypes better and for the most part their performance was without bias because they could successfully control it.

Coming to the ACC, the role of this conflict related antiretroviral cortex activity in prejudice control and its relation to the lower levels of race bias behavior has also I mean just as we seen in the study has also been replicated in several subsequent ERP studies. You can look for Amodio and colleagues 2008 paper for you know description of them. Interestingly, while fMRI studies have not really shown a relationship between conflict related ACC activity and behavioral control of race bias, some research has shown that simply just viewing the faces of black individuals actually elicited greater you know anterior cingulate cortex activity and greater medial peripheral cortex activity compared when compared with when they were viewing faces of white individuals. So, you can see here behavioral results, ERP results, even fMRI results are all converging to the fact that the anterior cingulate cortex is involved in conflict resolution in terms of suppressing the stereotype, suppressing the prejudice responses. indeed more research is required to determine whether the activations you know elicited by just viewing phases might be actually related to control processing and the regulation of responses to you know this.
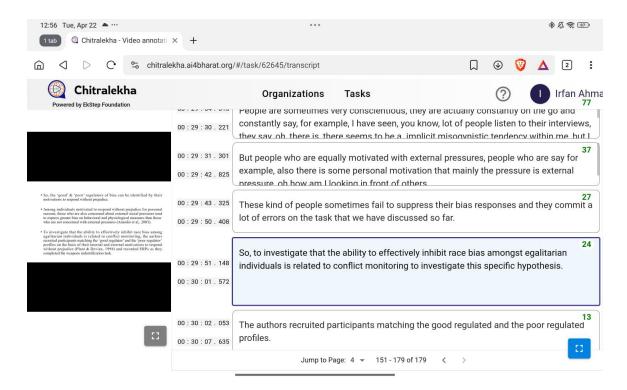
So, obviously, this is some studies that we are reviewing here, but there is much more research and there is much more research needed in order to actually investigate how you know the control processes operate, how they regulate how the regulation of these prejudice responses happens in response to race kind of biases. Now, moving towards a slightly different topic, as I said there are people who have different kinds of personalities, different kinds of personal histories and they can be variably or differentially sensible to detecting these conflicts and to managing these conflicts. So, there are always ought to be individual differences in the ability to regulate these kind of racial biases. So, as we have seen so far that conflict monitoring is a very important component in the regulation of prejudice, one needs to really understand how efficiently this mechanism can be engaged by different kinds of individuals across the board. In this respect a very interesting question can be asked about some egalitarian individuals, you know I talked about egalitarianism, the tendency to treat everybody equally or at least profess that everybody should be treated equally and justly and in a fair manner.

Now, how do some egalitarian individuals find it very difficult to control their you know behavioral expression of bias? They profess that they see everybody equally, but if you look at their responses in some of these kinds of task or in general behavior, sometimes it feels that they have let go of the you know let the bias take control of them. How does that happen? And some individuals however can actually do this much better, they can control you know their biases and their implicit prejudices and they can actually report equally egalitarian attitudes and they are rather effective in controlling these kinds of things. So, there seems to obviously be some individual differences in how efficiently a

person can control their biased or prejudiced responses. So, Amodian colleagues you know have proposed that the ability to inhibit automatic expressions of bias may actually be correlated with the sensitivity of their conflict monitoring systems. So, how sensitive is the system, how easily, how quickly, how rapidly this system can detect a conflict and engage the regulatory mechanisms can actually decide or can actually be you know the locus of these individual differences.

So, the good and the poor regulators of bias can therefore, probably you know be identified by their motivations to respond without with or without prejudice. So, how well motivated you are that oh I really want to behave in a manner that is just and fair and you know devoid of any kinds of prejudice or bias. And even within these kinds of individuals, among the individuals that are motivated to respond without prejudice for personal reasons, those who are also concerned about external social pressures actually tend to express greater bias on behavioral and physiological measures than those who are not concerned with external pressures. So, see as I said there are internal cues to suppressing bias, there are external cues to suppressing bias. The internal cues are personal reasons why do you you know how do you want to project yourself or how do you typically just want to behave in your own eyes you know if you want to behave in a fair and in a just manner.

There is great motivation, there is great sensitivity of detecting conflict. People are sometimes very conscientious, they are actually constantly on the go and constantly say, for example, I have seen, you know, lot of people listen to their interviews, they say, oh, there is, there seems to be a implicit misogynistic tendency within me, but I am constantly fighting it, constantly trying to suppress it and basically you know make my behavior devoid of any of these kind of gender biases or other kinds of biases. But people who are equally motivated with external pressures, people who are say for example, also there is some personal motivation that mainly the pressure is external pressure, oh how am I looking in front of others. These kind of people sometimes fail to suppress their bias responses and they commit a lot of errors on the task that we have discussed so far. So, to investigate that the ability to effectively inhibit race bias amongst egalitarian individuals is related to conflict monitoring to investigate this specific hypothesis.

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- So, the 'good' & 'poor' regulators of bias can be identified by their motivations to respond without prejudice.
- Among individuals motivated to respond without prejudice for personal reasons, those who are also concerned about external social pressures tend to express greater bias on behavioral and physiological measures than those who are not concerned with external pressures (Amodio et al., 2003).
- To investigate that the ability to effectively inhibit race bias among egalitarian individuals is related to conflict monitoring, the authors recruited participants matching the 'good regulator' and the 'poor regulator' profiles on the basis of their internal and external motivations to respond without prejudice (Plant & Devine, 1998) and recorded ERPs as they completed the weapons identification task.

Time	Transcript
00 : 29 : 04 . 010 00 : 29 : 30 . 221	People are sometimes very conscientious, they are actually constantly on the go and constantly say, for example, I have seen, you know, lot of people listen to their interviews, they say, oh, there is, there seems to be a, implicit misogynistic tendency within me, but I [77]
00 : 29 : 31 . 301 00 : 29 : 42 . 825	But people who are equally motivated with external pressures, people who are say for example, also there is some personal motivation that mainly the pressure is external pressure, oh how am I looking in front of others. [37]
00 : 29 : 43 . 325 00 : 29 : 50 . 408	These kind of people sometimes fail to suppress their bias responses and they commit a lot of errors on the task that we have discussed so far. [27]
00 : 29 : 51 . 148 00 : 30 : 01 . 572	So, to investigate that the ability to effectively inhibit race bias amongst egalitarian individuals is related to conflict monitoring to investigate this specific hypothesis. [24]
00 : 30 : 02 . 053 00 : 30 : 07 . 635	The authors recruited participants matching the good regulated and the poor regulated profiles. [13]

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The authors recruited participants matching the good regulated and the poor regulated profiles. On the basis of their internal and external motivations to respond without prejudice. So, basically these participants were selected on the basis of how well they express their motivation to respond without bias and what are the reasons. For example, do they say oh it is all internal or they say it is mainly external, but internal as well. You basically are able to divide these people in two kinds of groups and make them perform the weapons identification task that we were just talking about.

Interestingly both groups of participants actually showed significant levels of automatic stereotyping in their behavior on the task you know that we were just seeing. Although interestingly these groups are known to differ in their levels of implicit evaluation. So, evaluation when they are implicitly evaluating others there is difference between these people. but the activation of automatic stereotypes was found to be equal in both kinds of people which is interesting again goes back to the thing that the automatic implicit tendency is to activate and act on that bias. Although both groups reported positive explicit attitudes towards black people and thus both actually needed to you know use these inhibition mechanisms to inhibit these automatic stereotypes to respond in line with whatever they have said.

You know they have said oh I am completely unbiased, I have a good relationship with the black people, I you know view them fairly etcetera etcetera. Now, what they are professing and how they actually behave there needs to be a very efficient you know conflict monitoring system that allows them to actually respond in line with what they

have said. But as suggested by previous research good regulators actually exhibited greater control processing on the task as indicated by the process dissociation estimates which they worked out and they responded more accurately on trials that required the inhibition of serotypes. So, good regulators who had very highly sensitive highly sensitive conflict monitoring systems, they actually performed well on this task. They could actually navigate this task, they could actually suppress their stereotypes and therefore, they you know performed much nicer on this task.

Also good regulators showed significantly higher or significantly larger ERN amplitudes than poor regulators on trials that required the inhibition of these automatic stereotypes. But interestingly these ERN amplitudes did not differ on trials that did not require stereotypic inhibition. So, you can see again the ERN amplitude seems to be indexing the amount of cognitive control that is being exercised in these scenarios. Also analysis showed that the ERN amplitudes actually mediated the effect of the regulation group on control processing and response accuracy also. So, it is not that the ERN does not you know was mediating or activated in this other group you know on the regulation group.

Overall if you look at the performance of both groups the authors found that the conflict monitoring mechanism for initiating control processes accounted for the puzzling finding you know that some egalitarian were more effective than others. Simply saying if you have a highly sensitive conflict monitoring system you will be more successful in suppressing these biases as opposed to if you have a relatively low sensitive conflict monitoring system and your motivations are more external than internal. Now, that is all from this class, we talked about regulation, we talked about how responses might be you know bias responses might be suppressed or regulated. I will stop here, I will see you in the next class where I will extend this discussion on biases. Thank you.