Selected Topics in Psychology
Neuropsychology
Prof. Vivek Benegal
Department of Humanities and Social Sciences
Indian Institute of Technology, Kanpur

Who is at Risk and why? The Neurogenetics of Vulnerability to Addiction

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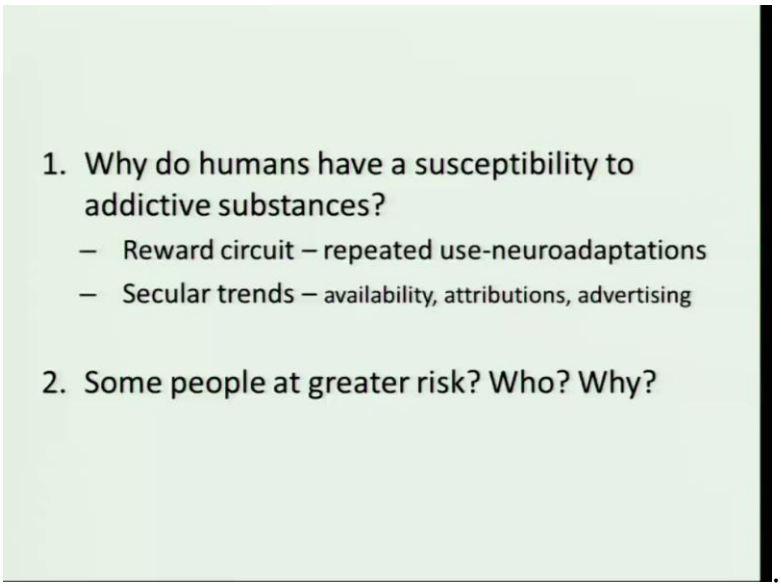

Alcohol and drugs are used by a huge amount of people all right? Some people do bungee jumping, some people do fast driving, some people do gambling, but, there are some people, who develop very early problems right. So, it would stand to reason everybody does not have the same risk. Like in real life even if all of you ate kilos and kilos of sugar, all of you would not develop diabetes some people who are at risk would go on to develop problems.

So, part of the thing that, we need to know is who is at risk. So, you can put in early interventions two is what is the risk. So, that even if problems develop, you can put in intervention you can device interventions. So, that is the second question that, we will try an answer which is in this talk I will focus on why are some people at greater risk and if. So, doing know who they are? And why what is this risk?

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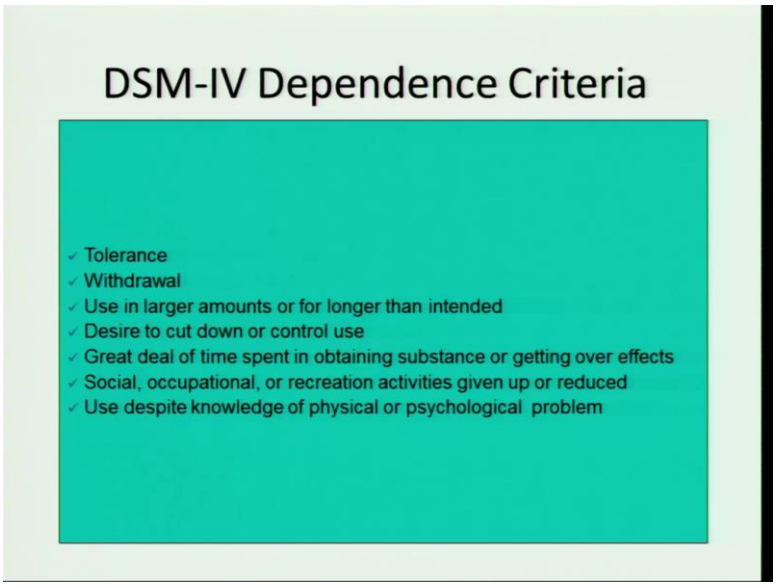

So, let us go forward and let me, be very clear that I am talking about addiction or dependence. There are two major ideas, as far as alcohol drugs all these things are concern; one is called dependence, where you develop most important; you develop loss of control that you are not able to control your use whether it is of gambling, whether it is of alcohol, tobacco, etcetera. So, these are some of the criteria that define dependence.

There is another great idea, which is called harmful use. I do not need to be dependent, I do not need to be an addict, but I can have a drink drive and have an accident. I can have 2 or 3 drinks go home gets so, upset that, I beat up my wife and kids; I am still causing harm you know. So, for the large majority, problems occur without the benefit of having the disease called addiction right. And in cultures like ours where, there are no strong rules about who does what; the harmful use of alcohol and drugs is much more the disease of addiction is similar throughout all cultures, because it is a brain disease ok. Today, I will be talking about the susceptibility to this particular brain disease.

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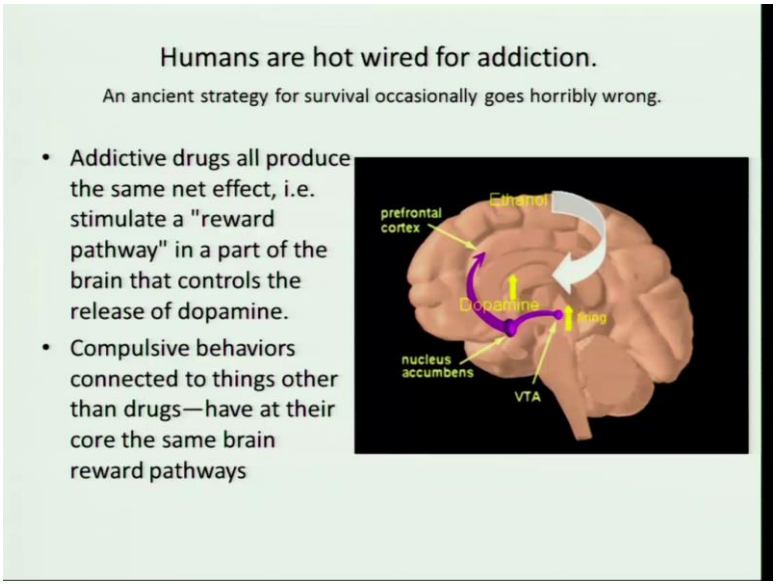

Now, one of the things that, I discussed earlier in the morning is, why are human beings prone to using all such a substances; they have been doing. So, from the beginning of recorded time, people have been doing stuff, people have been taking things from treason may you know grinding having it all to get high. Human beings are invested in getting high. And in a way its hard word into our culture, if you do not get high through substances, we get high through bungee jumping.

If we do not get high through bungee, we some of find high is in singing or some of us find high is in working accessibly, but getting high is hard word into the permanent wiring of our brain. And it is related to a particular structure in the brain, which is called the reward circuit ok. The reward circuit is basically there to give a feeling sensation wow let us, do it again. And it is there in all animals and the higher you grow in evolution the reward circuit gets more and more sophisticated.

So, initially it started out as something, which was meant to motivate you to continue the species. So, initially the whole purpose of the reward circuit was, to make sex interesting because if you did not, you would not continue the species but, then what happen was you cannot just make sex interesting, without make making food interesting. Because otherwise you would not eat long enough to live long enough to have sex; then you have to make shelter interesting; then you have to make going for a job interesting; then you have to make poetry interesting and so on, so forth.

So, as part of the evolution of the drive evolution, in is a very stingy process. It uses the same things over and over again. So, we have this particular circuit which we use to give us a reward to motivate us to do things and human beings learnt a long time back that, if you use a particular substance. They also work on this reward system and give you a much bigger high then you know a relationship then food, then I wouldn't say chocolate because, chocolate is also technically a drug, but you get the point I am trying to make.

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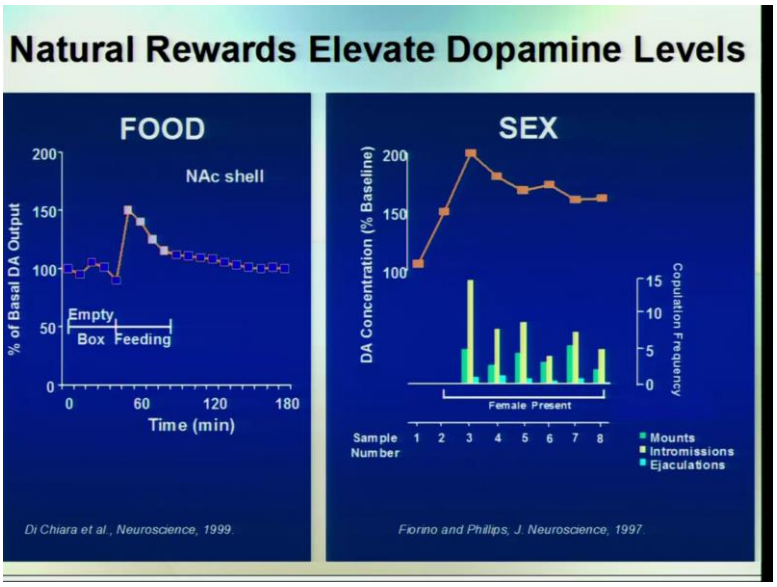

But what also happens is no this slight just shows that, in the same that there is increased activity, in this particular circuit for food and sex there is similar increase activity.

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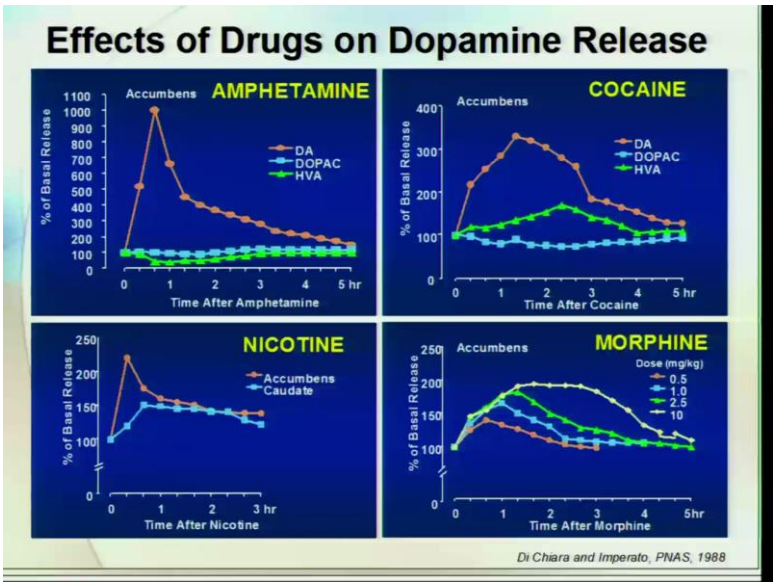

For drugs, in the same area ok.

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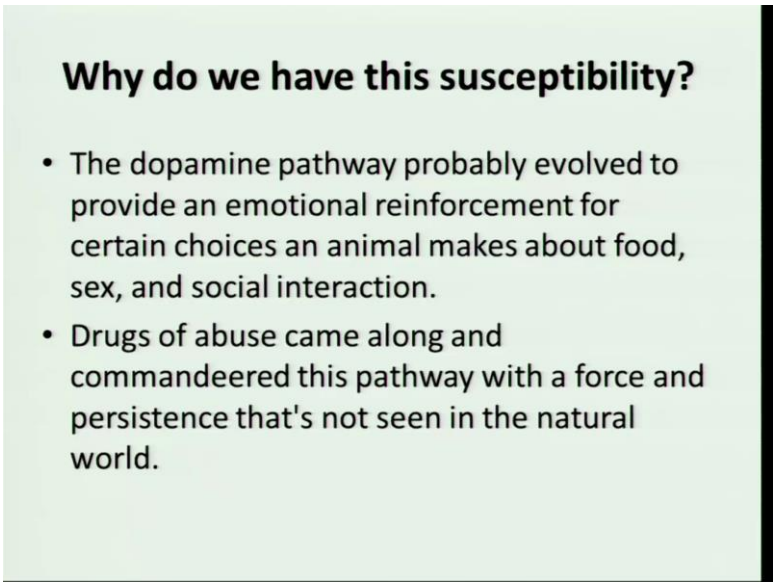

Now, why do we have this susceptibility? Like, I was explaining this pathway evolved to provide emotional reinforcement for certain choices and animal makes about food, sex or so, interaction. And in the middle somewhere, human being met these substances, which fade into the same areas. And give them a wow instead a just a wow.

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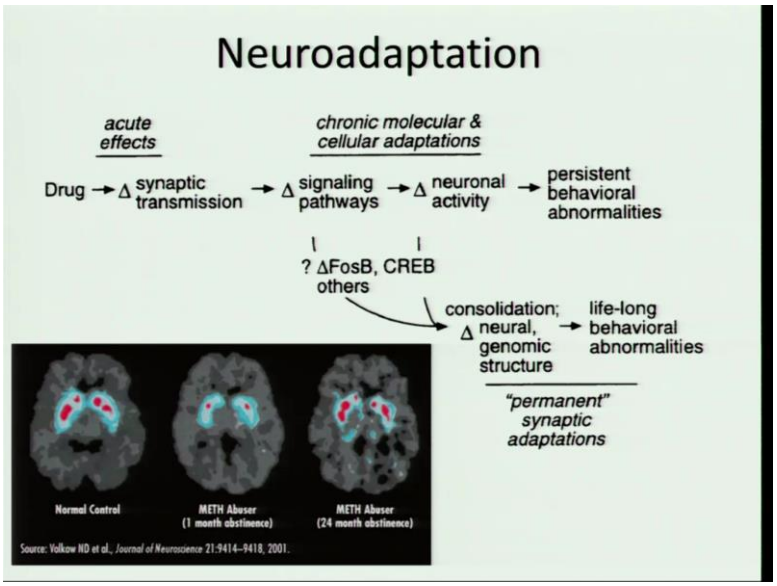

But, the problem is that because 1 is using a particular substance, which the brain was not meant for this. We have device the way of using it to short circuit our brains. So, what happens, when the brain fight back when you give the brain this substances. The brain adapts and it adapts with strength that you have a cute effects, immediate effects of using the drug, but, you have downstream, chronic adaptation which occur at the genetic label at molecular labels which means; that you develop persistent, long standing, behavioral abnormalities.

Just as an example: I borrowed a slide from doctor Naurab volcano in the national institute of drug abuse in the US what Naurab volcano has been looking at. As for example, I do not know whether, you can see this; this is the pet scan of a normal subject. And the blue red areas are the areas, where there is increase activity in the reward circuit which I was talking about.

Now, for a person who has been using drugs for a long time here Methamphetamine, you find there is reduced activity. So, there is net reduced motivation for things every things etcetera. Now, even after the drug user, has stopped using drugs for 24 months that is 2 years, you find there are still reduced activity. So, the point that I am trying to make is that the brain adaptation that occur, because of continue drug use are very long lasting.

So, it is not just a question of asking a person who has develop in addiction, to say I do not you just make up your mind and stop. Why do not, I send you to rehab center lock you up for 6 months and then you will get better ok.

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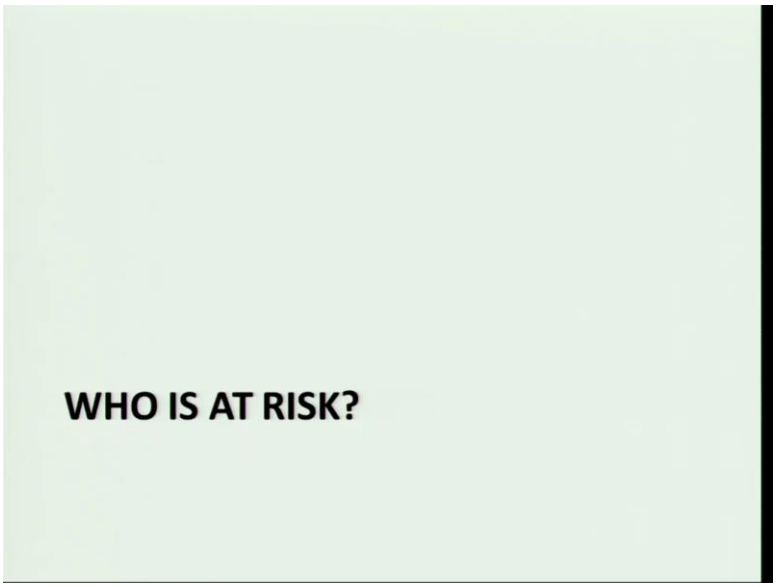

However, having said that the question that we now need to ask is: who is at risk? And that is what we will be focusing on today.

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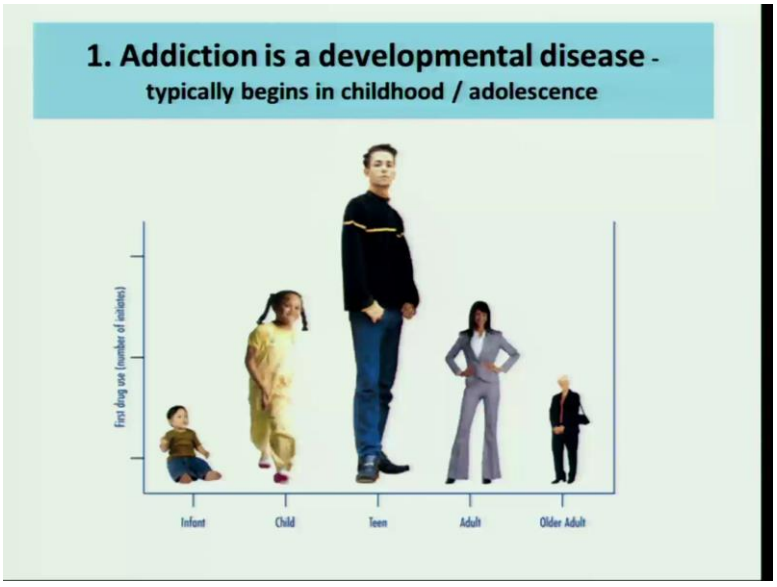

1 thing that, we know is that addiction is development till disease, I go further addiction is a pediatric disease, A disease which happens, in children and adulation it starts there.

So, the younger you start the greater the risk, if you start as an adult or as an older adult the risk comes down. So, between 16 to 21 you know if you start at 16, you have an 80 percent chance of develop in addiction. If you say start at 22, 23 that risk comes down to almost 10 percent. Which is why in almost all human societies you have this, you know aged official aged you know legal drinking which is peg between you know 16 to 21 and in India mostly its 21 and why does this happen.

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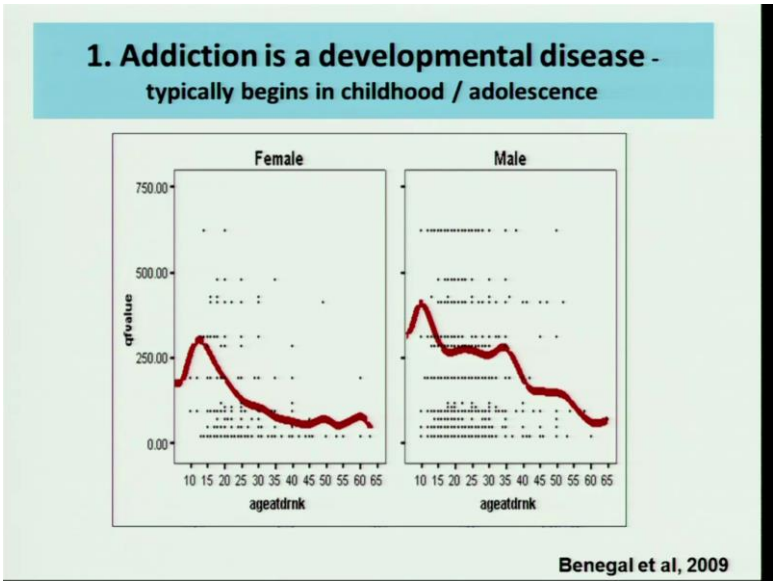

This is data that, we that we did from our study in the Andaman Islands this is the entire population of the Andaman Islands. And what we found is that people who started at the age of around say, between 10 to 15 years of age as adults at the greatest at the largest amount of you know drank the largest quantities and had the greatest frequency. We are in index quantity into frequency. And for people who started young they were a greatest risk of developing problems in adult age.

People, who started later, had lower and lower and lower risk. Why is this happen? We have establish that, it is a development easy typically it starts in childhood or adulation.

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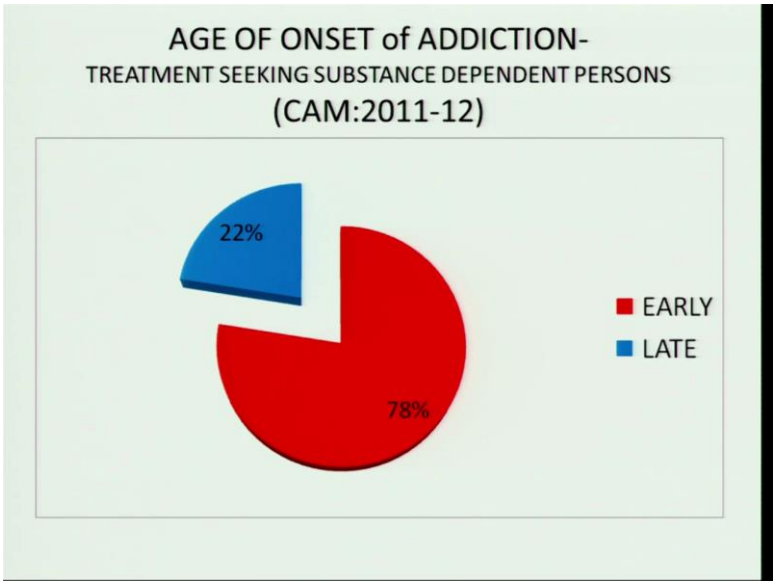

Also what, we find and these are figures from my treatment center. Which is 1 of the largest treatment centers in India; you find that, 80 percent almost 80 percent of people who coming for treatment, started young are early onset. And late onset constitute a very small number.

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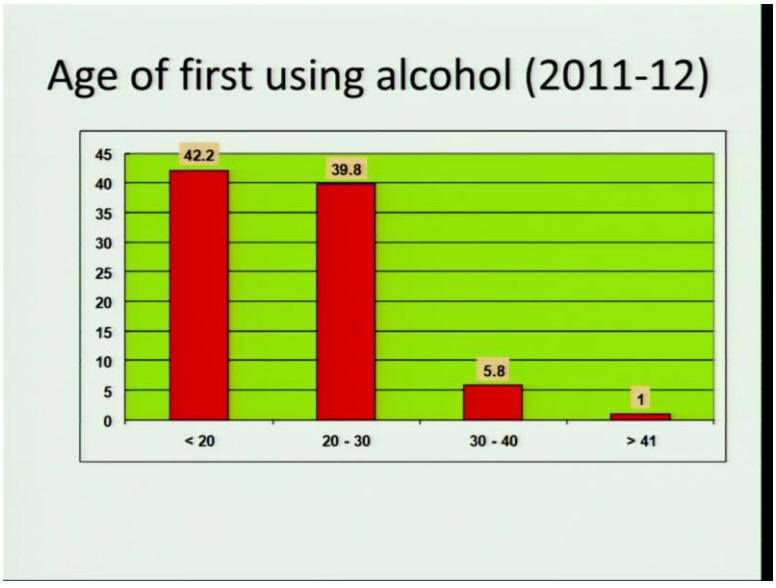

Again this is data from my treatment center, where you find that most of people who have come for treatment with alcohol and drug related started before the age of 20.

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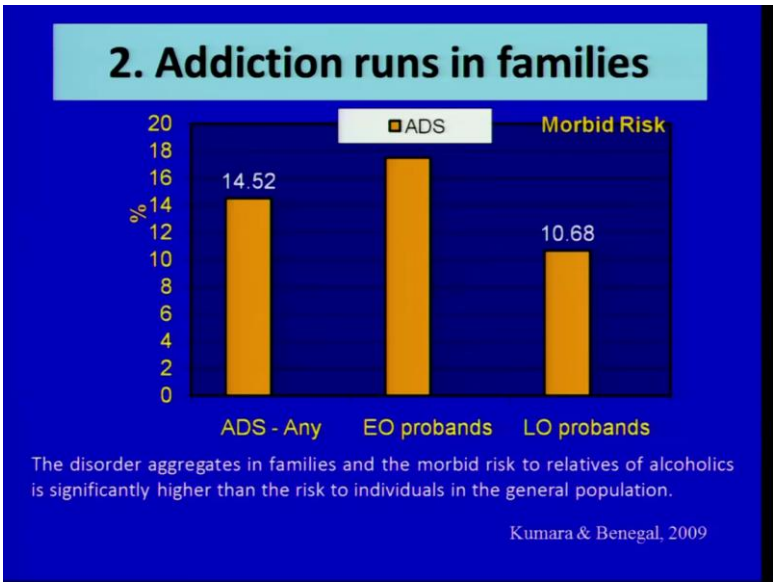

The second thing that, we know is that not only does it does increase risk in people who start young. There is a increase risk where, when people have a family history that addiction seems to run in families. And again this is our data from India where, we show that people who come from families where, there is early onset substance use are at much higher risk, then people who come from families which have late onset substance.

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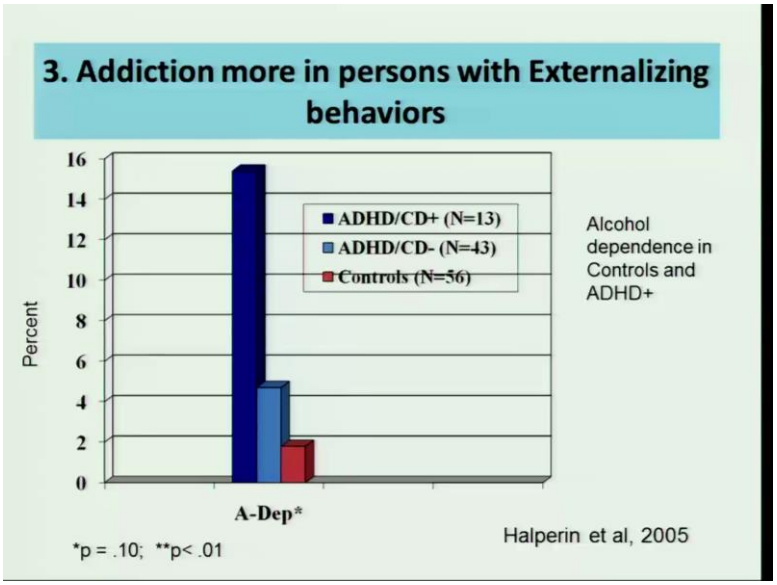

The third thing that, we know is addiction is more in persons with externalizing behaviors for all of you people of psychology you know, what externalizing behaviors

mean; externalizing behavior is: a spectrum behavior which include thing like: inner tension, impulsivity, oppositional behavior you know that you oppose everything that your parents say and a difficulty in learning from your mistakes ok.

And basically, if you recall what you learnt at child psychology, it is got to do with these disorders like: attention deficit hyperactivity disorder, conduct disorder, oppositional behaviors etcetera. What we do know is that, children who have this kind of difficulties are at much higher risk of developing drug and alcohol problems as well as risk for other high risk, behaviors like high risk early sexual behaviors, violent, violence, anti social behaviors etcetera.

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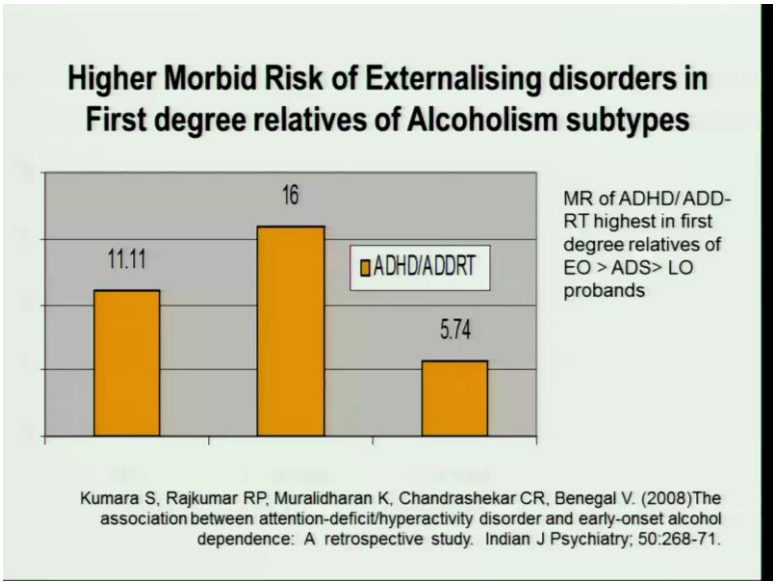

This is more of the same, this is these are families studies that we did which showed that, people who had alcoholism, had a greater family history of the externalizing disorders.

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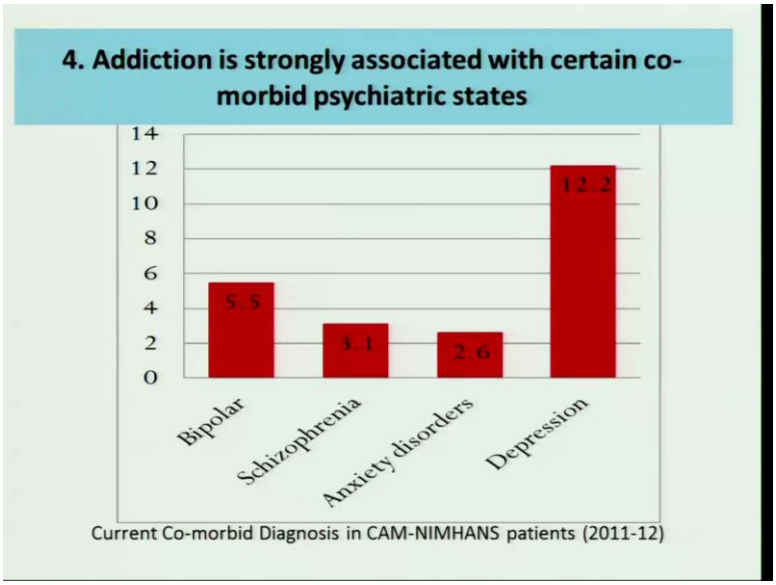

The forth thing that, is addiction is strongly associated with certain psychiatric; emotional, behavioral disorders. Especially the mood disorders, depression etcetera.

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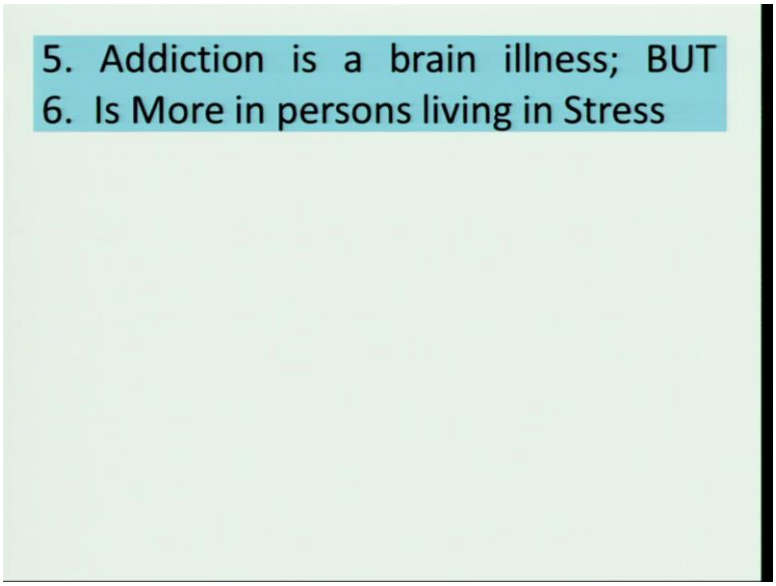

What we know is that, like; I told you addiction is a brain illness, but, it is also more in persons living in stress people; who grow up where there is what we call toxic stress. They cannot skip from the stress you know, people who grow up with poverty you cannot escape from poverty very difficult to mild nutrition in childhood violence, in childhood whether, its family violence or violence because of was family etcetera.

People who grow up where, there is inconsistent parenting these are children who are at much higher risk. The question is why?

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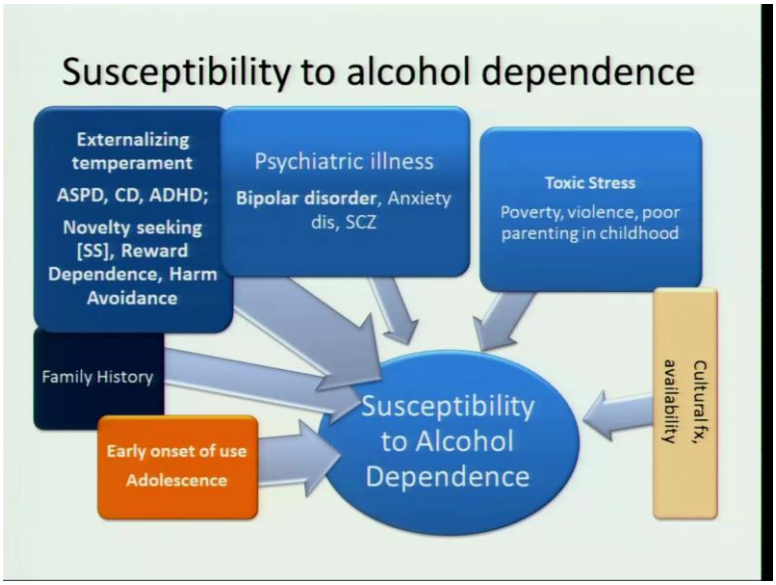

So, basically if you look at it, these are some of the things which increase the ceceptibility to alcohol dependence. I work with alcohol dependence, because I work in the southern part of the country where we have more problems with alcohol related problems then opaide drugs like: Cannabil, heroine etcetera. The Northern part of the country, there is a lot more of the other drugs, but alcohol is still is the drug of choice throughout India.

So, basically early onset family history externalizing temperament, psychiatric illness, toxic stress and of course, cultural availability these also determine vulnerability, I mean; if I am living in Saudi Arabia where, there is no alcohol to be available I am hardly going to develop problems with alcohol. I will still develop problems, with dune you know buggy racing or some other problems, but, not alcohol.

So, what we have been doing, for the last 20 years. Is looking at young people, why do we look it young people because, older people would a start at substance anyway. So, once you start using alcohol or tobacco then your brains change. So, there is no point you know studying you do not know, which is chicken, which is the egg, you know you do not whether, any differentiate you fine is preexisting or has started before after using the substance.

So, for the last 20 years we have been looking a children, who haven't had their first drop of alcohol who more or less haven't started smoking regularly. But, who come from families where there is a very high loading for addiction. And we have been scanning there brains, we have been looking at brain function. Specially cognitive functioning, I am trying to see whether there brain function, there brain brains are different from children who are not at risk that, is they do not come from you know the risk factor that I showed you.

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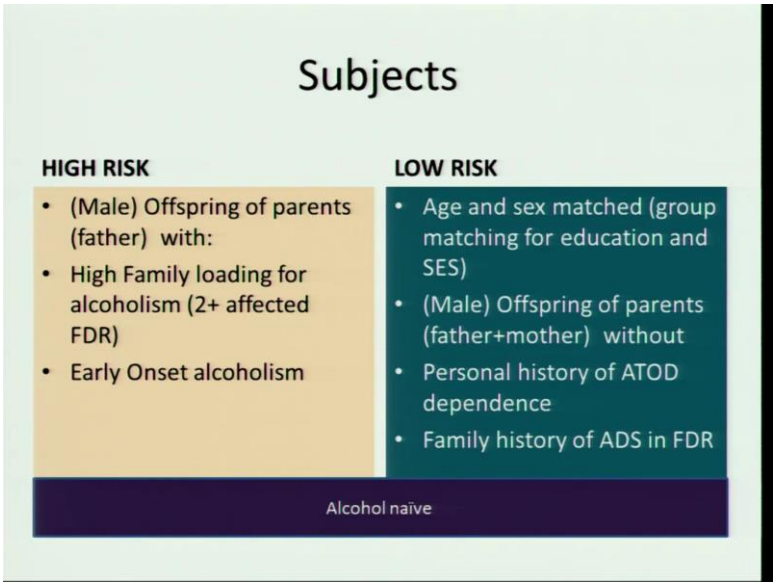

So, basically this is my high risk and my low risk. And what I am going to talk to you now, is what over the last 20 years, we have found. I am going to function most mostly on data from my lab because, we have 1 of few labs in the world who work in the vulnerability to addiction. There are 3 or 4 more labs throughout the world, who work in this, but we have we are 1 of the labs, which have been consistently working in this.

So, I am going to focus only Indian data because, the rest of the data is on the internet. If you are interested and I be glad to speak about it, if you are interested ok.

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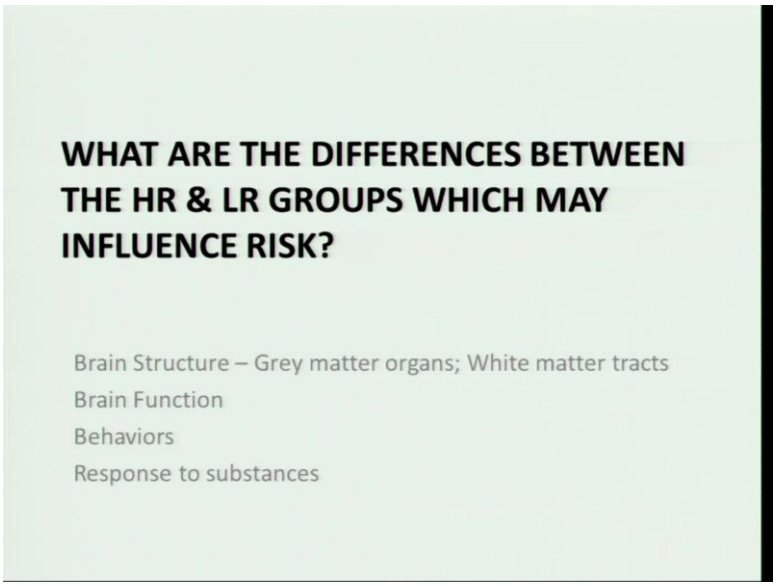

So, what are the differences, between the high risk and the low risk you understood what I mean by high risk and what I mean by low risk. Which me influence risk. So, we looked brain structure, we looked brain function, we looked at behaviors and we looked responses to substances. How they how do these young people respond to these substances.

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And 1 of the first things that, we found is that ever differences in the grey matter. If you are aware of the brain, the brain has to on the outside; there is a layer of a grey tissue.

Which is where all the cells are and then b below you find the what matter, which is where all the tracts are basically if you think of the stations, they are grey and if you think of the train line which connects the stations they are white. These are the tracks ok.

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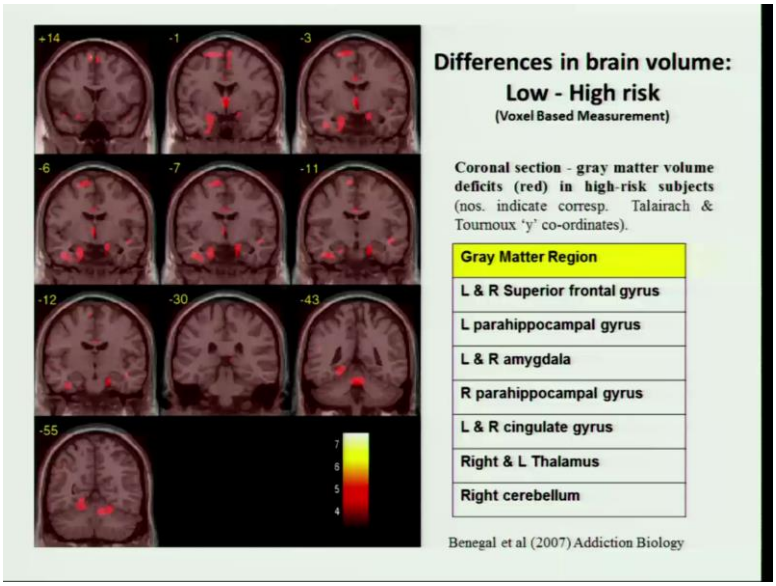

So, the first thing that we found, was that when we looked at these children at risk their brain was smaller, than the brain of children who were not at high risk consistently; across 20 years all the studies we have done consistently; across continents, in my colleague in the US, my colleagues in Germany have been finding this have been consistently finding this. And in certain areas of the brain only not the whole brain you know.

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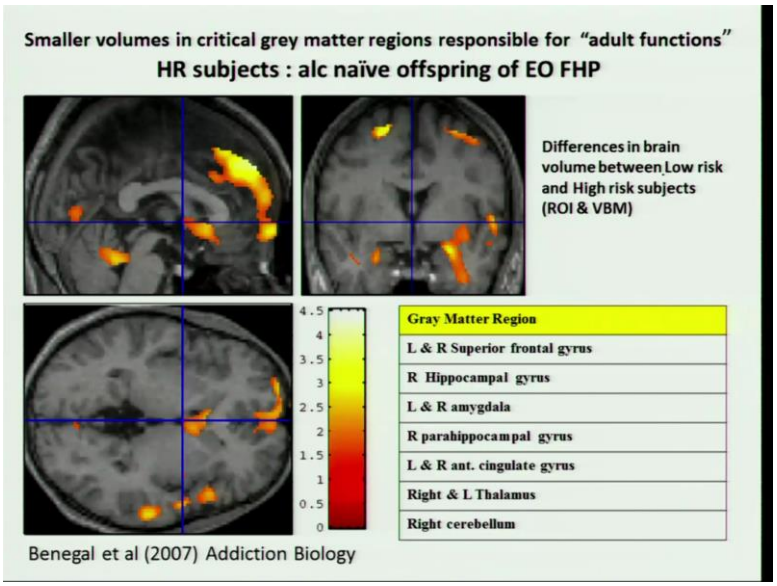

So, what is that mean; these are the again if you see the yellow, orange areas basically what we do is: we take brains scans MRI scans of 1 group of people, the low risk. And we take brains of the high risk can we subtract. And when we subtract the computerized subtraction gives us areas, where there are difference. So, the yellow areas and the orange areas are areas, where there are differences between the low risk and the high risk the low risk have smaller brain areas.

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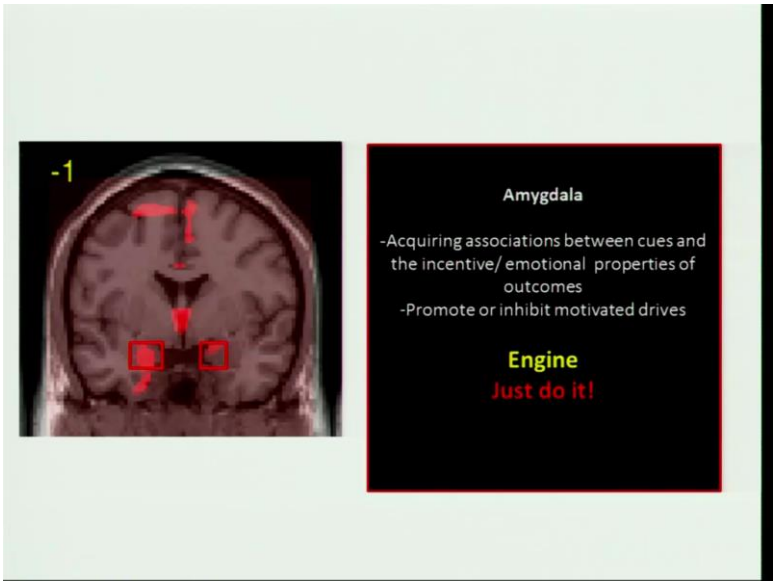

Where these are important because 1 of the areas where, we found smaller was what is called the Amygdala, the names are not important I will just tell you the functions. The Amygdala if you think of the human brain as a car; the Amygdala is the engine, because it motivates you to do things it says wow this is lovely. Because it gives emotional significance to things and makes you do things. So, it is like the engine.

We found that it was smaller, but it is more active then, I mean; it is that part of the brain call it the Nike brain you seen the Nike ad just do it that is the brain, which makes me just do it. Alligators have it, crocodiles have it, snake have it, tortoises have it, lions have it. And they just go for it they snake is bother whether, you know somebody else is watching it you know go and grab her at he just goes and takes it ok.

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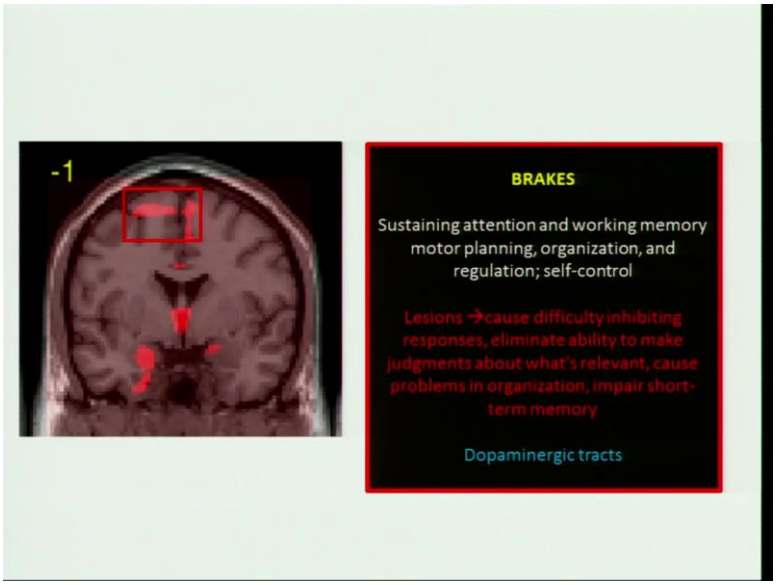

But you and I are bothered why because, there is another part of the brain which are the brakes of the brain, which is the frontal part of the brain whose job it is to say wait, think then do. This is something that the higher animals the more evolved animals have because they have to live in societies. So, I cannot just take it from her; she I will slapped ok. So, what my brain has to do if you look at brain functioning I wanted.

So, my brain; my Nike brains says go do it just take just do it. My brakes say hang on wait a minute. Let us, find out whether you will get into trouble or it will work for you. So, the frontal part of my brain says, hello can we go to the database and find out what happened the last time you took a keychain from a young lady. And there is another part

of my brain, which I shall talk about; which is like the gears of the brain which is the error detector of the brain, whose it is to see to learn from mistakes, to learn should I go the this way, should I go that way, should I go up a slope on first gear or should I go on forth gear ok.

So, that decides he boss last time you did it, you got therped. So, this time please do it differently ask her and take it ok.

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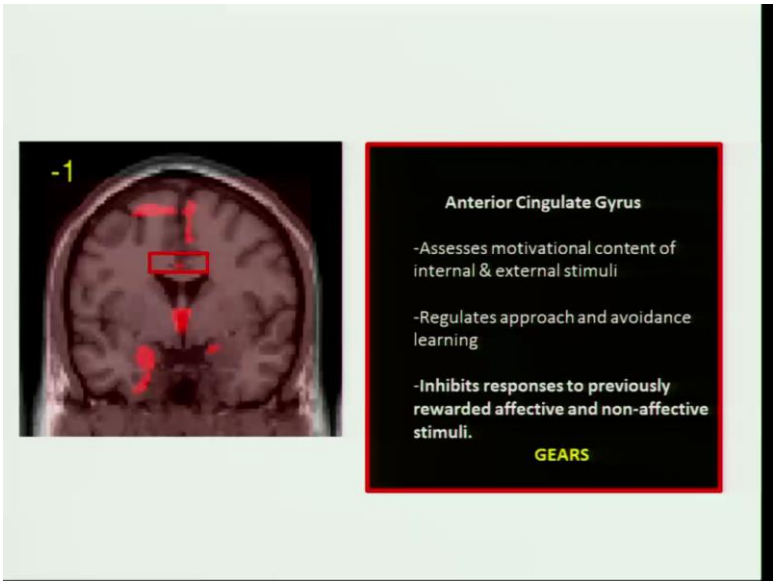

So, that is how the brain works basically, you know nutshell the brain as an engine with a car sorry brain as a car with the very powerful engine, it is got brakes and gears, but, what we are finding is that, the brakes are smaller. In these children who are at high risk, not only the brake smaller the gears remember I told you about the error detector of the brain is called the anterior cingulated gyros, but it is the end name is not important.

But, the fact that we have an error detector in the brain and that we found consistently smaller, which means; that in these kids they are just saying let us do it. But, there are no brakes saying hang on wait think and do. There is no error detector saying look last time you did you got into trouble do not put your finger into fire again, right do you know kids like this? Do you know people like this? There are people like this; we have been school with them sometime we have been them all right.

These are often people who are very bright and brilliant people because, they just think out of the box. They will you know come to the solution in 2 and a half seconds and then feel totally bored, because they cracked the problem before you even though of it right. But they get into trouble because, they have a difficulty in sustaining interest. They start of something today and half through they lose interest and then they go onto something else.

So, although they are bright and brilliant you know, most of the task that we have in society today they cannot complete they are the worlds champion starter they are the worlds champion I mean, lousiest finishers. So, and we found certain other areas, which was smaller. I am not really not go into go into detail about that, as long as you know I have been able to convey.

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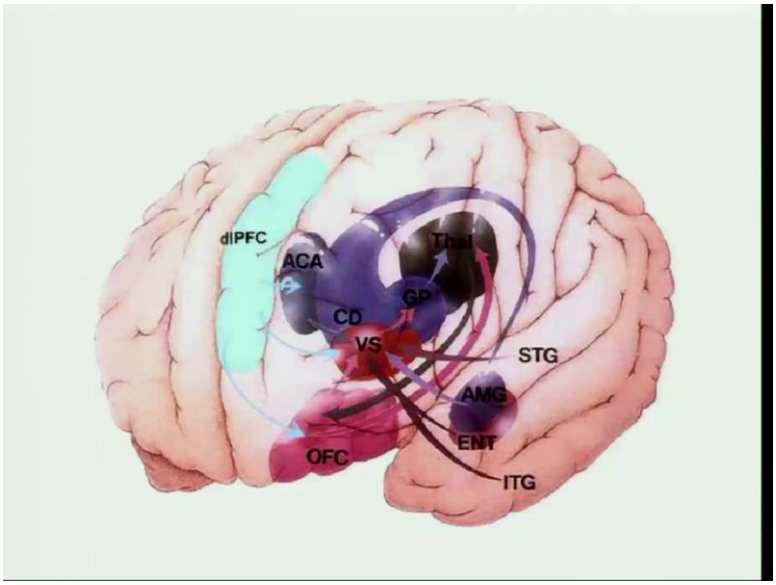

So, this is basically some of these parts that, I was talking about which are smaller in high risk children.

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What then we looked not just the stations, he looked at the tracks you know because, if the stations are you know not good. Let us look at the train tracks you know, hopefully the train tracks are good. So, at least the trains will go the messages will go faster.

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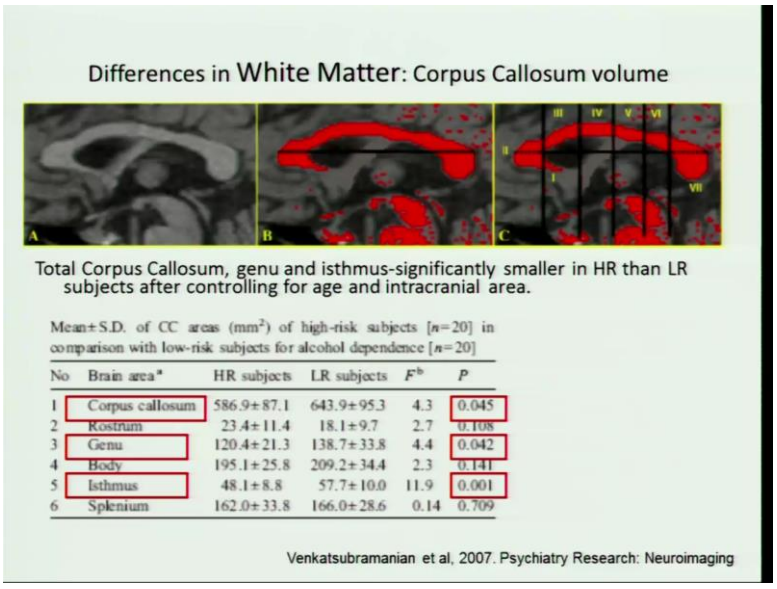

What we found was very surprising, what we have been consistently again finding is for example, this is the Corpus Callosum, which is the white mattered track with links 1 part of 1 side of the brain to the other side right to the left. As the huge fiber, it is the

highway; it is the major highway all right. And we found its smaller you know and it is smaller at a time specially in adulations.

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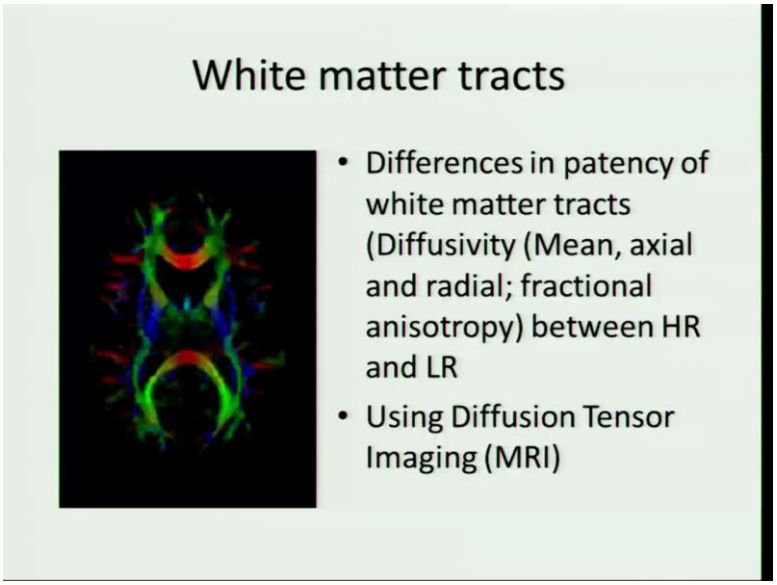

We did another procedure, which is called diffusion tensor imaging. Basically what it does is it tracks how water molecules move along these paths, you know just imagine water molecules are you know trains or cars going along this highway. And if there is lot of resistance then the water molecules would not move your cars will be stuck, there will be traffic jam; which in brain sense is good because, it means; that this actually matter there, it is mature.

What we found was water molecule are diffusing every which way, which meant like you seen these leaky hose pipes. So, it was leaking all over the place which meant that the these roads were not well formed. So, not only with the grey, the stations not well formed we found that the white matter. The great highways linking these cities or this stations or also not very well formed.

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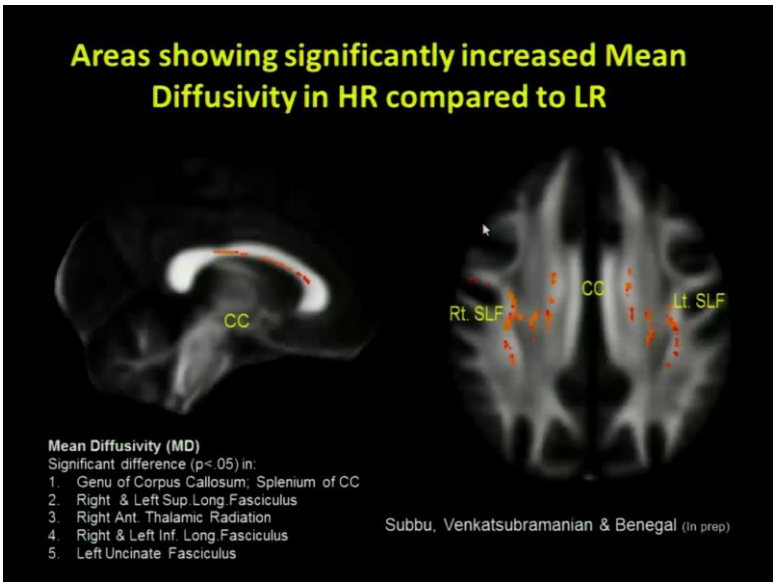

These are some of the pictures for example, these are the white matter tracks and we found that these orange areas are places, where there was leakiness happening. There was too much diffusion happening of the water molecules ok.

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So, what we also looked at, was these differences between the high and the low risk, was maximum when the children were young and as they grow older the differences decreased and. So, that may thus thing the this was because of a developmental lack is a lagging development, there was a delay in development that this kids were also their

brains were also growing, but, 5 steps behind. In fact, some of our colleagues in Canada found that there almost 5 years behind the other kids in development in brain age 3 to 5 years.

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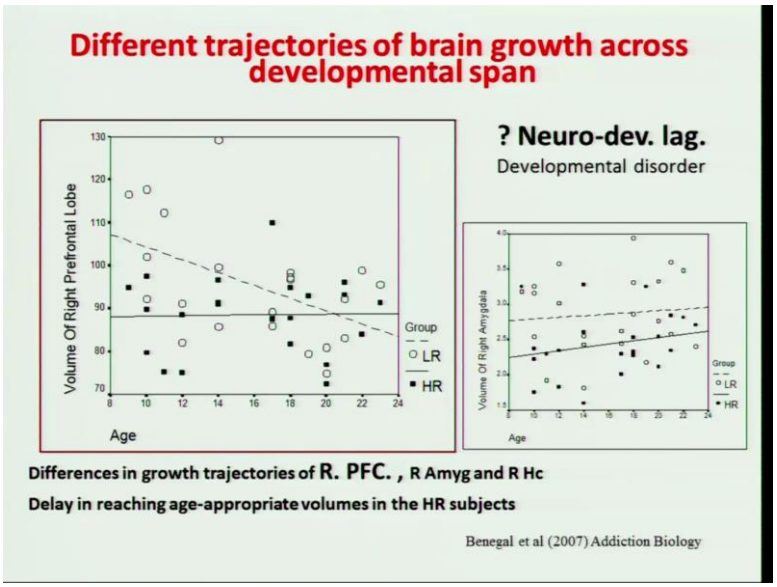

And this is also what we found that initially, at the age of 8 this is the difference as it goes around the age of 20, 22 and in some other studies that we did as late as 30, 35 the difference narrow down.

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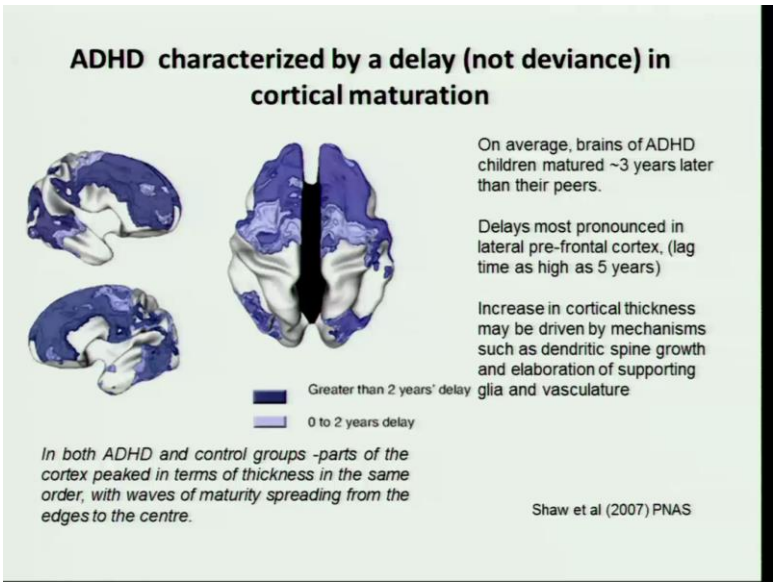

This is what this friends of ours have found that, you know on average these people brains mature 3 years later then they appears ok.

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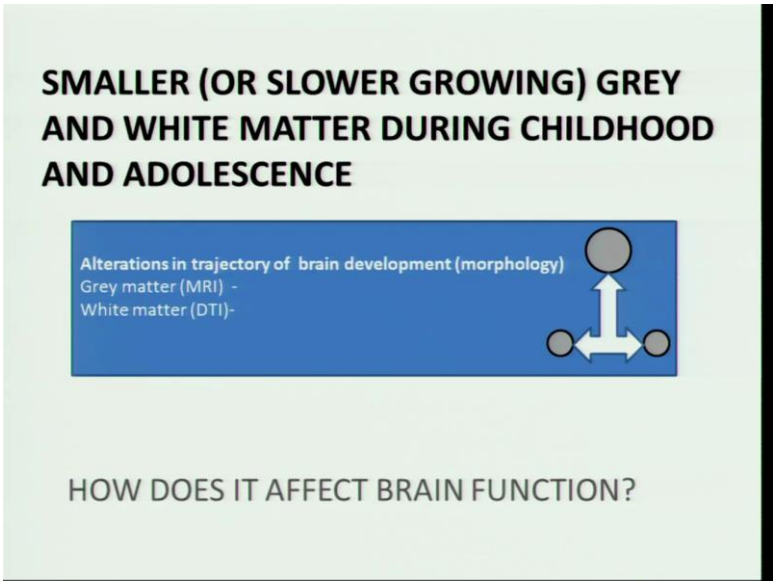

So, what did we find, we found that in these high risk children smaller or slow growing grey and white matter during childhood and adulations ok. So, how does it affect brain function, we asked ourselves that am I with you? Do you need me to repeat anything? Sure you got this story so far.

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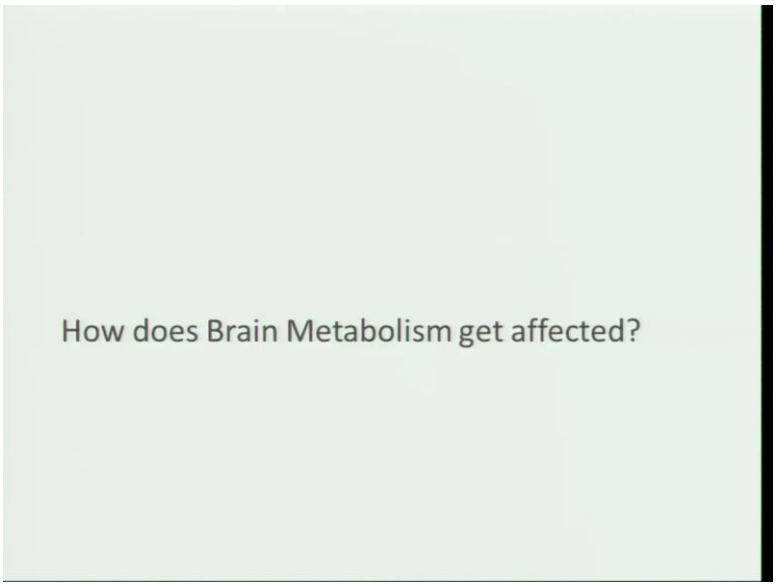

So, if brain structure is smaller. The question that you need to ask is the brain is there is something wrong brain activity is not it? That is a logical choice logic next logical question.

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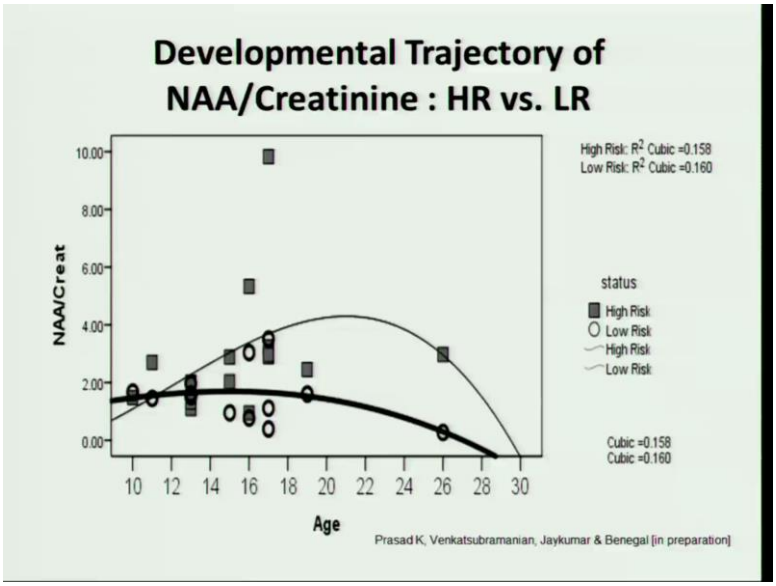

So, we asked ourselves as to what happens in brain activity. And to make long story short we looked at a particular chemical, which is basically if you like you have an OS operating system in computers. This chemical is the operating system of the brain basically, I would not go into details, but, it is very important for brain functioning. And when we look at it again, we found that there were over lapping curves. The high risk children developed less I mean slower than the low risk children. So, the activity was; obviously, reduced.

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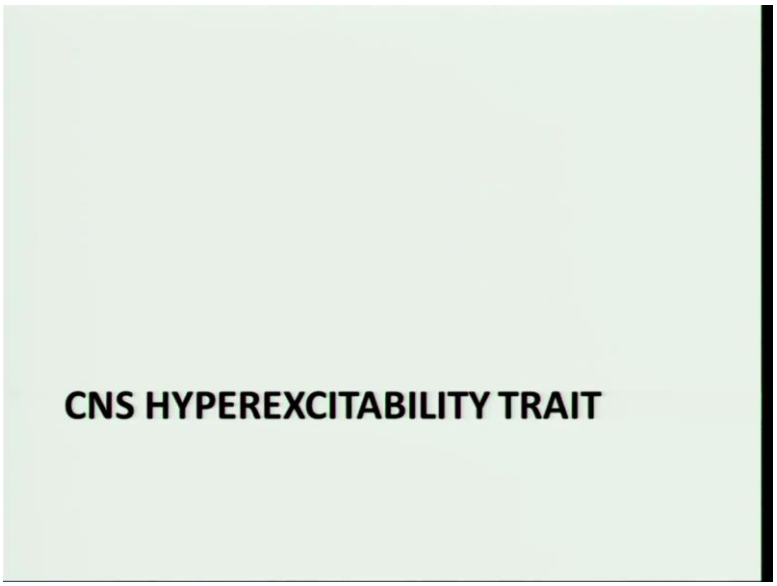

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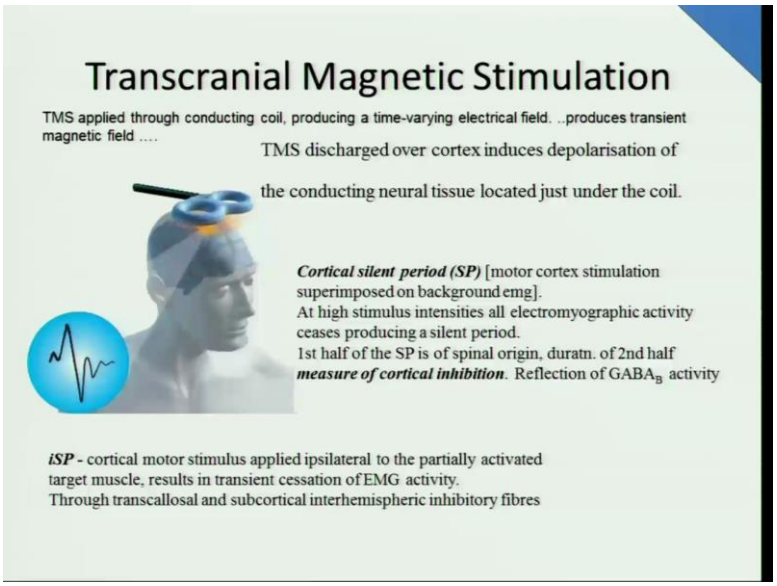

I am not going to go into this because very technical. the other thing that we did was again this is a technical issue. So, I will try and simplify it, by using magnetic stimulation in the brain, we are able to create electrical field here. So, that you can stop or start particular parts of the brain. So, you can see what happens that is very safe. So, it is not like neurosurgery or anything.

So, what we found net is that, when we tried to stop brain functioning, by using this magnetic field you know you can silence brain activity. We found that in the high risk

this smaller brain kids, you are not able to silence there brain functioning the brain is so, hyper active you could not silence them. Whereas, in the other kids, the low risk kids when you give this magnetic stimulation, you are able to stop their brain functioning. So, what we learnt was that these kids who are at high risk appear to have hyper active, extra active, brain activity ok.

Now, that is fascinating because, when you look at their outward behavior, you find that they are hyper active that they cannot stop themselves, that they cannot sustain interest in things.

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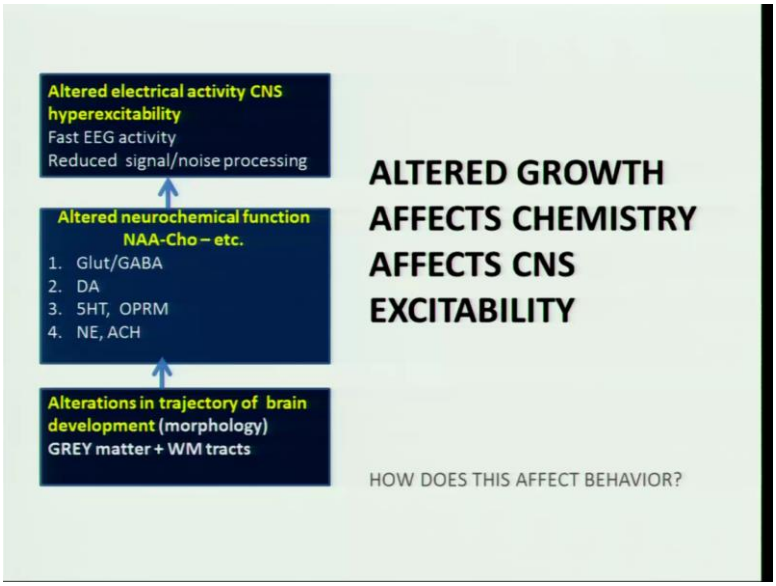

Now, so, basically what we did find was that there was alternation in the trajectory of brain development, how the brain grew. This caused changes in the Neurochemical function of the brain; these alter the electrical activity of the brain.

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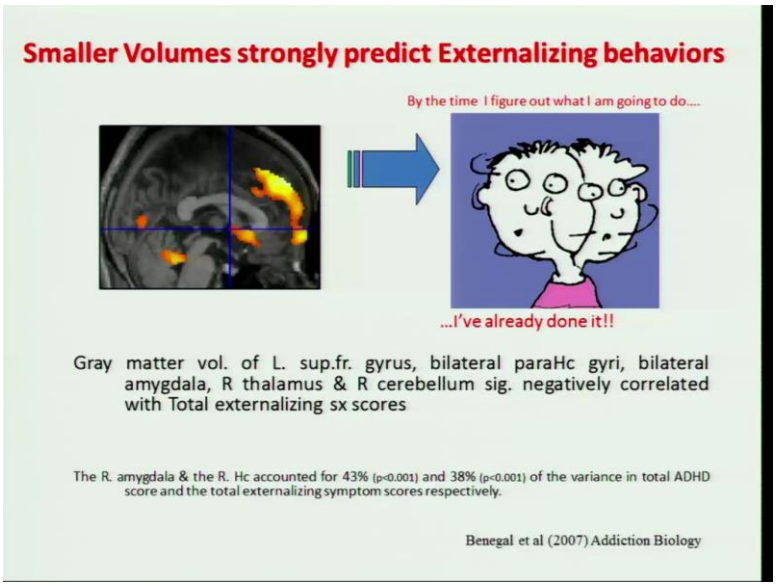

Now, how did this affect behavior and all your cognitive behaviors might be interested, we found that the smaller volumes very strongly predicted these externalizing behaviors ok. So, these smaller volumes increased hyper excitable brains, were a cause of these externalizing behaviors the ADHD.

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This affected decision making for example, we gave them a gambling task you know, this kids were asked to do a quiz and if you answer it correctly you got a certain amount of money. Sometimes they were told that, this is a risky thing do not answer it they

would still go and answer it they would take risky decisions he by even and they were told and even when they were not told they would take risky decisions.

Another colleague was worked on a similar thing and she study the brain functioning she you know, you heard of functional magnetic rezones imaging, which looks basically brain activity oxygen utilization in the brain during any particular activity. And she found something fascinating, when you give these kids a talks which gives them a reward the part of the brain I showed you the Amygdala and all that no, which is the Nike brain that gets very excited and.

So, that part gets very activated, but, when she stopped giving them, the reward this isn't this is normal children she stopped giving them the reward. The activity shifted to the frontal part of the brain the brakes because, the brain was save forget it I mean taking for a ride. Let us not get in to excited, but, with these kids the high risk kids whether, you gave them a reward or you did not give them a reward that Nike brain kept saying wow, next time I am it is going to happen, it is going to happen again it is going to happen.

Which is something that, we find in people with addiction or with gambling that I went there I got hurt, I am not getting a high any longer, I have got thrown out of school etcetera, but I still go I might get a high this time. I have lost ten Lakhs, but I still gambler I might win this time you know. So, the question then became for us not why do this people not learn from their mistakes. But, it became that, hey these guys are not capable of learning from their mistakes. So, we need to bring in interventions which will help them learn from their mistakes.

So, we cannot stand in judgment any longer and say why cannot a person with without 2 legs run the Olympics 100 meters, we need to give them something. So, that they can run the Olympics you understand. So, that is where this research is helped us this research is helped us move from a model stand point saying: hey there is something wrong with them to saying, yeah something different and can we help them become? You know very effective human beings ok.

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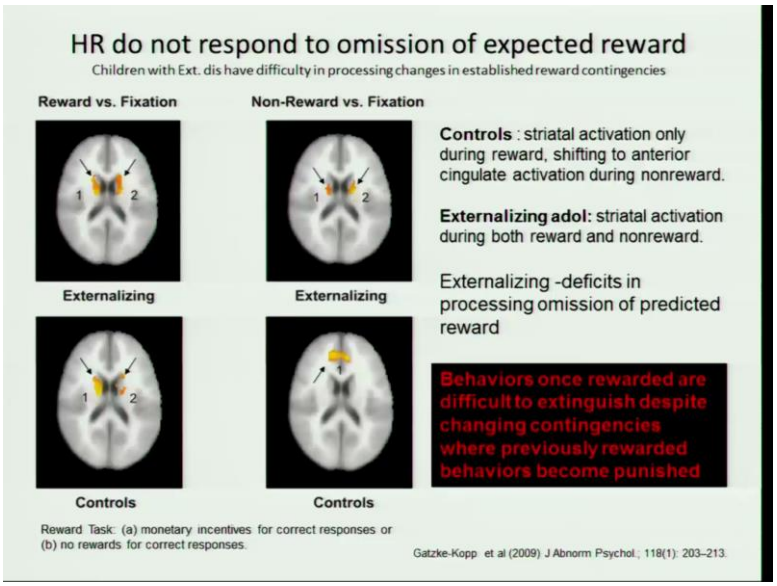

So, this is what I was talking about the decision making this at thing and I was talking about now let us, go back see for example, and then there is I was telling you in the controls this is the part which is responding to the reward. This is the Nike part and then it moves to the frontal part once, the rewards stop happening whereas, in the high risk its remains in the Nike brain ok.

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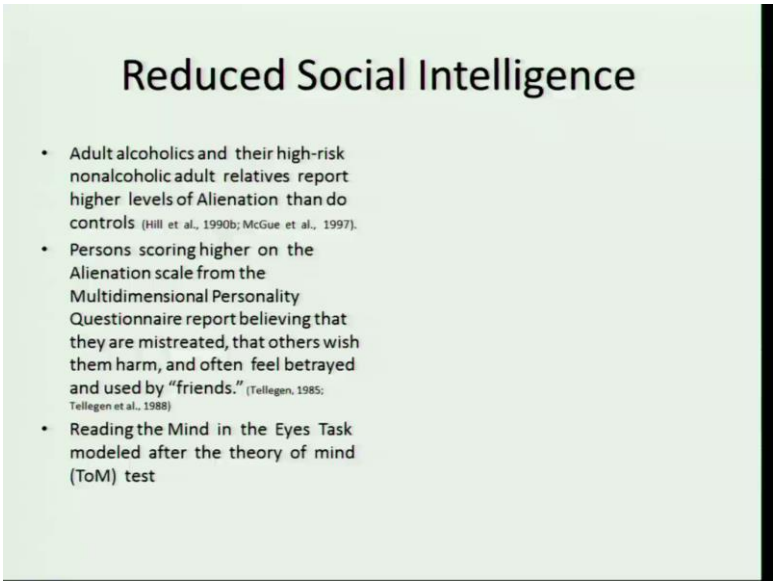

Now, let us go to our study this what we also find is that these children have reduce social intelligence, you are talking about that is not it about how people respond. When

we gave these kids emotional faces, we put them in a scanner and we showed them emotional faces: sad, angry, neutral and we saw how they reacted. What we found consistently again was that, they were not able to gaze another person emotion and. So, in real life what they would be doing is saying oh this girl is angry with me, because she sitting there doing that.

So, I will read a neutral responses and angry responses or a threatening response. So, I will then go and say why you doing this to me ok. And that is again something that we know about people with this kind of behavior.

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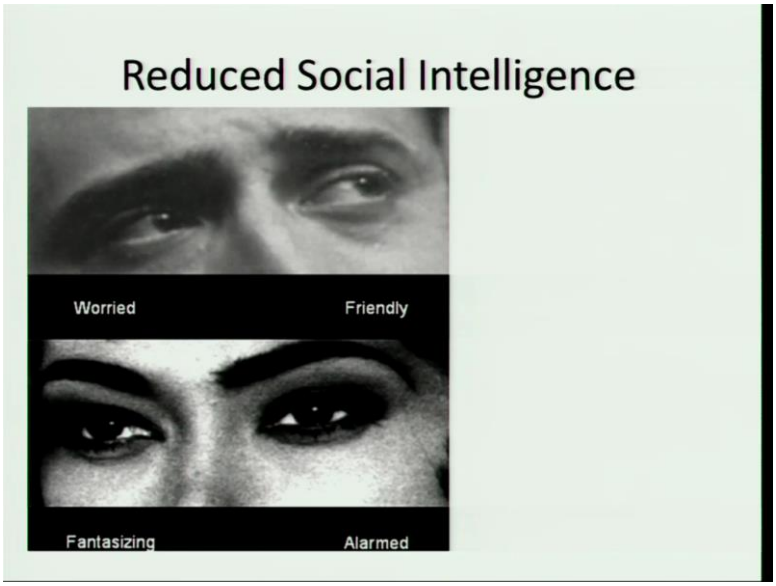

For example, this is again another test that is used you know is this guy worried or is he friendly? What do you think? Is this person fantasizing or alarmed? Anyway that is not the point; the point is that most of you will be able to make this judgment. People with autism cannot make this judgment and its uses as test for autistic children.

We are also using it with these kids and we find that they are also not able to make this judgment. And they do not make this judgment, because the parts of the brain which are used to make this judgments do not function very well ok.

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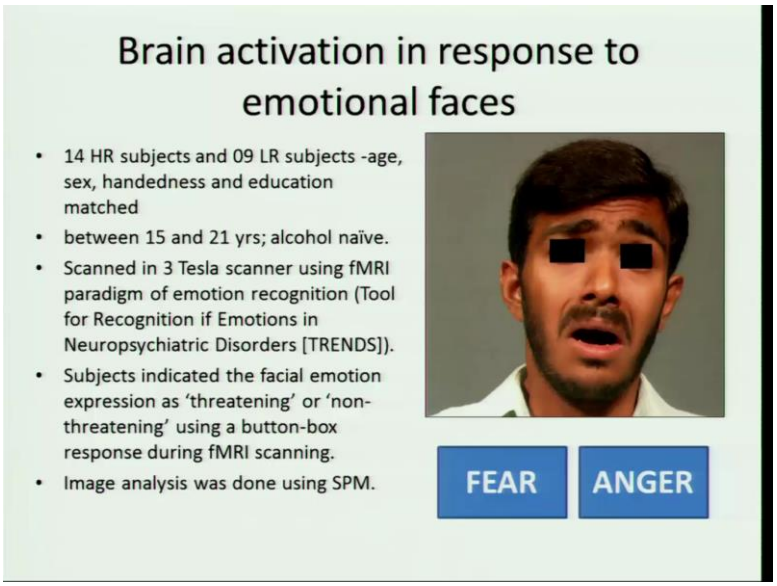

Let us go this is the test that we were talking about. So, we fear, anger? You know consistently the kids could not distinguish, between they would you know think none threat emotional things as threatening responses.

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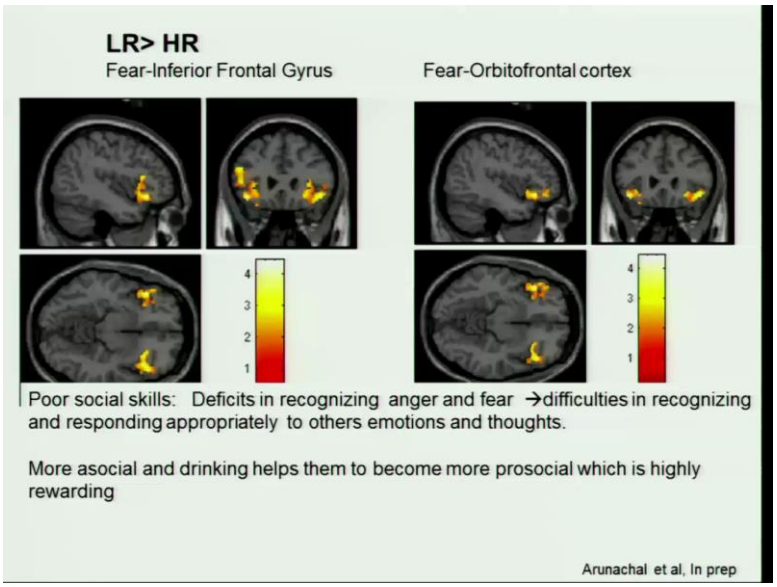

And these appeared in areas of the brain, which are responsible for modulation of emotion and you find that, they are responding much more when they do not need to respond.

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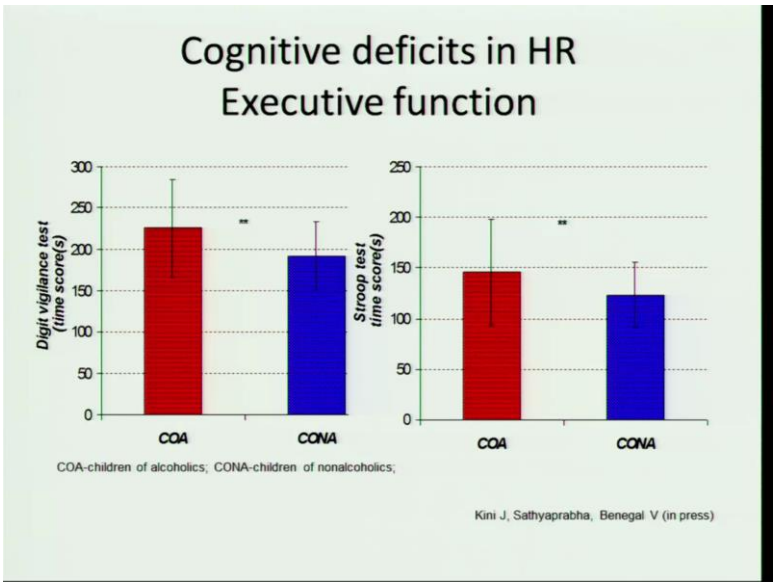

Now let me go past, you talking of cog cognitive deficits, what we again consistently finding is that, in these children the high risk children in red they have worst functioning on test of cognitive function especially executing functioning, you know decision making, problem solving etcetera.

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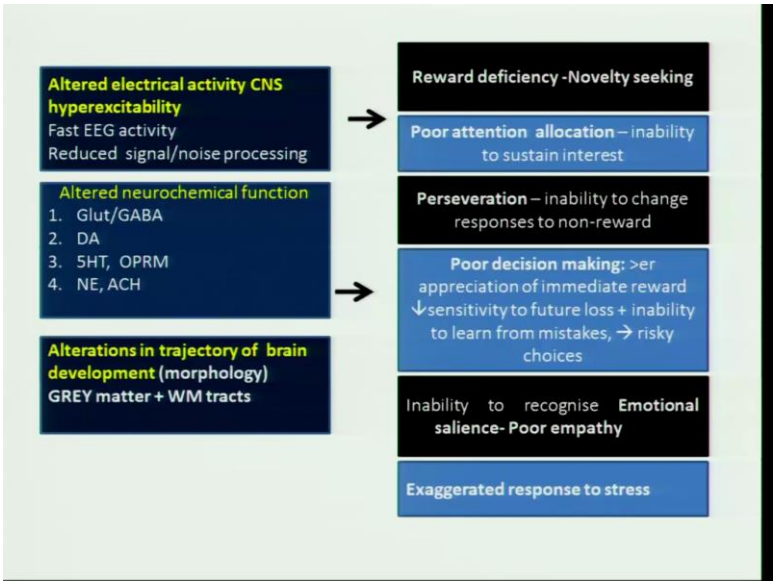

So, basically the point that, I am trying to make to you is that: alteration in trajectory of the brain occur, I mean; cause Neurochemical function deficits cause alter electrical activity in the brain, which then causes certain problems in behavior no we find novelties

seeking these are people who loves sensation, new sensations every minute. So, they are seeking novelty all the time. They are poor attention, allocation inability to sustain interest, which means; the despite the superior intelligence, they are unable reach their goals.

Perseveration inability to change responses to non reward, when the reward is stopped they still keep behaving as if a reward is going to come poor decision making, especially appreciation of immediate reward; inability to recognize emotional salience what is emotional important. So, they poor empathy and they have an exaggerated empathy and they have an exaggerated response to stress. And remember these are not people, who are taking any drugs or drinking or doing anything, but, those who are at high risk.

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So, of course, 1 other that we have is: what is causing this developmental age and I am not going to go into detail is but, just to say that we are looking at certain genes. And how certain genes are modulated by the environment; obviously, the environment is interacting with the genes to cause this.

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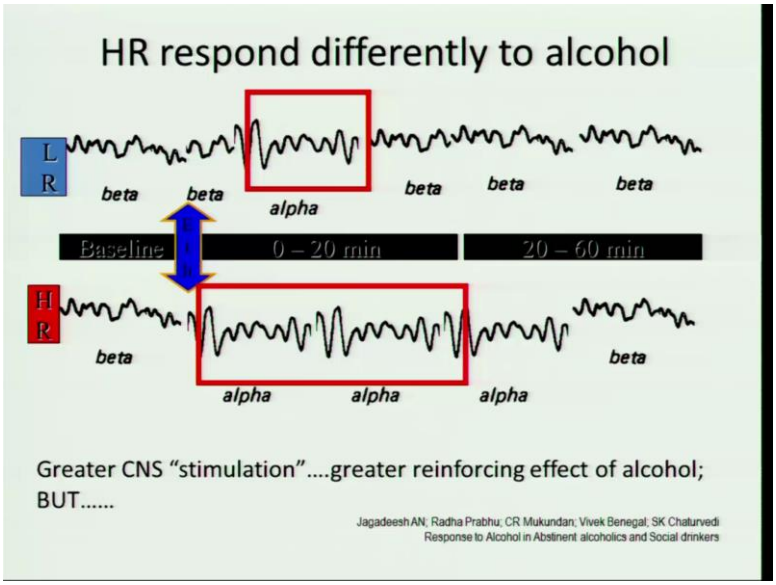

1 last slide; so, what? I mean the question that you should be asking me. So, what if you discovered this and this kids does not make an any difference. Why should they be drinking more and getting into difficulties? Why should they be taking drugs? So, 1 experiment that we did was not in this children, but, in slightly older people who are high risk; we gave them drink of alcohol you know he is a people who are already drinking.

So, we were not introducing them to alcohol and what we found was fascinating. This is the normal EG you heard of electro and Cathelogram the brain, which this is the normal brain width in the low risk people and the high risk people similarly, normal brain width and we started there was nothing to tell the difference between these 2. Then we gave them a drink of alcohol, in the low risk people the normal brain activity continued for some time and then its slipped into what we call the alpha, which is a resting activity, which comes when you close your eyes, which comes when you a relaxing, when you doing yoga, when you are listening to music things like that. And it lasted for about 10 minutes and then slipped back into the normal beta rhythm ok.

These people the high risk young people we gave them alcohol immediately switched into alpha rhythm, the relax rhythm. And it continued for a long period and then went back to the normal rhythm. So, which groups brains, were the affected more by the alcohol the high risk is not it? Who would have the second ring high risk there is no prices for guessing that excellent.

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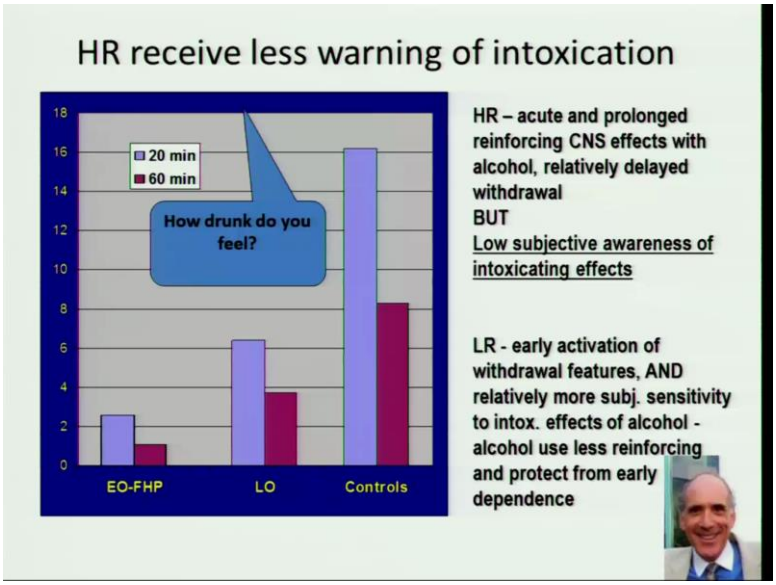

But then what we did was we asked them how drunk do you feel? And what we found was, the high risk whose brains are getting relaxed. So, drunk what drunk nothing anything up and nothing you gives us a drink give some more; because they were not feeling the negative effects of drunk getting drunk intoxicated slurring inability to walk all that.

Whereas the low risk people you know and their brains will not getting affected, they were not getting you know a high, but they were getting more of the negative effects of intoxication. So, it is a doubles 1 is your brains are getting very strongly stimulated or relaxed and you do not feel any of the negative effects and the other group you are not getting any effect you are only getting negative effects. So; obviously, who is going to have the second rink and the 3rd and 4th and the 5th and the 256th these group ok.

So, that was a fascinating revolution this is first talked of by, a friend of mine called a Mark Shauket, who in the eighties discovered what he called subjective response to ethanol, I did not know in the 80s. I was in college and looking up to all the guys who could take drink a hell of a lot and not and then still walk. We used to call them iron stomach people had iron stomach, but, the iron stomach guys developed early problems you know the all of us who would you know sat down after the second drink be still alive how long we do not know, but still.

So, what I am trying to you is that. So, what I am, what I have presented to you seems to be a logical series of data to explain why some people are at higher risk. What we have been trying to do is no point having this kind of data unless we can go back to Pedriatrisn and say, you know what this kids need a different kind of intervention, you need to go back to the teacher and say look this kids need a different kind of intervention because, what happens is children who are who have externalizing syndrome are usually kept at the back of the class.

Because they difficult children here, the brightest children who are asking the cleverest questions, but asking clever questions is not a good idea in most of our schools; they are the brightest children who finish their work in 2 and half minutes and then they poking somebody throwing things at other people and. So, you get sent to the back of the class. This is the best way of ensuring that, you create a problem 20 years down the line.

However, I want to bring to your notice that, these are same problems that you know I think Christopher Columbus had, he was creating problems and several getting drunk and getting into fights somebody gave him a boat said go. And he went and found what he thought was India, but turn out to be a different continent. This is the same problem that Steve jobs had and he has written in his autobiography, he was getting absolutely drunk and disorderly and getting high on cannabis in India until somebody, showed him something called a computer he change the world.

This is the same problem that, I am not going to name any Indian names, these people who have talked about it that is why I am naming it Michael Phelps that, guy who won so, many gold medals every time he comes out to pool, his mother had to keep him away from travel. Because the cops was arresting him for drinking and smoking too much, but putting in the pool give him a project, he changes the world ok.

So, the point I am making to you guys is that, this lot is like: a sword WH sword, it can cut both ways and depending on social circumstance you know it they can become heroes or they can become 0s.

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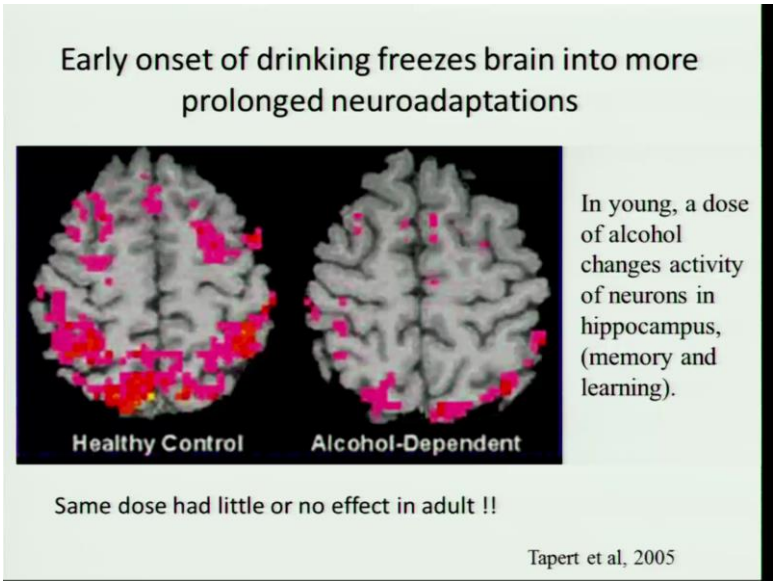

So, I want to end with this last slide that, these this is the brain of a healthy control. Given 15 year old, given a arithmetic problem and these are the areas of the brain which are using oxygen to solve the problem. This is a 15 year old person with addiction these are the areas which is using. So, the point is earlier you start, the greater the problems because, the brain is not mature enough and the more prolonged and more long lasting it is.

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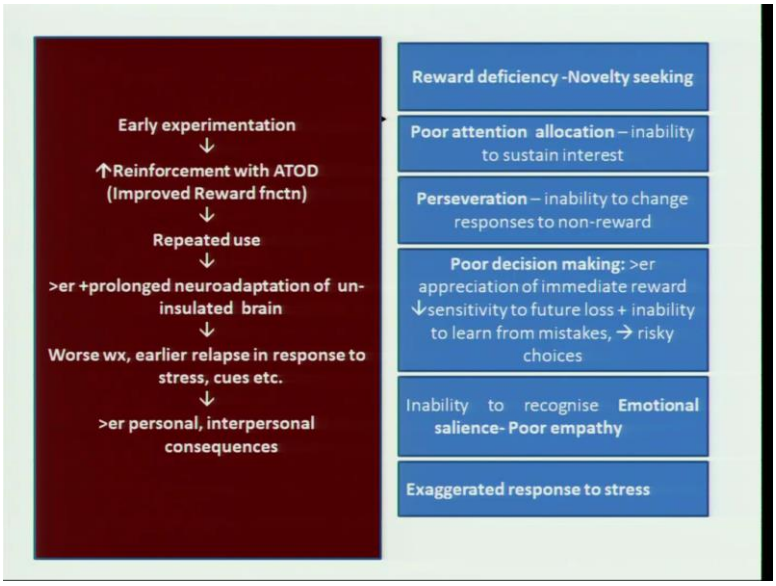

So, basically this is what I believe is the path way for addiction. And this in a way is also the data, which tells you why the earlier you start greater problems you develop why some people are at higher risk. In fact, I want to leave you with a very revolutionary emotion which I am trying to push throughout India. And the world which is say this no such thing is addiction, it is just an epiphenomenon, it is just a result of an externalizing syndrome you know we do not recognize it.

So, these young people go and try and find their own solution by drinking, taking drugs etcetera, because it is normalizes the brain initially, but, alcohol and drugs are bad medicines for this condition and they develop problems, because you or I do not recognize the condition and we do not help them. And if you help them, perhaps you know Tomorrows history will be different. I will end there.

Thank you.