Selected Topics in Psychology
The Neuroscience of Addictive Behaviour
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Neuropsychology

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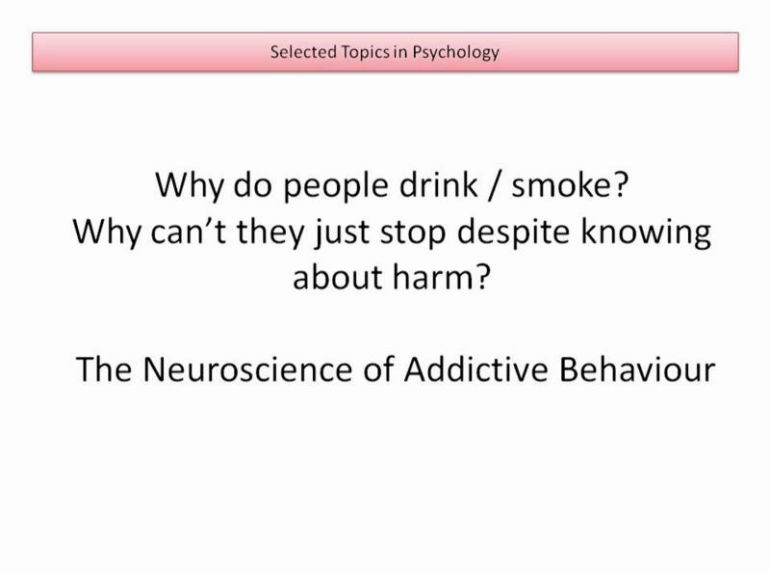

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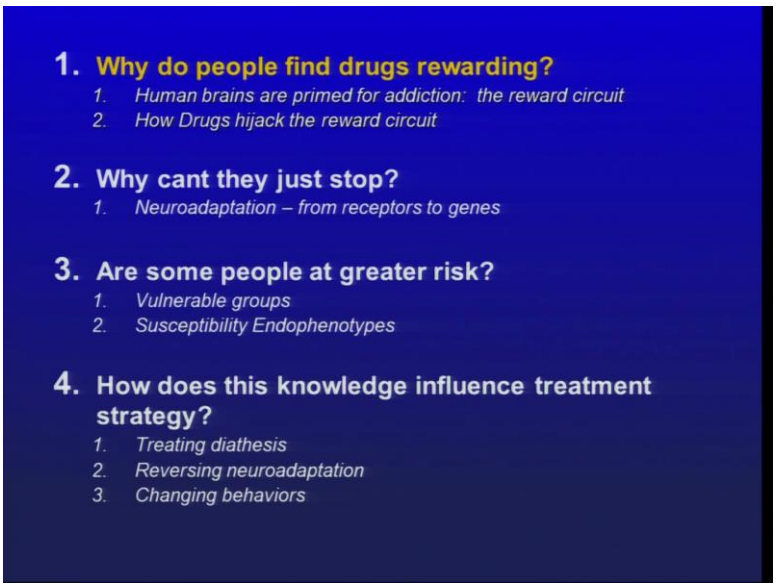

If you go back in recorded history you will find that, one of the first mentions of any society which learn to write or you know put their records into store was about getting

you know simulating their brain in somewhere way the other. 3500 years back, when people were reciting the first theme of the Rig-Veda, what are they about? About grinding Somrass out of some twig and getting high, staying wake in night looking at the stars and writing poetry.

If you go to South America, what are they doing? They were chewing a leaf called a coca leaf, which is like chewing pan and getting slightly merry. Around 3000 years back, the societies all across the world discovered that, if they fermented gray and foods etcetera, they could make a liquid which made them pretty high. So, the point I am trying to make is; drugs and alcohol have been there for a very, very long time. Yet human beings also had problems with drugs and alcohol. It is not be an easy right. There are some people we know, who can develop very serial problems using drugs and alcohol.

Now, the debate has always been of a very polarize nature, either North ya South. When it comes to for example; canvases debate - people say, you should have unrestricted access. On the other hand, people say it is a band drug and you should put people into jail for it.

So, what we need to do, is to actually separate; fact from myth, dangerous from non dangerous. We need to have facts, because unless we have facts we cannot decide. That is number 1. Number 2 is also, I mean 1 needs to stop getting drawn into these polarized debates and 1 can do only with facts. So, it is good to look at some of these things. And the first question that anybody has or anybody brings up, when people start talking about drugs and alcohol is, why does not the government banned it? As if it is that easy.

The second question is; why do people drink and smoke in the first place? If they wanted to they could just stop right? Which brings us to the third argument where, people say look I have no sympathy with somebody's who is develop an addiction. I mean if you just want, you can stop. The fact he does not want to means that, he must be a weak person or morally not good person right. We need to look at these arguments.

So, today you know what I would like to focus on this morning; is to talk about why do people use drugs in the first place. By drugs I mean variety of stuff you know. When 1 talks of drugs, 1 talks about substances which make changes in the brain. As opposed to drugs like say antibiotics or things like that, you know 1 talks about these drugs which

make changes in the brain, we called them substances abuse because, human beings tend to abuse them etcetera.

So, basically if you look at them, there are 2 great varieties: 1 are drugs which depressed the functioning of the brain like; alcohol, cannabises, opiates, things which come from opium like heroine, those stuff which in the cup seraphs etcetera. And then there are drugs which increase the functioning of the brain. For example: drugs like cocaine or you know various other drugs which are far less found in India today. That is not the point.

The point I like to actually start with is; why do people find drugs rewarding? Otherwise people wouldn't use it isn't it? The answer seems to be quite simple; that the human brain in some way is actually hardware for addiction. Its way is very strange answer that; they seem to be a circuit, which places human being at greater danger of addiction. Goods do not get addicted. Cats and dogs do not get addicted. Its only with the higher primates you know that, you get addicted.

You know how difficult to test to get fruit flies addicted? Very difficult. You have to put in a chamber and pump it full of alcohol fumes and keep the fruit flies in there some for 48 hours, which is many years is the life of the fruit flies. And only then they start you know getting buzzed.

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So, why are human beings prime for addiction? That brings me to a subsidiary question. Can I ask you a question: what is the meaning of life? Why does life exist? Why do you think life exist? Any answers? No. You know you what do you think take a guess.

Purposes in

There is no purpose in life that is you know 1 very influential stream of a philosophy. So, there's no purpose in life, but I hope some of you, other guys would think that there is a purpose to life. Why does life exist what do you think?

Same

No purpose that is an easy 1.

I said to fulfill our needs and aspirations.

What needs and aspirations?

Like evolve in a better human being and

And what about the people who do not evolve as the better human beings?

They just try

Ok, but why do you have to evolve as the better human beings?

It gives a kind of stability and saint.

What about the cats and dog? They have to evolve to be better cats and dogs?

Say it all depends on which section you are talking about, like for say

I am talking about all life. That we saw some meaning, why all these things happening? Human life has been there for more than 1 billion years. Not human life, I mean life. What do you think? There's 1 very influential opinion, which says life actually exists to the replicated itself. It is a self replicating structure that, 1 most important thing in life is to pass your genes on. And if you look at most of the life; that is what it does beautifully right.

But it is very strange that, in the small and the small you know more primitive form of life, they replicate by themselves; they self replicating. But as you get more complicated, as organism gets more complicated, you have to have 2 organisms which come together, share genetic material right and create another isn't it? Which basically is what? Reproduction by having sex.

So, 1 of the very important function of life is; to have sex right. And sex has to be interesting otherwise; nobody is going to get involved. And animal life human life is not going to go forward. So, to ensure that, sex is interesting, I would not use the word interesting, but I will use the word rewarding. Very early on in animal existence, they developed as brain groomed as brain evolved, they developed the circuit which made sure that, sex was main interesting rewarding. But it is not enough to have sex; you have to eat to live, so that you can have sex.

So, food has to be rewarding. That is not enough. You have to live long enough to mature to pass on your genes, which means that, the shelter has to be rewarding, which means that, collaborating with other animals has to be rewarding, which means that, there is other things have to be rewarding so on and so forth down in the land. You come to where, poetry has to be rewarding, literature has to be rewarding, making money has to be rewarding isn't it? And evolution is very stingy process. It keeps using the same what should I say, mechanisms over and over again.

Unlike you engineers, who devise multiple mechanisms for multiple things you know. And in today's age there are 2000 apps for the same thing on your cell phone right, but life is not like that. Life is very stingy. Once it makes a pattern, it keeps using it over and over again. So, the same pattern which is there for the ameba, no may be not the ameba, but yes also the ameba, is also there in human beings. The same genetic code is replicated over and over again.

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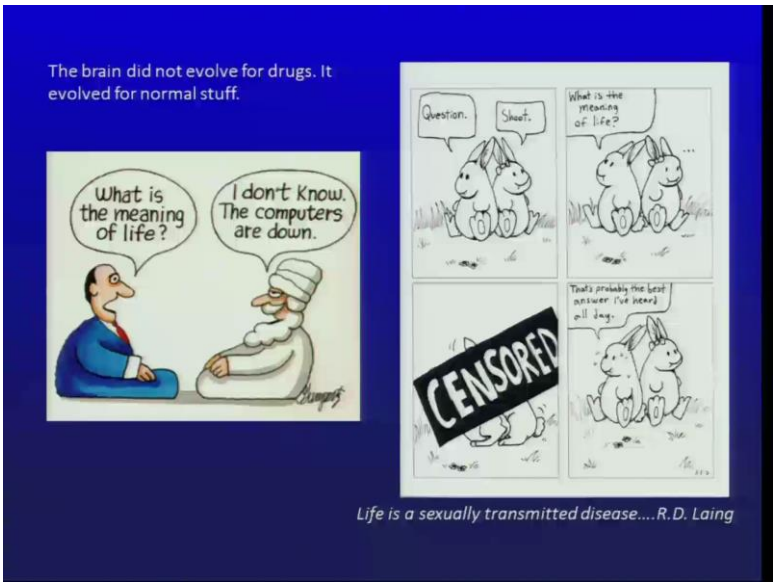

So, we have let me just see whether I can get this up. This is what I am saying, that the brain actually did not evolve for drugs, it evolve for normal life right.

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But, brains are hardwired to keep this species alive. And I was saying that, this normal circuit is for nature species and life and which establish, it establishes habits which dominant our behavior. When these activities are performed? Which is having sex, which is having food, which is looking after your shelter? The brain rewards the body

through very complex pleasure centre. I would not really call it pleasure centre; it is a reward circuit.

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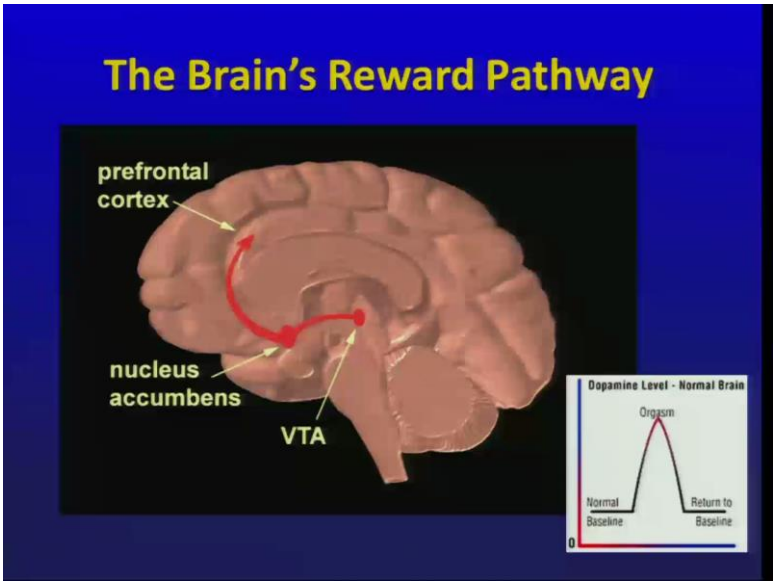

Now, this in red is basically the reward pathway of the brain. So, suppose I about to have a rasgulla first time around, my brain says; let us do it again right and its get hard coded. Next time, I see a rasgulla, can you bring that again? Somebody shows me a rasgulla, even before I eaten it, my brain says just go for it. So, it ensures that i will in perpetuity do behaviors, which are good genetics me.

Now, what happens if you look at that curve is that, in normal the normal rewards in life. The normal rewards of food, activity, you know you are being told by a teacher that you have done well or you are being given you're your reward of a money at the end of whatever work you performed, what happens is; if you look at it, the activity in that in this reward circuit goes up and comes down to the baseline right.

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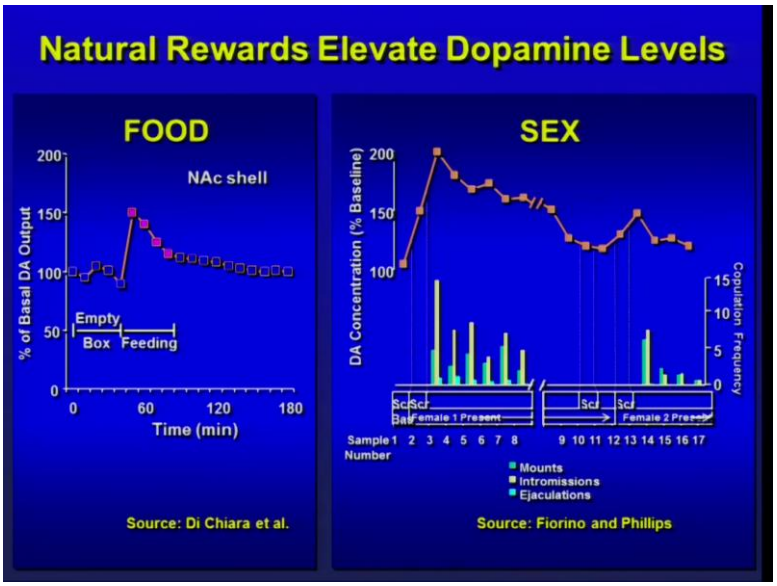

But, what happens like I am showing that, if you eat food the activity goes up comes down to baseline. If again similarly with sex, activity goes up comes to baseline.

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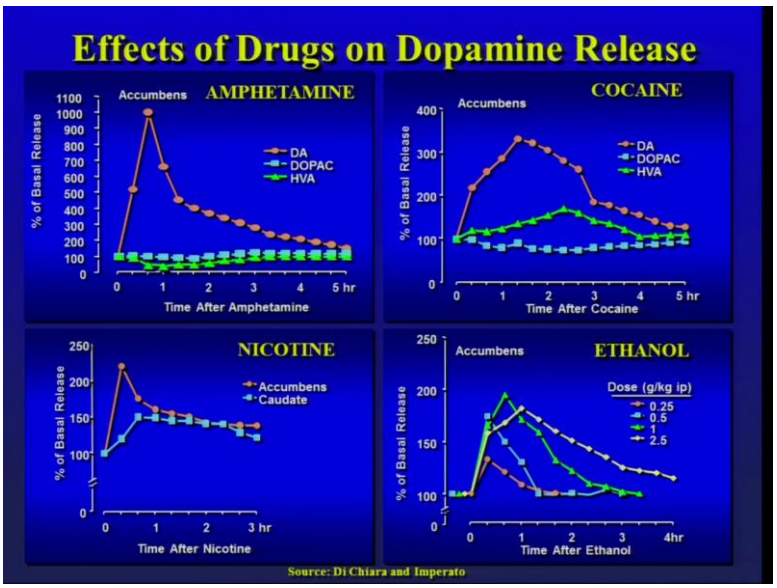

But, what we do find is that, when you give the brain drugs, you find similarly in the same areas there is increase the activity. Whether it is for amphetamine like drugs, whether it is for cocaine, whether it is for nicotine that is in cigarettes or whether it is for alcohol. So, what human beings have relied from the bingeing of time? When they started making Somrass and having it or, you know making alcohol and having it, is this

peculiar thing, where certain substances act on the same areas of the brain, which give you reward, to motivate you to live your life and hijack the brain.

Now it is a very peculiar knowledge that, human beings have possessed for the last, you know God knows 20000 years.

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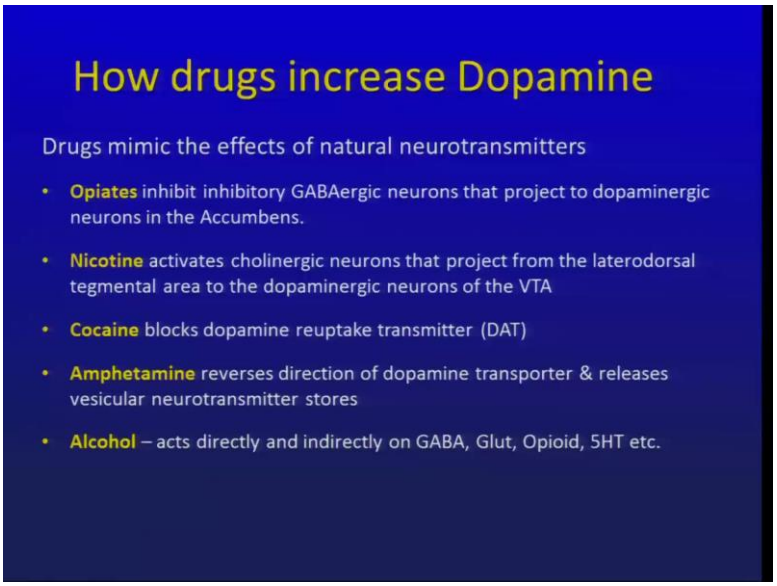

So, how do drugs increase this chemical called; dopamine in this circuit. You heard them these you know this what called dopamine? It is a neurotransmitter, which 1 of the chemicals substances, which increases the crosstalk between nerves in the brain. There are multiple neurotransmitters. This is 1 dopamine is 1 of these neurotransmitters. It is very important in motivation, its very important in learning in impulsivity etcetera.

So, drugs mimic the activity of the natural neurotransmitters. For example: opiates, drugs which are made from opium, they inhibits certain substances. I am not going to go into details, but basically opiates work on opiate receptors, which are already there in the brain. Nicotine works on acetylcholine receptors, which are already there in the brain and I have been used for natural purpose. Cocaine blocks these dopamine receptors, which are already there in the brain.

So, human beings very cleverly or by chance, have picked up substances which work on areas, which are there in the brain and stimulate us.

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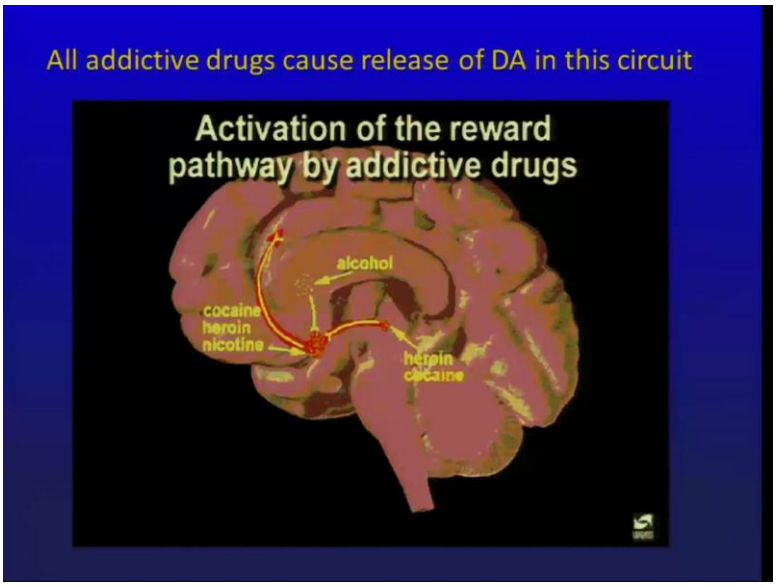

Now, what happens is that, all drugs of abuse work on this particular reward circuit. And drugs which do not work on this reward circuit are not drugs at all. So, substances which do not work on this circuit by increase increasing dopamine are not used by human beings to get high. So, this is the final common pathway for all drugs of abuse. Why am I telling you all this?

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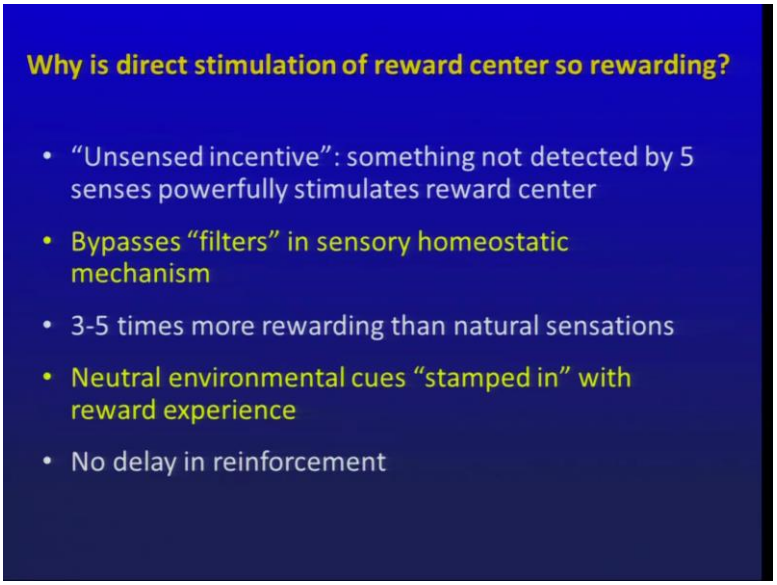

I am telling you this because, all drugs worked by, in a way direct or indirect stimulation of this particular circuit.

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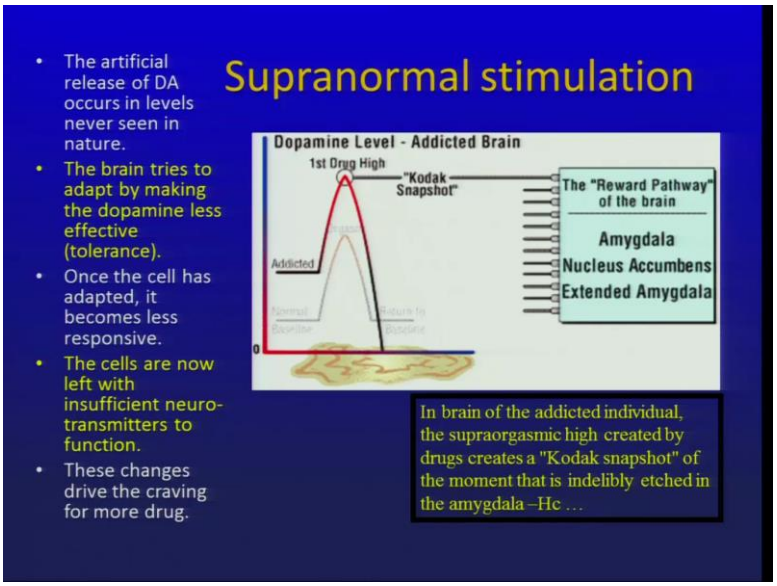

So, what happens is; I just want you to look at this particular slide. Can you see this 1? This is the normal change in the reward circuit; goes up comes down to baseline. But what drugs of abuse have a bad habit of doing is that, they give you a supernormal, a much more than normal high in the reward circuit. I mean that happens; the brain almost takes a snap sort of it, saying “My God” that was brilliant. You know it is like you see in the ads of the Kodak movement.

Now Kodak has gone out of market, but then basically snap that movement. So, the brain snaps that movement up and says; we need to get back to that, we need to recreate that movement. But also what does happen is; when goes up that high, you will understand by your physical principles and you are understanding of chemistry that, the low its comes down lower than baseline.

So, incrementally what happens is that, it goes high, comes down to the lower than baseline right.

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Let me use this to illustrate. The brain normally is like any other natural system in homeo stresses that, it is in balance. Now suppose, I use this substance alcohol which depress is the brain, we cannot allow that to happen. So, the brain has to fight back and increase the excitatory activity of the brain to keep the balance. So, the next time around when I want that buzz, the earlier amount of alcohol that I was using is not enough.

So, I need a larger amount of alcohol to give me the buzz, to depress my brain. And the brain has to work double to restore balance. And this keeps happening, keeps happening keeps happening, until 1 day the alcohol is not there and there is net-net increased excitation which is called withdrawal. You have heard of people having withdrawal from alcohol and drugs that, they get you know some people get fade, some people start shaking hands start shaking they are not able to sleep etcetera.

So, this process keeps happening and the brain basically decides after sometime, that you know we cannot keep doing this. So, this kind of daily adaptation cannot happen. So, we need to get the brain into adapt on a more permanent basis because, this guy is going to keep on putting the substance. I will show you what happens.

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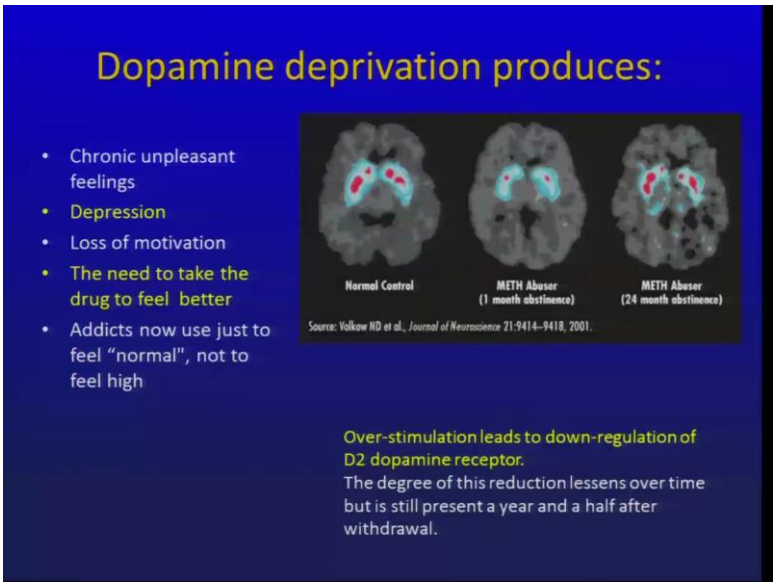

Let's go to; these are these are a few peaks scans which show, how you know once you are using a particular drug and there is net low because, you have use the for example, what we were talking about was that, you used drug and they are increased outflow of a chemical called dopamine. But there is only that much like in a bank there is only that much, your bank account is only that much; if you overdraw, then this is a negative balance. So, in the brain again there is a negative balance. And we knew you do not have the chemical which gives you a good feeling, you get feeling of deprivation.

Now, this is a normal brain, where the blue, red areas are the dopamine levels. Now, this is a person who has been abusing a drug and you can find that the dopamine levels are much lower than in the normal brain. But what happens is; this is a person who was using methamphetamine drug after twenty 24 months of absence. But even after 24 months of absence, you find that it has come back to near normal, but it hasn't return to normal. So, the reason why I have put up this slide; this to show you that when 1 uses a drug for a long enough time, the adaptation that occur, lasts for a very long time.

So, the normal response that people have about, taking a person who has a drug abuse and putting that person in a rehab center, saying you stay there for 6 months, you will forget about it; obviously, it is a not very good way of doing things because, the brain once adapted, stays adapted for a very long time. And let me try and lead to it.

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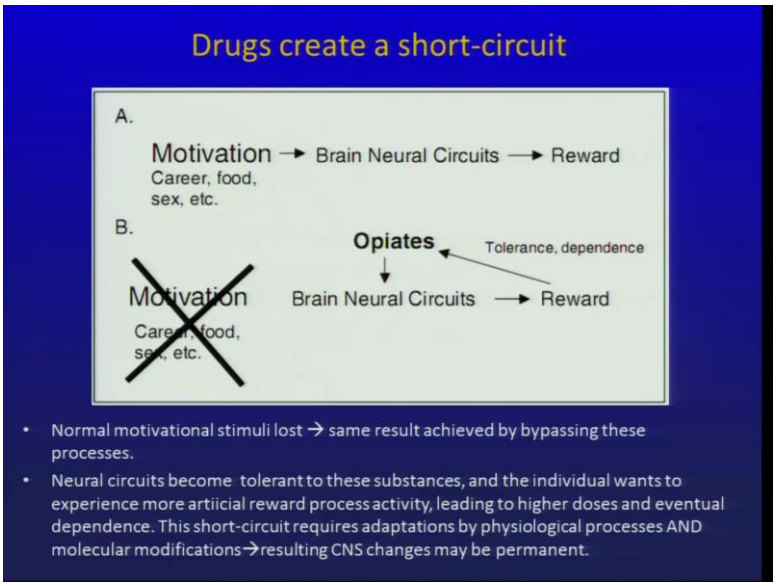

So, basically what drugs do is; if this is the normal circuit of behavior, that there is a motivation for career, foods, sex etcetera, and if you do that, your brain gives you a circuit. What most drugs of abuse do is that, they short circuit so that, the motivation for career, foods, sex etcetera, become the motivation for the drug.

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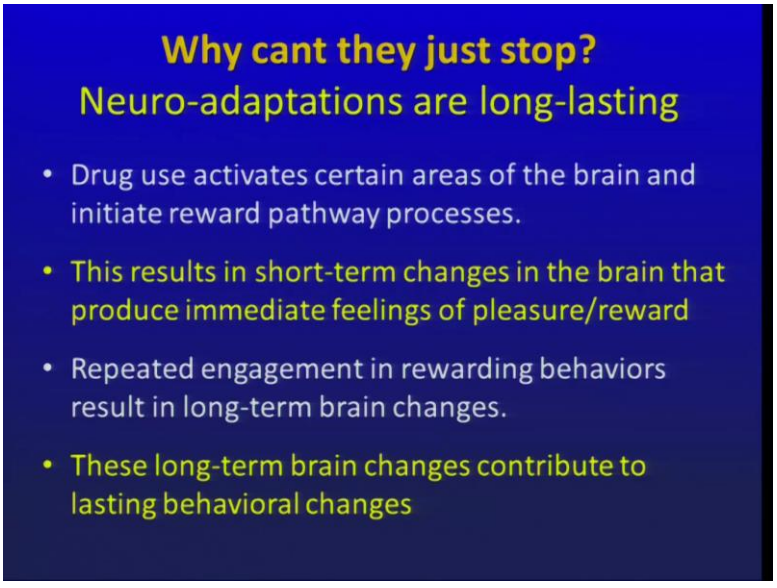

So, the other question about drugs is; why cannot you stop? So, you start a great; you had a good time, you had you know few highs. So, why cannot you just wake up and say with effort I will stop? Issue is that, it is very difficult to do so. As I have already said

that, drug use activates certain areas of the brain and initiates the reward pathway processes. This results in short term changes in the brain that produce immediate feeling of pleasure and reward and repeated repeatedly doing this, results in long term changes in the brain.

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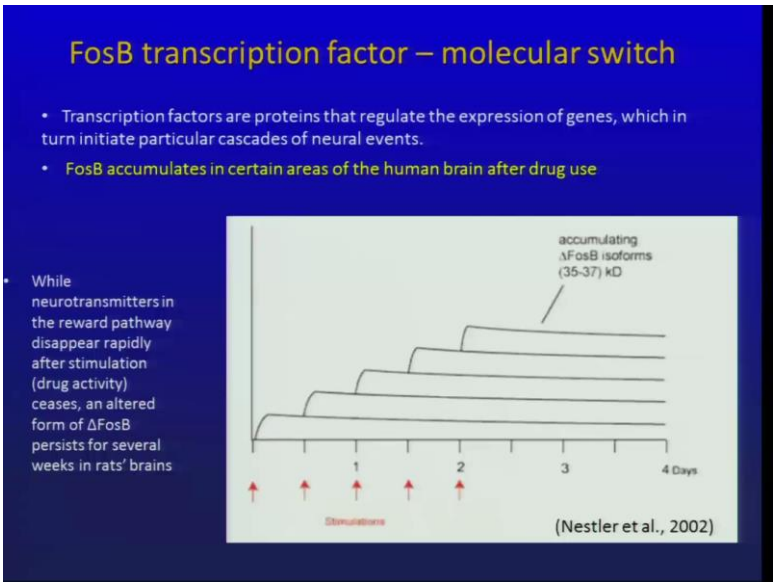

Let me just show you some of these slides. What it does, like I was saying that the brain gets tired of doing this daily seesaw. So, it puts into motion, certain processes. We would not going to details, but basically let me just tell you that, what it does, is it flips off or flips on certain genes. You are aware what genes are. Genes are in every cell of our body. There are chromosomes and there are parts of the chromosomes, which have the instruction for life, for their daily processes of life.

So, what the brain does is it switches off or switches on. And we know for example, that in frontal part in the brain, there at least 2000 genes which are switched on or switched off and response to say regular alcohol use. Therefore, as a part of adapting to drugs and alcohol, there are changes which are made and these changes are very long lasting.

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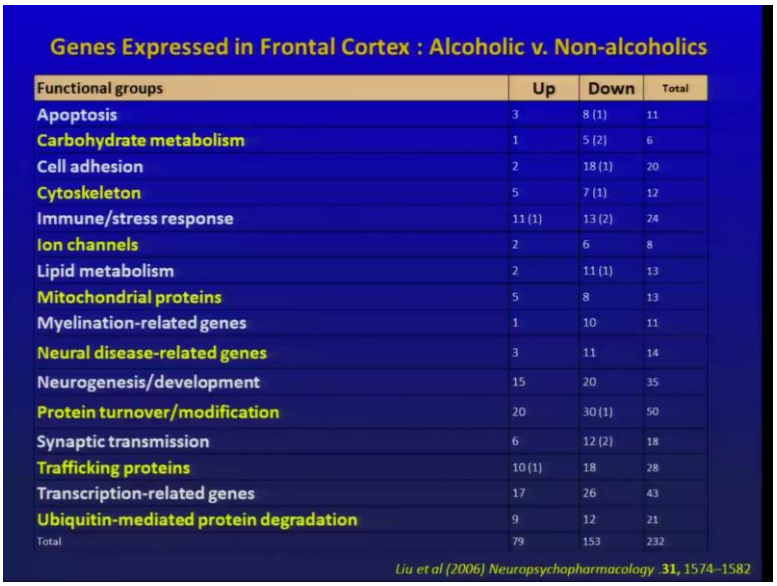

Now, without going into the details, let me just show you for example, this list is some of the genes that, we know which are expressed in the front frontal part of the brain. As you can see there are already 230 genes that have been discover, which are changed in the course of say drinking alcohol for 6 months.

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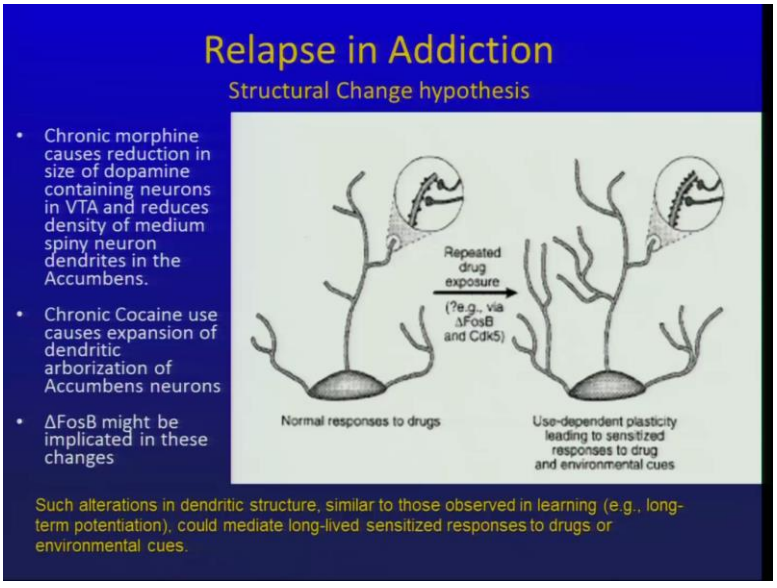

The net-net what it does is; a changes the structure of the wiring in the brain, of the neurons or these cells. You know the brain is full of cells which talked to each other and you know this hardwiring this, like the wiring in your computer; repeated use changes

the wiring. If I can go back to the picture if you see, you know this the cell connections specially the connections which are related to drug use and adjustments are made stronger. It is like this; if you go walking on your lounger and if you keep walking on 1 particular path and I am sure mean you guys must 1 have shortcut no and you find that there is a path made in the grass. If you want to grass to grow back, you will have to stop walking on a very long time and you have to use another path.

Similarly in the brain 1 path is strengthen another path is made weak. So, if you have to go back to the path of not using the substance, and going back to getting motivated by work, by relationships, by food, by your normal habits, then you have to spend a very long time not using the substance understood.

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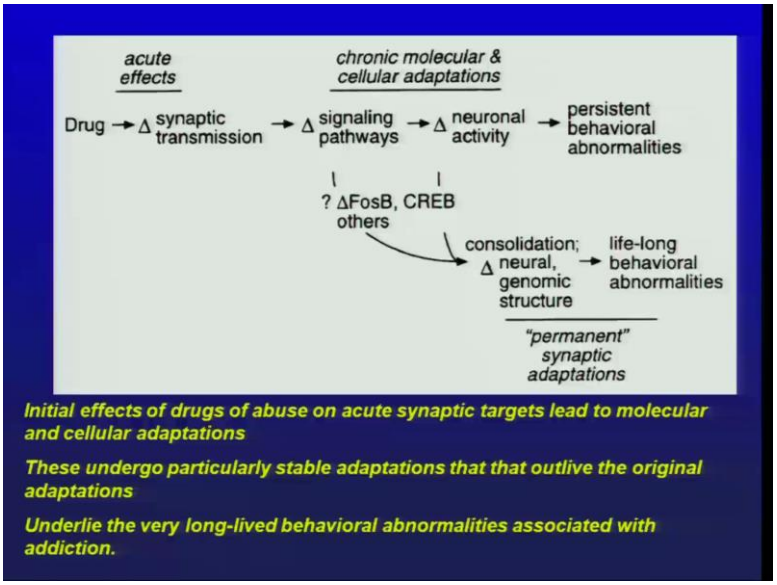

So, basically if I might what happens there; acute effects, immediate effects which is what we like about the substance because, it gives you high, and then there are chronic effects which are adaptations, which occur at the molecular level at the genetic level, which is why you get permanent adaptations that occur.

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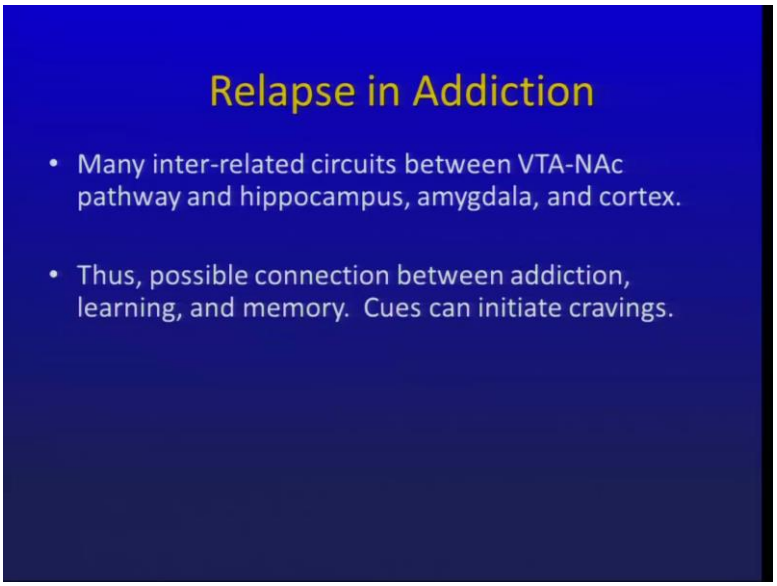

Now, because of these permanent adaptations, what happens is that, even people who want to stop using it and they get up 1 morning and say; no I am not going to use it. Because, in way the addiction is hardcoded in the brain, they tend to relapse. So, I know this is a complicated slide, but what I am trying to get through to you is that finally, when addiction does happen, addiction is a recurrent and a relapsing illness. That is keeps coming back because; the memory of the addiction is hardcoded in the human brain.

Therefore, what we now consider is that, when addiction does happen, it is a brain disorder in the same way and it is a chronic brain disorder. In the same way that is diabetes is a chronic disorder. You know you treat the diabetes, it remains you stop cheating it; it comes back like high blood. I am sure you would have seen people who have high blood pressure, you treat it; it stays under control, you stop cheating it comes back. Similarly with addiction, we now realize it is a brain disorder.

So, to come back to what I started with. What we started with was, asking why do people use substances and answer to that as we've already discussed, is that human beings have found overtime that, there is a particular you know part of their brain, which gets turned on by the use of these substances. But why do not people stop when they start developing problems? Because repeated use of these substances causes a change in this circuit, a change in the structure and functioning of the brain, which makes use of the substances a

brain disorder. And this is something that, we need to understand because, repeated use of substances also changes motivation for day to day working, it changes makes changes in personality etcetera.

The other question that we also need to ask; it does it happen in equal measure to everybody? And that is something that I will talk about later is; that perhaps it does not happen in equal measure to everybody. There are some people who are at greater risk, some people who are at lesser risk. And it is important to know that because, if some people are at much higher risk, they knew to put in interventions and these interventions will happen at different levels. They will happen as engineering interventions, they will happen as biological interventions, they will happen as medical interventions. You know already people are talking about brain vaccines, people are talking in terms of treating people at school age etcetera, which we will talk about it later.

So, net-net what I want to end this segment with is; to say that addiction is a brain disorder. And it occurs because of this fatigues circumstance of human beings, having this reward circuit which is part of the motivational circuit, which is also very sensitive to certain substances, which shown being like to abuse.

Thank you. Any questions?

Now, centers may not be the best way to treat under addiction. Then what are other ways to treat under addiction?

What we now realize because, it is a recurrent relapsing illness and because what occurs are changes in the adaptation. Or rather a adaptation of the brain to these, to these drugs what we need to do is; 2 things or 3 things actually. 1 is to use certain substances which are often medicines, certain changes in behavior etcetera, which change this adaptation. So we are increasingly starting to use, a combination of medicines, behavioral change; training people in certain behaviors, as well as training people to cannot live without high no, can you? But, there are safe highs and there unsafe highs.

So, training people to use safe highs. For example: exercise is a it also increases activity in the reward circuit. Yoga we have seen increases activity in a reward circuit. For example: you want to go mountaineering, it you know increases activity there; so to use alternative highs. So, these are these are some other things that we do. However, it is a

good idea when people have an addiction, to for a for a short time to take them out and keep them in a sheltered place because, otherwise you know if you have a access to substances you are not going to stop.

So, you need to be help to stay off, but then just keeping people locked in bard, is not a very helpful strategy. Have I answered your question?

Sir the peak that we used on consuming alcohol and drugs,

Hmm

Does it keep on increasing with increased amount of drug and alcohol or this is a limit that we used?

The unfortunately the limit is the, those effect, that you get on the first day. After that because of this adaptation, that I was telling you about; the peak keeps coming down and down and your brain tries to recreate that Kodak movement and keeps saying; No No No, if I use more I will get that. But that never happens, which is a tragedy that, you never get your first high done.

Sachin has gaming addiction.

We will talk about it that, you know there are substance addictions and there are so called behavioral addictions. And there are you know gaming addictions is a very important thing, I mean we do not really know too much about it because, gaming is a very recent phenomenon. But gambling, we do know that gambling addiction occurs, we do know that there is a addiction 2 things like; you know sexual addiction or pornography addiction and then, you know we do not know really know whether the cellph1 addiction.

But, you know whether there is facebook addiction. But I am sure some of you guys were on facebook, start getting withdrawals when you have to you know, when you cut off in your travelling and you do not have accessed to facebook do not you? From your face I think you get and control over larges how long you in on phone facebook?

Once a day.

Once a day.

Twice a day.

Twice a day. So, we talk about it.

I just wanted to ask 1 thing; see there are several cultural constricts. So, that coming to picture when people have opposed to prostitute or have alcohol a culture or certain type of fades and practices, where these things are generously recommended by the mediate culture. Compare to some other type of fade and practices where it is completely prohibited. You see that though people who are practiti1rs of 1 type of fade, are most sustainable to addiction compare to other people.

It is a it is a very good question. Now, there are 2 things which I did not talk about it because, this this was specifically about addiction. But there is something called addiction which is a brain disorder, there is something called harmful use. Sometimes when we see it, we do not see that the difference. Harmful uses when I am using a substance and its causing me harm or likely to cause me harm, this is called hazard issues.

For example: I drink and drive, I am likely to have an accident. Or I drink and then I get so violent; I go beat up my wife and children you know, I am causing harm. Or I drink and I get also lots of physical problem; gets serious liver, gastric is all that is harmful use. Vice I haven't developed addiction you know. Now, that is very strongly mediated by culture. For example: in culture where it is permissible, there are rules to drink, you know people tend to have lesser this harmful use.

The culture where, which has the least of harmful use of harm from alcohol, are people is the Jewish culture; where people are allowed to drink and you know there are strict rules that, you will not drink alone, you will not drink beyond the certain point. It is considered very bad to get intoxicated. Whereas, in culture which has the dry cultures; those are the wet cultures.

In dry cultures like us for the for that matter, we actually not a dry culture, but see in Islamic cultures where alcohol is forbidden and to a certain extent in our culture where alcohol is considered bad. So, the way people react to it is; when you are doing something bad, you expected to be bad. So, you go and hide in some dark corner and you know get intoxicated fast because, you have you do not have you have 2 minutes in

which to do to drink it and. So, you go buy 1 bottle finish it in 2 minutes and go off and because you've drunk alcohol, you have to do something bad. So, you go and beat your wife and children.

So, that is imbued in the cultural expectations. And that is very much part of a dry culture, which is why we find that, in dry cultures there is a lot of harm from alcohol. India is somewhat of we called a mixed drinking culture because, while we have a dry culture, at the same time 20 percent of our states economies come from selling alcohol. And there is a television, this, that you know are pottering the goodness of a using alcohol in social circumstances etcetera. But we still believe that, you know drinking spirit is better than drinking wines and beers because, it gives you a better kick that gives a better bank for your buck.

The aim of getting of drinking is to get intoxicated, otherwise, why waste money. Whereas, the aim of drinking is just to have a good time with your friends it to have social intercourse right. So, you are absolutely right that, culture mediates this. Unfortunately culture does not mediated in the way that we think it does. We would think that in cultures where, it is premise a people will drink more and cultures where it is not premised, permitted people will drink less. It is the opposite. I mean, they do drink less, but the harm is much more.

The harmful patterns are much more in these; so called non drinking cultures. And in India, there have been you know India is probably been dry a dry culture in that sense, for the last 300 years not much because, prior to that there were these rules for drinking, there were I mean if you go to the Arthashastra, you find that there were very strict rules to how alcohol will be made, how it will be tags, where you can sit and drink, what you can do after drinking etcetera.

You know the Sushruta Samhita has a list of 72 different kinds of alcohol, which should be drunk in this fashion, it should be made in this way, should be used for this kind of illness, should not be used by the people who have that kind of illness. Whereas, the last 300 years ever, since ever since actually the British started their first factory in Kanpur, now things have changed. That is a different story though.

That's why I asked 1 question the last.

The last more.

So, any activity which increases the performing level is a can be an addiction?

Theoretically yes. But there are certain things which are normal rewards, you know you asking me a question. So, I feel happy that you listen to me, actually increased my reward function you know. And yes in a sense, I can get addicted to it. So, I go on a lecture circuit and go on to talk. But in a way that is not too bad, except for you guys have to listen to me. You are doing some work and finding happiness and reward from it, is actually good because, it benefits you and your society. But there are certain things which do not help, I mean certain as I had showed you know when you have thing which gives a greater than normal reward, then the chances of you are getting addicted are much higher. As an example; I am saying bungee jumping, you know you might get addicted to bungee jumping, you might get addicted to driving fast and these are not safe in that sense.

Sir it is often time people consider that people those who are living all or some they have had some mishaps with them, they are more prone to drinking and all. So, while they d so and the height they achieved, what are they what is their mind actually trying to go to which level?

Now, what you talked about see I should have actually showed you the first slide, which is a about addiction; what is a addiction? Addiction is the most important thing is; in addiction there is a loss of control. That I do not have control over my activities that I say I will drink 3 drinks and I end up by drinking 8 drinks. Or that I say that I will not do something at a particular time and I end up doing it right. It is not that I am say using a particular substance in much larger measure than others. That is harmful.

For example: what happens with people for like you said you know; who gets sad and then they start using alcohol as a way of decreasing this stress, decreasing depression etcetera. Now that is harmful because, you tend to use that as a crutch. You do not find a way of solving your problem. So, it prevents you from solving the problem. But it is not necessarily addiction in that sense; it is more what we called harmful drinking harmful use.

But the point is that, you made a very good point that, if we use a particular thing, whether it is an alcoholic drink when we were feeling tired or sad or angry or whether we were using a crutch when our leg has got better. You are never able to use your natural coping responses. You are you are doing this course in a just point isn't it. And we all have coping strategies, there are good coping strategies for; when you feel sad, when you feel happy, when you feel unhappy, when you feel bored.

But for people who do not have this coping strategies, who do not learn these coping strategies, they tend to use shortcuts to deal with you know stress. And then it becomes a problem because, the first time around it works beautifully; the shortcut works beautifully, but that is not the real answer you know. And So that prevents you from actually finding out the proper strategies to deal with it.

For example: I am telling you at every time you got bored, you and your friends who said will go our drink. Then that you will find as a very easy way of dealing with your bored out and you will tend to next, your brain will learn; boredom: alcohol, alcohol: no boredom. That is how the brain learns. And then you will never ever develop a capacity of saying; get 3 friends together, sit and talk about a life liberty and pursuit of happiness.

So, that is where it is dangerous, that people learn especially when people are younger, the people learn that this will result in mine forgetting my sadness for 3 minutes. So, let me use this, it will get done. But then i do not develop the capacity to actually work through my problem you know, this whole thing of adjustments that I do not develop that. And this is this is something you know, this is this is the subject of our different lecture, but it is a very important thing.

If, when we find it more and more, in people who come from I would not called it, we in popular parlance you say tacky, but that is not necessary from a technological background. People who in our lives today more and more, we have been forced to do small proportion of big jobs, which is something that perhaps you guys will have to do. As an engineer, you will be given a particular task and you will find that somebody has made like plan the big plan. You do not know the full plan, you are asked to do this particular thing. It happens to the people who write code you know, they are asked to write 1 portion of code. Somebody has made the big thing and you are not aware of what is happening.

So, you do not see the big picture and when you are sitting there looking at this, you tend to get worked, out worked up, frustrated etcetera. And then if you do not have the coping strategies, you tend to use these shortcuts, which is 1 of the things that, we find when I sitting in my clinic I find a lot of young people who come in who very bright and brilliant people.

But they are getting frustrated at a much younger age, they are getting frustrated at lesser you know threshold partly because; of the work that we are forced to do in our current you know social responsibilities. And I think it is very important for you guys because; you guys will go out there and initially of first jobs would not be doing those large astronomical projects, it would not be, let us face it.

So, there is a great chance, if you have not learned how to adjust, how to deal with these stresses and strengths of you are starting to look for shortcuts. So, it is very important to actually see, whether you do have the capacities to deal with, what I do when I am in stress. Most important what do I do when I am bored, what do I do when I am angry because, things will make you angry, what do I do when I am sad; thing there will be thing which will make sad, what do you do when you are bored?

I play games.

You play games great. So, that is 1 of the things that we you know, at some level you need to talk about because, often people have strategies which are lonely strategies, l1 us strategies. And you come back you're bored, you come back sit with a book; excellent, some people are able to do it. Some people are not able to do it.

Ya.

which is where this whole reward thing comes. 1 of the greatest reward is actually social networks. Unfortunately what happens in the facebook social networks? Is no there has been worked on it which is why I am telling you and we probably talk about it later if you guys are also involve then, is that the kind of interaction that happens, when 1 human being sees the another human being, does not happen when I am sending a message say; you I like you know and you hit like. And that occurs because, there are very strange thing in human brains. I am looking at you and I am trying to think are you

able to understand what I am saying oh! no that is a very complicated example. I am looking at you and am I can see you flicking your pen.

Now, as soon as I am looking at you flicking your pen, the parts of my brain which I used to flick a pen get lighted up. It is happening right now. And that is how I understand about your flicking a pen. If for example, you are angry with me and say get lost man do not you know why you are talking nonsense here. The same parts of my brain which get angry get light up. And that is how human beings develop what is called empathy you know. There is this whole world called theory of mind and got it is a fascinating thing that, from childhood we learn to understand the mind was this and the way we do it is by mirroring, you know what you are doing.

In fact, people have done fascinating experiments. What they have done is; they put electrons into a monkeys brain and they have made the monkey see another monkey take a peanut they gave the peanut to another monkey. The same parts of the brain which will light up in this monkey to puts a peanut; lights up when he is seeing the other monkey have a peanut. You know monkey see monkey.

Have you seen babies? What do babies do? You do ‘oh’ the baby will do ‘oh’. So, the baby is starting to learn how to mirror your emotions etcetera. Why am I saying this because, human interactions are very important. He said when he is bored, he goes and plays. Some of us when we are bored go and sit on a corner. That is the bad strategy; which is why facebook by itself, I mean facebook is a very good thing, but facebook by itself is; a long term bad strategy because, it does not allow you see do monkey see monkey.

So, the company of other human beings is very valuable to human beings. And as people who will go in technological profession, who will spend more time with your computers, they knew we will do with other people most of you. You need to remember the monkey see monkey do is very important. I went very far from your question, but I thought it was important.

In which withdrawal does happen? Like suppose for facebook addiction, no matter how much time on devotes for faceboking, like we do not get withdrawn from the natural or a day to day normal stuff. So, in day sketch I do not think that any type of withdrawal happens. So, how do you elaborate on this?

In lot of people it does not happen; like in a lot of people they can drink alcohol without getting addicted, but in some people it happens you know I will be giving a talk; I do not know whether this it will same group or not. But there are people how have got so withdrawn that, they are gone on shut people. You know the biggest the maximum work d1 on facebook addiction and all internet addiction has been done in South Korea. They been following up and South Koreans are very addicted as a nation to this.

Having lots of cases where they followed up, the people once their internet privilege was cut off etcetera, they get very upset. I had several young people who have come; who actually become violent after their internet privilege was cut off even. And their internet privilege was cut off because; they would have doing nothing. They were not eating; they were not even going to the toilet.

You know there is 1 guy who stop bedding. He would sit on the internet and he wouldn't and play these, what is it called the massive multi player games like; all counter striker and all that. And he would go on playing it and because he was playing with people from here, same time zone he was playing in a day time. He was playing with people from other time zones, he was playing at night.

Then, I have another person who sits and does this; what is it called these are the coding games. I do not know whether you are aware of that that. There are contest which are for coders. So, this coding contest; he would go to the office, people had left he would continue playing, he wouldn't come back home. When his daughter developed meningitis say something; he wouldn't he just refuse to take his daughter to the hospital because, he had to do that.

Top for the society and culture on drugs addiction, we explained in the car we just read in terms of the peak or normal baseline.

In what sense?

For example, in wet cultures, the difference between peak and normal baseline would be less and in dry culture the difference be more because, in dry culture it affects more if some1 get addicted on to these drugs.

No you know what, as far as addiction is concerned, the brain illness called addiction which I was talking about in this morning. The rates for addictions are the same in all human societies; around 4 percent 4 to 5 percent in all human societies. Whether you go to say Russia, where they do a lot of drinking or whether you come India have we done this. We have done door to door service in large proportion of the world. World Health Organization has done it. I have d1 it down in India. And you look and you find addiction is around 5 to 10 percent.

But when you look at this harmful use; you find that it differs from culture to culture, has got to do with the cultural acceptance or non-acceptance or having rules for substances. In fact, it is very strange. I do not whether you guys know there; there was they used be a war on drugs, are you aware? There used to be a war on drugs. In the 1960 the United States got together all the nations of the world and said drugs are very bad and we should ban them. They conveniently band all the drugs, they were not selling themselves. That is always happened.

In the late 1700s the Brits band all the drugs they were not using. So, because they were selling drugs to China opium to China, they said opium in China is opium in India. And so that has that is a historical process. So, what happen was; they said that all drugs need to be banned except, for tobacco for alcohol because, we are selling them. So, in countries in like in South Asia, where people have been using knaves for centuries, people said no, this is no done, you know this is part of our religious process, this is part of our this thing.

So, we were giving 15 years extra to band it. And after that what is happened is; people have its gone underground. But the actual harm from drugs has increased much more. The underground economy of, you know selling these drugs, you heard of the Colombian drug mafia, you have heard of you know all the problems that occur because, of people in Afghanistan and in the in you know various parts of the world, producing opium and selling it for arms and all that. So, that has also versant. So, some of the convenient myths; that we had that; if you get people to ban things get better really does not you know happens that way.