Selected Topics in Psychology
Psychological Testing and Assessment
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Lecture - 22
Functional MRI in Psychology

You on a surprise for ever I came to India we back in the eighty seven; when I start working on this in Delhi and that was the time when we look this look at the brain structure, which will very excited over all this all to see where you would Sansei Garei the grey matter and white matter. I remember when I was in London in ninety two ninety three and that is the time MRI will get generate it and previous a well I am not sure with this real data or the fictitious data.

I worked with the great guy and one of the labs in molten and usual I am not sure would what is you know get and it was primarily, because the you are expecting a change of work on a 1.5 to assign those days feel strength about 1.5 percent only 1.5 percent change and that you are looking into that particular sign and at the level about 2 percent.

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So, the function MRI initially the people who are not worry know in client the dissolve I am not sure about this. But it is moved load a long way and every specialty in the neuroscience is accepted it as and more. So, with neurons commodity, sociology,

psychology, psychiatry because they have does not look at that is the only they can they can look at the brain actually. So, that is how I became very popular with them and with the clinician it was still remain a tool to look at the motor strip, the sensory strip and the language. Because in other words low then how much for way it is of the tumor and how much you can exercise it.

That is a magnet which we have it is a special magnet it is very wide board magnet seventy centimeter magnet and it has the themes and the light system you know which can vary according to the requirement the patient. So, the model imitation you know somebody likes to see your dull light or some theme of something you know we have available there that gives you at least little a confidence with children small children that is why this lighting system was designed. This the first time in the country, we have this kind of lighting system in the machine it should not available now you the country.

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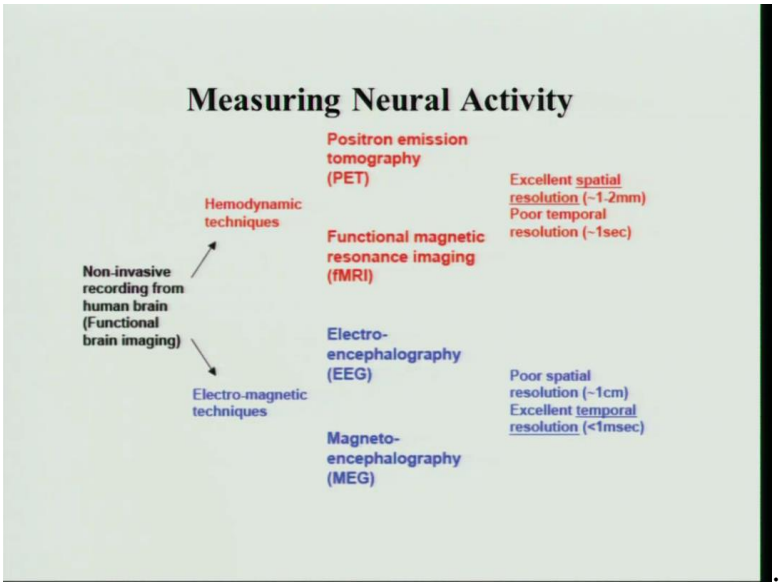

Now, question is we trying to measuring neural activity and the best we which were been doing for age to neural activity recording in the human brain is by electromagnetic techniques, electro encephalography and MEG with the current laser MEG, which is being used. It has excellent temporal resolution it matches with the brain you know functional connectivity, but it lacks the resolution that is where people start looking at the other kind of methodology like hemodynamic techniques and PET was being used before the MRI came into picture. So, the functional MRI there a functional merging and

the PET was based on the glucose utilization of cells. We will talk about the how the glucose is important and how the oxygen requirement is there and so on.

So, for the brain, but the only proverb the PET was a PET had a poor temporal as well as a special resolution, but with it coming out MRI the functional MRI system the available the functional as became available you could do it any number of times no need of any agent experience agent no radiation the resolution was good. That is why people taught this is the way; I think then everybody jumped on a from psychologies psychiatry neuron commodity scientist; I mean now will everybody in the world where looking at I think they use more scan other we use scan of call this it is telling the truth.

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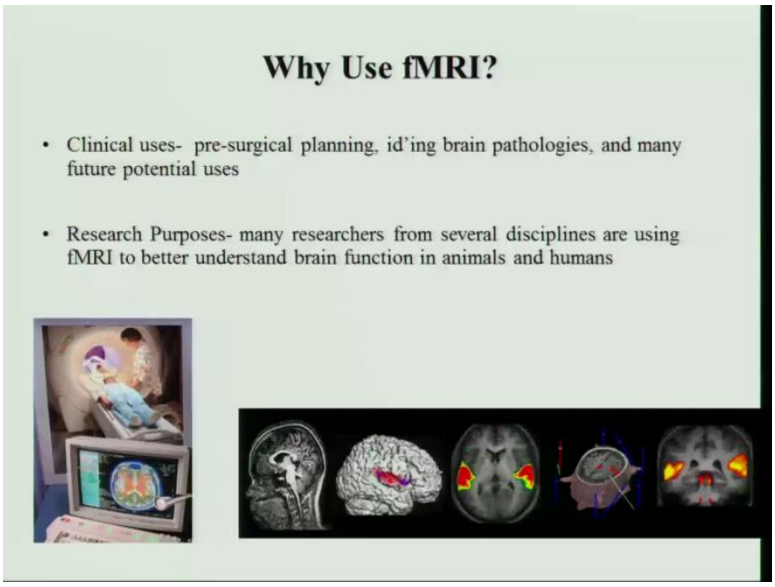

Now, why use fMRI; the clinical use basically I have the mentioned is in pre surgical planning for brain pathologies; the surgeon was know what exactly you should exercise. The basic research is being done by all over the disciplines for an animal as was he was on the humans you know by all kind of specialist even I was surprised people in hearts there are interested in functional analogy that is a kind of an interest it generated and the verified. There are more than 56000 papers actually currently on the every year every day you get an additional over papers on this.

You show the interest is still there though it is a more organic I am getting bore of this reading this you know because the same kind of little affair is there in same kind of

things of there, but that the given a tool to a scientist to look at the brain the way you wants to look at the brain.

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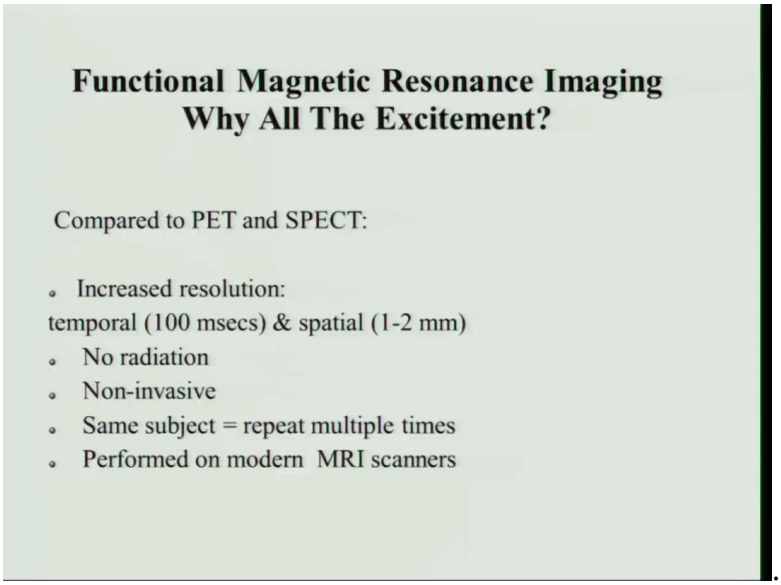

So, I had meant as a mentioned compared to PET and the SPECT, which was the one which was may use before the MRI became available increase a temporal resolution increase a specially no radiation non-invasive same subject. We can do number of times you can repeat paradigm. So, in the morning in the evening in the night depending upon what is the paradigm, they looking at and on a modern scanner the currently available scan of the temporarily is going to pretty high the resolution is also increased; especially 1.43 it has a 77 the slot feel strength. The resolution has tremendously gone now in terms of, but still we are not reached the level of roll over the will activity you know.

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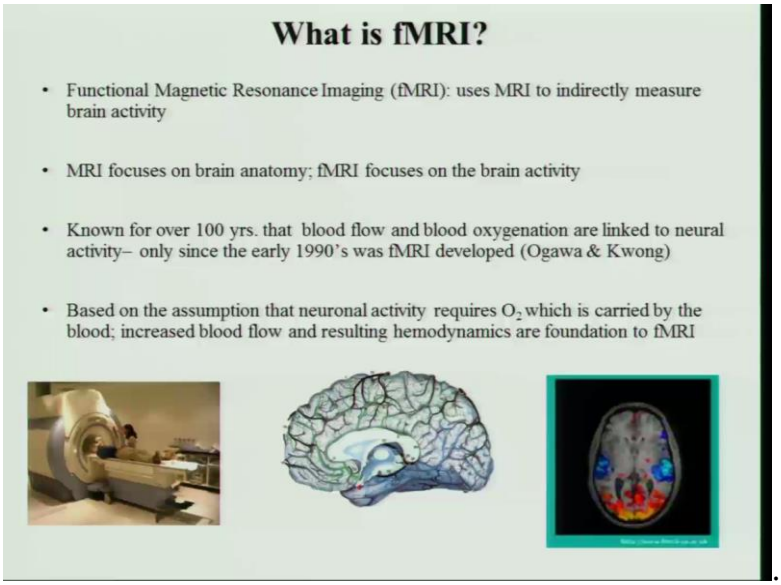

Now, the next issue what is the fMRI? It is a methodology by which we measure the indirect brain functions directly brain that is not a direct way of adult seen the neural activity. It is an indirect way as a lot debate on this a lot of psychology is do not believe whatever; what we say actually do it do very to very frank with this lot of contradiction between what we see on fMRI what physiology shows you actually on the brain. So, that is that is where the issue is I will talk about that. MRI focuses on the anatomy the brain shows beautifully there is no way to see brain, but on the fMRI and offering focus on the brain activity what kind of activity; it is would pretty well known all over the world that the blood flow and the oxygenation are linked to the neural activity.

Because any neural activity needs the flow with the blood you need oxygenation in the glucose utilization this was that. So, thus to everybody whatever working on the agent at the time is Japanese guy in those the guy called Robert Knight, who was work in the Cadmodel. So, these are two ways actually came simultaneously with based other than the non-other time. Then that is can be were saying those no I am and have seen actually the start of the humanly those says no. They talked about I think that lot of be discussing lot about this strength I say actual do not believe this in a what are all this say called so and so called, but any how this is how it started.

That is how over came out with an idea that you can actually show the function in the brain and the assumption was that the brain requires oxygenation. If it is carried by the

vasculature any change in the functional requirement change in the blood flow and the blood flow causes the increase in the oxygenation in that area and that is what we are trying to make use of it all the time.

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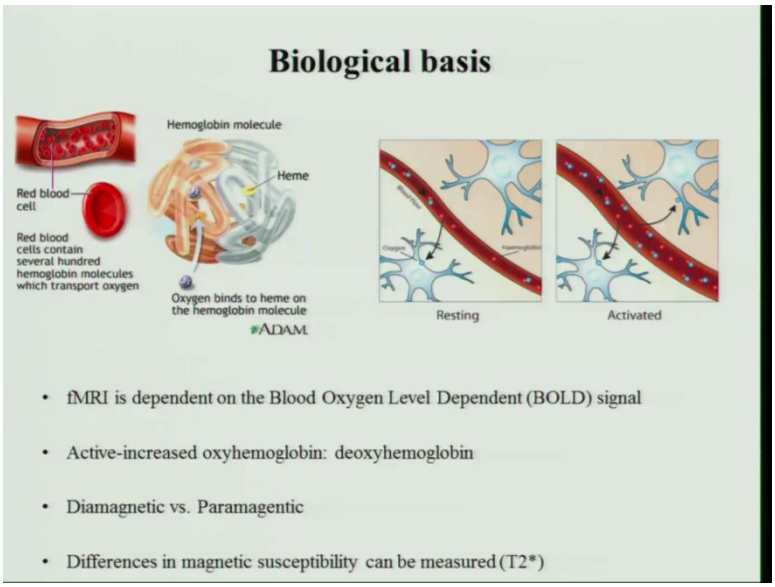

Now this is what is we know the hemoglobin is paramagnetic that deoxyhemoglobin is paramagnetic and oxyhemoglobin diamagnetic. So, that is what we all playing in the fMRI you know basically try to do the paradise create the increase in blood flow the deoxy gets replace by an oxy more oxygenation, which is the requirement for the brain and the difference of the oxy and the deoxy we take it as a net function. So, basically it is a vascular change in the vascular oxygenation, which you are trying to measure and presume that it is connected to the neuros in that area. Because the neuros are requiring the blood the neuros are requiring the oxygen the neuros requiring glucose.

So, the fMRI and functional immediately was available for the fMRI be available on the PETs and most validation relation you have done in the PET scale. What are we doing on the MRI will just cross check with the PET scale, which was available that own. Because it was dependent on the blood oxygen level and this signal was call by group as bold signal blood oxygen level dependent signal oxyhemoglobin, deoxyhemoglobin, diamagnetic verses paramagnetic and the interesting this is the terminology in MRI. I will talk about that is a susceptibility more is the paramagnetic or a foramina material

more in the susceptibility, which is see in a magnetic field and this is what we call as it is star effect that T 2 was any tissue is longer than the T 2 star.

That is what we are used it in this methodology to quantify the changes in blood flow. People keep asking why not to quantify the blood flow; simply these are the technique already s n, which is available today the world. There is maths which is whatever it be you have tried in other models, where we have used the fast component diffusability the fast or slow component. Any change in the functionality will affair the water molecule movement because all membrane. That is what we have try to quantify what is called the fast component and the behind is coming what is an idea why not we use a fast component and see the how that is more close to neuron than the blood.

We are actually we said just seeing the change in the water molecule movement across cell membrane that is more close to the real reality; then this reality actually this is what you people keep talking about. There a number of people with it is a neuroscience on the other papers are available, where live behind the show the only problem; it now is the fast component signal change is still not go to an one treat us law. So, one has to move to our feel strength to see more about this kind of thing.

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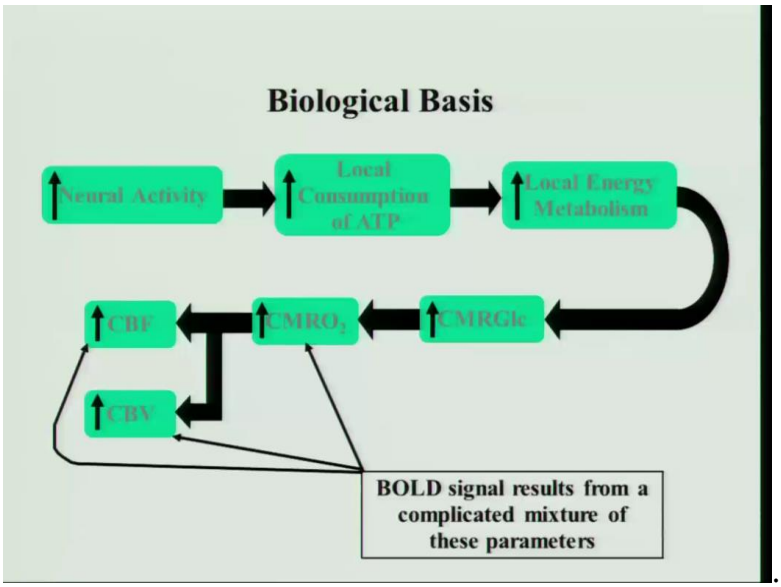

Now, this is what I said; there is what is the basis biological basis is that the neural activity, local consumption of an ATP, local energy metabolism, increase CMRG glucose, metabolic requirement glucose, oxygenation requirement, blood flow is the

blood walling. So, what we are interested in the whole the story is the CBF, CBV, CMRO 2, oxygen demand, blood flow and the blood walling this is whole story of the function within and for me it is a very simple method. It is a simplest methodology available an MRI to be used, but is this is the lot of facilitation to my friends in psychology, sociology and so.

So, good when methodology is very simple for say it is no big deal no doing this kind of technique you know. Now, this is what we call as a hemodynamic response where is the hemodynamic response in response to the neural response. So, there is whenever like even I am talking. So, there is a requirement for the neuros the blood flows and there is where the hemodynamic means the blood flow changes and oxygenation start coming that is what we measure is all more.

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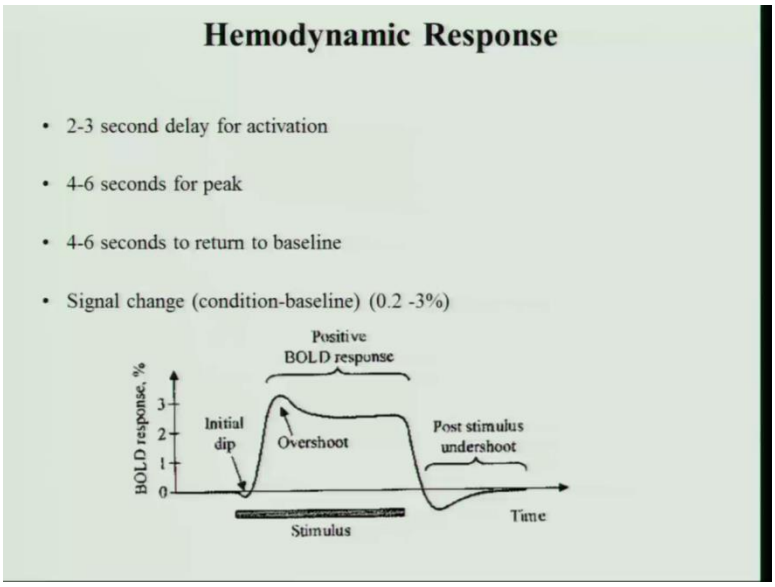

Now, delay the activation peaking and then the base line can be the base line. The total singular change is about 0.2-3 percent you can see what the change you are looking at is. One of three is three percent that is why you see better singled a noise want a seven as line go five percent because a tidy stall is a linearly related to the feed strength either feed strength goes out that is where seven to at last that is going to be a future. MRI you know the humans in the next I think three to four years.

We have kept our demand actually to our owners that we should have a seventeenth law in India you know and specially who brain then the muscles called the system we should

have seventeenth law. Because gives you more power to look at the data more as a higher resolution. I would like to go to 30 microns, 40 microns, 50 microns on the brain; thus will looking at one millimeter data; so, 0.5 million for a 5 microns right now.

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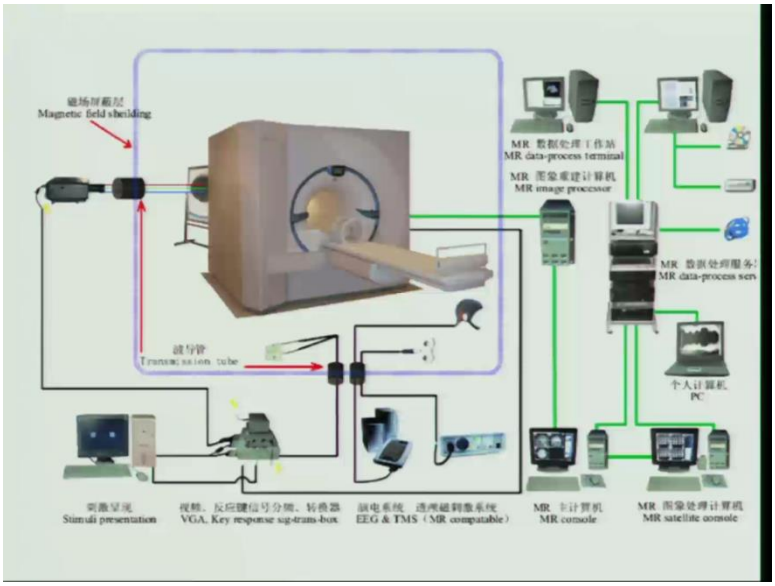

This is the hardware, I show to the example of the magnet they saw the magnetic hardware and the software are connected the machine and that is what and the problem is MRI is at MRI is not something you can just walk in a walk out. It is a high field magnet unit to know, what can go inside the machine even for the paradigm dimension some of the single to put inside the magnet have to be magnetic an acceptable. This should be anti-magnetic; this should be metallic, which is attracting the magnet. So, that is biggest challenge you know whenever you take anything lot of people are now working on different of things to get the anti-magnetic designs of different things.

The camera goes a now I think about it is seven even a not allowed a camera the shutdown start moving you know. Now, the lotion or camera, but I am telling in those days the shutdown the start flashing you know because a power remainder so, much. So, I think the things are to be designed at a very carefully looked into very over design a pro-paradise for function MRI.

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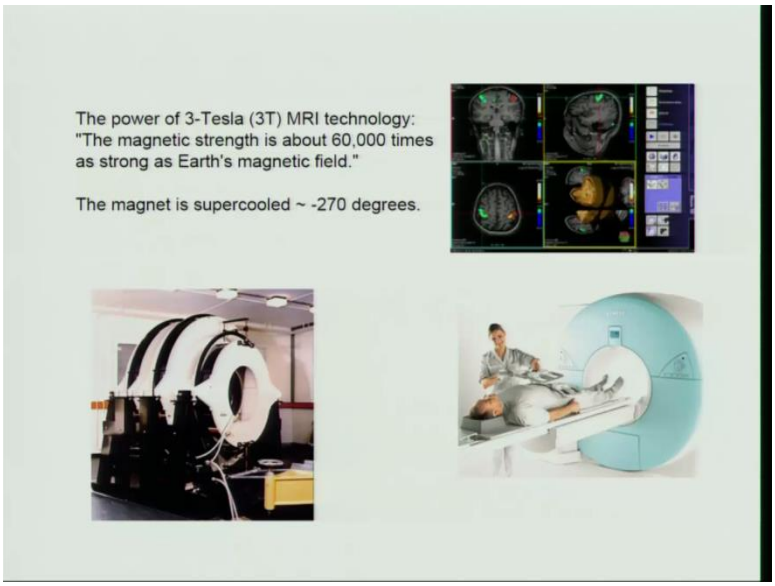

This is the current technology allows you to 3-Tesla machine, which has the magnetic field strength is equal to 60000 times those as strong as earth's magnetic field; look at the power of magnetic if we are handling in this. You cannot imagine the way it flies any air and flies, but already flies a fly is like a missile it we called a missile a fractal own thus all the machines. So, you have to very clear for where you going with this kind of saying inside everything has to be removed has to be checked in properly the estimation, which you want to look at as to be very carefully design. So, there it is it allows acceptability where the machine itself.

Now, what is interesting in this? Whatever paradigms you want to play you need to have a camera inside you need to have the screen to project the camera. All the paradigms need to be looked in by the patient or a person or the individual lying inside the machine; a way it has to be mirrored into the eyes. So, that all was developed right in front of us; when we started looking at this and it is available such actually the new machine, which we had brought about I was taken the machine actually. We had a complete set of way fMRI machine actually at rest whatever being the machine.

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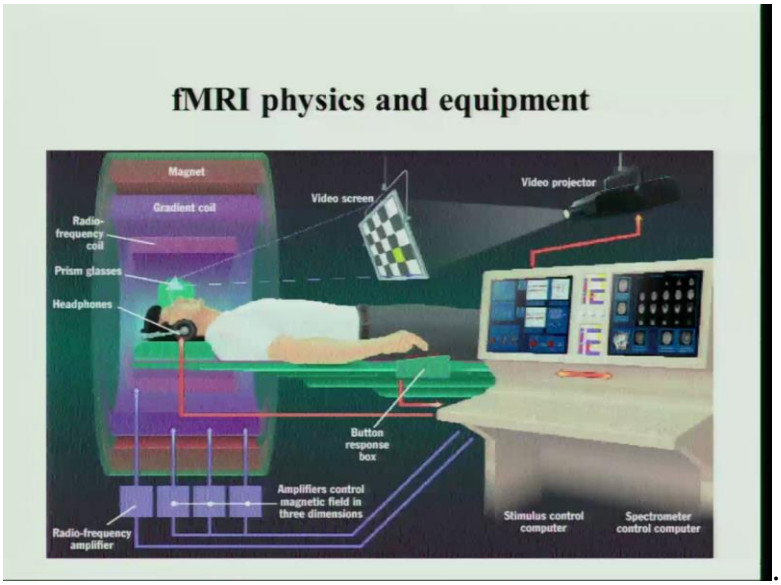

So, this is what the design of the all the system is especially for like better response you want to push responses yes slow whatever. You want to do all things are designed into this. So, any paradigm which has to be decided by you it has to be acceptable to the machine with in the confined of the machine we have to design those parameters.

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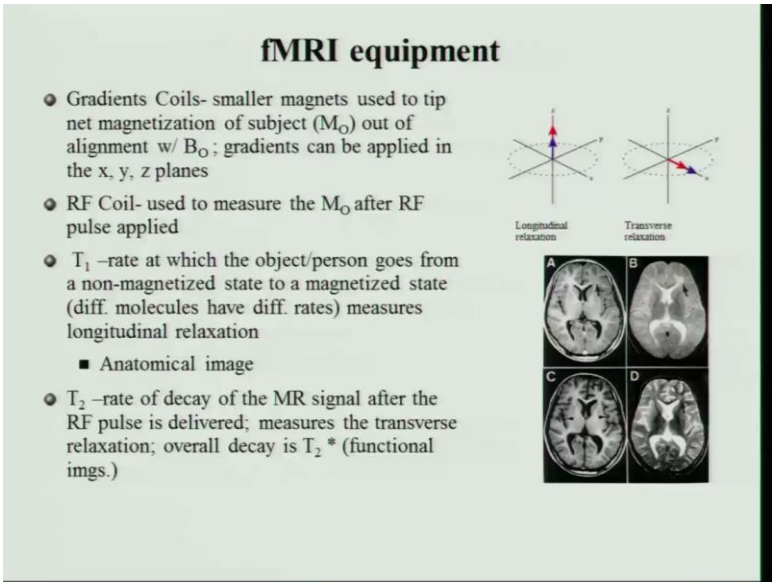

Now, the error is fMRI or MRI coupled whatever fMRI what I am saying what to make is a meet to by peoples on lot of people say that fMRI and MRI are not the same; they are the same; they are done the same machine. A lot of people say that the gradients and

thus see there are same any the magnet that I feel in a radiance; you need the definite need same you need everything like you likes or a shame cable later all this you will likely and a machine. So, if you I sometimes we have some scientist says you know; I will I we are if were a machine.

So, adding machine which is having good field says can do the MRI provided you have the desired test hardware? You can use in you know extra to body layer. So, every machine is capable of doing or if call the require the T 1 inter relaxation times; what is the important is the T 2, which is the decay of the m r signal after the RF pulse is delivered and it measure and the T 2 relaxation it also less. The T 2 star, which is gets quickly deface because of the you know never get the magnetic field and that is what we are using in the fMRI that you to fact let we use every day on the clinical practice I used to T 2 star fact every day you know a in some form or the other.

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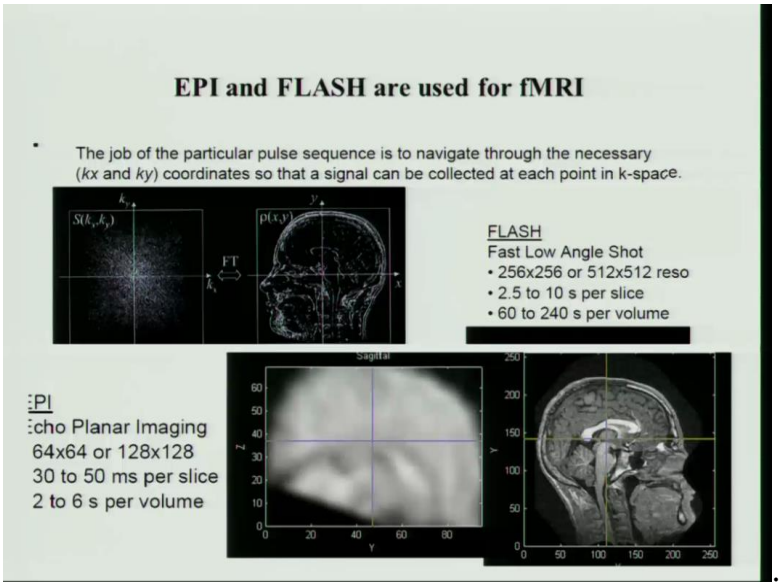

Now, what are the techniques which are using the most previews in its initial technique go to the EPI we the interesting thing, which is about the functional MRI, is before the EPI echo planar imaging became available. People was using the flow the fast lowing the shot over a great type everything to look at the function, but the greater calamity was slow as compute the EPI. EPI became available simultaneously ninety three. So, the concept of EPI came I think even before the MRI was designed I think thus peat moss will a give a give a concept in seventy four seventy five.

The theoretical concept of EPI you know for which you could now raise actually and actually implementation of the EPI was possible in ninety two ninety three. So, you can see the word how much difference in actually is the believing is saying is being down. That is a kind of nothing whether and was an EPI became available was EPI is even today all technique reviewing an EPI disjunctives.

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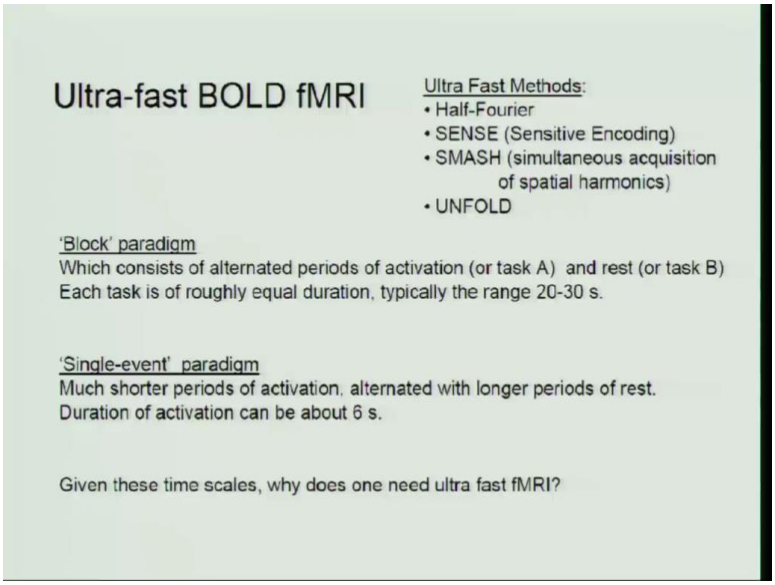

Now, we want to make it from first much faster the EPI do much faster and that is why a lot of ultra-fast techniques available like the half-Fourier sense smash kind of techniques, where you could actually taking the simultaneous acquisition reducing the timing of the face encoding steps and you could get much faster than what we are doing. So, today you can actually get typically a single a scale about hundred million seconds you know, which is pretty fast actually sorted.

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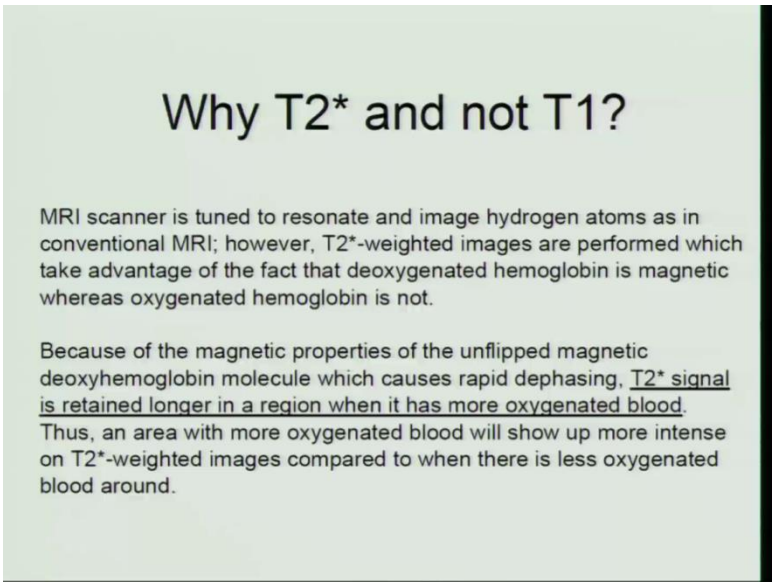

So, now, the issue is why T 2 star I mean I told you why T 2 stars. Because we are using the oxygen deoxy difference and t will does show the difference. You know basically that you t 2 stars that give the difference that is why we have to use a t 2 star emerging for. An EPI is not the best t 2 star emerging, but EPI the use because that the fast us it has a very high temporal resolution that is why we use it. Because movement is the you think there is a change in the neural function that I cannot catch by the machine what are the best you can catch you should catch that is why lot of people say it is a stabilized function. You are saying not the actual function you are seeing in the bare and are a long thing it is there.

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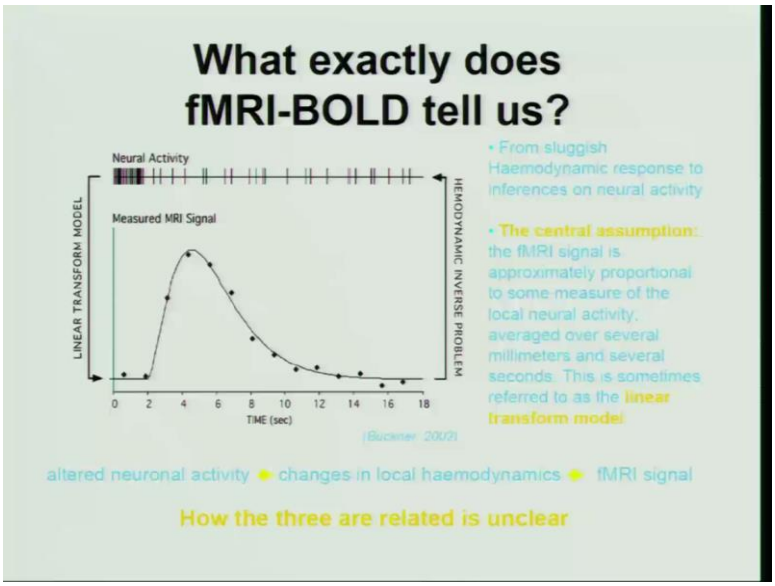

So, for this is what is a mixture of the bold effect we call it alter neural activity change the local hemodynamics is f MRI. This is what actually we are talking about a bold function.

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There is a conflict need a glucose need of oxygen combining both and what is causing the whole thing you know if it is confusing, but for us for this too among of our any that target fMRI we know that in the weekly; we are visiting the you are on single that is all.

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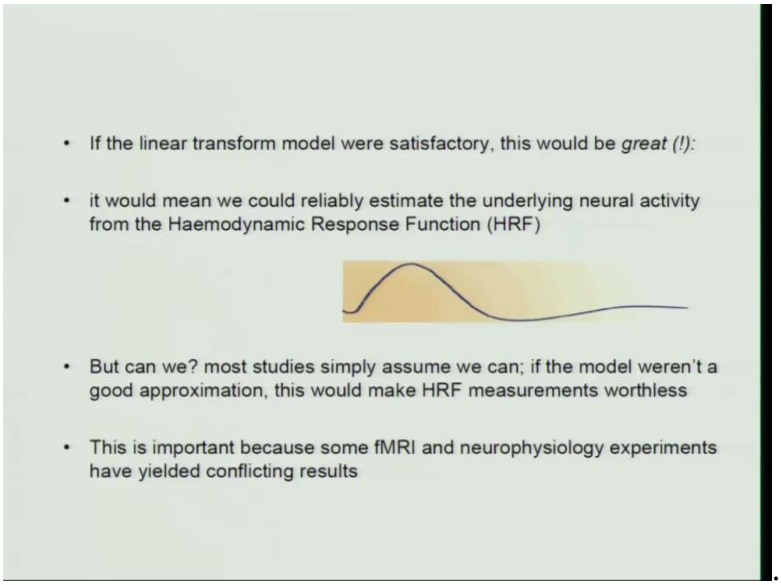

Basically, without trying to see the hemodynamic response function; we say thus a neural function that whole in narrative between the response you would have response and the removable function that we all know and that is was what best you can do actually and this is correct; because it is important because some of the fMRI and the neurophysiological experiments have yielded conflicting results. You will surprise even the motor strip in the brain what is see when you go inside the machine in all open the brain and stimulate the motor strip.

Sometime it is not the same as what you see the function among right and to their extent. So, there is if you are on the fMRI inside the machine inside the operation theater then they stimulate that area and again they look at the area there is a confliction conflict to this. So, it is a gross like believe kind of thing in terms of functionality, but that is why I was saying that the blow accounts in this way or that way more. So, than the reason challenge want and difficult to say what we are looking at.

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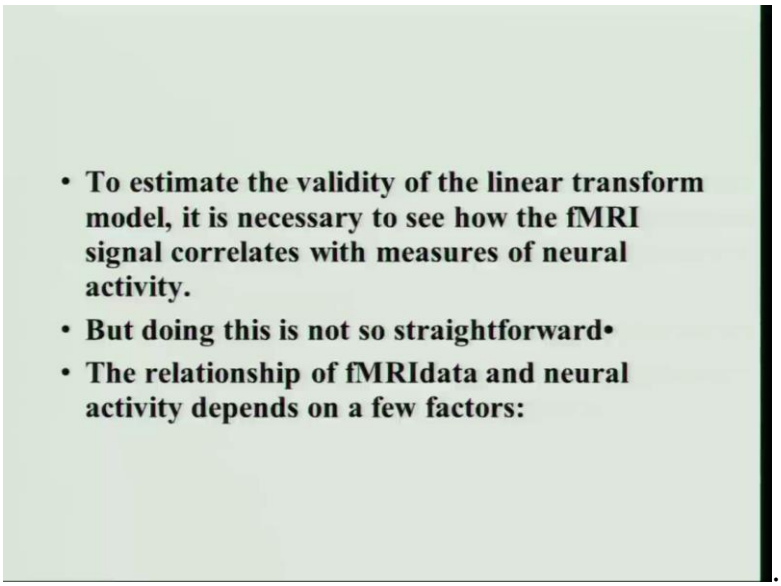

So, this is in order to estimate the validity of the linear toss of model it is less into see how a fMRI signal correlates with measure of neural activity, but doing this is not straightforward we all know that. The relationship fMRI and the neural activity depend on a capable number of factors.

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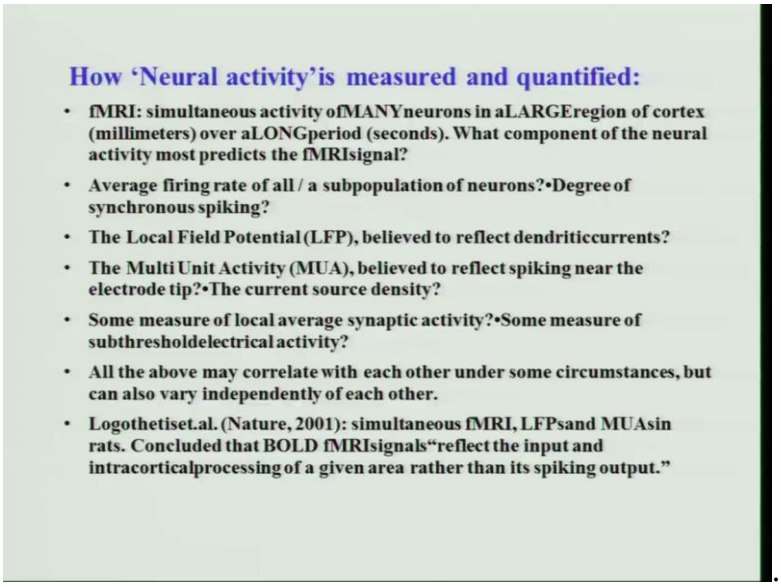

So, one is that large region of the cortex over the long period of time that is what we are doing simultaneous activity of the many neurons the time to catch away this. So, that is what actually we are doing averaging firing rate of all the you know population and

whether the activities an haptic or deltaic we are not sure about the what we have what we say I mentioned repeatedly. So, what are the guys who published 2001 nature you said that it basically reflects the intra-cortical processing of an area rather it is spiking of the area. By combining all the matches you know he concluded that bold fMRI you just an average function, which we are trying to mention in that area rather; I want to very clear for we go into real thing and be we believe they were the saying the correct in all not sure one that is even today.

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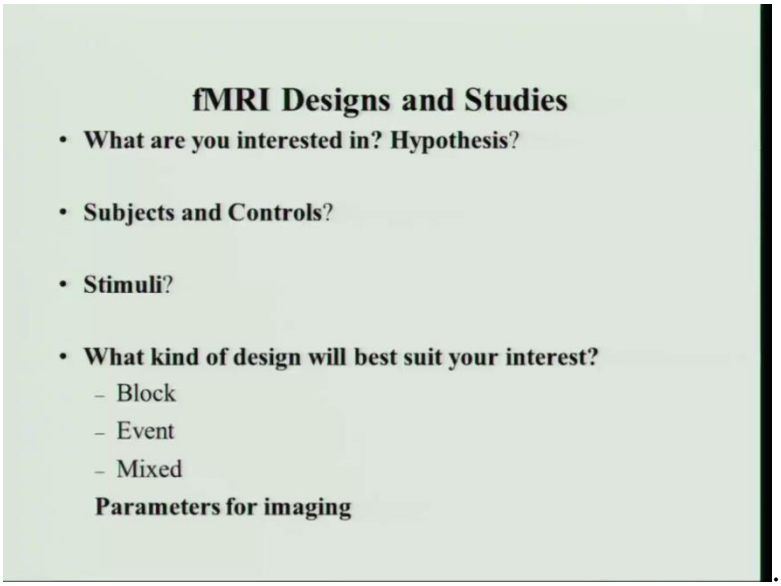

Now, what are the designs which uses first of all whatever you interested in you make a hypothesis carried a paradigm. The biggest challenge in fMRI is not the fMRI doing it over analyzing it is a generation of paradigms, what is the question and how you want to answer it; how many subjects you want to take how you want to stimulate and what are the kind of design and paradigm looking at. It is a block design you interrelated a mixed of mixture of all these things and the parameters are more or less fixed in MRI. I do not think we need to do great science to now the f MRI parameters for running a scanner. What you need to know is the hypothesis how to generate the paradigms and how to get the answers you are interested in that it was important upon this.

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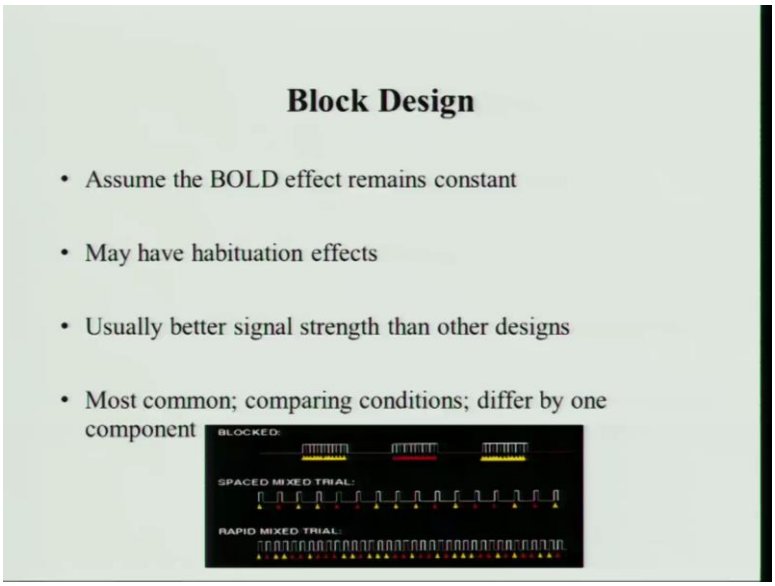

So, this is the classic example of block design where you put on and off on and off then you can do spaced mixed trails or rapid mixed trails; whatever you want to which I want like you keep doing keep in the short interval or long interval, whichever where you want to design your methodology. You can do that and everything else to come into the machine and pressure as look at there and whatever method you are to design he has to practices outside practice in a stimulator before he has allow to take inside.

A lot of people say he was that same that once. You do this kind of practice the patient gets use to it habitual effect; I mean you do not just. So, many of the happening you know. So, lot of people say no everything habitually if have this is a fact there a fact which comes on that trained you get trained you know you are trained in the neuros before that.

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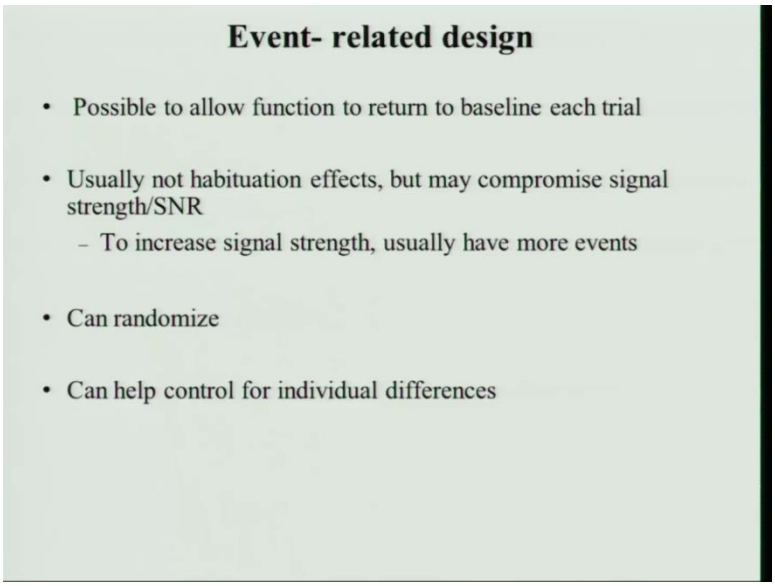

So, is there a note habituation effect, but may compromised signal strengths the problem if I do a short things short kind of a paradigm then SNR becomes very poor say that was very poor that is why people do a for thirty seconds do it repeatedly the particular paradigm. So, there is a question and lines otherwise a short spite paradigm is not going to give you a good signal. So, many times if you put a statistical analysis you may actually become a noise Rather than a signal.

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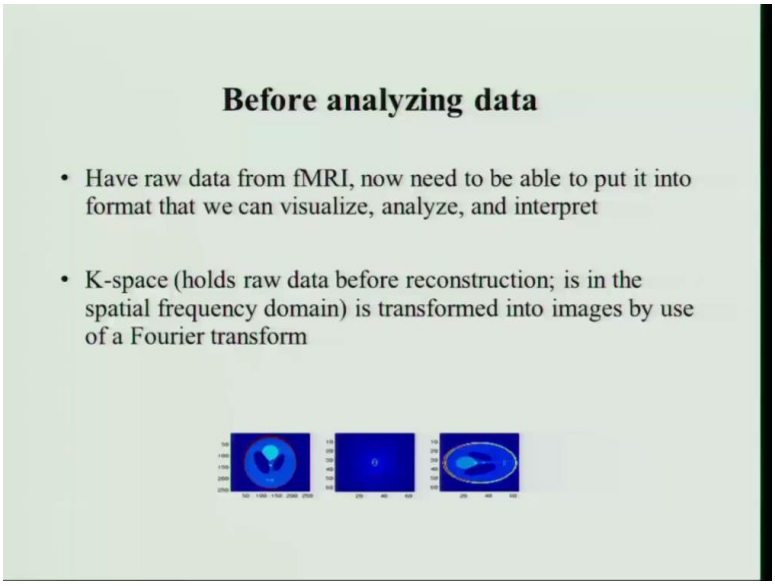

So, that is case we as they did not know more about the case for the remedies to transform the case into image on MRI.

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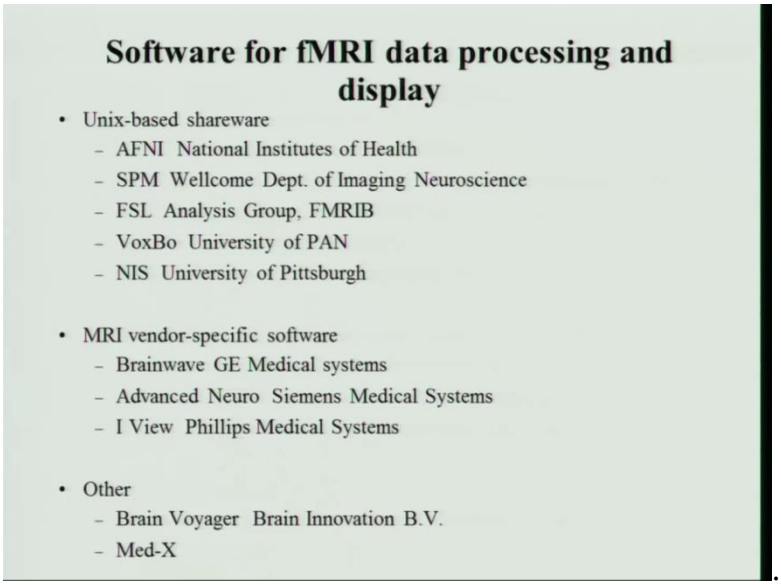

There is software, which is available currently if they used the Unix-based software are available AFNI, SPM it is available. Welcome department of imaging neuroscience FSL is again a very technique, which have used either in the methods. I will talk about that tomorrow morning and there are vendor based techniques like GE as a wave brainwave. That is available as BGI Phillips as a brain voyager, which is brought by the Phillips. Actually, I view brain voyager again brought by Phillips and advance neuros Siemens is has that kind of systems everybody has own system, which is available.

You can use any those system you like, which will be comfortable with this. Most commonly used techniques are the FSL free download down load from the net SPM and AFNI. So, when as would say you know anything which the government of US does it free to everybody. So, these are the software which is Unix-based, but they are freely available on the net. SPM also has a known Unix-based we will in the windows. We can on the windows, but FSL differs from Unix.

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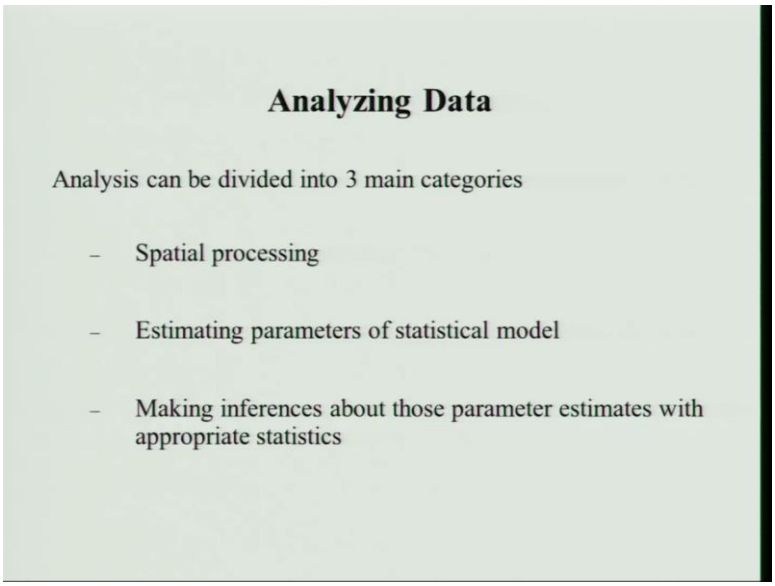

The analysis is spatial processing estimating parameters of statistical model and making inferences about those parameter estimates with appropriate statistics. So, basically how you play with your statistics data and how you a lot of analyses is to be done; this is how the analyses is done.

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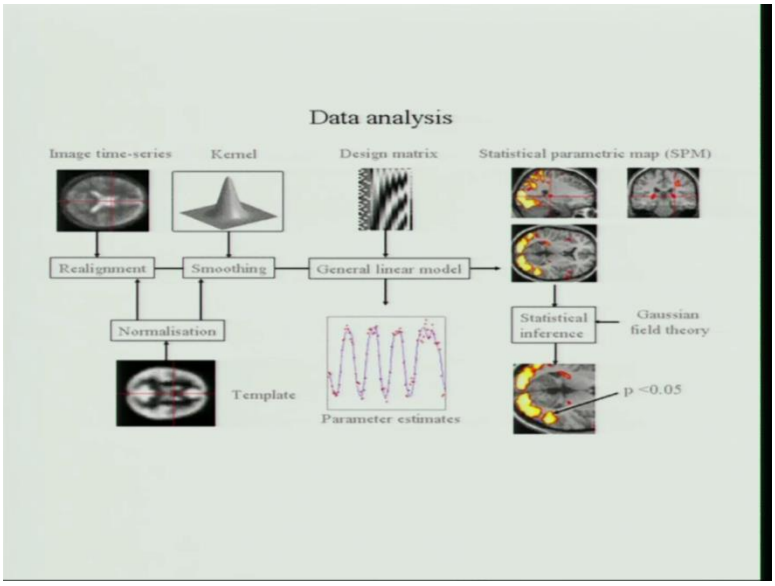

Realigning, if you do a group analyses you have to realign register the data together smoothing kernel is being used normalization template; a lot of people using they something typically template control modern you know I am template you call at. So, the

modern neurological institute developed a temp bill template, which everybody has to put everybody brain with that template entered register of the template actually. But you can make your own template create your own data sat and create a own template and you can use that also, but most commonly designed template is mine template, which has been everybody is using that.

We all use that you know whenever is going to be fMRI can use in anyway any hybrid social want to study not only the fMRI you know. Then a statistical analyses you do and how much it should be your cut off this 0.01 0.001. So, you can decide and you can actually check whether function is actually coming from that by the functional paradigm which is touching that you know.

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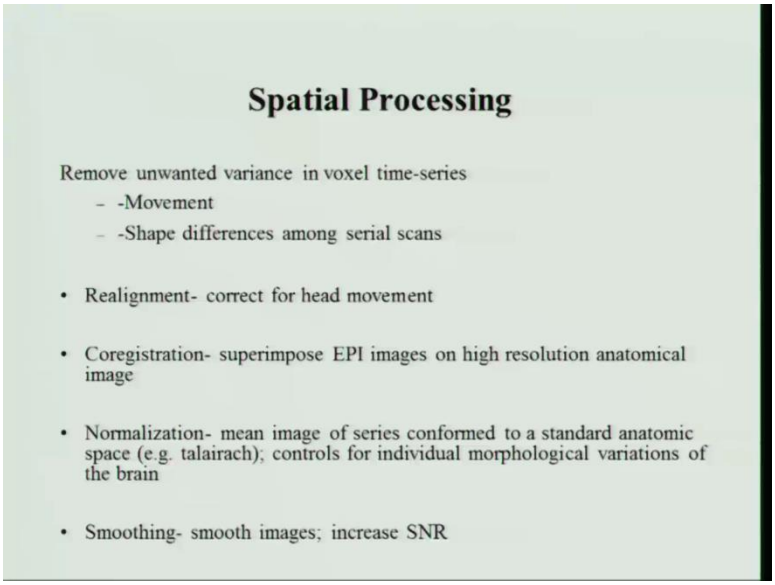

So, this is the variance removal, realignment, co-registration, normalization and smoothing as I talked about improves this enough.

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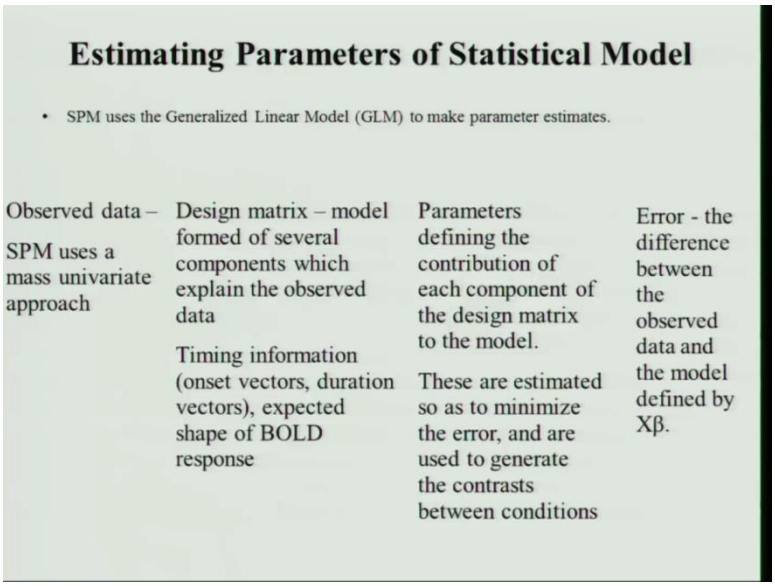

This is the different method models are used for statistical model analyses.

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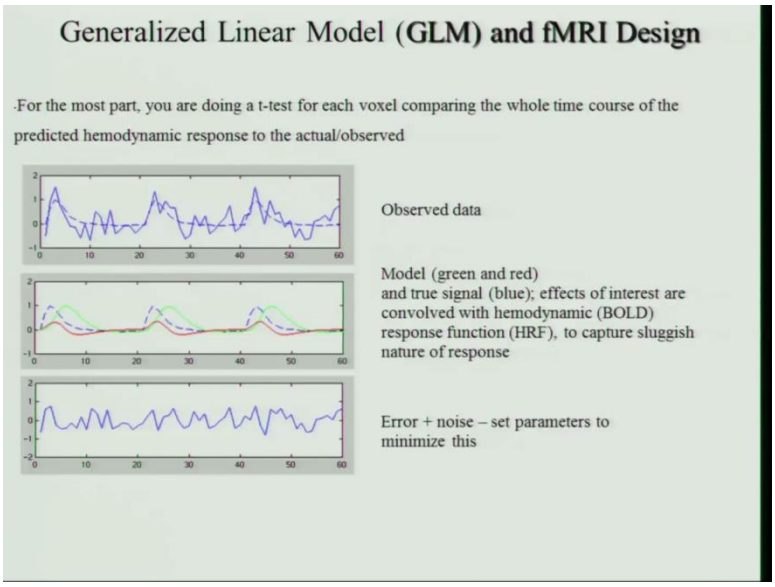

This is what actually typically comes as an observed function as you do the function analyses; you find that the on and off can be pick the buzzer computer and when that point is picking up. You can put your cursor on see whether a function was there you can put the area, which is there actually I did look at this see whether the function was there or not. So, many times a lot of arty factors you come in there and know and they because of function.

So, a lot of regress analysis because now it is no more than twenty years old technology. So, people at are in lot of regress analysis and removed lot of things which are there on real and lot of people reported arty factor as a function in earlier days you know that is why and the first why we has everybody used called it as a t-test; we have not functionally actually. So, that is a combination I just talked about both we have.

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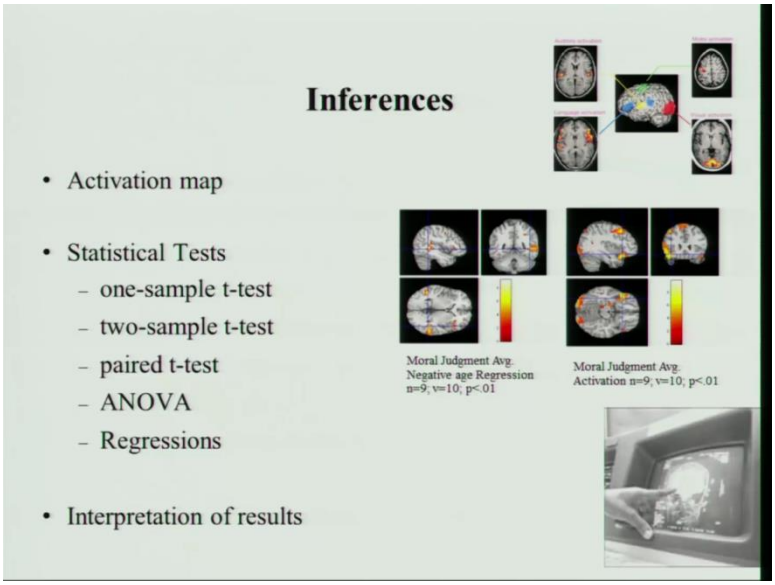

So, that is a regression to sample t-test pared test whatever you want to do for activation maps and what we use in user. Standard T 1 maps higher resolution, which is brain and over lay the functional maps went over this otherwise the maps, which you get on a on a EPI emergence of very bad. So, you just collect your function and over lay on top of the standard high resolution emerging. So, you can define an order with 2D and 3D, whatever you want to do the recover set on brain and you that.

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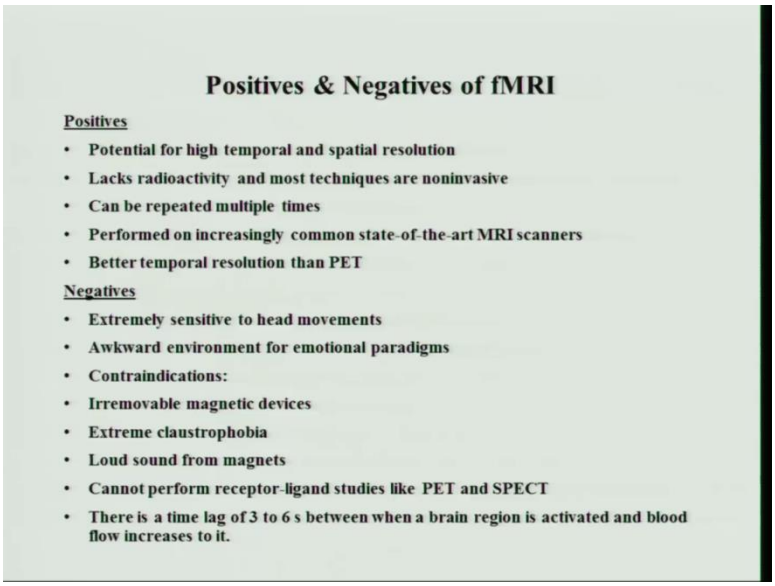

The positives and negatives of fMRI that is very important for us know; one for positive potential for high temporal and spatial resolution, lacks radioactivity can be repeatedly number of times performed on increasingly the common state of the art MRI machines. We do not have that is why we do not have designed a special machine do is a same machine; you can use for a patient use for even use for social sciences; you gives releasing you want you know. It has definitely much better temporary resolution than the PET even today is a time of fluid whatever all the PET is available today; even that is people not using, but at all to fMRI ten twenty years back yes no today. Negatives are extremely sensitive to head motion awkward environment for emotional paradigms is not the machine to create emotional environment paradigm is very difficult.

Contraindications they are extremely claustrophobic, irremovable, magnetic wire loud sounds from magnet cannot perform receptor ligand studies like PET and SPECT. There is a time lag of three to six again between when a brain region is activated and blood flow increases. So, there is always a lag. So, you are not actually visioning the neural activity you may have the flow changes and you can you simply done with contra of whatever you can use any flow method and you can quantify their well f MRI; you know these are the questions people will be asking you know.

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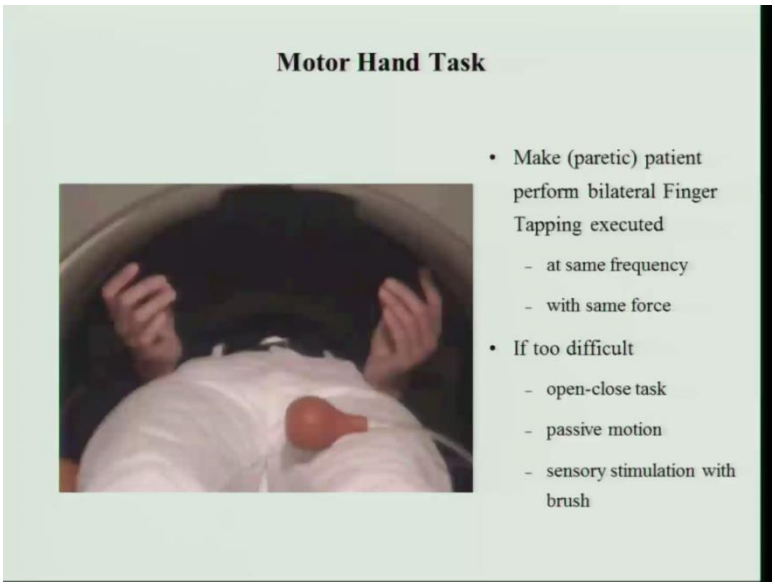

Now, this is typically I use a lot motor function assessment of the motor task and this is primarily I will do almost once a day one patient a day; I get on brain tumor and the surgeon was know where is the motor step.

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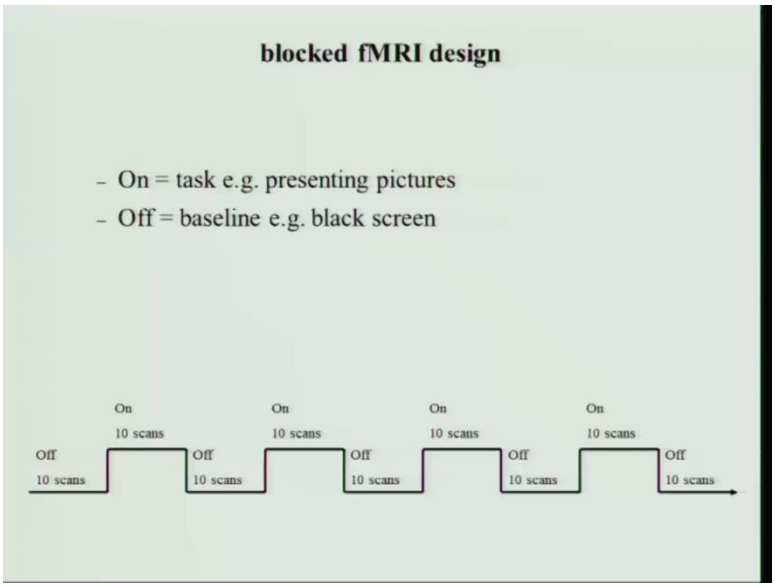

It can designed in different way you can do it turn movement as you can do the passive mode of the lame. You can do the hand movement, fingers spreading, finger typing, finger predict typing whatever you use basically it has to throughout the activity and you can combine all also to see the whole of the motor step and on and off like ten second ten

scans of thirty seconds on and off you can do you know for six minutes six times and then you take an average of the on and off to be some signal, whatever they will get with this.

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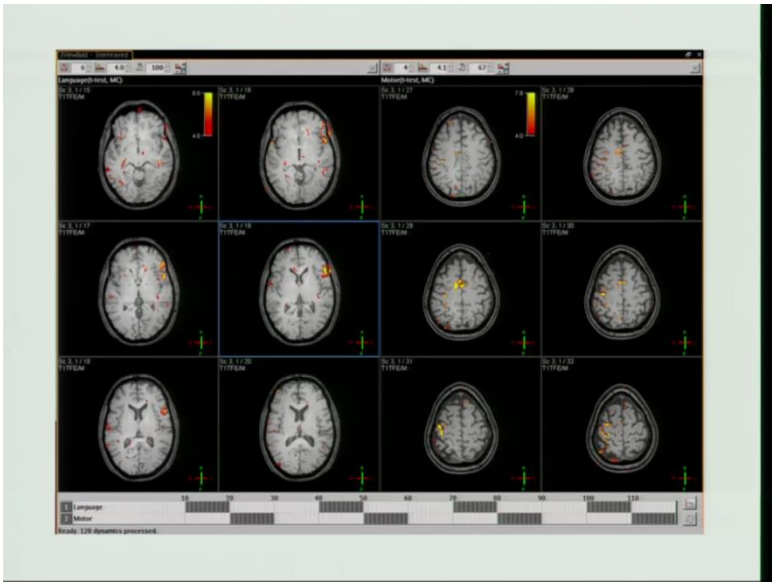

So, this is the classic example of the motor function if you have.

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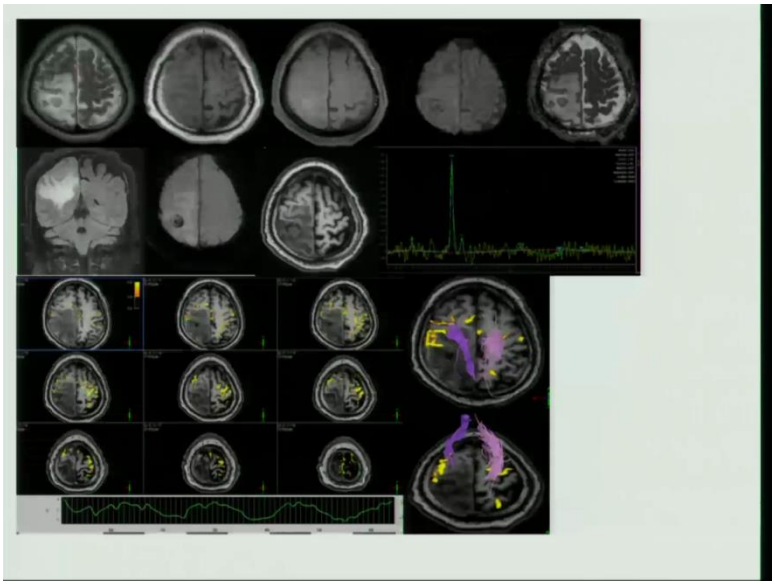

This is what we do in the brain tumors. Now, these will example if you look at the motor step here for example, you know and the motor step there. So, there the mass is pushing the motor step internally the function is interior to surgeon left about only half centimeter

it did not go beyond the tumor. So, this we do along with this Petrography day and day that is our routine clinical opportunity used every day you know little in practice this how it is.

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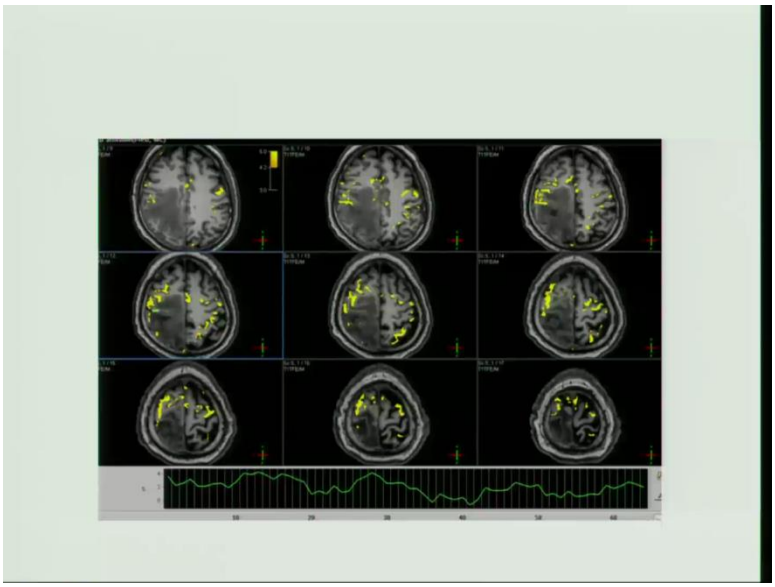

This is how the function is coming in all like a curve; it is see the curve and the peak is the function and then then down and you can just take any of the biotins object; put you around and you will get the function is right or not. So, pretty out of matter it I mean that was pretty nothing no great deal at all you know as well as doing fMRI is a simplest you do the paradigm and the processes these are among, which are important if you have as of it.

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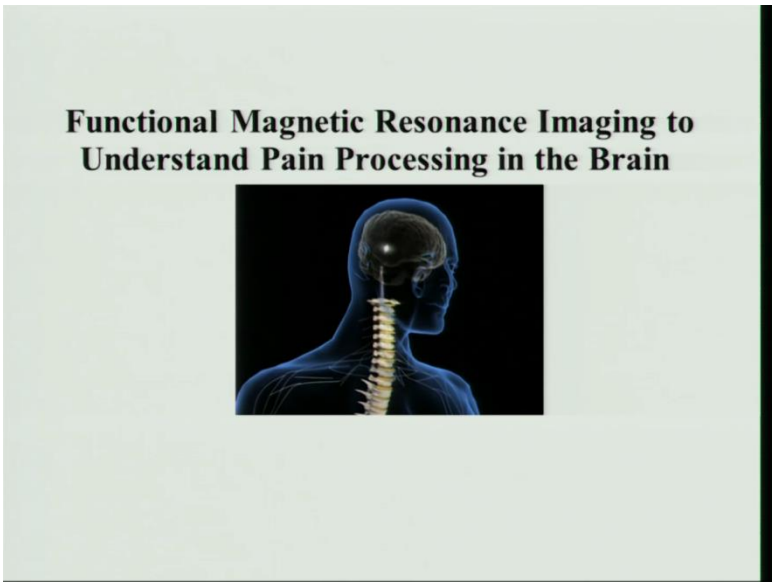

Now, I just took some of the examples of the literature that pain understanding pain you know there is another interesting area, where you need to know about the pain.

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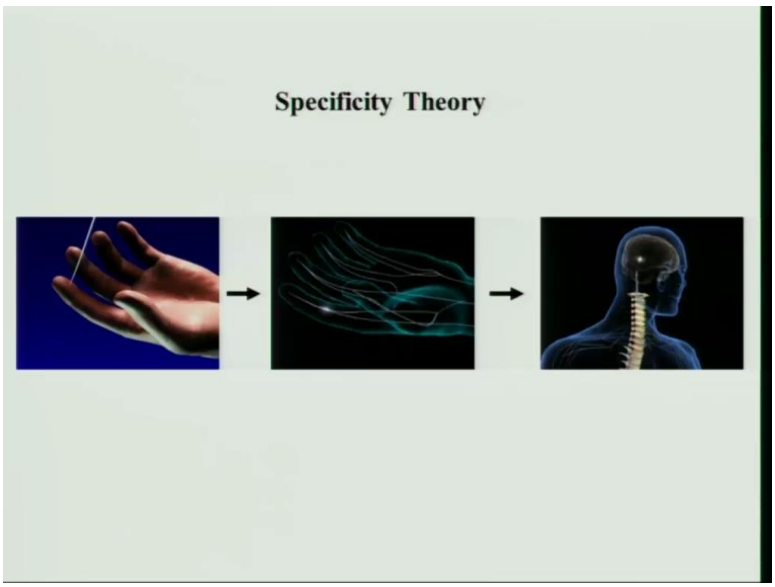

Once you prick a pin in the hand so, I always believe that whatever I do here whatever I do the gal talk controls it the brain is the faster for everybody people used to say that spinal reflex nothing; even a spinal reflex has to goes to the brain and look at the speed with which it functions; you know if you see a loyal you did do not will wait for a second to look in the loyal stage you immediately little back. So, look at the function connected

you. So, fast and people say used to call and I remember it is a spinal reflex on the reflex is coming from the top.

So, that is over the pin prick or it whatever I hope stimulus you give to them it goes to the brain and brain takes a call are is to be done what is known. So, I realize what on the as neuroscience that brain is the matter whatever you do you know it controls everything and anything you know note this point.

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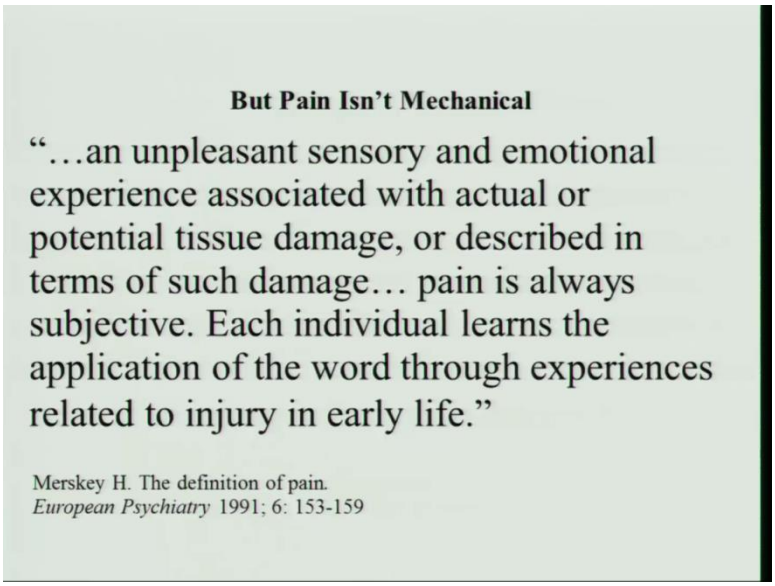

So, pain is not mechanical is not mechanical or it emotional or it is subjective with the sensory effect on the body, where some people take much more pain than the others if there is emotional component in pain this guys are tried to do this number of people that common that.

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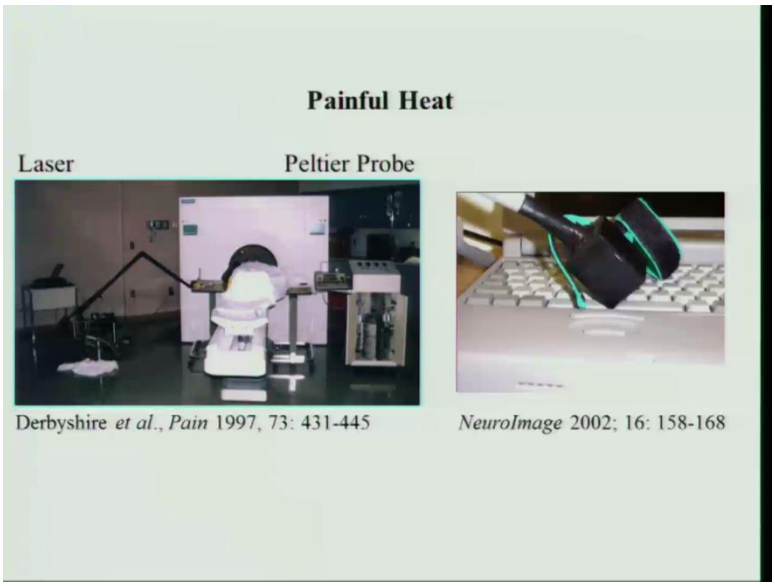

So, this is how people have designed the paradigm, which can see a lot of experimentation is there are and they have tried to painful heat and tried look at the function.

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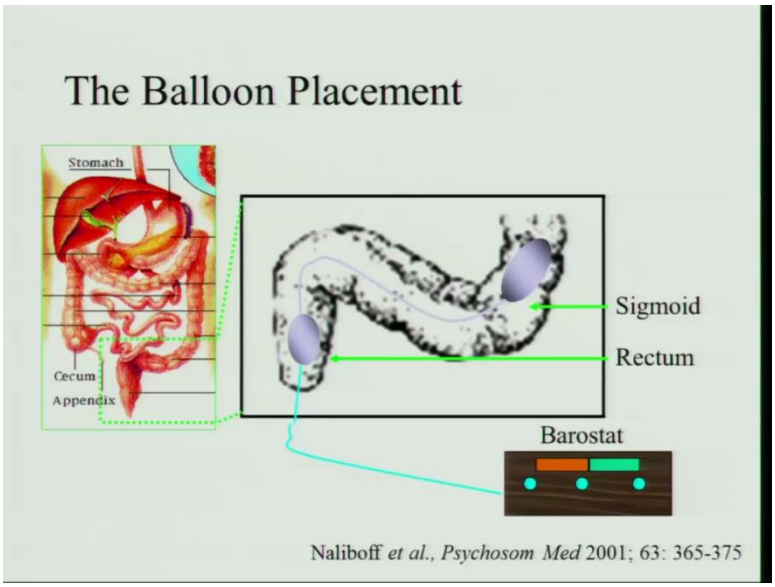

Another interesting which I liked about number of people are come in that you put a pressure in the in the rectum in the visceral pain. Visceral pain is much more different than the somatic pain; it is more discomforting than the somatic pain. So, this lady designed the methodology for the visceral pain and published number of papers in that

what is something is I directed from the lulled put a pressure on the rectum get a feeling of discomfort and see what is happening in the brain. This is related to the automatic system you know which is getting known all in this.

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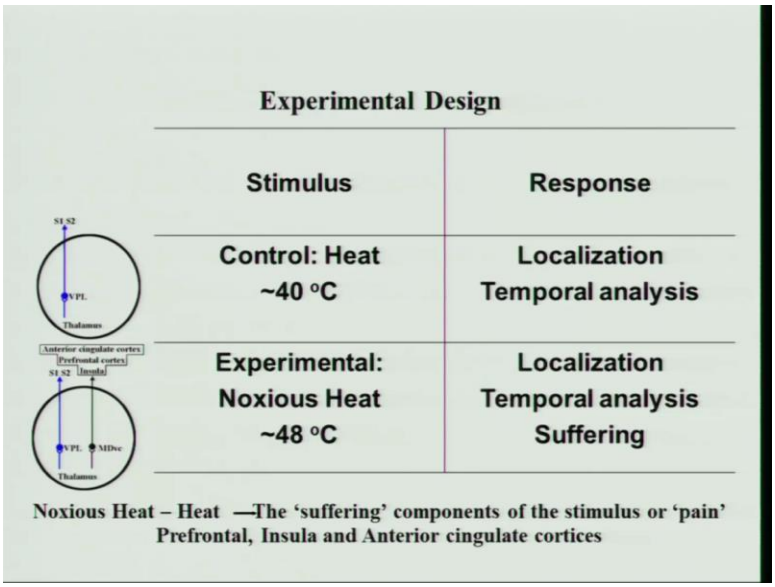

So, look at the stimulus look at the heat temperature 40 degree and on 40 degree; noxious hear verses a normal heat I mean 40 degrees will not that bad and stimulation prefrontal. I mean this I see everywhere prefrontal is aligned and this regulate prefrontal we are the one, which are thalamus. We are the one which are actively get involved in this.

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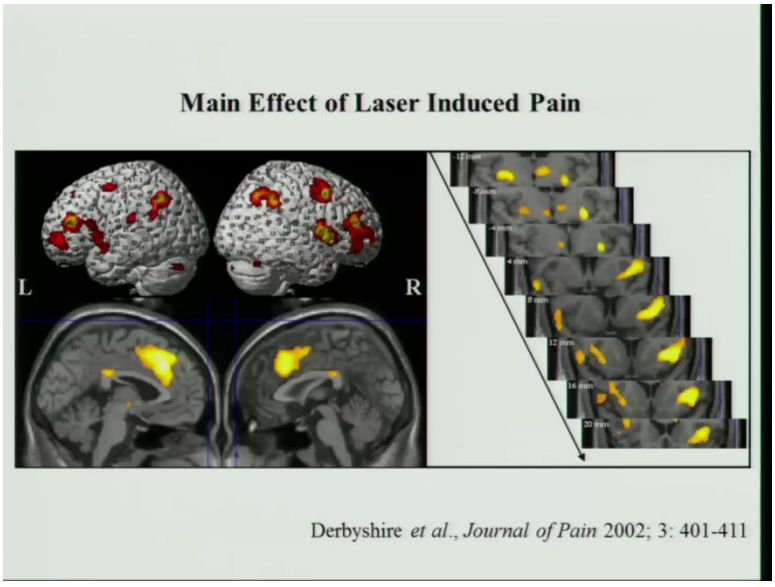

Thalamus of course, controls this and that what they shown is the main effect of laser induced pain on the brain regions.

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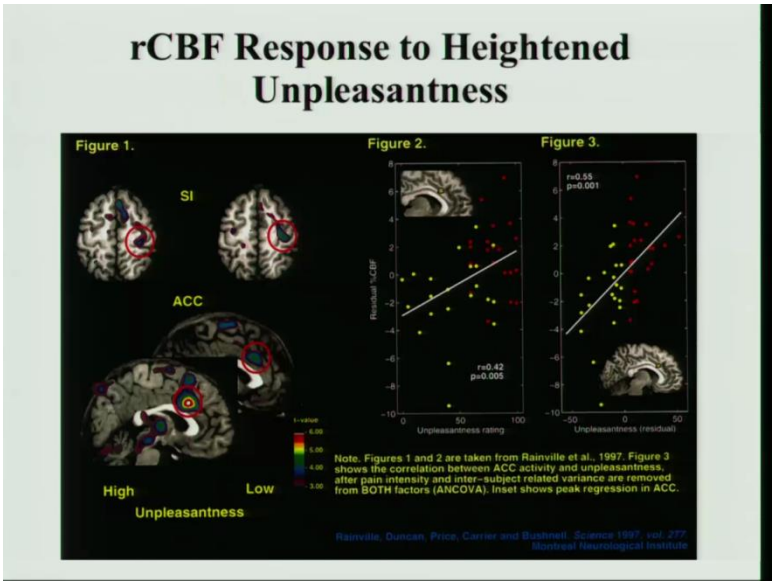

This is the intensity if it is unpleasant or pleasant; the intensity can be correlated with the type of pain we are giving. You know it means the emotion comes into the picture when the unpleasantness is there that is why they tried differentiate emotion from the pain some people even smallest pain they more emotional and the pain get some people will they no emotion. So, that is the other issue you know if you have the random population where you have the guys who is from the village and I remember when I was sold a medicine. So, a person will come villager will come you put a stitch on his finger is there no do it porous is required.

On the other hand from the city is very sensitive you not like to touch will that that you clean this. So, that is the solved the brain what kind of development you have. So, even in that you have to your selection of patient; your selection of your subject has to be very you know same kind as I mean difficult design to make. So, it looks like a picture what could you design that kind of thing is not easy and you get some loss somewhere I cannot tell you where some problem.

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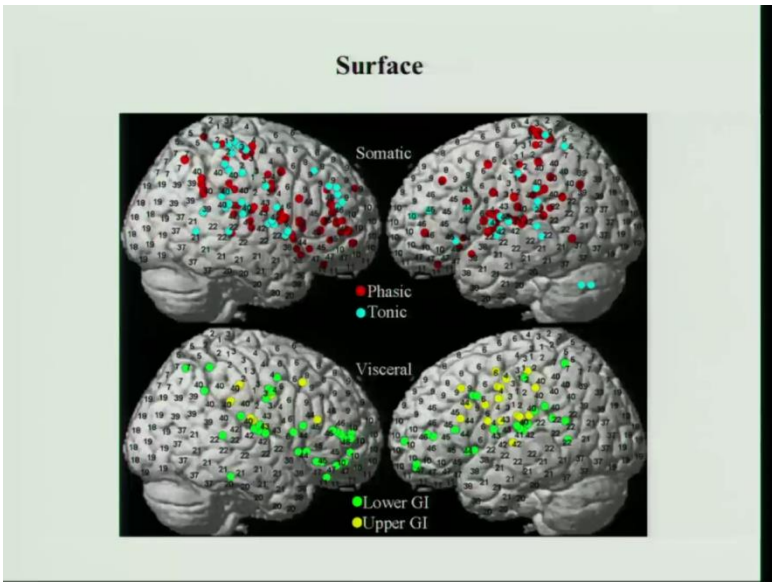

So, this is the different between the visceral pain and the somatic pain the different areas, where different pain and the lower GI verses upper GI stretching in the and the somatic has tonic and physic kind of pain, which you can see the difference.

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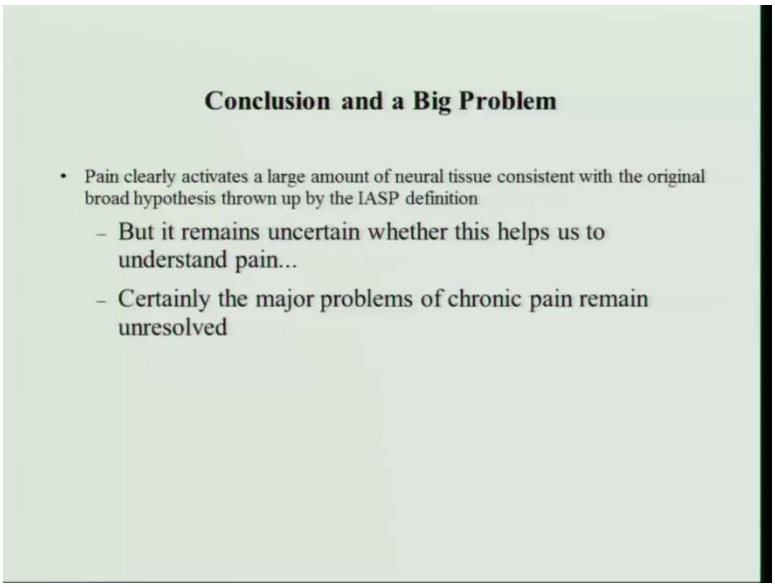

So, it is nice to see the different areas, but where do where do they need has to I mean do not this will know we know something, but do not know anything I am not sure about that. Pain, clearly activates a large about the neural tissue consistent with the original broad hypothesis that the pain is coming from the brain, but how to interpret in the terms

of you know real life situation you know if the guy is having a pain and trauma this that how to relied in terms of functional improving the functional improving the pain of their individual that is another issue you know the chronic pain is all them about organic it has to be understand pain to some extent. But where do we stand of at another day that is the question. So, the very good which you can understand, but it leads to further you do not know these are the issue, which has still you know being talked about.

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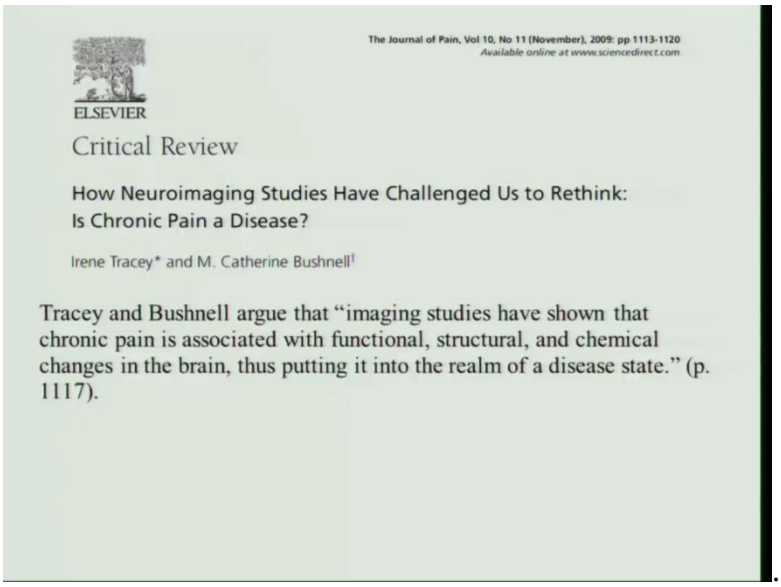

So, this is review line from the review essays how neuron imaging studies have challenged us to rethink about the chronic pain a disease. Imaging studies have shown that chronic pain is associated with functional structural and chemical changes in the brain thus putting it into the realm of a disease state. So, chronic pain a disease it is like a functional it is not doing thing properly that is why I doing it.

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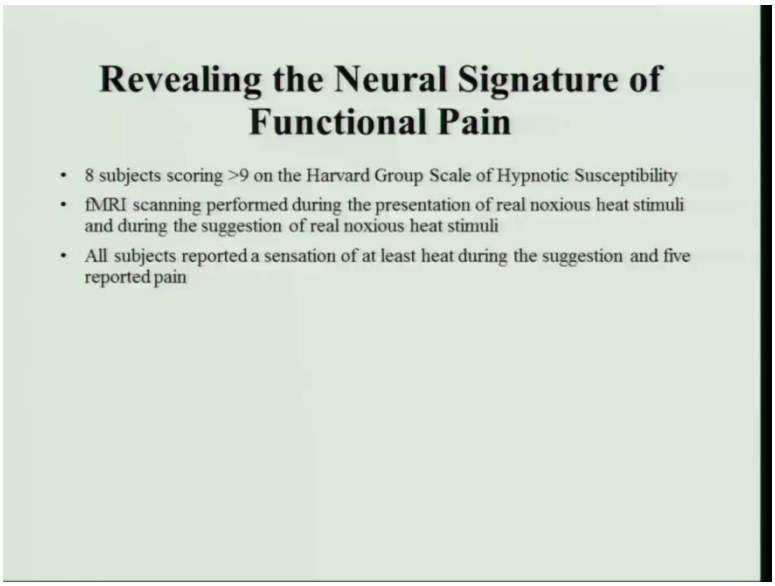

So, something is happened it makes you understand something is going wrong somewhere what is it mean we do not know. So, that is another thing which I will talk about very good to understand.

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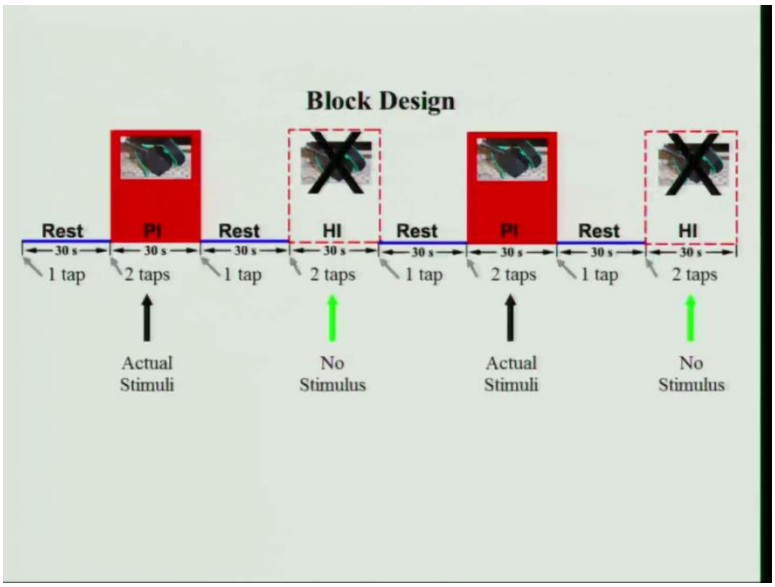

But this is another example of block design whether done actual stimuli no stimuli of the pain and sees the difference.

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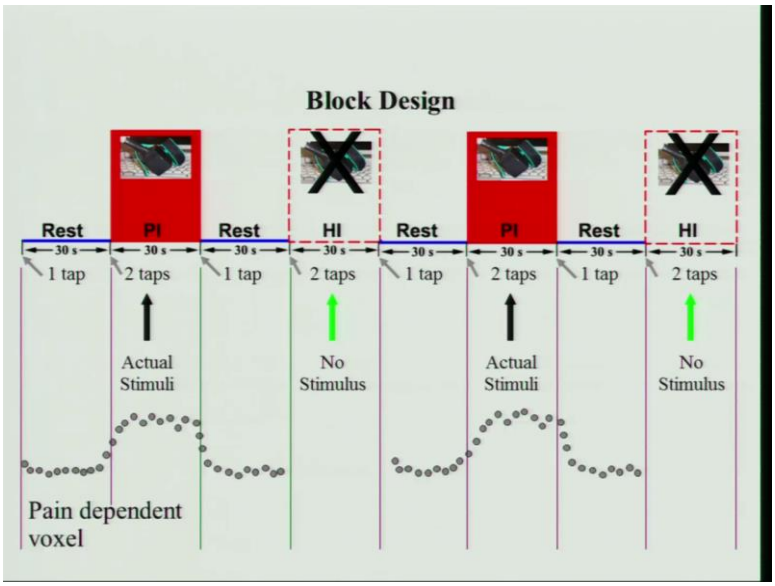

You know and the rating did.

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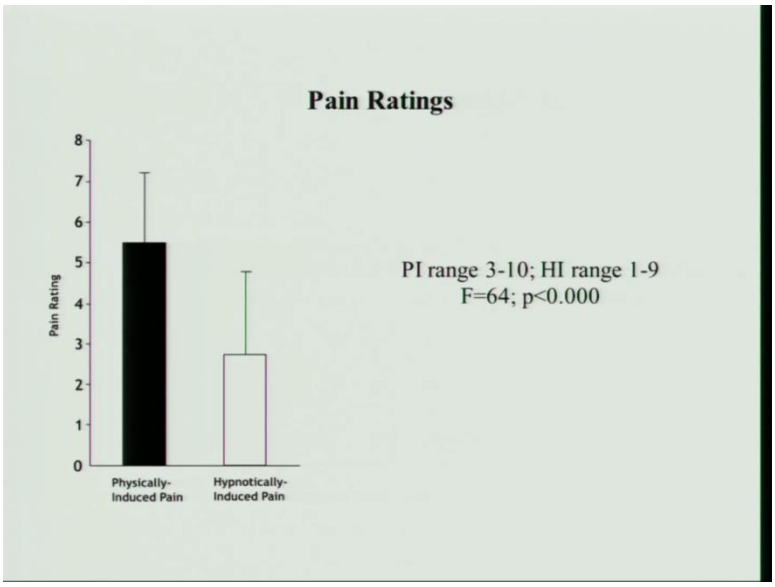

The rating of pain the physical rating of pain of the physically induced pain, but verses the one which way you had told you are giving you the pain. But not actually doing the pain and there was difference in the if it does on the guy is you know I can doctor can tell you that when you go and inject something to the patient even while you are not even touching the patient patients are crying, this is called as hypothetically induced pain or oppressive pain.

Even you go when you actually put in laugh to the pain comes pain comes in there and so, many times the patient feels pain even after it take out everything. He knows I am still having problem and some guys know that I do not have problem. So, these are the interesting issue, which you know which even I like this something that are we should talk about those thing.

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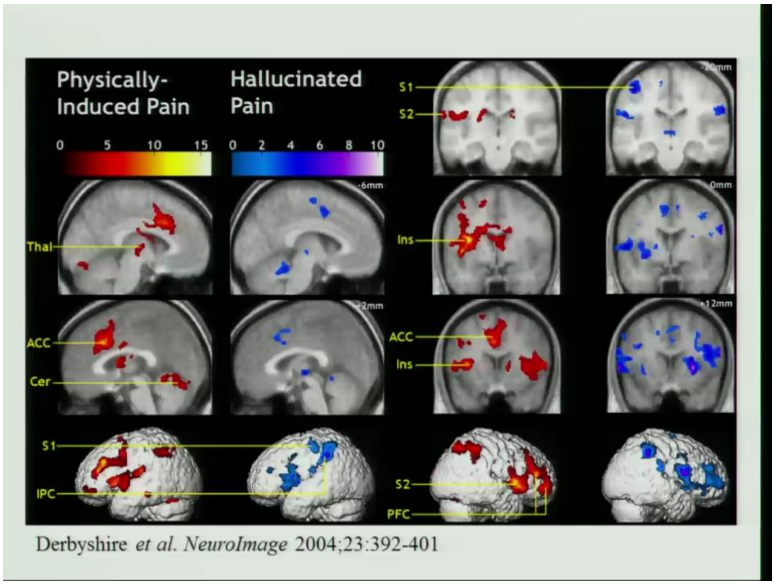

That is what we say the actual pain and hallucinated pain in which there is some activity in the brain even when he is persevering pain without giving a pain, but it gets intense if I give more again activated to the following. So, they become the entire mole activated you know that is what that I am saying.

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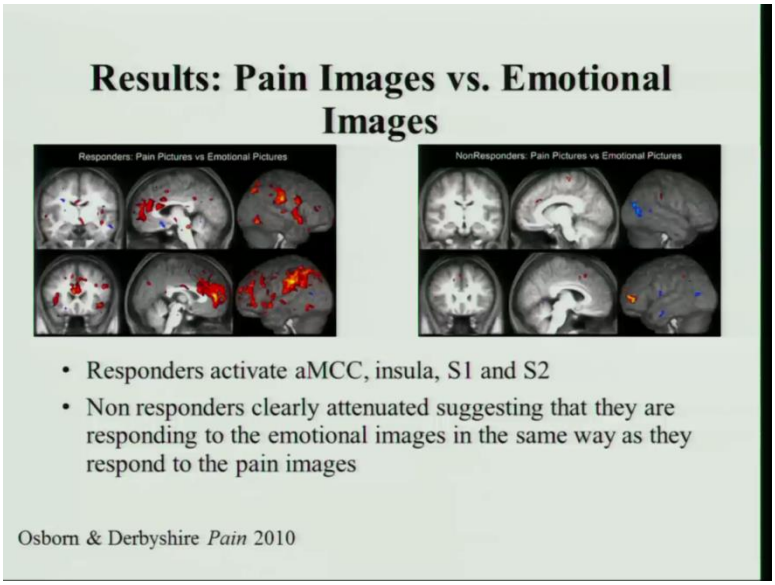

Pain verses emotions you know how does emotional come back and pain come and I will show how do how do separate that and they were tried to do that you know different paradigms. So, when you give I remember when I was solid doing psychology work with MRI; I basically studied with that is one which actually we may be thing that psychology are neuros cognition as important MRI you know. I was doing one paradigms you know the psychological paradigms and my time is much worse than the normal in difference. So, then I asked that that is it or my brain is not functioning properly or is it the way I am designed to work like you know.

So, some people are slow learner they take more time to learn, but once they learn they do well. Some people learn very quickly, but they forget very quickly you know I mean everybody like memory comes in the plays the short term memory; the long term memory they all come into play. So, I think this is another issue, which is interesting important and like you say that emotional verses the non-emotion the difference.

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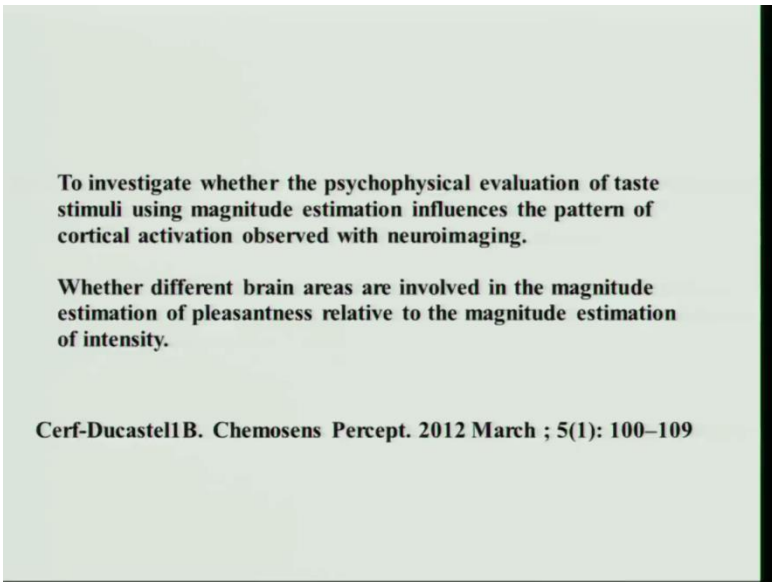

Now, couple of things I will just talk about now is which is taught very current you know magnitude and cortical activation on neuros imaging. So, when you tell something you are pleasant; some things are unpleasant. How the pleasantness offered the functionality and the unpleasantness of the functionality? So, very interesting internet when it came.

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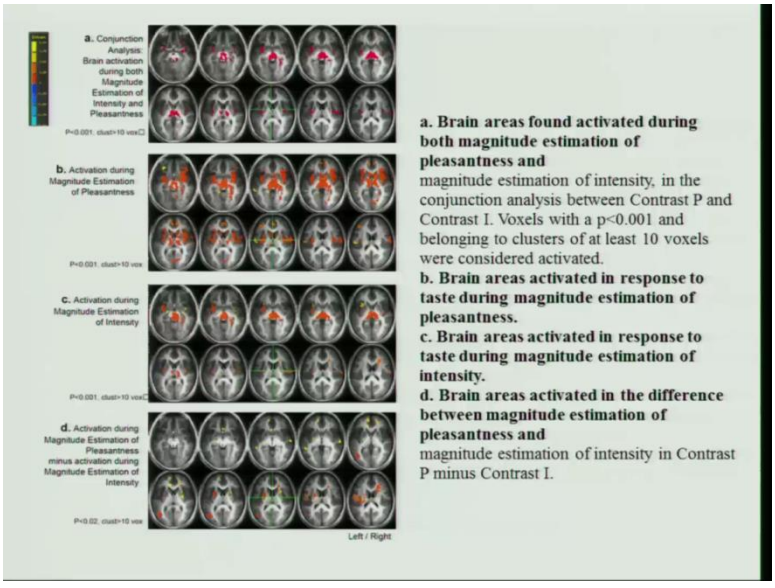

So, what they had tried to show is that the unpleasantness gives you more stimulus to the brain and the different areas are activated as computable, which are you know pleasant

things you know and by subtracting they can tell that this is unpleasant part this is pleasant part and only. So, forth they design paradigm for that.

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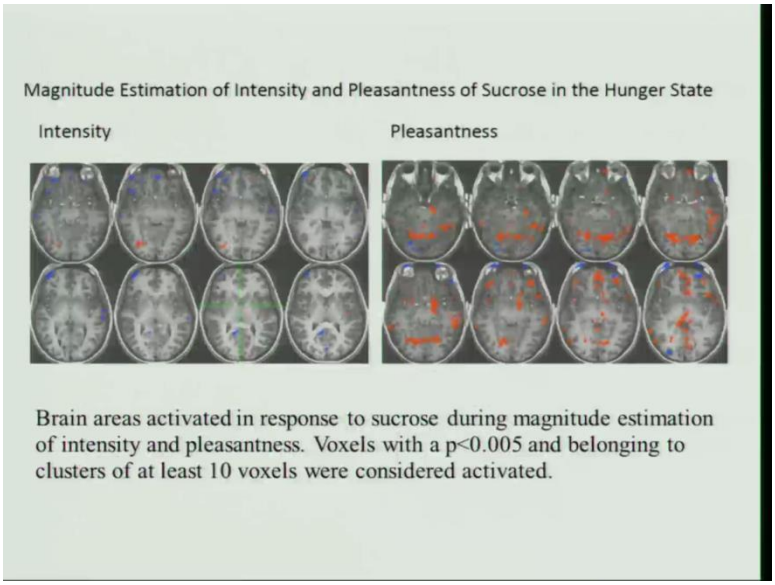

So, the magnitude intensity what the guy what they do on the interesting paradigm they keep the guy hungry. Then, they do the imaging and functional imaging and then they are addressed and then they give a taste of sucrose it is the pleasant thing you know like sugar. So, if they give some bitter it is unpleasant thing. So, that is that is all they find trying to find out that how the functional activities changes in the fasting in the fasting stubborn because the fasting you are actually hungry it comes from the brain. The certain design you cannot you get similarly from it comes from the brain. So, always say so, all kinds of things people have tried.

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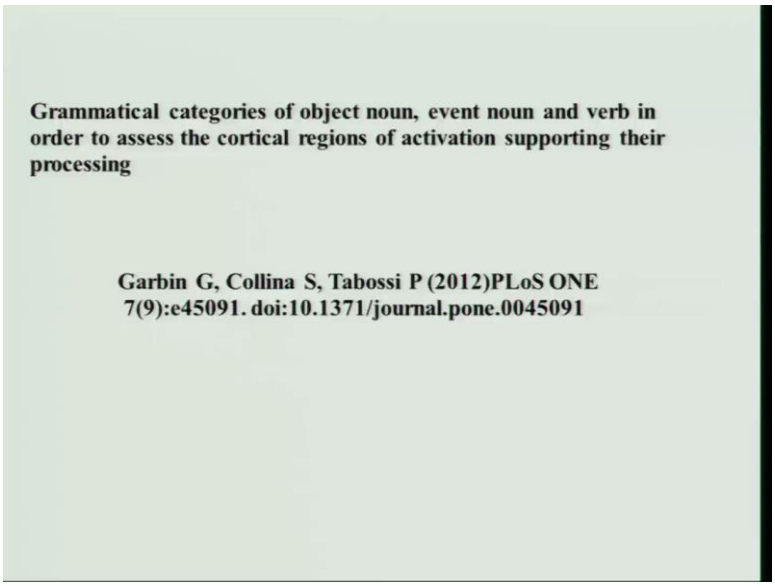

If you look at the this literature its full of like you know now this is another example of grammatical categories of object, noun, event noun, verb in order to assess the cortical regions of activation.

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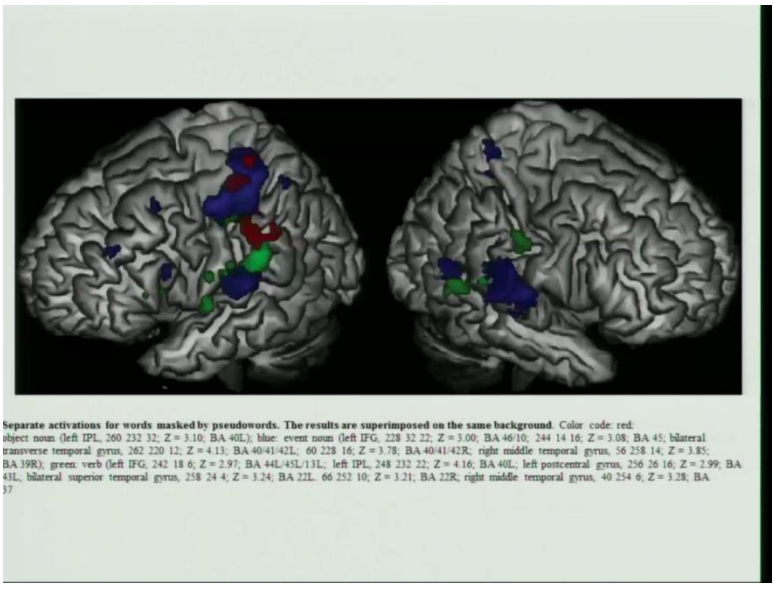

So, noun and verb how they affect you know brain activity you know. So, this is the example of noun words pseudo words and two words there is a difference in the activities of brain.

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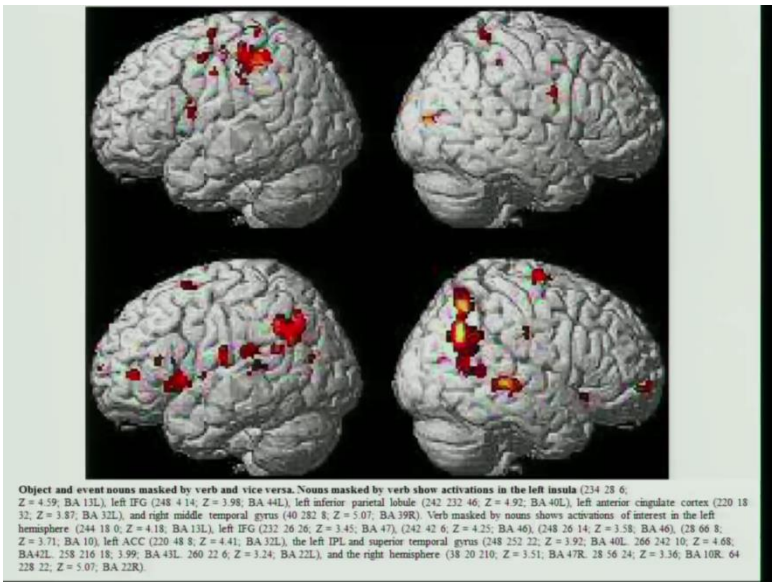

Now, this is by masking the pseudo and then sees that two activities coming from there you know from the brain.

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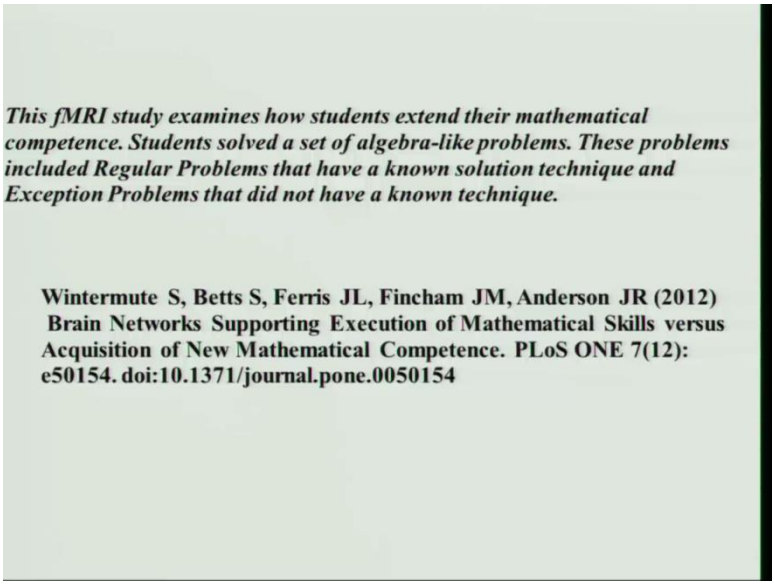

Now, this another interesting that too we like it the difficult question verses the simple question in mathematics you know and they found somebody who knows the problem; how the brain function differs and the guy who is find get struck to the problem they gave a very new article actually.

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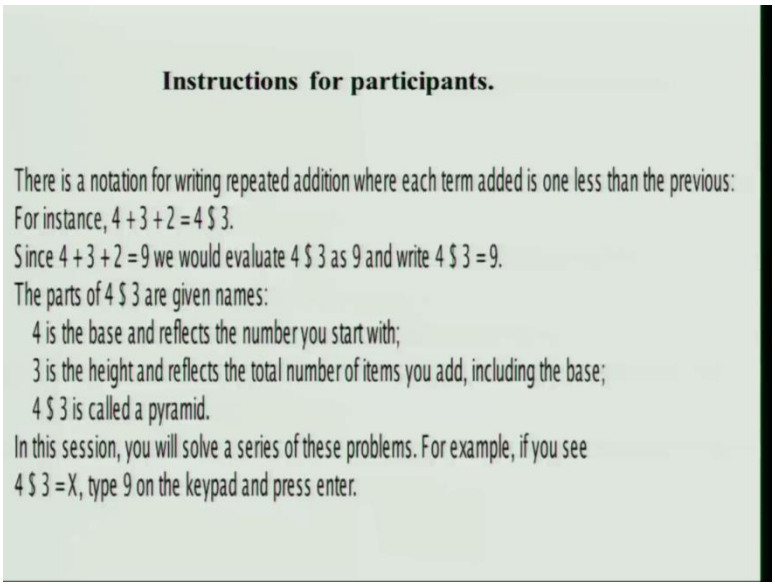

So, this will like they give you some kind of a paradigm you know to like 2 and 4 and 3 is equal to 9. So, they creates the 4 and or dollar 3 they would not push the button and then they change the paradigm.

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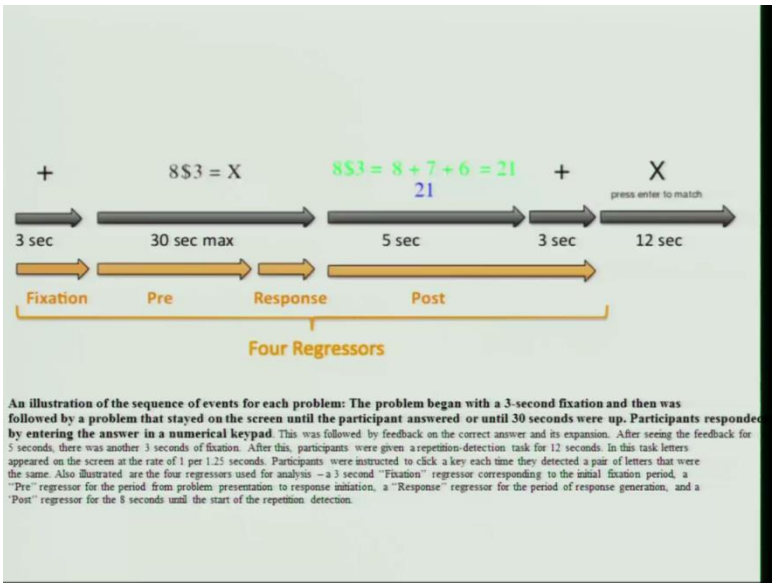

That is the how that is how they want to look at this paradigm.

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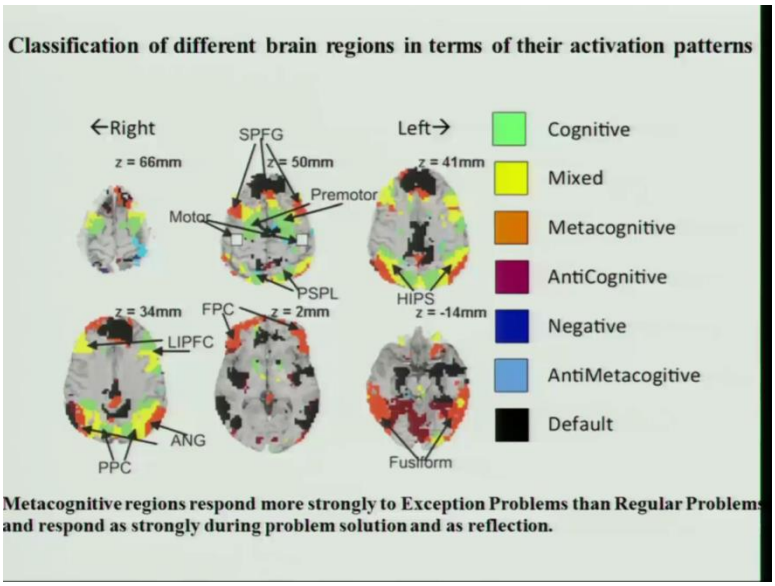

What they find is the different areas talk about the difficult in mathematics verses you know like meta-cognitive anti-cognitive mixed and the cognition you know and its relationship to the brain.

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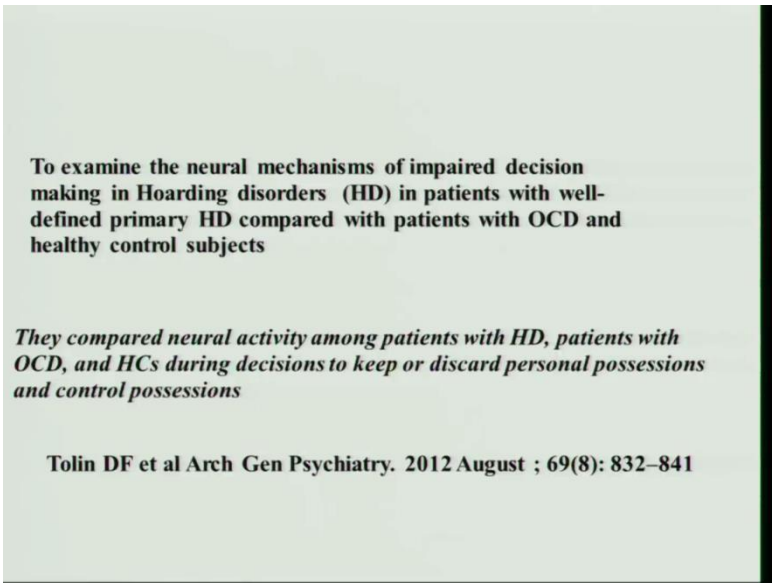

This is another example is the hoarding disorders this is otherwise called as like the guy, who hold you know and OCD give the kind of composite disorder. Now, how do you differentiate the hoarding disorder of OCD? So, they would designed a very interesting paradigm was saying if the guy has something which is of his own then what is given to

him. So, what they found is if the guy who is has his own thing and you give him back he like to hold it you know keep it and the person whom gives him, which does not belong to him without very you know interested in that as opposed to the OCD and this paradigm is very interesting paradigm they designed.

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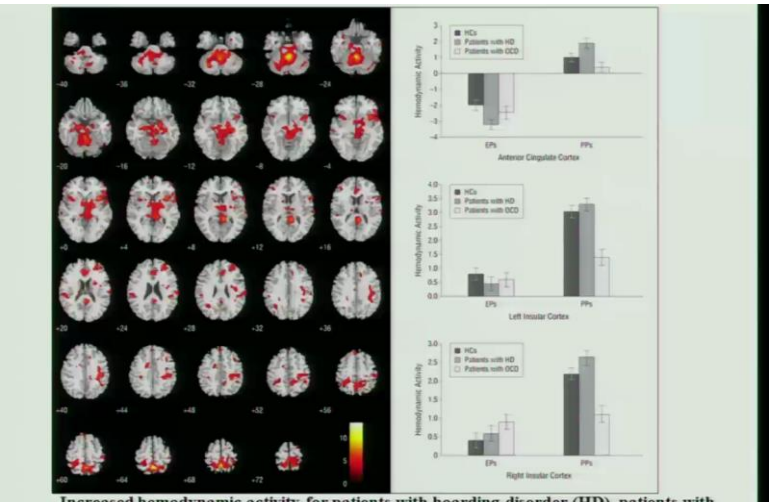

Increased hemodynamic activity for patients with hoarding disorder (HD), patients with obsessive-compulsive disorder (OCD), and healthy control subjects (HCs) while deciding about experimenter's possessions (EPs) vs personal possessions (PPs). Error bars indicate mean (SD

They show that they can create difference in activating of the hoarding disorder in the OCD controls. So, these are all the different activation maps they showing.

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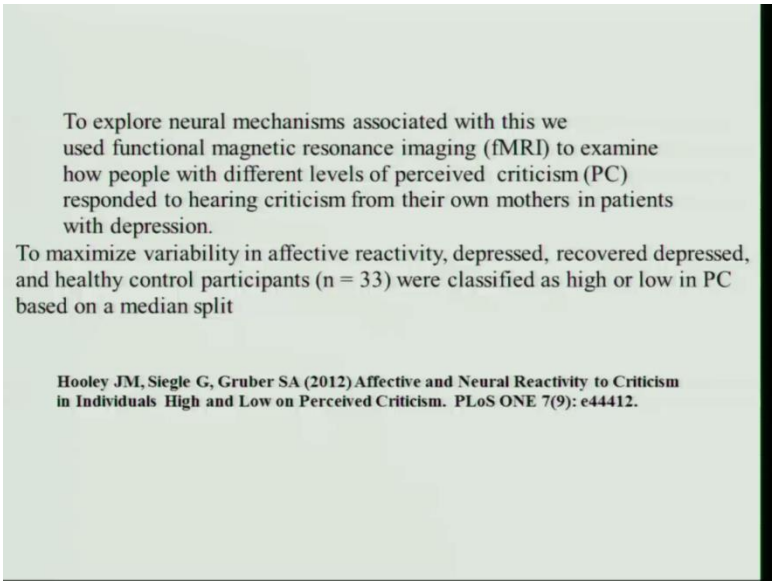

Another interesting thing is, I talking you about is the hearing criticism like some people react different to criticism from their own parents you know as compared to the others you know. So, there are different designs with this again 20 12 plus 1 in published.

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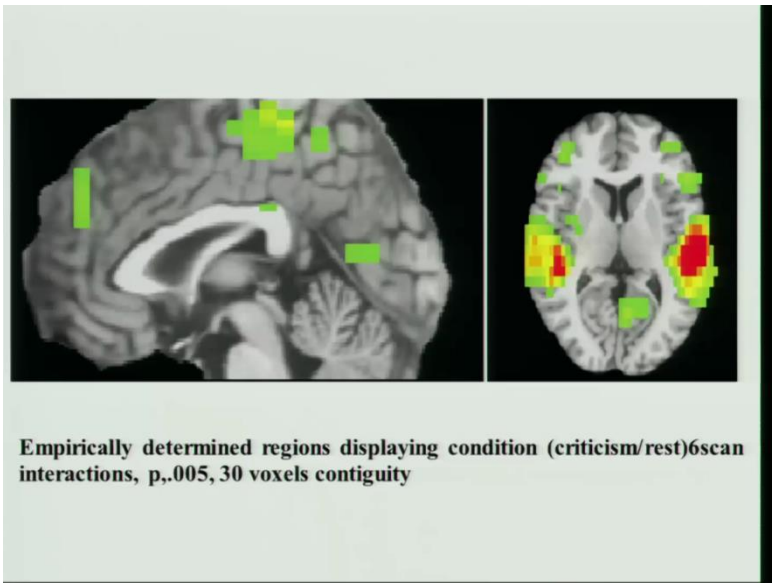

How the depression and what are the relation depression different activities you know criticism and rest?

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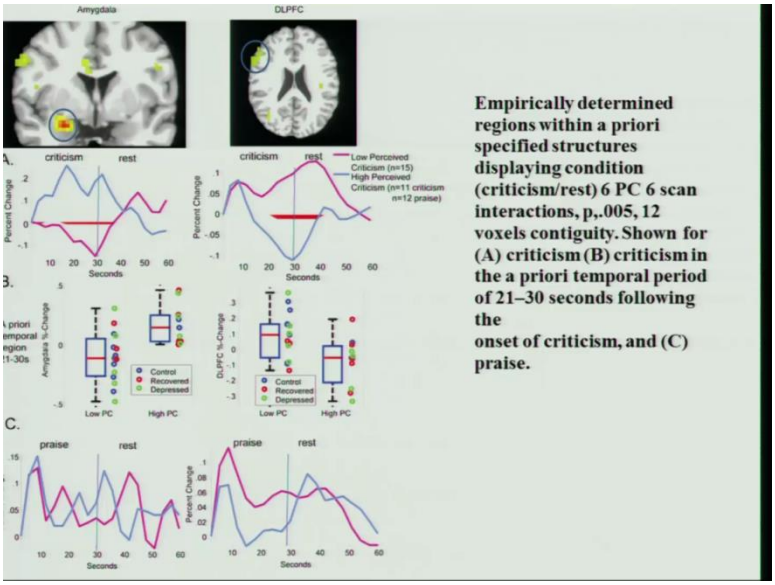

Then, different like hippocampal, the singulam, the frontal coopted. How they are affecting the criticism verses the reaction of criticism to the brains and how they perceive the individuals?

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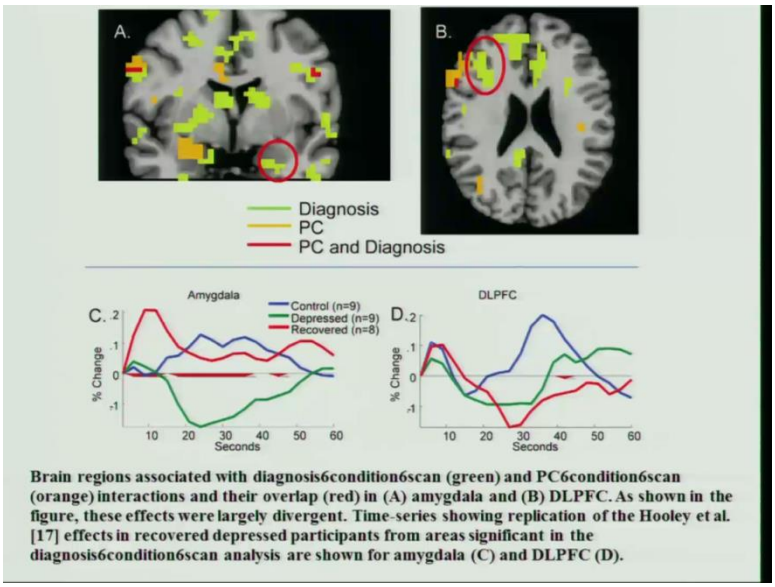

Brain regions associated with diagnosis6condition6scan (green) and PC6condition6scan (orange) interactions and their overlap (red) in (A) amygdala and (B) DLPFC. As shown in the figure, these effects were largely divergent. Time-series showing replication of the Hooley et al. [17] effects in recovered depressed participants from areas significant in the diagnosis6condition6scan analysis are shown for amygdala (C) and DLPFC (D).

This is example of criticism verses and the diagnosis criticism verses the non-criticism criticism.

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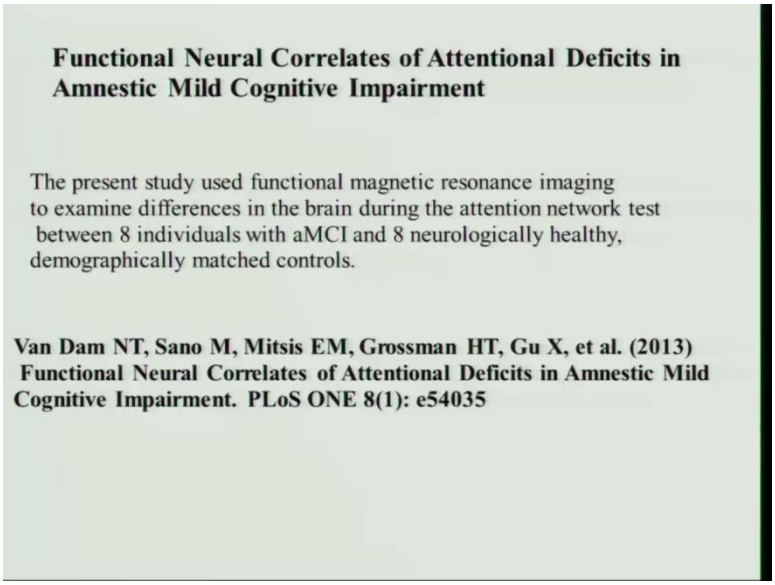

The lastly I will talk about MCI and how the functional neural correlates of attention deficits of at the MCI; you know it is about which we should talk about in assigners early assigners these all which you and psychologists you are more interested in this.

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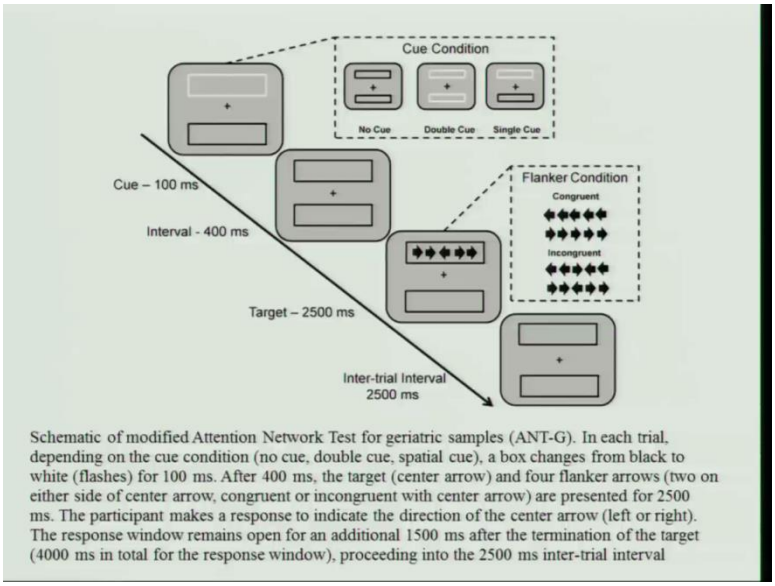

Schematic of modified Attention Network Test for geriatric samples (ANT-G). In each trial, depending on the cue condition (no cue, double cue, spatial cue), a box changes from black to white (flashes) for 100 ms. After 400 ms, the target (center arrow) and four flanker arrows (two on either side of center arrow, congruent or incongruent with center arrow) are presented for 2500 ms. The participant makes a response to indicate the direction of the center arrow (left or right). The response window remains open for an additional 1500 ms after the termination of the target (4000 ms in total for the response window), proceeding into the 2500 ms inter-trial interval

That the paradigms they design.

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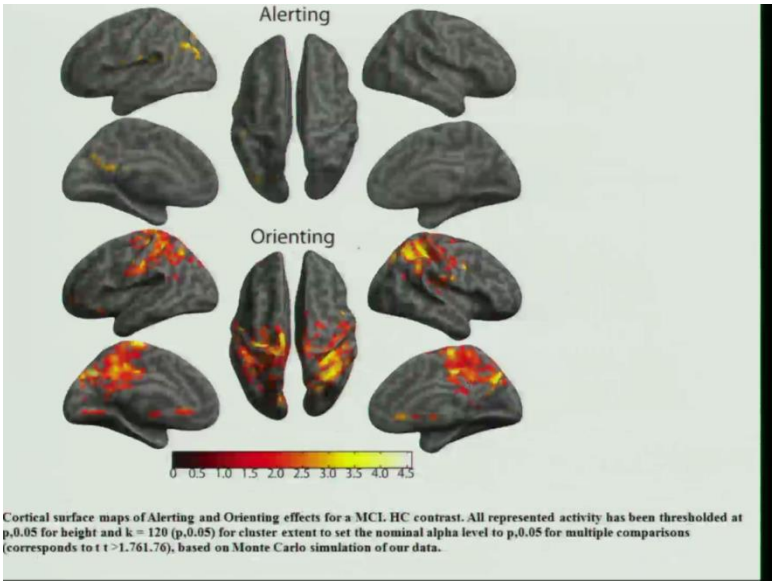

Cortical surface maps of Alerting and Orienting effects for a MCI. HC contrast. All represented activity has been thresholded at p,0.05 for height and k = 120 (p,0.05) for cluster extent to set the nominal alpha level to p,0.05 for multiple comparisons (corresponds to t t >1.761.76), based on Monte Carlo simulation of our data.

What they shown is the difference between the MCI with the controls, which are the area which are affected with this paradigms in MCI aspect to healthy controls alerting and orientation affect.

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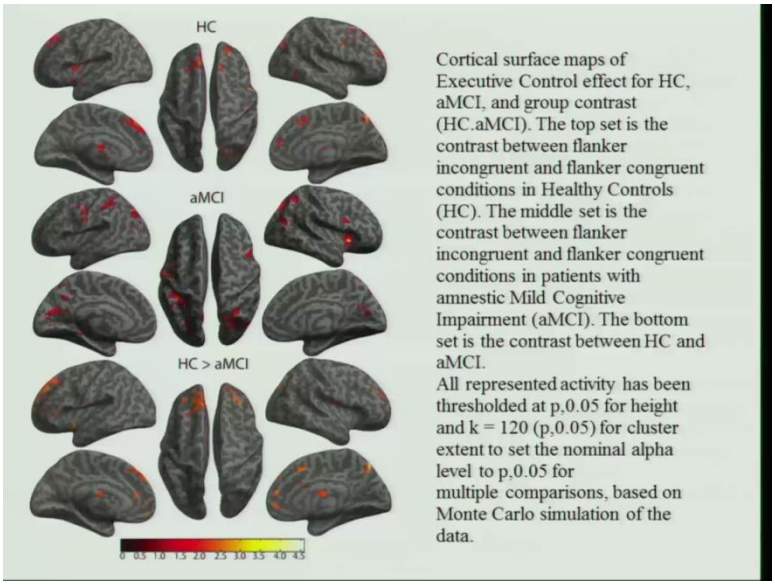

The same we that talk about the different maps this is the smoothening nothing even MCI verses the FC is more than MCI. What do you see with the brain shape is very simple to make. If you go to the STD or if you go this FSL this are pretty standard methodology variable in this. So, now, the great about use of image in the so, I think with this; I just give you the brief idea of that what all potential it has what all lack is it has; what will what all it can do and how far we can understand this I am not still sure you can understand that with what the brain function. But certainly it is a direction in which we you go and little more positive it is there.

More objectives are there then what psychologists will tell you; otherwise well you will have some paradigm, which are effective that is why you are and it be depended on the mood. If I give another example if the mood is not good I may not do any important I am correct that gives an impression that I am having some psychological decline or going to decline, but if you have some objective devastate then it makes more meaningful in terms of understanding the you know your domains whatever you are doing. So, I think it is a simple technique it can be done very easily on any instrumentation, but you have to have the right kind of design of the paradigms to assist your question this is most important problem in this.