Indian Institute of Technology Kanpur

National Programme on Technology Enhanced Learning (NPTEL)

Course Title
Basic Cognitive Processes

Lecture: 26
Attention - II

By
Prof. Ark Verma
Department of Humanities and Social Sciences

Indian Institute of Technology Kanpur

National program of technology

Enhanced Learning (NPTEL)

Hello everyone welcome to the course basic cognitive processes I am our karma from IIT Kanpur now we have been talking about attention since the last lecture and if you remember.

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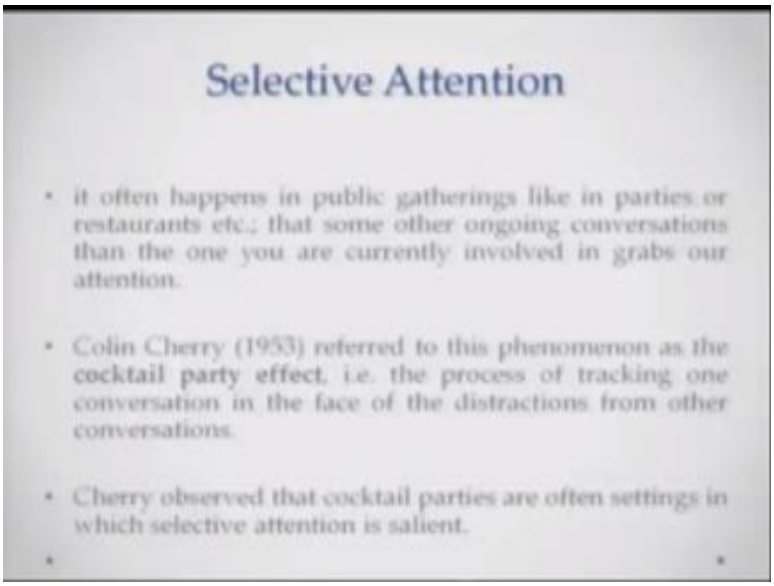

What I was telling in the last lecture was this very interesting experiment or a very interesting finding that Colin cherry found out and this finding was referred to as the cocktail party effect so it often happens just to give you a brief recap it would often happen in public gatherings like in parties or restaurants or in a busy classroom that you are talking to somebody your engaged in this particular conversation but there's still some other conversations going around and suddenly.

You know someone in those other conversations wherein you are not really involved and they are probably here you know 10 50 meters away from you somebody mentions your name you quickly get oriented towards that particular conversation you do notice something that somebody took your name maybe even though that person is not really talking-to you is talking somebody else and it is sitting say for example 20 meters away from you it does happen now why is this happening you were engrossed in particular conversation.

You were attending to you know the persons not oriented to your name in the other conversation there are two important things here first is that that particular conversation is also in some sense probably being processed in your head so that you could notice that the second is not any other information you might you know so distinctly remember what you remembered that your name was taking so information that is relevant to you was in some way prioritized and had more attention so that you quickly lubed to it.

So you have to look at teethe attention system in such a way that it is doing at least two things it is prioritizing and information relevant to you is probably at a much higher priority than any other kind of information and also the second thing is that other kinds of information are also being processed even though they are notactivelyyou know engaged in while you are listening to that or processing that so this is this is something which is important and in today's lecture.

We will be talking about selective attention different theories of selective attention and we'll be talking about you know on do all those theories with reference to calling Jerry's work okay so Colin cherry observed that cocktail parties.

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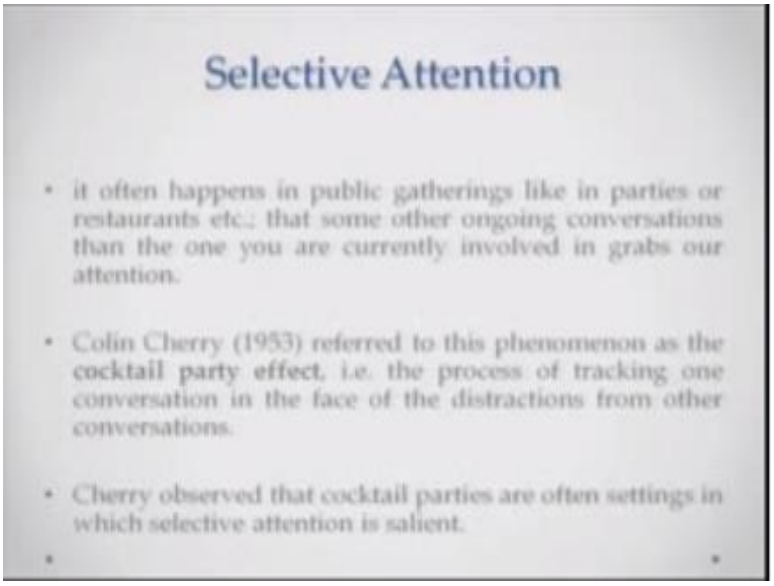

Are often settings wherein selective attention is very salient see there is a lot of hustle muscle there a lot of things going on too many people are talking so you have to really you know keep up your selective attention game at the best so that you can atleast listen to somebody if you okay say for example you know in fairs or in you know very busy crowded malls obviously sometimes even attend to the person walking next to you becomes difficult.

So your selective attention is working overtime to help you at least understand one conversation that you are part of okay so yeah this is just a meme I picked up from the internet.

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Let us now talk about so cherry was interested in studying selective attention cherry was in he actually studied selective attention a very carefully controlled experimental setting and he used a task which is referred to as shadowing so what happens is that one is listening to different kinds of messages so cherry presented a separate message to both theirs so a one-year receives another message the other area receives different kind of message.

This important task of giving two different kinds of messages two different kinds of signals are you and sometimes to the same kind of signal to both the years depending on what your experimental design is it's called the dichotic listening task so this presentation was called dichotic presentation where you are presenting separate message to each year and you ask this participant she has these subjects of his experiment to repeat back only one of the messages and as soon as possible after hearing it Jerry's participants.

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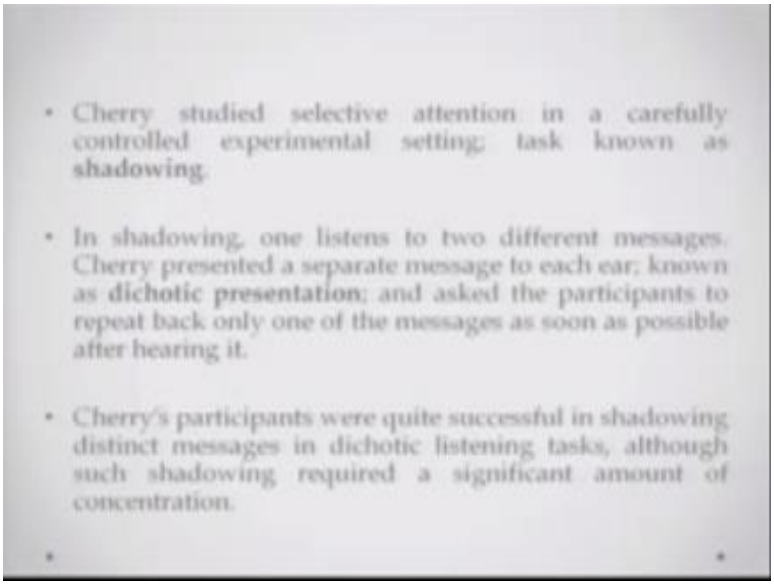

So this is the setup basically again something borrowed from the demonstration is powerful Sternberg and Sternberg so you can see that this lady is getting two different kinds of messages in the two ears so in one ear is she is hearing in the picnic basket she had peanut butter sandwiches and chocolate brownies in the other year she is hearing the cat so nice attitudes' you see these two messages qualitatively different and she is shadowing they from the shadowed ear she's repeating that message out.

These participants and generally were quite successful in shadowing distinct messages in these dichotic listening tasks although such shadowing required significant amount of concentration if it was kind of you know pickup two phones and start talking with two people at the same time you will find that it is so confusing it is so difficult to even listen to what these two people are saying they leave alone the repeating part.

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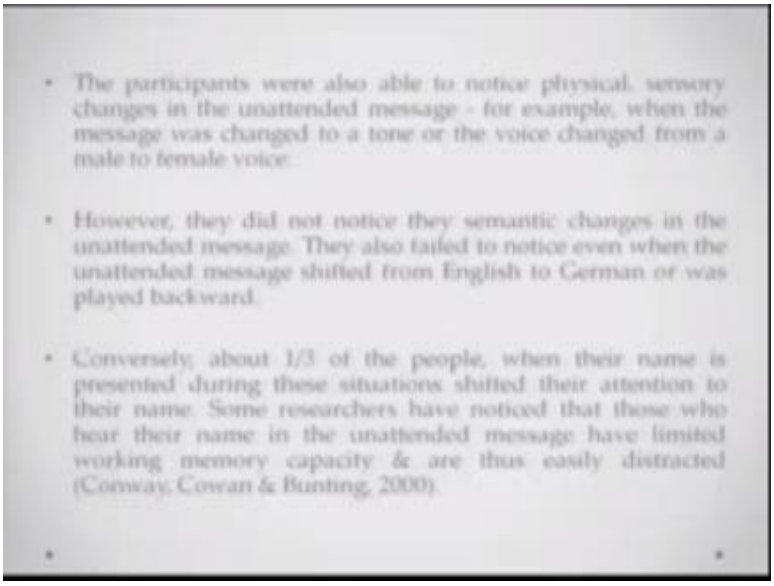

These participants however were also able to notice physical or sensory changes in the unattended message as well so you might think that you know all the concentration is spent in just shadowing one of the years and repeating that butchery notice that these participants were actually noticing if there were any physical or sensory changes made in the unattended message remember this is not the shadowed here when the message the unattended message that is was changed to a tone if they were just a beep adhere the message in the picnic basket is playing or say for example.

Here the cat was suddenly was being player said by amole and suddenly now it is being said by a female they also would notice it now however they did not really notice the semantic changes in the unattended essay the meaning would change they will not notice that they also failed to notice even when the unattended message was shifted from German to English or was started to play backwards those kind of things they did not really notice.

So they are doing some analysis with the message in the unattended here but they’re not really doing this analysis to a semantic level where in you're kind of really understanding that as well it’s that's where probably the resource limitation would come in now conversely about one third

of these people when their name was presented in during this kind of situation shifted their attention to the name so even if in the unattended ear.

Their name was presented they would quickly grab it and quickly attend it now some researchers that have noticed that you know these people who do heart heir name even in and the unattended message where in a concentrated task is going on in the shadowed ear may have what is called you know limited working memory capacity and thus are easily distracted have lower amounts of concentration there so your working memory capacity just kind of gets filled up and then you kind of are very distracted towards all the other things that you are hearing.

Now if you kind of try and analyze this how this is happening what are the findings of this experiment and how you can make sense of them three factors will help you to understand it there will be three factors that will help a person to selectively attend the target speaker if they for example you are caught in a busy restaurant or those kind of things now distinctive sensory characteristics of the targets we say for example somebody has a very peculiar voice you know we you must have heard everybody makes fun of such in Tendulkar ways.

So there is a distinctive characteristic of that particular voice you will probably attend it better the second is the sound intensity if the person speaks very loudly verses of the speaks very slowly it becomes that difficult if the person speaks to her rather loudly you will certainly that will grab your attention and you listen to that the third is the location of the sound if she's coming very close to you it is coming from slightly further away from you know sometimes you would have seen that people.

You find it difficult to hear it should and then they will call the person they are talking to and come and sit next to me and then they have the conversation so these are the three sources three features of the persons of the target persons you know a voice that might may help you to concentrate on them better now let us talk about theories of selective attention now there will be few theories we'll be talking about this theories can be grouped into filter theories and bottleneck theories very broadly speaking a filter.

Theory basically says that there is a filter which blocks some of the information going through and thereby selects only a part of the total information to pass-through the next stage a bottleneck basically says that you know bottleneck is going to slow down the information passing through though all the information will pass so this is the distinction between filter theories of attention and bottleneck theories of an engine just to repeat a filter theory is we were saying that some of the information area you know will be blocked from going through and only a part of this total information will pass so something that you not selected kind of stays outside the perceptual thing the second area is that everything.

Very passed but there will be a bottleneck so we will be some kind of a capacity limitation of handling information so this is these are the two things you have to remember now two questions one can ask say for example if there is filter if there is a filter being applied whether there is a distinct filter for all kinds of incoming information so auditory information isotherm filter which is another filter it is that does that happen this way the second is where in this entire processing the filter will be put will it be put at the initial at the most early stage.

That all the information coming this passing through filter only some information really get through you know get past you and get past your brain where you understand it or you put the informations like put the filter much later so that all the information coming in get processed to some particular stage but wherever the most relevant and important stages there the filter is and so that you are kind of just passing the most processing happens only for a limited set of information by basic process probably apply to all the other information are coming.

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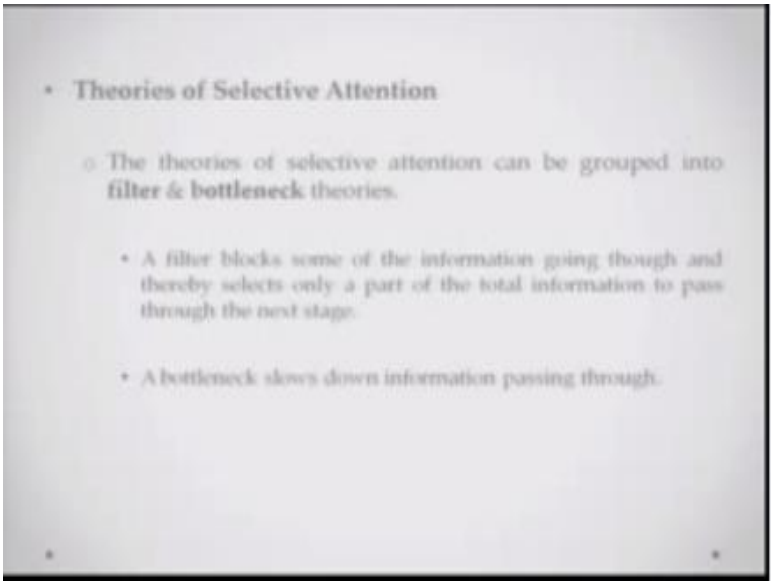

So these are the two kind of questions you can ask if you are talking about these filter theories one of the very important filter theories is the Donald Broadbent theory our Bradman basically said that we are filtering information right after we notice it at the sensory level so it's an early filter kind of theory so we are kind of filtering out information the sensory level itself multiple channels of sensory input reach an attention filter those channels can be distinguished by their characteristics like loudness pitch or accent say for example.

There are multiple people speaking in a busy room and you are kind of you know just prioritizing or each of them is salient in one way or the other by the incoming information now the filter permits only one channel of sensory information to proceed and reach the process of perception we thereby after this we will assign meaning to our sensations okay.

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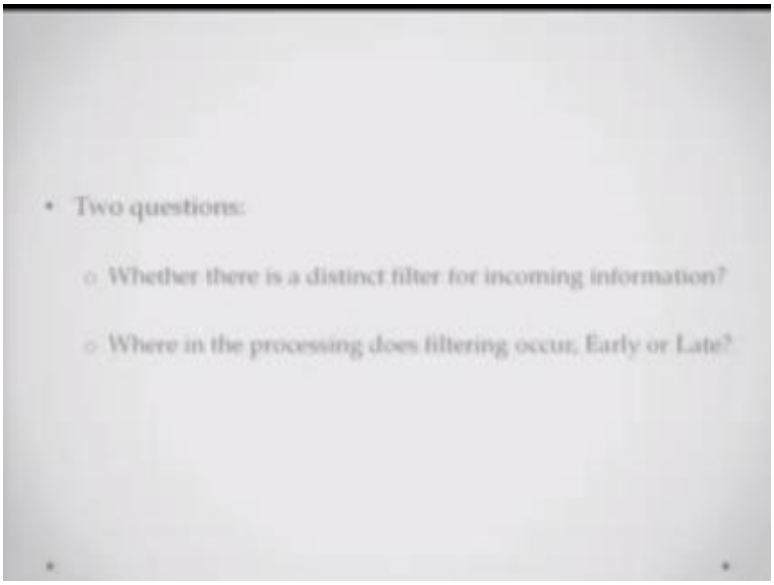

So the filter has to basically select from these different kinds of information but it will basically really affirm it only one of the pieces of information to pass-through this filter and that is the one which you will be able to analyze completely and assign meaning to other stimuli that you have left out will be filtered out at the sensory level is say and you will never reach to the level of perception okay.

If you remember from the sensation and perception class sensations just the analysis of incoming information perception is about assigning meaning to that you know evaluating whether you know this information or not those kind of things now Godwin's theory was supported by Colin Cherry's findings that sensory information may sometimes be noticed ban unattended ear if it does not have to end even if it does not have to be processed elaborately say for example if that you know a voice was shifting from towards a tone or the male voice was being converted to female voice.

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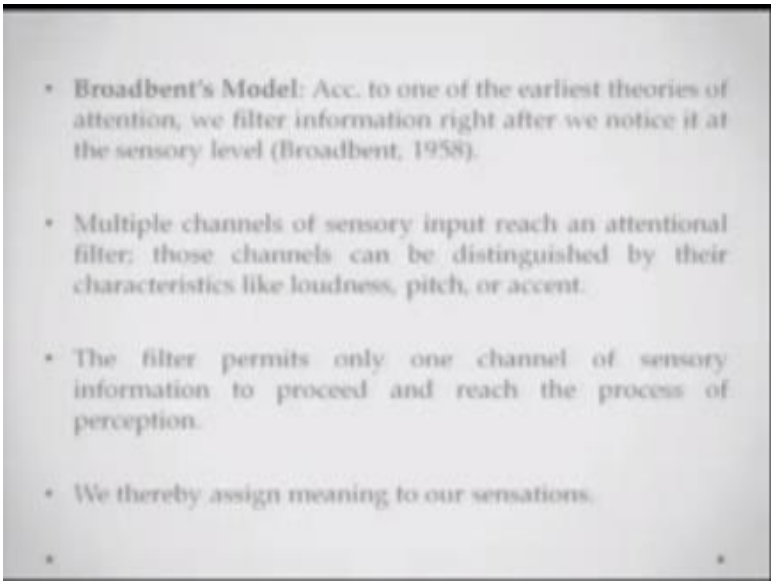

It was still being attended but information requiring higher perceptual processing say for example knowing the language of the message that will happen even if this is not attended to so there is this distinction that is happening another model that we can talk about is the selective filter model no more basically found out that even when participants are ignoring most of the other higher-level aspects of an intended message they do frequently recognize their names in an alternate unattended ear.

So the filter is not really that hard and it is not really that strict in that sense and information that is you know like things like your name do pass on he suggested that the reason for this effect is that the messages are that are of high importance purpose and may anyways breakthrough the filter of selective attention so if say for example somebody says your name somebody is talking about people from your family somebody‘s talking about something.

That you are very interested in say for example a conversation about cricket that might still be relevant to you in a special way and you might still be attend it might say grab your attention now to modify Broadbent's metaphor you know in light of these findings what one could say that

according to Murray the selective filter blocks out most of the information at the sensory level but some personally relevant information still passes off.

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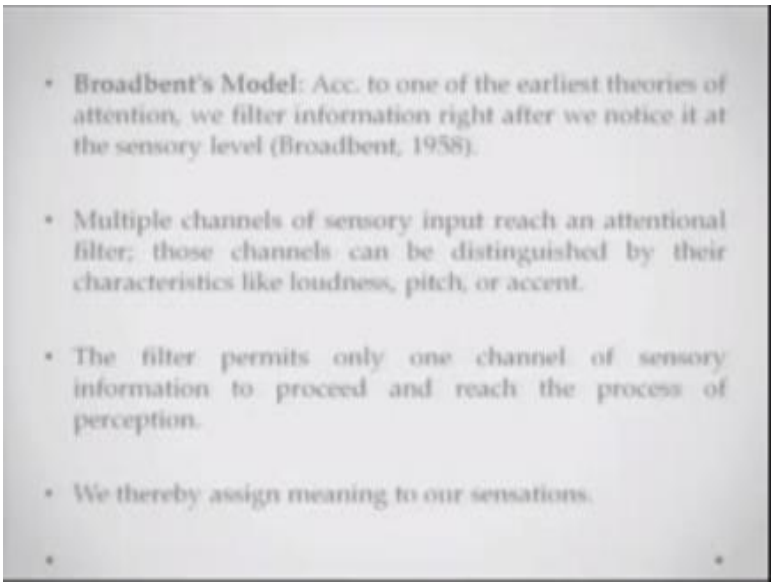

So the filter is not really a very strict filter and keeps everything out and not getting them processed but everything that irrelevant to you something that you really like you know some conversation about cricket or football or whatever you are interested in will still be heard you know imagine yourself in a metro and you know some people is talking about your favorite player you might still attain that even though you are not really part of that conversation .

Now the third model that we can talk about another different kind of model is called the attenuation model now an crease man tried to explore wireless unattended messages passing through the filter and she kind of tried to explore this by doing certain kinds of experiments now she had participants chorus and shadowing these coherent messages and at some point what happened was that she switched the remainder of the message to unattended here so what is happening is again the dichotic presentation is happening some information is coming in the left.

Here some information present in the rightherenow what she is doing is that whatever information is playing in the attended year the shadowed here that is at some point in time that information from the shadowed here switches to the unshadowedor the unattended here now what happened in this scenario some participants picked up the first few words of the message that they had been shadowing in the unattended here as well so they were some processing up happening in the unattended year as well.

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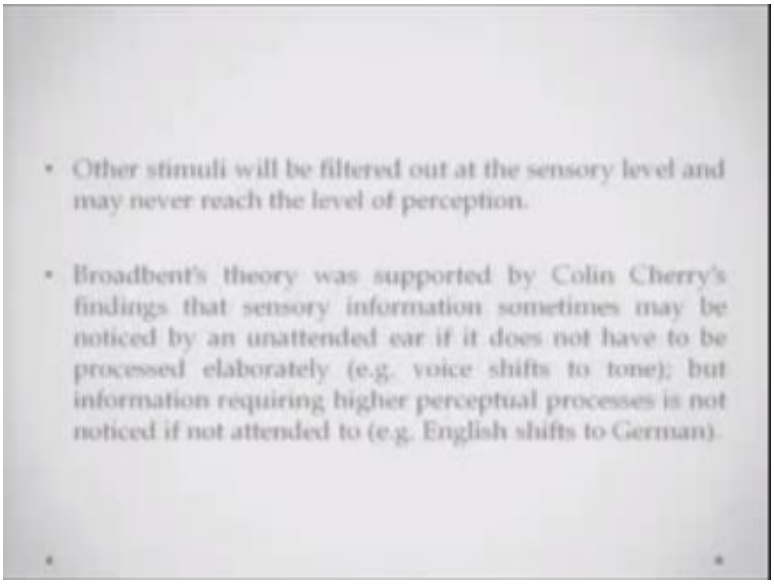

So they somehow must have been able to process whatever is going on in the 110 dead year even though they are shadowing this particular year moreover it was found that if the unattended message was identical to the attended one all the participants will notice it so they notice even if one of the messages slightly out of the temporal synchronization say for example you are talking to two people on phone or several sometimes you know your headphones they get out of sync those kind of things can happen and that that kind of differences people do notice now treatment also observed that if there were some very fluently bilingual participants.

In the same kind of setup that I was talking about they will notice if the messages in the unattended ear was translated version of the attended one so for example if I am talking about a

burglar phenomena herein English and the translation of this reception in Hindi here I might still be able to follow what is going on as aattendhere so unattended here that is so thesis also happening.

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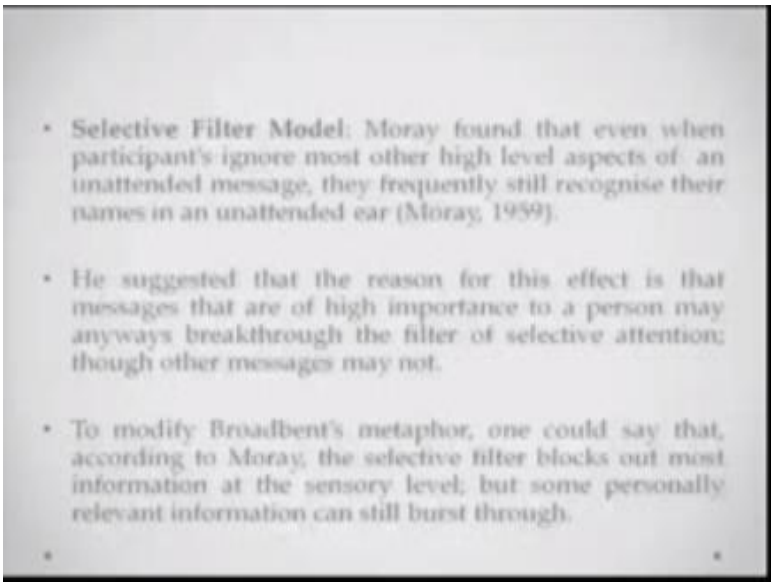

So some kind of semantic processing must be happening here as well now these findings that treatment found out suggested that at least some information from the unattended here is also being analyzed it's not only being sent and being evaluated at the sensory level but it is analyzed at a higher-level as well now treatment account for all of these findings proposed a theory of selective attention that involves us like the later filtering mechanism instead of blocking the stimuli out the filter is mainly weakening the strength of the stimuli other than the target zone.

So everything else is just getting slightly weakened and the filter is applied much later So when the stimuli reaches we are analyzing them at a low level for target properties like allowed this page etc but if the stimuli possess those target properties we pass the signal on to the next stage if you do not possess these kindness and properties then we get a very weakened version of these state gets passed on whatever selection criteria you have given to this filter it will search for that

selection criteria matching if something matches it is directly sent to the next stage if it does not match it is weakened and silts tend to the next stage and a next step.

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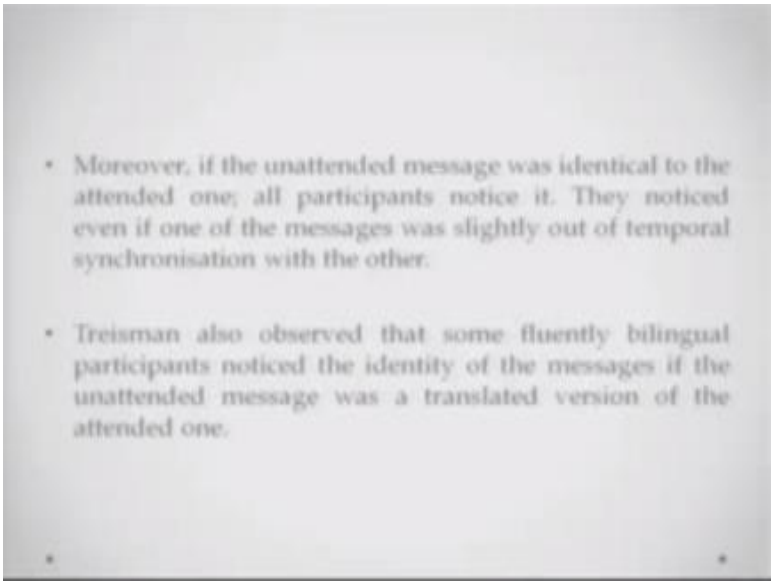

We perceptually analyzing the meaning you know we are perceptually analyzing the meaning of the stimuli and their relevance to us so that even a message from the unattended ear which is supposedly weaker now and if is 11 to us can come into awareness and influence actions if say for example it has some meaning for us even if I hear a faint version of my name in the unattended ear I am still going to attend it even if this one is a translation of whatever is going on in the attended here I will listen to it.

Here you can see you know the comparison of Broadbent's and Christmas model you will notice that say for example while roadman displacing the filter selective filter just out of just after the sensory register freeze one is basically doing some kind of attenuation controls there are two taps okay one there is a direct capacity tab and the other is kind of limited capacity so again thesis metaphorical comparison of what the models of attention proposed by roadman and tradesmen are Saints and very important theories have been very important in communist psychology now even later filter model.

You know has-been proposed and Deutsch in Deutschedeveloped the model in which the location of filters even later they suggested that the stimuli are filtered out after they have been analyzed for both their physical properties and living so they are saying versionDeutsche saying that no it not like that we will not analyze the meaning of the unattended information we will do that as well and only after that we will throw it away so this late filtering would allow people to recognize information attending the unattended ear information presented in an unattended ear

As well for example they might recognize the sound of their own names or translation of the unattended version this is what deutschemark Deutsch was saying they are saying that the selective filter is applied even after the perceptual processing has happened now you can see how these three models differ from each other as to where this filter has been applied will recogniseher he was going through all of these kind of models and he wanted to synthesize the early filter and the late filter models.

So he proposed that there are two processes that govern selectiveattentionfirst is the pre-attentive process these automatic processes are rapid and they are occurring in parallel and they can be used to notice only physical and sensory characteristics of the unattended message but they do not discern meaning so a very low level analysis of the unintended message is happening the second process happens is the attentive or the controlled process these occur slightly later and they are executed serially.

So they happen one of the other they consume time and attention resources such as working memory now these kind of processes the second dinophysis can be used as cues to observe the relationship among these features and synthesize fragments into mental representations of a particular object so once you're doing this second kind of processing on the unattended message you might be able to discern whether it has some relevance or meaning for you or not and if it does not have you throw it out.

If it does have it grabs your attention this two-step model basically could seriously account forth cherries and mores increase amongst data also this model has been found to nicely incorporate aspects of treatments signal attenuation theory and her feature integration also according to

crease man discrete processes for feature detection and feature integration occur during searches which also are accounted for by this particular model let us come to the neuroscience of selective attention let us talk a little bit about that now herein colleague basically conducted aground breaking studied.

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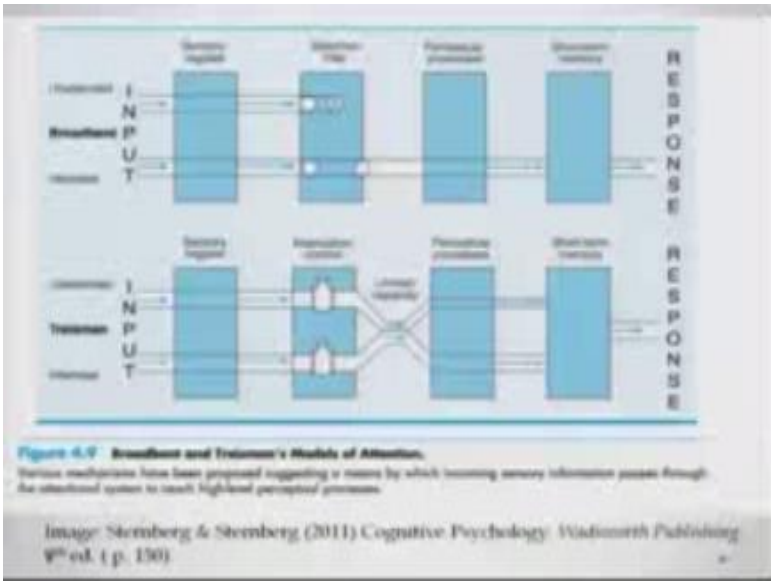

And they expose part his was two streams of tones one in each year participants were asked to detect occasionally occurring target stimuli when the target of life occurred in the attended year the first negative component of ERP was larger when then when the target have occurred in the second year the unattended year the first negative ERP company is the n1wave okay which happens around after 90milliseconds the researchers hypothesize.

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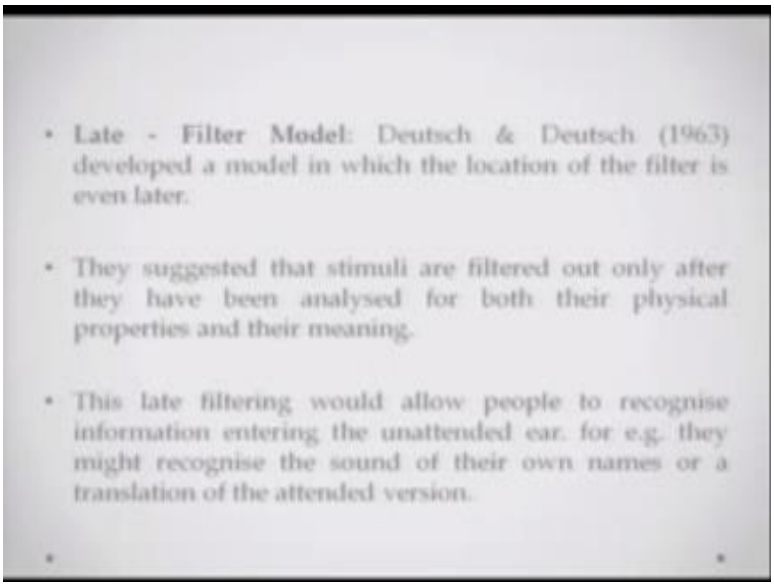

That the n1 wave was a result of the enhancement of the target signals because it is prioritized enhanced at the same time there was a suppression of the other stimuli with it were thedistractors this result is consistent with filter theories of attention and later theories like once by volt off in1993 found an even earlier reaction to targets illness in the form of positive way that occurs about 20 to 50milliseconds after the onset of the target now this wave originates in what is called the Herschel's gyros the auditory cortex and similar findings have also been reported for visual attention.

So if a target stimulus disappearing even in an unattended region of the via fields the occipital p1 thep1 that is happening in the occipital cortex is larger than when the target appears in the unattended so you farseeing that there are different brain responses to stimuli coming in the attended and unattended fields and also depending on how much you want to you know enhance or attenuate that kind of information now this is all for today.

We have talked about selective attention we've talked about the different kinds of theories that have talked about selective attention we saw that a very prominent theory of selective attentions the filter model we've talked about for the fact that they were let us say you know the sight of the

filter is very important we saw that broad want as saying that the filter model should be reapplied much earlier just you know after the sensory analysis of everything that is coming in we saw the trees one was saying that maybe the filter is not really weak you know putting everything out.

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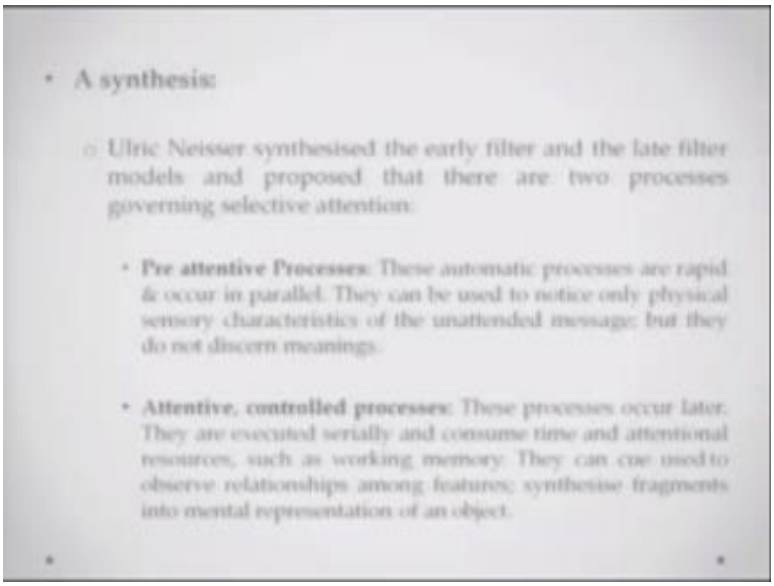

It is just beaconing this information so it's limited capacity kind of a thing it's a bottleneck kind of a thing and it is still letting everything pass but throne with higher priority passes faster and more directly the one with a slightly lower priority passes in a more slower fashion it just gets we can even though it gets analyzed as well we saw that there was this later model byDeutsch in Deutsch recess sensory processing has happened perceptual processing has happened and only then the filter is applied.

So you think that there are consequences in terms of many mental processes as to which kind of you know filtering or a selection mechanism that are you using in attention and they are also consequences for varying the entire processing you are putting this filter you are applying this facial filter in more interesting part we solve towards the end of this lecture was by eunuch noisier.

When he said that let us kind of you know compile all of these three kinds of bodies and then see you know what kind of a model what kind of an integrated order one can come up with and his data the experiments that he did could account for a lot of findings which each of these separate models on their own could not so this was all about selective attention in the next class we will talk about divided duration thank you.

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