Advanced Cognitive Processes
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Lecture – 14
Language Acquisition – 1

Hello and welcome to the course introduction to Advanced Cognitive Processes, I am Dr. Ark Verma from IIT Kanpur. This week we have been talking about language, if you remember in the last class, we had discussed a little bit about what the study of language is referred to as psycholinguistics. We talked a little bit about historical background a historical evolution of thought about psychology of language about psycho linguistics, and in the latter part of the last lecture.

We also talked about the fact that evolution of language is such a vast topic, and there are so many different perspectives to look at. And the fact is that these perspectives come from a variety of fields, I mean say for example, an archaeologist also in some sense is you know trying to find clues about evolution of language same as a psycholinguist or same as a biologist, and all of those things together can only have the potential to inform people about you know what evolution of language is all about anyways.

So that is done. Today's lecture we will start talking a little bit about acquisition of language. If you remember in the last class I told you about how study of language is structured, and it might be a good idea to actually divide this study of language into 3 or 5 parts. The first being acquisition of language the second could be comprehension of language you know you can talk about words, and sentences and so, on and so, forth. You can talk also about production of speech, and that is speech production and we can in the end look at other cases say for example, bilingualism or other kind of things, we will see how it goes and will take up topics as they come.

So, let us try and begin talking about acquisition of language, and the acquisition of language basically when I am referring to I am referring to children acquiring language, you know children were born starting from 1 month 2 month 3 month old they start showing certain abilities showing certain interest in listening to language, showing certain efforts in you know in trying to produce, but certain kinds of language, and you

will notice that these skills increase almost exponentially over time as the child grows up.

In this lecture and in the lecture after this we you are going to look at language acquisition, in some more detail and we are going to also talk about the fact that how is language, you know in its complexity language is not just sounds, it is not just words it is not just meanings it is.

So, many other things as well you know there is this whole story of syntax, and whole story of grammar that even if you know how to you know construct words, and what do different words mean you would need to have some knowledge of syntax or grammar to be able to you know produce correct language, and it is not that we instruct our children to you know speak grammatically I mean that comes much later in school.

But the idea is you will see very young children 3 5 or 5 years of age start speaking a natural language start speaking language which; obviously, has some errors, but for the most part is grammatical is correct has all of those you know features of complexity that we were discussing in some of the earlier classes, you know when we were comparing apes language with children's language.

So, let us try let us begin let us try and talk about you know how babies acquire language. So, one of the questions you could ask is do babies talk they make, all kinds of sounds they make, cooing and babbling sounds they make you know all kinds of vocalizations can we refer to them as they are talking what does talking comprise off.

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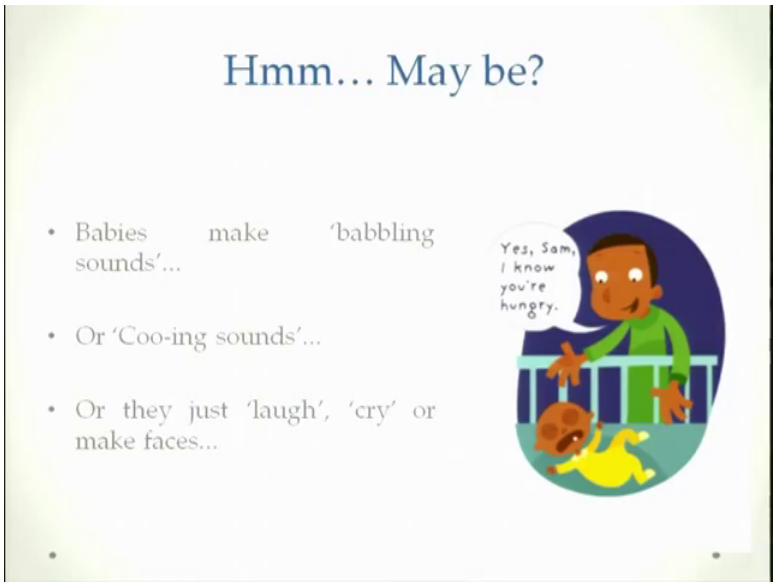

So, let us let us look at it babies do make these babbling sound uu etcetera, and they keep on doing it again and again they keep on you know going at it drawing attention of elders, and babies using these vocalizations, or they make cooing sounds and they make you know or they might just you know laugh in cry or emote, and these are the ways in which babies communicate to each other, I am sorry babies communicate to the parents.

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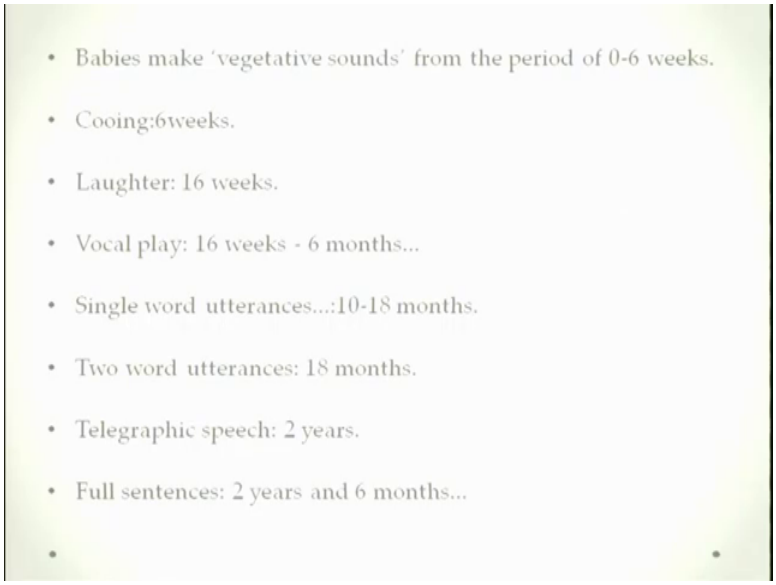

But is this what language is I have tried to draw a chronology, and from the help of Matthew tracks latest book, the chronology of how babies you know develop.

So, the first period of 0 to 6 weeks babies just make vegetative sounds uu things like that it is not really a full blown vocalization as well. They start making cooing sound slightly larger louder sounds by around 6 weeks you can here, a full blown laughter by around 16 weeks, and then there is a period of vocal play which goes on from around 16 weeks to almost 6 months, you know where the baby is constantly engaging in making different kinds of sounds.

And one of the things is that the baby kind of tries to figure out at this point in time. What kind of sound leads to, what kind of response from our parents? And then by a 10 to 18 months maybe start uttering single words, you know mama papa those kind of things, and this kind of goes on and on in toward utterances by 18 months telegraphic speech comes around, 2 years where they are speaking broken words, or just set of words not really arranged together in any you know strong syntactic framework.

But around 2 years and 6 months of age a little bit for maybe plus 6 months 6 months a lot of people start producing full sentences. I want this I want to be taken here, I want to eat this, all of those kind of things again depending upon the kind of language these children are using. Now there is any of this comprise, what language is you know we had a lecture earlier, where we talked about what does it mean to say that you know somebody has language what are the salient features of language.

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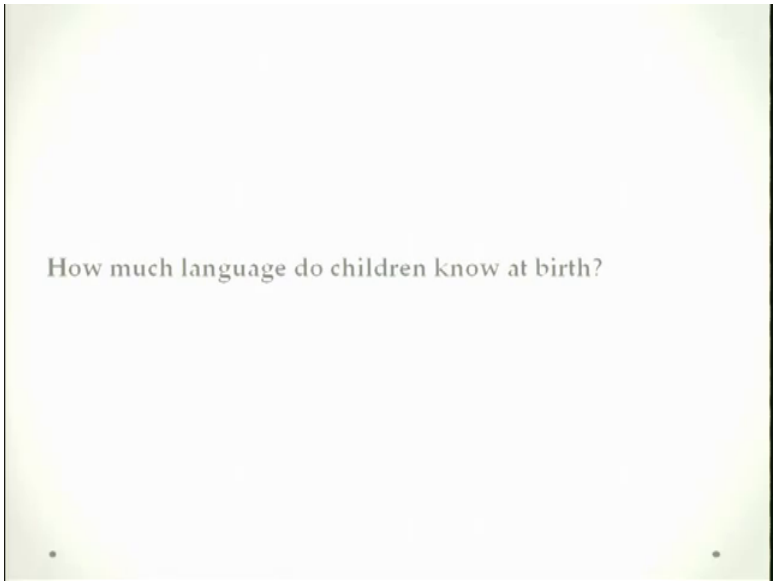

So, let us try and you know reason at it. So, the question could be how much language do children you know at birth, I mean they are making all of these sounds they know the function of these sounds as well, you know they are making efforts to communicate using these sounds they are making efforts to communicate, if they need food. If they need water is any attention all of those things they are kind of you know in some sense communicating by their starting from the 8 6 8 ones onwards 10 ones on words and or so on and so forth,

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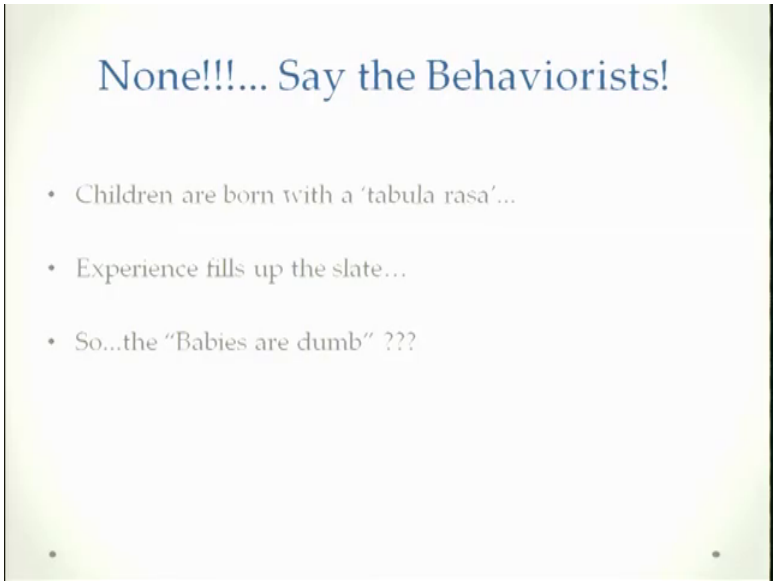

So, behaviourist if you remember the behavioural school of psychology which says that human beings are born tabula rasa they are born as a blank slate, and anything that they acquire anything that they learn to do later anything that they do later is actually learned from the environment.

So, the behaviours would say no children's do not know any language at birth, they are basically you know blank slates and they are kind of using you know whatever input is in the environment to learn of this experience is filling of this slate. So, in some sense you would say that you know these people are saying just for the funny part of it the babies are dumb, they do not know anything they just come into this world, and they start picking up material from this world.

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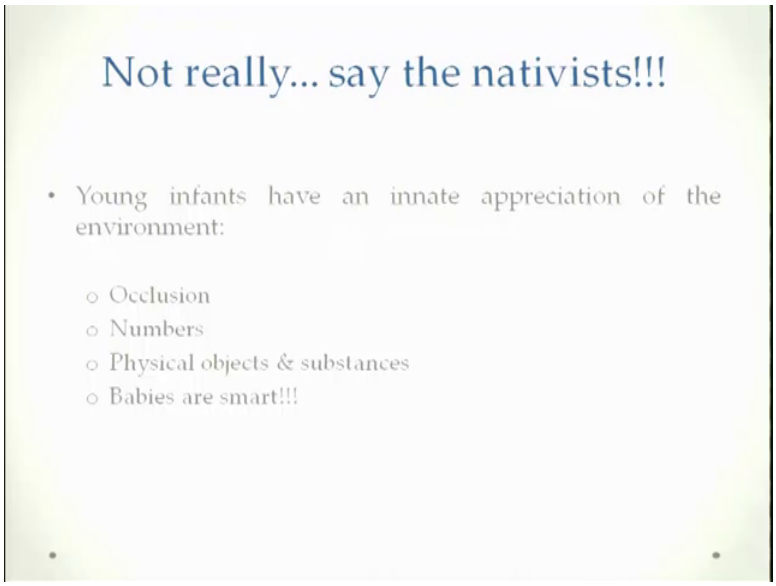

But there is very strong opponent of the behaviourist theory which is the nativists championed by people like norm Chomsky Steven pinker, and so on and so forth. And nativists basically say that no it is not possible that human being is born with a blank slate you know, there is a wide history there is a long history of evolutionary you know knowledge being accumulated, and it is very difficult to assume that you know a child born in 20 first century.

So, many years millions and thousands of years post evolution, still being born as a blank slate. So, they would say that you know infants have a very innate appreciation of the environment, they have a very detailed pattern to look into the environment and to draw information out of it. So, they say infants are aware of things like effusion, they will look for objects even if they are hidden from them.

They have some appreciate appreciation of quantity in terms of numbers, and they also have some way of looking at physical objects, and substances. So, all in all what they basically are trying to say is that babies are smart they are not really completely dumb, they are not born as a blank slate there is; obviously, a history of evolution that is behind them. And that is what on which they will actually build upon acquiring the other skills that they have to in their you know in their current lives.

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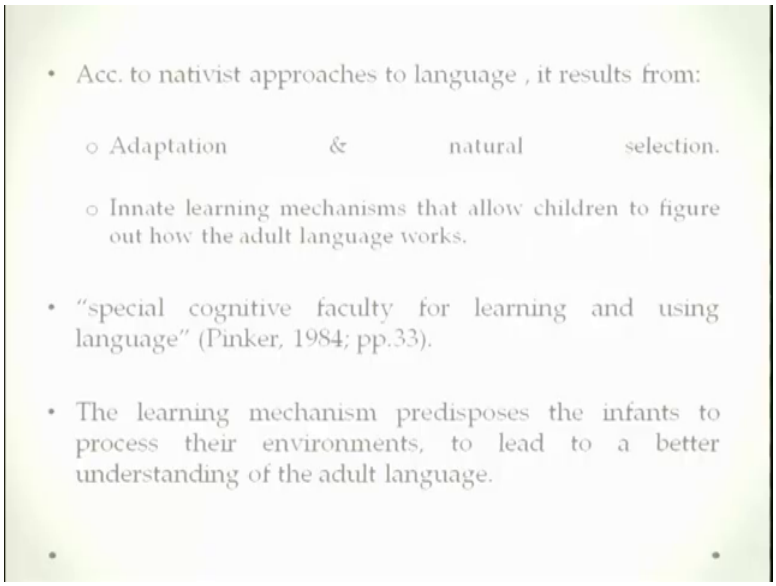

So, that is one. So, you see that there is this kind of contradiction between the 2 theories, and nativist approaches again just moving forward with them nativist approaches say that all of these abilities that children show at birth are a result of things like adaptation natural selection you might remember Darwin here that. So, many of these abilities that children and you know generations before them have mastered and have, discovered to be very important in life are still dead they might not be so manifest, but they are still there, and children are using help or aid from these skills in order to you know categorize, and classify and understand the environment also to classify the input, and get some appreciation of the language part. We will talk about this in a bit.

So, this is what Steven pinker and other people would say that these innate learning mechanisms, some things that have been passed down from generations to generations are the mechanisms that allow children to figure out how adult language works. So, children are very attentively listening to whatever the adults are speaking around them.

And this is what they are actually using to you know these in learning mechanisms is what they are kind of relying upon in order to figure out, how this puzzle is really did imagine a child who was born, and the child does not know what sounds are and the child does not know how sounds are connected, and child does not know that these sounds refer to something, it is a bit of a puzzle it is a very complex puzzle that the children have to figure out. And pinker and others say that there are innate learning

mechanisms that are helping children do that that are actually you know making life slightly easier for them. We will talk about these things in a bit more detail as we move ahead.

So, pinker says there is what is called a special cognitive faculty for learning, and using language. So, there is a cognitive ability let us say in the brain somewhere probably in the mind you know as cognitive psychologists would like to speak, that is allowing children to parse whatever adult language is there to detect patterns in it that is what will help them learn the language, and later that is what will help them produce language as well.

So, this learning mechanism is what is a predisposing children, they are making them ready to process their environments in such a way that they lead that leads eventually to a better understanding of human language. So, in that sense children are kind of half prepared semi prepared for a using other language, and that is what they are kind of building upon in order to start understanding what their mothers have to say or what the parents have to say, what other caregivers around them have to say.

So, this is again the contrast between the behaviourist view of acquisition of language, and the nativist view of acquisition of language. You will see as we move ahead in this you know in the topic of language acquisition that, for almost everything there is both of these views, and you have to in some sense you know take both of them with a pinch of salt try and see which sounds more logical, I try and prepare you know presence some evidence for either of them, and you know in the course and you have to really evaluate that and see how this process is really moving.

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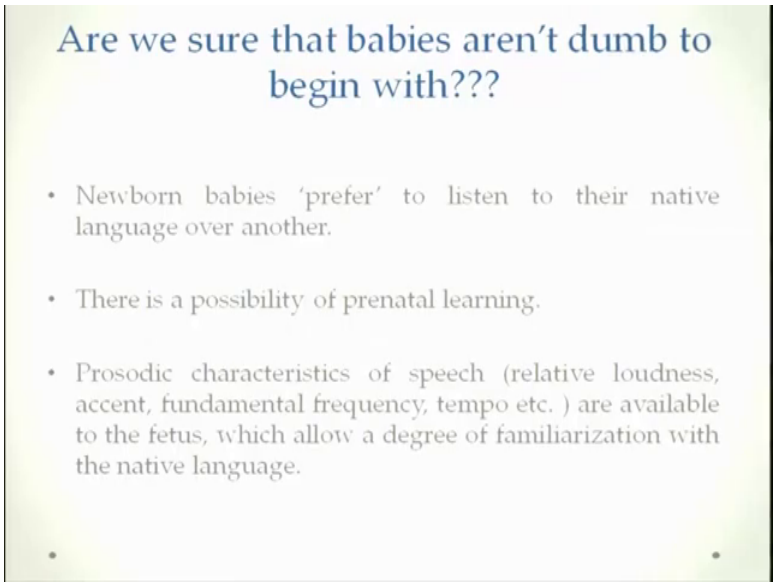

Let us move ahead. So, are we sure that babies are not dumb to begin with there is one possibility that the behaviourist advocates point out they say that no children are dumb when they are born, but the idea is there learning might actually have started even before they are born even before they are delivered out of the womb of the mother. So, they say that newborn baby save the observations are and again these are experimental observation. Observations are that newborn babies prefer to listen to their native language over another language.

So, apparently they have been processing, and they have been kind of identifying what the native language is and it is probably, because you know the mother has been talking to people the mother, and in some sense the child's auditory system which is developed by around, the end of the second trimester of pregnancy. It is starting to pick up patterns already, even before it is out in the open it is starting to pick up patterns from whatever mothers vocalizations are and maybe that is leading to the preference to listening to the mother term.

So, that is one. So, they are saying this could be taken as an evidence of that some prenatal learning is happening, you know it is a very smart way of saying that no children verb on tabula rasa, but you know it is just that they started learning too early. So, that you think that they are born with some abilities that is that is how this argument is placed.

Now, there are other things about the mothers speech or the speech that is in the environment of the child things like prosodic characteristics, you know relative loudness you know kind of accents people would have the fundamental frequency, the tempo the speed at which person is speaking, all of these are available to the fet us even before birth by the last trimester of pregnancy, which might be allowing this degree of familiarization with the mothers language with the native language. And that is what the child is speaking up, and if that is what the child is speaking of it is certain almost that this is what the child will use to acquire language later on.

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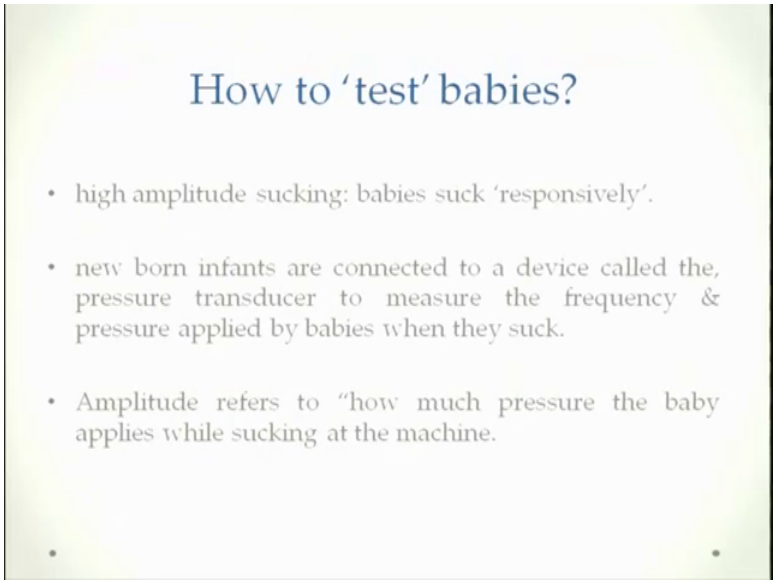

So, let let us see how the story pans out. Now one of the I am kind of taking a break from this argument for now something that I would also want to talk about, because I am going to present experiments later is how are you going to test anything with a baby you know, if you have the hypothesis that the baby is responding to this language.

You will have to conduct experiments, and you have to really make sure of that the baby is responding to language and nothing else. So, there have you know there have been very ingenious methods, they have been designed and people like josh amos in those kind of people, and I will talk about their experiments in a while they have developed ways in order using which they can experiment with children.

So, one of the very famous very much used paradigms is called the high amplitude sucking. The high amplitude sucking is basically it is coming from the fact that babies if

they do nothing at all, they at least get nutrition by sucking behaviour by acquiring milk from, the mothers body and from bottles or those kind of things. And this high amplitude sucking procedure is something that we can be exploited, in order to get some kind of a response from the child.

So, what they did was their newborns infant are connected to a device called the pressure transducer, and the pressure transducer is basically a device that measures the pressure that is applied during sucking. And the pressure can be kind of looked at in 2 terms one is the frequency with which the sucking is happening, and the other is the pressure that the baby is applying on that you know sucking device.

So, both of these things can be measured, and it there could be a way to really sucking and manipulate the kind of pressure that there is depending upon whatever you show to the child or whatever you make the child attend. So, am. So, amplitude basically in terms of reading surface to how much pressure they will be supplying, if the baby is applying too much pressure at the sucking nipple, then the player amplitude will be much higher, if it is not applying. So, what then amplitude will be lower.

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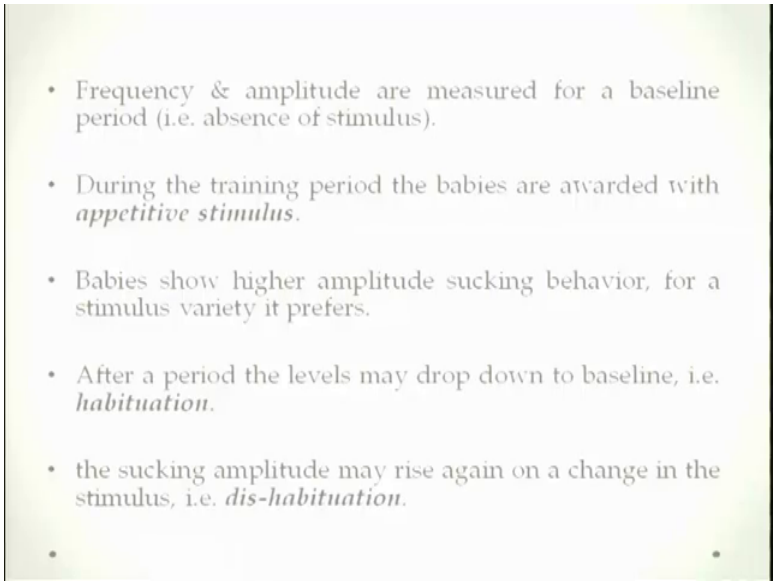

So, frequency and amplitude are measured and a baseline period is established. Suppose where the baby is doing nothing, is just resting you again put the pressure transducer, and you kind of get the baseline thing. What is the general rate of sucking of this particular

baby? What is the amplitude that you are going to get? What is the frequency number of such per minute? And the device is going to register, then there is a training period.

So, during the training period what happens is babies are awarded with something called appetite of stimulus. So, they would be you know given something to suck some liquid that they want to really take. So, they are given something all the appetitive stimulus. All some more some kind of noise that the baby is you know kind of oriented towards. So, this a appetite of stimulus kind of it leads to higher amplitude in sucking behaviour.

So, the child is attending to the other child is involved in that then that leads to increase in the you know amplitude, and frequency of sucking. After a particular period the child kind of gets used to this stimulus, and then they are getting habituated. So, they are sucking levels will drop down to the baseline level, and you know we have established a baseline already.

After this you can induce a change in the appetitive. So, suppose you are kind of singing a particular song to the baby la la la la, and the baby kind of you know in at first he was kind of attending it, and then the thing is the baby is you know they have a very short attention span. So, they very quickly get disenchanted with this and then the sucking rate will go to baseline so I am saying la la la, and then I said duh, and whenever I say duh, this is basically what will again dis habituate the baby. There is a new stimulus and the baby will start sucking differently in response to this. So, this is again a very typical paradigm that people have used so on and so forth, to test this and these are called high amplitude sucking studies.

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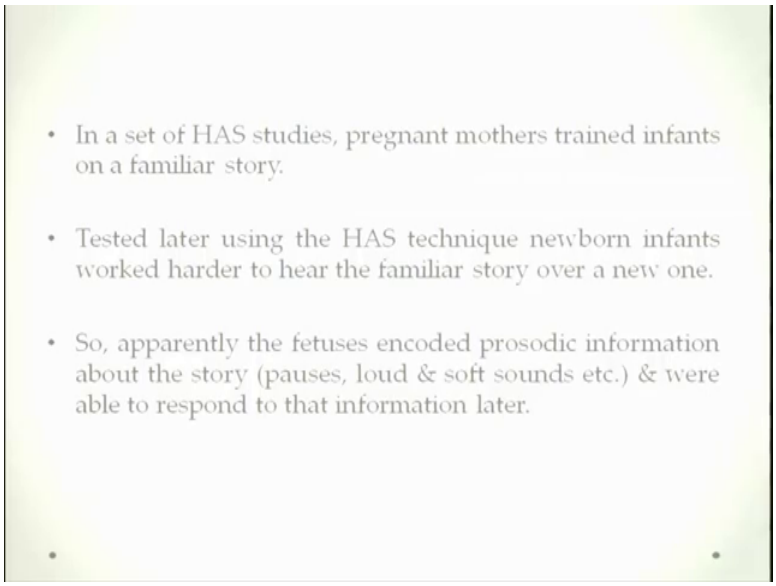

So, and again let us take an example that in a set of high amplitude signal studies, pregnant mothers, train their infants they were still unborn, on a familiar story you know. So, they kind of made a routine of reciting or narrating a particular story to their children, again and again and again for a large period. After these children were tested with the same HAS technique, and they were actually you know made to hear the same story that their mothers had been reciting before, they were born and some different story. And they and it was seeing that infants worked harder, they were you know more attentive when they were listening to the same story that their mother has been reciting.

So, in a sense children had attended to that story you know, it is not possible otherwise had been grasping something about that story maybe just the prosodic characteristics; obviously, it is they are not getting the words in the meaning, but the prosodic characteristics of the mothers narration are registered, and children are responding to that.

So, apparently even the fetuses you know they are encoding prosodic information, the information or tempo page, fundamental frequency in those kind of things about the story pauses loud, and soft sounds those kind of things, and they were able to respond to that information later when tested you know 1 month after birth, 2 months after birth etcetera.

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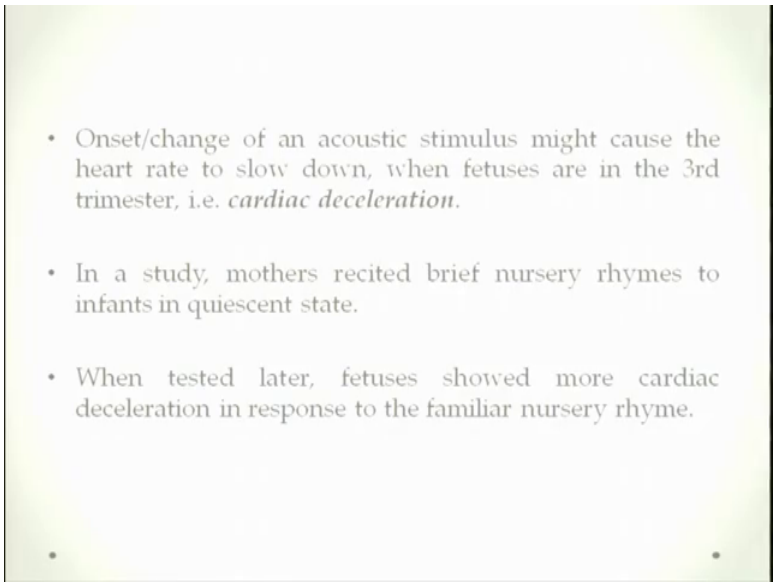

Another method that has been used is the following. So, on set if a new stimulus is introduced in the environment are change, if a new super different services were produced there of an acoustic stimulus has been shown to cause the heart rate of the baby to slow down. So, the baby is kind of you know very excited in a heart rate goes up, and then kind of it might, lead to some kind of slowing down as well ok.

So, when fetuses are in the third trimester, they observe this that if there is a new stimulus the heart rate slows down the baby is kind of conserving all the energy, and attending to this. So, this phenomena is called cardiac deceleration, and in a study cardiac dissolution is also been used in a number of studies. So, in a study mothers have you know recited nursery rhymes to children, in the question state when they were silent, when they was calm and peaceful.

And after this when they were tested later, fetuses really did show more cardiac deceleration, in response to the familiar nursery rhyme again. It is probably their way of responding to the familiar story, at least it tells us the fact that children are as young as 3 you know minus 3 months into the world, they are processing some kind of speech input they are processing, some characteristics of the speech input, and then they are remembering it so, that they can respond to it after their birth.

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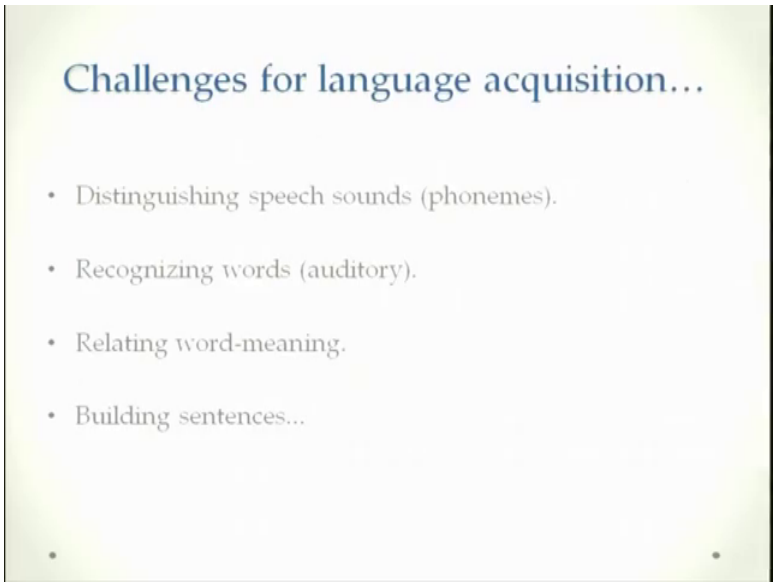

That is something very fascinating you know in in terms of acquisition of language by children.

So, if you look at this there are few challenges that the child will have to overcome if the child has to you know talk about you know, if at some you know talk start talking at around 2 2, and a half 3 years of age. So, the first is the child needs to distinguish speech sounds. So, the child needs to really distinguish between what is a language sound what is a car sound, or animal sound, or a bird sounds, things like that also was the child kind of masters speech sounds a child.

Also needs to recognize words you know, if you want to get a taste of this try listening to try watching a movie that in a language that you do not really know, and you see it is very difficult. If you watching a Chinese or a Japanese movie, and you do not have any knowledge of these languages or for example, a South Indian movie, or for people in the South and North Indian movie, sometimes you know you do not have a way of segmenting this continuous stream of speech into words, you can get some help by pauses it is rare, but sometimes these things are also not that you know helpful.

So, the child will need to figure out what the words are and accordingly kind of you know try and grasp, them second is once the child has got an idea of what word meanings are they have to also kind of what word. So, they also have to kind of relate these words to what they mean. So, if an apple is said again, and again the child has to

learn to link the word apple to the fruit apple, and you know that connection has to be made. Also eventually once the child has grasped sounds, and words, and meanings, there is when the child will need to start constructing sentences. So, these are the 4 major challenges that the child has to overcome in order to acquire language.

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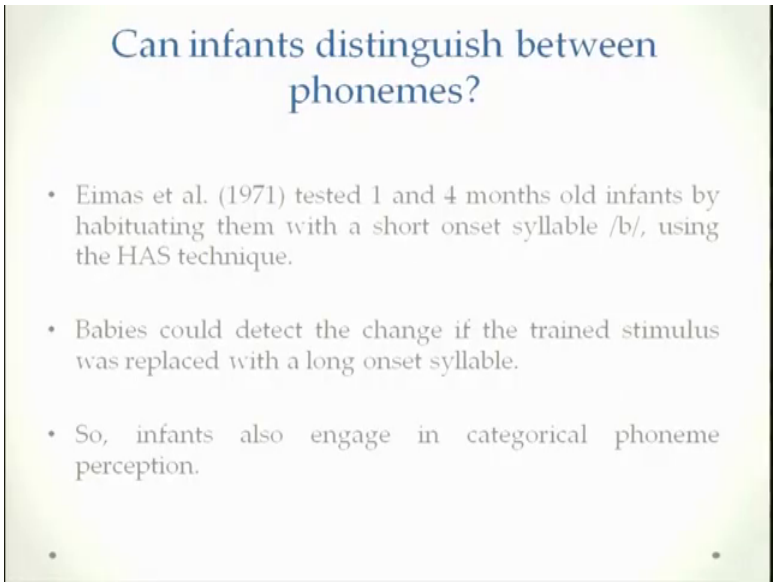

So, let us begin with the first one can children distinguish between phonemes can they detect sounds, we have seen some of the evidences recently, you know the h a s studies, and the cardiac exploration study, but I must increase in 1970 one we tested around 1 month in 4 month old infants by habituating name with a short answer shall be ba ba ba ba ba, and then suddenly they introduced a different syllable ba ba ba ba ba da, and they saw that babies could detect the change in this simulus if the train stimulus was there is a you know change with a long vowel. So, the idea is that yes children are being able to categorize these sounds, they are able to categorize these phonemes

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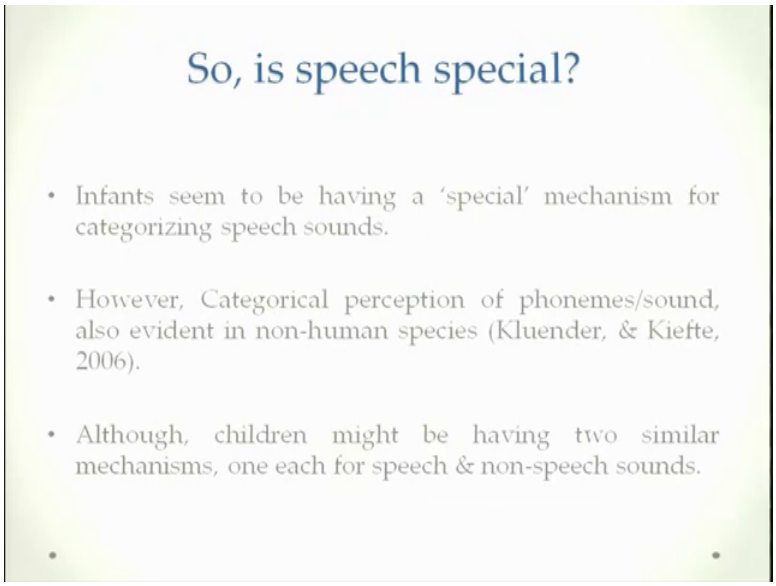

So, is speech special because children are processing all of this speech very rapidly at such an early age. So, there must be a special mechanism for getting to this speech, and that is what basically is referred to as categorical perception, but the idea is if speech were special other species would not be able to do it, but there is evidence that other non human species also show this ability of categoricals perception.

So, it might be that they are not really attending to speech, because you know they really have no idea what speech is about, but they are kind of attending to this class of stimuli in a more highlighted way, and that is properly leading to you know them being able to do these kind of tasks. So, it has been proposed that children might have 2 auditory mechanisms, 2 similar mechanisms, one for speech sounds, and the other for non speech songs you know all the other environmental sounds cars versus animals anything.

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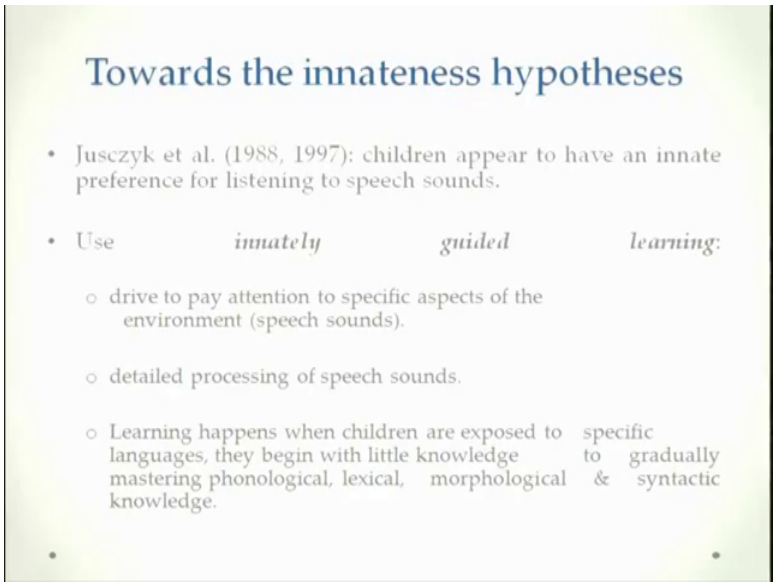

So, because children are doing this so, early that is the case there is something of a case that people are making. And they are saying is Jusczyk says that children appear to have an innate mechanism for listening to speech sounds. So, there is some innate mechanism that is predisposing them, that is allowing them to listen to speech sounds more significantly as compared to so, many other sounds in the environment.

And again as pinker was saying earlier there is something called innately guided learning, and this innately guided learning is what is leading them, it is what is you know predisposing them to pay more attention to the specific concepts of the speech sounds ok.

So, that is one. So, they are kind of giving extra attention to speech sounds found spoken by mothers, fathers, caregivers other things as compared to the other kind of sound that might be their primary, and this attention might be leading to detailed processing of these speech sounds. This attention might be leading to more sophisticated processing of these speech sounds finally, when this detail crossing is happening learning will be happening, because children are now processing these things in detail, they are picking a pattern from this and this learning, you know picking a patterns this learning is happening drilling which are exposed to specific languages, you know they begin with little knowledge to gradually mastering the you know very complex, you know for logical lexical, and the characteristics of the language.

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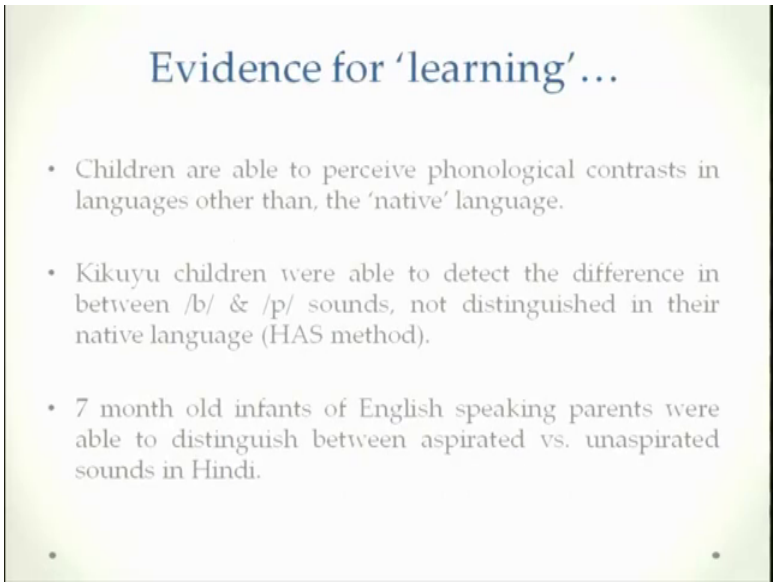

So, this is again one of the proposals, and there is also at the same time some evidence for this kind of learning happening.

So, it is been shown the children are able to perceive phonological contrasts in languages, other than their native language as well. So, if it were that this process is selectively tuned to speech, and basically the speech that the mother is speaking or the father is speaking or that is being. So, mean and home it should be linked to only the native language, but it has been shown, that they are being able to do the for logical contrasts in non native languages, where language they have not really heard of see.

For example, kikuyu children in Africa were able to detect the difference between ba, and pa sounds not distinguishable in their language. So, they are in substance having a very general auditory processing mechanism perhaps, 7 month old infants of English speaking bins were also shown that they could detect the difference between aspirated, and unaspirated sounds in Hindi a language they have never heard earlier not been exposed to that.

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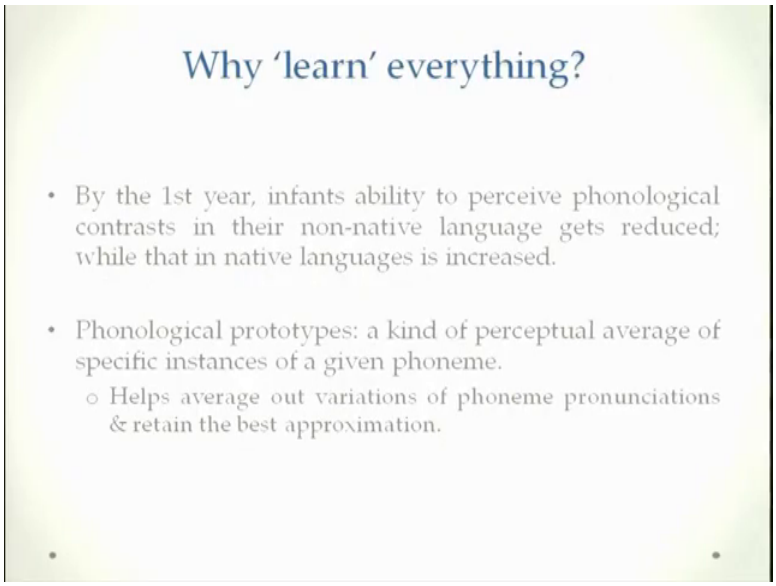

So, it seems that they are learning something, but they are doing it in a more general sense to begin with.

Let us move further from here, by the first year the infants ability to perceive phonological contrasts in their non native language starts getting reduced. So, maybe initially you came up with an open mind, and you are learning all the languages, but because by the 6 8 months 10 years the child has realized that this is the native language, this is what I am most exposed. So, this is what I have to learn and master.

So, then this ability to perceive phonological contrasts, and non native language starts getting reduced, all of the effort starts being concentrated in learning the native language, and how are they doing it. So, they might be using again a technique called phonological prototypes, we have talked about prototypes earlier a prototype here of a phonological type is here, which is kind of a perceptual average of specific instances of a given phoneme.

So, things like I say per, you say per, somebody else says for all our purrs are physically different sounds, but to a child who does not know that this is a basically you know it is a phoneme of a particular language. The child will try and average out all of these instances different people saying different ways, they are saying the kind of average it, and they restored the average of this. And they compare every incoming thing it is close

enough they will accept it as per, if this far enough they will kind of put it in a different box.

So, this phonological prototype thing is kind of helping them, average out the variations of phoneme pronunciations that you know that a children might be exposed to in their environment, and retain the best approximation. So, that that is one of the building blocks of children starting to acquire sounds.

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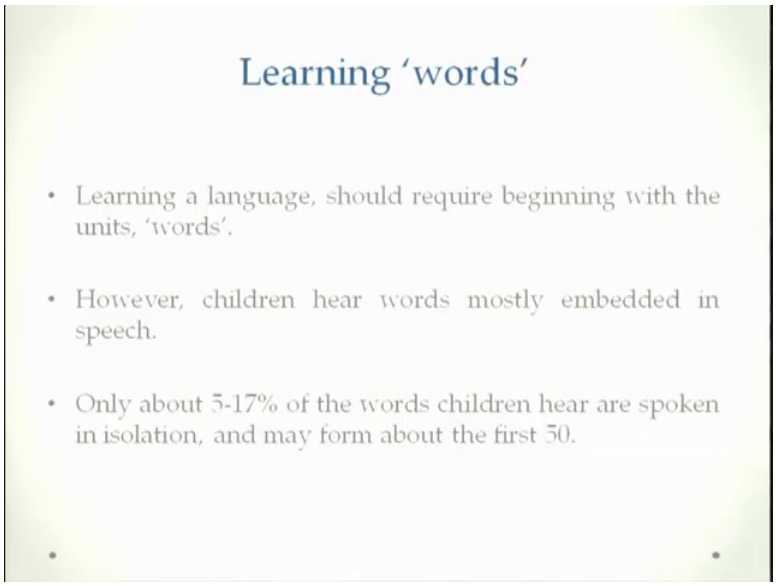

Now, we have talked a little bit about sounds, we started from prosodic features, we then saw that even children. So, young could do phonemic contrast, and we say that you know their ability to do for any mean contrast, in native languages decreases in native languages gets more and more better. So, that was about the sounds let us go to the words. Now learning a language should require beginning with the units, and words, you know.

The basic units which are words, and how children basically here these words mostly embedded, in speech they are not being able to really when the child or suppose you listen to a movie of a particular language for the first time, it is very difficult that in the first time you will start parsing them into particular words that is what the children are also doing also they are not being exposed. They are not being exposed to isolated words. So, so much only about 5 to 17 percent of the words that children here are spoken in isolation, and they may form about the first 20 30 or 50 words that a child might learn.

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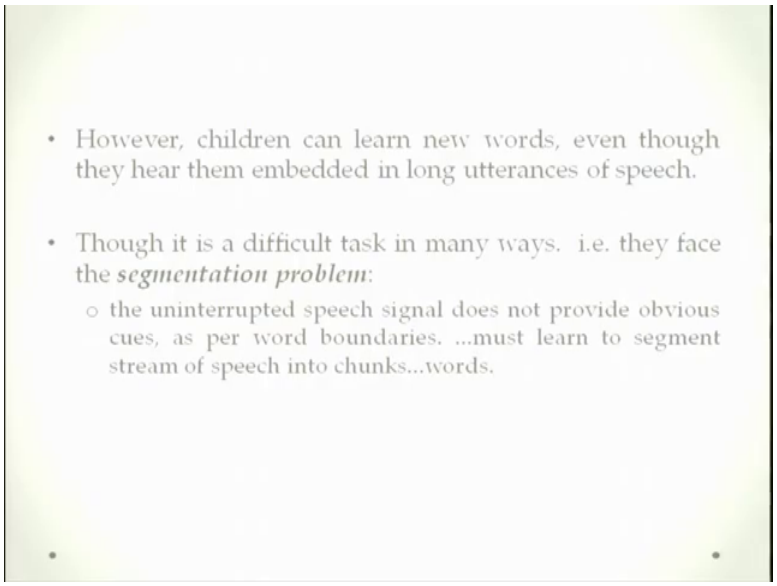

But children have been shown to be able to learn new words, they have been shown that even though they are hearing words embedded in longer traces of speech, they can figure out what words are you know, And this problem this problem of parsing out single words from a continuous stream of speech has been referred to as the segmentation problem. So, this uninterrupted speech signal does not really provide of excuse, as per word boundaries, and so, children have to learn to segment they have to use different kinds of mechanisms to learn to segment, these speech of and stream of speech into chunks called words.

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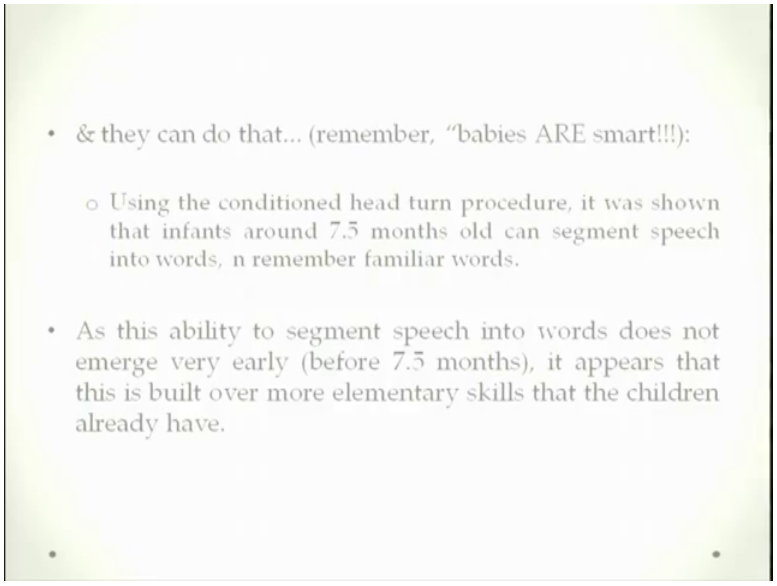

So, let us see how would they be going about that and it is been shown that children can do that. So, there is another procedure called the conditioned head turn procedure, the conditioned head turn procedure is very simple. It is basically that you put 2 kinds of speakers next to the baby, and both speakers will produce some sound, and depending on the sound, if it is coming from this speaker the child will look at this direction, it is coming from this speaker the child would look at this direction.

So, that is the conditioned head turn procedure now, using this condition head turn procedure it was shown that infants as young as around 7.5 months of age could segment speech into words, and they could remember familiar words that they were exposed to. So, that is one and other is this ability to segment speech in towards, it does not really emerge very early it is not happening before 7.5 months of age, it happens at around 7.5 months and later. So, the idea is all of those things we were talking earlier the prostatic processing, in the thing of bursting phonemic contrast are actually building upon these characteristics, and that is what is probably contributing to a segmentation of words.

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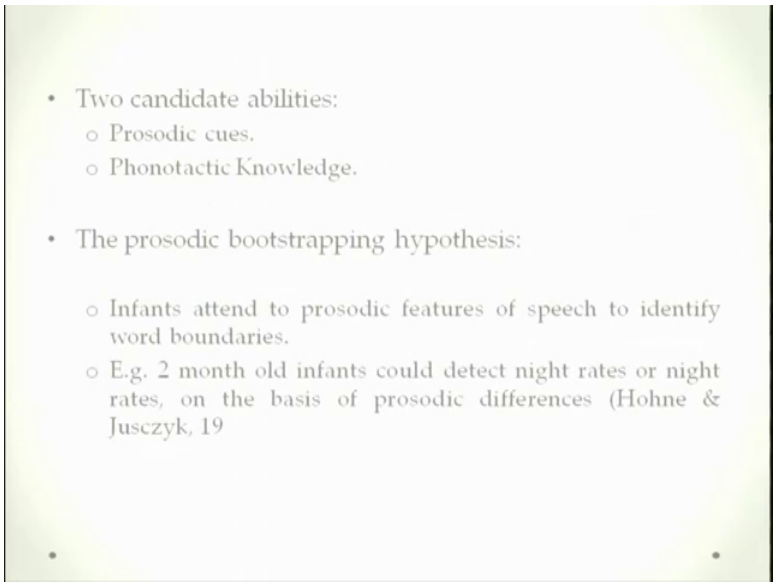

So, there could be two kinds of cues, two kinds of abilities that children are using first is the prosodic cues, we have talked about that a little bit, and the second is phonotactic knowledge.

Now, prosthetic cues is basically again it is the refer to as the prostatic bootstrapping hypothesis. it basically says that infants have the ability to attend to the prosodic

features, in the speech to identify word boundaries also for example, 2 month old infants have been shown that they can detect the difference between nitrates, and nitrates ok. So, if you see what I did here I am just introducing a pause night pause rates, and if I am not inducing a boss it is nitrates which is a chemical.

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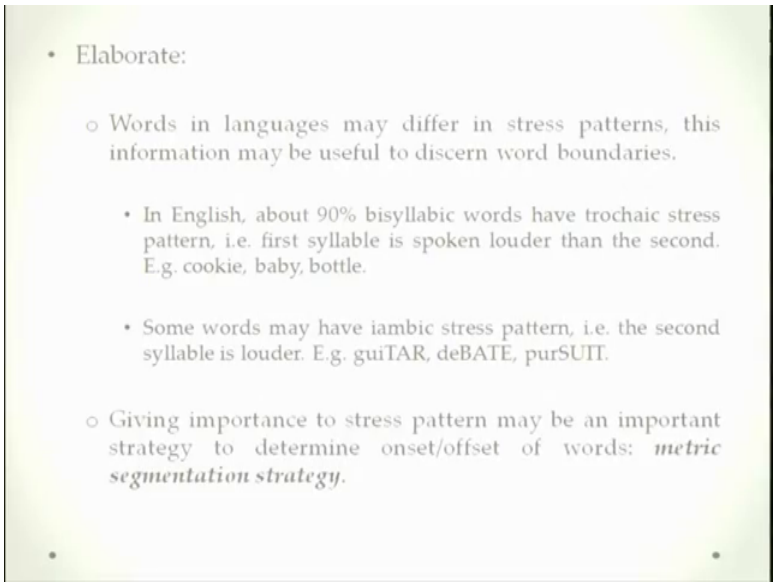

So, children have been shown to we will do a register this, also words in different languages have different stress patterns, you know you might hear of trochaic stress patterns wherein the first word is you know kind of first word is stress more so, cookie, baby, bottle, things like this or they could be I am big stress patterns, in which the second syllable is kind of a stress ball. So guitar, debate, pursuit those kind of things and children are being able to register these differences.

And these words some of the cues that the children might be using, in order to you know parts whatever the input is into words. This kind of segmentation strategy has been referred to as the matrix segmentation strategy, because they are using stress patterns in speech in order to parse words again.

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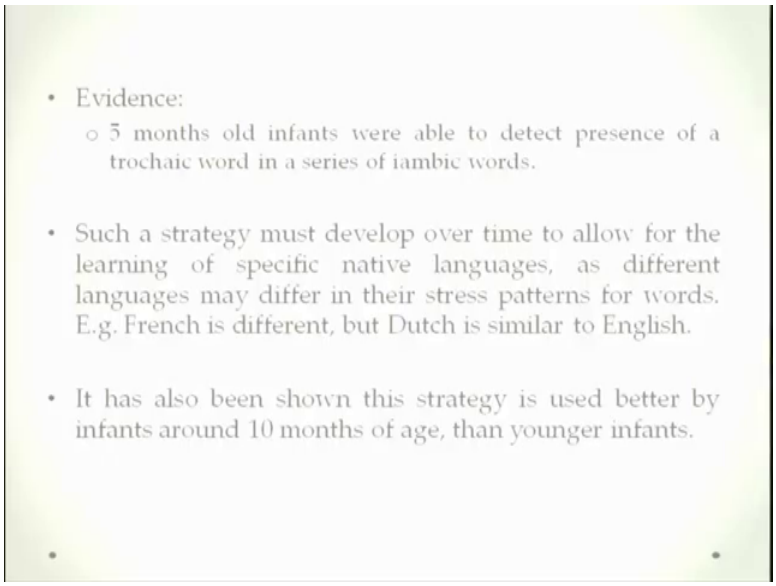

It is a very simple very ingenious way of doing this, and there has been evidence people have shown that even 5 month old infants were able to detect the presence of astro shake word in a series of I am equals. So, they are really paying attention of these stress patterns. So, they are using this matrix I am going to do the same strategy, and maybe it is very good.

But it is also being shown that you know the strategy develops rather slowly develops over a period of time, and this basically is something might be allowing them to learn whatever native language, they had born in faith, because different languages differ in you know things like stress patterns. It has also been shown that this strategy is used better by infants of around ten months of age, but younger infants are probably not being able to do that.

So, again you see that there is a sequentially in learning of language it starts with prosodic cues minus 3 months of age, 1 month of age, then it goes to phonemic contrast 1.5 months of age, 7.5 months they can start segmenting words, 10 months of age they can start really you know using the stress pattern or the metric segmentation stuff, what else.

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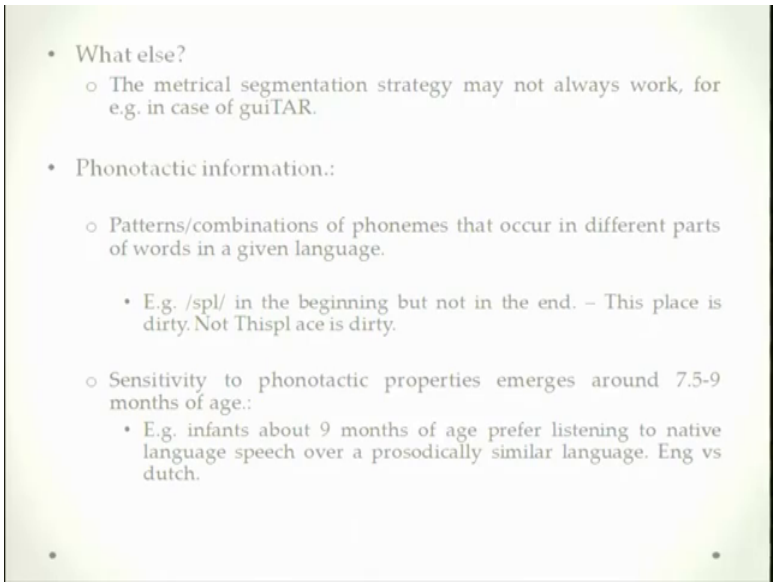

So, metric segmentation; however, can me not were different people speak in different ways, and sometimes these segmentation based on stress patterns might not be so, reliable. So, what does the child do what are the other sources of information. So, the other sources as I was mentioning is phonotactic information, how our words arranged. What is the probability that this set of funny will come after that set of funny. So, the ideas patterns or combination of phonemes that occur in different parts of a given language, might also give them a clue to you know parse them into words.

So, for example, if I say this place is not dirty, and this place is not dirty, if I am saying something like this you will not put this nclor together, because that pl does not really come at the end of words. You will have that sense that you know this is probably wrong, this is not happening, because you have this sense over your experience of you know 10, 20, 50 and 30 years of experience you know that this is just this phonemes do not really come close together.

So, this is what is phonotactic properties mean. So, for example, if there is a world called pretty, if there is a world called free, and there is almost a seventy eighty percent probability that t will follow it. So, children kind of have a cognizance of this kind of thing. And they kind of remember, this they kind of use this, in able to you know in order to pass the incoming speech string into words. This sensitivity to phonotactic properties has been shown in infants around 7.5 to 9 months of age say for example, it has been

shown that inventor online was a phage prefer listening to native language, speech over a prosodically similar language. So, they are being able to make this very fine discrimination between 2 prosodically similar languages, and recognizing one of them as their own. So, you know there is this increase in the sophistication of processing that is happening.

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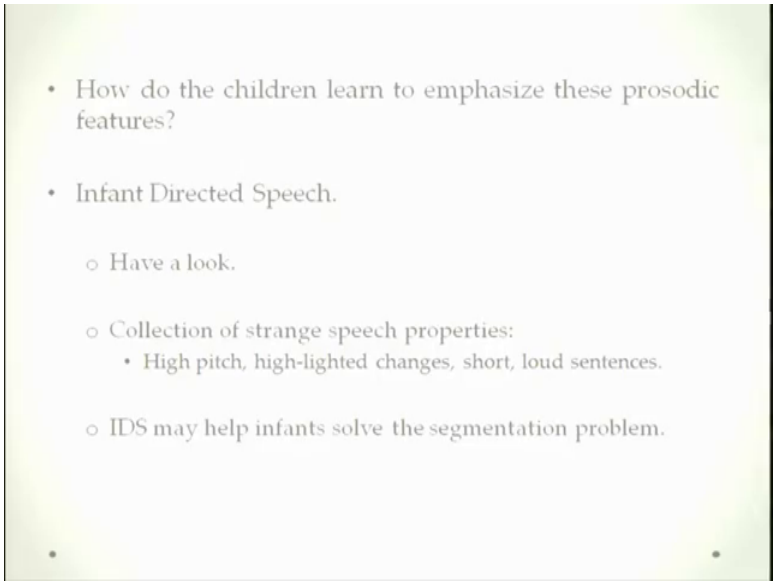

So, how are children specking of these things you know one of the questions, we might ponder about its how are children specking up these prosodic features. What is it that they are really grasping out of it, one of the clues is infant directed speech, you know infinity rip your speech is basically the way we talk to children, you know we talked to children a very highlighted sort of the way.

We talk to children in a very stark kind of favorite as high pitches, as highlighted changes, if you remember reading any nursery rhyme or a story to a child. A shorter sentence is very loudly you speak so, that the child can appreciate, you know the curves and you know the pitches of your language, and this infinity directed speech is something that is providing the children with clues to parse the native language. So, that is also you know something that the children are using, and they are probably building upon, this a little bit more about ideas.

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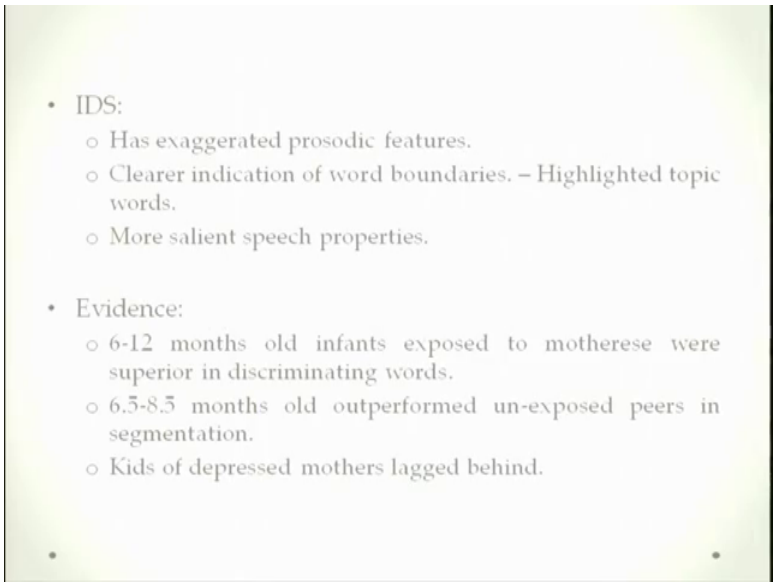

So, ideas has this exaggerated prosodic features, you know the highs and the lows, and those kind of things, it has a much clearer indication of word boundaries you say hello, have this thing, those kind of things you know it has very clear word boundaries.

And in some sense these are more salient to for the child we will do process, and there is evidence that children up to 6 to 12 months you know when they were exploited exposed to mother is they were or infinitely speech, they were shown to be superior in discriminating words, children who were devoid of infant edited speech, were poorer in actually processing these words. So, this is again some of the evidence that you can see that children using.

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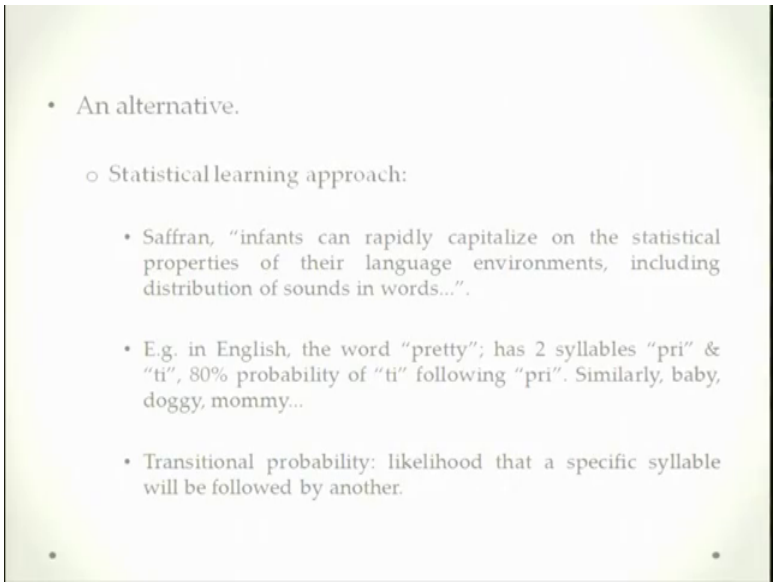

Now, we talk about prosodic or phototactic cues, you have talked about material segmentation, what we can also talk about is the fact of there is an alternative that has been suggested which is the statistical learning approach, what is the statistical learning approach. The statistical learning approach says, again you know put forward by a friend in one of his papers 99 he says he says in can rapidly capitalize on the statistical properties of the language environment.

What are the things how are they following each other what is the pattern, and they are kind of using this including the distribution of what kind of words are there in the speech, using this to understand speech. So, for example, they did this thing I was giving you the example of pretty, in the word pretty there are 2 syllables, and pri basically is followed by ti with the probability of almost 80 percent.

So, the statistical learning; however, those people would say that children are aware of these statistics, they are you know concentratedly listening to adult speech, and they are making out these patterns all the time. And again we are not really calculating it, but that sense is there, and they are using that statistical sense in order to parse speech. So, these things are refer to a transitional probabilities you know which phoneme will be followed by which one aim with what probability is called transitional probability, and this is that likelihood that a specific syllable is going to be followed by other one.

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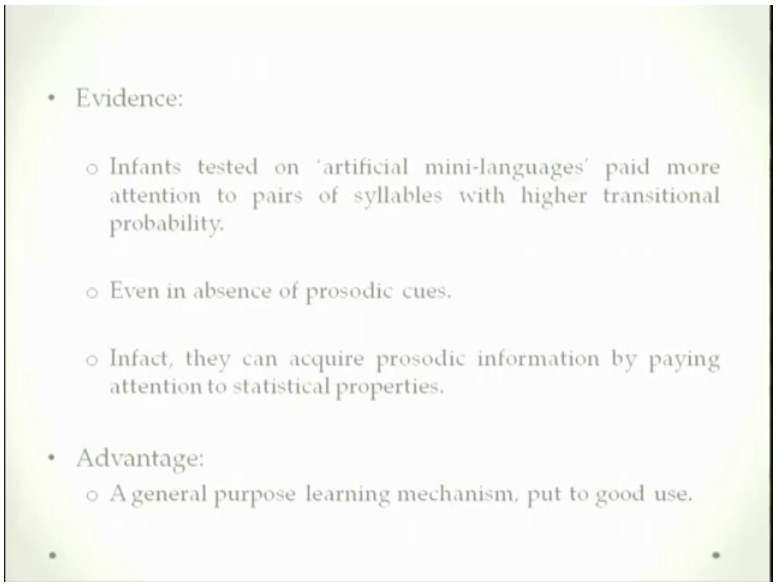

And t his is one of the things that a child might be using, is there still evidence to back it yes there is infants were tested on artificial mini languages, in which these transitional probabilities were a manipulated. And it was shown that they paid more attention to pairs of syllables that had higher transitional probabilities than pairs a syllabus that had lower transitional probability.

So, in subject they are attending to that ok, even in the absence of prosodic cues, and the advantage of this is that you know it is a general purpose learning mechanism, it is not really prosodic cues or metric segmentation are basically focus to speech. Statistical segmentation, or statistical learning, it is probably something that you can apply to anything any kind of processing with the environment. So, it is something that is that can be interesting.

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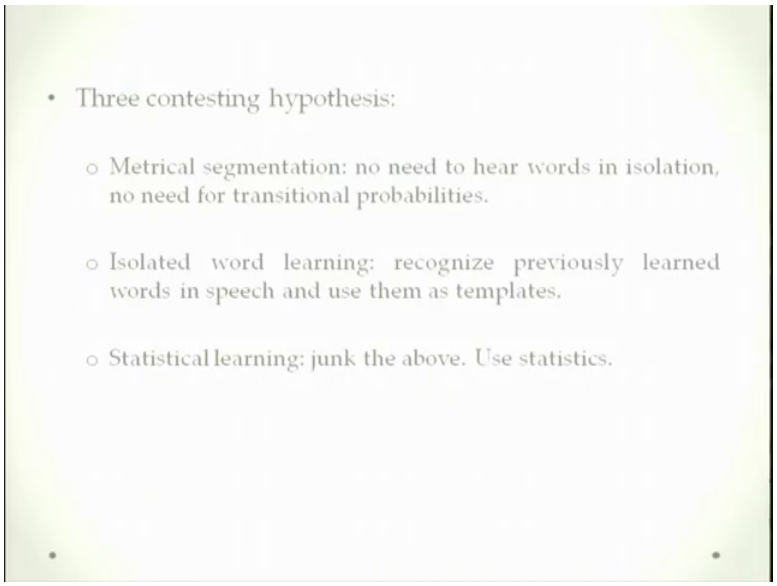

So, we have now three things, we have metrical segmentation, using fresh patterns the child is you know segmenting speech, we have isolated word learning, they are using ideas and heightened prostatic features to a segment speech, or statistical learning strategy learning, says you just throw out all the other to test you status we do not really need to attend to all of those things.

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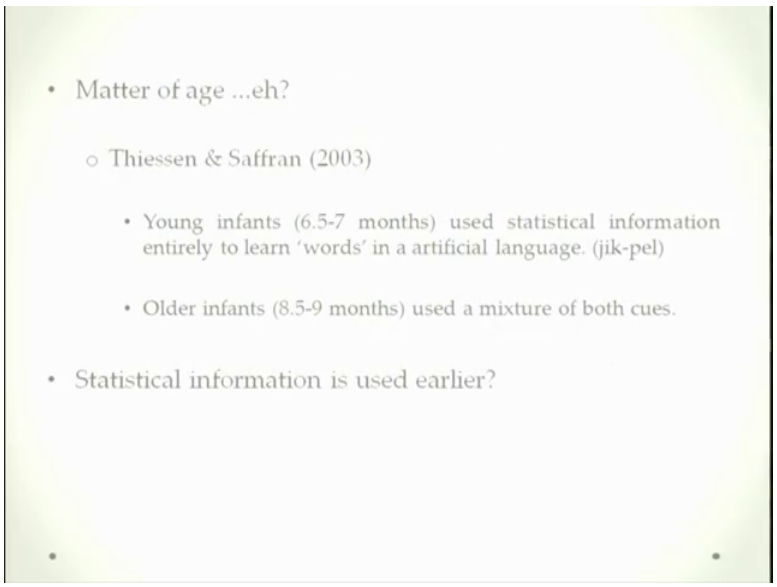

Also if you see the kind of evidence I have been present might be just a matter of age. At what age children are using what strategy? So, young infants have been shown 6.5 to 7

school that they use statistical information much more, older infants have been shown that they use a mixture of statistical information, and prosodic or metric cues. So, is statistical information used earlier is that the case probably I mean that is what the evidence is showing one of the ways.

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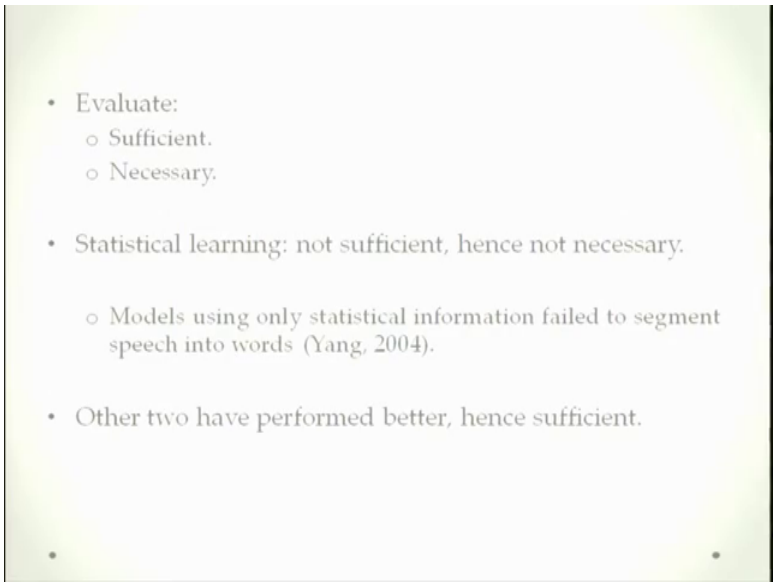

Because I am giving you 3 candidates no other ways to evaluate which of them is the necessary thing, could be the evaluation between what is sufficient and what is necessary.

Now, statistical learning has been shown that it is not sufficient to explain all language learning. So, people have tried to model this, and they have shown that only statistical information does not really help a particular model to segment speech. So, it is not really sufficient, because it is not sufficient it also means that it is not the necessary aspect. So, it is because it is not sufficient is probably not necessary. Other 2 things metric segmentation, and prosodic cues have been shown to perform much better together, and explain most of language learning. So, in that sense though those are probably those are sufficient things to learn language.

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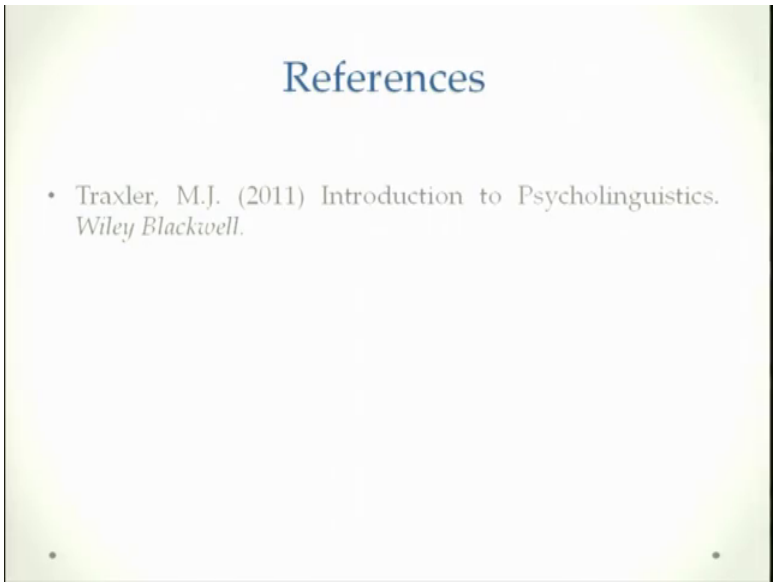

So, that is all from me about acquisition of language, this is the first part of the lecture, we talked about prosodic cues, we talked about we know it started about minus 3 months of age children are using prosodic cues, and they are doing phonemic contrast. Then they are segmenting words using 2 or 3 mechanisms, and this is what was about learning words. And, you know in the next lecture we will talk about more things related to language.

Thank you.