The Psychology of Language

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Lecture-11
Words III

Hello friends, welcome back to this 11th lecture, this course on the psychology of language. Now, before we progress and understand a little bit more about words, let us take a quick recap into what we have been doing over the past 10 lectures. So, we will quickly go through all the concepts that we are done and will continue from where we left off in the last class which of class number 10. Now, the courses design understand language, what is language.

And why do we need language and we started off by explaining this idea of language not from a linguistic point of view, but from psycho linguistic point of view, meaning which we were primarily focused on the psychology or the psychological aspects of language. So, the outline of the course was designed in such a way that we will only touch the psychological aspects of language and looking at language as a cognitive process.

So, the first 2 lectures were which we did I was trying and explaining to you what is language first of all, and what is the need for language and a little bit of history into how language started. So at the very beginning, I picked up the very idea of what languages and how it is different from communication. So, we saw the very primitive form of language which is called animal communication system.

We looked at why animals communicate and what is a characteristic of a language like that and after looking of on that we move forward and compared this with the human language system, as we know that animal languages have minimalistic idea conversion, which basically means that they can generate and share only minimum ideas with human language, a number of ideas can be generated in chat.

So, we looked at what is the difference between them. So, after looking at the most primitive form of language, which is the animal communication system, we moved on to understanding what is human language and how does even language progress and what is the structure of human language right from the phonemes to the morphemes to the sentence discourse and so on and so forth.

So, moving along the axis, and then towards the end of this lecture, we started welling into the idea of how language started where is the history of language. So, we looked at things like how in the evolutionary cycle or in the evolutionary timescale, how language developed, there we also verified certain aspects of certain evidences to look at how our language evolved from the primitive humans to the modern form, which it has.

We looked at several evidences for example the idea of pig gains and the idea of proper language and how these provide evidences or support to the fact that language developing both fast manner and a slow manner. So, we looked at these 2 theories, also competing theories of language development with one is a slow theory, the other is a fast theory of language development.

Now, obviously, once we are done with what is language and what is the basic and history of it, the next 2 chapters we dedicate entirely to looking at the scientific research methodology using language and we looked at a little bit into the scientific methodology starting with the discussion on what is theory, what is how is theory leading to generating of hypothesizes, how the hypotheses are tested.

And based on the hypothesis testing how the theory is either refuted or additions to the theories done, both using the inductive and deductive methodology. So, we discussed in detail all the components of good scientific research. And then we took some classic examples from language research and we explained the whole theoretical procedure based on these classical research in language.

Towards the end of this section, we looked at the brain regions which are involved in language and discuss little bit about the broca and the wernicke area which is the 2 main area for language further to it we also looked at certain neuro imaging techniques, and electro physiological techniques, which are used for studying language and the brain in action while we are using languages.

So that is the content of the third and the fourth chapter. Now from the fifth chapter to the sixth chapter, we were looking at how people perceive language. So, if something is said to you, how do you respond to it, how do you understand it, that was what the main concern was in the fifth and sixth lecture. And then what we were looking at is first of all how do people perceive speech. So speech basically is a form of wave.

And so we looked at the properties of wave like amplitude and frequencies and how these amplitude and frequencies and the overtones the fundamental frequency, these concepts of the wave and how they are explored in terms of sound waves. So how these properties are explaining in the psychological domain, not only that, we looked at the functioning of the human ear.

And how the working of the inner ear, the basilar membrane, how that and these projections to the primary auditory cortex and secondary **or** auditory cortex, how they help us in perceiving the language, that was the concern of the first part of it. And then we also looked at how the development of speech perception happened, or happens in young children, and how does it progress throughout the adult age.

And several questions into that this particular domain was what we were interested in. Now, once we were familiar with how people perceive language or how people understand language, or spoken language for that matter. We went into looking at how people produce language, that was the section 7 and 8. So in 7 and 8 section we were looking at the production of language. And so a lot of emphasis was put on the definition of the wise box.

The whole vocal track system, and how these vocal tracks system basically help us in producing languages. We detailed the idea of how the phonemes are produced, and the basic phone sounds,

which are the consonants and vowels, how they are produced, what do they mean, what are the various inflections, what are the various exceptions, and things like that. So everything related to that is what our concern was in the section and pretty using of language.

Other to that, what we did was we also focused on how the production of language takes place in both in infants, and how infants develop this language production, how 2 language production is developed, and how this whole story of language production, it moves from, right from birth, to the point of time when the child is able to produce more than 10,000 words, which is when he is more than 8 years of age.

So that story is what we covered in that section. After that so once we are able to understand both the production and perception of speech, what was next was the next level of dedication or the next level of interest for us was studying what is the word. So what is the meaning of word and what does word, now why we were interested in understanding the word, the basic concept is that word is that point from which we have a clear cut distinction.

Below the level of the word, we have phonemes, and we have morphemes, and they do not make any meaning as such. So they are not proper language. And above the language of word, we have sentences and discourse and syntax and grammar and those kind of things. So what is the gateway, which starts making meaning or at word is that particular point from which meanings has been generated.

So that is what the concern was. So we were more interested in studying word. So lecture number 9, 10 and this lecture which is 11, we dedicated entirely to studying words. So we started of a journey on studying words by first looking at what the anatomy of a word is. So basically, what are words, how words resemble sound symbols for different kinds of words. So the meaningful word is related to the concept which symbolizes.

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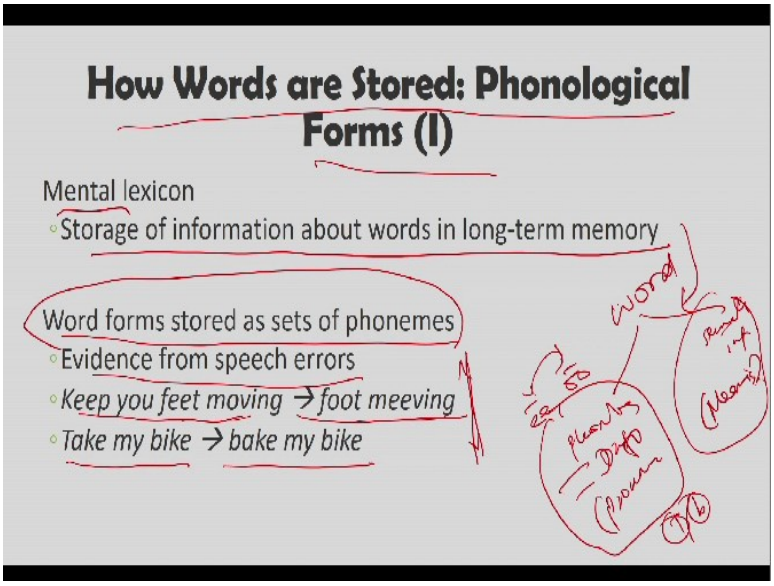

And the concept that it symbolizes is related to the mental representation, so how words take on meanings and how these meanings are represented into the mind in forms a mental representation is what our interest was. So we looked at this kind of an anatomy, we looked at the cognitive and approaches to word learning and we looked at how semantic primes and embodied representations, these are in sounds symbolism.

And how they explain the anatomy of a word, then the next idea was how do children learn words, and so that was what it is. And so we found that the word learning was actually in a s shaped curve, the initially the children learn from 0 to 18 months, the word learning is very slow. But there is a spot from 18 months to 6 years of age where the word learning is very fast. And after 6 years, the word learning drops.

Now this part is believed to the fact that children acquire some recall insight in the start learning more words, and also why this part is there from 18 months to 6 years is because the children have developed a mastery over the phonology. Also the memory has developed and so there is this particular issue was there. So we are looking at that kind of approaches, and we are looking at constraints in word learning and several kind of assumptions and so on and so forth into the idea of word learning.

And how several other factors example being in the neighborhood and those kind of things actually help us in learning words. The next issue which was of concern to us is how words are stored. So what is the way in which words are stored into the mental lexicon, now most of you have seen a dictionary, now what is the dictionary. Dictionary is a place or is it is a, kind of a book, which stores the base form the lemma form for word.

And we discussed this before lemma is the basic abstract form of any word. And so the dictionary store is the lemma form of a word, now in the dictionary for taking a word, you will get both the phonological excellence the pronunciation of the word as well as the meaning in a dictionary both the phonological form and the semantic form which is the meaning is told, but most dictionaries are arranged in alphabetical order.

They arranged in from A to Z order, these days, when you are looking for what meaning what you do is you type it into a browser or Google browser or any browser and immediately the word comes to you. Now the way the mind stores the word is in this form, it can immediately give you the meaning, but then mind also source the word into both the phonological form and semantic form.

So basically, what we were interested in is to know how words are stored into the human mind, what is the way in which is stored first thing and later on we also looking at how words are literally from the human mind. So the mental lexicon is a place it is or form of memory, in the information about words are stored mental lexicon is the storage of information, what words in long term memory.

And this information as we looked at which is stored in the long term memory is in 2 forms, we have the phonological form, and we have the semantic form. Now any word which is stored in the long term memory is in terms of its pronunciation, is in terms of how the phone various forms of speech sound they can comprise together to form syllables and then further on to comprise of what the word or how the word is pronounced.

The other way in which a word is from, the other fact characteristic of any word is a semantic form. So basically the meaning of it, what it symbolizes, what it means, or what is the mental representation that it is **is** influencing. And so what is the story both as phonemes, and so basically they are stored as phoneme as well as semantics. So, how do we know words are stored in terms of phonemes or the mental lexicon has word stored in terms of basic phones.

And that comes from the explanation for that comes from speech errors, the kind of speech errors that we do and so look at this, we often tend to make this kind of speech error. So, example saying keep your feet moving, we tend to say keep your foot meeving. And so this kind of changing phones basically suggests that words which are stored in the long term memory they are stored in their basic physiological form.

One way of storing it is in a phonological form or in terms of how they are pronounced or we also make errors like take my bike becomes bake my bike, so, the b becomes t, and this is basically because phonological errors the way they sound, that is somehow change. And so words are stored one way of storing word is in terms of the phonological.

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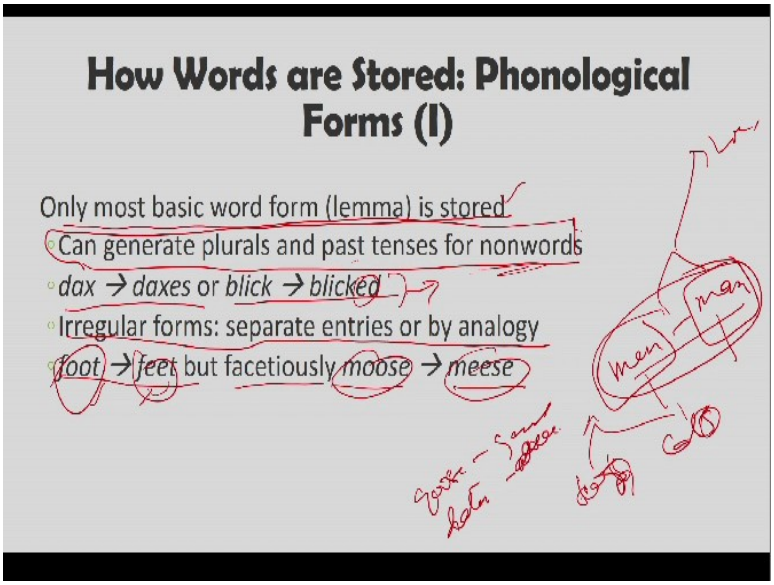

Now, it is been believed that the most only the most basic forms of the word are actually stored in the long term memory. So, not all forms of words are actually stored in the long term memory only the basic forms of the word are stored in the long term memory and other forms are

generated through certain rules. So one theory believes that only the basic form the stored and then other forms of the word.

For example, if you want to make plurals or if you want to add suffixes to a word, or if you want to make any kind of other derivations to the word that can be done by using certain rules, so only you have the basic form and that is what it is so dax become daxes or clock becomes blicked is because what is stored is dax and blick are the ones which are stored and one way to look at that words are stored in the lemma form is because we can make plurals of non words also.

And so if you can make plurals or non words, which basically says that the idea of making plurals it comes from certain rules, it is not the words are not stored in our plurals are not stored into the mental lexicon. Now, irregular form separate entities or by analogy so there are certain irregular forms also in which the words are stored. And so these irregular form certain words or certain irregular forms of words are also stored into the mental lexicon.

So, far some forms of word both the forms are let us say the lemma or the other forms of the word are also stored, for example, look at foot and feed and moose and meese. In this case, the plural of foot and feed or moose and meese and this kind of plural making does not happen to certain rules, because what is happening is the word itself is getting changed. And so, in this case is what happened is both the words the singular as was the plural is actually stored into the mental lexicon.

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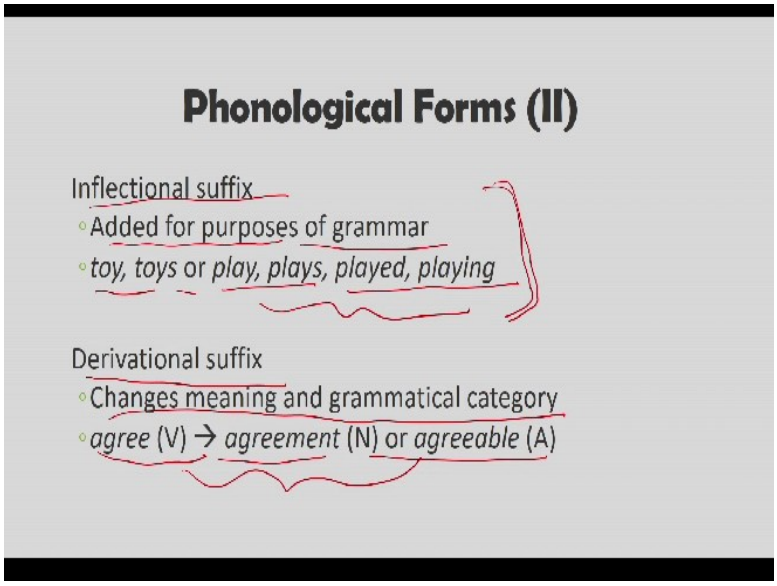

Now another interesting thing is to look at the idea of inflectional suffix and derivational suffix and these inflectional. So, suffixes are basically certain words, which are added to the basic lemma form to the word and when you add the suffixes what happens is the meaning of the word changes and so by looking at something while inflectional suffix and derivational suffix, we can think of or we can basically predict that how words are stored into the long term memory onto the mental lexicon.

So, what is inflection suffix it is added to the purpose of grammar. So, any suffix which is added to a lemma form of a word, the basic abstract form of a word, so that this addition changes the grammar of the word that is called inflectional suffix, for example, look at toy and toys what is happening the grammar is changed by it has become plural or play plays, and again it is plural played and playing.

So, play, plays, played and playing in this case this is it becomes from singular to plural in this case, what has happening is that the tense marker is changing from present, continuous tense to pass tense to so on and so forth. And so, the grammar is changing and so, inflectional suffix basically suggests that these kind of suffixes are added to words. So that what happens is that the word changes its grammar only the grammatical property changes.

Now, the other kind of suffix which is of interest is something called the derivational suffix and so what is these suffixes, these changes of meaning and grammatical category. So, in one hand, we have the inflectional suffix which only changes the grammar of a word, we have the derivational suffix which not only changes the grammar of a word, but also changes something called the meaning of the word.

And so sometimes what happens is adding certain suffixes make work into a now, look at it, we have agree as a verb, and you add the suffix meat into it, and what you get is a noun. So, this kind of suffixes or this kind of the word endings can change not only the grammatical form of a word, but also the meaning of the word and so agree, agreement and agreeable are 3 different things and so, it becomes an adjective by changing the able by adding the able and the ment which are 2 different suffixes the word becomes either a noun or it becomes a adjective.

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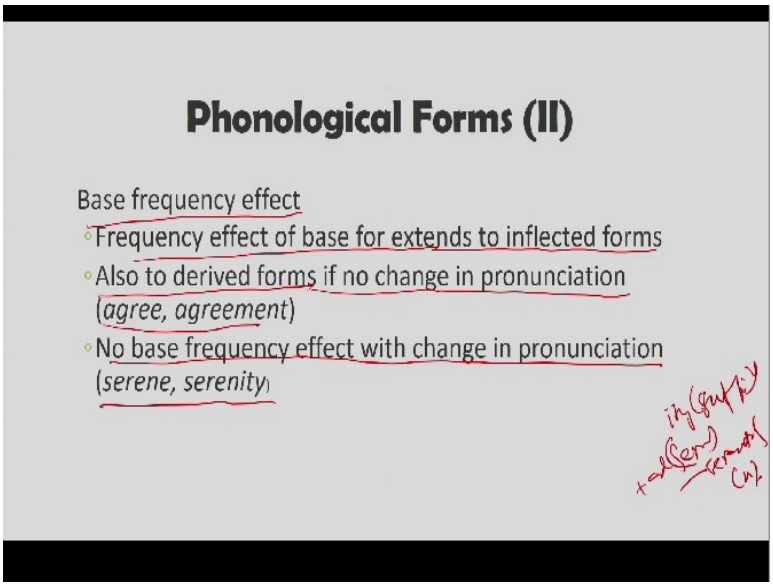

So, what does it all say, what it says is that words are basically stored in the phonological way or in the words are stored in the mental lexicon, in the form of the pronunciations in the form of the phonological character. Now, another interesting thing to look here is something called the base frequency effect. And so, what is the base frequency effect.

The bass frequency effect is a very simple thing, which means that the frequency effect of the base form exchange with inflected form which basically means that the more frequently particular word is tackled or is met with the higher the chances that other inflection forms of the

word will also be tackled in the same way. So, the amount of time you are requiring for understanding the base word.

And the more frequently you have accessed or you have seen the base form the same amount of time or the same lower time will be spent by you in finding out or in realizing the inflection forms of the words. Now frequency affects the base for extended to inflected forms also derived form in no change in pronunciation for example an agreement. So, basically what it says is not all derived forms exhibit the base frequency effect.

Now, what happens is that the more frequently you are familiar with a word generally what happens is other inflection forms or other suffix form of the word will also be recognized at the same speed, but then there is a catch to it and what is the catch it says that not all derived form or the word exhibits the waves frequency effect. For example, look at the suffix ity and added to the adjective serene.

What you get is something called serenity which is a noun. Now, if you look at the word recognition for serene how much time do you take for identifying serene it has a faster reaction time people are able to react faster in understanding serene, but serendipity the word itself has people or a for understanding the word serenity people take more reaction time or people are more slower in understanding serenity.

Now so basically then, how do we solve this idea of how the base form and inflected forms are thrown into the mental lexicon. On one hand, we have this idea that the only the pure lemma form is stored and other forms are governed by rules and there are certain exceptions to it where we have all the forms which are stored to it. Now if you look at the collectivist approach, which provides an answer to how all the forms of award are stored into the mental lexicon.

The collection approach solves this problem by saying that all word forms both the inflectional and the derivational had separate entries into the mental lexicon. So the collectivist approach basically proposes that all forms of the word may be the lemma form the inflection form the grammatical form any other the derivative form, all forms of the word have a separate entry into

the mental lexicon, which means that each word has a representation into the mental. Now let us explore this mental lexicon that we are talking about.

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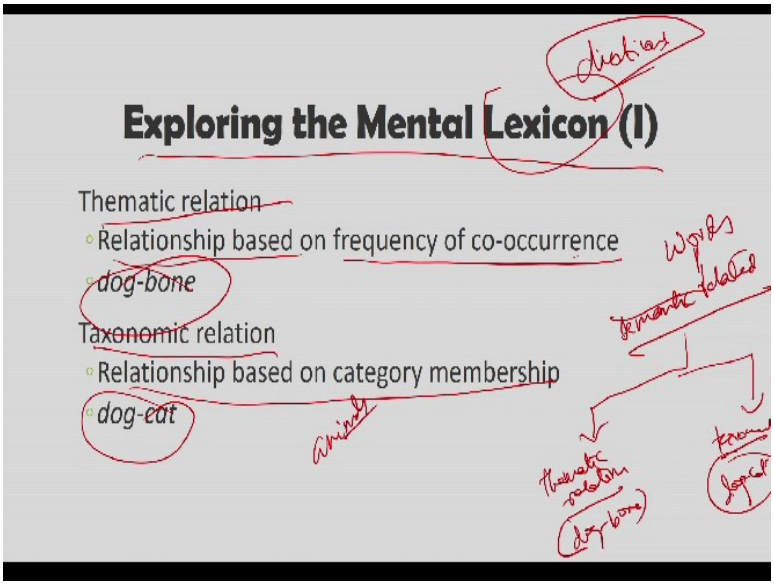

Now mental lexicon is the mental dictionary, we know that we have mental dictionary because there is a phenomena called the tip of the tongue phenomena. And so, why does the power of the tongue phenomena happen, the tip of the tongue phenomena happens because what happens is when we are trying to end this, this is a very famous thing. So there are times when you remember what a word is made up of.

What is the first letter of a word, you know meanings of what the word is, or particular name is and but you are not able to retrieve the word and this happens, because what happened is, you are able to access the lemma form of the word which is the basic abstract form of the word, but you are not able to access that derivational forms because it is a derivational form that you want to remember.

And that error in generic the derivational form is what is the reason for the tip of the tongue phenomena and this also explains that mental lexicon is arranged in form of a network. And these network has more than the activity spread through these notes, we will come back to that in a moment. So how do we explain the mental lexicon or explore the mental lexicon. Now let us play a little game.

Now, when I say dog, and we what you have to do is quickly tell me what comes to your mind. So when I say dog, you say cat or some people will also say bone. Now the way you are expressing the word which comes with dog beat a cat or a bone is basically 2 forms of how the word dog or the meaning of the word dog is represented into your memory. And exploring the mental lexicon is done through something called a word association task.

And so what is word association task, it is a simple procedure in which the participants they are asked to produce a word in response to prom. So, I said dog and you will say whatever comes first to your mind, and so that is what the word association task is and the way you define the target word. So, the word I present is called the Q and the word you give me by after hearing my q word is called a target words.

So words in mental lexicon generally are arranged in 2 forms, in terms of its semantic relatedness, so most word in the mental lexicon is arranged in terms of its semantic relatedness. And this semantic relatedness of any word into the mental lexicon is basically arranged in terms of either the thematic relation or the taxonomic relation and so what is the semantic relations. So, when I say dog and bone, they are thematically related.

But when I say dog and cat, they are related in terms of something called the taxonomic relation. So, what is semantic relation, what relation based on frequency of co-occurrence, so, basically, if a particular word co-occurs with a word, more number of times, this type of relationship between 2 words are called thematic relations, but the relationship between words which occur because they are from the same category.

This type of relationship is called taxonomy. And so, what happens is both dog and cat are from the same animal category and so, this kind of relationship that they share with each other is called taxonomic in nature, but when I say dog and you say bone to me, it is thematic relation because they occur together or they occur with the same frequency. So, what is thematic relationship. The relationship which is based on frequency of co-occurrence of words are called thematically relationship.

For example, dog and bone and so what is taxonomic relationship, it is the relationship based on category membership for example, dog and animal and the category here is called animals and so this is how word stored.

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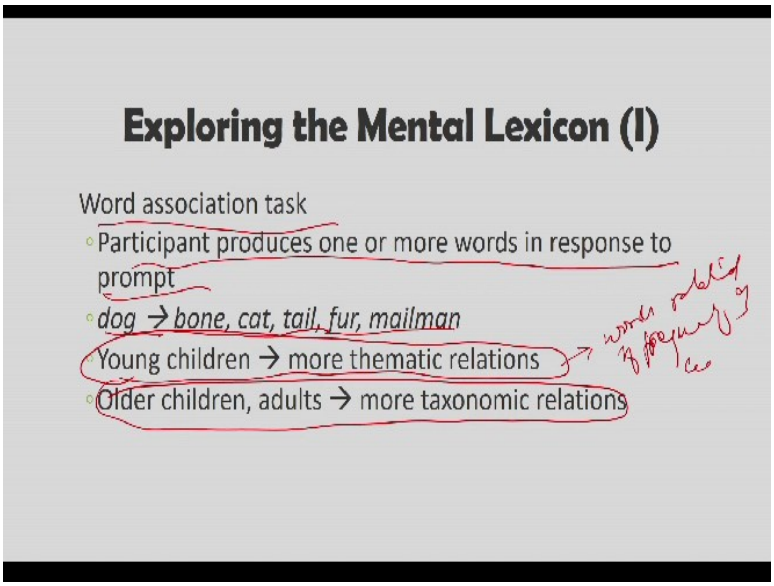

Now, how does the word these kind of relationship explored, this is explored by something called the word association task and so what does he do participants produce one or more words in response to a prompt for if I say dog, you will produce bone, cat, tail, fur and mailman and so young children they form generally something called thematic relationships that means that words are related in terms of frequency of co-occurrence.

And older children produce something called taxonomic relationship. Now older children they have more knowledge and so, they have more idea of how 2 things are related in terms of in terms of the category, in terms of the higher order concepts, but smaller children they generally relate words in terms of co-occurrences. So although dog and cat are not related to each other, but through a category they are related in the category here is animals.

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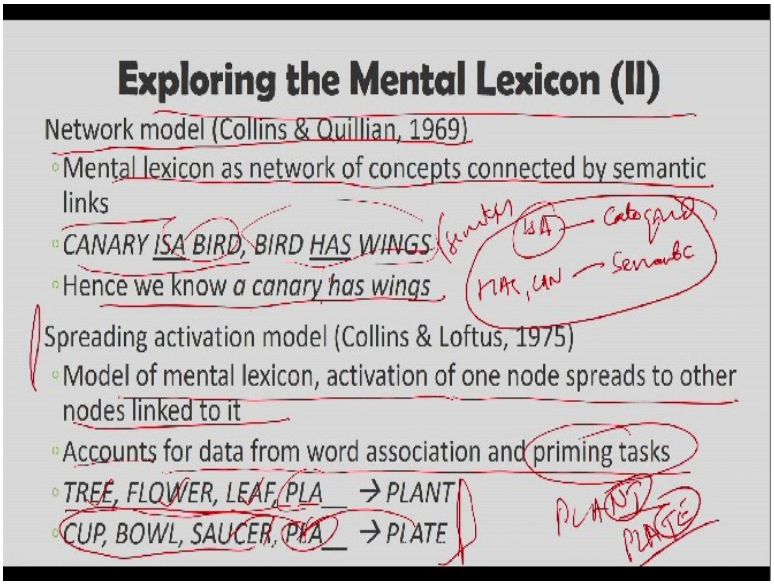

So, how do we explore the mental lexicon. Now psycho linguists they conceptualize the mental lexicon as a network of words or concepts connected to each other by semantic links and that is what I have started my explanation or mental lexicon way, psycho linguists believes that words and concepts they are related to each other through some kind of a semantic link. So, and these links that the word and concepts have in the semantic network or in the semantic space of long term memory can be expressed in terms of 2 different kind of links.

I can have a is a link which replace categorical relations or I can have a has an can relationship between words and this can be semantic in nature. So, I can have these 2 type of links or relationship. So, 2 words or 2 concepts in the mental lexicon, which is explained as a network model, that is what I was trying, I started of my explanation of mental lexicon with that has 2 kinds of relationships.

So words in a network, so, first of all words are arranged as networks with basically that one word is connected to another word, that is how the mental lexicon is first thing, and so these relationships can be in terms of categories or in terms of taxonomy. So, categories is taxonomy or in terms of frequency of occurrences, which is in terms of the themes or thematic relationship.

And so, the kind of relationship that they can have is either it has easier kind of relationship which is represents categorical relation or it can have has an can kind of relationship which

represents semantic relationship. Now, the network model was proposed by someone called Collins and Quillian in 1969. And so what they said is that most words in the mental lexicon are related to each other through a network.

And these networks has links between them, these networks have words and concepts which are connected to each other by links and these links can be either categorical links or it could be semantically. Now mental lexicon as network of concepts are connected by semantic links or categorical links and what is semantically a canary is about for example, look at it we have is a relationship.

So when I say canary is a bird it is explaining a categorical relationship because canary forms in the category of bird. Similarly bird has wings if I say it is representing something called semantic relationship, so bird has wings, birds can fly, these are symbiotic relationship meaning related things, right. But as soon as I say canary is a bird, or parrot is a bird, or a lion is an animal, what I am trying to relate or what I am trying to show you is a categorical relationship.

As we know that canary has wings, so and you can see, this is the relate. So, canary is a bird is basically a categorical friendship, but when I say bird have wings, I can deduce from this that canary has wings why, because canary is a bird and so all birds has wings. So, canary is a bird which has wings and so canary has wings is the actual reduction and so this kind of relationship exists between concepts into the mental lexicon.

Now, there is something called the spreading activation model, which was proposed by Collins and Loftus in Loftus in 1975, to explain the idea of this mental lexicon. And so what does it propose, it proposes that activation of one node spreads out to other nodes linked to it, what are the spreading activation model actually say, it says that models are in the models of mental lexicon activation of one node space to another node linked to it.

So, basically, they have words different words, which are connected to each other in the mental lexicon. And so if you excite one word or concept, what will happen is the energy which is excited it, it will spread to all other nodes, which are connected to this central node, or this

central idea or the central word. And this idea is called a spreading activation, now the very idea that activating one node or one concept into the mental lexicon, it excites all other nodes that can be that are the proof from them is on that leads to accounting for the data from word association and priming task.

So, basically from both priming and word association task the what it explains is that displaying activation, so why do we get certain words more related with the word of in question. So, in let us say, dog if I say and you say cat, or if I say king, we say queen, so why am I getting queen out of king, although they are not related to each other, the reason is that they are related together, which basically means that they are connected to each other with a higher strength.

And so, the moment I excited the word king, the queen will be a excited, although king and queen do not lie in the same categorical level in a semantic related map. Now, a little bit of detail about this spreading activation, you can, go to my previous lectures on semantic memory, and the idea of spending activation and the idea of how semantic networks really work.

And if you just look at 1 or 2 lectures there on the courses on introduction to cognitive psychology, there they will you will find a little bit more detail about this idea of spreading activation and how the spreading activation actually explains the lexicon or how the mental lexicon is arranged and priming study. So what are priming first of all. Now, the what is the meaning of priming.

In priming, what happens is a partial information is given to you or some kind of degraded information is provided to you and this degraded information later on helps you in understanding on in recognizing or in perceiving certain other kind of words, for example, a very generic kind of priming is if I tell you something about someone, if you are not met somebody before a new person comes to you or a new person has come to your department.

And opposed even before you meet this person, I give you some information about him saying that he is from that region, this region or little bit information a very degraded information that are linked to that person, the moment you go meet this person, what will happen is your behavior

towards him will be primed by the information that I have given to you. So, there is basically priming.

In priming what happens is some kind of information a pre information is given to you or a pre kind of information is provided to you and this information then shapes the way you answer certain questions or the way you behave. And so if you do this kind of priming is called semantic priming. And what is happening here is I am showing you word like tree, flowers, leaf and that kind of thing.

And then when I present to PLA, normally what people do is since they are already given this kind of letters, people tend to fill in NT here to mean plant because they are prime, they have been given information like tree, flower and leave all related to the plants, all related to the herbivores or the plant side of it. And so, most people generally then fill the NT word here to mean plant.

But if I show you words like cup, bowl, and saucer and then I present to you the PLA, generally people tend to write te here plate, because this plate then forms a category with these are it is a sub category or maybe it is the main category of these things. So, these are members of the category plate and these are members of the categories plant. So, we tend to refer to the original category and this is what is called priming.

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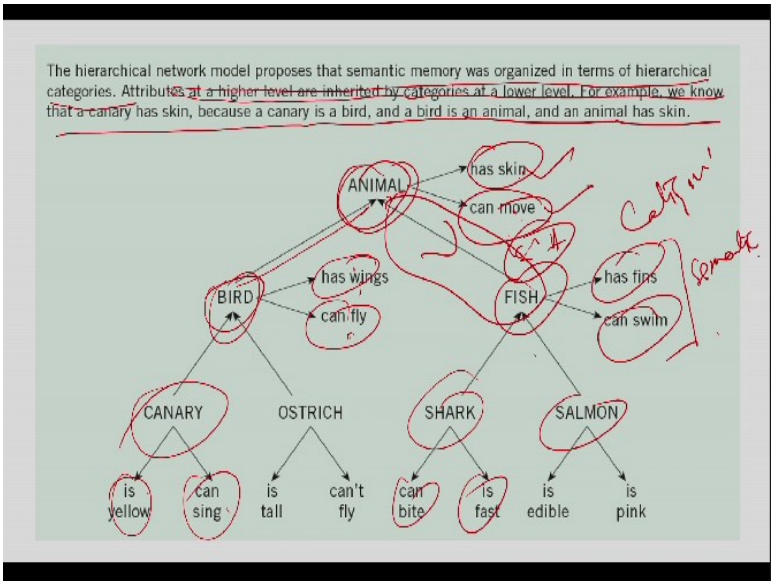

So, this is how the hierarchical model really works. So, if you look at animal there are 2 characteristics of it, has skin and can move and so if you look into it birds are animals. So, by nature of it birds will have skin and they will be able to move because animal is the higher order category and lower order category will have all the characteristics of the higher the category and so if we look at bird it has wings and it can fly.

So then animals may not have wings and fly but words have wings and fly and also they has skin and they can move and then look at calorie which is a part of this bird. And so if you look into it the canary is yellow in color and can sing. So, canary is yellow in color and can sing it has wings and it can fly and it has skins and can move but not all birds are yellow and they can sing, but most birds have wings and they can fly.

And similarly animals most animals has skins and move but neither they have most of them have yellow skin and can sing on neither they have wings and fly. So, this is the way in which the mental lexicon is arranged. And so, if you look into it, this is the fish it can swim it has fins it can swim. So, this kind of relatedness is called semantic relatedness and is so a fish is a animal, if I look at it.

So this relationship is categorical relationship. And this relationship is semantic relationship and so fish as shark and salmon as can bite and is fast. And so, this is the arrangement which is there. So hierarchical network model proposed the semantic memory is organized in terms of hierarchical categories. Now, attributes of the higher levels are inherited by categories or lower level.

For example, we know that canary has skin because canary is a bird and bird is an animal, an animal has skin. So they said members of this category will have all properties or most properties of higher members, but the reverse is not true.

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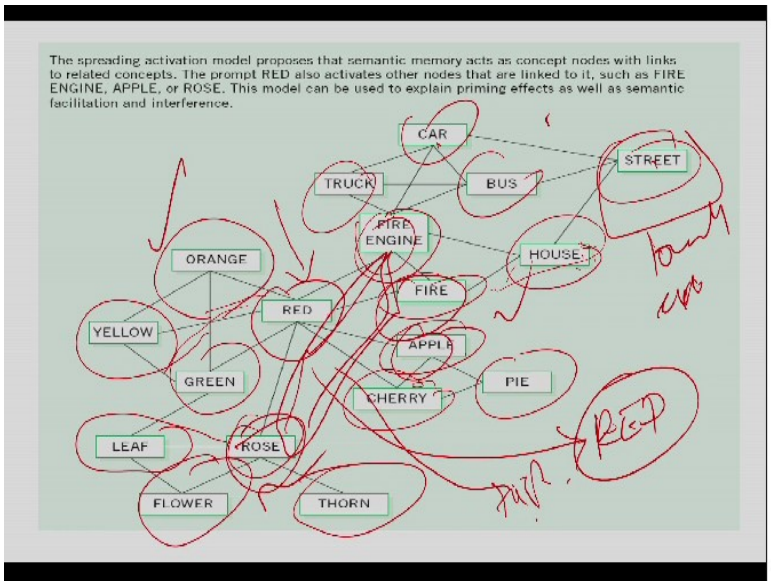

Now, what the spreading activation model, how do we look at the spreading activation model. For example, let us say by somehow we activate the concept red. Now this red is related to so many other concepts. On one way this red is related to rose, which leads to the idea that it is leaf, it has flowers and just thorn. On the other way, the red is related to color category, which is green or again red.

Also red is related to the category of fruits. And so you excite Apple, cherry and pie. And also red is related to the word fire, which is further related to the fire engine, truck, car, bus and street. And similarly the fire is also related to house because the house gets on fire. And so this house is related to the street, which is again related to the car and so on and so forth. So as soon as you excite this red through an energy the moment you say read, what will happen is all these networks get excited.

But the way if you look at street this has the lowest excitation. But if you look at rose and if you look at fire, if you look at Apple, and if you look good fire engine, so the words, this triangle has the highest activation, right because they are the nearest and so they have the highest activation they have the highest energy related to the word red.

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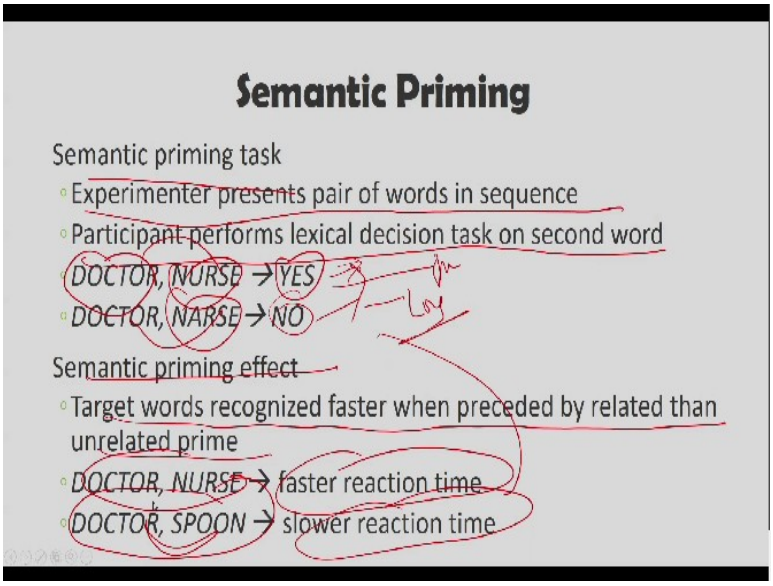

Semantic priming now semantic priming is the another find of priming that is used, now in semantic priming tasks what really happens is, so what priming generally does, it measures the associated strength of between words. So what a semantic priming task does is that experimental technique that presents a pair of words and measures the participants reaction time to those pair of words, or target was recognized faster, which proceeds by related primes, then unrelated crimes.

And then this is called semantic priming effect. So what happens in semantic prime is that people are presented with pair of words which are either related semantically or unrelated words. And when they are related semantically, what happens is people tend to respond to semantic primes faster than when they are unrelated words, say experimenter presents of pair of words in sequences, participants perform lexical decision task on the second word.

So they see doctor and then they see nurse, and so you have to tell whether nurses is a word or not. And so in this case, it is easier for you to say yes, but if it is an if you see doctor and then see a non word nurse, narse, then you say it is a non word, but the reaction time that you take in the first is shorter than in the reaction time that you take in the second word, which is longer. The reason being that doctor and nurse are semantically related, but doctor and narse are not.

And so what is the semantic priming effect and semantic priming effect what happens is target words are recognized faster when preceded by related then unrelated primes. And so that is what I have been telling. So if you see doctor nurse you will have a faster reaction time. But if you see doctor and spoon you will have a slower reaction time, the reason being that they are not semantically related to each other.

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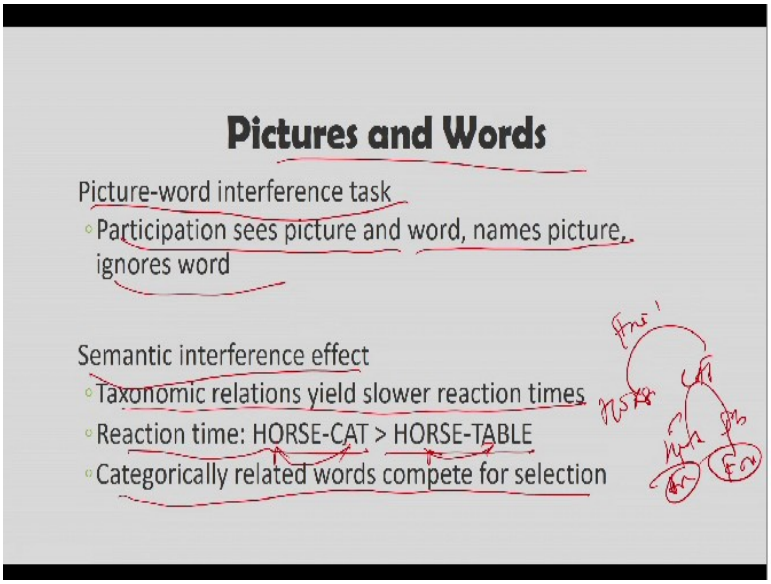

And so that explains so that gives us a picture of how the mental lexicon is actually arranged. We also have something called picture and words. And so we have something called a picture in word interference effect in this case what happens a certain word and certain picture is presented. And so the picture in words are from the same category, the reaction time is also affected by it, which basically means that those words that we store in the mental lexicon is not only arranged in the semantic form in the meaning farm, inherited form it also are in terms of the pictures.

And so participation sees pictures and word names, and picture and words, names picture and ignores the word. So in this case, what happens is that this experiment or this kind of work shows you that it is not only in terms of the words or in terms of semantic or meaning is also in terms of pictures. Now we have something called a semantic interference effect, in which what happens is the taxonomic relationship, he has slower reaction times.

For example, reaction time between horse and cat is greater than horses and table, why it is there, because horse and cat are related to each other in terms of taxonomic relationships . But horse

and table are not related to each other in taxonomic relationship, because both the horse and cat are from the same category, which is animals. But if you look at horse and table they are from horse is from the animal category and table is from the furniture category.

And so they are not related taxonomically and so the reaction times are then disrupted, now categorically related words are compete for selection. So what we have is, if we have 2 words, which are categorically related, they will compete with each other for selection. And so that will influence the word reaction time.

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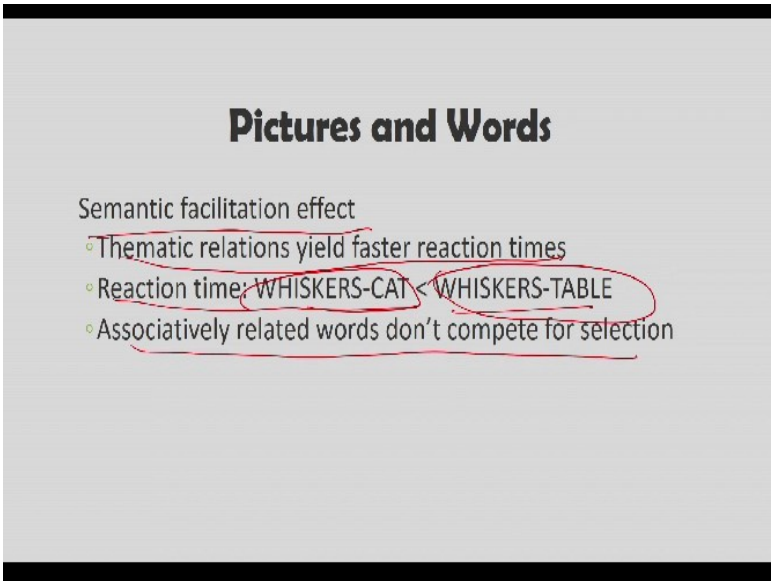

You also have something called semantic facilitation effect. And so what is the semantic facilitation effect, what does it mean, the thematic relationships yield faster reaction times, for example reaction time of whiskers and cats is lower than whiskers and table. So here what happens is this will take more time than this because they are related semantically related. Associatively related words do not compete for this kind of selection.

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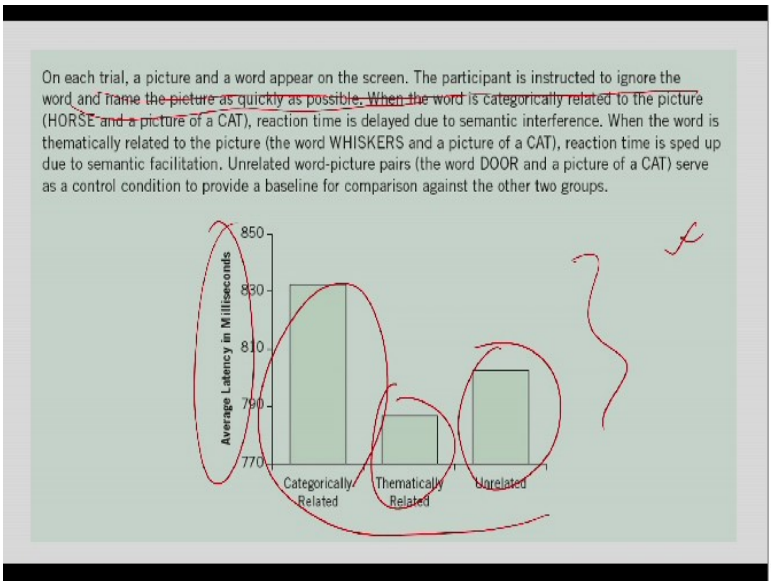

So although we have categorically related word, they compete for selection. But if we have associatively related word, they do not compete for the selection. And so this is the kind of priming that we have or priming effect that we have in terms of words and pictures. So this is on each trial, a picture and the word appears on the screen participant is instructed to ignore the word and name the picture.

So what I will do is I will leave it to you to read it and see how category related, thematic related and unrelated words, and this is the average latency. And so how they are related and what kind of timing that they are taking.

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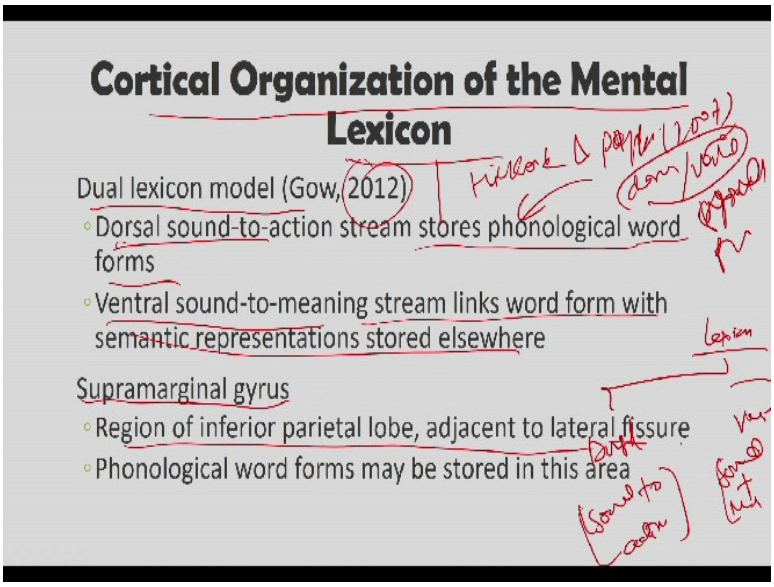

The next thing that we are going we are looking at cortical organization of the mental lexicon. So how is the mental lexicon actually arranged that is the issue that we are interested in. So there is something called a dual lexicon model. And so what does the dual lexicon model actually do. The dual lexicon model says that it was now as it was based on Hickok and Purple 2007 dual stream model, if you remember the dorsal and ventral stream in terms of speech production, the same issue has been used here or the same kind of conceptualization has been used yet.

And so what does it say in Gow propose this idea in 2012 and so what does he say that there are 2 ways 2 pathways in which the mental lexicon is actually arranged. So 2 mental lexicons are there, there is something called the dorsal lexicon and there is something called the ventral lexicon. Of course, if you remember Hickok and Purple idea of dorsal and mental stream in word, in speech production.\

The same concept has been borrowed here. And so what does it say is that there are 2 different kinds lexicons, which are there, you have the dorsal lexicon. So mental lexicon, is of 2 types, you have the dorsal lexicon, and you have the ventral lexicon, the dorsal lexicon or is defined for making sound to action, how sounds are converted into action, and the ventral lexicon is related to the fact of converting sound to meaning.

So the on one hand, the dorsal lexicon convert sounds into actions, the ventral lexicon is basically responsible for converting the phonological word form or the sound form of a word into its particular meaning. So dorsal sound to action stream stores phonological word forms and ventral sound to meaning links word with semantic representation, you have something called a supramarginal gyrus region of the inferior parietal lobe, adjacent to the lateral fissure and phonological word forms may be stored in this particular area.

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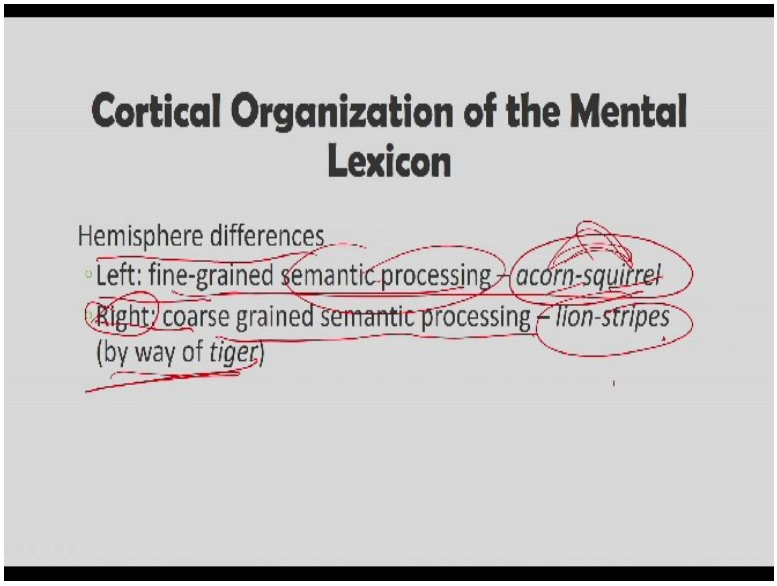

Similarly, there are hemisphere differences between them, for example, left hemisphere is fine grained and semantic processing, acorn and squirrel. And similarly, the right hemisphere is coarse grain and it processes something called semantic processing, which are of course gain. So if you are looking at relationship between lion and stripes, it is basically the right hemisphere, which is doing the action.

Because it is the way of the tiger which the comparison happens. But if you are looking at fine grain semantic processing, for example, 2 different kind of smaller animals, acorn and squirrel, in this case the semantic relationship is happening in terms of the left hemisphere okay.

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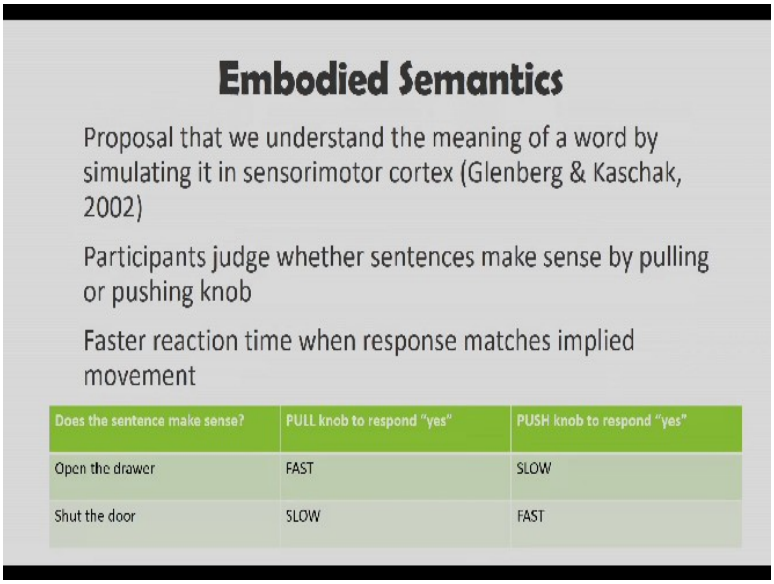

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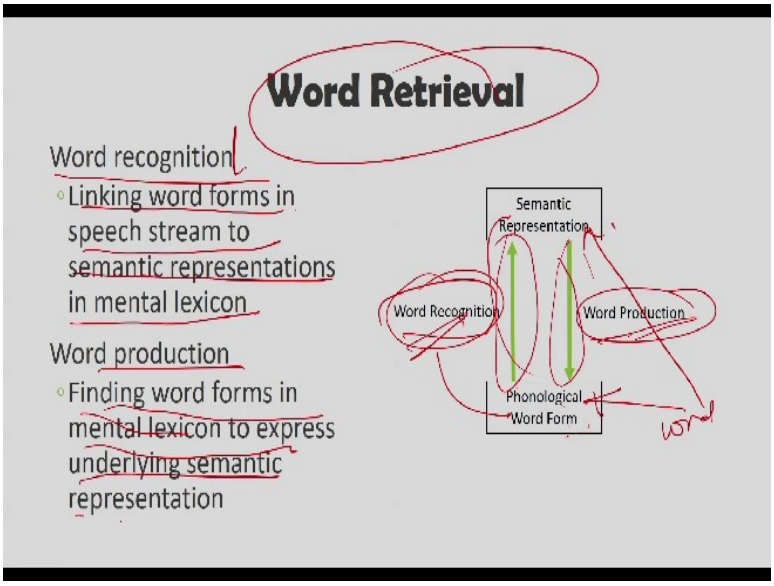

So now we are interested in finding out how these words are retrieved. And so we have a little bit about embodied semantics. And so what it says is that the body movement also has a lot to do with the understanding of the word or the learning of the word. And so I will leave it to you to read this and so what it basically says that the kind of movement that we do while speaking of word has an effect on how it is learned or how it is coded into the mental lexicon.

And so the last part of this lecture has to do with something called the word retrieval, how are words retrieved, now words are recognized, the word recognition happens by extracting the phonological word form. So, most words are recognized by extracting the phonological word of form, which is from the speech stream, and it links it to the mental lexicon or the semantic relationship.

So, as soon as a word is given to you, what happens is extracted from phonological form is extracted and semantic form is extracted and so they are linked together or they are linked together through the mental lexicon. So, the phonological word form relates to the semantic representation through word recognition, and the semantic representation is related to the phonological word form through word production.

So, in terms of word recognition we extract the phonological in terms of word recognition we extract the phonological word form and then link it to the semantic relationship, but for word productions what we do is we first find the phonological word form within the mental lexicon, and then express this in terms of the semantic relationship or thoughts. So, word recognition how does it progress by linking word forms in speech stream to semantic representation, in mental lexicon, this is how words are recognized.

So we link the word forms in speech stream. So, the way you speak to the semantic representation in the mental lexicon, and when we produce what happens is in part of word production we find word forms first in the mental lexicon, and then express underlying semantic representation in terms of phonological representations.

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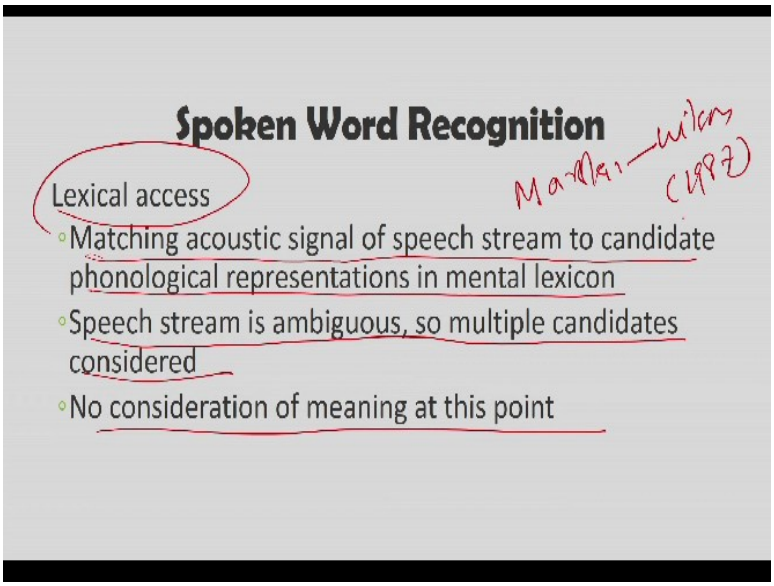

So spoken word recognition. So, how does it really work. Now hearing a word and making meaning out of the word has a 3 stage the processing and that was proposed by someone called Marslen-Wilson in 1987. So, they say that hearing a word and extracting meaning of it of the word or getting meaning out of a word spoken word recognition has a 3 stage access or a 3 stage processing system.

The first is called the lexical access, the second is called the lexical selection and the third is the lexical integration. So in the first stage what happens is and a acoustic signal from the speech stream is there and that acoustic speech stream or a acoustic signal from the speech stream is

matched to candidate phonological representation. So, all kinds of phonological representation is represented. So acoustic signal is there and this acoustic signal is then read by the brain and compared to all kind of candidate phonological representation.

So, the what possible phones or what possible combination of phones could actually mean what is being said or what is being extracted from the acoustic signal and so it is dependent on something called multiple passing ways and something called multiple word candidate. So, basically lexical access the first stage is spoken word recombination, in first stage what happens is a matching acoustic signal of the speed stream to candidate phonological representations in the mental lexicon.

Now, the speech stream is ambiguous. So, multiple candidates can be considered and no consideration on meaning at this point. So, the first stage the word phonology is extracted and this is compared to multiple a number of speed signals of that time and this basically is why multiple phonological forms are my multiple phonological presentation pronunciations or phones are present is because the words are passed by different ways and multiple candidates are available.

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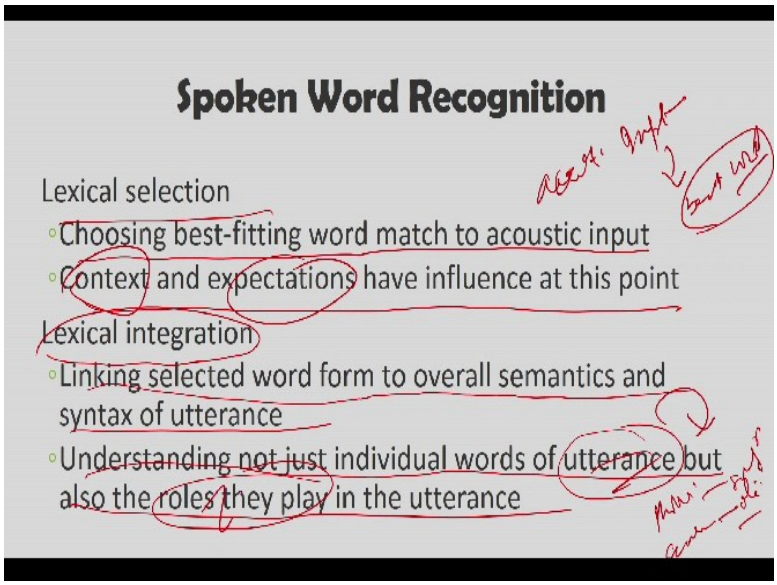

Now, the second stage is called a lexical selection, in this stage what happened is , best what is fitted, so choosing the best fitting word match to the acoustic input context and expectation ever influence at this point. And so the context in which it is so, what you have is you have a

phonology also the best phonology that you have that is extracted and then a meaning is generated of it and how the meaning is generated based on the context and based on the expectation.

So, what is their expectation and what is the context in which it is coming are best fit word is generated out of it, and the third part is called lexical integration. In lexical integration, what happens is the word form which is selected is related to the utterance which is the semantics and syntax. So, here what happens is the linking selected word form to overall semantics and syntax of the utterance understanding not just individual words of utterances.

But also the role they play in the utterance. So, here what happens is not only the single word that you have spoken order, the word that has come out of the acoustic signal that is generated or that is learned, it is also linked to or more information about this word is generated, and what is this information about, this information is about the utterance and also the role that this what is playing in the sentences.

So these kind of things are extracted from it. And so, there are 2 things phonological symmetrical representations and symmetrical representations other concepts are sentences, so, you **you** both generate the phonological, which is semantic representations of it, and then you have semantic representations which related to other concepts in the sentence. So what the word may actually mean in the utterance and what role this word is playing in the utter, that is how it is or that is what is extracted from it.

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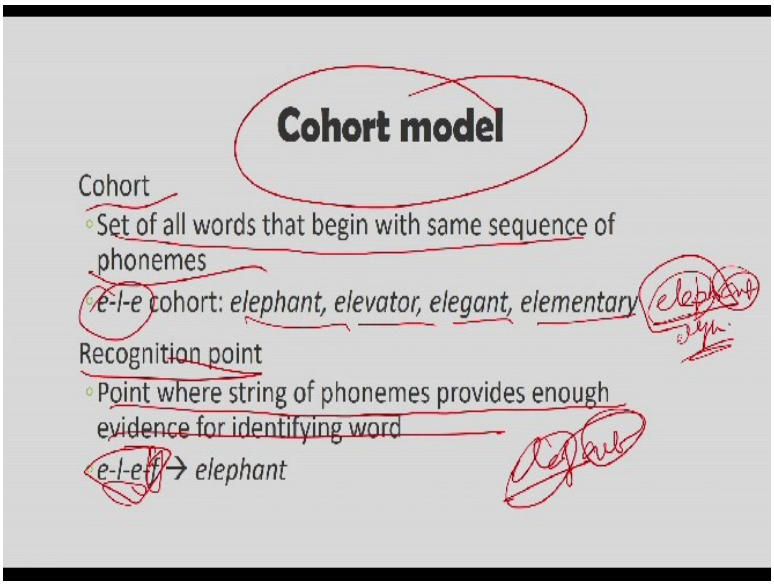

Now, most people or most word recognition theories work with something called the cohort model of word recognition. So, what is the cohort model of what the cognition the model of word cognition proposed that listeners initially consider all possible word, which matches to the incoming speech stream, but identify the word as soon as the recognition point is reached, that is the model.

So, it says that all possible word forms are considered when you are matching the input signal and you know what the best phonological fit and you matching this with the all the word which is present in the mental lexicon. Now, what happens is you consider all the word till the point of time that a recognition point is region from the recognition point on then you get the best word. So cohort word what is a chord first of all.

A cohort is a sort of words, a set of words that begins with the same sequence of phonemes. For example, look at the e-l-e cohort with the e-l-e cohort the e-l-e word we can have elephant, elevator, elegant, elementary, if I add eleph, this cohort then there will be only one word to it, which is elephant or eleph, then I can have some other word but then mostly you would not have a word.

The more number of phonemes you add to it, the lesser the cohort becomes. So, example cohort is set of phonemes. So, if you use the eld word you can have elephant, elevator, elegance,

elementary and so and so and other cohort you add to it elef elephant and you get elephant only and no other word is there. Now, the point at which a string of phonemes provides enough evidence for identifying a word is known as that words recognition point.

And so what is the cognition point it is a point where the string of one is provided enough identification for the word. So, elef and from there you know that the word will be elephant. And so, the word this particular point where I add f to the ele is what is called a recognition point and this is what the cohort model is basically composed of **x** of.

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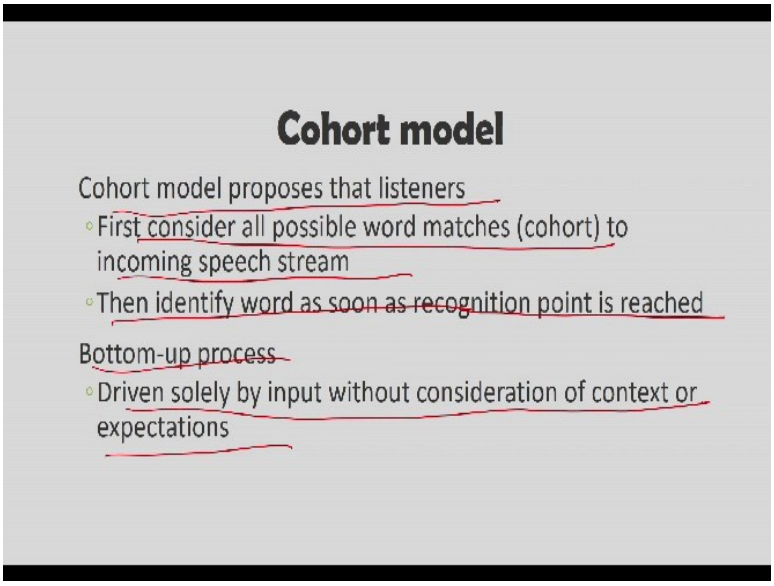

The **court** cohort model it proposes that listeners first consider all possible word matches cohort to the incoming stream and then identify word as soon as the recognition pointer is reached. Next acting all possible word falls from the speech how does it happen, it is a bottom of processes. So the bottom of processes reversed only by input without consideration of context or expectation. So, bottom up process even if context primes or context primes one word all words are cohort the activated.

So, what happens is that it through the process of bottom up without looking and expectations and the context all forms of the word is available. And so the cohort model says that we keep on increasing the phonemes and the point at which the recognition point happens at that point on the exact word is matched to the list of phonemes or the word that you are searching for.

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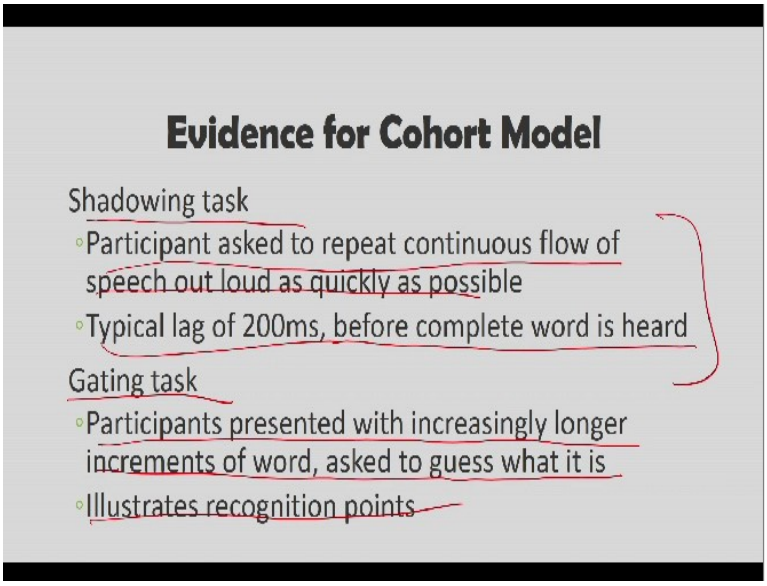

Now, what is the evidence for this cohort model, we have something called the shadowing task what happens here is the participant is asked to repeat continuous flow of speech out loud as quickly as possible and typical lag of 200 milliseconds before complete word is heard. And so, this basically shadowing task is you have to repeat continuously and so even if 200 word 200 millisecond lag is that people are able to produce complete word.

And so this basically says that the cohort model that all forms of the words are available, we also have something called a gating task and which participants presented with increasingly longer increments of word asked to guess what it is illustrates recognition points. And so what happens is the point at which the recognition happens after that if we increase the number of word nothing is going to happen the recognition will still take place.

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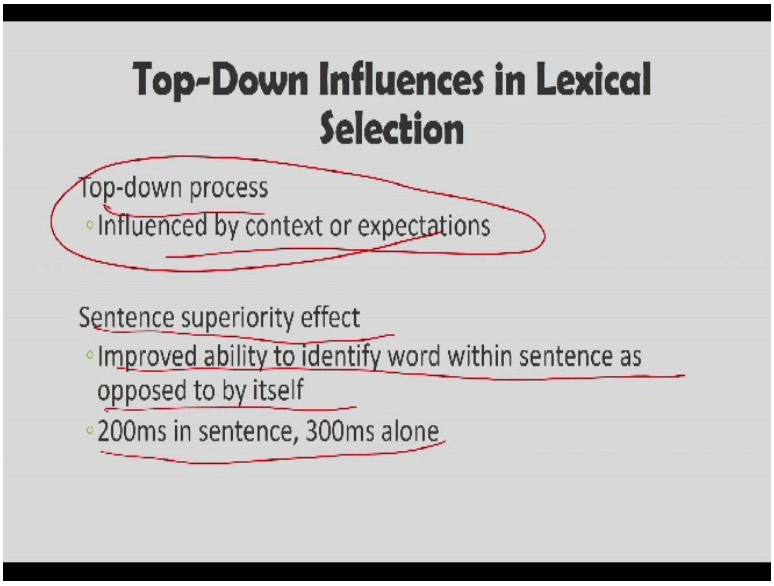

Now top down influences in lexical access, top down influence are influenced by context and expectations so word in recognition is influenced by the context in which the word is coming on the expectation that people are sentenced superiority effect, improve ability to identify words within sentences as opposed to itself. So, it has been believed that if a word is producing a sentence, it takes one 200 millisecond for the word to be identified.

But in the same word is presented to you alone, it takes a longer 300 millisecond for you do identify the word.

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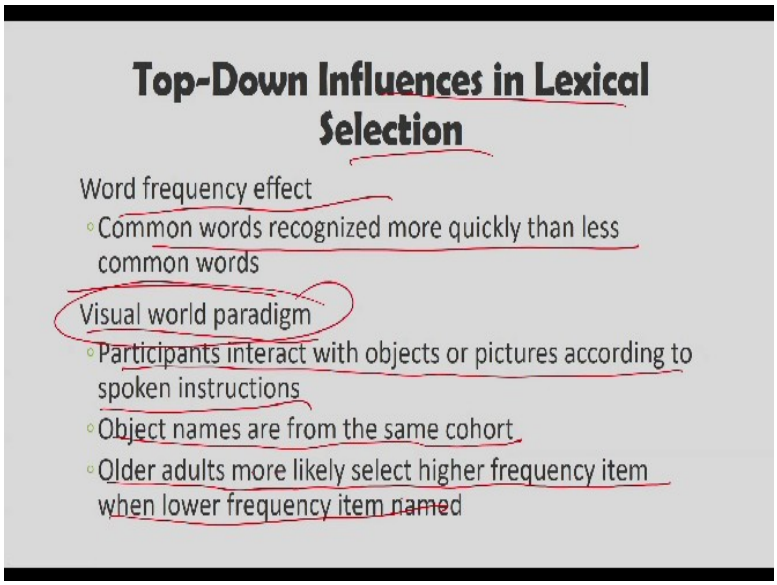

Also we have something called top down influence in lexical selection. So, what a frequency effect common word recognize more quickly than less common words and also individual world paradigm what happens is participants interact with objects and pictures according to spoken instructions, now object names are from the same cohort or older adults more like to select higher frequency item, then lower frequency items.

So visual word paradigm shows that this frequency word frequency has a say in the kind of selection that happens.

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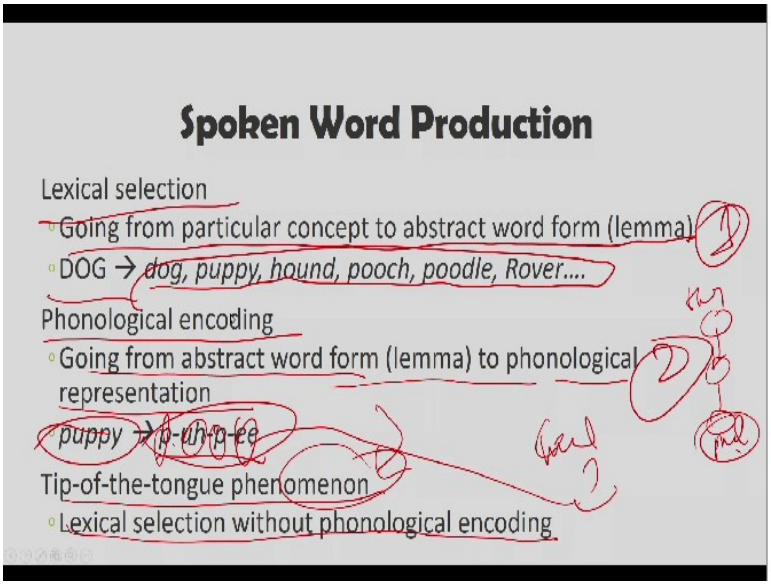

Now, what spoken, spoken word production, how does the spoken word actually get produced. There are 2 stages of production of the spoken word, one is called the lexical selection and the other is called the phonological encoding. Now in the lexical selection, what happens this particular concepts to abstract word from the lemma and the phonological form encoding what happens is abstract word from the lemma is later the phonology.

So first, you start with finding the correct word to represent a thought. And then you relate this word to the phonology or to the pronunciation that is how the spoken word production really takes place. So firstly, the lexical selection going from particular concept to abstract word form lemma, for example, dog it could mean dog, puppy, hound, pooch, poodle, rover, we have to select one of these. In the phonological encoding, which is the second step.

So, this is step 1 , and this is step 2, in theological and you have to start going from abstract word from lemma to phonological representation. For example, if we select puppy, then you have to look at p uh p ee pa pee, this is the phonological excess, now tip of the tongue phenomena is basically represents that this kind of phonological access if you are not able to produce certain words it because of the phonological accesses, not correct or not, has been not approved.

And so lexical selection without phonological encoding can lead to this tip of tongue phenomena. So you know the meaning of the word, but you do not know how it is pronounced and that is what is the tip of tongue phenomena and this basically says that there is no systematic relationship between meaning and sound and also the tot abstract lemma form exists.

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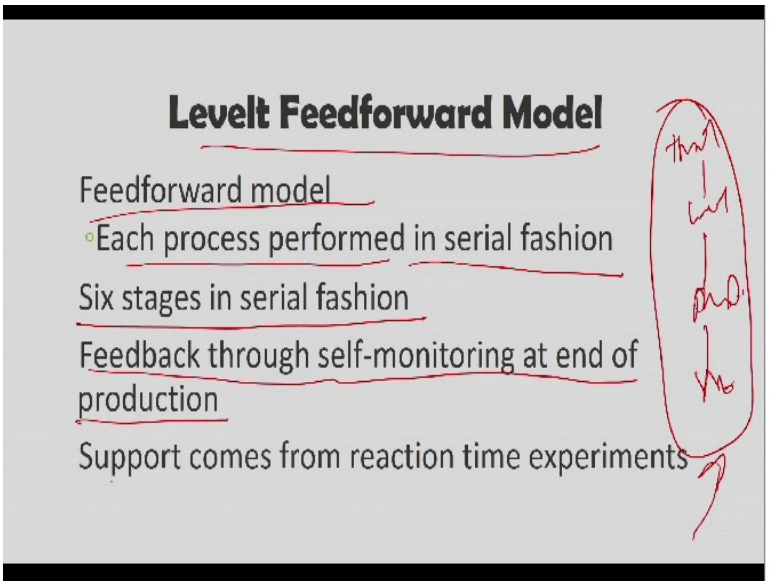

Now, there are 2 models which have been **prop** proposed to look at how word production is done. One is called the levelt feedforward model, and the other is called the interactive model. Now there is a difference between the feedforward model and the interactive model. Now, as we know, the recognition starts by first naming the thought through a word, and this word is then related to the phonology of it, and then a pronunciation is made.

This is how you produce words. Now, there are 2 ways to look into how these words are produced. The first is called the feedforward model in what happens is that each step progresses one by one, and there is no interaction. In the interactive model all stages of the model interact

with each other to produce the word, now in the best model to explain this word production is something called the levelt feedforward model.

And so what is this model, it is feedforward model, which is out there. And what it explains is that lexical selection leads to phonological encoding. So there are word less thought and this word less thought how it becomes sound wave is what the feedforward model explains through 6 stages. And what are the 6 stages which are connected to or how are they are connected they are connected both in a feedback manner and a feed forward manner.

Feedforward is how the model we processed or progress and feedback is our monitoring process, which is embedded in the model to monitor if the model is working in the right direction, and this is thinking without language leading to lexical concept. So there are 6 steps to it we look into the 6 steps one by one. So, each process performed in a serial fashion, 6 stages in a serial fashion.

Feedback through a self monitoring at the end of the production and support comes from reaction time experiments.

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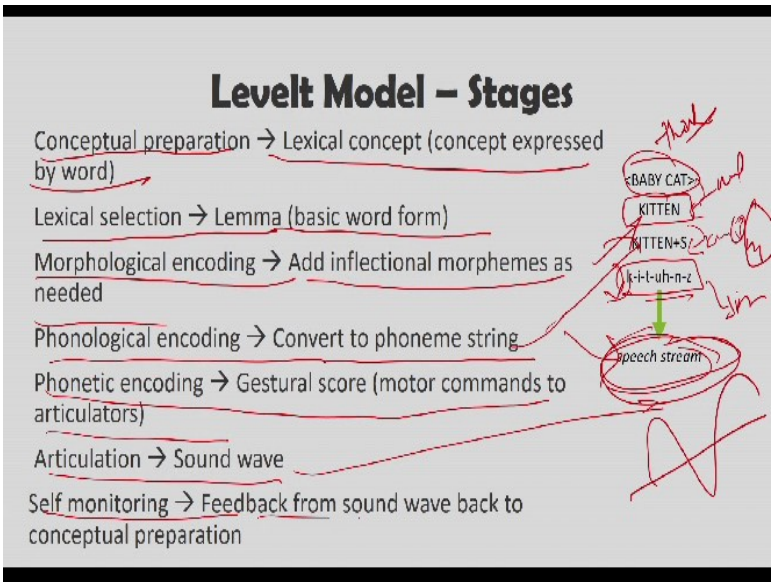

Now, what are the stages which is there, for example, we think about a baby cat and then we get the word for it kittens, and then we look at the phonology of it, so kitten and s and then the phonology is kittens and then we convert it into the speech stream. So, this is the thought, this is

the word, this is the grammar and this is the pronunciation and this is the speech stream or how the wave pattern will look of kittens.

So, the first level is called the conceptual preparation level. Here the lexical concept, the lexical concept of the concept is expressed by word in the second stage, the lexical selection, the basic form of the world is selected in that morphological encoding form and inflection morphemes are needed. So, this is the morphological form, then the phonological encoding conveys the phoneme strings, this is the morphological form and this is my phonological encoding.

The phonological encoding gestural score motor commands on articulators is done by the speed stream and articulation or the sound wave. So, here remember the motor theory what it say is the way the pronunciation is that that will tell the motor movements or that will generate the motor movements will actually generate the word and so that signal to the articulator is done by the 6 stage.

And then there is a self monitoring stage which is a feedback from the sound wave to the conceptual preparation. So, when you hear what you are saying, and that integrates to the concept of the word, you will feedback that whether you are saying the correct word or not, and so on and so forth.

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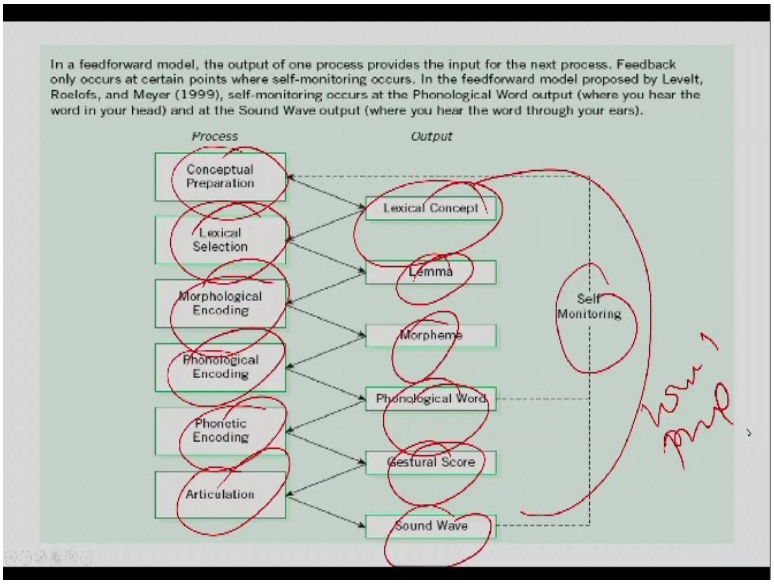

And so, this is how the model works. So, this is the process conceptual preparation, lexical selection, morphological encoding, phonological encoding, phonetic encoding, and articulation. This is the lexical concept, the lemma, the morpheme, the phonological word, gestural score and the sound way and there is a self monitoring step one by one and this is how the word is produced, this is one model of it and this is called the feed forward model.

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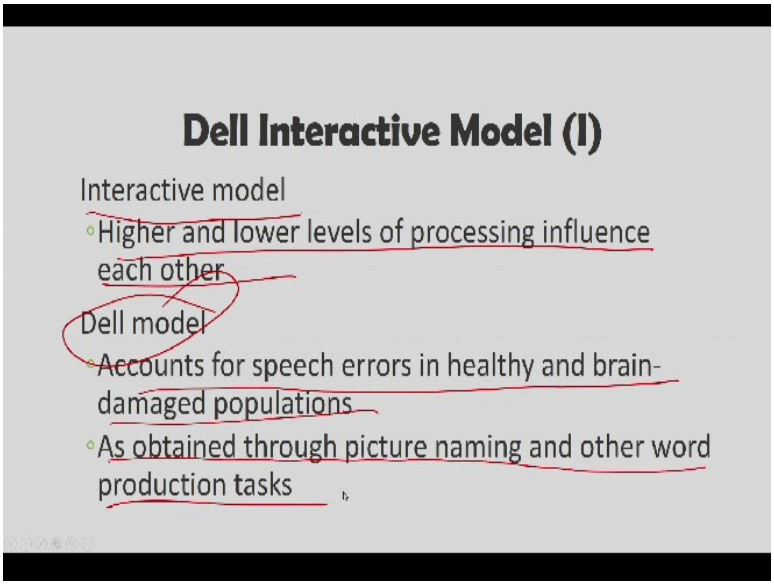

There is another model which is called a dell interactive model of the word production and this comes from this model was developed from errors in healthy people and interactive model it says that there are higher and lower levels of processing influence and they influence each other. The dell model, it accounts for speech errors in healthy and brain damage populations, as obtained through picture naming another word production task.

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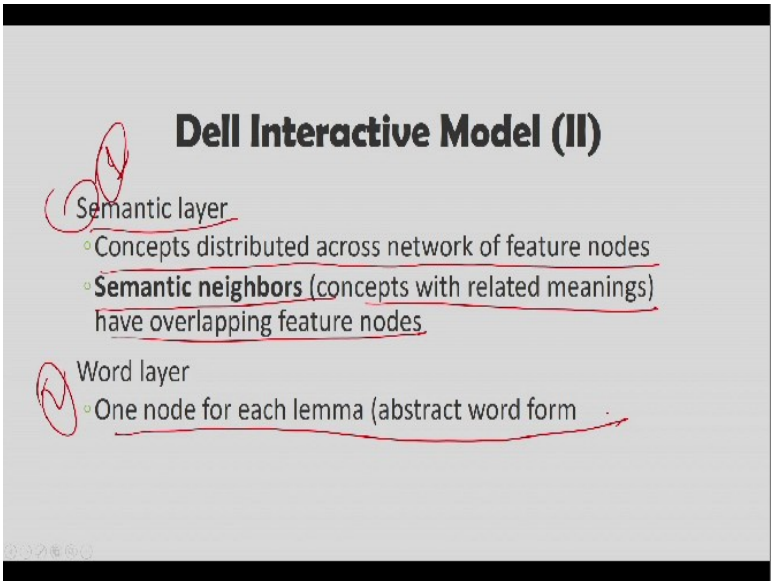

And so what does this model like. This model says that there are several layers and the several layers of the independent processing and in between the layer there are several processors which integrate the layer together. So you have a semantic layer in which what happens is concept distributed across the network as feature nodes, semantic neighbors, concept with related meanings have overlapping feature on nodes.

So you have a semantic layer, then this is the first layer you have something called the word layer, one node for each lemma or abstract form.

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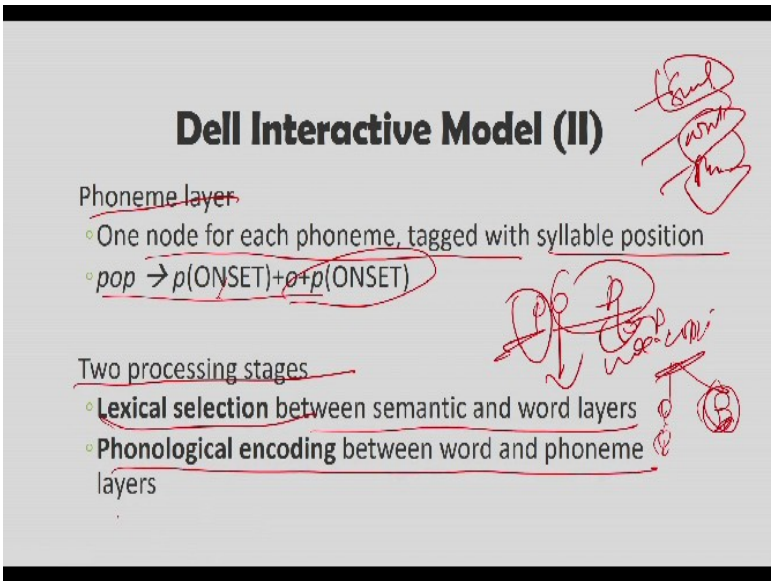

And then you have the phoneme layer, which is one node for each phoneme tagged with the syllable position pop p is the onset op is the . So, in pop you will have p as the onset op as the coda, and in the op you have the o as the iun nucleus and the other p as form of it, if you remember, forgetting a little bit, so this is basically the, first access and the second. So this is my vowel and this is my consonantal string in it.

And so the nucleus and the coda, which is basically so, if I am remembering right, that is how it was defined, and then you have to processing stages. So, basically, there are 3 layers, you have the semantic layer, you have the word layer, and you have the phonological layer and each word each of them have separate representations and they are connected together by using the lexical selection processing stage between semantic and word layer and phonological encoding between word and morphemes layers.

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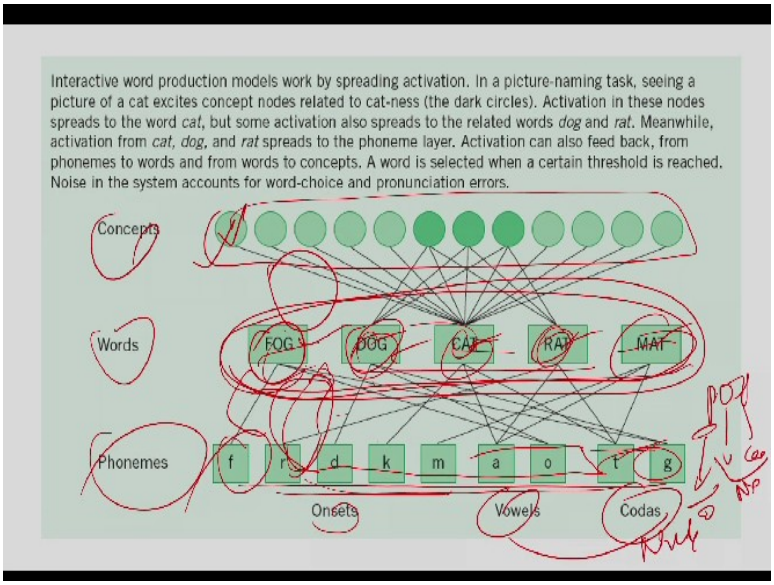

So basically, as soon as somebody says are you think about kittens, the concept is generated first and then it is related to this concept then or if you have yeah, so kitten, so word is so the concept of the kitten is generated, and so layer at this level, and so then this level talks through lexical access or to the word layer. In the word layer you will have so you are thinking about kittens and so all words related to kitten gets excited so frog, dog, cat, rat, mat.

Now cat, rat, and mat will be excited and frog and mat will not be because these are all those similar in word which are sounding similar, but they are not meaning similar. And then there is a

phoneme layer in this phoneme layer, you will have the dog, the cot, rat, and so these phonemes the onset vowel and coda, and these 2 are called the nucleus right. So, remember the pop, so p is the onset, the vowel is o, and this is the coda and this together is the nucleus and this is called the onset.

So, this is how the thing really works. If you remember from or if you look back at lectures, you will see that how these things are explained. So basically, what will happen is these phonemes, then we will compare itself through the process to the second process, which is called the phonological encoding and this phonological encoding process. So, here is my phonological encoding process, what it will do is, this kitten concept is generated and then the kitten is then not related to or it is matched to a word.

And so these are the words which are clauses and these are words just for the part and the words which are related to it, these words will actually have certain phonological representations or certain speech sounds and those these speech sounds will be excited, the ones which are excited at these and the ones which are not excited are these example f and these are the little excitation.

So, it will take feedforward from here, it will take input from here, it will take input from here, and the finally word is then identified and this is how the interactive model works. So, it is against the idea of how the feedforward model says that one stage after another state, here what happens is the processing happens it all the stages through all the processes which are available.

And so this is how the word processing happens using something called a dell interactive model. So this brings us to end of this lecture, where we were looking at what we did was we started of this lecture by looking at how the word is represented in the mental lexicon. So we look both at the phonological, the phonological way in which the word is represented in the mental lexicon.

And we also looked at the semantic way in which it is stored. And so we looked at these representations, how the word I learned and words are represented through these kind of property or these kind of representations. So, what we did was we looked at several factors, for example,

the bass frequency effect, and all those decides out is delayed. So we looked at the mental lexicon as both the taxonomic and thematic relationship in which the words are represented.

And so we looked at how these representations are basically used for accessing the mental lexicons. Further to eat we looked at how the acoustic signal is generated into meaning and the meaning is generated into the 2 stage model or the dorsal and the ventral stream and how these 2 stage model actually experience the storage of word. Then we looked at how the words are retrieved from the mental lexicon.

And so, we looked at both the theories of spoken word recognition using either the cohort model or the extracting of information based on levelt model or which is feedforward model or the dell interactive model. So what we did here is we looked at how not only how words are learned, what is the word or what is the anatomy for word how it is represented in the metal lexicon.

We also looked at how they are recognized. Now when we move ahead and meet in the next lecture, what we will do is we will go a step ahead and maybe start looking at how these words are expressing sentences and how sentences are constructed and what are the various aspects of sentences. So you up till we do that, and meet in the next lecture, it is thank you and goodbye from here.