Psychology of Bilingualism and Multilingualism
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Hello and welcome to the course introduction to The Psychology Of Bilingualism And Multilingualism. I am Dr. Ark Verma from the Department of Cognitive Sciences IIT Kanpur. This is the final lecture of the third week and we have been talking about speech production in bilinguals and multilinguals. Now while in the previous two lectures I took in some details of the speech production process although we were talking mainly about monolinguals and we discussed that these models may need to be tweaked a little bit to account for bilingual speech production.

In this lecture I will dive a little bit deeper into cases of bilingual speech production and we will try and understand what kind of processing assumptions, what kind of tweaks may actually be necessary which will explain how bilinguals actually you know accomplish seamless speech production as well. An interesting illustration of the same has been offered by you know Kroll and colleagues for bilingual picture naming which I will just come to in a bit. Now picture naming is one of the simplest task that are used to experimentally illustrate speech by word production researchers as it involves processes that are very similar to you know the entire gamut of speech production that we saw conceptualization, formulation and articulation as we have been discussing. Now more specifically the process of speech production has been proposed to consist of the same sequential operations say for example, computation of the visual percept basically helping us think about oh what what do I want to talk about, activation of the appropriate lexical concept oh I am seeing a car or I am seeing a pen I should talk about a pen something like that, the selection of the target word from the target from the mental lexicon, activation of phonological you know codes phonetic encoding and finally articulation.

So if you want to sort of study the process of speech production in the lab if you want to you know create a dummy or create a simulation of that entire process picture naming task is one of your best bets because you can basically see how people go through these steps of you know production of speech starting from the first at the conceptualization level to the articulation level and you can basically study that in much more detail because the conditions and the properties of the pictures etcetera can be controlled. Zooming in when a picture of a concept is presented to you, you initiate the perceptual analysis of that picture and you basically come out you basically come out by activating

the conceptual nodes in in your semantic memory that are associated to that picture. For example, if I am presenting to you a picture of a cat or a dog or a picture of a fruit, apple, mango, banana what you will first do is you will perceptually analyze the picture and once you have analyzed that picture you will basically recognize that object. Recognizing the object basically would imply that you have tagged a specific word in your memory to that picture oh this is the picture of a dog, this is the picture of a cat, this is the picture of a mango or an apple or a banana and that basically what would would result in activating the aspects of meaning of that picture that are related to that picture and each of these words that are getting activated in your mental lexicon will basically specify one aspect of the meaning of this. So, in some sense you could say is that initially when we are seeing a picture or when you are shown a picture the exact word you know gets activated, but before the exact word is selected a bunch of words get activated that start explaining aspects of that picture.

Say for example, if I am showing you a picture of a dog maybe fur gets activated, forelegs, snout, mammal, canine all of these things can get activated which share meaning with that particular picture. Now if you look at you know if we go back towards levels model and some of the suggestions that DeBOT and Schuder made these activated conceptual components would form the preverbal message. So, in the preverbal message where you have not exactly selected the specific word associated to that picture you will basically have selected a sense of that picture. In some way a number of words that combined together to describe that picture. So, a furry animal for you know legs having a snout has a tail, canine, barks, lives in a canal you know you may like the animal or not and bunch of these things get activated.

So, what really would happen is that aspects of this words meaning would get distributed over several elementary meaning units in a form of a distributed representation all right. So, moving forward you will see that these conceptual components would feed down their activation to the lemma level using unidirectional links. So, from conceptualization phase to lemma level there is a unidirectional link feed forward way of activation where each word is represented as a single non decomposed entity. So, at the lemma level what you are having is you are having specific words and the word which most appropriates the number of meaning the nature of meaning that has been activated in the pre verbal message will get the highest activation. So, for example, when I say furry, four legged, pet, has a tail etcetera then both cat and dog may get activated, but as soon as I you know also look for a matching for the word snout then the dog which matches this entire message much better and therefore, the word dog will get selected.

So, at lemma level you will not have a decomposed componential representation, but

you will have a single non decomposed entity which will be that word which you will select. So, the activation here the interesting part with bilingualism the activation here is not restricted to the lemmas from only the target language, but also the lemmas in the non target language as well. So, for example, it could lead to activation in translational equivalence of the picture   as well. So, for example, if I am talking about if we are talking about the word dog the Hindi word kutha or the Spanish you know word pero would also get activated if I were to know Spanish as well. So, lemma activation you can see here is language non selective basically saying that lemmas from both the target language and the non target language are getting activated once you are moving down the   conceptual   you   know   ladder.

  Now what happens from here on?   From here on from the lemma level activation spreads unidirectionally to phonological units. Now what is happening is activation from the lemma level you have to select a particular lemma and from here activation will spread unidirectionally to the phonological level where the phonological word form is presented. So, for example, if you are saying dog it has three sounds duh and guh these phonological units will need to get activated each representing a part of the sound of a given word. For instance one phoneme duh or guh or a and so on and so forth. This is the description of the Kroll's model you can see here that say for example, the picture that is shown was that of a cycle you have a distributed representation at the conceptual level, but you when you go further down you see at the lemma level these are specific words   okay.

  Fietze is the word in Dutch, beig is the word in English and this is basically how a bilingual Dutch English bilingual will sort of go ahead through these processes. Eventually however if you see the phonology at the phonological level only the phonemes or only the sounds of the selected target language are getting activated, but not of the non selected or non target language. So, this is just an appropriation of how speech production or picture naming would play out in a Dutch English bilingual which was explained you know in a paper published by Kroll and colleagues in 2005. Now according to this model the activation of phonological units happens for the most activated word as I just said for the target language and for none of the words from the non target language. Now if you look at this in a little bit more detail the processing assumptions at various levels in the current model as well as in some others have been subject to some disagreements some deviations as well because every time you know somebody sort of comes out and proposes a model they propose the model with certain you know parametric assumptions in mind, but obviously you know with new data and new experiments coming up some of those assumptions may need to be tweaked and obviously in science not everybody agrees with everybody else's assumptions and for that reason you can see that various models explain the same process to different degrees

of   success.

  Now just coming back to what we are talking about here for instance levels model proposes a unidirectional movement of activation from top to bottom whereas some other monolive models that we just saw spreading activation model assume both forward as well as backward you know spread of activation.   Hence they are proposing bidirectional connection between levels of representation say for example from concept to lemma to phonological level while for levels model this is unidirectional going forward for Dells model it could have feedback loops as well. Also instead of non-decomposed representations at the lemma level just as has been described in Kroll's model some other authors such as Dell and Butterworth have assumed that the semantic aspects of a lexical entry could be componential or could be decomposed and not necessarily represented in a single entity. This kind of view is very interesting because it can explain the activation of several candidates at the lemma level as well that have matching meaning components with the target lemmas. For example when I am you know talking about a pet animal when I am talking about or a particular fruit or a particular type of furniture there are aspects there will be you know meaning aspects in you know whatever picture you know I have been shown there will be other concepts which will share meaning aspects with that and they will also get activated and that you basically would help explain why there is so much competition at the lemma level as well.

  So these kind of models which assume the non-decomposed view of lemma representations   is basically explains you know is better explained in terms of the spreading activation in the lexical semantic network wherein semantically related and similar items are connected and activated in one are connected and activated such that one if one is getting activated it will activate others as well. So there are these there are these two sorts of you know ideas that are there you can have a decomposed componential view of representation at the lemma level you can have a single entity view of representation at the lemma level. If you are having a if you are having a componential view then everything that shares aspects of meaning gets activated. If you have a decomposed view then how you explain it you will basically say that okay all these related concepts are connected to each other in a particular manner if one gets selected the others will eventually get some activation as well and will become available for selection. Now interestingly if you assume both the existence of pre-lexical conceptual elements as well as lexical lexical semantic conceptual elements the latter will be you know part of the lexical entry into the lexicon it leads to the doubling of components you know whether you are having single entities or whether you are having shared entities if you are having both then it basically you are having to store information at two places one at the shared meaning level and one as the single meaning level as well.

This is why some of the more recent models have basically proposed that lemmas will not contain or lemmas do not contain both the lexical items semantic and syntactic information, but it they will only contain the syntactic information about the target lexical item. Alfonso Caramazza actually offers a more radical solution based on some of these evidence from you know based on evidence from a diverse set of neuropsychological studies where he proposes an independent network model wherein lemmas are dismissed altogether. They say Caramasa opines that lemma level of representation is not not required at all. He proposes in this model that a word's phonology is independent from access to semantic information and a word's syntactic makeup is not prepared prior to, but independently from specifying its phonology. So, basically what we are saying is the phonology and the syntax of a word when it once it starts getting activation from the phonological from the conceptual level will be both activated   independently.

So, in the model that Caramazza proposes the independent networks model how would activation work? Activation from a lexical semantic network would flow down directly to both phonological lexemes and to syntactical features and then from the phonological lexemes to segmental phonological information which is say for example when I am talking about the word mango ma n g o and so on. So, basically what we are saying is that there will be the strain of events from conceptual level to phonological units to sub lexical phonological units and this will somehow be connected to the syntactic unit as well. Let us look at the figure to understand this. Here you can see Caramazza's independent networks model. You can see the lexical semantic network contains distributed representations of the meaning elements whereas, and they activate the phonological lexemes which further activate the sub lexical phonological codes, but which are also coordinating with the syntactic network which has information about the syntax   of   these   you   know   to   be   activated   words.

So, the you know what we see is that direct connections are postulated between the phonological lexemes and the syntactic features network and such a setup is considered independent because the activation of lexemes is no longer tied to the activation of semantic information. This is happening both independently. The   model proposes componential instead of non decomposed word meanings if you if you noticed the top level here it basically has component it basically has a distributed representation of meaning as opposed to a single non decomposed level which was seen in earlier models. However, how these lexical components are activated because of prior conceptual processing is not really been described in a lot of detail. Now, finally, in models of speech production what happens a lot of times is that the processing assumptions are not explained in a lot of detail and because they are not explained in a lot of detail they may

have   a   potential   of   getting   confused.

 For instance say for example, in a model of you know bilingual   picture naming representing the naming for cognate and non cognate items can be taken to resemble Kroll's earlier model as well, but actually has slightly differing assumptions. You can look at this model here at the top you are looking at cognate level representations Gart and Gato in Spanish and Catalan whereas, you have two other things tau line mesa which are basically words for the concept of table, but are non cognate. You can see here that the way processing really happens in cognates because they also share sub lexical phonological codes is different from you know in non cognate activation because they are not sharing the sub lexical phonological notes. So, the processing is happening slightly differently. Also there has been a dispute about whether the conceptual message contains information   about lexical semantics or a pre-verbal conceptual structure.

 More specifically the dispute is is whether word meanings exists separately from general conceptual knowledge or they exist together. Now, why levels model assumes this to be the case that you know they are existing separately the other researchers have put forward the view similar view as well. For instance the distinction between lexical semantics and general non linguistic conceptual knowledge forms the basis of a three store hypothesis which is put forward by Michael Paradi. Now Deboert and Schuder have also distinguish between the two and said that lexical semantics and the pre-verbal message are actually different entities and need to be specified differently. Again what we are basically seeing in this lecture so far is that the processing assumptions for when you are talking about bilingual speech production are slightly different are slightly more nuanced as compared to the processing assumptions that we could run with when we were   talking   about   monolingual   speech   production.

 Francis for example, has put forward a slightly more simplified view of the relationship between general conceptual knowledge and lexical semantic concepts. He says that all humans possess a non linguistic conceptual system consisting of a large set of conceptual elements. For example, we were talking about features, we can talk about functional properties so on and so forth. Whereas semantics is actually involved in this when the conceptual system maps onto language or more you know precisely instantiates language. Now the idea here is that there is a general conceptual pre-verbal setup which has aspects of meaning which has you know which is basically more has more to do with our semantic memory how information is organized in our semantic memory.

 But this pre-verbal conceptual structure will need to map onto language only when it basically needs to be expressed using a particular language. This is where the semantic notions will come into play which will basically say oh this aspect of meaning is better

described by candidates from this language and so on and so forth or this word is the better word within a language as well this word is a better word that can expresses the idea that I want to talk about. According to this view word meanings do not exist separately from the knowledge store that contains non linguistic conceptual information, but are actually represented by subsets of units in the store. So, the idea is that the conceptual store is in some sense a super set of all that we know about the world about these concepts about their aspects of meaning and related knowledge. Whereas, lexical semantics basically is just a subset of this entire thing which basically represents information which maps on very neatly to lexical concepts in a given language.

Now this way what would happen is that the same conceptual element in the store may serve as a component part of meaning of many words you know that is why we have synonyms and that is why we have you know translational equivalence when we are talking about bilinguals. Any word meaning is identified with a subset or particular pattern of a activation that happens across this entire conceptual system. So, what we are basically saying is meaning is more is represented in a more distributed fashion whereas, lexical semantics basically all of those words will get activated which share meaning with the concept that we are selecting for production ok. So, you can see here this problem can be discussed in terms of monolingual speech production as well because you have synonyms in a given language, but this problem sort of amplifies itself a little bit when you are talking about bilinguals or multilinguals because for the same concept they may have words sharing meaning with that same concept across these three languages and within each of these three languages as well. So, you can see the amount of competition that is hypothesized or that can be assumed to happen in the setup will be slightly more and therefore, the models will become slightly more nuanced slightly more complicated when we are talking about bilingual or multilingual speech production.

That is all that I wanted to say here I will continue this discussion on speech production bilinguals and multilinguals in the next week. Thank you.