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 at IIT Kanpur. This is the third week of the course and we are talking about speech production in bilinguals and multilinguals. In the previous lecture I talked to you about model of speech production in monolinguals which is the Levelt-Weaver plus plus model and we discussed the stages in speech production that are there starting from conceptualization formulation to finally articulation. In today's lecture I will sort of you know look slightly deeper into some of the processing assumptions of the model and the implications of those processing assumptions for how speech is produced.

And then while I am discussing this mainly in the context of monolingual speech production it might be interesting to think how these assumptions or how these implications of you know processing assumptions may get slightly changed or tweaked when we are talking about bilingual speech production. Now the Weaver plus plus model actually assumes a very specific kind of information flow as activation goes you know as people go from activated concepts and the conceptualization phase to activated lemmas to activated set of syllabified phonemes. So you are starting with conceptualization to selection of lemmas to finally selecting actual sounds which need to be produced by the articulatory system. In particular if you note that this model assumes a very strict feed forward pattern of activation and there are no mutually inhibitory links or no feedback is actually present in the way this model.

So according to Weaver plus plus production would begin with a set of activated concepts which lead to the set of activated lemmas before phonological information can be activated and one of those lemmas needs to be selected for further processing. So once you have activated you know once you have a set of activated concepts you have to select one concept that you want to talk about then you go to lemmas you have to select one lemma that you want to use up and then you go to you know activating the sounds. The sounds will be activated only for the selected lemma but not the other lemmas and so on. So it is basically a very serial a very feed forward way in which the model specifies its functioning. Now remember whenever we talk about models in cognitive psychology the models are best approximations of you know whatever kind of data is

available and they are not always correct they are not always I mean not every model has the entire solution of how the process happens they are basically approximations of how the researcher is thinking that this would play out.

So while Weaver plus plus falls within the feed forward class of processing models because information is obviously moving only one direction from the top to bottom and does not allow feedback there is also possibility of alternative ideas where other models would say that okay there is you know some kind of feedback available and it could offer us alternative suggestions. Looking more closely just sticking to levels feed forward model for the moment if this happens what would happen is if this is correct then what would happen is lexeme at the lowest level when you are talking about phonological words will not be able to feedback and influence the activation of lemmas and lemmas will not be able to feedback and influence the activation of the concepts. So sticking to this if somebody commits a error let us say a semantic substitution error which may happen say for example if you have asked people to do a timed picture naming task what would happen is that individuals will you know in semantic substitution what happens is if you give somebody a very you know a timed picture naming task you are showing them pictures of different kinds of animals or fruits and so on and so forth sometimes by mistake what a person would do is that if you are showing them a picture of a rat they could say cat if you are showing them a picture of a cat they could say dog but again this happens very very rarely but when it happens how does it happen basically if you try to explain that using this model it would basically the current levelt plus plus levelt view plus plus model will explain it by saying that because a target concept is activated you know related concepts as well sometimes the wrong lemma may have been selected. So whenever you are starting to think about a four legged furry pet animal you may start to think about a cat or a dog at the same time and during selection what may have happened is erroneously you have selected the lemma for dog while you actually intended to select the lemma for a cat this is one kind of explanation for semantic substitution errors. An alternative account you know which allows for feedback and cascaded activation would probably explain this in a slightly different way.

An alternative model of this kind is Dell's spreading activation model which differs from the way Weaver plus plus explains the semantic substitution errors. According to Dell's model information should be allowed to flow both in a feed forward and a feedback direction and also information also processing at a particular step basically does not need to finish before processing at the next step starts. Basically Dell's model says that in a spreading activation type of a setup activation is allowed to flow in a cascaded manner. So whenever some processing starts at the top level some aspects of processing have already initiated at second and the third levels as well which basically helps the system to be prepared and more ready for the task that will come in the future. Now in this

spreading activation model by contrast as soon as activity will begin at one level as I am saying activities will start to spread to the next level as well.

Now in this model if you want to explain how semantic substitution happens it could be explained that if the lemma of a cat gains some activation by seeing a picture it will feedback to the concept layer and reinforce the activation of a cat's conceptual representation. If phonological information associated with the pronunciation cat begins to be activated it will feedback and reinforce the activation of the cat lemma which will again feedback and strengthen the activation of the cat concept. So this basically explains why the errors of semantic substitution are so very few and they rarely only happen. Now other implications of you know having feed forward or having both backward and forward information flow is that and also having this you know cascaded flow of activation it can help us to explain a number of findings which have not been accounted for by Levelt's model. For example feedback connection from phonological processes to the lemma level can explain what is called the lexical bias effect.

Just as an aside the lexical bias effect is basically when people are making sound exchange errors they end up producing actual words rather than non-words. If you are mixing sounds and erroneously speaking out something that whatever you speak out has more chance of being a word than being a non-word. Let us look at this a bit more closely. Now if speech errors simply reflected random errors in phonological units and random selection of phonological units or execution of articulation there would be no reason why sound exchanges almost always would result in an actual word being produced because then there is no pattern to it there is no constraining there is no scaffolding at this. However also if errors are purely based on hiccups in the phonological output then you would just be as likely to produce an error such as blip or clip or any random gibberish sound that you would produce.

But typically if you look at how speech errors really happen if you look at the you know the amount of speech errors or the type of speech errors people commit you will find that speech errors mainly sound exchanges never really violate the phonotactic constraints of a given language. They end up creating more word like errors or word errors as opposed to non-word errors. So for example if a person is asked to speak big feet again and again and again and again they are more likely to reverse the first syllables of big and of a b and f in this and end up speaking fig beat much more likely than if they were asked to speak big horse and then they would commit an error. It is the chances of error happening here are much lesser than the chances of error happening for big feet. Why does that happen? Because when you flip the sounds of big feet you end up with fig and beat which are both actual words and in this feedback loop they will still have some support from the phonological from the lexeme level to the lemma level to the

conceptual level because these things still exist in our mental lexicon.

If you flip the sounds of big horse you are going to end up with hick bores and as soon as a feedback loop sort of starts it will not find support in the adjacent top level or its you know second adjacent top level and it will be very quickly set aside. So this tells us that there is a lot of merit in assuming that speech production actually has both forward and backward activation of information and also that there is cascaded flow of information just like Dell's spreading activation model talks about moving forward. In the spreading activation kind of model phonological activation would begin as soon as lemmas have started to be activated and even before a final candidate you know for speaking has been selected as individual phonemes begin to get activated at the lowest levels they will start sending feedback to the lemmas that they are connected to increasing the probability of selection or activation of these lemmas. Now because real words at the lemma level and non-words because real words have some representations at the lemma level and non-words do not it will basically this you know it is likely that any mistaken activation among the phonemes will reinforce the activation of actual words rather than the intended you know that will sound like the intended target word much more than let us say if they are doing sound flip between big horse and big boss is ending up. So again we are explaining how it is highly improbable for us to commit sound errors or sound exchange errors which end up in resultant non-words as opposed to actual words.

So what happens is on average sets of phonemes that produce non-words will be less activated than sets of phonemes that will eventually produce words and that basically could be a reason as to how this kind of selection can happen. Also the interactive activation account like Dell's can help explain a special kinds of error called mixed error. What is a mixed error? In a mixed error a person produces erroneously a candidate which is both semantically and phonologically similar to the intended target word. Let us take an example if a person were to say lobster if a person is intending to say oyster they are more likely to eventually produce the word lobster than they are to produce octopus. Now if you see just these three words oyster, lobster and octopus all of these three have large semantic overlap because all of these three are sea creatures but lobster and oyster share one more thing which is the stir set of phonemes which basically is saying that oh there is a huge phonological overlap here as well whereas this phonological overlap is not there between oyster and octopus.

So you can typically see there is more common points between oyster and lobster than there are between oyster and octopus and this is sort of there so if somebody were making an error in producing you know oyster they are much more likely to erroneously produce lobster than they are likely to produce octopus and if these errors and if you look at the speech error data you will find that these kinds of errors are much more

common than if errors were purely random because if errors were purely random you will have an equi-potential chance of producing either lobster or octopus or any set of jumbled phonemes. Now the spreading activation account of speech reduction views the relatively high likelihood of us producing mixed errors as resulting from the cascaded activation and feedback process between levels. So how do they explain this they say that thinking about oysters will activate semantically related items such as lobsters and octopi which will lead to activations of the oyster lemma as well as the octopus and lobster lemmas. However activating the oyster lobster and octopus lemmas will cause feed forward activation to the sounds that make these words. So at the semantic level all three are equi-potentially activated they are now sending activation down to sound levels.

Now given the fact that the stir set of phonemes is common to both oyster and lobster this set of phonemes is going to receive activation both by the target and the active competitor lemma which is lobster. Now these sounds therefore will be you know I have a high likelihood of being selected for eventual output and sounds that occur only in the target lemma or only in the competitor lemma are slightly less likely. So the first selection that the sound system would make amongst the three candidates oyster, lobster and octopus is the stir. The next one would be oh what did I want to speak I wanted to speak octopus I want to speak oyster so oy or just octopus has slightly lesser you know probability of getting selected. If there are no cascaded activations then either of octopus or lobster would have an equal chance of coming out.

Competing the target adjust the conceptual and lemma levels and there is no reason why mixed errors would be more common. So Dell and colleagues basically say that because of cascaded activation there is an edge that you know oyster and lobster have over octopus because through cascaded activation while they started activating you know while they were activated at the lemma level the activation was also received at the phonemic levels as well and the stirred set of phonemes was selected and therefore these two sort of trump out the other semantic competitor which is octopus. This is how Dell and colleagues or the spreading account of spreading activation account of of speech production says that oh this is basically how the production of speech happens and it sort of explains some very real phenomena which are speech errors. Now till this point what we have done is we have sort of looked at in the previous lecture you sort of looked at the steps that are involved in speech production, monolingual speech production basically and in today's lecture so far what I have talked to you about is looking at these processing assumptions of this model in a bit more detail and taking examples from speech errors to actually say that okay while levels model presents to us a very interesting a very you know well accepted chronology of speech production there are some processing assumptions that may need revisit for example you know information

probably flows both in a forward and a backward direction. Also processing does not need to be completed at one step before it starts at the second step because probably the cascaded you know style of processing suits or explains more data as opposed to just you know the serial kind of processing.

So these two things we discussed using examples of speech errors as cases of reference which tell us that okay we know how speech production happens however we also know that there are these two or three assumptions which we will need to take into account when we are talking about speech production. Now so far we were talking mainly in the sphere of monolingual speech production I said in the beginning of the previous lecture that please pay attention to how this really happens and also try to think oh how will this happen how will this play out if a person knows two languages for example I know Hindi and English but I want to speak about let us say the weather would I start with weather or would I start with Mosam would I start with cold oh kitni thandi hai kitna jaada lag raha hai and so on and so forth. So basically the problems in multilingual or bilingual speech production would actually compound the set of processes that we have seen in monolingual speech production and there are these you know interesting aspects where there will be more candidates available for selection and so on which people have talked about when they have started to sort of think about bilingual or multilingual speech production. One of the first set of people that started you know looking at bilingual speech production basically extending Levelt's work were De Bot and De Schreuder who basically wanted to extend the insights gained about monolingual speech production from Lebaltís model to interesting you know cases or interesting references in bilingual or multilingual speech production. For example as you would know a bilingual language two or more languages may differ in the way they lexicalize the conceptual information as I was saying if I am going to talk about the weather am I going to use the word weather am I going to use the word Mosam how do I do it more interestingly even the same concept and probably we communicated differently in the two languages for example for certain concepts there is a single word in English but in Hindi you would want to sort of let us say you know you might use an entire phrase or say for example if you are talking about Dutch or French or German or Tamil or Telugu or Malayalam or Bengali what happens is if a person is a bilingual he would find that lexicalization itself starts becoming a little bit more complicated because you do not just have to find words in your language you might eventually also find words in the other language and you will then need to decide how does this idea get expressed best in language one or language two and you know which of these languages do I have to use given the listeners and the setting of conversation.

Another you know so De Bot and Schreuder basically wanted to solve this dilemma for bilingual speech production by proposing extra component in levels model they said that

there is this extra component called a verbalizer which would basically receive input from the conceptualization stage and carve it up in such a manner that it will match the semantic content of the target language say for its target lemma. So which is the word that I am going to use now so the content will be carved out in a certain way that it is that it matches the semantic content of the target language if now the information from the conceptualization phase is lexicalized differently in a bilingual two languages the verbalizer would basically result in different sets of information chunks and then these two chunks can be chosen dependent on which language that the person intends to speak in what scenario. So it is again you can see the model that is why we discussed the levels model in some detail what we are trying to do here is we are adding a tweak to the model by adding a verbalizer which basically makes way for lexicalization process in the two languages or more languages of a bilingual or a multilingual. Another issue that these people you know have sought to solve is that of language selection. Now if you look around and if you even observe yourself most of us now speak more than a single language all that you know comfortably a question that can be asked here is that how do bilinguals manage to produce speech in the language of their choice without interpretation without any kind of interruption from the other language or you can ask that how do bilinguals are you know very swiftly code mix or code switch freely between the two or three languages.

Now a solution to this point was offered by the authors when they with the assumption that the decision about which language to speak in is determined at the conceptual level itself by the conceptualizer because the conceptualizer is the only body of knowledge in that sense you know it is your semantic system which has access to information that can lead to language choice. For example who am I talking to what is the topic that I am talking to what is the setting that I am talking in all of these actually go a long way in deciding how and which language you know how do you communicate a particular idea which language you use to communicate that idea because say for example if I am surrounded by only English speakers then I would not you know switch into Hindi and start explaining the concept in Hindi or if I am surrounded by only Hindi speakers it will not make sense that I switch into English and a continuously speak you know keep speaking in English. So this is again something that you know can be achieved with a certain tweak to this levels model and this is what De Bot and Schreuder 's work try to do. So the information that is you know representing language choice is a very important component of the conceptualizers input and it is referred to as the language Q. Moreover the authors have assumed that the semantic information within each lemma would also include the knowledge of what lemma the you know what language that does lemma belong to.

So this is this can be referred to as language tags for example if I want to eventually select a lemma and remember I said that lemmas have information about semantics and syntax as well the syntax obviously would differ between different languages. So a lemma will have to be language specific because it will carry information about not only the meaning part which can still be common across languages but how this language how this specific word in this language is expressed or how this specific word in this language is used even though I am talking about the same concept or I am thinking to talk about the same concept. So with this arrangement the match between the pre-verbal message and the semantic information in the lemma of the target language will generally be larger between the former and the semantic information in translation equivalents than in a word which is not the translational equivalent of the word that we are talking about. So consequently what will happen is that the target lemma will generally become more highly activated than the lemma of its translational equivalent so that the words that will exit the production system will actually be words from the selected language itself. So basically what happens is through weighting through language tags through language queues we have devised or we may have abstracted a system which enables us to speak in the language of choice more often than not.

So that is pretty much what I wanted to talk about you know language choice but one of the things that remains is let us say how do bilinguals you know fair between language mixing code mixing and language switching. Now De Bot initially adopted the idea that bilinguals would generate two speech plans simultaneously one for the target language one for the non target language and both of which will be active at the same time. So this would allow the bilingual you know flexibility to switch into language one and language two at any point in time depending upon who the listeners are and how the situation is. A lot of times you will see that you are surrounded by people who understand both the languages that you know and you feel comfortable in switching into or out of a given language. Now De Bot and Schreuder basically you know later offered a different solution wherein they proposed that the language queue in the preverbal message may carry different weights given different specific situations.

For instance if the language switching is not desirable in a given you know situation then the language queue may be assigned a higher value following which the individual will not you know have access to tokens from the other language as opposed to in instances where language which is permissible the weightings for the language queue would be assigned a lower weight and thus it would allow for switching or mixing to take place more flexibly. Again you see the base at least so far that what we have discussed the base is still our understanding of how speech production happens which we could derive from levels model but obviously there are tweaks needed there are some kinds of you know extra considerations that we need to take into account when we are trying to

explain speech production in bilinguals or multilinguals okay. So just to summarize speech production in bilinguals and multilinguals carries its own nuances while there is a detailed understanding of speech production in multilinguals so those models we need modifications in order to accommodate the different requirements of speech production in bilinguals and multilinguals. That is all I wanted to say for today I will see you in the next class. Thank you.