Psychology of Bilingualism and Multilingualism
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Hello and welcome to the course introduction to psychology of bilingualism and multilingualism. I am Dr. Ark Verma from the department of cognitive sciences at IIT Kanpur. This is the fourth week of the course and now I will move on to understanding comprehension processes in bilinguals and multilinguals. Let us begin, Now an interesting question in terms of comprehension that has been asked irrespective of whether we are discussing about monolinguals or bilinguals is this process of understanding meaning.

Now the thing is you might be aware that a lot of words carry a single meaning, a lot of words carry more than a single meaning and a lot of times when we are interpreting the meanings of a given word it is in reference to the context in which the word has been used. So, for example, the word cat as we know refers to a particular animal, a feline but the word catwalk actually refers to a particular kind of a walk which is basically exhibited by models on a ramp. Now the thing is depending upon where we are you know using a particular word, depending upon what context in which we are using on a particular word meanings can be actually made out differently. Now this has been a problem of consideration for you know not only linguists and psycholinguists but also philosophers and people have sort of you know weighed in differently on this thing.

For example, people have really wondered whether meaning making is actually you know is actually or in fact in some sense affected by the surrounding linguistic context or a global context for that matter based on you know who you are talking to, what is the topic, where are you actually having that conversation versus you know the more local linguistic context of a given statement. Now initial research in psycholinguistics or cognitive science about this particular topic was led by the ideas of Jerry Fodor who gave this very influential theory referred to as the modularity of mind theory. Now according to Jerry Fodor the central idea is that the mind is composed of mental modules you know small little modules in the mind which are basically information processing devices that perform basic cognitive functions on incoming information. These modules you can think of as very domain specific you know centres of information processing that work within this overall structure of the mind and are you know basically attuned to handling very specific types of stimuli. These are informationally encapsulated in the sense that they only deal with that particular kind of you know information that they are attuned to treating and are not affected by extra information from other modules and so on.

Also these modules are supposed to operate very fast and mandatorily and there are some other you know factors like they have graceful degradation and so on and so forth. They have specific breakdown patterns and so on and so forth. Now the idea of modules is sort of fascinating because it divides the brain into smaller functioning units which importantly do not interact with each other. So for example, if you were to write a program of a library and if I am sort of asking you to write you know code to basically run a library where books will come in, books will go out, you will enter books that are being brought on by individuals, you will exit books that are being issued by individuals, there will be from time to time new inventory etc and so on etc and etc. But how will you write this code? Say for example, if you want to write this code what you will do is you will probably need a 5000 or 10000 line code.

Again forgive me because I am not really a computer science person, but the idea is mostly programmers would try and do you know the way they would try and handle this problem is by basically writing functions or writing you know modules which are basically taking you know care of specific functions. Say for example, you could write a function or a code for entering a new book in the inventory or issuing a book to a user or for example, you can write a code for you know when a book is being returned by user how does that it how does it get entered again into the overall system of the library. Now, this is precisely what Jerry Fodor sort of or this is something similar to what Jerry Fodor sort of thought about the mind and he said that mind is basically doing so many things, there are so many interesting you know functions that we operate and the smallest functions the most specific functions at least say for example, you know colour perception or decisions with respect to language, word recognition for that matter, facial recognition for that matter can be thought of as modules where these modules are basically performing very specific tasks, very specific circumstances in an informationally encapsulated manner basically saying that they do not need input of other kind to influence their processing let us say of faces or of words. Now, if the mind were indeed composed of such modules as described by Fodor, researchers have actually wondered how the system of visual word recognition may be considered of as a module as well. The idea is that possibly influent readers at least visual word recognition basically is fast, is mandatory and is dedicated to processing a specific kind of input.

You might be you know fascinated to know that there are that you know researchers have reported a particular area in the brain that only lights up when it is presented with letters and not with other kind of stimuli that is referred to as the visual word form area. Now, if the visual word recognition system is indeed modular then neither the linguistic context of a word basically the sentential context nor any extra linguistic information such as who you are talking to or where you are having this conversation would be able to affect how

we make meanings out of the word. And this is an interesting conundrum because you will see and there are a bunch of studies that actually show that meaning making does consider a you know a lot of these issues. To basically study this better or to basically study the understanding of meaning, researchers have actually tried to investigate this issue by you know studying how individuals resolve lexical ambiguities. What are lexical ambiguities? Lexical ambiguities basically have to do with understanding words that carry more than one meaning within a given language.

For example, say you could have the word bank which is which can refer to the bank of a river or it could refer to the financial or monetary institution that we know as the bank. Or for example, the word bug can used to refer to an insect, a beetle or anything like that or also for example, error in a program or something like you know that will that can be used to over hear conspicuously over hear conversations and so on. Now, lexically ambiguous words are referred to as intra-lexical homographs because they are you know words having the same spelling within a single language system that can lead to different types of meanings. Now, researchers have investigated the fact that whether a single meaning or all of the meanings concerned with this word or with these types of words get activated when they individuals are encountering these words. And there are different views posited about this and there are a bunch of experiments that are presented evidence for and against this idea.

For example, the exclusive access hypothesis suggests that only the meaning that is contextually appropriate in a given scenario will get activated and the other meanings will not get activated. Basically suggesting that individuals have a very strict grip on what meaning a particular word is going to make given the linguistic or sentential context of the word. On the other hand, there is the exhaustive access hypothesis which basically suggests that both meanings of the words will get activated at least momentarily and will affect how individuals react or respond to such a word. A very interesting demonstration of this was provided by Swinney in his 1979 experiment where he had participants read a particular you know excerpt of a text where it the text basically referred to something like you know the building was very there was this text is about a very old official building and there is a sentence where it is said given that this is a government building you can accept expect bugs etcetera their bugs other insects and so on and so forth. Now, the thing is the word bug as I said is a it has two meanings it has the meaning of an insect, it also has the meaning of a conspicuously concealed device of a concealed device that can allow people to hear something.

Now, given that government buildings deal with secrets and so on it is probable at least in the global context that people might have bugged the building to get information out of it. They actually asked their participants to decide you know to basically read on the

text while they presented them with the lexical decision task with words which either you know aligned to one meaning like insect, ant etcetera and which aligned with the other meaning like spy which would align with the word bug in the bug in the concealed hearing sense and they actually found that at least for some time both of the meanings of these of the word bug were activated. So, in that sense they the experiment actually provided some support for the exhaustive access hypothesis. What does this mean for us? It means basically that if a word has two meanings or let us say more meanings it might be in that sense we able to activate multiple semantic representations in the mind of an individual who knows the word. How will we basically spin this to bilingualism? How will we basically you know how does this inform us how does this inform us anything about bilingualism? Now, while lexically ambiguous words are certainly an interesting problem to solve in a monolingual context, in the bilingual context the problem sort of metamorphosizes into something else.

The problem basically converts into whether lexical activation of a given word is encapsulated within a single language context or whether say for example, if a word has meanings in both the languages both the meanings across the two languages will get activated. There are examples for example, if a word means two different things in bilinguals for bilinguals in two languages suppose the German word gift in German the word gift means poison whereas in English the gift the word gift means present. For example, also the French word coin which means corner you know in French and refers to money in English. Now, these words are referred to as inter lexical homographs and basically the property that they have is that they basically from the same spelling can refer to two different meanings across the two different languages. So, these category of stimuli has have been sort of important for researchers to sort of look at and understand whether meaning activation happens across languages or meaning activation stays within the ambit of a given language.

Another interesting class of stimuli that have that people have used for understanding you know lexical ambiguities in bilingualism has been the inter lexical homophones. The inter lexical homophones are words which have identical phonological form they may have different spellings, but identical phonological forms and different meanings across the two languages. Now, before we move on to you know specific studies in the bilingual domain we would like to point out two major differences between monolingual and bilingual research studies on lexical ambiguity. For one, the majority of monolingual studies have focused on presenting the critical words in a sentential context motivated by the idea that motivated by the idea of checking whether lexical access of these words is affected by a linguistic context or not. On the other hand, bilingualism research has mainly focused on lexical access in you know in within a given language and has since basically you know try to present words in an isolated form.

Another point of difference has been that while monolingual studies have mainly concerned with the process of resolving an ambiguous words meaning bilingual studies have mainly limited themselves to basically just accessing the words form or lexical access. Let us look at some of these studies. Now Beauvillain and Grainger were among the first to use the cross language primed lexical decision task in English French bilinguals to study the lexical access of inter lexical homographs. The participants were presented with a set of stimulus fares consisting of a French prime word and in English target word or non word wherein the prime and target were presented sequentially. So, the primes came first and the targets came second you know in a priming paradigm the primes are presented momentarily they are almost you know unseen by the individuals, but they still have an effect on the target word based on the relationship between the target and the prime.

Now participants in this study were basically instructed to read each prime and then perform a lexical decision on the target that followed. Most of these primes were French words however some of them were actually French English inter lexical homographs such as coin which I was mentioning earlier. Here the question that the researchers were trying to answer was basically whether such inter lexical homographs would facilitate the processing of the subsequent English targets such as money. Now while the participants would have deciphered that the primes are you know French words whether their English meaning will get primed or not is what we are testing here. Because the word coin means corner in French, but it means money in English and in that sense if the English meanings are being primed you would basically be able to deduce that both meanings of the word coin are being activated.

Indeed this was the case when the interval was between the prime and the targets was relatively short that is around 150 milliseconds, but it was not really found when the difference between the prime and target was as long as 750 milliseconds. What does this tell us? It tells us that both meanings of the inter lexical homograph was actually you know activated and only at a later moment was a contextually inappropriate meaning deactivated. So, at least in the initial stages of when we are reading a particular word both or all of its meaning may become activated to differential degrees, but obviously with time when you have the time to integrate the entire syntax entire sentence context and the broader linguistic context maybe people are able to switch off or deactivate the contextually inappropriate meanings. So, the findings are, but there was a bit of a thing with this study that the findings of the current study could be called into question because the authors could sense both in could sense because both English and French words were present and hence people could argue that both the lexicons were automatically activated and hence may be able to sort of account for these kind of findings. You might remember

that Grosjean gives the language mode you know theory where he said that you know if individuals are primed for both languages in the environment they will sort of be ready or sort of keep their mental lexicons prepared for handling stimuli of either kind.

However, when the situation is such that only one of these two one of the two languages of bilingual are being used and implied in the overall context they would be more ready for just one of the two lexicons and the other lexicon would be slightly you know it will take some time to warm up to that. Now therefore, for a stronger test of language selective word recognition language non-selective word recognition it would probably be best if words from one language are exclusively presented and it was checked whether also under these circumstances the non-target language lexical candidates are getting activated. Further, given the fact that most the most salient characteristic of an inter-lexical homograph is the fact that it has different meanings in the bilingual two languages this has been an interesting aspects of the future studies. Some of the researchers have not looked explicitly for evidence of both of the homograph of whether both of the homographs meanings are actually getting activated. Mainly what researchers have actually looked for in bilingual studies is the is basically evidence for co-activation in the non-target lexicon without making the a priori assumption that meaning activation would underlie such you know evidence.

So, as I said bilingual studies have mainly be focused on whether lexical access of both types can be performed or not irrespective of the fact whether meanings have been accessed in much detail across the two languages. Now, a study that investigated similar you know with a similar stance was conducted by Kerkhofs and colleagues which employed the semantic priming methodology with primes and targets in the same language measuring both behavioural and ERP responses to the critical stimuli. In the study responses to unprimed inter-lexical homographs were compared with the responses to unprimed unilingual control word. Basically people were you know performing this lexical decision task where they are presented with inter-lexical homographs and control words which had meanings in only the only one of the two languages. Now the homographs and control words would match on a bunch of variables that have been shown to you know affect people's word processing times such as word frequency and so on.

Importantly the only difference between the two types of words was that the inter-lexical homograph as the definition goes occurred in participants both the languages whereas the unilingual controls occurred in only one of the two languages. Given the set up any difference in responses to homographs and controls would certainly result from the fact that the inter-lingual inter-lexical homograph is bivalent has two meanings whereas the unilingual control is you know has just only one meaning. So across this one and some of

the other studies it was actually found that depending upon the exact demands of the task you know which experiment and what kind of participants in stimuli are being used the composition of the similar sets so on where responses to inter-lexical homographs were either shorter or longer than the control words. This effect has been referred to as the homograph effect in the literature. Now the magnitude of the homograph effect has been you know shown to depend upon a range of variables.

For instance the homograph effect was found to be large when the homograph was more frequent in the participants non-target language than in the target language and the participants were performing the language specific version of the task. Now if language non-selectivity were to be observed under any circumstances these frequencies effect you would expect because in this sense you are saying that if the participants are sensitive to the frequency of a given word in a non-target language it means that they have activated the word in the non-target language as well. So these findings are actually in line with the assumption or with the prediction that when you are reading words that exist in both languages both of their meanings which across the two languages are getting activated to a certain extent people are accessing the word representations across the two languages. On similar lines bilingual studies have also investigated what are called inter-lexical homophone effect you know words that have the similar sound not necessarily the same selling but similar sound and different meanings across the two languages. For instance Dijkstra and colleagues sought to separate the contributions of cross language orthographical and phonological overlap their participants were Dutch English bilinguals who are visually presented with letter strings.

Interestingly in the study orthographic overlap actually was found to produce a facilitating effect whereas phonological overlap was found to produce an inhibitory effect. Similar results were also obtained by Doctor and Klein in an English Afrikaans study although in a different studies by Hay and Jared French English bilinguals were shown to respond faster to inter-lexical homophones than to control stimuli in an English lexical decision task. Now although the effects of the orthographic and phonological overlap occasionally produce you know opposite types of effects both these effects at least provide evidence of one thing that the language you know that for these words there is a certain degree of language non selective processing happening people are being able to activate both orthographical and phonological forms of bivalent words which basically exist in both languages. Now given the slightly conflicting results across a range of studies people have sort of assumed that at least under some circumstances bilingual word recognition may operate in a language selective manner. Let us look at some evidence according you know some evidence towards this idea.

Now in a study by Jared and Szucs there is some support for this idea. The authors of the

studies tested French English and English French bilinguals in a word naming task wherein they visually presented English words which were to be read aloud. In one condition English target words were preceded by a block of French words to be read aloud in French and in other condition they were not. Now the French English bilinguals with you know the target language English as their vehicle L2 named the English homograph targets much more slowly than the non-homographic control words in both the conditions providing at least some support for the fact that language non-selective processing is happening in both conditions. On the contrary English French bilinguals for whom the target language English was the dominant language named the English homographs more slowly than the control words when they were preceded by a French naming block only and not when they were not preceded by the French naming block.

You can see here that for French English bilinguals they are obviously going to be slower in naming English which is not their dominant language, but for the English French bilinguals they are only naming the you know English words slowly when they have just read a block of French words okay. What does this actually tell us? These results were taken to imply that under certain conditions language selective processing indeed occurs. Most specifically these results suggest that while the stronger language can be immune to influence from the weaker L2 such as English was immune to influence from French in this case although it does not happen the other way around. So French does not sort of get you know influenced by English so much. Moreover the pattern of results for the English French participants also demonstrates the fact that when the activation of non-target language is boosted somehow by people you know just naming in French prior to naming in English the dominant language may also get slightly influenced by the activation in the non-target language.

You know we have just sort of primed that particular language mode. Converging evidence suggests that language selective processing may certainly occur under some circumstances as is obtained in the study by Haigh and Jared who demonstrated language selective, language non-selective processing when French English bilinguals processed inter-lexical homophones in an English lexical decision task but not when English French lexical participants served, English French individuals served as participants. So you can basically see that there is some evidence for co-activation across the two languages however there is also some evidence to the fact that there is some kind of language selective processing also going on here. Now another very interesting caveat of the study by Jared and Szucs was that these authors obtained an inhibitory effect of the inter-lexical homographs in contrast to the facilitatory effects obtained by Dijkstra and colleagues. It was seen therefore that task specific factors such as task demands basically what is the participant required to do in a given task situation actually has a very important say in determining the direction of the homograph effect whether it will be larger, smaller or it

will manifest itself or it will not.

For instance, inhibition is mainly observed in the naming task due to the task requirements you have to prepare and name. However, when you are just talking about lexical access during word recognition inhibition may not play a part because you are still sort of being able to access it. That is all that I wanted to share with you in this lecture. I will talk to you about some more things in the following lecture. Thank you.