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 second week of the course and we are sort of moving to the second lecture. Now you might remember that in the previous lecture we were talking about categorical perception and the ability to perceive phonemic contrasts across different languages and also in the native language. We said that this is very very fundamental to the infant's ability to perceive speech and acquire language eventually.

In the current lecture we will begin with discussing the consequences of the same for infants who are bilingual either in a sequential bilingual sense for example they are learning their first language and then after sometime the second language comes in or in a simultaneous bilingual setting where they are exposed to both their languages starting from the birth itself. Let us go ahead. Now if a bilingual child is introduced to the sounds of a second language at a slightly later age the ability to perceive phonemic contrasts is already on the vein it is shifting from more of a language general to a language specific ability with more focus on the contrast of what it considers the native language. So basically what will happen is that perceiving the phonemic contrasts of you know the second language or the third will become as much more difficult the further you know you take this introduction of the second or third language.

So children have sort of you know we know with increasing age are becoming generally less sensitive to the non-native phonemic contrasts including contrast that may be meaningful for the second language. So basically it presents a sort of a challenge you know given how the organization of phonemic perception is happening within the children and therefore it will become a bit harder for them to acquire the sounds of the second language the further it happens from the first language. Let us go ahead with that. Now if children have to in order for them to learn the sounds of the second language you know or say basically you know they have it becomes part of their ability to perceive non-native contrast will need to be restored. They have to acquire these phonemic contrasts from the second or the third language.

Basically what we need is we need a little bit of a reversal of this you know decline of you know language general phonemic contrast you know perceiving ability. And in this

instance De Groot for example takes the you know De Groot takes the example of a Japanese born child at 12 months of age who could no longer perceive the difference between the La and ra sounds which are instances of the same phonemic in Japanese but basically are treated as separate categories in English. So obviously the later the onset of you know second language learning will be it will be that much more difficult for these children to acquire the sounds of a given second or a third language. Now Kuhl and colleagues basically examine these conditions which would lead to the reversal of this ability to perceive non you know non-native phonemic contrasts. So what they did was in 12 laboratory sessions of around 25 minutes across spread across four weeks they exposed a group of 9 and 10 month old American infants from only English speaking families to Mandarin Chinese.

In these sessions four different Mandarin Chinese speakers read children's books to the infants and they played games with them exposing them to around 25000 syllables from Mandarin Chinese whereas for a control group the similar sessions were conducted but by speakers of English. So here you are saying basically is that you are while not explicitly teaching language to children you are basically exposing them to the sounds of a different language these are children who are from only English speaking American families, but what is happening is that during play during there is interaction they are getting exposed to more than 25000 syllables which are part of Mandarin Chinese. Now post training this ability to perceive you know contrast in Mandarin Chinese for the two groups was tested using the head turn paradigm. I hope you remember what the head turn paradigm is about if not please go and refer to lecture 5 from the first week. Now as experimental stimuli during test two computer synthesized speech sounds were chosen so that they were contrasting in Mandarin Chinese but not in English.

Now the results what did the results show? The results actually showed that infants who are exposed to this interactive sessions of Mandarin Chinese across you know the 12 across the 12 laboratory sessions of 25 minutes each were able to actually perceive the contrast in Mandarin Chinese almost as well as native Chinese infants. So you can see here that this is still a very plastic ability it is still and because we are talking about these very young infants it is still an ability that can be restored the ability to perceive non-native phonemic contrast can still be restored through practice and instruction and interactive games and so on. Now if you look at these findings from a distance these findings actually provide support to the notion that the decline in this ability to perceive non-native contrast can obviously be reversed through you know systematic exposure to that language. So it is not like if something is lost at least at this very early age it is lost permanently. Now in another similar experiment which exposed children to audio visual material or just the audio material actually it was found that the same effect did not happen.

So the same reversal of this ability of you know perceiving you know this the reversal of this inability of perceiving non-native phonemic contrast could not be achieved when the interactive sessions were replaced by audio material let us say just sounds on a recorder were played or even audio visual material where videos of Chinese speakers were played. So this is also something very very interesting that you know we need to keep in mind that when we are imparting language lessons to children or let us say when children are themselves acquiring language they do so much better in an interactive true to life kind of scenario rather than picking up language from only you know audios or only videos. Now let us look at how this might play out in bilinguals okay and there can be a few questions we can ask about this for example what would happen in the case of infants who are exposed to a bilingual environment from birth, what would be considered as the native language which contrast the infants will prioritize with the perspective of learning. Now imagine say for example you know in case of simultaneous bilingual and as I keep giving the example suppose a child is born to parents who speak let us say English and French you know one parent speaks English the other parent speaks French and the language environment at home would be constantly you know of both these languages together, okay. Now what would happen in that case what is the native language here which phonemic system will the child prioritize over the other one and how will they actually learn will there be an order of learning here as what happens in the non-native as what happens in the sequential bilingualism you know system.

So researchers who were trying to look at these questions focused more on the role of the statistical distribution of the information available to the infants from the two or more languages that are available to them. So the idea is that these infants are probably paying attention to the statistical properties of the language input and remember the language input is mixed there are both languages which are coming in so what the infants are probably doing here is they are paying attention to patterns of you know speech sounds in when they are being spoken to in English or when they are being spoken to in French or Chinese or whichever the second language is. Now for instance my end colleagues you know in 2006 in a study with 6 and 8 month old infants actually demonstrated that infants were able to exploit the statistical distribution and statistical distributional information or speech sounds from the language input to build these different phonetic categories. More specifically what they did was that they expose these infants to either a bimodal distribution say for example wherein two types of phonetic categories were you know equally frequently presented or a unimodal you know distributional system wherein say for example only one type of phoneme category was presented again and again and what did they find? They actually find that infants in the former condition were able to develop two distinct phonetic categories whereas infants in the latter condition where they were presented only with unimodal distribution were able to you

know develop only one prominent category. So this sort of tells us that language input actually plays a very very important role when you are talking about how are infants picking up language from their environment, the nature of language input, the regularities in the language input.

Although you know in the previous lecture we were talking about that categorical perception is innate and this is something that we are born with, you can see here you know this is a very solid example of the fact that although the basic abilities might be innate, the input actually plays a very very important role. The statistical properties of the input plays a very very important role in how the child and to what extent and to you know what will be the nature of how children will pick up language from their environment. Let us go further, now infants who are raised in a simultaneous bilingual environment are actually exposed to two speech sound systems at the same time. Now these sound systems may either be very similar to each other or they may differ from each other in a number of different ways. See for example in the carving out of phonemic categories based on you know voice on set time values or maybe rhythm or maybe some other things.

So in that respect you know my colleagues demonstration that infants are sensitive to statistical distribution of speech sound from the input may serve as a mechanism you know it may be a candidate mechanism for acquiring speech sounds you know basically in a way that you know that that becomes the fundamental source of information for children. But in case of simultaneous bilinguals we can ask this question that okay how are you you know how are children actually doing this? Which speech which regularities in their input they are actually paying attention to? Are they sort of doing something like they are paying more attention to first English and then French or let us say first their L1 and then their L2 or in which order and how are they actually extracting this information? Because obviously the input is mixed the statistical patterns are probably too many to decipher from. So given that you know the linguistic environment of the simultaneous bilinguals is considerably more complex than of monolinguals or even sequential bilinguals because in sequential bilinguals also you are exposed to the first language first and you know you might be learning aspects of the first language the second language only comes later. In simultaneous bilinguals you are having input from both languages at the same time starting from birth and it becomes that much more difficult for people to sort of you know or for these infants to maybe acquire these categories from the two languages simultaneously. And these competing sound systems or are they you know very similar sound systems both will have their own challenges.

So using the head turn procedure Bosch and Sebastian Galles actually looked at the development of vowel contrasts in Catalan Spanish infants for two groups of 4 and 8

month olds. So when I am saying Catalan Spanish infants we are talking about infants who you know who are speaking whose environment consists of both Catalan and Spanish input and you will see that the choice of age groups is also interesting because remember prior to 6.5 months the ability is more language general. So for one group of infants which is the 4 month old infants it is still that more language general and for the other group of infants which is after 7.5 months which is around 8 months old it is gradually moving towards more language specific capabilities.

So as a control group now as a control group 4 and 6 month old Spanish and Catalan monolingual children were also tested and the idea was to be able to compare their developmental pace and trajectory with these infants which are 4 and 8 month olds of you know Catalan Spanish bilingual infants. So technically what we have here in this experiment just to sort of recount is that we have 6 groups we have Catalan Spanish bilinguals 4 months and 8 months so 2 groups here we have 4 month Spanish monolinguals and 6 month Spanish monolinguals and we have 4 month Catalan monolinguals and 6 month Catalan monolinguals. So in all what we have is we have 6 groups of infants which are being sort of you know contrasted with each other at each age group. Now the vowel contrast that the experimenters chose to study was the contrast between a as in bet and a as in bet. Now this is this vowel pair is contrastive in Catalan so in Catalan bet a sound or bet a sound is actually different phonemic categories but not really in Spanish.

So in Spanish they basically instantiate the same vowel category and is not really distinguished so for example for Spanish adults these 2 will be the same sounds whereas for Catalan adults these 2 will be slightly different sounds. And infants were basically what we how they were testing is that infants were exposed to different instances of these 2 sounds embedded in disyllabic non-words and why are they using non-words because a they are you know sort of they do not have any other familiarity clue of familiarity to these children and they were basically disyllabic non-words and they were embedded in words and not produced in an isolated fashion so that things are slightly closer to how these phonemes are actually encountered in natural speech. More specifically what they did was that during the familiarization half of the infants in each age group were presented with a as in bet and half of them were presented with a as in bet whereas in the test trials they were presented with either the same one that were presented in the test in the familiarization phase or a different sound to that was presented in the familiarization phase. So the discrimination they have to make again remember the head term procedure is being used if I am correct your head term procedure is being used they are basically asking them to make these discriminations and what we are sort of going to see is whether the Catalan Spanish bilinguals make this discrimination well or whether the Catalan monolinguals obviously should be able to make this discrimination

Spanish monolinguals might not be able to make this discrimination. So we have these 3 predictions.

But around 4 months of age the authors predicted that for at least 4 months of age all the 3 groups will be able to perceive this monomic contrast because you know there is this ability there is this language general ability of perceiving monomic contrast that is there up till 4 or 5 months of age. However Spanish infants at 8 months of age might have lost this ability might have lost this generic ability of making these monomic contrast. So technically they should not be expected to be able to make this difference. Ok. So by this time they would have lost the ability to perceive this Catalan specific contrast since these are not relevant to Spanish. Interestingly if you look at the possibility for bilingual for the simultaneous bilingual kids if only continued exposure to both languages is important they should have developed distinct categories for a you know as in bet and e as in bet and should be able to perceive the contrast.

So let us see. Alternatively it could also be possible that due to the distributional overlap between the Catalan a and you know in bet versus a as in bet and acoustically intermediate category that happens in Spanish they could fuse everything together and just come up with a single phonemic category. Let us see what the results tell us. The results actually showed that for all the 3 groups of 4 month olds they were able to perceive the phonemic contrast in a versus a, bet versus bet which as you know we were reasoning is perfectly plausible. Also 8 month old Catalan but not 8 month old Spanish people could perceive the contrast which is also you know perfectly plausible because we know that 8 month old Spanish monolingual infants you know would not be able to do this because they are sort of moving more towards the language specific phonemic contrast than the language general phonemic contrast. The interesting pattern of results was found with bilingual infants you know the results were interesting because they seem to have lost the ability to perceive this monemic contrast and they behaved much like the Spanish monolinguals of the same age.

How is this happening? Why is this happening? Will the ability be restored again? Why are they not being able to perceive the phonemic contrast that are specific to Catalan because they are also Catalan Spanish bilinguals eventually? By when would this be restored if at all? So to answer this question they you know tested another group of slightly older 12 month old Catalan Spanish simultaneous bilingual infants and actually found that the ability to perceive phonemic contrast in Catalan were restored by this age. So what we are seeing here is for simultaneous bilinguals this ability of being able to perceive the contrast in you know given language may be slightly delayed. You know it may take some time for the system to you know pick up the contrast of one language and then pick up the contrast of the other language and then sort of you know reach some

kind of a reconciliation where they are able to keep these two categories separate. What might have happened and again I am speculating what might have happened in this earlier age is that they might have sort of you know fused these categories together and it is because it is not relevant in Spanish they are not being able to make these differences. But as they grow older as they move towards the capability of developing language specific contrast in Catalan and language specific contrast in Spanish they get back this ability to make these you know distinction between the bet and the bet ace out.

This is something very similar to the author's conclusion. So they said that due to the simultaneous exposure to both languages Catalan and Spanish these infants may have initially developed a single phonemic category of these a sounds and you know as in bet and bet and hence initially they fail to distinguish between them. However gradually as the ability to perceive these contrasts you know becomes better they become better in processing language specific input they get this ability back albeit with a delay of a few months. So you know interesting because it sort of tells us that how is this mixing of two languages since birth is impacting the development of phonemic perception in these children. Similar demonstrations were also documented in later studies by Bosch and Galles in 2003 and 2005 and based on these findings it could then be concluded that cross language distribution overlap indeed delays slightly the building of language specific contrastive categories in simultaneous bilinguals.

It does not impact it in a sense that they do not have that ability it just delays it basically you know you can say that the system is buying time for itself to acquire the language specific you know phonemic contrast for both of their known languages. Now an additional interesting proposal was made by Sundara and colleagues in 2008 who proposed that infants are not only sensitive to just the distributional characteristics of the speech sound, but also to the frequency with which these speech sounds occur in these respective languages. And how will they test their hypothesis so what they did was they compared the speech perception ability of monolingual French, English and bilingual French English infants and they basically compared them on their ability to distinguish between the French /d/ and the English /th/. Now in French the sound is /d/ you know do something or something like that and whereas in English it is very specific /th/. You can also see that in French /d/ is basically pronounced by you know keeping the tongue just at the back of the teeth whereas the English /th/ is pronounced by keeping the tongue in the alveolar ridge you know in the palatal.

So while the French and English /d/ sounds or /th/ sounds are differently produced you know the place of articulation is different and this difference can be phonemic in some languages but interestingly what happens in English is that these two sounds instantiate the same phonemic category. So technically while you are saying /d/ or /th/ it is actually

instantiating the same phonemic category irrespective of whether it is English or whether it is Dutch because there is a lot of overlap. So still when you test English adults are able to distinguish between the French /d/ and the English /th/ but French adults are not capable of distinguishing between these two. So these given that these two versions also given that these two versions are very frequent in French and English respectively it could be expected that French English bilingual infants might be expected to follow the same strategy as adults would do. So basically they should be able to you know make this distinction as you know as their monolingual English controls.

Now for the experiment what did they do was they actually had a visual fixation habituation procedure and three groups of 6 to 8 month old infants and three groups of 10 to 12 month old infants were tested during the habituation phase half of the participants half of the infants were presented with the French /d/ tokens and half of them were presented which were produced by French monolingual speakers and the other half were exposed to the repetitions of English /th/ tokens which were produced by verse exercise you know from monolingual English speakers. So they were basically half of them were familiarized with /d/ half of them were familiarized with /th/ and again we are basically asking them to make the same different decision. The results actually showed that since language specific perception has not really developed by around 6 to 8 months of age infants from all three groups French monolinguals English monolinguals and French English bilinguals were capable to make this distinction between the French /d/ and the English /th/ sound. Interestingly since language specific perception has started to crystallize by the around 10 to 12 months of age English and French monolinguals actually showed very similar patterns and were not able to perceive the difference. Again something very interesting as to you know what we saw in the previous study.

Now for the results of bilinguals to be you know these infant simultaneous bilinguals 10 to 12 month olds if only cross language distribution overlap would determine the time course of phonetic development these bilinguals should actually fail to perceive the contrast you know and they would basically be grouping the instances of French and English /d/ and /th/ together. On the contrary if frequency really matters and because in English /th/ is much more frequent than the these people should follow the example of English adults and be able to distinguish between /d/ and /th/ sounds and indeed this is what happened because the these bilingual kids were actually able to detect the difference much like English monolingual infants and adults. So, we can see here that not only the statistical distribution, but also the frequency you know of use of these particular sounds in a given language and which basically would reflect in the input that they would have received actually also matters. So, to conclude this the if you consider the joint results of both types of studies you know from sequential bilinguals to

simultaneous bilinguals you could it could basically say that simultaneous bilinguals develop some contrast at the same pace and with the same trajectory as their monolingual peers although the development of few other contrast may be slightly delayed and may follow a different route. Further both cross language distributional overlap as well as the frequency of occurrence of specific speech sounds in these different languages actually plays a very important role in how these individuals are going to acquire these speech sounds.

Alright, so this is all about you know how in you know these phonemic contrasts are acquired in sequential bilinguals and simultaneous bilinguals and what are the specific characteristics. In the next lecture I am going to talk to you more about words and how things are sort of how children start you know to segment the word stream. Thank you.