Psychology of Bilingualism and Multilingualism
Professor Ark Verma
Dept. of Cognitive Sciences
IIT Kanpur
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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 and we are talking about language acquisition in bilingualism and multilingualism. In the previous lecture we saw that infants relied on the statistical regularities of the speech input to solve the segmentation problem. Just to recap the segmentation problem is basically about how do infants segment the continuous stream of speech into words in order to basically understand and isolate separate words and attach those words to meanings eventually.

But is the statistical regularity the only cue to solving the segmentation problem? We have considered the statistical you know regularities and patterns in much more detail in the previous lecture, but is it the only solution? In today's lecture we are trying to consider an alternative option as well which is prosodic bootstrapping. What is prosodic bootstrapping? This is an alternative suggested by some researchers that in addition to the statistical learning device as shown by Saffran and colleagues, infants also rely on the prosodic characteristics of speech for example, the rhythm of speech in order to distinguish in order to segment the continuous stream of speech into words. Now note that you know you can typically distinguish between different languages distinguish different languages into basically three kinds of categories based on rhythm. For example, there are stress based languages like German, English and Dutch, there are syllable based languages like French, Spanish and Italian and also there are more based languages such as Japanese.

Now these three classes basically emerge based on the kind of rhythm scheme that is used in these languages. Now infants have been shown to you know utilize and understand the rhythmic scheme of a given language and use that for segmenting the speech stream into words. Let us see some examples. Many studies have shown that say for example, adults can exploit the specific rhythmical pattern of their native language to segment the stream of speech using a segmentation procedure which is basically attuned to or based on the metrical unit that is typical for this language. For example, Mehler and colleagues demonstrated that since syllables are very clear and unambiguously defined in French and as French uses syllable timed stress syllable time pattern, French adult speakers are actually very adept at you know using syllables as a tool to mark the word boundaries in a continuous stream of speech.

In contrast, native adult speakers of Dutch and English actually are found to utilize stress patterns to segment the speech stream into words. For example, most of the words in English you know carry the stress in the first syllable for example, baby, bottle and so many other words which carry the stress on the first syllable. These words are referred to as having Trocheic stress pattern. Similarly, only a few words have what is called the iambic stress pattern basically having stress on the second syllable which are words like guitar, debate and so on. So, the idea is that infants and adults can actually use if they find words having you know stress patterns on the first syllable as a cue to determining word boundaries.

Again, this is something that probably does not always work but can be a very good clue in addition to the statistical regularities of speech for infants and adults to basically utilize and segment the continuous stream of speech into words. Now given that rhythm can actually be useful in segmenting the speech stream into specific languages, how would this play out in the case of bilinguals? How would bilinguals segment the speech stream with the help of prosodic characteristics? For instance, one may ask that whether bilinguals behave like two monolinguals. Basically let us say if my first language is English and my second language is French, do I use stress based pattern to segment English and syllable based pattern to segment French or do I use a combination or you know amalgamation of both these strategies which I apply to both English and French whenever I am listening or trying to segment them. So this is something that you know lot of researchers have asked and a bunch of experiments have been carried out. I have picked up one similar experiment to sort of talk about this in a bit more detail.

So Cutler and colleagues actually took a group of highly proficient French-English bilinguals and tested them in both English and French languages to basically check for what kind of segmentation strategy they are utilizing to segment materials from English and French. The result collapse the clause across all participants presented a rather ambiguous pattern where you know in neither condition the bilinguals replicated the behaviour of the corresponding monolingual group. So for example these were French-English bilinguals, their pattern of results neither represented the French monolinguals nor they resembled the English monolinguals. So initially the pattern of results were rather mixed and the authors were obviously you know at a loss as to how to explain these results. So what they do is that they sort of try to zoom in and they subdivided the participants into two groups based on the preference of language and then analyze the data on these two groups separately.

What did they basically you know how would they divide the participants into language groups by preference? They actually posed the question that okay in case of you know a

scenario where you are given a choice as to which of the two languages that you know you want to retain and you know so the individuals who are basically supposed to answer either in English or French. So they actually gave one answer depending upon you know which language they preferred speaking in or which language is probably their native language. In the sense and once they sort of gave these answers, Cutler and Colleagues could divide the participants into two groups, the French dominant group and the English dominant group. Once the data was analyzed separately for these two groups an interesting pattern of results emerged. Now the results were depending upon which language is dominant or preferred bilinguals may either you know behave like two monolinguals within one person or apply the same segmentation strategy to both their languages.

To be more specific French dominant participants performed similar to French monolinguals when they were segmenting French materials using a syllable based segmentation scheme and they performed like English monolinguals when they were segmenting English materials using a stress based segmentation scheme. Interestingly the pattern was slightly different in English dominant participants who used the stress based segmentation scheme to segment materials both in English and in French. This sort of is confusing because if the English dominant participants also followed a similar strategy using a stress based for English and syllable based for French you would say that okay bilinguals actually you know perform segmentation based on the kind of language that they are segmenting. But this sort of is still a mixed result and the authors were trying to you know account for this by proposing that syllabic segmentation is something of you know is something similar to a you know a special or a marked routine that language users would only develop if necessitated by their native language or their preferred language. So basically what they were trying to say is that syllable based segmentation scheme is not the default one it only develops in individuals when for example the native language necessitates it.

So they proposed that such a routine would be developed and used only if the individual is dominant or native to you know syllable based segmentation language like French and they would in addition if they are acquiring a second language in addition they would be able to use another strategy for example the French bilinguals did another strategy stress based segmentation for segmenting materials from a different language which was English. So here what we can see is that the segmentation strategy that individuals are using to segment their language does sort of rely a little bit on the rhythm or on the rhythmic scheme of the given language, but it is not sort of uniform across the different types of bilinguals it basically depends on various factors such as the preferred or the dominant language that is used by a given group of bilinguals. Now this was mainly adult studies let us move on and look at infant studies how does this play out in infants?

A number of infant studies have actually looked at and they have tried to investigate the age at which the sensitivity to specific rhythmic schemes actually develops for these specific languages for instance some research has suggested that sensitivity to the language rhythm is actually innate and they base their assumption on the fact that findings from that newborns were actually found to be able to distinguish between rhythmically different languages, but not between rhythmically similar language. For example if you test infants they would be able to distinguish between let us say English and French, but they would not be able to distinguish between English and Dutch which are from the same rhythmic class. Interestingly some researchers have also shown that this ability to distinguish between rhythmic classes is not specific to humans only and is also found in other mammals and other species such as the tamarind monkeys and rats.

It could give us a clue that this ability of perceiving rhythm in a language is something which is again deriving from the general property of the auditory system and therefore is something that is shared with other species as well. So it is not something that is language specific or developed specifically to deal with language, but it is probably a more generic property of the auditory system that is sort of in some sense utilized or comes handy when we are talking about languages and when we are talking about segmenting languages based on rhythm. Now moving forward from birth, infants knowledge of the native language increases and it sort of starts influencing their ability to discriminate between their native language and other languages as well. Let us look at it, Mehler and colleagues found that two month old English speaking infants could actually discriminate between English and Italian. Remember English uses stress based segmentation whereas Italian uses syllable based segmentation, but they could not distinguish between French and Russian which belong to the similar you know rhythmic class.

Similarly Christophe and Morton demonstrated that two month old English speaking English babies basically were able to discriminate between English and Japanese again English and Japanese from two different rhythmic classes, but not between French and Japanese. Even though in both cases the languages belong to both rhythmic classes, so in that sense this ability of being able to distinguish languages based on rhythmic classes is also not foolproof abilities. It is not because both these language pairs belong to different rhythmic classes and if this ability were foolproof infants should have been able to distinguish between both English and Japanese as well as French and Japanese, but we see that that is not really the case. So again it is something that is a very useful you know strategy, but it is not a foolproof strategy that allows infants to distinguish between different languages just based on the rhythmic differences. A more interesting pattern of results was later presented by Christophe and colleagues when they tested this two groups of two month old infants they divided them into two subgroups and found very

interestingly that while one group failed to discriminate between native English and foreign Dutch probably treating them in the same way because they belong to the same rhythmic class, but another group succeeded in discriminating between foreign Dutch and foreign Japanese.

So what is happening here is that these infants are you know obviously considering English and Dutch as their native language together because they are very very similar to each other not only in the stress based rhythm that they use, but also in other prosodic characteristics, but foreign Dutch and foreign Japanese basically are also distinguishable because they belong to different rhythmic classes. Now interesting study in this regard was conducted using a visual orientation procedure by Bosch and Sebastian Galles in 1997 where they looked at you know comparing the ability of monolingual and bilingual infants for discriminating between a pair of rhythmically similar languages one of them would be native and the other would be foreign. Remember these languages belong to the same rhythmic class, but one is a native language the other is a foreign language. So what did they do? They across two experiments they tested for three languages Catalan, Spanish and Italian all of which are basically belong to the same class using you know syllable based segmentation. So in the first experiment they found that four month old infants growing up in Spanish or Catalan homes basically and they presented them with Catalan or Spanish sentences and the results showed that infants coming from Catalan homes oriented faster to Catalan sentences and slower to Spanish sentences and infants coming from Spanish home oriented faster to Spanish sentences and slightly slower to Catalan sentences.

This basically tells us that these infants are now able to distinguish between native language and a foreign language even though they are belonging to the same rhythmic class. So you can see while at birth they were only being able to make broader distinction between you know languages belonging to different rhythmic classes around four months of age they are being able to distinguish between a native language and a foreign language despite the fact that they belong to two different rhythmic classes. Now in the second experiment these four month old infants from Catalan Spanish bilingual homes were presented with either Catalan sentences or Spanish sentences and on one hand and on the other hand they were contrasted with Italian sentences. Here the results showed a very interesting pattern and they showed a difference in orientation time for familiar Catalan or Spanish on one hand and Italian on the other hand. So see we are putting Catalan and Spanish in one basket and Italian in one basket and we are sort of trying to compare them and what is basically happening is that infants were taking slightly longer time for the familiar language.

So basically what is happening is to decide between Catalan and Spanish they are taking

slightly longer time and taking slightly lesser time you know for orienting to Italian. Now why would this happen? Basically what the researchers sort of argue and they say is that what might be happening here is that when these infants are hearing the familiar language materials either from Catalan or Spanish because they are bilingual infants and have been exposed to both these languages they might spend some initial time first trying to determine which of their native languages is being spoken in. So for example they might spend the first few milliseconds or first few seconds to determine whether English is being spoken or Catalan is being spoken and then they are sort of making you know the time to orient to either of the two and as compared to Italian if you are just comparing Catalan to Italian or Spanish to Italian the discrimination would be a little bit faster. So given the fact that the two language condition led to different orienting times can probably indicate that these four month old bilingual to be infants could also discriminate between two languages of the same rhythmic class irrespective of same rhythmic class because one is native in this case and the other is foreign. To summarize we can say that infants at birth seem to be able to discriminate between rhythmically different languages at around two months they can discriminate between their native language on the one hand and a foreign language on the other hand even if the foreign language belongs to the same rhythmic class.

Around four months of age however infant from both monolingual and bilingual homes can get this ability to discriminate between their native language and a rhythmically similar language. So what is happening is that you can see chronologically from birth even though the capability of discriminating rhythm maybe in it they are gradually sort of you know advancing this ability a bit more and they are being able to utilize this ability of discriminating between rhythmic classes to discriminate between their languages. Remember all of this is feeding into their language perception system allowing them to you know attend to whatever language input they are getting in more discrete ways in more sophisticated ways and this is basically what they are using to build on you know this capability of you know isolating words from this you know continuous stream of speech and then the next task that sort of remains then is to start attaching meanings to these words. So this is something which tells us if you look at these results with you know at one month of age, two months of age and four months of age it is something that sort of tells us that around this time around four months of age infants have now acquired the phonetic knowledge that is specific to their native language and they have started using it to you know discriminate their native language with other languages. Remember if you look at Kull's timeline or chronology of language acquisition especially in case of perception it is around this time that they are starting to also notice you know language specific combinations of sounds and so on and you can very easily if you make this connection you can very easily make this connection between this ability also being a very important part of making those

decisions going further when they have to sort of isolate words from speech prefer their native language over other languages and so on.

So that is all that I wanted to sort of say with respect to you know prosodic bootstrapping. As we have seen so far in the two lectures about statistical bootstrapping and prosodic bootstrapping as one of the major ways to solve the segmentation problem what remains now is that we sort of once infants have started being able to segment this continuous stream of speech into words we will look at in the next lecture as to how they start attaching meanings to the learned words. Thank you.