Psychology of Bilingualism and Multilingualism
Professor Ark Verma
Dept. Of Cognitive Sciences
IIT Kanpur
Week – 03
Lecture – 11

Hello and welcome to the course introduction to the psychology of bilingualism and multilingualism. This is the third week of the course and I am Dr. Ark Verma from the cognitive science department at IIT Kanpur. In the last lecture we have talked a little bit about various stages of language acquisition mainly with a focus on first language acquisition but also simultaneously keep having an eye for how are individuals acquiring their 2 or 3, 4 languages simultaneously. One of the very interesting aspects of this you know exercise of language acquisition is the chronology of how this happens and basically does this chronology have any boundary conditions.

For example, are the developmental milestones that we discuss for example, in Coles 2003 you know description of what happens at what age for these children are these milestones really watertight or are they overlapping with each other or say for example, if a child misses these milestones what are the consequences for that. All of these debates in some sense are gathered around a particular very influential hypothesis in the field of language learning which is known as the critical period hypothesis for language learning. In today's lecture and the lecture after this I am going to sort of take a detailed look at this critical period hypothesis basically with a view to understanding is there a critical period at all that limits or let us say gives a sort of a boundary condition for language learning. In today's lecture I will talk more about the critical period in terms of first language acquisition whereas, in tomorrow's lecture I am going to talk a little bit more in detail about whether there are critical where whether there can be a critical period or let us say age of acquisition kind of effects in second language learning.

Let us begin. Now the critical period hypothesis you know as birdsong aptly summarizes is basically to the tune that there is a limited developmental period during which it is possible for individuals to acquire a language whether it is their L1 or their L2 to normal or native like levels. What is native like level I will come to that and I will talk about that as well, but the idea is that this is a biological or intellectual sort of you know it is mainly housed in a biological argument which basically says that once this window of opportunity is passed the ability to learn languages steadily declines over time and in some sense a consequence of this hypothesis would be that while children will be very good children are in fact very good at picking up languages you know very swiftly the

ability to pick up new languages learn new languages apparently should diminish or does diminish when people of you know growing age say for example the older you get the harder it becomes for you to grasp another language. Now is this actually true should we sort of look around ourselves have a look at particular examples and do we find that this is actually the case. This is something I would invite you to ponder upon because if that is then there must be either biological or intellectual cognitive factors that might be governing this.

The critical period hypothesis as I just said is more of a biological hypothesis that basically you know is in line with Chomsky and ideas of innate language specific learning capabilities rather than actual factors you know which are housed in cognitive theories or functional descriptions. So the critical and also in one sense if you look at the critical period hypothesis you might look at it as a summation of the general notion that acquiring new skills any skills be it language or otherwise gets progressively more difficult with age even if you were to learn driving or swimming at a later age let us say you decided to go to learn swimming at the age of 40, 45, 50 maybe it is that much harder for an individual to learn swimming at that age rather than if the individual was learning to swim let us say at 3, 4, 5 years of age. More specifically you know if you look at this in more detail you would find that some forms of skill learning may require very specific stimulation. Say for example, if you want to learn gymnastics you know a particular kind of training is required if you want to learn speaking a particular language a particular kind of training is required although when I am talking about first language there is typically not really explicit language instruction that parents engage in but there is obviously that particular kind of input that is required for individuals to learn language. interestingly people have reasoned that this training or this exposure to this external stimulation must happen within a particular bounded period of time within which its effects are most optimal and out of which the effects are slightly you know less effective for that matter.

Say for example, if somebody were to take swimming classes you know every day the swimming classes every day that you take at the age of 3 or 4 years might be more helpful than if you take the same kinds of swimming classes every day at the age of 45, 50, 55 and so on. So, the same kind of stimulation works better when it happens within a particular bounded period of time versus if it works outside that bounded period of time. Let us take an example the songbird Schaffinch must be exposed to the male song of its species within 10 to 15 days of its birth otherwise it would not be able to develop the similar singing skill. Similarly with ducks I am sure you would know that ducklings need to be imprinted or say for example, need to be attached to their mother immediately after birth otherwise what would happen is that they would attach themselves they would have this irrevocable sort of attachment with any moving object or things that they

would you know come across you know minutes after birth. It could be you know even a crocodile you know swimming around in the river or let us say a twig or any other thing for that matter.

So, there are instances in nature where you know there is this need for a time bound stimulation and if this stimulation does not happen with the time bound period it leads to semi-permanent changes I will not call them irreversible, but semi-permanent changes that would happen with the biology you know of the individual in question. So, the critical period hypothesis for language learning therefore, has been favoured for by experts from linguistics, psychology, neuroscience, foreign language teaching and even policy makers you could see some of the policies that exist in our schools some of the things that we sort of talk about even in the new education policy for example, there is a lot of stress on teaching a lot of skills very early in life there is a lot of stress on what kinds of skills need to be imparted at what age because in some sense the idea is to align the cognitive and biological capabilities of an individual with the kind of pedagogical you know instructions that they are being imparted with. Interestingly the critical period hypothesis comes in various shapes and forms one of which basically is made by let us say you know Penfield who says that the superior language learning skills of young children is due to the higher plasticity of brain the higher brain plasticity that is available to younger children as opposed to older individuals and he goes on to say that this higher plasticity is because when you are growing you know at early ages diminishes because at later ages the myelination of the you know neurons is finally, complete and you know and fewer new connections can be formed and etcetera. This is one way of looking at it the other way of looking at it was put forward by Lenneberg in 1967 who says that you know the critical period of language learning basically has something to do with the progressive lateralization of the brain. So, the idea is the brain is maturing it is you know it is sort of reaching its eventual final developmental stages by the age of 8-9 years and this is around the time where the brain is also getting lateralized.

What does lateralization mean? Just to give you a brief recap from some of the earlier lectures that I may have taken lateralization basically refers to relative specialization of either of the two hemispheres for a particular skill. In our case it is very well linked to the left hemisphere because the left hemisphere of the brain is supposed to be specialized for language functions whereas, the right hemisphere of the brain is supposed to be specialized for non-language functions vision, emotion those kind of things. Now Lenneberg basically says that our brain starting from birth is getting progressively lateralized every you know with every passing day because of the new information it is getting and one of the key drivers of this lateralization or you know in that sense is the lateralization towards the left hemisphere for language and towards the right hemisphere for other non-verbal activities. Lenneberg basically says that around birth both the

hemispheres are equipotential however as a consequence of maturation that is growing with age lateralization you know is in some sense getting culminated gradually and during this process the left hemisphere sort of becomes more and more specialized for language. Now I mean this in some sense you can say call this as a culmination of the maturational period as well or the culmination of the lateralization process as well the sum total of that is that by the time these two processes are complete the left hemisphere should be should have already become specialized for speech whereas, right hemisphere for non-verbal functions.

They are linking this to the critical period hypothesis in a way that once the lateralization or the maturational process is complete newer skills specially language is harder to come by is much more harder to learn because whatever inputs that the brain had to take during this lateralization for language was happening is already assumed complete by that time. If something happens after this it will delay that entire process or it will make it that much more harder for the brain to pick up these new skills. So, the progress of lateralization or the progress of lateralization as you know the an individual is growing up is also supposed to be accompanied by the decreased plasticity of the brain which in some sense basically you know according to some biological researchers culminates at around puberty. So, around 10-11 years which is where the critical period also ends and basically what we are now saying is that by the end of puberty by the end of the period that the brain is reached its you know penultimate or ultimate stages of maturation lateralization is complete myelination is complete plasticity is limited and these are you know a bunch of biological explanations that people have put forward in order to explain you know the so called diminished ability of older people in learning new languages. Now is that really the case we can sort of you know zoom in and look more closely at the evidence that there is.

Before we move on to individual cases another supporting idea for the notion of this critical period is the relatively better recovery of language functions in children compared to adults following brain damage due to an injury. So, it has also been observed a lot of neuropsychologists have observed and reported this that when an individual suffers from brain injury supposedly to the left hemispheric areas of the brain which are supposed to be specialized for language that younger children actually recover from that much earlier and you know the recovery is more is better it is you know as compared to an older people sort of have a brain injury let us say have a stroke or something they do not seem to fully recover from the effects of that injury and this basically happens you know owing to the higher plasticity of the brain of these younger children. So, for example, if a younger child suffers from accident and areas of the left hemisphere are damaged what would typically happen is that because the brain is still maturing and the activity in the brain is maturation is still going on other surrounding

areas of the brain surrounding the damaged areas sort of take up the language functions all right. So, this is again something that has to do again with this higher plasticity in younger brains as opposed to older brains and so on. Finally the idea of a critical period as I said earlier as well is supported by Chomsky's proposal of the universal grammar or a species specific language learning device and the idea is that it species specific language learning device and basically works upon the input that it is receiving from the environment to allow us to learn language.

Once the you know the brain has reached its maturational you know stage or once the progressive naturalization is complete it basically happens that this language learning device if it has not received any input during these early years you know of an individual's life this language learning capability or whatever the neural basis of this language learning capability is it veers off it gets destroyed it gets diminished and its ability to allow us to learn and pick up several new languages also fades away and goes away. So, the idea is it is the time it is very time specific it is very time sensitive that individuals get the proper linguistic input and the proper environment to learn a language within this specific bounded period of time because this will allow them to learn language to the best probable extent that they can as opposed to if this simulation arrives slightly later in life when all of these three processes you know program myelination progressive lateralization maturation have completed. So, in some sense so far we have seen that the critical period hypothesis is actually more of a biological hypothesis that sets us aside conditions within which language learning can happen and after which language learning becomes increasingly more difficult. Now let us look at you know age of acquisition effects for the first language you know what really happens depending upon when the individuals pick up language typically for most of us it happens that we are acquiring you know input related to language since birth or if you remember the previous lecture n minus 3 months after birth which is when our auditory systems have already developed. Now children and it happens it has been reported in some very rare cases that children who have not been exposed to somehow to reach linguistic input since birth have eventually been found to you know have restricted linguistic development going forward and interestingly these children offer us a very interesting opportunity in terms of studying language acquisition and its breakdowns whenever you know this really takes place.

There are different types of scenarios where these kind of cases have been discovered typically it has happened you know typically these people these children have been referred to as feral children basically children who are reared in the wild or group in the wild reared by wild animals and there are two or three categories of these kind of children that you know have been documented and we are going to talk about them. Firstly children who are deserted in the wild and have been supposedly raised by animals

such as wolves or monkeys and so on and so forth. An interesting case of this type was that of two girls found in Midnapore in India back in the 1920s called Kamala and Amla. Kamala was around 6 to 8 years when discovered Amla was around 4 to 6 years when discovered they were both discovered in the wolves den and were taken to an orphanage by that by a missionary named Joseph Singh who start who immediately put them on language training and you know other kind of you know we will training that is expected of girls of this age. Now, interestingly these girls were being apparently being raised by the wolves.

Now Kamala the older kid who is probably already passed this critical period that we are talking about after 3 years of training could master only about 40 words you know something that a normal 2 year old could probably mastered within a week or a fewer days all right. And even though whatever words she was learning were and when she would try to speak them would be phonologically under specified. The details the phonemes will not be as you know presented in that much detail as opposed to you know even for example compared to a 2 year or a 3 year old normal developing child. Kamala died at the age of 16 due to typhoid infection and although the younger sister Amala who was basically you know making slightly better progress than Kamala given that she was still in this critical period you know that we have talked about she also fell ill very very quickly and died within a year of being discovered. So again while there is some trend of the importance of critical period the evidence is not really conclusive.

So we can go to another type of feral children that have been discovered it could be something though say for example there is a case of this boy called Victor you know from Aveyron and you know Aveyron forest near the city of Toulouse in France. Victor was discovered at the age of 12 years and was trained by Jean Marc Itard who was a medical student at that time. Interestingly you can note that Victor is also been discovered post the you know critical period and what happens is that even after 5 years of rigorous training you know Victor showed almost 0 progress with respect to learning language and the only couple of words that he would actually master eventually were O Dieu basically meaning O God or lait which is milk. So other than that the child is not been able to pick up anything because probably he was discovered after the critical period had already passed. Finally a third category of such children whose behaviour resembles that of feral children but they have not been raised in a wild environment but let us say within the human familiar environment but have been kept devoid of any kind of linguistic input or human interaction.

For instance say for example some of these children that we could talk about were actually kept confined to a room, a cellar, kept logged, not allowed to speak, not allowed to hear any kind of linguistic input and then when they were discovered and rescued their

language abilities at that time were assessed and then it was also assessed that okay how did they improve with human contact with better living conditions and so on and so forth. A very interesting case of such a kind is that of Oxana Malaya who was a Ukrainian girl who spent her life between 3 to 8 years of age in a dog kennel behind her house. So she was basically somehow deserted by her parents and she spent the time of 3 to 8 years in her life in a dog kennel just behind her house. When she was discovered she was found to be you know her behaviours were found to be resembling that of dogs. She would walk on all fours, she would bark, growl, sniff at her food and so on and so forth.

Interestingly if you type Oxana Malaya on YouTube you will be able to find a very long sort of one or two a documentary that sort of describes her and you will see that it is very interesting that by this time you know when this documentary is made she has actually gained a bunch of language functions which probably were not there when these tests were being conducted. So Oxana also could not learn language to the you know to any significant extent because when she was discovered she was already passed what is referred to as a critical period. Final notable case in this you know in this category or in this variety could be that of the girl called Genie who was discovered in 1970 in a Los Angeles suburb. Now genie was kept in a linguistically impoverished environment from the age of around 20 months to 13 years. She had been kept locked up in a room tied to a party chair with no you know permission to make any kinds of noises or even the input of any kind of human conversation was sort of very very minimal almost non-existent for her all right.

Her father was obviously you know had some kind of mental issues and he could not tolerate any noises. So, Genie was not allowed to make any sounds moreover the household was also completely quiet. She was rescued around the age of 12 or 13 and once rescued she was first moved to a child's hospital where the only speech she could produce were words like stop it no more or sorry probably arising from you know her predicament in that particular place. Now Genie was in some sense or her training was undertaken by Victor Fromkin a psycholinguistic from UCLA and his graduate student Susan Curtis who basically tried to rehabilitate Genie and you know help her grasp aspects of intelligence as well as aspects of language as well. Now according to Curtis's records within four years of her rescue Jeannie clearly attained most of the aspects of operational intelligence including that of you know a figurative thought.

Moreover she could also demonstrate fully developed and superior abilities in the domain of visual and spatial function. So, some of these aspects of you know children being intelligent is were very evident were pretty apparent in Genie. However when you read Susan Curtis's reports it basically tells us that the linguistic repertoire of Genie was

slightly atypical. Atypical in the sense that although within you know few months of her discovery she had begin to produce single words couple of months later she had acquired a productive vocabulary about of 100 to 200 words and had also started to combine words the development of morphological and syntactic aspects of language were slightly impoverished. According to the earlier reports Genie could not pick up comparable development of morphology and you know syntax such as tenses, word order, affixes you know also things like prepositions, auxiliary verbs you know I will do this, I will do that and so on and so forth.

And this basically led the researchers to believe that while Genie is being able to at least understand word meanings which is basically referential name lexical knowledge she is typically being able to pick up what a word means say for example, this is a pen, this is a watch and so on. She was being able to do that, but she was not being able to master aspects of grammar which basically tells us maybe this critical period talks more about the development of syntactical capabilities rather than picking up semantic relations from the conceptual environment. And the researchers actually published a bunch of papers documenting Genie's prowess in language learning and so on and so forth. However, years later probably you know a couple of decades later when this data was relooked at and a lot of researchers sort of went back and started looking at this data it was discovered that actually Genie was progressing rather well. She was able to pick up a bunch of aspects of a syntax as well as morphology and what probably was happening was that due to some kind of an experimenters bias some of those aspects were being ignored by the experimenters or being treated as fluke or being treated as something that she is just done by chance and will not be able to replicate later.

So, this here is a very interesting case of you know experimenters and scientists being in some sense slightly you know restricted in their vision or interpretation by the idea that they already have. Obviously Fromkin and Curtis probably believed more in the critical period hypothesis which may have led to you know some let us say a harsher interpretation of Genie's linguistic skills than was basically warranted by her linguistic behavior. Because a lot of later research actually talks about the fact that Genie did eventually pick up some aspects of grammar and you know morphology which were obviously overlooked by these earlier researchers. So, to summarize the critical period hypothesis seems to be able to predict a period of optimal learning for the first language which is let us say within this bound of critical period till puberty or up to 8, 9 years and so on. However the evidence for individuals you know who have missed this critical period is actually rather hard to take into account.

Even if you talk about Kamala and Amla or Victor or Genie or Oxana all of these evidences are slightly under documented a bunch of these things may get confounded by

experimenters bias bunch of these things basically. So, because we cannot really create an experiment around this we cannot actively control for all conditions and keep somebody isolated without linguistic input for any length of time. A bunch of these things are not really testable and demonstrable in that sense. So, the evidence for the critical period hypothesis although it is part of folklore and common wisdom these days and has always been the part of the evidence for the critical period hypothesis especially for first language acquisition looks sketchy at best. So, in the next lecture I will talk about some of the related effects of critical period or age of acquisition for second language learning in bilinguals and multilinguals. Thank you so much.