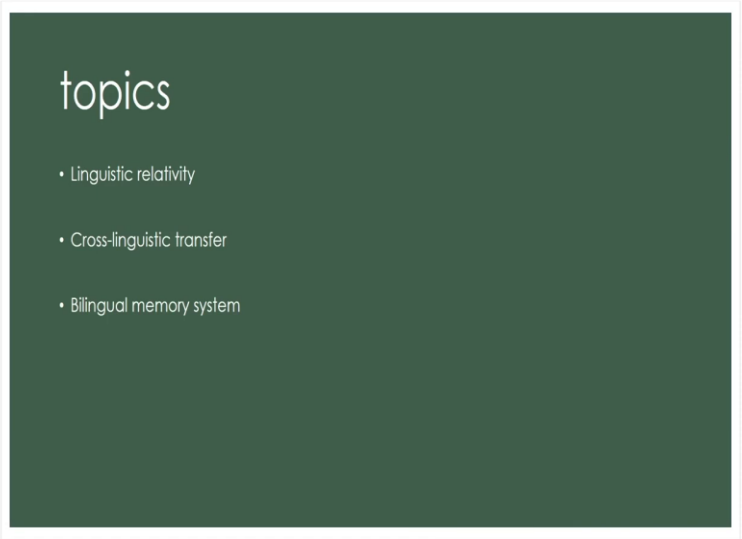
Bilingualism: A cognitive and psycholinguistic perspective

Dr. Bidisha Som
Department of Humanities and Social Sciences
Indian Institute of Technology, Guwahati

Module - 03
Bilingual cognition
Lecture - 06
Language and cognition among bilinguals

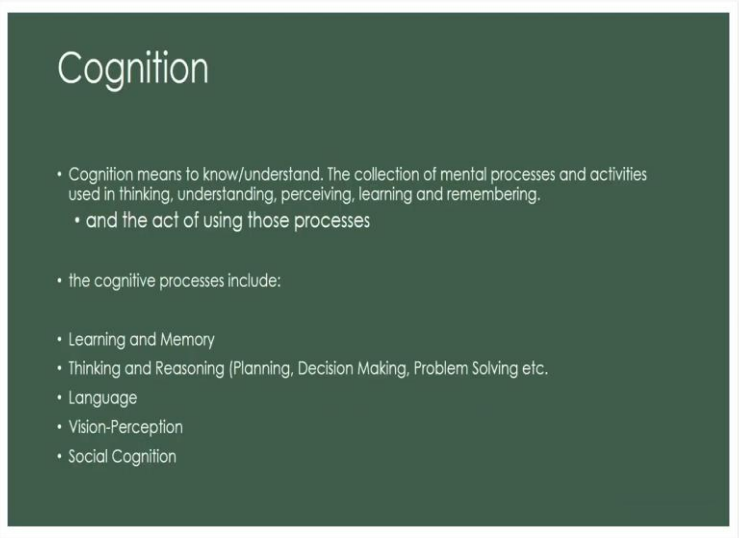
Hello and welcome. This is module 3 of the course. In this module we will look at Bilingual Cognition.

(Refer Slide Time: 00:39)



As in how cognitive mechanisms and bilingualism interact with one another. Now, to do that we will take three topics to look at this issue: first will be linguistic relativity, then cross-linguistic transfer and then the third will be bilingual memory system. So, with the help of these three topics, sub-topics within bilingual cognition, we will try to see if we can gather some good enough picture about how bilingualism and cognition are interrelated and how what is the nature of that interaction ok.

(Refer Slide Time: 01:16)

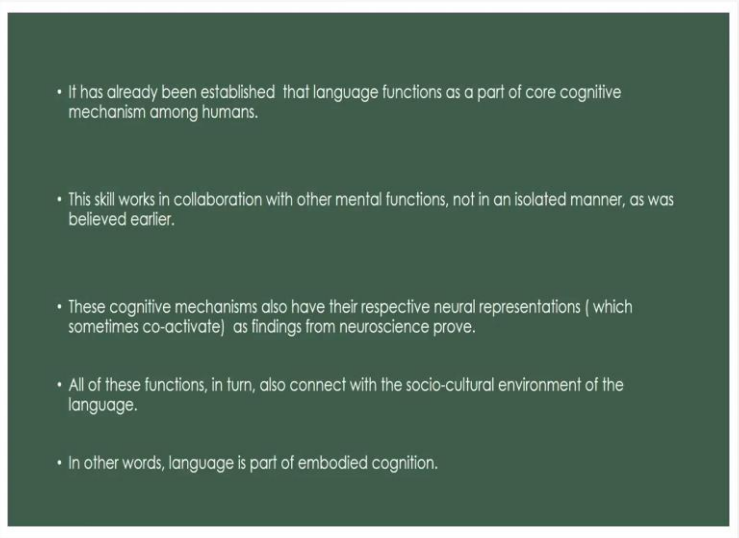


So, before we move ahead into bilingual cognition, we need to know what is cognition itself. So, cognition primarily means to know, to understand, right? So, the collection of mental processes, now understanding and knowing is not a simple process, it has it is various layers, various sub-processes.

So, basically it is a collection of processes that mental processes and activities, that are used in thinking, understanding, perceiving, learning and remembering. So, these are so, this is the textbook definition of cognition. So, what is cognition? Cognition basically refers to knowing and understanding.

Now, knowing and understanding itself has its many layers, they will include thinking, perceiving, memorizing, learning as well as remembering. So, basically these there are many processes, certain sub-processes. For the benefit of this course, I have just added few that will be relevant as we will see soon. Learning and memory, thinking and reasoning, language, vision-perception and social cognition, language thus is a very crucial aspect within the larger cognitive apparatus.

(Refer Slide Time: 02:26)



If any of you is interested in knowing about this connection between language and cognition, I have a course on MOOCs, you can check that out. So, the field as it is stands today, it has already been established that language functions as a part of the core cognitive mechanism in humans.

What do we mean? We have just seen that cognition includes language as one of its primary functions. So, language is part of the core cognitive mechanism, as in the fundamental cognitive apparatus that we have. Now, as part of the core cognitive mechanism, language works with, in collaboration with, other mental processes, other mental functions.

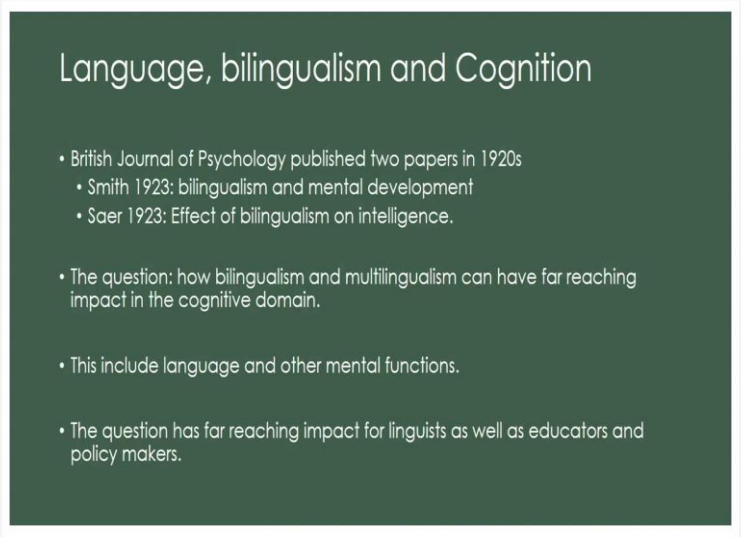
For example, attentional mechanism, social cognition, various executive control mechanisms and so on. So these various parts of cognitive architecture, they cooperate with each other. So, language is one of them which is part of that network. Hence language does not function in a vacuum. Language is not an isolated phenomenon. It is a part of a general-purpose cognitive mechanism, that bit is already established.

Now, these cognitive mechanisms, in turn, also have their representative or and respective neural representation in the brain. Meaning that each of these functions, each of these outputs that we see also has a specific neural signature, so to say. Sometimes they co-activate. So, language functions and certain attentional mechanism functions, they co-activate. Meaning certain neural networks, they fire together, they work together.

Now, that is the neural aspect of it. So, all of these functions are again connected with the socio-cultural aspects; so, the kind of a background within which the language is set, that is also an important factor in this entire network. So, language, various other mental functions, neuronal architecture, networks and the socio-cultural setting, all of these interact with each other and together they create what we call cognition. So, that is the starting point.

So, in other words, language is part of embodied cognition. There are two types of cognitive mechanism. One is called the symbolic cognition, the other is embodied cognition. Embodied cognition is that understanding of cognitive mechanisms where it is said that various cognitive mechanisms are embodied as in, they are dependent on the sensory motor input. So, that is basically how we situate language in this course.

(Refer Slide Time: 05:06)



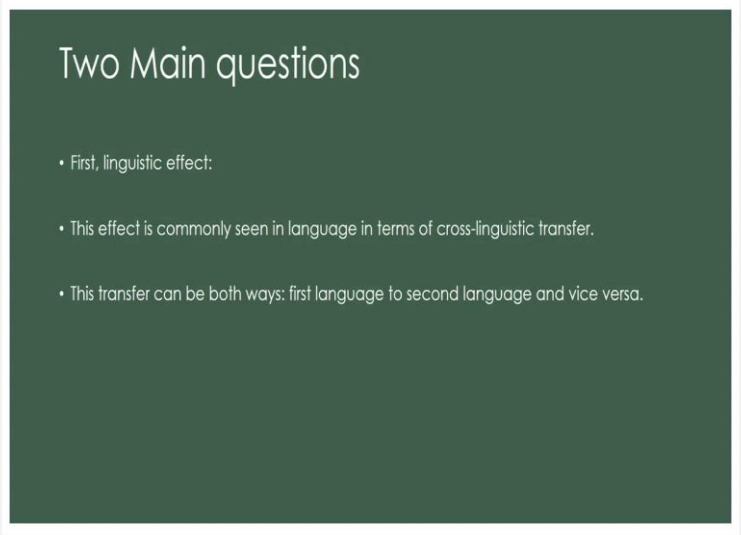
Of course this is very sketchy, but as I said, one can check out other courses. I also have one course on language and cognition. So, coming back to our topic, we are looking at bilingualism and its connection with cognition and how they interact, what are the mechanisms and what are the various relationships.

So, in the 1920s, the British Journal of Psychology published two papers, two very influential papers that kind of set the tone for research for many decades to follow. These papers were both published in 1923, one by Smith, on bilingualism and mental development. Another was on effect of bilingualism on intelligence.

So, the question that both of these papers asked was the how bilingualism and multilingualism can have far reaching impact on other cognitive domain. So, you see in the 1920s itself, that is 100 years from today, that more than 100 years from today that the question about how language and bilingualism can have impact on other cognitive domains like intelligence, like mental development and so on.

So, mental development and other kinds of mechanisms also included language. So, the question basically, this particular question, has been a very important issue to resolve from the perspective of educators, linguists of course, and many other types of policy makers. We have seen a bit of it in the initial lectures.

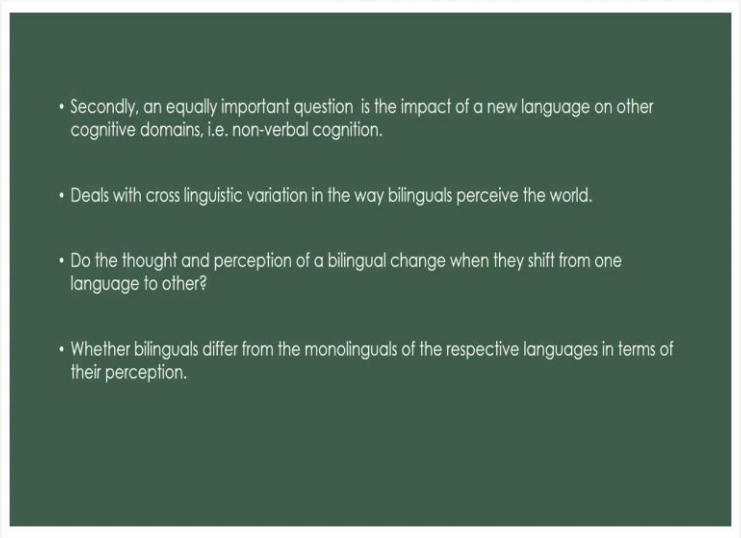
(Refer Slide Time: 06:48)



So, taking things forward, we, now we are in 2022, we will look at bilingual cognition from mainly two main question, two main standpoints. One is the question of the linguistic effect. It is almost a common sense that if you are speaking two languages, anybody who speaks two languages, there will be an interrelationship between those two languages. There will be an impact of one language on the other.

So, the impact can be from first language to second language or from the second language to first language. It works both ways. We will see during this module itself how that works. So, there is a transfer, this is called transfer. So, cross linguistic transfer, transfer of grammatical aspects, transfer of concepts from one language to other, either from one L1 to L2 or from L2 to L1. It happens both ways.

(Refer Slide Time: 07:42)



Secondly, which is also an important question, is the impact of a new language on cognitive domains, other cognitive domains for example, non-verbal cognition. So, on the one hand, we have impact on language itself, of one language on the other. On the other hand, we have impact of language on non-verbal cognitions. So, this deals with cross linguistic variation in which the bilinguals perceive the world, ok.

So, there are mainly two questions within this broad brushstroke basically. One is, do the thought and perception of a bilingual change when they shift from one language to another? There are interesting takes on these many researchers have claimed that when you speak L1, you take on an L1 persona and when you speak an L2, you take on an L2 persona.

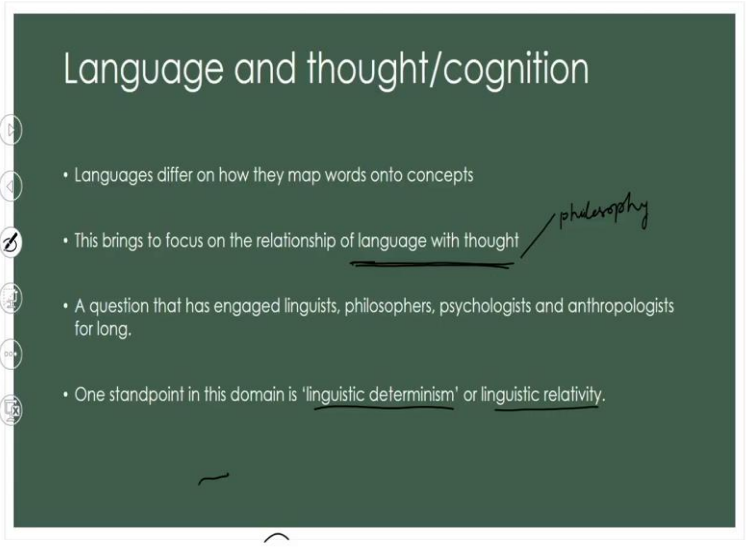
You can recall our discussion on cultural bilinguals. This is somewhat of that type. So, when you are a bicultural bilingual, a person can shift between L1 and L2 culture, cultural aspects. So, do you think like an L2 speaker, do you think like an L1 speaker and so on, something of that sort. So, do our fundamental cognitive apparatus, fundamental cognitive mechanisms also change when we change language? That is one question.

Second question is whether bilinguals differ from monolinguals of those respective languages. For example, in case of a Hindi English bilingual, is a Hindi English bilingual different from 1, a Hindi monolingual and 2, an English monolingual or do they behave

like monolinguals on both sides/ These are questions which has very quite far reaching impact.

So, we were talking about how a bilingual's language probably has an impact on his thought process, on his on the way he looks at the world, on the way he cognizes, how the cognition and language in a bilingual are different from that of the monolingual.

(Refer Slide Time: 09:55)

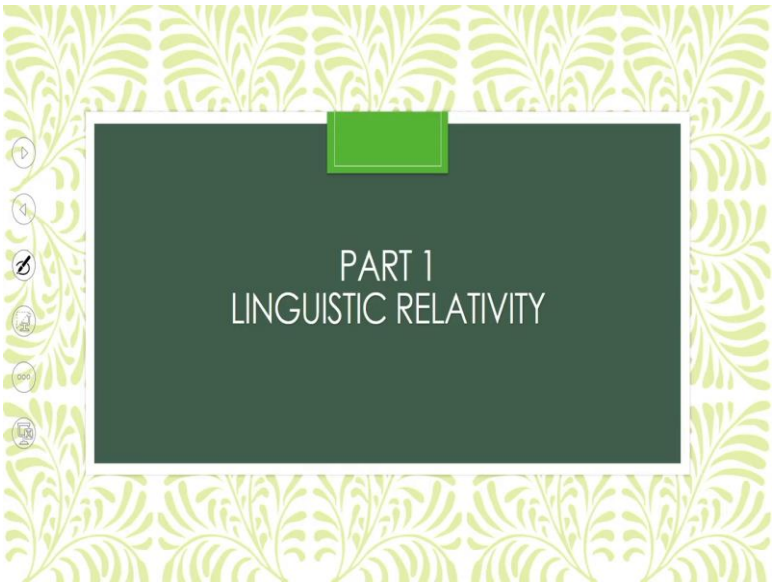


So, this is what brings us to the question of language and thought. Now, when we talk about language and thought, relationship of language and thought, this is not merely a linguistic question. This is not only a question for linguist, this is also a very important question in philosophy for example.

Philosophy has for a long time been bothered about how language and thought are connected to each other, what is the nature. However, we are not going there here, in this course we are not talking about primarily from the perspective of language and cognition.

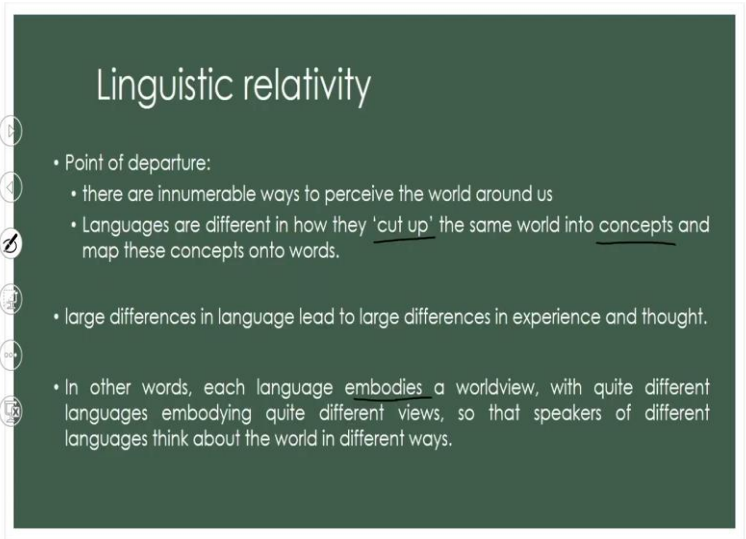
So, we are not going into philosophy here. Now, there are various ways of looking at this question. As far as we are concerned, the primary focus has been, from linguistic perspective, has been on what is called the 'linguistic determinism' or linguistic relativity.

(Refer Slide Time: 10:59)



Linguistic determinism and linguistic relativity are the same thing they are calling the same aspect by using two different names.

(Refer Slide Time: 11:05)



So, primarily what this refers to is that the point of departure is like this. There are innumerable ways of perceiving the world around us. As many languages are there in the world, that many ways of perceiving the natural world as well as the socio-cultural world that is open to us.

So, basically languages differ in how they ‘cut up’ the same world. This is I quote here, cutting up the whole same world means. So, everybody has the all of us let us say the there is a room full of 20 people speaking 20 different languages. Now, what they see all of them are taken to a mountain to a hillside and they are looking at the same scene. Chances are very high that each of them we will be looking at the same picture.

So, physical reality remains the same for each of them, but in their mind, they will interpret the scene differently. So, this is what we mean by how we ‘cut up’ basically we slice basically we colour and you know compartmentalize that knowledge worldly knowledge into our mind and we do that through language. So, basically we cut this into concepts and these concepts are then mapped onto what we words in that language, right.

Now, different languages have different ways of doing this. Often language A and language B might have a large amount of difference in how they do this, how they carry out this activity. Similar languages may do things similarly, with minor differences. Some languages which are different on a where there is a large-scale difference the difference of mapping also may be largely different.

So, in other words, each language embodies a different worldview. This is very crucial for to you for you to understand this whole thing. So, embodiment, embodying a concept means what does that concept mean for that person. For example I will give you a simple example of Indian English.

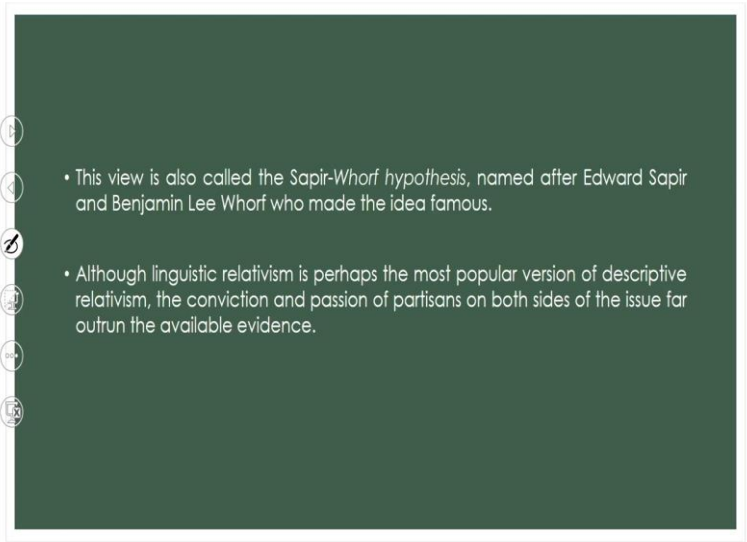
In India anywhere you go the concept of pickle remains more or less the same. So, the idea of what a pickle is, the concept the reality and the word. So, the mapping of the word pickle on the concept ‘pickle’ remains more or less similar for all Indians with minor differences here and there, but no large difference. Now, you imagine yourself going to Europe.

Many European countries will have various kinds of vegetables put in vinegar or other substances, for preserving that. In our Indian pickle also is a way of food preservation. There theirs also is a food preservation. What is the difference? In the let us say German or the Dutch pickle does not have all the ingredients that we do have, nor does it have the laborious process involved, various you know at every level there is a different sort of process, different sorts of oils and spices and so many things.

So, pickle is not a simple thing for us which is compared to the Dutch pickle. It is a vastly different world. So, that is, but in both cases the word ‘pickle’ is used. That is what we mean that mapping can be very very different vastly different, right? So, this takes us to a very different.

So, an Indian traveling to the west for the first time will be rather surprised if not anything else by looking at their pickle. You would be because the food we find their food very bland. So, we might as well think that ok a pickle little bit of pickle will help, but it does not help there as well.

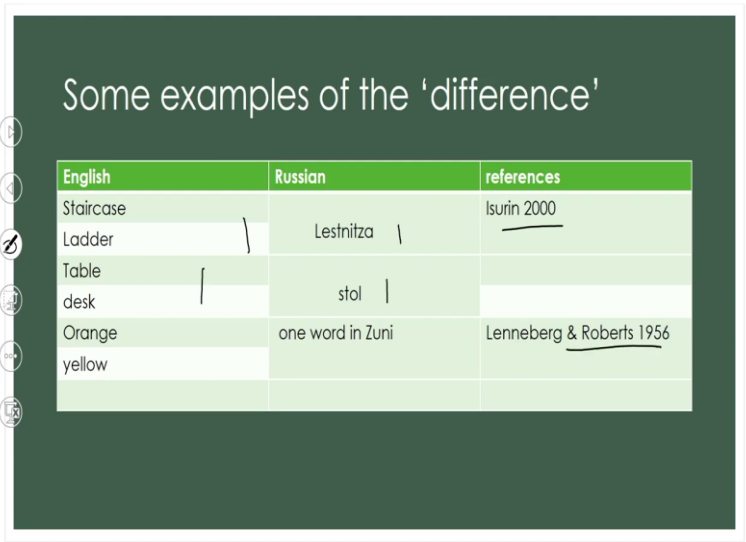
(Refer Slide Time: 14:44)



But in any case so, this is a an example of how languages use words and mapping and concept mapping and how languages can be different in that mapping, right? So, this view is also called linguistic relativity. So, what is the linguistic relativity idea, that languages differ vastly and how languages look at the world determines how you the how languages embody the concepts will determine how the people speaking that language will look at the world.

This is also called Sapir-Whorf hypothesis because Edward Sapir and Benjamin Lee Whorf where the first ones who made this idea very famous.

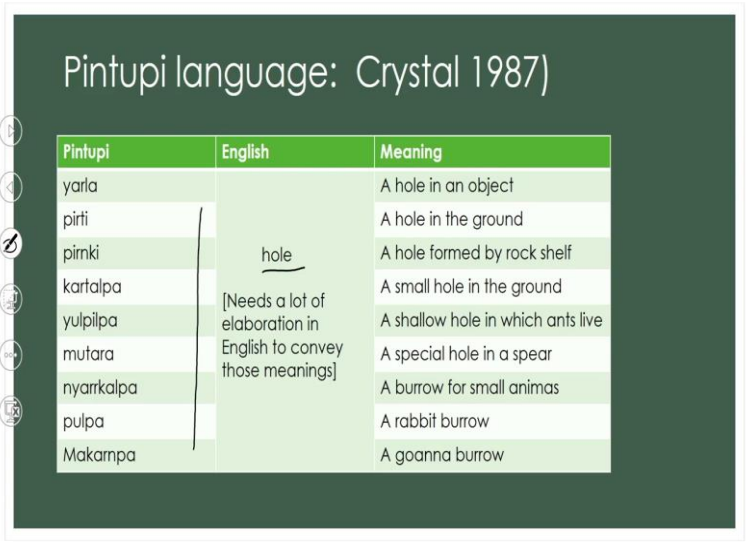
(Refer Slide Time: 15:39)



So, linguistic relativism, linguistic determinism or Sapir-Whorf hypothesis, they all talk about the same thing that language structure has an impact on the languages are different in terms of their codification and that impacts your way of looking at life. So, before we get yeah get down to the finer details, let us look at some examples of those differences. This is. So, here you have we have two words in English you have staircase and ladder for both of these Russian has only one word right. This is from this particular study.

Similarly, table and desk are two words in English. However, both of them come under only one word in Russian. Similarly, in Zuni, there is only one word for both orange and yellow. Yellow, orange and yellow colors in English and this has only one word expression in Zuni language. In fact, this study is one of the most well-known studies going back to 1956 by Lenneberg and Roberts, to show how languages can have different ways of portraying the world.

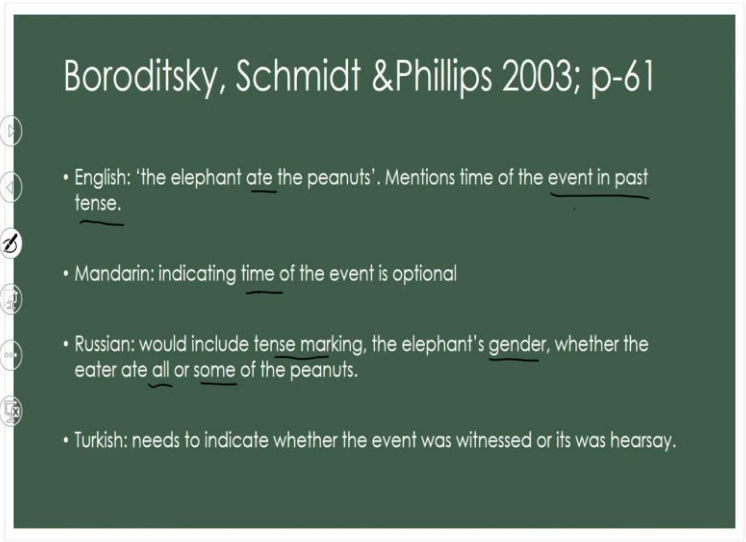
(Refer Slide Time: 16:43)



Yet another example from David Crystal's 1987 work. Here you see he worked on an Australian Aboriginal language called Pintupi and you see for the English word 'hole' they have series of words. They are single words they are not descriptions. So, you see just to for the word yarla you have in English there is a whole description.

So, similarly for all of these so all of these words need a descriptive sentence in English language, that is what we that is what is interesting here. So, this language has one-word depictions for different kinds of holes. So, in the ground, in the rock, you know small or what kind of animals have are using that hole and so on and so forth.

(Refer Slide Time: 17:39)



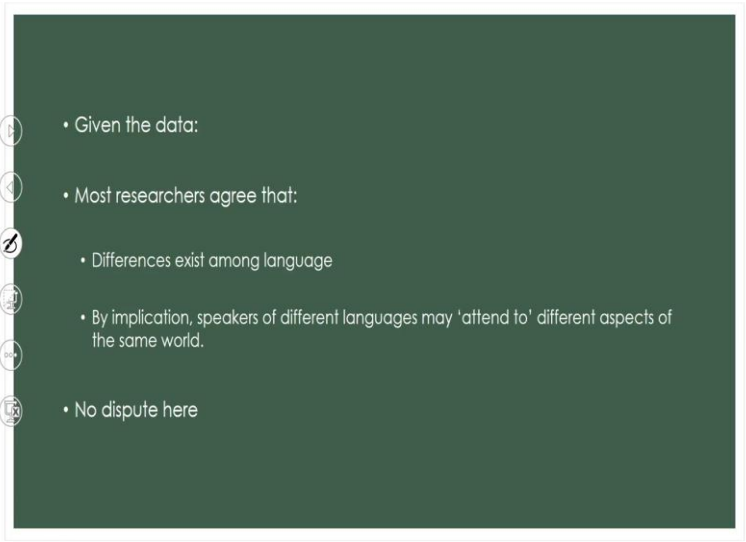
This kind of differences are there not only in the at the word level, but also at the grammatical level and syntactic level. A very influential work again by Boroditsky and her collaborators in 2003. They show that is the English sentence 'the elephant ate the peanuts' this in this sentence. This is basically a sentence that depicts the time of the event.

So, this happened in the past. So, English has eat-ate. So, you have mentioned. So, the event in the past tense is mentioned. So, English only takes care of that part. If you have to express the same concept in Mandarin for example, now you the you are indicating the time of the event is optional. You do not need to specify the time when the eating happened. Let us go to Russian.

Russian will include tense marking, elephant gender and whether eat ate all or some. So, the amount of peanuts that the elephant ate also has to be grammatically, explicitly mentioned in the sentence. So, basically the Russian equivalent of this sentence will have all these extra information included in that.

In Turkish it also needs to indicate whether the event was witnessed or it was hearsay. So, when somebody says the elephant ate the peanuts is did the person see it happening or did he hear it from somebody else. You see that is the kind of difference that is the kind of range of differences languages may have.

(Refer Slide Time: 19:22)

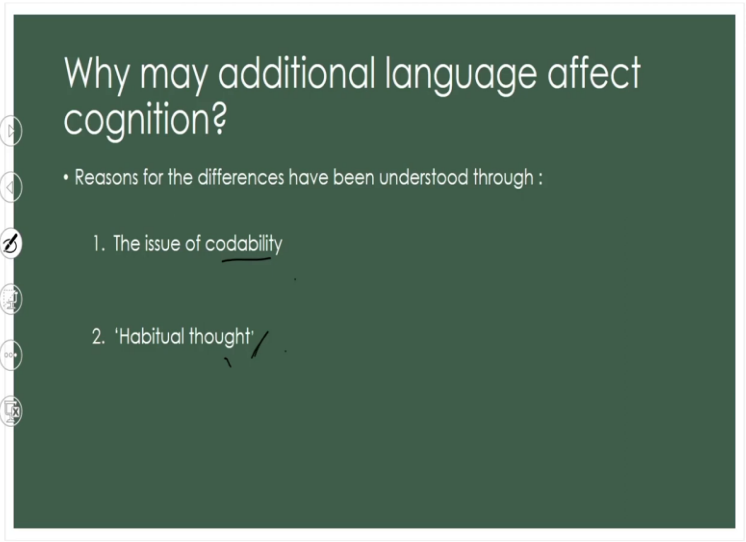


Now, given this kind of and there are of course, many other such studies. These are some of the most well-known ones. Now, given this data, most of the researchers agree that yes languages are different. There are lots of differences in terms of concept and word mapping and concept and grammatical structure mapping.

So, by implication, different speakers of different languages may attend to different aspects of the same world. For example, when you are when you are a Turkish speaker, you need to be constantly aware about whether every sentence you are you are saying, you have to be aware of the fact that one needs to mention the mention whether the event was witnessed or was it a hearsay.

So, that is what we mean by attending to. We will see this is also called habitual thought. How languages can affect our habitual thought process. So, there so far so good there is no dispute in till here.

(Refer Slide Time: 20:23)



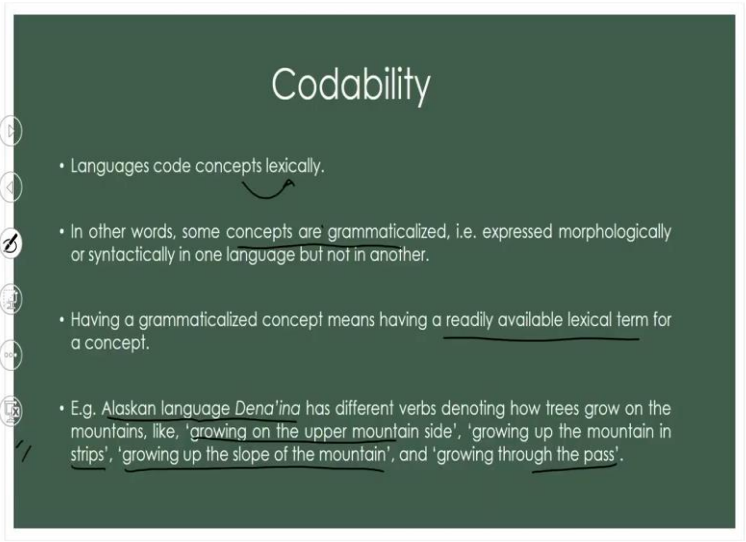
Before we go to the dispute before we go to the quarrel, we let us let us see a little bit more. So, why may additional language affect cognition? We have seen that languages differ on various levels in terms of mapping concepts into the language. So, why where does it all start?

So, technically speaking, there are two issues here. One is the issue of codability. So, what is codable? What do we mean by codability? Codability basically refers to that language is basically a code. It is a system. It is a it is a symbolic way of referring to things in the world.

So, what do we care to symbolize and what do we not care to symbolize is what takes us to the issue of codability. So, is the idea of whether the concept of witnessing versus hearsay is a codable idea or not is where the difference between Turkish and English remains.

In English you do not have to codify. You do not have to say anything whether you saw the elephant eating the peanuts or not, it does not really matter. In English sentence it does not really matter. In Turkish it matters. So, that is what is codability. So what is codable in one language.

(Refer Slide Time: 21:47)



Second is the idea of habitual thought. So, whatever is codable depending on what you code what is codable in your language will, in turn, affect your habitual thought process. How does it work? Let us see. First and foremost, languages code concepts lexically. We just saw in case of the work by Crystal where there are 8/9 different terms for the single English word ‘hole’. So, that is what it means. So, code concepts lexically.

So, concept are mapped onto words. This is how it works right. In other words some concepts are grammaticalized. For example, that is expressed morphologically or syntactically in one language, but not in other language. So, codability primarily refers to that some languages care to grammaticalize certain concepts.

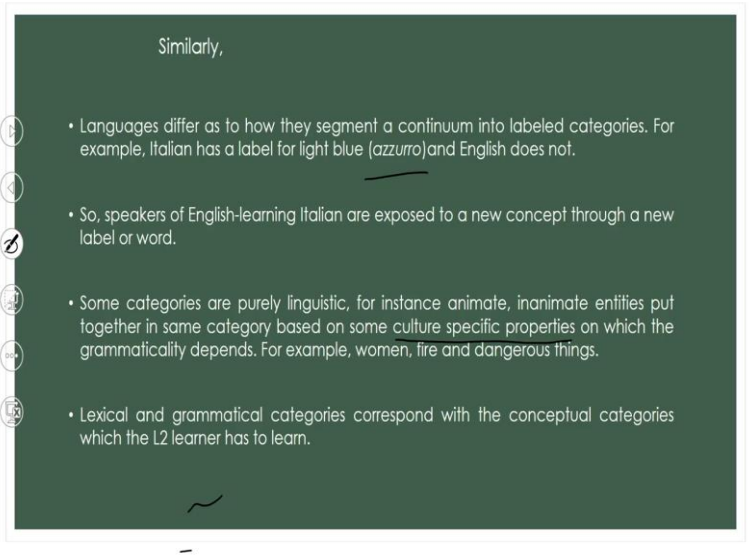
So, certain concepts are grammaticalized. It means certain concepts are either they have a lexical item for this or sometimes they will have a in the structure, in the syntactic structure itself there will be the concepts will be grammaticalized, like in like in case of Turkish or in case of Russian for example, in the previous case. So, what does it mean? Having a grammaticalized concept basically means that you have a readily available lexical term in case of lexical term in case of words.

So, another example here is that of Alaskan language Dena’ina has, this has different verbs. So, for the simple concept, simple in English, concept of trees growing on the sides of the mountain slopes trees growing on the mountain slopes this language has different lexicon for you see how many types.

So, on the slope, growing on the upper mountain side, growing up a mountain in strips. So, depending on the position in the mountain where exactly the trees are growing, in what kind of shape, what kind of patches they form and so on depending on that they will have different words.

This is not possible in English, not possible in English, what do we mean by that? It means that in English there is no single word lexical item, there is no single word for this you need to describe you see how we have described: going on the upper mountain side, in Dena'ina there is only one word for that concept.

(Refer Slide Time: 24:12)



Similarly, there are there are also sometimes different ways of segmenting a continuum. Continuum can be color continuum, can be time continuum, various things like this. So, we segment time into past, present and future tense. We segment colors into blue and purple and dark blue light blue and so on and so forth.

You also have words like mauve and lilac and so on and so forth. So, basically what we are doing is we are segmenting the color continuum into discrete units. So, this is another case, where you will find a lot of cross linguistic difference, variation. So, one classic example is that of English and Italian.

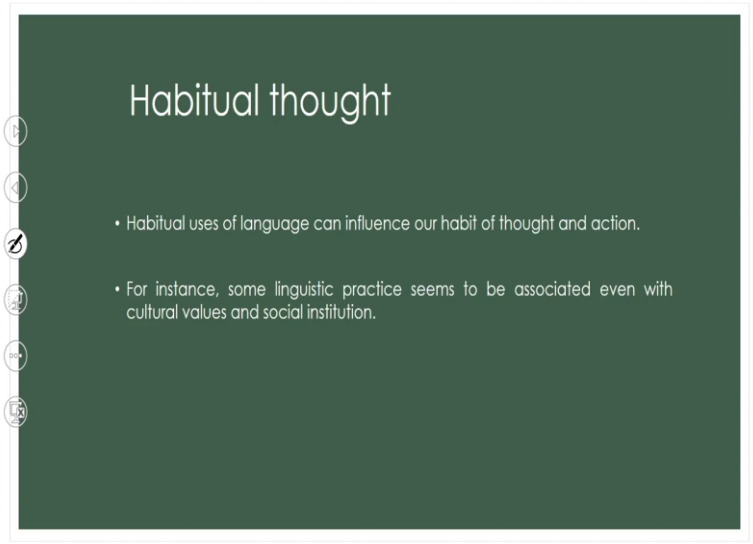
In Italian, there is a word called azzurro which basically refers to 'light blue' in English. Of course now we do use azzurro as a term, but initially English did not have that as a

single word concept. So, speakers of English speak English learning Italian are expected to learn new concept through a new label or word.

Similarly, some concepts are purely linguistic. Purely linguistic, as in, it has no real-world ramification. For example, in some languages in another language another Aboriginal language women, fire and dangerous things other many other dangerous things are put under the same category of objects, same category of nouns.

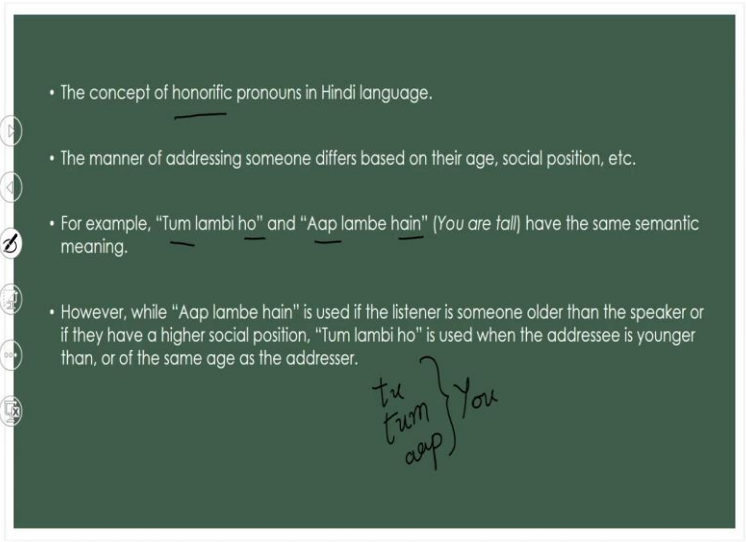
So, this is done with the use of a classifier, which is of course, based on some kind of a culture specific property. It is not necessarily a real-life property of women and fire and other dangerous things that decides. So, some sort of a specific, culture specific, idea that gets grammaticalized in terms of some kind of in this case it is a classifier, in some other cases it can be something else.

(Refer Slide Time: 26:21)



Now, this is something that the L2 learner has to learn. So, if an a learner L1 does not have these concepts and L2 does, then the person has to learn those concepts and they are mapping. And that, in turn, will of course, have some impact on the habitual thought process. Habitual thought process basically is that habitual use of language that can influence our thought, that is simple.

(Refer Slide Time: 26:52)



For example many linguistic practices are I have to do with the socio-cultural systems. For example, in Hindi, and many other languages, you have the pronouns have a three way differentiation in terms of honorific system. So, in honorific pronoun system in Hindi has [tu] and [tum] and [aap] difference, which is the case in many Indian languages. So, [tu] starts at the lowest level which you use for [tu] is basically' you'. So, in Hindi you have [tu] and [tum] and [aap], all the three correspond to the 'you' in English language right.

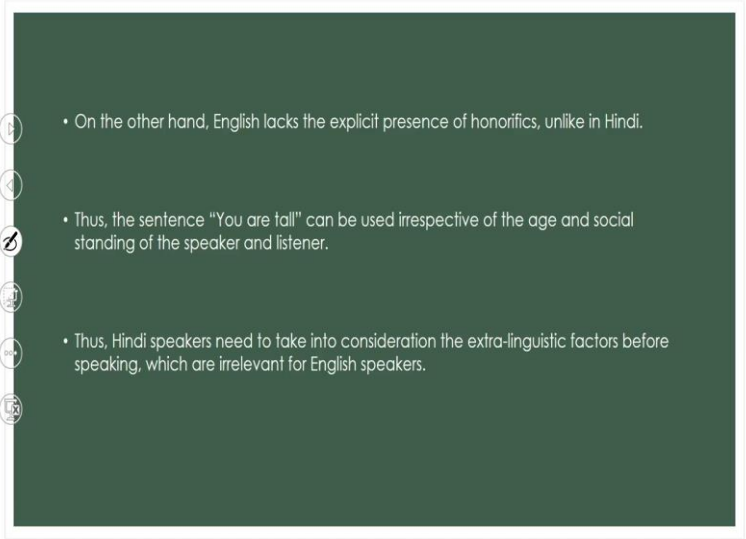
Now, here [tu] is basically used with somebody who is either younger to you in age or it is also used with somebody who is subordinate or to (Refer Time: 27:52) to the speaker. So, even if somebody is older in age, but lower in the social strata [tu] is often used. [tum] is used for close relationships within the family among friends among equals and so on. [aap on the other hand it is used for people who are either older to the speaker or their superior in the hierarch, in the social hierarchy of some things.

Now, this will this is this appears very simple in terms of grammar, but it is not so simple when it comes to your communicative competence, when you have to speak in that scenario in the social scenario. So, for example, [tum lambi ho] and [aap lambe hain] by the way this the pronoun here agrees with the verb. So, depending on how what pronoun you use the verb also changes.

So, [tum lambi ho] and [aap lambe hain] are simple like the both mean the same thing. Semantically they are just referring to somebody who is taller than the speaker. However depending on age or social hierarchy that the pronoun changes. Now, this is not only the case of only age, but the there can be a complex mixture of things. So, somebody who is younger to you in age, but much superior in social strata and hierarchy and so on there [aap] can be used.

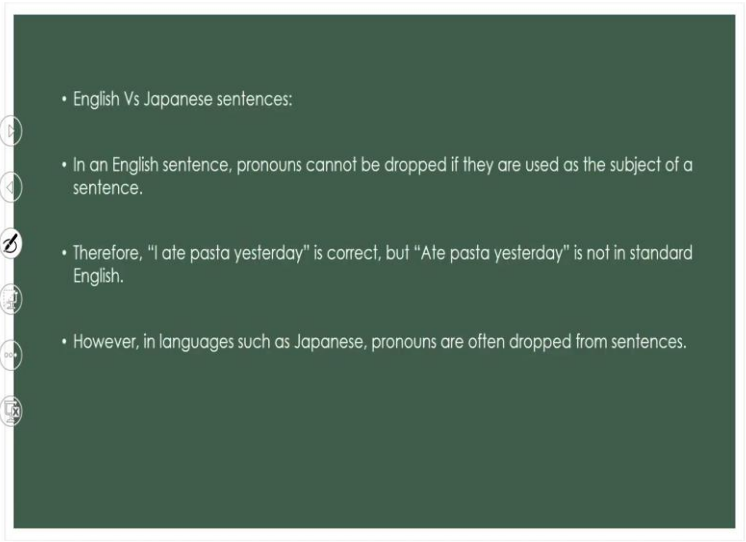
So, which means that you cannot ignore the addressee in any conversation set, of the addressee's age and social status and so on you have to constant you have to be watchful. So, that feedback system is stronger in case of Hindi as opposed to in case of English. So, when you are speaking in English you do not really need to worry about all of these.

(Refer Slide Time: 29:42)



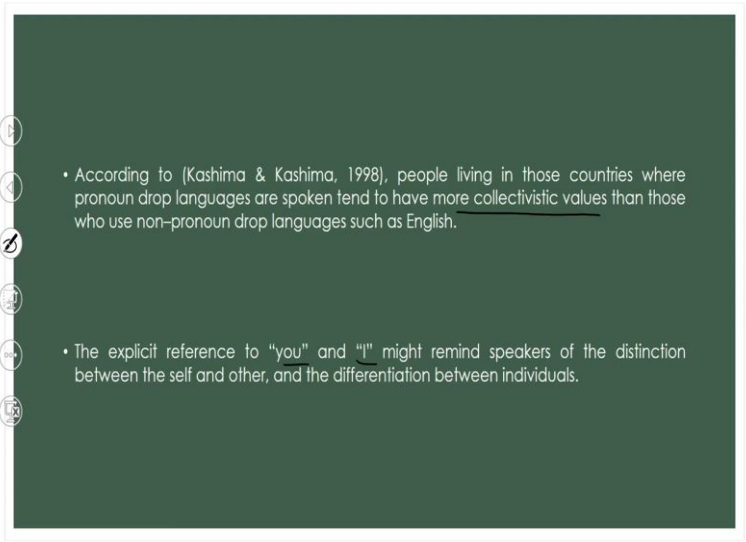
This is another. So, habitual you are having in Hindi speakers have this as part of their habitual thought, which is not the case with English.

(Refer Slide Time: 29:50)



Similarly, in English versus Japanese studies have looked at a slightly different issue. In case of English, pronouns cannot be dropped right. So, pronouns have to be used. So, 'I ate pasta yesterday', its impossible to use ate pasta yesterday. In Japanese; however, it is perfectly possible to say ate pasta you do not need to use the pronoun, similar to Hindi similar to many Indian languages. So, in Hindi it is perfectly fine to say 'pasta khaya' even in Bangla and other Indian languages also. So, it is ok, but in English it is not it is not a possible even.

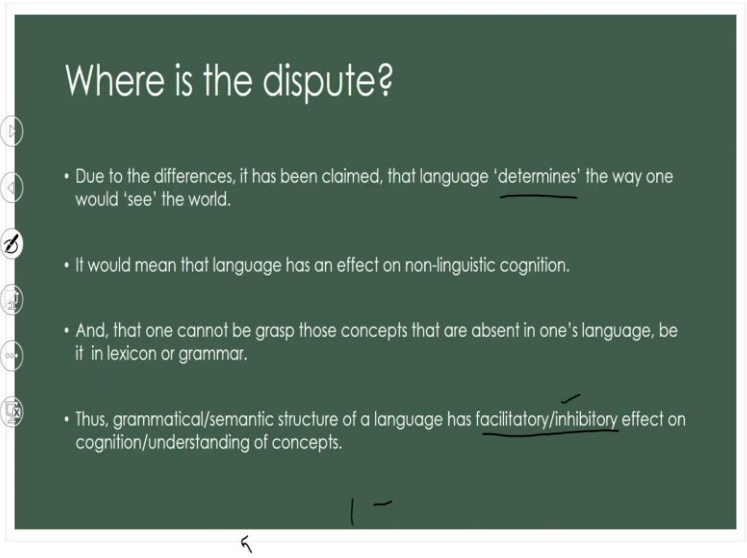
(Refer Slide Time: 30:33)



Now, there has been a very interesting study connecting this pro-drop pronoun dropped languages and with the societal system. So, this study by Kashima in 1998, they have proposed that people living in those countries where pronoun drop languages are spoken, tend to have more collectivist values than those who use non-pro-drop languages. So, more collectivist values as opposed to more individualistic value. This is a very very interesting take on this whole idea of using or not using pronoun in a sentence.

So, they say that the explicit reference to "you" and "I", this probably remind the speakers of the distinction between self and the other.

(Refer Slide Time: 31:24)



Quite an interesting take there, but just to show you how languages and the grammaticalized concepts can differ to a large extent and what all they might even imply. So, so far things are fine we see that languages differ, their codification system differs, as a result, the habitual thought process may also differ that is all fine well attested and well-studied. Then where is the problem? The problem is when we make claims on the basis of that difference that is where the stronger version of the linguistic relativity hypothesis comes in.

The stronger version says that language 'determines' the way we 'see' the world. So, if your language has a particular structure, we are obliged to look at the world through that lens only, right ? So, this means that languages affect non-linguistic cognition non-verbal cognition in a very significant way. You take this thing one step ahead and it means that,

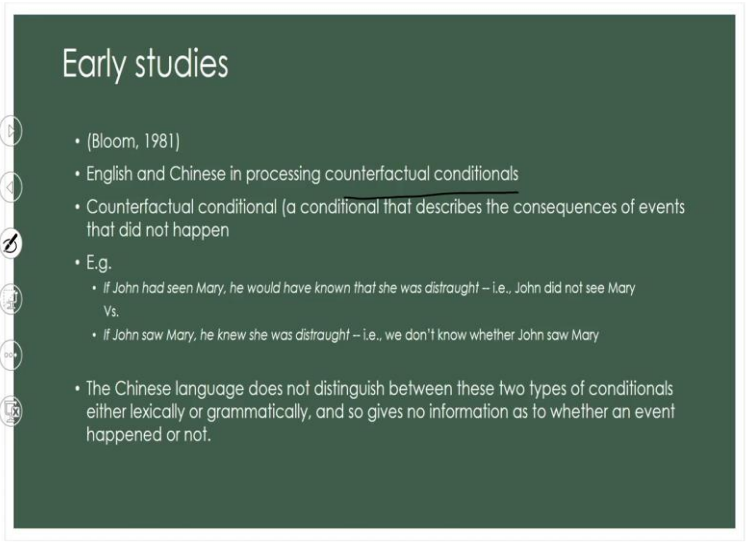
it implies that, those languages which does not have codified lexical items for certain concepts will also not be able to grasp those concepts.

For example if Eskimo has a large number of words for snow, varieties of snow and English has only two: snow and ice, English speaker will not be able to distinguish between those different types of snow, that is the claim. So, if your language does not have the word for a particular concept, it will be very difficult for the speaker of that language to grasp, to understand, to learn that concept that is the strong claim that linguistic relativity seems to make.

So, basically grammatical structure or syntactic structure or semantic structure of a language has either facilitatory or inhibitory effects on understanding concept. Now, we need to unpack these words. What is facilitatory versus inhibitory. Facilitatory as it as the name suggest that if your language has a large number of words for finer nuances within a bigger concept, that means, this helps you understand those concepts better.

So, an Eskimo, because the language has let us say 20 words for snow then the Eskimo children when learning the language, they will have a better access to those fine grained differences within that concept ok. On the other hand, the inhibitory effect basically talks about that if your if a language does not have the words, if a language does not have so many grammaticalized, codified way of looking at a concept, then it will be very difficult for that person to, for that speaker to learn that learn that concepts this is the primary claim.

(Refer Slide Time: 34:16)



Now, this is where the entire dispute is or call let us call it debate or disagreement and hence this (Refer Time: 34:28) this is a big claim to make and the initial strong claims were discarded almost immediately. However later on, following cognitive revolution in the 50's and 60's, a lot of a new wave of looking at the same question age old question started. This is called the neo- Whorfianism neo- Whorfianism as in a new way of looking at the linguistic relativity hypothesis.

Now, the standpoint is that you do not go by the strong version of it as in that language does not probably determine the way you look at the world, but it does have some sort of an impact, that is where the neo- Whorfianism slightly differs from the older version. So, the newer version is also call the weaker version of the linguistic relativity hypothesis.

So, a lot of studies have tried to look at whether this is the case, whether how languages codify a concept and in case of a bilingual, if that codification has either helped him or you know stopped him from learning a new concept and how what is the what are the dynamics.

So, one of the early studies by Bloom in 1981 looked at a very interesting construction in English language which is called counterfactual conditional. Counterfactual conditional is a conditional that describes the consequences of events that did not happen. So, for example, these are the two examples that he has given; 'if John had seen Mary, he would

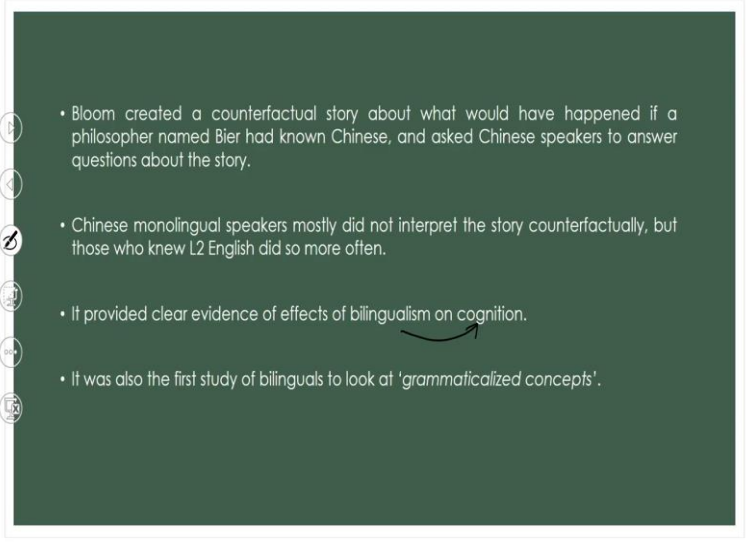
have known that she was distraught', ok? John did not see Mary that is the implication of this sentence.

Second sentence, 'if John saw Mary he knew she was distraught', we do not know whether John saw Mary. These are the two possibilities of codifying this difference in the understanding with respect to John whether you know John did not see Mary or whether you do not know.

Depending on these this is the consequences will vary and how do you grammaticalize this difference in concept? This is how, this is how, you change the sentence structure to main two different things. Now, this is a very subtle difference in English language this is called counterfactual conditional.

Now, Chinese language does not distinguish between these two possibilities these, two types of conditional either lexically or grammatically and so, gives no information whether the event happened or not. In English you know,m whether it happened or not at least understanding of the concept will be clear, in Chinese it is not clear, it is not mandatory to use that.

(Refer Slide Time: 37:21)



So, taking this as a starting point, Bloom created a counterfactual story about what would have happened if a philosopher named Bier had known Chinese and then he asked Chinese speakers to answer questions on the story. So, a non-Chinese person learning

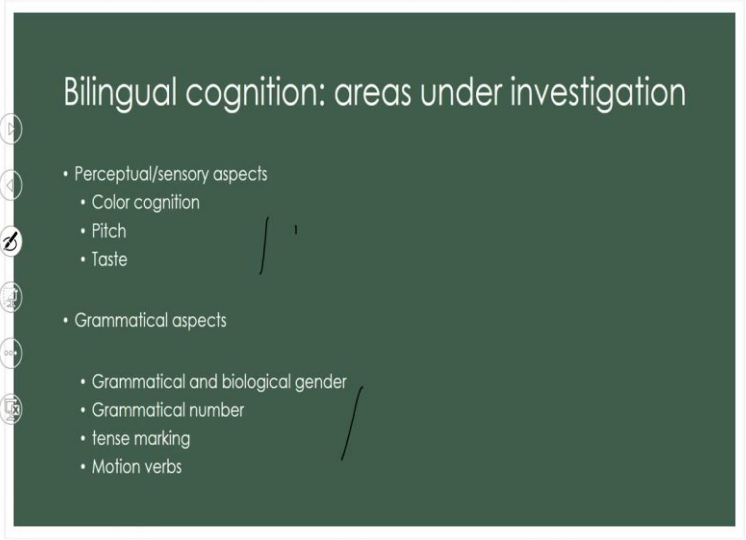
Chinese and then asking Chinese speakers about certain stories or certain questions about that story.

Now, Chinese monolingual speakers did not interpret the story counterfactually, because counterfactual conditionals is not even anything to be talked about it is not it is not does not even exist in Chinese language. So, they do not have to worry about it and hence they did not answer the questions keeping this factor in mind. However, those who knew English Chinese speakers who learned English as an L2, they did they used counterfactual argument more often in their language structure.

So, this is one of the earliest and clear evidence of the effect of bilingualism on cognition. So, that once you have started learning at the new language you are incorporating the conceptual and aspects and grammatical aspects of that language into your first language also.

So, there is a slight adjustment in your non-verbal communication as well. So, you are thinking slightly differently, that the L2 speakers of Chinese L2 English speakers of Chinese L2 English speakers were using counterfactual arguments more often than monolinguals, meaning that there is a slight change in their thought process. So, this is what one of the first studies.

(Refer Slide Time: 39:01)



The studies that followed after this there are many many different domains within which this bilingual cognition has been looked at, some of them are of course, we can divide these studies into two categories, looking at two different aspects one is the perceptual and sensory aspect. So, the kind of sensory input that we get from the world and how that is coded in the language that is one. Another is the grammatical aspect grammatical and syntactic structure, structural differences, alright?

(Refer Slide Time: 39:34)

So, let us go to the perceptual and sensory experiences first.

(Refer Slide Time: 39:37)

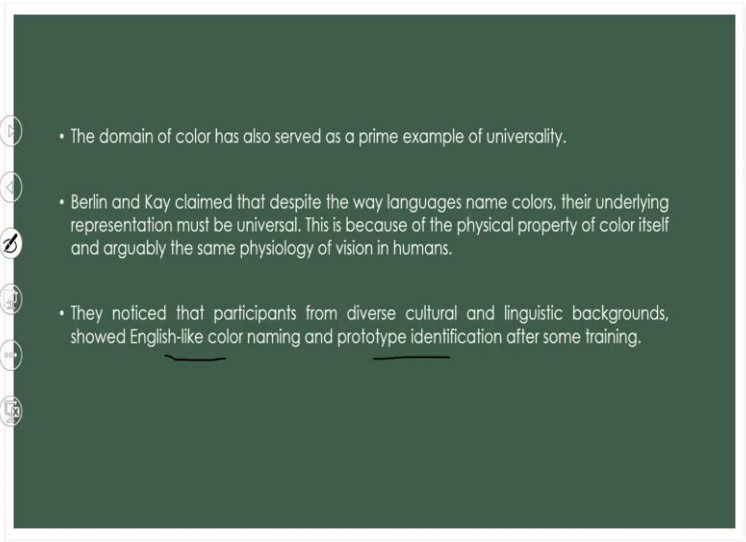
Sensory aspects first. Color cognition has been one of the most important domains one of the most important topics for understanding cognition language and cognition among different groups of people and also in terms of bilingual cognition. So, because color is such a thing that basic color terms differ across languages in the world.

So, languages differ from having 2 basic colors to 11 basic colors, right/ So, Berlin and Kay's landmark study on color terms across worlds languages have found this. Now, some languages so, then minimum color terms you can have is 2 and the maximum they found where was 11. Now, this has been, as a result, a very rather traditional test-set for a Whorf's idea to see if languages that have less number of color terms are incapable of distinguishing those colors in real life, that is basically what the entire study has been.

Now, I mentioned Zuni in a few slides back that Zuni has only one term for orange and yellow whether English has two. Similarly, many a languages have one term for blue and green together. So, one term refers to both blue and green, in English we have two words. Similarly, many other languages have this kind of Papua one language in Papua New Guinea has only two color terms dark and light. So, dark includes a lot of dark colors, light includes a lot of light colors.

Now, if that is the scenario, if a language has very few color terms in its vocabulary, does it mean that you that person, that speaker of that language cannot grasp the color differences if it is shown to them, without asking them the names, forget about the language, but color do they identify the subtle nuances of color difference, this has been the study that has been carried out by a number of researchers.

(Refer Slide Time: 41:39)



So, Berlin and Kay, as I said, I have studied this in depths and they claim that despite the way languages name colors, there must be something universal in terms of those the representation of those colors in the human mind. And this is because the physical property of color itself, as you all know color perception, the what with what colors we see and how we see them does not depend on language right color.

Perception is primarily a matter of biology and physics, basically wavelength and the way those wavelengths lights of wavelengths are interpreted by the visual apparatus, human visual apparatus. So, basically that remain more or less the same. So, how is it possible that humans will not see certain colors until and unless your color blind, but otherwise, in normal cases. So, that is the same claim that he made that color of property itself is universal. in terms of it is biology and it is physics.

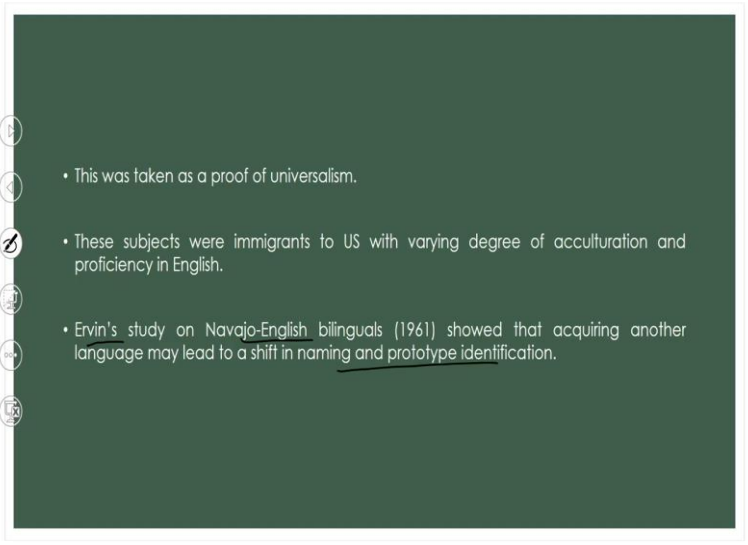
So, this devised a many studies and they proved that participants from diverse cultural and linguistic backgrounds showed English like color naming and prototype identification. So, basically what he means at that time they called it English like color naming and prototype identification; basically with a bit of training, if you train them that this this language is called these this is called this this color is called this and so on with a bit of slight training those people are perfectly fine at learning those terms.

So, one on the one hand it is perfectly possible to teach color terms different color terms to people who earlier did not have them, that is one. Secondly the prototype so, what is

blue, typically what is used in these cases is called a Munsell color chip we will show I will show it to you slightly later. So, in the color chips there the colors are different in terms of hue and brightness. So, where what is blue is there is a prototypical blue for an English speaker, for similarly for other speakers what is a blue, what is a green.

So, if you have only one word for blue and both blue and green, that word the exact mapping of that word and the concept and the exact color might be different from that of another language which has different words. So, that also changes. So, not only the speakers learn can learn new words, they can also adjust their prototypes of those different colors, that is what they found.

(Refer Slide Time: 44:26)

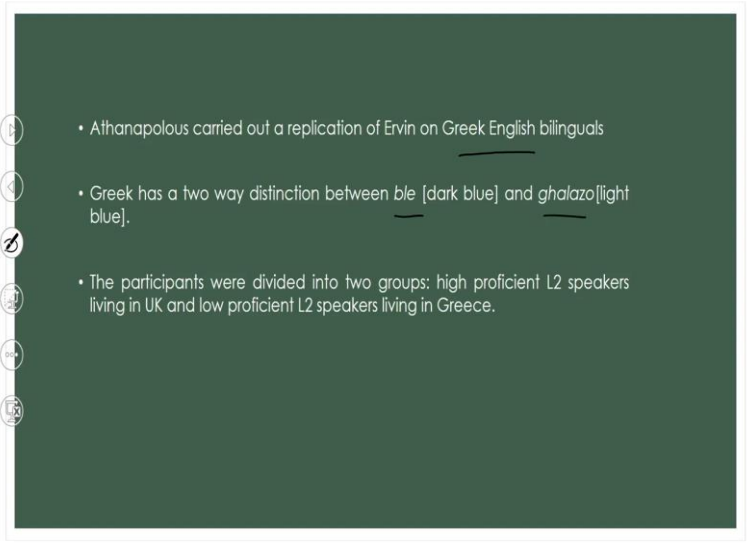


Which means that even though languages may differ in terms of vocabulary in a certain domain and that might have some impact on their cognition. However, it is open to changes, so they are capable of grasping. So, the stronger version of the linguistic relativity hypothesis is not tenable is what they found.

So, this was taken as a proof of universalism, as in the color understanding color perception, is universal. These subjects were immigrants to US with varying degrees of acculturation and proficiency in English. So, as the English proficiency goes up, the color perception also changes, that is what they found.

Another important study by Ervin on Navajo-English bilinguals, that was carried out in 1961, showed that acquiring another language can lead to a shift in naming and prototype identification similar to what we have found before.

(Refer Slide Time: 45:21)

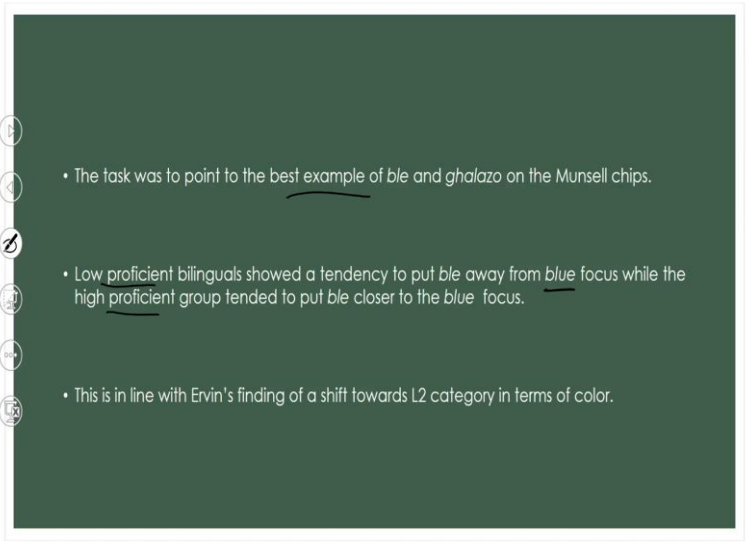


Another interesting study carrying the Ervin's findings ahead was Athanapolous Athanasapolous on Greek English bilinguals this is comparatively recent, now he had he was looking at a very interesting concept because Greek has a two-way distinction in blue, one is called ble that is dark blue and there is ghalazo which is light blue. Now these two are quite far away in the Munsell color chips, these two colors are rather far away both in terms of hue and darkness.

They were trying to see if this concepts. So, the prototype of what is ghalazo and what is a ble, will it change if they start learning English language that is the question that they asked, because Greek monolinguals know this difference very very clearly, how will it be modified if they start learning English as their second language.

So, they chose their participants very carefully. They had two levels of proficiency, one group had initial level of proficiency, another group had high level of proficiency. So, low proficient versus high proficient bilinguals, Greek English bilinguals. The high proficient bilinguals were living in they were Greeks living in UK and the low proficients were living in Greece and they are learning English.

(Refer Slide Time: 46:43)



Now, the task was to point to the 'best example', best example is the prototype of that term. So, what is the prototype of ble and what is the prototype of ghalazo, is the question right,? What is the best example of these two in the color chips, they were not asking about English language at all nothing. The English proficiency is a background information right they had to this was a non-linguistic task, they had to find out the prototype.

Now, in low proficient bilinguals showed a tendency to put ble away from 'blue' focus blue as in English blue, ok? What color is when we say blue when English speakers say blue that it has a very different prototype as opposed to ble in Greek. So, low proficient monolinguals one low proficient Greek English bilinguals basically behave like Greek monolinguals in that their ble and ghalazo were far apart.

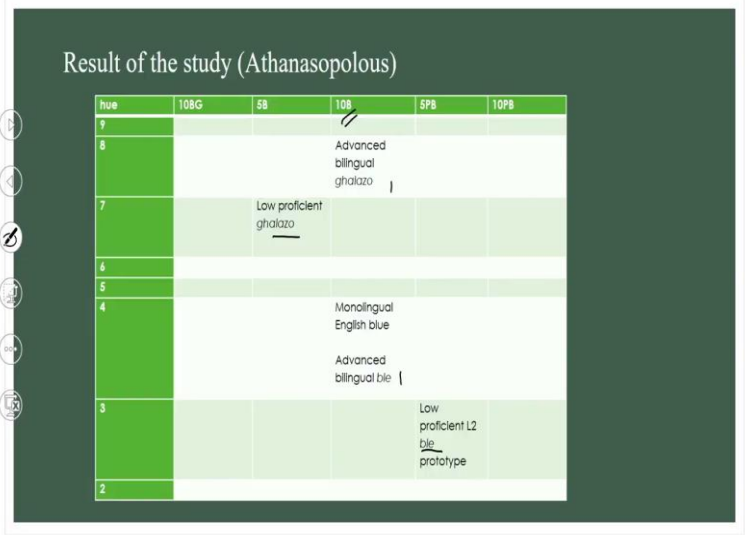
So, ble was put quite away from a English prototype of blue.Whereas, high proficient group tended to put ble closer to the blue focus. So, the key word here is proficiency. So, the low proficient versus the high proficient and low proficient Greek-English bilinguals behave like Greek monolinguals. On the other hand high proficient Greek English bilinguals had their color perception closer to English monolinguals alright.

(Refer Slide Time: 48:24)

So, this is also this his finding support Ervin's finding. So, this is how a Munsell color chip looks color chart looks. This can have various modifications, but primarily this is what it is. So, there are two levels of difference on this side and this side. So, hue and brightness difference and on the basis of that, you can call this is let us say 5 and you have C here. So, this is 5 C similarly. There is 8 or 10 G will be this color this is 10 G like this they are marked ok.

So, how each color has a name, depending on this these two variables.

(Refer Slide Time: 49:01)



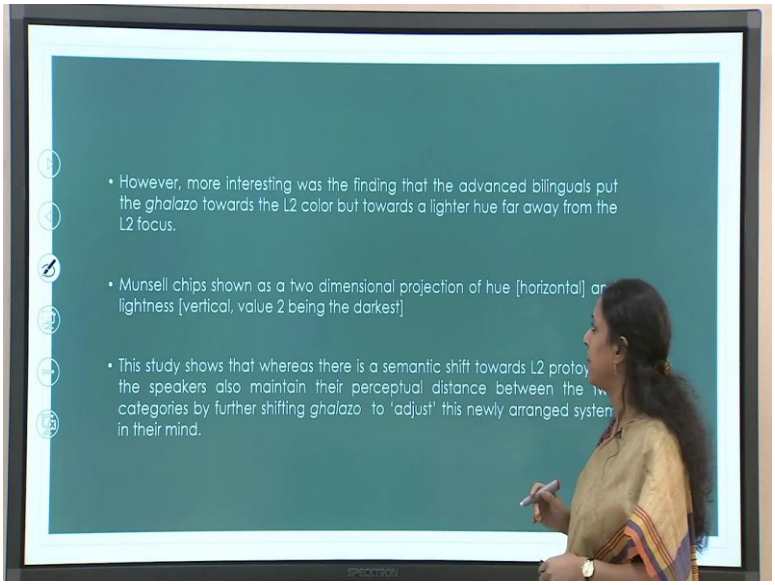
So, this is how the study by Athanasopolous looks, in case of for a Greek, ghalazo is basically 5B on that chart 5B will refer will be what is ghalazo and then monolingual ble is here right. So, that is where ghalazo and this is where ble is. So, this is 5 P B, P B is purple blue.

So, PB and 5B you can see the difference between these 2 color words. However, in case of English monolingual blue, this is what 10B is the English monolingual blue prototype, do not go by the slight color the colors are not here I am just showing you the numbers ok.

So, this is actually green in the slide this is green and white, but I just focus on this number. So, 10B is English blue, the prototypical blue in English language refers to 10B on that chart right and prototypical ghalazo refers to sits in the 5B position and prototypical ble sits in 5PB; this is the distribution. Now what happened with low proficient Greek speakers of English their ghalazo and ble were like this; however, the high proficient bilinguals put their ble here and ghalazo here, right.

So, both have moved, both have kind of converged towards 10B. However, there is a slight difference here ok. What is the difference? Even though their color categories, high proficient English L2 speaker's L2 English speaker's Greek speakers who speak English as L2, and who are high proficient, their colors both ghalazo and ble have moved closer to English blue.

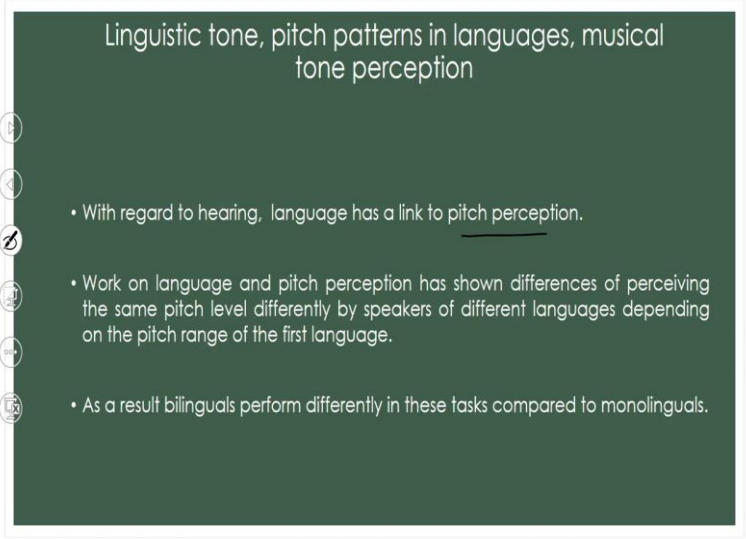
(Refer Slide Time: 50:53)



However, an interesting thing here is that even in advanced bilinguals, they have still maintained the distance between the two as you can see, even if they have come close or they haven't come here, only ble has come here ghalazo has remained much higher in the darkness versus lightness category.

So, that is the thing, that even though there is there is a convergence on one side, there is also they have kept the differences to some extent in the in their prototype.

(Refer Slide Time: 51:23)



So, this is the color, this is the domain of color.

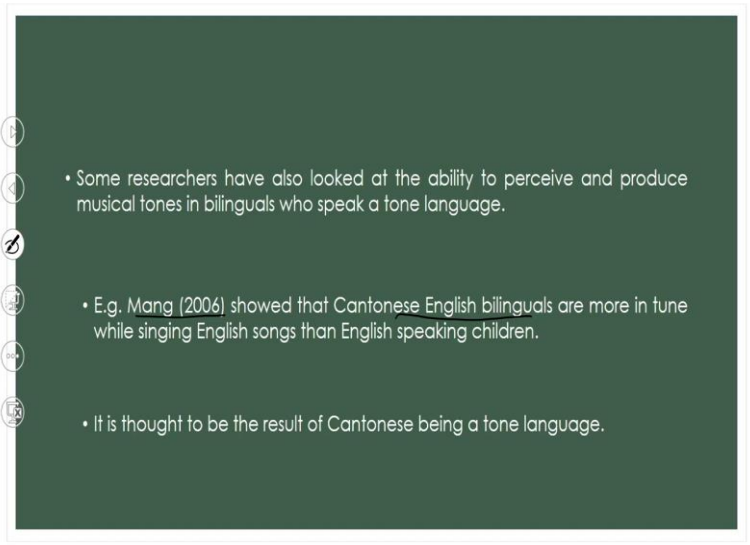
Now, let us move on to another perceptual sensory ah aspect of language, which is the domain of pitch, pitch tone so on. So, this is very interesting because depending on the tonal properties of one language, the tonal properties of either L1 or L2, the perception of those things in the other language can change.

So, language typically has a link to pitch perception, this is very every language has its own chart in that domain. So, this has work on language and pitch perception has shown that differences of perceiving the same pitch level differently by speakers of different languages differs on the pitch range of the first language.

So, if your L1 has a different pitch range, chances are very high that one will carry that over to the second language and perception of the second language pitch variation will

depend on the first languages pitch variation map. So, as a result bilinguals perform differently in this task as opposed to monolinguals.

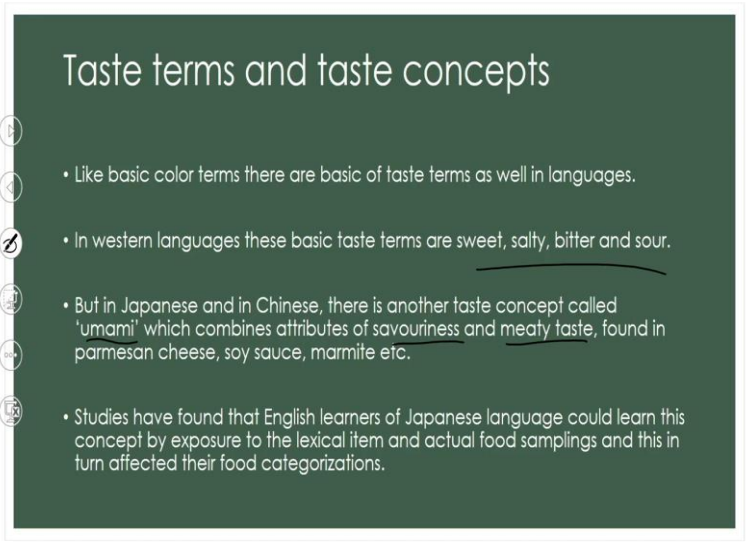
(Refer Slide Time: 52:34)



So, this has been used, this idea has been used also to look at the music understanding and perceiving of musical tones. Most one of the most important studies in this domain is that by Mang 2006 on Cantonese-English bilinguals, they found out that Cantonese-English bilinguals are more in tune while singing in English, than their English monolingual peers, than English speaking children.

And this was attributed to the fact that Cantonese is a tonal language. Many many tonal in Chinese both Mandarin and Cantonese are tonal language. So, are many languages in North East India the tone, what do you mean by tonal language here, tone has a grammatical property. So, the same grapheme, but with different tones will be different words, that is what it means.

(Refer Slide Time: 53:38)



So, if a language is a tonal language, chances are that speakers of that language will also have a higher perception higher better ability of handling musical tone. This is another interesting domain of study that takes care of the bilingual cognition of these things into consideration.

Again, we have something called the taste terms. So, taste terms are more or less universal. There are four taste terms in western languages there are four, some languages may have one or two extra. So, in Japanese and Chinese for example, they have another taste concept which is called ‘umami’. Now this is something that one will not understand until and unless we have tasted something that falls in that category right.

So, this is kind of a combination of savouriness and meaty taste, some kind of a combination of this type. However much we try to describe this taste, it is impossible for somebody to perceive it as exactly what it is until and unless you have tasted that thing which has this taste.

So, studies have found that English learners of Japanese language could learn this concept after exposure to the culture and the food, actual food sampling. Before that it is very difficult for you to categorize. So, if an English speaker is learning Japanese he has to learn that there is a different, fifth taste term basic taste term, called umami and then if you expose the learner to the actual food item which has this taste it will be the speaker has been able to learn this.

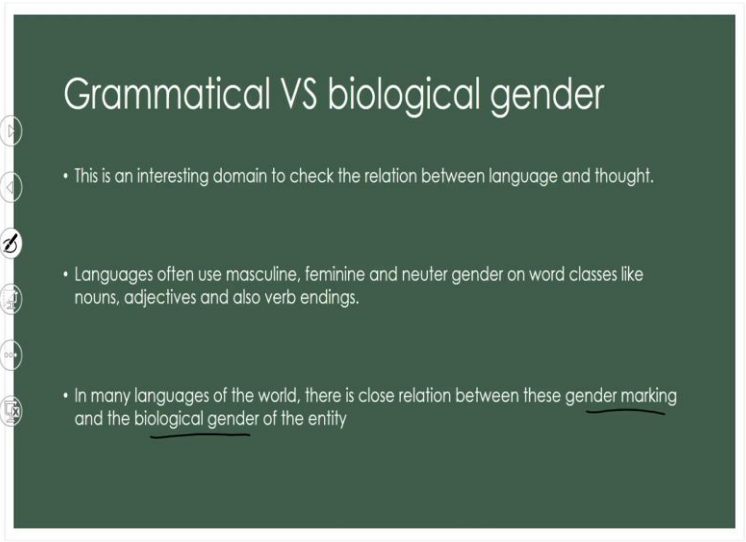
(Refer Slide Time: 55:15)

So, primarily what we have seen, let us summarize in color in terms of color, pitch and taste, color cognition has been a very important domain. So, color cognition has shown us that even though languages may differ a great deal in terms of the basic color terms in that language.

However, that does not stop one person from learning the new, if the second language has more number of words, more lexicalized and grammaticalized concepts and more finer nuances within that category, with some training it is possible to learn. Another finding from color category, color cognition studies among bilinguals, is that if that is also a shift, bilinguals make a shift in their prototypes color prototypes in terms of by adjusting them with the L2. Some, whether it is English Navajo-English speakers or it is Greek English speakers.

Similar findings have been found out similar findings have been reported that basic color categories the prototypes of a color, particular color term can change, there can be some shift. We will discuss this more in detail when we talk about conceptual transfer in the next segment. Now, now let us move on to the grammatical concepts.

(Refer Slide Time: 56:35)



Now, grammatical concepts as we have seen include the concept of gender, grammatical gender, number, tens marking and motion verbs. So, starting with gender, this is a rather interesting domain and it has been studied by many researchers many groups of researchers to take the connection between language and thought. languages.

So, what is gender in terms of grammar, when we say grammatical gender what we mean is that languages have languages use gender marking on their nouns, nouns, adjective sometimes even verbs take the gender marking. So, there are three possible genders as far as grammars go, masculine gender, feminine gender and neuter, this is still here things are fine. Often if the noun is animate and then the gender marking and the object and the referent they share there is a close relationship.

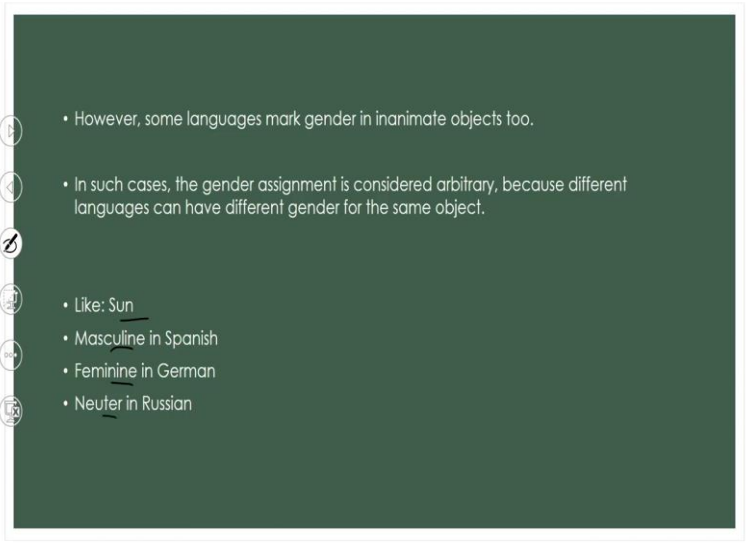
So, a boy is of course, will take a masculine gender and you know many languages, English is not a gendered language, but in Hindi and many other Indian languages are gendered language. So, on the one hand you have animate of animates plus human, minus human any kind of animates they will have a gender.

So, natural biological entities have their genders. So, when gender marking is mapped on to the real life gender, this is called a close correlation. However, some languages do not have this close correlation what do we mean by that, we mean that in some languages inanimate objects can also have a gender marking. So, inanimate objects can be either

masculine or feminine or neuter, there are all kinds of possibilities. So, this is where it gets really interesting.

So, in some cases there is a close relation between the gender marking and the biological gender, that is when it is in tune with the real world. So, gender marking of on the word also has a the object the entity also has a biological gender, sometimes they do not have a biological gender.

(Refer Slide Time: 58:40)



Some examples here, it is the Spanish, German, Russian for example, they are they have gender marking on inanimate objects. Now, when gender marking happens on inanimate objects, you can imagine that this is very arbitrary there is no rhyme or reason what is so ever as to why a chair should be masculine in one language, feminine in another language, neuter in another language and so on.

So, an example here the sun in English this has masculine gender in Spanish, it has feminine the same object has feminine gender in German and it has neuter in Russian, this is what we mean by arbitrary. So, grammatical gender without biological gender is a rather arbitrary thing, this mapping is arbitrary as to why it is called.

(Refer Slide Time: 59:30)

Now this naturally as one can expect, has triggered a lot of interesting studies one of them one of the older studies goes back to 1983. They were trying to see if the gender load in a language understanding will help acquiring gender identity in any way, this is for children.

So, when children are growing up learning a language in a language environment, depending on the language whether it is a gendered language or not a gendered language, does it have any connection with how quickly the child learns gender identity, that is the question that they were trying to figure out.

The subjects where children aged between 16 to 42 months and the environment was monolingual environment. This is not a bilingual study this is a monolingual study. So, monolingual environment of Hebrew, English and Finnish languages. Now the choice of these three languages were based on the gender load, is it heavily gendered language or is it partially gendered or is it or whether the language has no grammatical gender right.

So, the Finnish has the least load, Finnish has no grammatical gender marking on inanimate objects, Hebrew has the highest load, Hebrew has obligatory gender marking for all inanimate objects, English typically is somewhere in the middle. So, that is why they chose these three languages and all the children were tested in monolingual environments.

Now the task was Michigan gender identity task, they had to find out whether the child is capable of identifying gender from that kit and the finding suggest that gender loading correlated with gender identity alignment.

(Refer Slide Time: 61:19)

So, if the language that the child is exposed to, if the language in the environment has a gender load meaning it has a it is it has grammatical gender, chances are high that they will learn gender understanding identity much quicker. Now this is a rather old study. In more recent times 2003, Boroditsky et al they had taken this question a step ahead and they asked if a speaker uses a language with grammatical gender does it make or mislead him into thinking those objects have real gender.

Meaning if you have let us say, your language you speak a language that uses grammatical gender for inanimate objects, does it make the person, that is does it make you look at those objects as if they are actually masculine or as if they are actually feminine, that is the question that Boroditsky asked.

And this they took to bilingual they had Spanish-English and German-English bilinguals the choice of Spanish and German here is very interesting. They were tested separately because Spanish and German languages which uses opposite gender marking for the same objects. So, there is a long list of nouns that have opposite gender in Spanish and German, that is why they had taken Spanish-English and German-English bilinguals. The task was they were given subjects were given 24 objects and the object names.

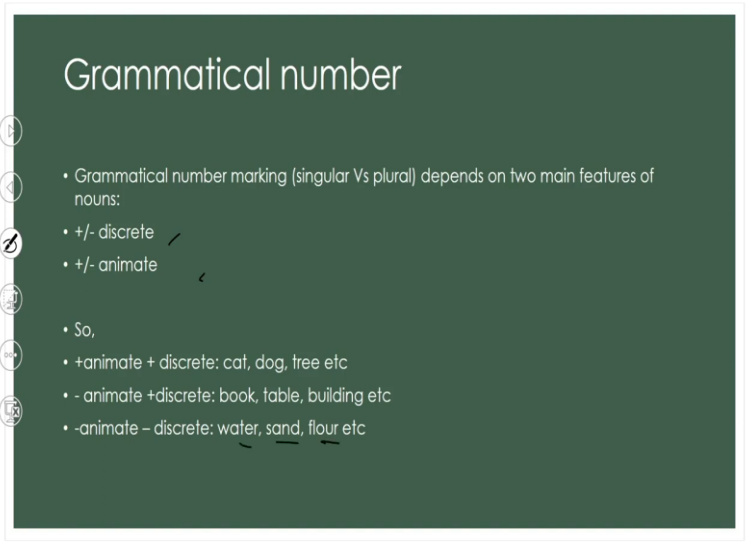
Now, these were objects that had opposite gender in Spanish and German and the task was to name first three adjectives that come to their mind. So, as soon as you hear ‘bridge’ what comes to your mind. The reason why the they had ask them to use first three to so that you do not get to really think automatic reaction this was automatic processing. So, bridge: what do you think of bridge? keys: what do you think of keys? House: what do you think of house? You know like that, so adjectives for those 24 items.

Now, as I said those 24 items were cleverly chosen because they had opposite gender in Spanish and German. Now for both the subject groups the output language was English they were not using either Spanish or German, the language of the experiment was English. What do you expect the result to be? The result is as expected. The groups used adjectives depending on what gender their L1 assigns to that object.

So, if the bridge is feminine in one language, they have used words like elegant, slender, beautiful versus if it is masculine in the L1 they have used sturdy, strong, intimidating, things like that. So, from this study,they concluded that there is a the gender marking does have an impact on your non-verbal cognition in terms of gender and in and this also gets transported from your L1 to L2.

So, because the target language in this case was L2, it was English for both the groups; however, because those languages that their first languages had gender marking, English does not have gender marking, even then the gender understanding, this is what they spoke about misleading him into thinking that these concepts have real gender. This is the proof that they tried to, that they have shown us that this probably make them think that those objects actually have gender and this is why they use those adjectives.

(Refer Slide Time: 65:05)



There are many other studies. By the way there are for the reason of brevity I could not include all the studies and their results in this there are many many studies in this for each of these domains. I will include all the references, one can go and find out one can read up and also try to upload the papers as much as I can, all the referring to all the papers is not possible within this time frame.

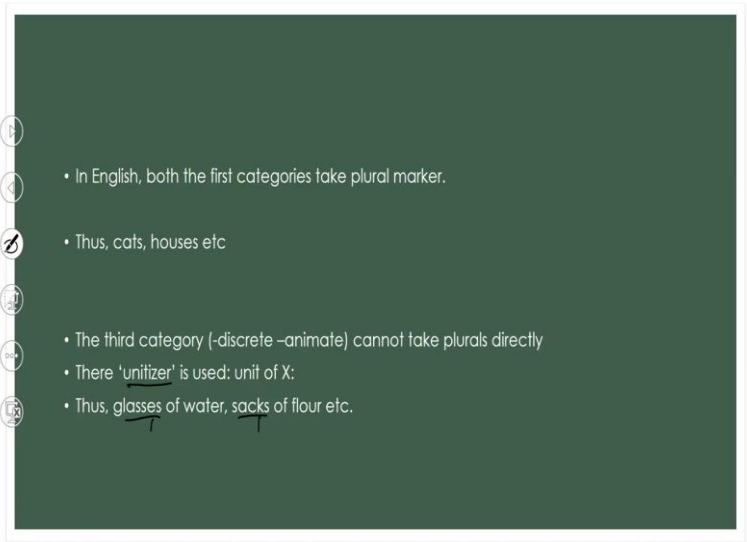
Another interesting domain that have been studied is the domain of grammatical number, grammatical number, as in, the singular versus plural number. So, many of the languages in the world they have a singular versus plural some languages also have a dual number, which is not very common. So, singular versus plural. So when there are more than one item we use the plural marker, that is what we call number grammatical number marking system in a language.

Now, what does it depend on? It depends on two primary factors: one is of course, numbered whether there is one or more than one; however, there are two more things that is one is called discrete, the other is animate. So, plus minus discrete, as in if there are individual entities possible within that category. So, there are, there is one house many houses. So, house is a discrete thing, it is an one individuated item right. So, there can be one house and there can be many houses. So, that is what that is the idea of discrete. Animate plus minus animate.

So, whether the entity refer to is animate versus it is inanimate. Now, combining these two possibilities there are primarily three categories that are there. So, you have plus animate plus discrete: things like cat, dog, tree, etcetera things that are leaving things alright and then you have minus animate plus discrete.

So, things that are inanimate objects, like book table building and so on and then there is a third category, where you have things that are neither animate nor they are discrete, like water, sand and flour etcetera. As you can already imagine that in English this is a separate category and these two are a separate category right.

(Refer Slide Time: 67:16)

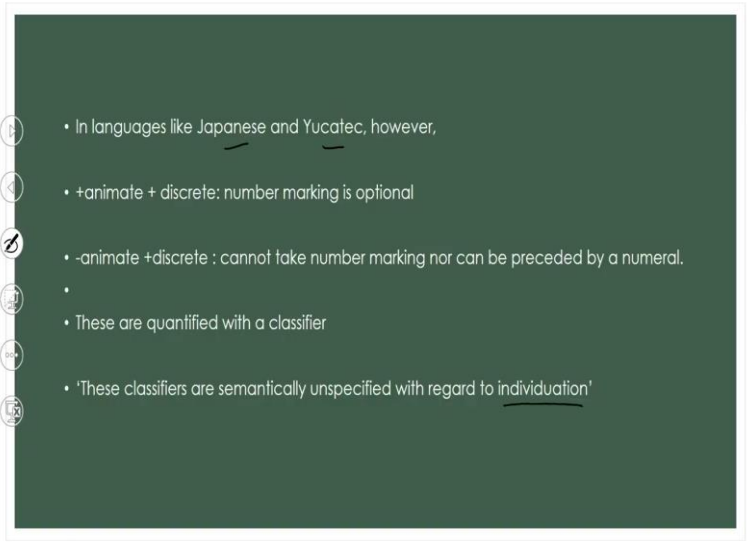


So, in English, both the first categories take plural markers. So, in both cases so you have cats, houses, books, men, like this. So, both animate as well as in animate objects, if they are discrete entities they can be pluralized, as in, they can take a grammatical number marking.

However, for the third category, because it is not discrete, it is neither discrete nor animate. So, we have something called a 'unitizer', unitizer as in you have to make create some sort of a unit. So, you have a 'glass of water', you have 'sack of flour' and so on because you cannot have 'many waters', 'many flours' that is not possible.

So, you need some sort of units. So, the glass is one unit, sack is one unit right, like that this is for English.

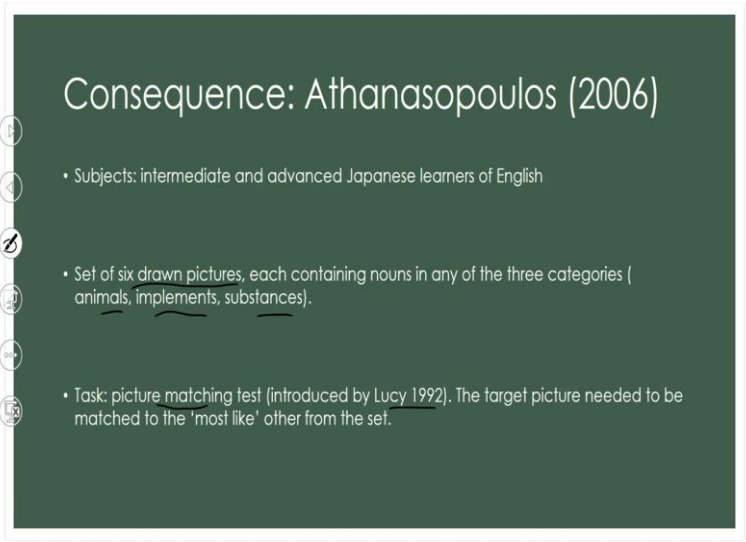
(Refer Slide Time: 68:09)



Some languages; however, are rather different in this regard. So, some most famous examples are of course, Japanese and the Yucatec language. So, in case of Japanese, animate plus animate plus discrete, the number marking is optional, it is not obligatory. Like in English you must differentiate between one cat and two cats, in Japanese it is optional, you do not need to. And it gets even more interesting when you have minus animate plus discrete.

So, cannot take number marking, nor it can be preceded by a numeral. So, these, then how do you quantify in this language? You would use a classifier. Now these classifiers are semantically unspecified. Semantically unspecified as in, they do not specify the individual units right, they are not individuated. There is no individuality about the thing, it is just a classifier that talks about the entity, that the substance.

(Refer Slide Time: 69:07)



So, the focus here is more on substance than on the individuated entity. So, keeping this in mind, there have been many studies as I have been quoting only the most well-known ones among the most well-known ones. So, Athanasopoulos 2006, he studied intermediate and advanced Japanese learners of English, since they are talking about bilingualism.

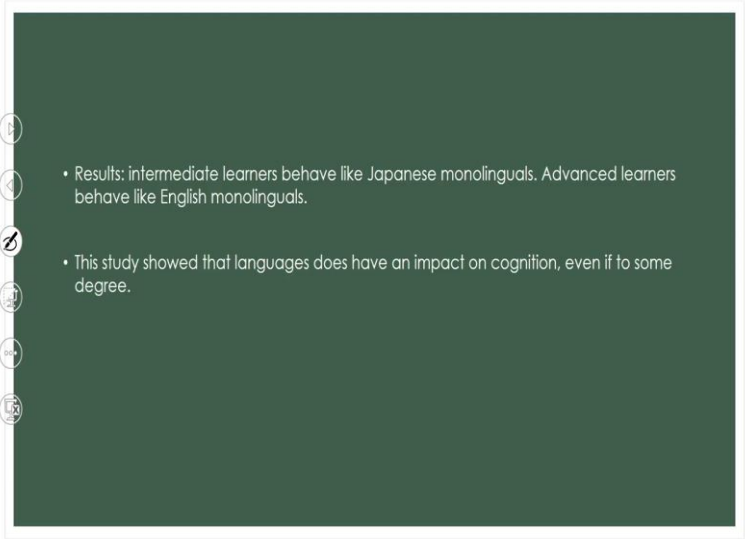
So, they he looked at Japanese-English bilinguals and what happens to their number marking system and understanding of those things in by differentiating between intermediate learners and advanced learners. Intermediate learners, the expectation is they will behave more like Japanese monolinguals and advanced learners will be closer to English monolinguals, just like we saw the Greek English bilingual study.

So, what was the task? The task was a set of six pictures six drawn pictures now each containing nouns in any of the three categories, like we saw already discrete based on discrete and animate criteria. So, they had animals, they had implements; that means, minus animate plus discrete and they had substances: neither animate nor discrete right.

So, these three categories of objects were depicted in through pictures in those cards, each set had six pictures. Now the task was it was a picture matching task. So, one picture was by the way this task was introduced by Lucy in 1992. So, the target picture needed to be matched to the 'most like'. So, there was a target picture, one picture let us

say picture one and they had to make find the closest match to that picture from among the other five pictures, that was the idea, that was the task.

(Refer Slide Time: 70:58)



Now, the results showed what we have what we have already know, what we have already can predicts that intermediate learners behave like Japanese monolinguals in terms of understanding. So, the difference is blurred in terms of because there is no number marking there is no distinction in terms of those animacy versus discreteness right.

So, they behave like Japanese monolinguals and advanced learners will behave like where their choice of words depended on number marking, because English provides number marking. So, they went by the categories, whether it is animal versus it is object, whether it is substance.

So, this pictures I will add in the annexure towards the end of the slides, you can see. So, this study also showed that languages do have an impact on cognition, even if to some degree, even if to some degree as in, you see here that there is a difference between as your proficiency in your L2 goes higher, the choice of words the choice of cards choice of those matching also differ.

So, this is a gradient process and starting from monolingual L1 monolingual behavior, going through various stages to L2 monolingual behavior. So, this is about number. So,

you have already seen gender marking gender marking and number grammatical number marking on bilingual by behavior. Next, we will take up tense marking and tense aspect marking as well as motion verbs in the next segment.

Thank you.