Bilingualism: A cognitive and psycholinguistic perspective

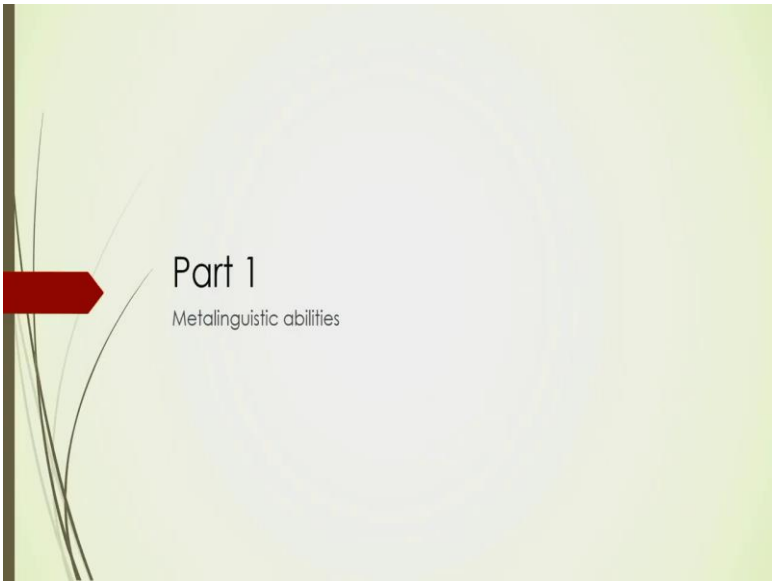
Dr. Bidisha Som
Department of Humanities and Social Sciences
Indian Institute of Technology, Guwahati

Module - 07
Bilingualism and its effect
Lecture - 16
Metalinguistic Awareness

Hello and welcome. Today, we will start with module 7. Module 7 will focus on bilingualism and its effect. So far, let us have a quick recap. So far, we have looked at bilingual acquisition, bilingual, the workings of the bilingual brain, how the bilingual processing takes place at various levels from starting from speech level like phonological level to word level processing to sentence processing.

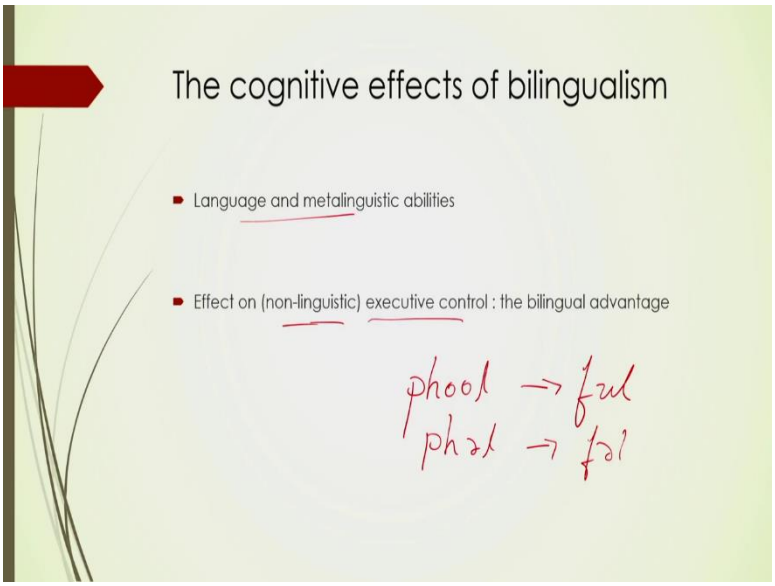
So, after we have understood all of these, the nuances and the finer aspects at each of these levels, now it is time for us to look at how does all of that add up. What is the consequence of having these kind of processes at work. So, bilingualism and its impact, its effect.

(Refer Slide Time: 01:14)



The effect is, we will discuss this effect in two different domains. One will be in the linguistic domain and the other will be in the non-linguistic domain. So, the first part will concentrate primarily on the metalinguistic abilities and language abilities that will be that has an impact of bilingualism.

(Refer Slide Time: 01:37)



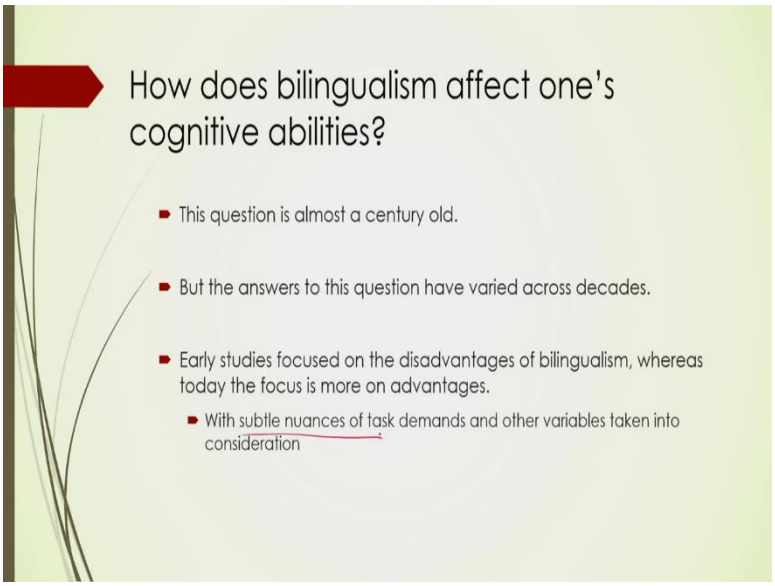
So, cognitive effects of bilingualism, when we say cognitive effects of bilingualism, we are looking at not only at the language aspect of it, language aspect as in the how the language structure changes, how the language we all know that you know for all of you it is quite common to find in Indian in the urban Indian lexicon, even in Hindi when we speak in Hindi, the word for flower in Hindi which is 'phool' in it has changed into this has become something like this when we speak in Hindi, even when we speak in Hindi, right.

So, even for example, 'phal' also has become 'fal'. So, these are linguistic impacts on over structural impact on the language of one language on another. So, English is impacting the Hindi here. So, this is on the surface, this is something that we see all the time. This is a very common outcome of bilingualism in any given society.

But, in this domain, in this segment we are focusing more on the cognitive aspects, on the mental aspects of cognitive of bilingualism. And, that even that is visible at language level, language and metalinguistic level as well as non-linguistic level. So, bilingualism has an impact not only on the linguistic level in terms of cognitive mechanism, but also in that in terms of non-linguistic level.

So, non-linguistic level is also called the executive control or cognitive control, domain of cognitive control. So, we will look at each of them one by one.

(Refer Slide Time: 03:22)



Now, how does bilingualism affect one's cognitive abilities? This is a question that is not new. We have seen before also when we started the course that bilingualism has gone through various stages of acceptance and we can also say denial in through center through decades.

In the initial stages, bilingualism did not really enjoy a very nice patronage from the academia, from the intellectual circles. So, the and the question has been bothering scientists for a very long time. The early studies had a negative report to give as far as from today's perspective it was quite a negative answer. So, the question is very old, almost a century old, but the answers have varied over time, over decades.

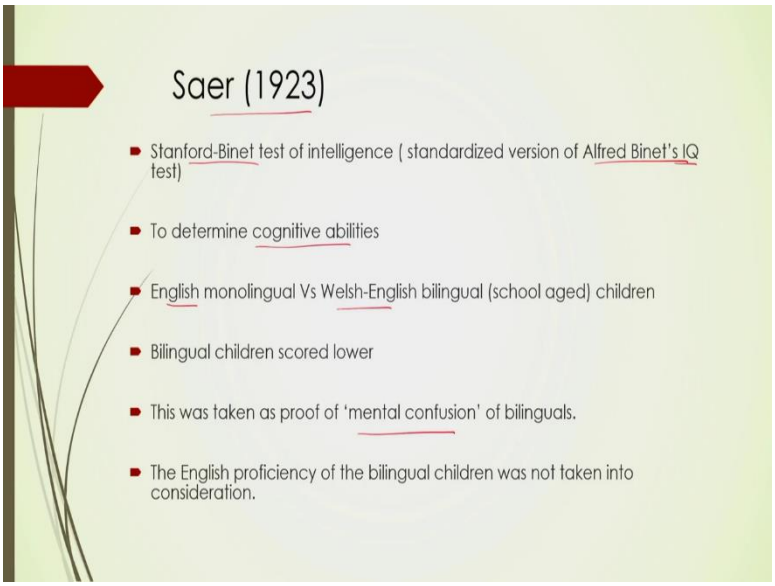
Early studies were primarily focused on disadvantages because if you recall we did talk about how the findings on bilingualism were basically tied to the performance in the school education and in terms of policy and education and so on, they were found to be lacking. So, school going children who were bilingual who has a different L1 at home and the school language of school was L2, those children were found to be lacking in their abilities. So, that is where we go back to.

And, as a result of which primary focus on bilingualism was it’s disadvantages. But today we talk about the same issues, the impact of bilingualism on cognitive abilities from an advantageous point of view. We now look at the advantages of being a bilingual rather than disadvantages of being a bilingual.

Now, while with this while there has been a tectonic shift, so to say, in terms of how bilingualism is looked at now, there is also a lot of new insights and lot of understanding, fine grained understanding in terms of the nuances in terms of task demands. So, it is there are yes, there are bilingual, there are advantages of being a bilingual. However, there are graded so to say responses to the various tasks.

So, we also know not only we know that there are advantages, but today we also know that subtle nuances of task demands and other variables also play a role. So, bilingualism is not a monolith as we will see in this segment. So, being a bilingual and being a monolingual are not two homogenous things that we can compare.

(Refer Slide Time: 05:56)



So, this is the very first study that we have been we have referred to before as well. This study goes back to 1923, almost a century back when the study when the test was carried out. The test is called Stanford-Binet test of Intelligence which is actually an updated version or standardized version on American or let us say American version of the Alfred Binet's IQ test which is even older.

So, this particular test was used to on school going children to check their determine their cognitive abilities. So, the study had juxtaposed monolinguals with bilinguals; monolinguals were all English speaking monolinguals and the bilinguals were Welsh-English bilinguals. So, who had Welsh as L 1 and by English as their L 2.

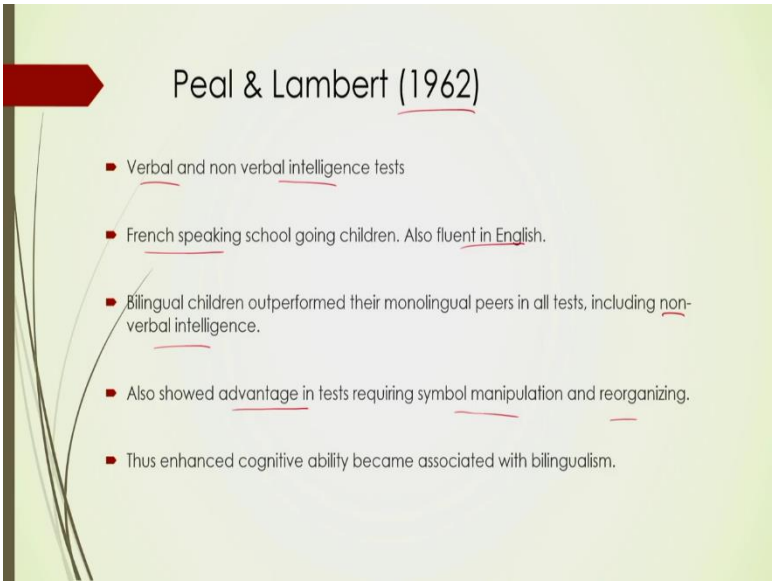
So, these are all school going children and they found out that in this entire test battery the score of the bilingual children were much lower as opposed to the score of the monolingual children which means that the monolingual English children did a lot better than the bilingual children in the school in the same age group.

This was one of the first studies to juxtapose bilinguals with monolinguals in terms of their cognitive abilities because this test is not on language. This is an IQ sort of an IQ test. This was a test of intelligence. Hence it had direct correlation of bilingualism with cognitive abilities. And, because the bilingual children in this test scored lower than their monolingual peers it was taken as a proof of mental confusion of bilinguals.

It was projected that bilinguals are somehow confused because they have two languages to deal with and each language has its own you know baggage so to say. So, there is a confusion that the bilingual children are facing. Hence, they are not able to cope up and they are not able to do as well as their monolingual counterparts. So, this is how it all started. This is how the disadvantage of being a bilingual was put forward.

However, in this study the English proficiency of the bilingual children was not taken into account. The reason why we are mentioning this is that today when we do any kind of such studies every single thing is measured. So, L1 proficiency, L2 proficiency, alongside the IQ and various other any other random variables that might have an impact on the outcome. But this is 1923 and this is how it was done at that time.

(Refer Slide Time: 08:41)



Now, move forward about 30 years or so and then there was yet another landmark study in 1962. Peal and Lambert this also we have mentioned in the in before. So, this was again a task on verbal and nonverbal intelligence. This the earlier study was only on IQ. This was on verbal as well as nonverbal test.

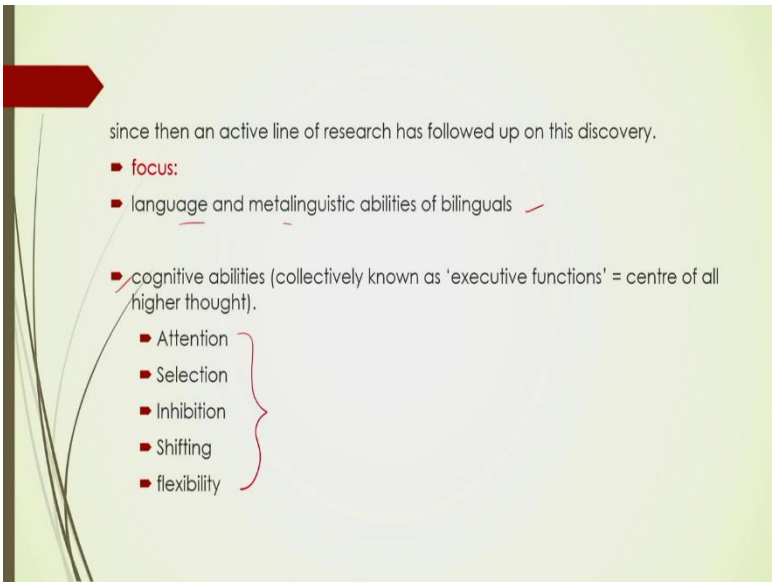
The crucial difference here was the population, the study, the participants who took part in this study. In this particular study they had French speaking English, French speaking school going children they were also fluent in English. This was on in Montreal where the there was this immersion program going on for Anglophone children in going to French immersion programs.

So, in this study however, what they found was that bilingual children outperformed their monolingual counterparts meaning bilingual children did way better than their monolingual friends. Not only in all tests, including nonverbal intelligence; meaning including tests that were similar to the IQ test done before.

Now, this test had turned the table significantly in terms of understanding the impact of bilingualism in on children. So, this in this study it is showing advantage whereas, the previous study showed disadvantage. After this after 1962's this particular study, they found the that now we can look at it without the tag of being a disadvantage.

So, not only they found advantage in terms of linguistic task, non-linguistic task, they also had found better performance in symbol manipulation and symbol reorganizing. So, an overall advantage of being a bilingual now started getting associated with big speaking two languages, it all started in 1962.

(Refer Slide Time: 10:41)



So, after this important landmark study in 1962, a lot of research has taken place, lot of studies have come out in investigating this particular phenomena. So, connecting bilingualism with cognitive abilities. Now, the primary focus of all of these studies have been two ways there have been two main focus: one is the linguistic and the metalinguistic abilities how they are affected and simultaneously what are the cognitive abilities.

The reason we are including metalinguistic abilities here is that this also includes cognitive abilities to a certain extent. We will shortly see why. So, the 19th or 23 study did only IQ test there was no language performance test there was no verbal test. '62 study did both verbal and nonverbal test and the bilinguals found to be better and gradually studies had started taking into account a larger number of tests that spanned both linguistic and non-linguistic both verbal and nonverbal intelligence into account.

So, when we are talking about verbal intelligence, we are talking about in today's terminology we call them language and metalinguistic abilities and when we talk about cognitive abilities, we all we take into account all these various factors. Cognitive abilities or cognitive control or executive function as they are called, they include various sub domains. So, we will see them one by one. Let us start with language and metalinguistic abilities of bilinguals.

(Refer Slide Time: 12:24)

Now, one this is almost common-sensical that a bilingual's first and foremost the most important thing that should be noticeable in a bilingual is that the language will change. There will be changes in his linguistic abilities, that should be the most common thing to notice. As I said in the very beginning, that a Hindi speaker using a 'ful' rather than 'phool' which is the actual pronunciation is something very noticeable. Similar things have been talked about before also.

So, the most noticeable effect of bilingualism should be language and that is where this entire study goes back to. Now, this view encouraged studying a lot of bilingual versus monolingual groups starting in the 1970s to 80s is still going on. So, the focus has been when we talk about metalinguistic abilities, what do we basically mean? We mean two things primarily. One is that we explicit knowledge of the linguistic structure.

Speaking is one thing, but being aware of what we are speaking is a completely different thing. How many of us are aware that you know in English you use -ing because of course, you were taught through grammar, but at the same time if you were a let us say you were a monolingual you were not taught the language in through formal methods you just pick it up from your parents, from your peer group, from home and at home and in the playground and so on.

Nobody really teaches you explicitly that in this language the progressive marker is this, the plural marker is this and so on. So, that awareness is different from your skill of using

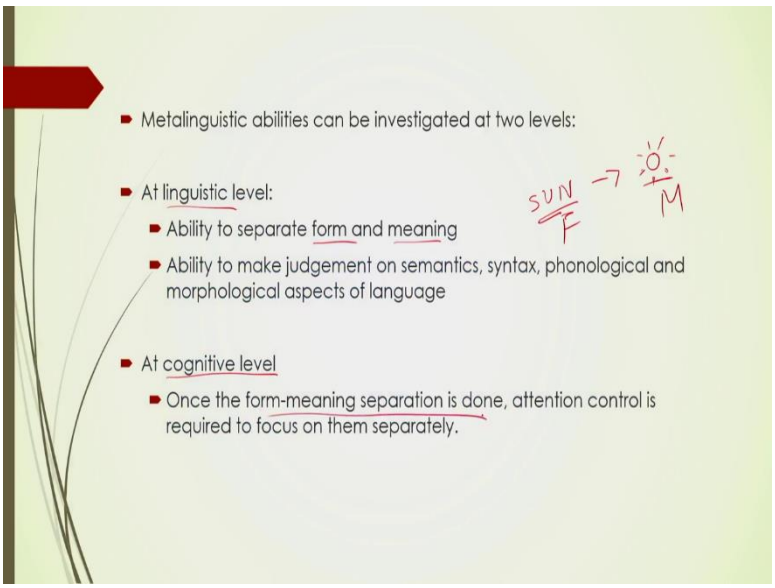
them. So, metalinguistic awareness takes us to that level. So, explicit knowledge of the linguistic structure exactly what is happening at a structural level and then the ability to access that structure intentionally.

So, you should be able to parse them that you know this structure is this is the, but this is the particular pattern of this grammatical function that is then there is another pattern B, pattern C and so on and if needed we should be able to separate them out. So, that is what is basically metalinguistic ability and this ability develops in children in small starting from very small children and we will see how that ability is different or whether they are different among monolinguals and bilinguals.

Why is it important? Why are we even talking about it? This awareness is very important because it is an useful tool for development of complex use of language. Only when you are aware of the structural complexities and the way they can be manipulated is when you can use complex sentences and you can put to you put language to use for better purposes.

This is something Chomsky has told already told that the innateness hypothesis talks about that all the structure is already there in an algorithmic form. The child is in born with that capacity.

(Refer Slide Time: 15:04)



So, in terms of psycholinguistic research we look at those abilities through some experimental situations through some laboratory scenarios. So, metalinguistic abilities can

be investigated at these two level linguistic level and at cognitive level. Now, at linguistic level what we mean by metalinguistic understanding or awareness is that the ability to separate form and meaning.

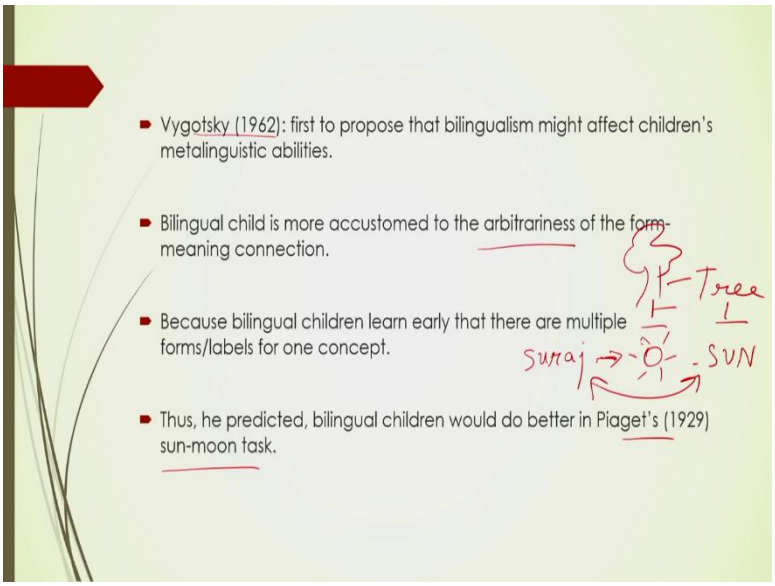
Form and meaning as in the word as it looks. So, the sun the word the sun SUN refers to a particular thing. So, let us say this is the form and this is the meaning, ok. Let's us just take it as a sun so, this is the meaning, this is the form, this is the meaning, this is what we mean by separating form and meaning. So, the ability to separate these two is the at the very root of metalinguistic awareness.

And, then the ability to make judgment on semantics, phonology, mono morphology, syntactic various aspects of the language. So, this is at the level of linguistics, at the level of language, the metalinguistic understanding. This also has a cognitive counterpart. How? Once you have understood that there are different layers to language, it is not one concrete solid whole, it has various aspects to it, various parts to it or let us say various nodes to it.

Once you have separated those nodes in your head, now you should be able to handle them separately if needed or you can, you should be able to use certain permutations and combinations of these various factors. That is where cognitive control comes into the picture.

So, the once the separation is done, form and meaning separation is done, attention control is required to focus on them separately if need be. Why should we need that kind of a trick? We will see.

(Refer Slide Time: 17:25)



So, this again goes back to all these understanding goes back to Vygotsky for 1962. He was the first to propose that bilingualism might affect children's ability in the metalinguistic domain. He was the first to propose this. Now, we are talking about metalinguistic abilities being one of the domains to study impact of bilingualism, but this is this comes from Vygotsky in 1962.

He said that bilingual children are more accustomed to the arbitrariness of the form-meaning connection. All every all students of linguistics know that the Saussure's famous 'signifier-signified' connection. Again, to draw a very bad picture, this is. So, this is the signifier, this is the signified.

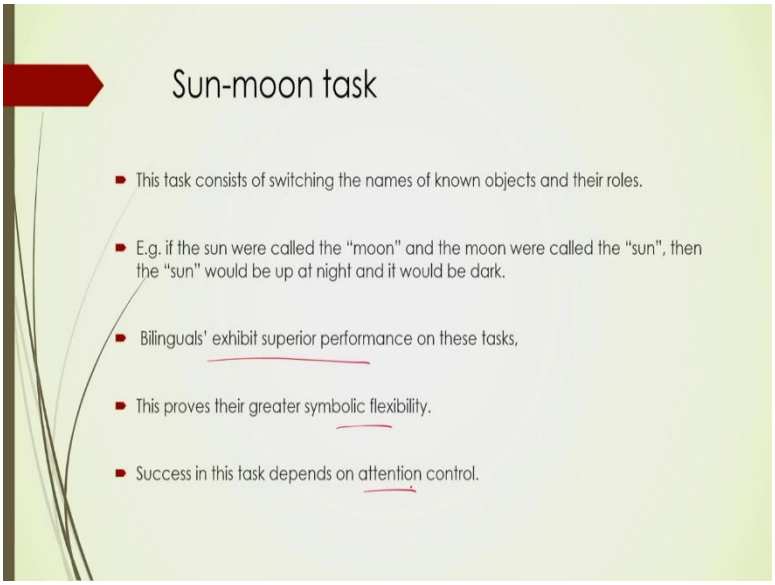
So, this is the form, this is the meaning right. So, this kind of a form – meaning connection, the very fact that this connection is arbitrary is more apparent to a bilingual than to a monolingual, is what Vygotsky said. Why should it be so? When you are a monolingual, you are automatically, you are this becomes almost an automatic process that this is called a tree and this is called the sun, right. This is an automatic process. This is how you learn.

But, the moment you learn another language, then you become aware that this particular thing, this 'signified' or the meaning has another form, another form. As in let us say if you are if you are Hindi speaker, you can also call it 'suraj'. So, as a result of which these two are equivalent. You see this becomes very apparent to a bilingual child, the moment he starts learning a second language.

They realize that the meaning can remain constant, but the forms can change. Hence form meaning separation is possible or to put it in a different way that form and meaning are arbitrarily connected and they are separable in terms of understanding. That is why Vygotsky says that bilingualism could be a very important trigger to create that awareness, that level of metalinguistic awareness.

So, he predicted that bilingual children would do better in what Piaget's famous task called sun moon task. This is a very very interesting task that is used for children to see if they can separate form and meaning connection and to what extent.

(Refer Slide Time: 20:03)



So, the sun moon a task that requires changing of names of objects, well known objects and their roles. So, the sun appears in the day, the moon appears at night. Now, there are tasks where they the child children will be given something like this. If the sun were called the moon and the moon was called the sun, then the sun would be part of sun will be up at night and it will be dark.

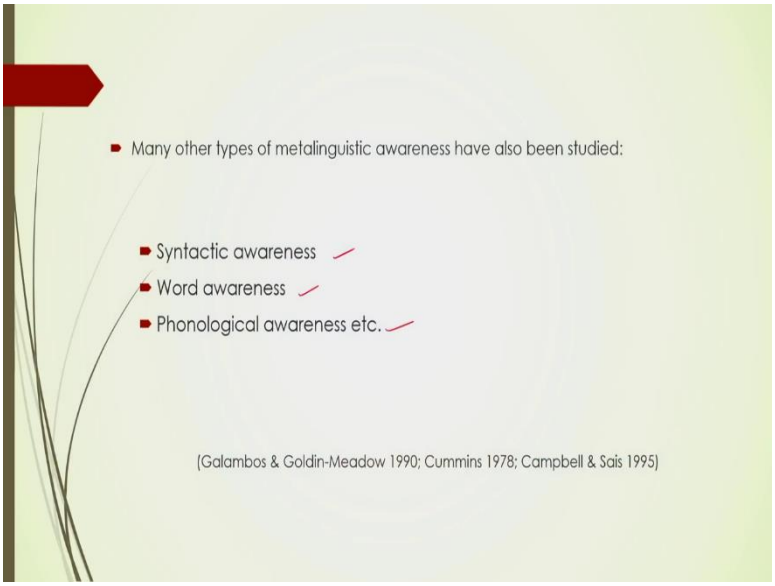
This kind of a structure is created, there are various games, there are sun moon stoop tasks also that are available. These are these are tasks that are used with children. So, if they will be said that let us call the moon the sun and the sun the moon. Now, who will be up at night? Right. And, how will it be? Will it be dark? Will it be bright and so on?

This kind of task checks the child's ability to separate out the name from the function. So, the name does not really. So, you can call the sun the moon, it does not matter if it is up at night, it is up at night. The function is different from the name. So, that separation is what is at the root of sun moon task created by Piaget.

So, Vygotsky proposed that in this kind of task, bilingual children will do better compared to monolingual children simply because bilingualism itself gives them the understanding that same meaning same signified can have different signifiers. So, that separation is already inbuilt.

So, this was has already been proved now that bilinguals exhibit superior performance in this kind of task, sun moon, various versions of sun and moon task. So, this basically takes us to the greater symbolic flexibility of bilingual children, because the reason being that this task also requires a certain amount of control on the attentional mechanism, right?

(Refer Slide Time: 22:02)



So, there are many other kinds of metalinguistic awareness as well which are more based on language ability. So, syntactic awareness, word awareness, phonological awareness and so on. So, there are as you see as we are building up the story that there are awareness, at metalinguistic level that bilingualism probably has a connection with.

Metalinguistic awareness has to do with the awareness about structural properties of language and the ability to focus on those properties individually, right. So, it and in those

cases if you are able to focus on each of the properties separately this will also be seen in tasks that require that kind of form meaning separation. So, and that kind of bilinguals have been found to be doing much better than monolinguals on those kind of tasks.

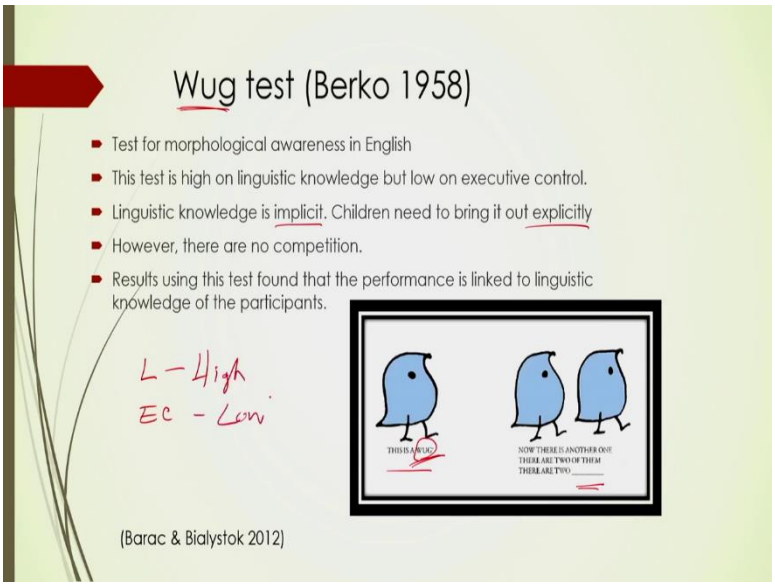
(Refer Slide Time: 22:58)

Now, we will get a little more into detail on this. Now, this is in the background. Current approach to linguistic and metalinguistic abilities because of this various nuances into it because of the attentional mechanism in-built and language ability in -built because of this, now, the current approach is to use tasks that are different in terms of how much of it depends on language ability and how much of it depends on executive control ability, right.

So, there are different kinds of tasks based on their graded dependence on language and executive control. So, there are three kinds of tasks that are typically used because bilingual the language ability as we have seen linguistic tasks can also have a measure of cognitive control mechanism in-built.

So, if you combine the linguistic ability and cognitive ability in various degrees, there are these three kinds of tasks that you get which have been used by many groups of researchers in this domain Wug test, grammaticality judgment and the verbal fluency task.

(Refer Slide Time: 24:02)



So, Wug test is actually it goes back to 1958. It was designed in order to check for morphological awareness in English language. It was not designed for checking bilingual proficiency as such, but this was this is a very interesting task where Wug is not a is not a being, it is a nonsensical a word, nonsensical thing and it is created like this. This task is primarily dependent on mostly heavily dependent on knowledge of the morphological processes of a particular language; English in this case.

So, they use this words like Wug and many other such non non-words and create a scenario. So, scenario is like this. This is a Wug, first they introduce the idea that this is a being something a something that can be called a Wug. Now, there is another one, there are two of them. So, there are two, what will be the form of Wug in this particular case. This is how the test goes. There are many manipulations to this, many layers to this, but this is at the root of it.

So, what is the morphological process of forming plural in English is in this particular, this particular plate shows us that. Now, this is entirely about linguistic knowledge, linguistic knowledge as in completely dependent on the language aspect of forming plural. Hence, but this knowledge is implicit in case of monolingual children this knowledge is implicit.

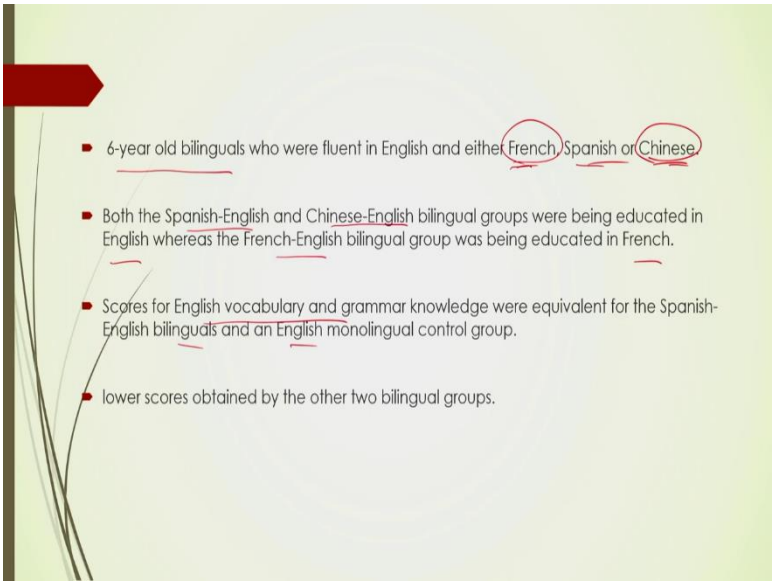
You know it. So, you just know it you. It is not like you are consciously sitting and deciding ok let me put an S because S is a plural marker and so on. However, if there is a task like this you need to bring that implicit knowledge out in the open, as in you have to make it

explicit because this is not a thing that you have been ever been used to. So, it is not a it is you are using the same morphological marker for a completely new, novel entity and hence we are talking about explicity here.

So, explicit use of a particular morphological process which is otherwise implicit knowledge. However, even if there is a kind of a mechanism involved here, but there is no it is not a big big problem because there is no competition. There is no other you know there you do not have to do another process simultaneously. This is only one simple process, your awareness about the morphological marker for plurality, that is it.

So, it is very high on the level of linguistic knowledge, but not very not at all high on the executive control level. So, if we take both level of linguistic knowledge as well as executive control mechanism, then you have this is high and this is low in this particular kind of a task, right. You need primarily linguistic knowledge, but not much of executive control mechanism.

(Refer Slide Time: 27:07)



So, one of the studies that was done by Bialystok in 2012. They use the same task on 6 year old bilinguals who were fluent in English and they had three different other languages. So, they were fluent in English and French fluent in English and Spanish as well as Chinese-English bilingual.

So, three kinds of bilingual children were they took part in this study. So, Spanish-English and Chinese-English bilingual groups were being educated in English whereas, the French-English bilingual groups were being educated in French.

So, you see there are different types of groups, they are all bilingual. However, they had different first languages as well as they had different language of education; whereas, two groups had English as their medium of education, another group had French as their group medium of education.

So, these are the different variables that they used. And, scores for English vocabulary and grammar knowledge were equivalent for the Spanish-English bilinguals and English monolinguals for the control group, but the scores in English were lower for the other. So, the French group and the Chinese group had lower vocabulary score as opposed to the Spanish-English bilinguals.

So, there are three different variables that are being utilized here. The English score, English vocabulary and grammar score. Second was the first language. There were three different first language groups that were used. Third variable was the language of education in which the their schools were using.

(Refer Slide Time: 28:47)

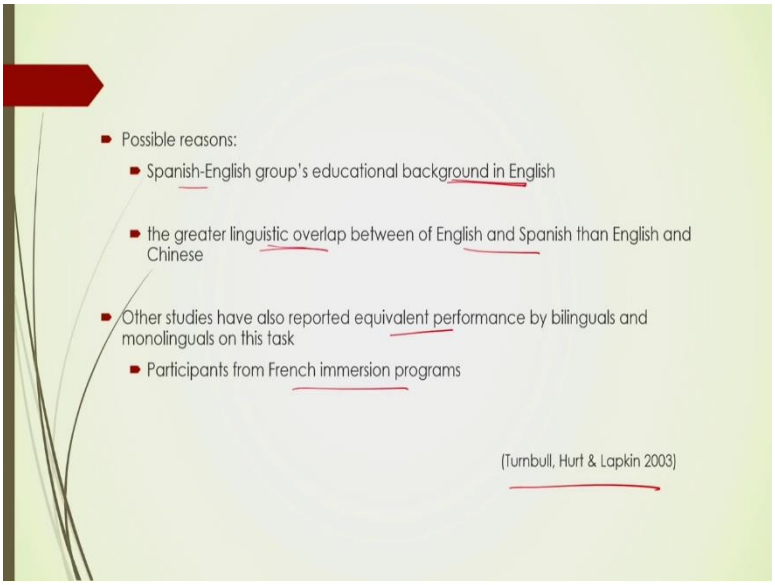
The results are show that Spanish-English bilinguals outperformed the English monolinguals on the Wug test. Only one group did better than monolingual control which

is the Spanish-English bilingual. Remember Spanish-English bilinguals were also had high score in their English grammar and vocabulary performance.

On the other hand, the Chinese-English and the French English-bilinguals did not differ from each other and also with respect to the monolinguals in their performance. This brings us brings to the focus that being a bilingual is not exactly a marker of your of the impact. Bilingualism also has various layers as we see here.

So, on the one hand the Spanish-English bilinguals did better meaning they showed an advantage in terms of metalinguistic awareness is in this domain even though it is a completely linguistic task. However, the others did not because there are significant differences between them.

(Refer Slide Time: 29:56)



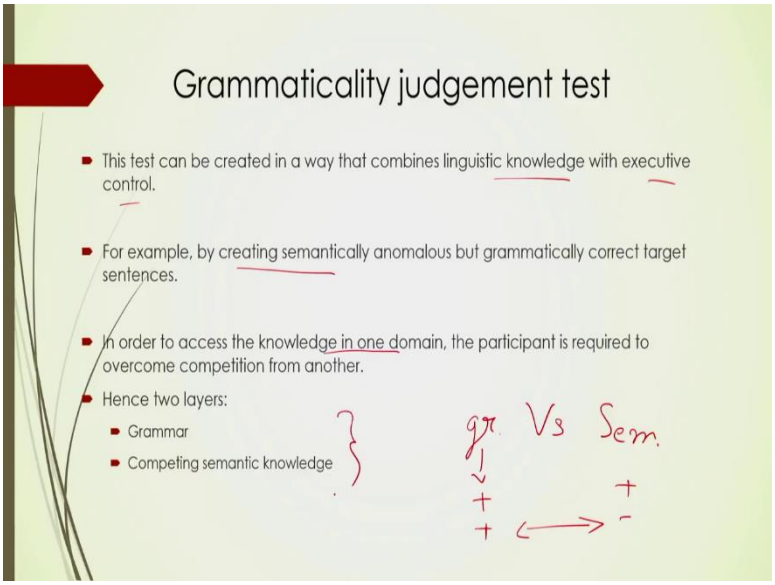
So, these factors also need to be looked at. So, what are the factors? One was the first group's Spanish-English group's educational background in English which is not the case with in case of French-English bilinguals and also the linguistic overlap between English and Spanish. Overlap between English and Spanish is much higher compared to overlap between Spanish and French and English and Chinese and English, ok. So, that also seems to be one important factor.

Similar tasks have been done by many other groups. Another important study was done in 2003. They looked at the performance of French immersion programs, students in French

immersion programs and they also showed equivalent performance by bilinguals and monolinguals on this task.

So, the factor is that if the language skill of vocabulary as well as grammar are comparable, then both monolinguals and bilinguals will do equally well or sometimes bilinguals tend to do better in Wug test. That is one of the major findings.

(Refer Slide Time: 31:03)



Now, second type of task that have been used in this domain is called grammaticality judgment task. Grammaticality judgment task is a very simple task where a sentence is given to the participants and they are asked to say yes or no, in terms of whether the sentence is grammatical or not. Very simple task. However, this task is typically manipulated in such a way that we bring in another level of problem which challenges the automatic response.

So, it basically combining linguistic knowledge with executive control. So, not only the sentences are based divided on grammaticality that is grammatical versus non-grammatical, but there is also another variable that is built into this which is the semantic anomaly. Semantic anomaly as in sentences like the sentence like the ‘dog bit the man’ is grammatical as well as perfectly fine sentence.

However,’ the man bit the dog’ is also grammatical sentence; however, it is semantically anomalous. So, that is the nuance in this kind of a task that is typically built in. So, the

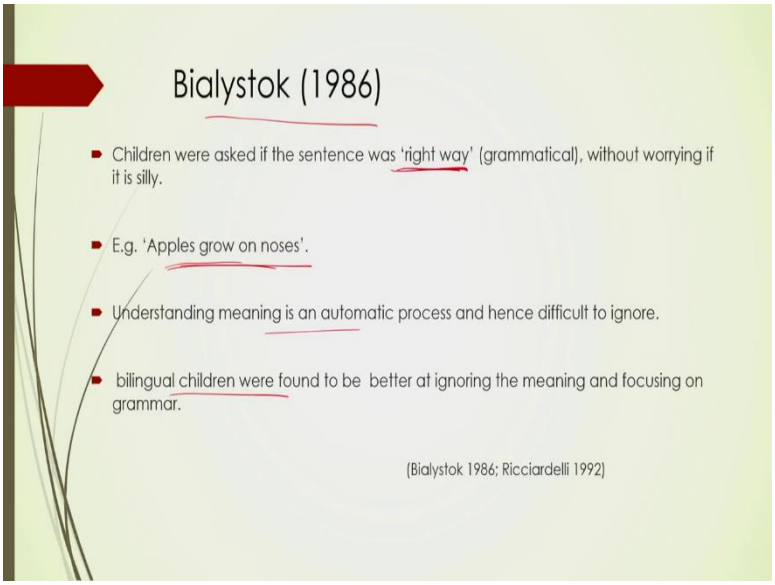
probe sentences are typically semantically anomalous; however, grammatically correct, that is the probe sentence in this kind of tasks. So, in order to know the knowledge of in one domain in this particular case the knowledge of grammaticality that the participant now has to face a competition from the domain of semantics as well.

So, there is there are two domains here. There is grammar as well as there is semantics in the let us put it like this grammar versus semantics, ok. So, if grammar on the on the one hand it can be plus grammatical plus semantically fine, it can be plus grammatical minus semantics and the other way. So, our target probe in this case is this case when sentences are semantically anomalous, however, grammatically correct.

So, what is happening here is we are giving two tasks to the participant at the same time even though they are not being told about it they are not overtly told. What they are told is that check the grammaticality of the sentence. However, because when we see a sentence or when we hear a sentence, both in auditory versus visual processing of a sentence, looking at the meaning understanding the meaning is an automatic process.

It is not something that you need to you know do as a conscious process. Hence the competition occurs. And, this as a result we have two different layers of this of task into built into one task.

(Refer Slide Time: 33:57)



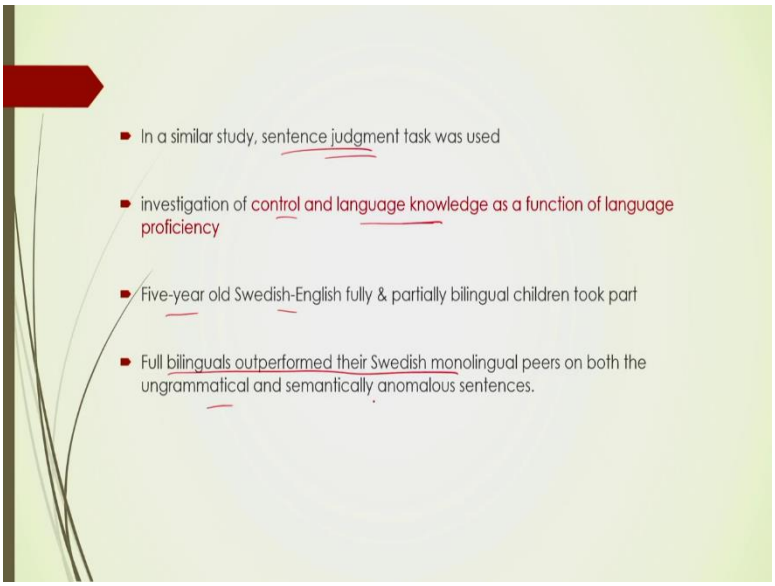
This was utilized by Bialystok in her famous study in 1986 which have been replicated by many others with similar kind of findings. So, in this particular study she had children as participants and they created a story like there is a puppet figure who falls down the, stumbles down the steps and bumps his head and as a result starts saying funny sentences, starts saying silly sentences.

The task was for the children to just see if the sentences that the puppet is creating are grammatical or not, or they called it ‘was the sentence right way’. Was it the proper sentence? Was it a right sentence? Because for children you do not you cannot really use heavy words like grammatical, semantic and stuff like that. So, the probe question was was the sentence right way and there were sentences like this.

So, there were some sentences which were perfectly fine, semantically as well as grammatically and then there were sentences like this and as we have just said that understanding meaning is an automatic process and it is difficult to ignore. So, when you have a sentence like this, the semantics of it, the semantic anomaly of it is automatically processed and hence it should it should hinder your processing of the grammaticality aspect.

However, bilingual children were found to be better at ignoring the meaning and focusing on the grammatical aspect meaning bilingual children had better accuracy and less reaction time in this kind of scenario where they are supposed to ignore. They were told that there are some sentences might be silly because he has bumped his head while falling down. So, he might just you know create sentences that would not make sense, but just say if the sentences are created ‘right way’, and bilingual children are found to be doing better.

(Refer Slide Time: 35:50)

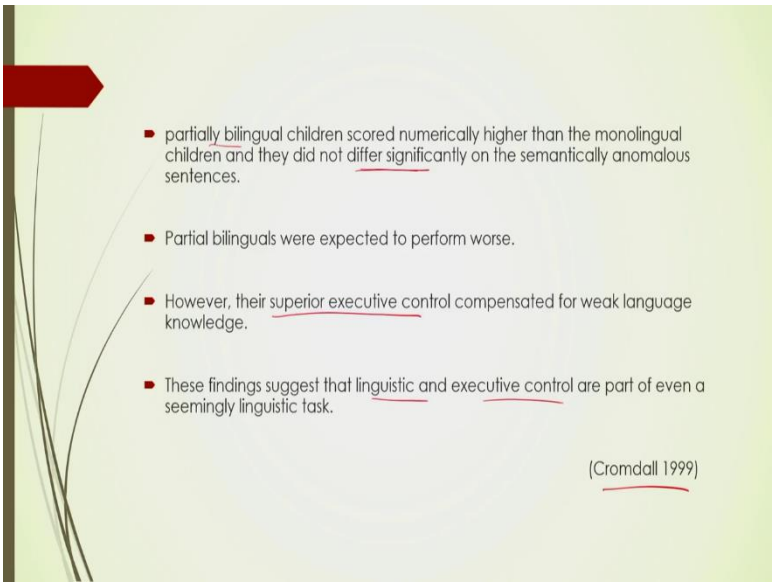


There are many other studies like this. In a similar study sentence judgment task was used and they tried to see if control and language knowledge are also are equally contributing to the results that we find. So, in this case children were five-year old Swedish-English, fully bilingual and partially bilingual.

So, this is a slight difference from the previous study, previous study had used monolingual versus bilingual children. In this study, Swedish-English bilingual study they used full bilingual and partially bilingual, basically dividing them in terms of proficiency. And, hence the language knowledge, does proficiency have a role to play in this kind of a task.

So, what they found was that full bilinguals outperform their Swedish monolingual peers on both the ungrammatical and semantically anomaly, anomalous sentences. So, they had a semantic sentence judgment, two tasks here. They had grammaticality as well as grammatical versus ungrammatical and semantic anomaly sentences.

(Refer Slide Time: 36:59)



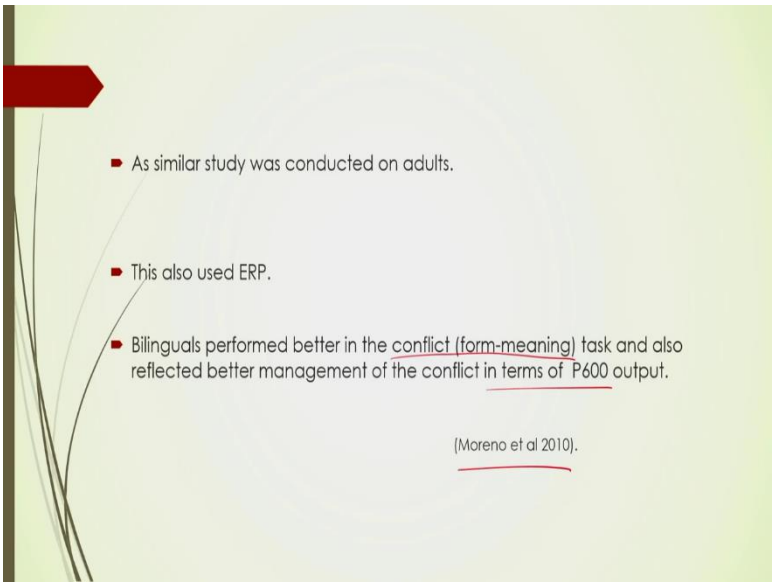
So, they found that the full bilinguals as in high proficient bilinguals are doing better than their monolingual peers. However, partial bilingual children scored numerically higher than the monolingual children, but they did not differ significantly on the semantically anomalous sentences meaning that they were not doing as well as the fully bilingual or the high proficient bilingual children.

However, the catch is the participants who were less proficient were expected to perform worse. They were performed worse than the monolingual because their ability in the second language is not very high. Now, but still, we do not see much of much of that happening. They did not differ significantly. There was not much of a difference. They were not doing better, but there was hardly any significant difference.

The result according to the authors, according to Cromdall 1999, who would conducted this study, they proposed that the reason for this, the reason for even partial bilinguals to be doing almost equally well like monolinguals is because of superior executive control. So, language ability, even if language ability is not at par, the executive control mechanism can compensate for that, right.

So, that is what an interesting finding in this domain is, that linguistic control and executive control are an integral part of even something that is seemingly an entirely linguistic task.

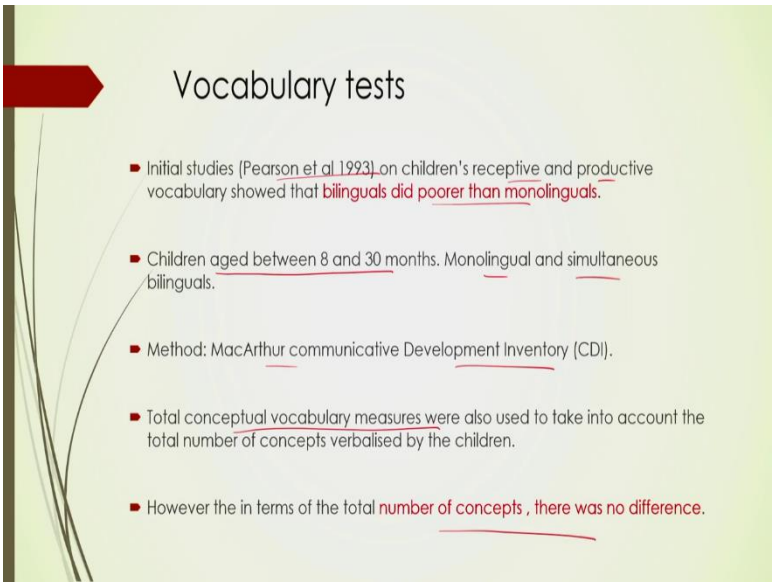
(Refer Slide Time: 38:31)



Similar kind of studies have been conducted on adults as well, adult bilinguals and same kind of results have been found that bilinguals outperform monolinguals in all of these. In one such study in 2010, they had done also they had used ERP along with the behavioural study and they showed that bilinguals performed better in conflict task and also, they had better management skill in terms of the brain activity.

So, they found that the conflict in terms of P600 output, we have discussed P600 output in terms of processing before. So, bilinguals showed better performance as was found out through ERP signals that they had better ability to control the conflict as well.

(Refer Slide Time: 39:20)



Not only they did perform well in the in the behavioural task, but mentally also as in terms of neurological neural aspects, they are also doing it better, they handling the situation better. Now, the third type is the vocabulary test. Vocabulary test as in how the vocabulary whether they approve what kind of size of vocabulary do you have for bilingual versus a monolingual and so on.

One of the initial studies the Pearson et al 1993, they looked at children's receptive and productive vocabulary on based on certain inventory. This is called MacArthur Communicative Development Inventory. They used that to check the receptive and productive vocabulary of bilinguals and they found that bilinguals did worse than monolinguals.

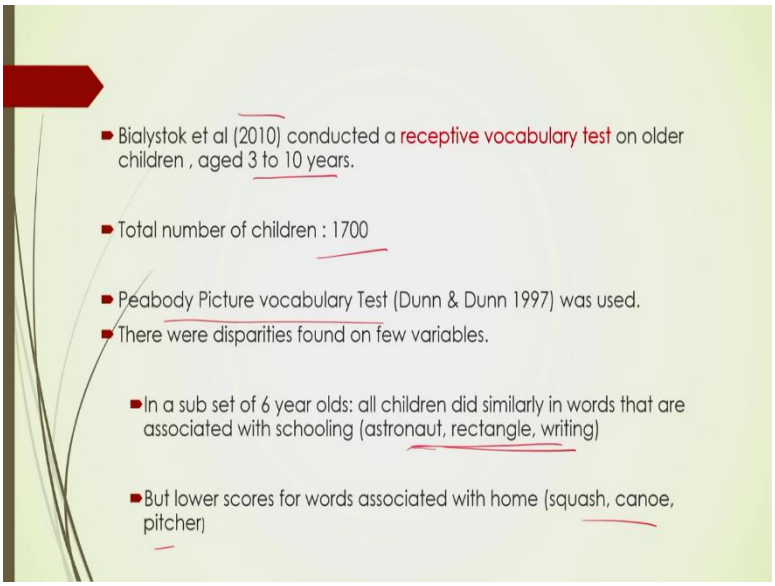
This is why we often see in the literature that bilinguals are typically found to have less vocabulary, the size of vocabulary of bilinguals is lesser than the monolingual peers. So, this study goes back to this 1993 and the subjects, the participants were children aged between 8 to 30 months, very young children. As they are building their vocabulary, this study was carried out and they found that monolinguals, they are monolinguals and simultaneous bilinguals.

Obviously, if you are looking at bilinguals at 8 months, they are all simultaneous bilinguals; they are learning both the languages at the same time. And, even then they found that bilinguals were doing slightly worse than the monolinguals. So, total conceptual

vocabulary however, they had also used conceptual vocabulary measure and they found that in number of in terms of number of concepts, there was no different.

So, in terms of vocabulary, there was a difference, but in terms of the learning mm learning of concepts, there was no difference.

(Refer Slide Time: 41:15)

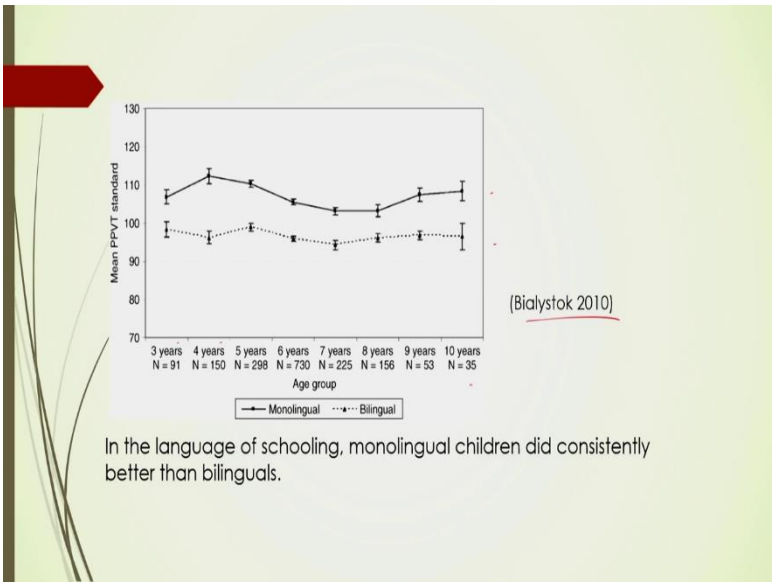


So, bilinguals and monolinguals did similarly in terms of concept learning, but in terms of vocabulary learning, there was a difference. Another study by Bialystok in 2010 conducted a receptive vocabulary test for older children aged 3 to 10 years and this has a huge database of 1700 children.

So, this, the task here was Peabody Picture vocabulary test and they found certain disparities. For example, in case of the subset of 6 year old children, all children did similarly in words that are associated with schooling, that the word that you learn in the formal environment in terms of formal teaching of language, these words are associated with that kind of a scenario.

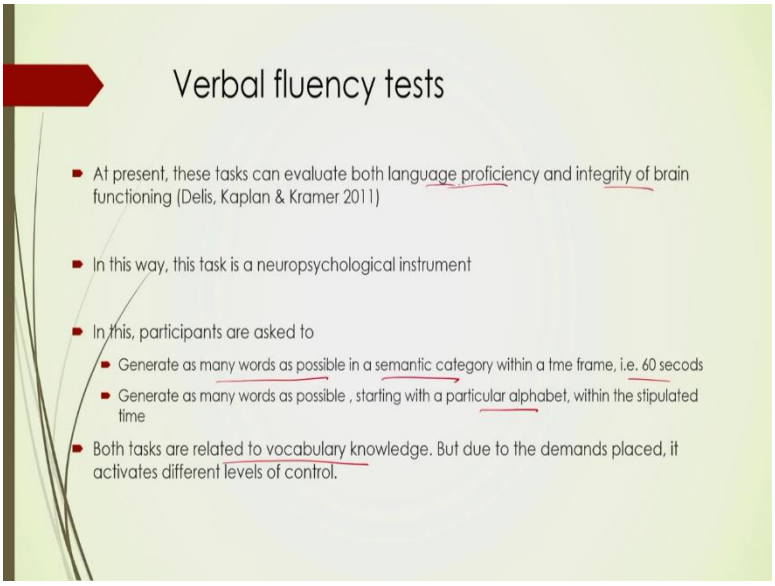
So, astronaut, rectangle, writing and so on versus there were words like squash, canoe, pitcher and so on that are used for at home. So, if on the basis of this kind of a division depending on what kind of words are used in which context, there was slight disparity, there were some differences. So, all children did similarly in the words associated with schooling, but there was a difference in terms of the words that are associated with home.

(Refer Slide Time: 42:33)



But on the whole, the overall picture is like this, this is taken from Bialystok in her paper. As you can see across all the age groups 3 year, 4 year, 3 to 10 years entire study, bilingual proficiency is much less compared to the monolingual. So, bilingual in terms of in the language of schooling, monolingual children did consistently better than bilinguals in or across all the age groups. That is why we commonly say that bilinguals have less vocabulary knowledge as opposed to monolinguals.

(Refer Slide Time: 43:09)



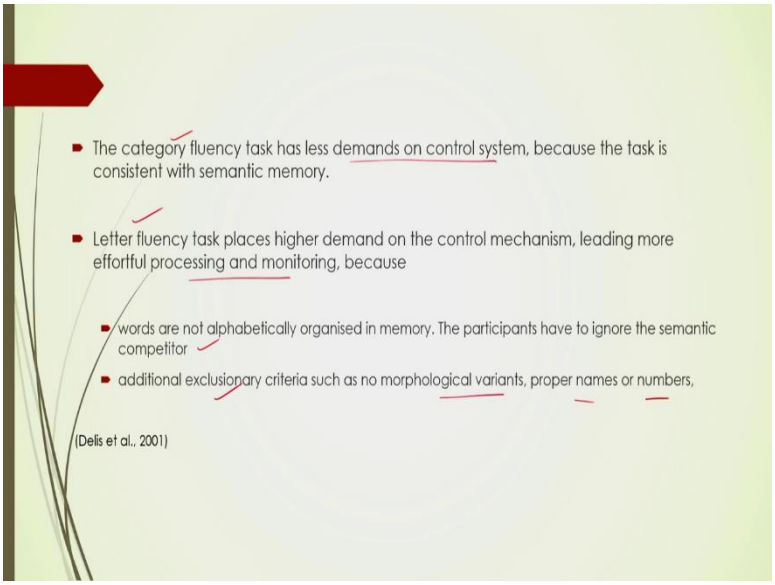
Similarly, there are also tasks that are called verbal fluency tasks. Verbal fluency tasks are the tasks that use language proficiency and integrity of brain functioning. This is something related to verbal vocabulary tasks, but slightly different because here they we check not only the vocabulary, but also in terms of how you can associate the vocabulary to various kinds of domains.

For example, there the tasks typically are the participants are asked to use or generate as many words as possible in a particular category, semantic category ok within a particular time frame. So, 60 seconds typically within 60 seconds. So, name as many fruits as you can; as you can within next 60 seconds, name as many flowers as you can, name as many cars as you can, something like this.

So, this is generating words within one semantic category, one larger semantic category that is one type. Another is this is what is called creating words starting with a particular alphabet. So, name as many words as you can that starts with the alphabet A or starts with the alphabet B for example. So, this is these are the two varieties of the verbal fluency task.

Now, we will see shortly why this is very interesting. These tasks are based on or say related to vocabulary knowledge, right. So, how many words you know either in the semantic domain or in the or in terms of alphabetical arrangement, but the demands on these two tasks are very different. Demands are two different because one of them is based on similar automatic process the other is a conscious process.

(Refer Slide Time: 44:57)



So, in the terms of category fluency which is the semantic category like name of fruits, name of flowers and so on, this has less demand on control system because the task is consistent with semantic memory. Remember our representation memory, bilingual memory in terms of representations and so on, so, we know that when the conceptual storage is created semantic memory is based on association of various types, association of various types in terms of connection, semantic connection, associative connection and so on.

So, this is something we have already seen. So, this is how the mental storage really works. As a result of which if you have access to one word, if you have if you are using the word apple, if you and then automatically oranges and mangoes and stuff or the other things like this automatically come to your mind and hence it is called a automatic system. So, it has less demand on your control system. You do not really need to put too much of pressure.

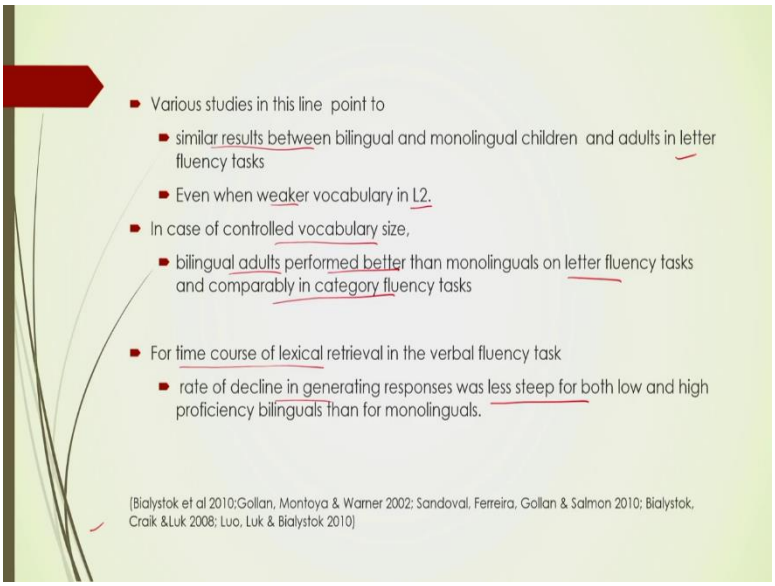
However, letter fluency which is generating as many words as possible with a particular alphabet, this puts a certain amount of pressure on your control mechanism because words are not stored alphabetically in our mind. It might be stored alphabetically in a dictionary in a physical dictionary or in a virtual dictionary, but that is not how the human mind stores it.

Human mind stores it in boxes of semantic categories and other associations, but not in terms of alphabetic order and hence if you have to generate words based on alphabets, you need a certain amount of effort in processing and monitoring, right. So, as a result of which you have an added amount of cost that is part of this kind of a task.

And, also there are additional exclusionary criteria like no morphological variance. So, you cannot say go and going and you know walked like that is not allowed in this kind of a test. So, you have to say walk and then you have to really sit down and think another word with the starts with w.

Proper names are also out, numbers are also out. So, there are lots of constraints that are typically placed in terms of letter fluency task as opposed to category fluency task. As a result of which verbal fluency task when it takes care of both of these is a complex task that has a very high demand on executive control mechanisms.

(Refer Slide Time: 47:33)



So, this is one such study that has looked into this and various other studies have also taken place I have given the references here. So, typical findings of all of these studies in these domain they refer to that similar results will be obtained between bilingual and monolingual children as well as adults in their letter fluency task, even when the vocabulary in L2 is weaker.

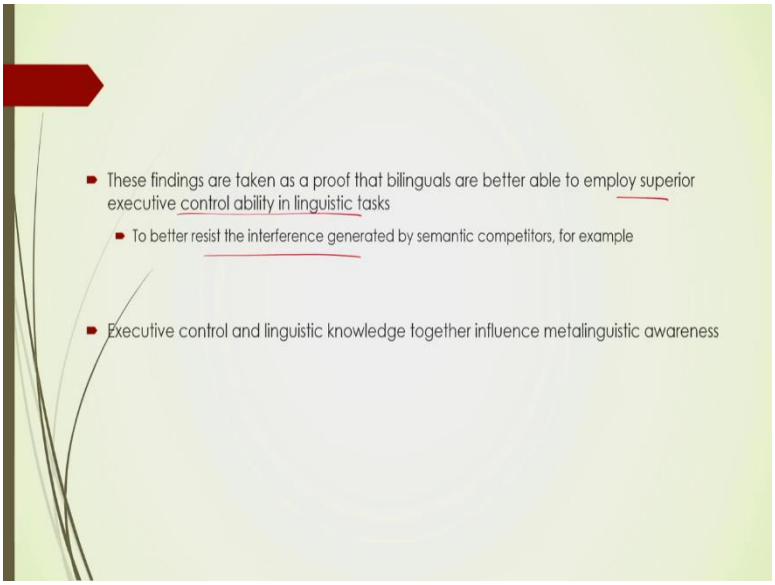
Even if L 2 vocabulary is weaker which is often the case in case of bilinguals, even then the letter fluency task will be done better by bilinguals as opposed to monolinguals. In terms of controlled vocabulary size, so, there are various parameters that are used. So, if we keep the vocabulary size controlled in that case the findings show that bilingual adults performed better than monolinguals right on letter fluency task, and comparably in category fluency task.

So, in category fluency task there is hardly any difference whatever may be the parameter. In letter fluency task, there are sometimes similarity sometimes bilinguals even do better than monolinguals if the vocabulary size is controlled. And, not only that there have been studies that looked at the time course for lexical retrieval, and they found that the rate of decline because over a period of time as the time goes the time the number of words that you can generate basically decreases.

But, even in that case what they find is that for bilinguals it was less steep for both low and high proficient bilinguals. Monolinguals had a suffered more in this kind of a case,

but bilinguals suffered less, even if they are low proficient. Both types of bilinguals low proficient and high proficient bilinguals did better.

(Refer Slide Time: 49:38)



So, the most important take home lesson for this study is that bilinguals are better able to employ superior executive control even in case of linguistic task. All of these are linguistic task – Wug test, vocabulary verbal fluency task or grammaticality judgment. Starting from Wug test to the last one we have seen that gradually for each of these tasks we can include more and more amount of cognitive control elements.

We can put some amount of competition. When they are speaking when they are generating or understanding language, there is an amount of competition that you can build in into the linguistic task, depending on the task the degree varies. So, in Wug task it is primarily linguistic task, but in verbal fluency task a heavy amount of control mechanism is also in-built because of the letter fluency task.

Similarly, grammaticality judgment if you include the semantically anomalous sentences being brings in the executive control mechanism. So, whenever there are executive control mechanism in-built bilinguals have typically outperformed the monolingual peers, even if their vocabulary was weaker. And, in the Wug test also there are similar kind of findings in terms of bilingual versus monolingual participants.

So, basically bilinguals are able to better resist interference, better resist interference generated by various kinds of competitors, in case of both in case of grammaticality judgment as well as in case of verbal fluency judgment. Semantic association or semantic competitors are creating a competition in the production or in the comprehension process.

So, in that kind of a situation when you have to have exercise some amount of inhibition; inhibition of the competitors in this case semantic competitors, in all of these cases bilinguals have always found to be outperforming monolinguals. So, that is about the metalinguistic awareness of bilinguals as opposed to monolinguals.

And, the basic lesson take home lesson from this segment is that bilinguals seem to do at least similarly and sometimes better, given if the executive control mechanism is an inbuilt part of the experimental setup.

So, this is about metalinguistic awareness. In the next segment we will look at non-linguistic task which focuses primarily on executive control and not on linguistic task. Till now, we looked at linguistic task which had executive control also. Now, we will look at only at non-linguistic task in the next segment.