

## **Fundamentals of language Acquisition**

**Prof. BIDISHA SOM**

**Dept. of HSS**

**IIT Guwahati**

**Week 12**

**Lecture 057**

### Lec 57: SLI and Williams Syndrome

Welcome back; in lecture 2, we will continue with the typical features of language deficit in SLI patients, and we will also look at another disorder called Williams syndrome. So let us move forward; we have discussed, and we started with the typical features of grammatical deficit. The most notable of them is the inflectional categories and inflectional deficits with respect to tense marking and other kinds of grammatical structures. So, let us start. Inflectional feature deficits are one of the most significant aspects. So, one of the interesting domains is the use of optional infinitives; often, they use the infinitives because the inflectional marking is difficult for them, and inflectional marking is often also absent. So, they tend to use more of the optional infinitives in structures where they are actually supposed to use the inflectional markers for tense and for other kinds of markings. So, for example, this is an example from a French-speaking child. So, here they are talking about the "little baby sleeping". So, the sleeping is missing. So, the sleep, the 'to sleep', the infinitive verb, the infinitive part of the verb is mentioned here: to sleep, little baby. So, the little baby wants to sleep or the little baby is sleeping. So, those inflectional markings are missing. Similarly, another boy, an English-speaking child, I think it is a girl named Eve. So, she says "Cromer wear glasses".

So, the S marking is missing. So, that is what we mean by the inflectional feature deficit. So, there have been many studies on this; one particular study compared the SLI children aged between 4.4 and 5.8 years with control groups. The study looked at the comparison between SLI children and age-matched control groups on morphemes marking tense, third person singular present and past tense /-ed/, alongside the auxiliaries be and do and various forms of other verbs. So, these were the categories on which the children were studied; the children were compared. SLI children were compared with age-matched and

language-matched control groups. So, this is a graph that the study presents; this is the age-matched group, their performance. This is the language-matched group, and this is the SLI group. So, as you can see, the difference in performance between the age-matched group and the SLI group is very, very high. Language matched is when they have the language matched but may not have the age matched. So they are somewhere in between, but the difference between this and this is quite striking, and this difference persists in all the grammatical cases and on all the parameters on which they studied. So, the marking S, S, is the third person singular marker in the English language. Similarly, the past tense marker "ed," the verb "to be," and the verb "to do" are used. In all these cases, the SLI children's performance was well below par when compared with the age-matched control. So, that is how we determine the degree of deficiency in these children. Then we look at agreement relations; many scholars have pointed out that SLI children have trouble with the ability to mark agreement in an otherwise normal grammar. So the other things might be like normally normal structures, but agreement marking will be absent. So, agreement markers, what are agreement markers? It is a specific kind of relation between the subject and the verb.

For example, in the case of Indian languages, you need to mention that your verb ending will show not only the tense and aspect but also the person marking. So, is it first person, second person, third person, and so on? So, in the case of the first person, let us say I have to, if I am speaking, I have to say "mai ja rahi hun." So, that "rahaa" becomes "rahi," and for a male, it will become "rahaa," and like that. So, that is what we mean by an agreement. So, the relationship between the verb and the subject can vary based on various parameters, such as number, gender, person, and so on. All of these will be marked. So often, these children will have trouble with agreement morphemes and inflectional morphemes because agreement marking is what is difficult for them. So, these morphemes will either be omitted or wrongly placed. So, a study on German children showed that they have good control over plural and past participle morphology but not agreement morphemes, like third person auxiliaries. That is why many researchers have talked about specific grammatical deficits in the case of SLI children.

So, in this particular study, the German study, the plural and past markings were fine, unlike the previous study that you just saw with the English children; but in this case, the agreement morphemes were missing. They had a problem with agreement morphemes, like third person auxiliaries. Another study on Greek children aged 5.5 years. It also reports similar information. So, Greek has a very rich agreement system and uses a six-way distinction in person when combining it with other factors and case. So you can imagine the complexity. So, there is a six-way distinction in person marking. The particular child that was studied mostly used agreement markers incorrectly in the second

person singular and second person plural, with 78 percent and 97 percent error rates, which indicates the level of difficulty the child faced. Other agreement morphemes were correct 90 percent of the time, so very, very specific grammatical categories are being affected in each of these cases.

So, in the case of English children, more categories in the German, and in the case of the Greek child, some other kinds in other areas were affected. However, contrasting evidence is also found in another language with a rich morphological agreement system, which is Italian. Another study showed that this also has a very complex grammatical system, a complex and rich morphological system, but in this case, the children did not have that similar kind of problem. So, SLI children aged 6.2 to 13.5 years were studied longitudinally over a period of time. This child was found to use all the forms of agreement patterns correctly with a mere 3 percent error rate. So, the contradicting evidence also exists. Hence, this child who was diagnosed with SLI did not show a deficit in computing ability in the case of complex agreement patterns. However, the generalizability is one issue with this kind of finding.

This particular study found cases where the child had no issues, but we cannot really say you cannot generalize beyond a point; we are just presenting the cases as they are. So, in some cases we have seen a serious deficit and in some other cases, a very low error rate. Structure-dependent relations deficit is another area that we had marked. So, subject agreement is one such relation. So, another other cases will be binding. Binding principles are an important part of syntactic understanding and syntactic processing in children and adults alike. So, binding principles govern the syntactic relations between reflexives, pronouns, and their antecedents. So, reflexives must be bound in some local domain while pronouns must be free in the same local domain, right? Thus, reflexives and pronouns cannot be treated in the same way when interpreting a sentence. Let us see some examples. This was a rather well-known study, sentence, and picture matching task. It was by Van der Lely and Stolowak, 1997. So, the age range of the SLI children was 9.3 to 12 years. The task was picture and sentence matching. So, the sentence was, "Mowgli is tickling himself." Now the pictures were, one picture showing Mowgli tickling himself. So, this is a matched condition, as the sentence and the picture are exactly the same thing. So, whatever the sentence says, the picture depicts, and that is called a match condition. So, in this case they gave the correct responses they could match them properly. And the other condition was the mismatch condition, in which case it showed Mowgli tickling Baloo bear. So, this is a mismatch condition. So, in this case also they could correctly respond that this is a mismatch. It does not match. This picture does not

match the sentence. Then comes a complex sentence. Balu Bear says Mowgli is tickling himself. Now in this case, this "himself" has to agree with "Mowgli" because this is the local domain. That is what the theory says. In the local domain, the reflexive has to agree with the subject. So, in this case, when Baloo the bear says Mowgli is tickling himself, the person getting tickled is Mowgli.

Now the pictures have three types: Mowgli tickling himself, which is the matched condition, and the children responded correctly to this matching. Another picture of Mowgli tackling Baloo the bear shows a mismatch condition, and they also responded correctly. Baloo Bear tickling himself, now this was also a mismatch condition, but here the response was mostly incorrect. Why, because in this case, Baloo Bear is tickling himself, so what is happening here is that the children, the subjects, and the SLI patients connected this; they interpreted this "himself" with Baloo Bear. So, not only in the case that they are not obeying the binding principle here, the binding principle says that it has to be reflexive and must be interpreted as being within the local domain.

So, they were considering this correct as well. So, the response was that this is a mismatch condition, but they, as a result, thought this also matched the sentence, which was an incorrect response. So, this is how they showed that this particular study demonstrated that they have a problem in this domain, which is sentence-picture matching in the case of complex sentences. So, the results were justified as an inability of the children to obey the binding principle, that is, they could not compute the binding domain of the reflexive. Hence, the performance was at chance level.

So, whatever they thought it might be, they just took chances. This is reflexive. Now, let us look at the case of pronouns in the sentence "Mowgli is tickling him." Pictures of Mowgli tickling Baloo bear, which is the matching condition, so they got it all correct. Mowgli is tickling himself, which is a mismatch condition; fewer correct responses were found.

So, the idea was that the justification here was the explanation that was given, probably because they take the pronoun to be anaphorically connected to the local antecedent. So, they had a lower number of correct responses in this case. So, a complex sentence again using the same pronoun: Baloo Bear says that Mowgli is tickling him. The pictures were of Mowgli tickling Baloo Bear, which is the correct one, and we have Mowgli tickles himself, which again they performed at chance level.

So this is another domain. So, grammar lacking in inflectional features, will now be examined. SLI reflects an inability to construct a normal grammar in the sense that

individuals with SLI cannot abstract the rules governing the surface forms. That is the argument on the basis of which this was proposed. The reason why they do not get it and the reason why they sometimes make mistakes in inflectional morphology is that they do not understand the rule. They are simply looking at the things, looking at the sentences in isolation, the words in isolation, not as part of a rule-governed phenomenon.

So, for them, each word appears in isolation and needs to be committed to memory through rote learning. They are not following a rule; they are just memorizing this, as a result of which they make mistakes. So, a series of experiments was done that included Canadian and British English, Greek, Japanese, and Quebec French. They used various tasks in both written and oral formats that covered both comprehension and spontaneous and elicited production.

So, it was a rather wide-ranging study. And they showed that linguistic representation in SLI children does not include the inflectional features of plus minus plural and plus minus past. So, wherever the plural marking and the tense marking need inflectional morphology to be utilized, that is when they do not perform very well. So, the idea as a result of which that was given was that they do not have this grammatical representation or linguistic representation and do not include this information. For example, "walks," "walked," and "houses" are not derived by a rule-governed phenomenon like stem plus inflectional morpheme; rather, each of these words is separate. So "walk," "walks," "walked," and "walking" will all be considered as separate words, and because of this, the cognitive load gets higher.

Since you are not following a rule, you are simply memorizing everything. So, if you are committing things to memory, obviously you will need to utilize more cognitive resources, and that is where the problem lies, according to this particular idea. If you are memorizing them as unanalyzed chunks rather than as rule-governed behavior, then this will result in frequency effects. Frequency will have an effect on the difficulty with the inflection of novel words and incorrect segmental and prosodic features of the inflected word because you are memorizing all of them separately. So, these features will be visible in this kind of case.

So, the processing deficit is a problem here. So, they will also have difficulty with functional morphemes like the past tense plural marker, as we have just seen, and the idea with which this is explained is called the surface hypothesis. The surface hypothesis says

that these markers are particularly difficult because they are non-salient owing to their acoustic properties. Remember we talked about the various kinds of acoustic and prosodic properties on the basis of which the segmentation of sounds also happens. So, this seems to be a recurring issue. In this case of SLI, the processing difficulty also arises because these features are non-salient; they are below the radar, so to speak.

So, the usual difficulty is seen when these have shorter duration morphemes; they lack stress, are non-syllabic, are subject to deletion in production, and do not occur in final position. So, if these are cases, then that is when you find them having an issue with producing them. So, why is the lack of salience a problem? According to this theory, it is not duration per se that is a problem, but the perception of a non-salient feature basically exhausts cognitive resources, as I was just explaining. So, this is what prevents them from identifying the grammatical function of these morphemes and thereby placing them in a paradigm. So, in short, inflections' function is what they cannot process, which is at the heart of the problem. Why is that inflection used at all? Why do you use "ing"? Why do you use "s" or "ed" for you know to signal a certain kind of grammatical function and a certain kind of semantic information that the rule is not understood. As a result, the surface hypothesis says that they are looking at it only at a surface level, which leads to memorizing them as chunks of words that are not connected; that is the idea. So, the evidence comes from various studies. So, from various languages such as English, Italian, and Hebrew, speakers with SLI have looked at these different languages in these studies. English learners omit a range of grammatical morphemes, such as the copula, the article, plural, and tense marking, which we have already seen.

In contrast, Italian and Hebrew-speaking SLI children had no problem with inflections on nouns and verbs and were found to use this morpheme accurately, as their non-SLI counterparts. So, whereas English-speaking children have a serious difficulty with inflections of various types, these children did not have; Italian and Hebrew did not have. Now, why did they not have the problem? The reason is that in these languages, these morphemes are salient. They are often final and syllabic. So, how are they made salient? They occur in the final position, and they are often syllabic.

So, as a result of which you will notice them. They become a salient part of the sentence structures. So, because of their salience, Italian grammatical morphemes are not difficult to perceive. and as a result of which they can produce them. Hence, the processing resources of the children are sufficient to incorporate them into the paradigm. However, the investigation of Italian and French-speaking SLI children shows an asymmetry; articles and clitics are homophones in these languages.

So, if salience is the factor, then both of these should be equally weak in their speech; that was the hypothesis. But some studies reported an advantage of articles over clitics in the case of French children and the reverse in the case of Italian children. Of course, this asymmetry we do not yet understand is why it is happening. So, salience, at least, is not what the important factor is here; something else is happening. So, we still do not really understand what is happening, but studies are ongoing in various other languages as well.

But these are the most important findings so far. So in SLI, we have seen that this is a specific language disorder; in this disorder, there are no cognitive deficits or any physical, emotional, or other kinds of deficits; certain kinds of grammatical domains get affected, but that deficit is also not universal. Some languages show a greater degree of deficit; some languages show a lesser degree. This has been explained with the idea of salience placing it within the surface hypothesis, but there are also various kinds of studies that have not agreed with that hypothesis because the results are not conclusive. That is where we leave SLI.

Now, we move on to Williams Syndrome. Williams syndrome is the opposite of SLI in some senses because, in SLI, the cognitive features are intact. Language is affected; in Williams syndrome, it is the opposite. In this disorder, cognitive abilities are disrupted while language ability is more or less intact. The etiology of Williams syndrome is clearer than that of SLI. This disorder, also called infantile hypercalcemia, is a rare metabolic disorder that affects calcium and calcitonin metabolism.

So, this is a rare disease; it is also called hypercalcemia, and this affects the calcium and calcitonin metabolism in the body. So, this leads to a cognitive disorder, but linguistic abilities remain more or less intact. So, features of this disorder include these things: mental retardation, elfin facial appearance, several medical anomalies including supravalvular aortic stenosis, this is a congenital heart disease, heart defect, where the large blood vessel carrying blood from heart to the rest of the body is narrowed and so on. So, this is in the case of Williams syndrome; it is not just a cognitive disorder but also has many other physical problems as well. So, it is a biomedical condition that affects the body and the cognitive abilities at the same time.

So, there are serious intellectual limitations. So, this is a typical Williams syndrome face; this is what is called an elfin face. So, the puffiness around the eyes, the blue eyes with a starry pattern, and the long upper lip length are all typical facial features of Williams syndrome. Small and widely spaced teeth are also characteristic of this condition. Williams syndrome also comes with very serious intellectual limitations and trouble with many of the Piagetian cognitive tasks, such as the seriation task and conservation task; we talked about the conservation task before. The seriation task is arranging, when every

child at the beginning of their education, so to say, is taught to arrange things in an order, either ascending order, descending order, or various kinds of other seriations.

So, this is called a seriation task. So, these children suffering from Williams syndrome will have serious problems with all these Piagetian tasks like seriation and conservation; they are weak in problem solving, and even in some everyday activities, they will struggle. So, there are various kinds of disabilities and problems in children with Williams syndrome. Personality-wise, they typically have a very talkative and friendly personality often called the cocktail party personality. They are poor at drawing and often show a lack of integration of parts of an object. So, if you ask them to draw something, it is not that they do not understand or do not know, but they can explain the thing; they just cannot put them together. So, the bigger picture is missing. So, because of a visual-spatial defect. So, this is how they will draw a cycle. This is how they have one particular patient of 9 years and 7 months, and this is for 12 years and 11 months. So, when you ask them to draw a cycle, this is what they produced. So, it is not like if you ask them what a cycle is, they will explain what the parts are and what the functions are, but because of a visuospatial defect, they cannot put them together as one whole.

So, that is Williams syndrome. Now, the tasks are Piagetian tasks for developing children. So, the seriation task tests the child's ability to organize objects according to one dimension. It could be length, height, weight, and so on. So, arranging numbers in ascending and descending order and so on, as I was just saying. Conservation tasks, on the other hand, are logical thinking abilities. Being able to conserve means knowing that a quantity does not change if it is altered by being stretched, cut, elongated, spread out, shrunk, or poured, whatever. So, the continuity of the object will remain constant. There are 7 types of Piagetian conservation tasks that generally tend to be acquired in this order. So, they will there is a order through which they understand they typically tend to develop this. So, starting with the number acquired by age 6 and then followed by length, liquid, mass, area, weight, and volume.

The last one, volume, which is typically acquired by the time children are 10 years of age. Now, in stark contrast with their nonverbal tasks the language of these children is generally less affected and is better than other populations with similar mental retardation, like Down syndrome. So, their language abilities remain quite good and almost unaffected, actually. And it is better than many other patients in the similar kind of bracket. Some scholars have argued that language abilities are not entirely intact, but in some cases, there are deformities and deficits in some patients; largely in the case of Williams syndrome, their language abilities are okay and good. Nonetheless, the dissociation between language and other mental functions in these

patients has suggested modularity of language in the human brain. So, on the one hand, we have our SLI, which is specific language impairment; on the other hand, we have Williams syndrome. So, Williams syndrome is a very severe kind of cognitive disorder where simple daily activities are also affected; visuospatial acuity will be affected. Various kinds of Piagetian tasks they will not be successful in fulfilling, similarly many others.

So, alongside many other physical deformities as well. However, in spite of having so many issues, the language abilities are more or less intact; in fact, they are better than those of many other similar populations, like individuals with Down syndrome. So, because of these two important disorders, which seem to have, you know, separate trajectories of development that do not affect each other, cognitive deficits do not affect language, and language does not affect cognitive deficits. Because of this, the idea of modularity of the human brain has been proposed using these findings as proof and justification for the modularity hypothesis with these two disorders. So, word acquisition in the lexicon of these children is unusual for children of normal age. In a study by Clahsen, this is quite an important study with children with Williams syndrome aged 11, 12, 13, and 15.

They obtained scores above their mental age in one of the test batteries, the British Picture Vocabulary Test. They also enjoy using low-frequency words and know their meanings very well, not only because they have a higher vocabulary size. But they also enjoy using unusual words often, which is higher than their mental age-matched peers. In a study by Belugi et al. (1993), children aged 11, 13, and 16 could match words like canine, archaeologist, and cornea with the correct ones from among four pictures.

These are not high-frequency words; these are very uncommon and difficult words, but they could do well on this. This could explain how they could explain the word meanings using long definitions, as if they knew how to use them in an appropriate context. There are very interesting studies on this regarding how they describe things in a vivid way if you ask them any question. For example, the definitions are sometimes peculiar but almost Sheldon-like. So, for example, in one case, somebody says "sad is when someone dies or when someone is hurt, like when you cry". Another "sad is when you lose somebody that you love and care about. It means something has happened to you, like your grandmother died". "I wish I could surrender; that means I give up". "I would like to commentate on it. It means that, like all the sportscasters do, they tell who is doing what". For their age, their linguistic output is quite mature and often quite noteworthy in terms of their age-matched controls.

This is typical of Williams syndrome. Inflectional morphology is important because we have checked inflectional morphology with SLI. Unlike children with SLI, children with WS use a number of inflectional morphemes correctly. Even though they start to speak late, their mastery over inflectional morphology is better, as shown by various studies conducted by the same group, Clahsen and Almazan. Typical comparisons between SLI and WS with their age-matched and language-matched controls show that WS children have adult accuracy in language even though their cognitive abilities are lower than those of the other groups. Thus, even when children with Williams syndrome and SLI have comparable language development in terms of MLU, MLU means mean length of utterance.

So, in terms of MLU, they will have some amount of, you know, they can be comparable. The latter shows a significant lack of understanding of tense marking, which the WS children do not show. So, in terms of the length of utterances, they can be comparable sometimes. However, the inflection that is a serious problem for SLI children is not seen with children with Williams syndrome. Another study showed that the WS children had no problem with inflecting regular existing and non-verbs, whereas matched SLI children achieved lower scores. "Every day I spling around London". It has no meaning; this is a nonsensical word, a non-word, so "just like everyday yesterday, I ---- around London". So, basically, here it could be, you know, they could have used the /ed/ mark. So, /-ed/ is the inflectional morpheme for past tense marking in the English language; this was the task. So, first they gave the regular form the root form "I spling around London" and then "yesterday I splinged around London". However, WS individuals did not do very well in the production of irregular verbs and tended to overgeneralize. So, the main difference between these two groups is that SLI children fail to use the past tense morpheme, thereby using only the base forms. On the other hand, WS children did use past morphemes, but they overgeneralized them. Children with Williams syndrome display good comprehension and production of syntactic structure. So, for example, structures like reversible passives, conditionals, relative clauses, and comparatives do pretty well in all these cases. These are some examples. Similarly, it has also been seen that these children perform very well in all types of passives. Passives are a difficult domain. We have seen while looking at syntax that children take time to learn passives, and we also have cross-language differences in terms of at what age they learn it. In the case of WS children, they do pretty well.

So, in reversible verbal passive, "the teddy is mended by the girl". In this kind of case, they do well. By contrast, children with SLI whose chronological age matched the mental

age of the WS children perform poorly on this kind of passive. So, unaffected controls also made some errors in some cases. So, because these are difficult constructions in the first place, WS children seem to do pretty well. Again, when tested on the principles of binding theory, we have looked at binding theory in the case of SLI for children with WS. So, the same has also been tested on these children, but they have been found to be performing at ceiling level, which is performing at the highest level given the variable. So, they have done optimally well. This was in contrast to the performance of the SLI children again. They even performed better than children without Williams syndrome matched in mental age. These are some of the proofs of their abilities in language-related functions and language-related processing that show that children with Williams syndrome typically tend to do a lot better than children with SLI in various grammatical domains, such as passive constructions, inflectional morphology, and so on; and sometimes they do better than the control group, which includes non-affected children.

So, these are the two cases that are often used as examples of modularity, and this is where we will stop with these cases. In the next lecture, we will start with some cases where both language and cognitive deficits are seen. So, it's kind of a comorbidity where you see language deficits as well as cognitive deficits and other issues. So, those are the other types of cases that we talked about, and in this segment, we talked about the separate cases where language disorder and cognitive disorder do not match. Thank you.