

Cognition and its Computation
Prof. Rajlakshmi Guha
Prof. Sharba Bandyopadhyay
Biotechnology and Bioengineering
Indian Institute of Technology, Kharagpur

Lecture - 50
Language and Thought - Speech Language Disorders

Hello and welcome back to this session on Cognition and Computation. Today, we shall be talking about Language and Speech Disorders.

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Disorders of Language and Speech



And, so far in this 10th week, we have spoken about introduction to speeches and language, you have looked at the components of speech and speech production and now we are going to you also looked at speech perception and animal communication lessons from animal communication. And, today we are going to talk about what happens when there are disorders in language and speech and how do they manifest, how do we know the differences. So, this is what brings us to today's session.

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Types of Language and Speech Disorders

- **Language Disorders**
 - Autism Spectrum disorders
 - Delayed Language Development in Preschool Children
 - Specific Language Impairment
 - Pragmatic Impairment
 - Learning Disabilities
 - Aphasia
- **Speech Disorders:**
 - Children with speech sound disorders
 - Dysarthria
 - Apraxia
 - Fluency and Fluency disorders
 - ADHD and communication disorders
 - Speech disorders due to head and Neck cancer



So, when we talk of language and speech disorders, they may be divided into multiple types. And, especially when we talk of language disorders, we speak of language disorders in different other illnesses, where communication may be a problem. And, one of the primary areas where we talk of language disorders is autism spectrum disorders, other than that an individual especially a child may show problems in delayed language development in preschool and early childhood or in preschool children as seen.

And, there may be specific language impairment, pragmatic impairment, learning disabilities and aphasia. And, in speech disorders, we often come across children with speech sound disorders, dysarthria, apraxia, fluency and fluency disorders, ADHD and communication disorders, that also show problems with speech and speech disorders may be due to multiple other reasons like head and neck cancer and also problems with vocalization may emerge as a form of speech disorder.

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Autism Spectrum Disorders

Symptoms:

- a. impaired reciprocal social interaction
- b. disordered verbal and nonverbal communication
- c. restricted, repetitive behaviour or circumscribed interests.

Failure to meet language development milestones is one of the earliest red flags for autism

Impairments in language and social communication are included in the primary diagnostic criteria for ASD. Variable characteristics like sensory processing and attention issues interact with the core symptoms, adding to the heterogeneity of the disorder and the manifestations of the symptoms



So, we are going to this is too long detail to be covered in one or two lectures. So, what we shall do is we shall just look at one or two very important disorders. I thought of covering learning disabilities, but as I have already covered learning disabilities in an early session, earlier session on specific learning disability.

So, that is why in today's session talking about language and speech disorders, we are going to talk about autism spectrum disorder, delayed language development in preschool children and apraxia from the speech disorder, we are going to talk about apraxia.

So, now what is autism spectrum disorder? Well, autism spectrum autism is viewed as a psychiatric condition with mental retardation earlier, that is how it was seen and as a characteristic feature of this disorder, it was it is often accompanied by social awkwardness.

Now, autism spectrum disorders encompassed a range of presentations which may be traced to a multiple you know range of symptoms again. So, primarily the symptomatology that we see is impaired social interaction, disordered verbal and non-verbal communication and restricted or repetitive behavior or circumscribed interest. So, you know today we have much better awareness of about and sensitization about autism spectrum disorders as compared to earlier.

And, well thankfully several movies have got us got this picture of tried to cover the symptomatology of autism. So, Dustin Hoffman in Rain Man is a classic example of autism spectrum disorder. And so, what we see in these individuals is an impairment in language and social communication.

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Language in Autism

- Language abilities may range from being nonverbal to highly idiosyncratic language with echolalia and unusual prosody (tone or inflection)
- Those who are in normal IQ range are considered high functioning even though they may have significant language and communication deficits
- Individuals with Asperger's syndrome, generally have an average or superior intellectual ability but have difficulty with social communication. Articulation, vocabulary, and grammar is relatively preserved. People with Asperger's have difficulties in prosody and abstract use of language

- Children with ASD have receptive and expressive language impairments
- Deficits in joint attention and receptive language and reduced vocal output are evident as early as in the first two years of life. Some children who have ASD may have apraxia or oral-motor impairment



And, this is one of the primary diagnostic criteria of ASD and variable characteristics like sensory processing and attentional issues that may be beyond the primary symptoms of autism, but actually interact a lot with these four symptoms may add to the heterogeneity of the problem and the manifestation of the symptoms.

So, as such language abilities may range from being nonverbal to highly idiosyncratic language with echolalia and unusual prosody and at least, so, it may be like this a lot of repetition and the same intonation being used while saying words especially for children who can verbalize. It has been seen that those who are in the normal IQ range or are considered high functioning even may have significant language and communication deficit.

And, when we this brings us to another group another syndrome known Asperger's syndrome which earlier was considered as a part of the autism spectrum disorders. And, individuals with Asperger's, generally have an average or superior intellectual ability, but have difficulty with social communication. And articulation, vocabulary and

grammar is relatively preserved in these people and people with Asperger's have difficulty in prosody and abstract use of language.

So, generally anybody with Asperger's or within the autism spectrum group who can communicate even partially do have problems with abstract reasoning; so, abstract communication, abstract language use. So, for example, it is tough for them to understand joke or implied messages, but they it need to be spelt out.

Children with ASD have receptive and expressive language impedance. It is being seen that the profile of impairment varies with age and the development level. For example, deficits in joint attention and receptive language, reduced vocal output are evident as early as the first two years of life. And, some children with a ASD may also have apraxia or oral-motor impairment impacting their ability to communicate.

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Social deficits and communication difficulties in Autism

- "Absence of communicative intent" due to social deficits often manifest as an expressive language impairment in Autism
 - A reduced social drive to talk may manifest as delayed or impaired language development
- Verbal children on the spectrum do not have difficulty with speech sound articulation though their speech can be quite perseverative with an unusual vocal quality (e.g., monotonic, nasal, atypical stress)
- Autistic children have difficulty in language pragmatics
 - They show limited use of language in social context (e.g., rarely to comment or request information), once again pointing to a strong link between language and social skills in autism



So, but what is the primary feature of these children is the importance of we must pay importance to the social deficit that add to the communication difficulties of autism. So, the absence of receptives, absence of communicative intent due to social deficits often manifest as an expressive language impairment in autism.

And, this may manifest because of a reduced ability, reduce social drive to talk or you know whether autistic child does not feel like interacting or communicating or does not

have the keenness to connect with others. And, this may manifest as delayed or impaired language development.

So, verbal children generally on the spectrum do not have difficulty with speech and sound articulation and though their speech can be quite preservative with an unusual vocal quality. So, it may be a monotonic, it may be a nasal or you know there may be extra stress or emphasis on certain word. But, the primary problem because of this poor social communication that is seen is in autistic children in the communication or language of autistic children is the lack of you know use of pragmatic.

So, the language use of language pragmatics is very poor and children who have ASD, show limited use of language in social context. So, they rarely ask or communicate or for information or request for information and this shows that language has very very you know very very strong links to social skills in autism.

So, in this case for autistic autism, it is not only a language impairment from within, but also because of the lack of the social connect individuals with a autism spectrum disorders may show problems with their languages or with their communication.

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Delayed Language Development (DLD) in Preschool Children

- **Delayed Language Development in Preschool Children** - Delays in the acquisition of language are the most common presenting problem in preschool children referred for clinical evaluations
- **Linguistic Characteristics of Children with DLD:** Their language development is delayed than deviant,
- It is often asynchronous - some developmental features may be more delayed than others



So, this brings us to the next disorder language disorder called delayed language development and this is in preschool children, this is as this is a picture of preschool children that we are going to talk about. And, this may later manifest as specific

language impairment in young adults or you know as the individual process preschool into their childhood. So, this the delayed language development shows the delays in a symptomate by delays in the exposition of language.

And, the most common problem in preschool children it is the most common problem in preschool children and is generally sent for clinical evaluations. More often than not you will hear of somebody taking their child to a speech set of it as a class teacher has referred it in preschool. The child may not be talking properly or the child may not be pronouncing properly or the child may not be talking at all or many times the there is a restrictive use of words.

And, generally how we the picture that we see of delayed language development is you know with the linguistic characteristics is that they are delayed rather than deviant. So, this is the language development is not disturbed due to for permanent, but more often than not it is delayed and it is often asynchronous, that is it shows the developmental features that there may be other development features that are delayed as well.

So, this may be related many times it is seen related with intellectual deficiency. Again, at times you will see that it does not, it is not correlated with intellectual deficiencies, but it may stand out as a singular problem.

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Linguistic Characteristics of Children with DLD

- **Speech sounds:** hard to understand, difficulties in the areas of syntax, morphology and semantics; delay in acquiring CVC syllables and multisyllabic productions; acquire words more readily when the words begin with consonants that they are already producing correctly in other words
- **Word meaning:** Use of early semantic relations in young children with DLD appears to be similar to that of language-matched peers; lexical development is slower, talk and communicate less often
- **Syntax:** Delayed development; Shorter sentences, less varied, less complex; difficulty producing passive sentences and questions; omits function words such as the determiners 'a' and 'the', or the conjunction 'and'
- **Morpheme:** difficulty in acquisition of regular-irregular tense inflections, auxiliary forms, third person singular forms, 'be' verbs
- **Pragmatics:** pragmatic skills are generally better than skills in language that they are secondary to the primary difficulties in morpho-syntax characteristic differentiates DLDs from children with autism spectrum



So, the types of problems that we see, characteristics of that we see in delayed language development are the speech sounds. The speech sounds of many of these preschoolers are you know easy to are not easy to follow. So, they have frequent articulation errors and they become very hard to understand. These children often show disturbances in the areas of syntax, morphology and semantics as well.

So, there the there are grammatical errors, there are syntactical errors as well as you know errors in how they are trying to express their meaning. So, you know you get to see these jokes about the placements of the word in a different place, you know in the formation of a sentence in a different area.

So, this is sometimes children come up with you know sentences that may mean something entirely different. So, this is something that children by 2 years learn, but delayed language development children with delayed language development have problems with learning the structural context as well as the semantic context.

Children who demonstrate inaccurate production may also have you know other difficulties producing some morphological inflections that are marked by sounds and that are difficult for them to pronounce. So, such as you know when they are when they are using s; so, the use of you know tenses and also in the sound production. I remember a child had a problem with the word blue.

So, it always for a long time, it came out as zoo. So, bla the combined consonant is tough which often more often than not many children do learn, that the average children at the pace that the average children like this child with delayed language difficulty learn this much later.

So, although sound acquisition and phonological simplification processes are similar in many aspects to those of their peers of for the children with DLD, consonant sound repertoire is smaller. So, the overall vocabulary also becomes much smaller and they it takes them longer to acquire CVC, Consonant Vowels Consonant syllables and multi-syllabic production. So, as I was telling you about blue being pronounced as zoo.

So, you know double consonant vowel positioning becomes tougher, this is also with CVC word ok. But, this is also a picture which is very very predominant when you look

at learning disability. So, when we are talking about, but in learning disability there will be other markets as well.

So, when we are ruling out learning disability, we will have to see whether the person has problems with reading all kinds of words whether it is improving over time or not, whether you know it is just only in reading and not in pronunciation. Because, in delayed language development the area is the problem is not in reading, but in speaking out the word so, in the speech.

So, there is a close relationship between the developments of the sounds and the words and young children who produce few sounds also tend to produce few words; so, fewer words I should say. So, you know so, when they are these children may appear to be very quiet in a classroom in school, they may be despite whether their behavioral actions are more excitatory or maybe termed as naughty.

They may speak less because they have a problem with pronouncing the sound, they their vocabulary is less and they become very restrictive in their use of vocabulary. And so, children with DLD so, acquire word more readily when the words begin with consonants and they that they have already learned to produce in some other word. So, for a child to say cat and who is learn the word cat for that person to say cat is easier than seeing saying it.

So, it starts with a consonant that the child is familiar with. So, here again I am emphasizing on the sound of the word ok. So, if the children are familiar with the sounds of the words, it is easier for them to pronounce the new words and learn new words. Regarding, word meaning there are these children also face a lot of problems and the use of early semantic relations in yeah in children with delayed learning language disability, delayed language development appears to be similar to that of language map spear.

But, early lexical development in children has a slower pace and they talk and communicate less often as I was just telling you. So, by the age of 3 to 4, there is typically some resolution of the vocabulary deficit, but it has been found that they are these children are in quick incidental learning task, they are less stable than their peers and with and in terms of learning new one.

In 2003, Gray showed that children with DLD require more repetitions to comprehend a new word and more opportunities to use the word before adding it to their lexicon. So, now see why in all language and speech disorders, social context is very important because social context gives us an opportunity to use words.

So, you know if it is familiar to me I use it more or rather I should say if I use a word more, it becomes familiar to me. And, the more familiar it is, the more comfortable I am with using that word and also using the same consonants in different combinations, consonant vowel in different combinations.

And so, you know Gray found that children with DLD demonstrate word finding difficulties, but that is again because they do not have that word in their repertoire, so, their vocabulary is poor. In syntax children with DLD appear to acquire syntactic rules in the same order as typical children, but just if that is delayed, it takes a longer time. The first noticeable delay in syntax acquisition is seen in the failure to combine words spontaneously as early as 18 to 24 months.

So, by one and a half to 2 years the syntactic acquisition delay is already noticed. And, generally these children have a shorter use shorter sentences and which are less varied and less complex and the if the communication repertoire is much reduced. So, there is difficulty producing a variety of sentence types. So, it may be more like we will do, will go, will I see, I go, I want rather than to completing the sentences with you know full words and making it complex sentences.

So, and they generally have a problems in problem in producing passive sentences and questions and they have a tendency to omit function words like a, the, also and I eat, I see or I eat, I sleep. So, it is not like I eat and I sleep. So, these functional words are more often than not omitted and also conjunction. Regarding, morphology the morphine acquisition including regular and irregular vowels sorry plurals.

And their allomorphic variations possessive, regular and irregular tense inflections, auxiliary forms, third person singular form and especially the use of be verbs is a huge problem with students with children who have delayed language development. So, and coming to pragmatic; pragmatic skills are generally better than other skills in language form and they are secondary to the primary difficulties.

This is the significant discriminator with autism spectrum disorders. Autism spectrum disorders have a problem with pragmatic language pragmatic. But, in DLD you will find that they have more problems with other skills in language development than in pragmatic ok.

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Speech Disorders

Apraxia:

- **Apraxia of speech** (AOS) is a motor speech disorder affecting both children and adults.
- AOS represents a disruption of the translation of linguistic units into actual speech movements.
- Apraxia does not reflect impairment at the linguistic level (aphasia) or the neuromuscular level (dysarthria)
- AOS is distinct from problems with phonological processing or motor execution and is considered the quintessential disorder of speech motor planning/programming



And, now next we move on to speech disorders and in speech disorders as I just told you that there are multiple types of speech disorders like fluency and fluency disorders, dysarthria, apraxia and you know speech problems, because of illnesses like cancer, vocal cord disorders so, and of course, apraxia.

So, here we are just going to consider apraxia, I will make it very brief for you, this you know this again is very very long. And, if you wish, you can go through these materials, I have also given the reference for the book that I have covered that I have used for primarily for this you know presentation. So, for apraxia it is apraxia speech is a motor speech disorder and, it affects both children and adults.

And, AOS or apraxia of speech represents a disruption of translation of linguistic units into actual speech movement. Thus, apraxia does not reflect impairment at a linguistic level. In linguistic level, if there is a problem we call that as apraxia or the neuromuscular level which is known as dysarthria. I did not cover aphasia and dysarthria, but it is also very common speech disorders.

So, as such in apraxia, it is distinct from problems with phonological processing or motor execution and is a quintessential disorder of speech motor planning; so, program planning and speech programming. So, please understand in it may manifest as a problem in speech, but the disorder may be added in specific level so, in different levels right. So, in apraxia it is a problem with motor speech motor planning and speech motor programming.

So, how you are going to structure it, how you are going to stay. But, on the other hand in aphasia, it is at a linguistic level and while in if there is a problem with the muscular, neuromuscular then it may manifest as dysarthria.

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Etiological classifications of Apraxia

- AOS consists of three separate etiological classifications:
- **Neurological AOS** - resulting from known neurological disease. Approximately half of the cases resulted from left-hemisphere stroke, including mostly single strokes and multiple strokes. It may also develop from degenerative diseases
 - Brain areas involved - left anterior insula, Broca's area, as well as other premotor cortical areas (e.g., lateral premotor cortex, Brodmann area ([BA] 6).
- **Complex neurodevelopmental AOS** - A primary symptom among other cognitive and linguistic deficits in people with genetically transmitted syndromes. Complex neurodevelopmental AOS studied in a four-generation family with a speech and language disorder (KE family), half of whom present with impaired speech and language, including symptoms of AOS; a genetic linkage study isolated a point mutation of the FOXP2 gene as the apparent locus of the disorder
- **Idiopathic AOS** - results from a neurological deficit, although the locus of the deficit has not been identified till date. Likely to be present at birth, initially presenting as late-developing speech, followed by a delayed progression of speech development in which the child's often very difficult to understand



Now, I in AOS, it may be it may be because of different reasons. So, coming back to the coming to the different ecological classifications of apraxia, there are primarily three separate ecological classifications. And, they are namely neurological apraxia, complex neurodevelopmental apraxia and idiopathic AOC, AOS.

So, the neurological apraxia generally develops from results from known neurological disease and approximately half of the cases result from left hemisphere stroke, including even single strokes or you know many times in multiple stroke. And, it may develop also from degenerative diseases like in dementia, neural degenerative diseases like dementia and Alzheimer's.

Aphasia is also very common in dementia, sites of lesion if you are looking at the brain regions that are affected, these include the left anterior insular, the Broca's area; when we are talking about speech motor planning and production; obviously, the Broca's area as well as the premotor cortical areas will be involved. And, that is why we see that you know pet scans have shown us in MRI has shown us that generally the lateral pre motor cortex and, Brodmann area 6, BA 6 have been involved in neurological AOS.

For complex neurodevelopmental AOS, it is the primary symptom among cognitive other cognitive and linguistic deficits, in people is generally with genetically transmitted syndromes. And, this has been identified with study, a detailed study of a four-generation family with a speech and language disorder. And, this is the KE family and half of whom impaired represented with impaired speech and language including symptoms of AOS.

In the KE family, a genetic linkage study isolated a point mutation of the FOXP2 gene as the apparent locus of the disorder. Now, this was found out by Lie et al in 2001. So, it is pretty recent, but and some other studies also have showed a genetic linkage in neurodevelopmental apraxia. And, further brain studies of anatomical studies and functional studies of the KE family have shown that there are also possible abnormalities in the basal ganglia as well as other regions involved with speech.

So, again when we are talking of motor planning, you know we see that the areas of motor planning in the brain have been engaged in neurodevelopment complex, neuraldevelopment is apraxia. So, looking at idiopathic neurogenic AOS, idiopathic AOS likely results from a neurological deficit though the reason the locus for this deficit is still unknown ok till date. And, idiopathic AOS is likely present at birth, the though you know the diagnosis requires the presence of some speech, sounds.

And, initially so, when we are talking of at birth unless the speech, sounds are available you will not be able to diagnose so, quickly. Initially, the it presents as late developing speech, so, it might look at as a delayed language development. But, followed by a delayed progression of speech development in which the child's verbal output often becomes very very difficult to understand. So, gradually it emerges with a picture of apraxia.

So, it now as I started when I started, I mentioned that well apraxia can be there both in adults as well as children. So, a diagnosis of apraxia in children is tougher because you

will have to rule out language delayed language development before you can look at apraxia. So, well as I was as I mentioned that the initial at the start of the stuff, that there are just too many language disorders and speech disorders that could be covered.

But, we just focused on these three, the autism spectrum disorder, the and delayed language development in children in language disorders and in speech disorders we spoke about apraxia. We could have also covered dysarthria and aphasia, but well if anybody is interested, I would surely pass on some more details to you. So, well I hope you did find some answers to language and speech development, when you were when you went through this week and let us move on to the next.

Thank you.