

Fundamentals of language Acquisition

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Lecture 021

Lec 21: word forms to meaningful words

Hello and welcome back. We will start with Module 5 today. Module 5 will deal with word acquisition, focusing on how infants, starting from slightly before one year of age onward, begin to produce words—not just sounds—but words, and what the levels of production and comprehension are, how they compare, and what kinds of constraints and difficulties they might face when trying to speak in words, as well as the various theories based on this. So, all of these are part of this module. So, this is sort of a roadmap, in brief, as to what is to be expected in this module. So, I have organized them by lecture.

Lecture 1, which is today's lecture, will provide a brief overview of how the transition from the phonological word form to the word as a vocabulary item looks, and that is what we will talk about. So, the phonological word form to word meaning mapping is established. So, by the time we talk about speaking in words, we mean that there is an entity, a unit of language that also has meaning; it is not just a sound. So, that is the journey we will talk about, and of course, word comprehension.

In the next lecture, Lecture 2, we will talk about the reference problem and the extension problem. Lecture 3 will discuss theories of innate linguistic bias, non-linguistic factors, and syntactic bootstrapping, and the last lecture will discuss the emergent coalition model. So, basically, this entire module will look at the various kinds of models, theories, assumptions, and constraints that are discussed in terms of language acquisition at the word level and how word-level language acquisition happens in infants. Now phonological word form to word meaning mapping occurs when we are actually speaking in words and meaning something. So, this is a stage where children are growing; children are no longer in phonological acquisition.

We are talking about very small children, starting from a few days to a few months, and we have kind of mapped the trajectory. Today we will talk about kids who are slightly older because by the time they start producing words, they are around 1 year old or older. So, that is the stage of life on which we will focus. So far, what we have seen is that infants may learn words by separating the speech stream using various kinds of phonological information. If you recall, we were talking about the rhyming, the stress pattern, and so on, as to how, by activating the phonological information embedded in the words, in the sentences, and in the speech stream, so to speak, children might be able to segment the stream.

So, these were based on this in the domain of phonology, focusing on sounds and their various properties: speech, stress, and so on. So, these are the things that we have already talked about. So, together they are all called phonological bootstrapping. Because starting from phonology, the sound system of the language, children are expected to create some sort of understanding through which they can segment the continuous speech stream into units that we later call words. So, at that level, when they are segmenting, it is called a word form, not a word, but a word form.

So, the resultant understanding is that of a phonological word form, basically meaning some sounds come together to form some kind of unit that children have achieved at that level. Now, knowing a word usually means these three things: sound, the form of the word as in how the word sounds, then its denotation as in what it denotes, what it refers to, what it means; that is the second thing, and the third, of course, is the syntactic properties. So, for example, a word like "table" sounds like what it sounds like, and that is what we use with the IPA form. In dictionaries, if you are looking up words, the IPA form tells you how they sound, such as "table." Not all the letters that we write are in the spoken form because they are not individually uttered; that is how the sound is.

Now, the denotation is that it is a thing that looks somewhat like, you know, something that has a flat surface with 4 legs or 3 legs or whatever that kind of thing. Now, the syntactic properties of it—what does it mean by syntactic properties? There are a couple of things. First and foremost, it has to tell you whether it is a noun, a verb, an adjective, an adverb, and so on. Each of these parts of speech, traditionally called, has a syntactic property. For example, if the table is a noun or any noun we are talking about, a noun can have two primary positions.

One can be the subject, the other can be the object, the agent, and the patient roles. So, what kind of role is the word playing in that particular sentence? What kind of role does it play? So, these are the three things that are fundamental to understanding words or producing words, for that matter. So, word, when we say "word," this is what we mean.

These are the three parts of a word that exist. But infants up to 12 months may not really know this part; they may not truly understand what a word means for adults or for slightly older children as well.

So, all the denotations of the words they do not know, nor do they have any idea, at that stage, of course, about the syntactic properties until 12 months later. So, basically, what they have is the word form. Thus, they are said to understand word forms—only word forms—which are the phonological word forms. For example, we have, of course, seen quite a few examples in the phonology section, where we looked at how effectively children can segment fluent speech and extract units from fluent speech. Today, we will look up more references and more works in this vein so that you understand the continuity from understanding word forms to meaningful words.

So, we have already seen that infants who are familiarized with a set of words can identify them in the test phase. So, you are familiarizing them with individual words, and when they hear them in phrases or passages, they do identify them. So, in one such study, the infants were first familiarized with novel pairs of words like "cup," "foot," and so on. In the test phase, they could identify it within the context of a passage. So, this is just to refresh your memory on what we have already discussed.

So, these kinds of findings primarily point to the emergent word knowledge that is present at that particular stage. This is a continuously developing phase of life when development is rapid. So, this is a stage where emergent word knowledge occurs. That is the time we are talking about. When they are not yet exposed to word-meaning pairs with regular frequency in the environment, it is not always the case that every word has a referent that we can point out to them.

All the speech that they hear around them may not always have the referents readily available. So, that is what we mean by the lower frequency of the word-meaning pair in the environment. Some words, of course, are like toys, or, you know, whatever the children are surrounded by. Another word that is very frequent is the word "mummy." So, these words, of course, show a recognition at a very early stage, like 6 months of age, but other, less frequent words, which are more numerous, will not yet be exposed to the word-meaning pair.

So, by 7.5 months, they can generalize across pitch changes for familiar words. Now, this part is important for generalizing across pitch patterns and pitch changes. So, for example, I think we discussed this before: the same word uttered by different people will have a different, you know, acoustic signature. Not only may the same person utter the word in different kinds of scenarios and at different times with a different pitch, but some slight

differences in acoustic signatures are also possible. So, the children try to figure out or are capable of figuring out the invariance within this entire set of possibilities, that even in spite of the slight pitch difference, and slight differences here and there, this is the same word.

That understanding, that generalizing capacity, starts to develop at 7.5 months of age. Now, even though there is a lot of proof that supports this view, there are also some studies that have pointed out that this fine-tuning has some issues. For example, infants are not always capable of finding words in the continuous stream. For example, when do they fail? They typically face problems that relate to these three types of issues.

For example, a change of emotion can be expressed through the same word said in different kinds of ways. So, in a flat tone versus an angry tone versus, you know, a sad or happy tone, or something. So, a change in emotion about the same word might make it difficult for children to understand. The gender of the speaker and the same words spoken by a man versus a woman might pose some challenges regarding fundamental frequency. Even though we understand that children are capable of understanding many acoustic cues, when fundamental frequency is manipulated, it has been found that they do not always identify the words very well.

So, this is probably because one of the reasons put forward is that they are unable to understand the interaction between the change of sound and the change of meaning. Now, this is very important. On the one hand, they need to understand that the same word may have a different pitch and slightly different acoustic properties, but it is still the same word. At the same time, slight changes may also lead them to minimal pairs, for example. So, pen versus pan versus fan; for example, there is also a slight difference occurring in the first sound.

So, there is a sort of limitation that children are typically faced with. So, other early limitations are also present, such as infants being able to segment only words that conform to the predominant stress pattern of their language. We have seen that very young children can identify languages by their own stress patterns. So, it is either the syllabic type, the moraic type, or any type they are able to use. When the stress pattern remains the same, they find it easy; but when the stress pattern changes, they find it difficult.

So, if you give the same word by altering the stress pattern, they may find it difficult, as we will see in some examples. Another point that has been put forward is the frequency. Is frequency an important variable? What does this mean? The children's ability to distinguish between words and nonwords might be due to their familiarity with the words from their experience. The surrounding words that they are growing up listening to might be a reason

why they are able to distinguish some words from non-words, because non-words are not something that you use; nobody uses them.

So, that is probably one reason. So, in this regard, one important study used the head-turning preferential procedure, which we discussed before, and it involved 11- and 12-month-old infants. What they did was show the infants high-frequency words, such as more common words like baby bottle and biberon; this was with French children, as opposed to some other words that were less common. And of course, they showed the infants that they listened longer to the words that were more likely to be frequent. So, you can know the kind of words that parents typically use with children, the list of words that children have more in common in their environment, and so on. So, that is what they found out as well.

The words that were more common in the environment were recognized more readily. This work was also extended by others to determine the degree to which infants retain the phonological details of the word forms they know. So, what aspect of the word forms? So, in terms of word form, we have talked about stress patterns, other acoustics, rhyming, and so on and so forth. So, which aspects do they retain when they try to understand? So, in this case, in this study, the stimuli were divided into three types: familiar words, unfamiliar words, and altered familiar words. So, familiar words are fine, while non-familiar, that is, unknown words, and what they did was alter some familiar words by changing the syllable-initial consonant to another incorrect consonant.

So, there were three kinds of words that they used. For example, "tummy" is a very common word among children. So, this is very familiar, and this word, when you juxtapose it with a word like "tenor," is a much less frequent word in a child's environment. In most households, this is not commonly used. So, tummy is familiar; tenor is unfamiliar.

Now, the third category they created involves changing the initial sound of the word to another incorrect sound. So, for example, one word was "sami." So, tummy replaces the /ta/ sound; replace it with the /sa/ sound, and it becomes a sound like "sami," which is not a word; it is a non-word. That nonword sounds maximally similar to a familiar word.

These are the three categories. So, the hypothesis they were trying to find out was that the tummy is more likely to be familiar, and hence it will be more readily understood and more readily recognized. Similarly, if Sami is not recognized as familiar, no preference between Sami and an unfamiliar word is expected because Sami is as unfamiliar as the unfamiliar words, since Sami is not a word. So, it is not; it will be in the category of a non-word even if it sounds like a familiar word. So, that is the manipulation they performed on the stimuli. What did they find out? Very interesting findings: first, the infants could recognize words with deviant forms.

So, "deviant" is the Sami word for tummy and "Sami." So, Sami was a deviant form, and infants could recognize him. However, when the alterations occurred in unstressed syllables, they were in the second syllable. In English, remember that we talked about how it follows the strong-weak pattern. So, the first syllable gets the strong stress, followed by the weak stress, and like that, it continues.

However, when the deviance occurred and the change happened in the unstressed syllable, they were able to understand and recognize the word. But infants did not recognize words consistently when the stressed syllables of the words were altered. So, if you have altered the word, if you have changed the word "tummy" to "sami," but changed the stress to the final position, then they could recognize it, but not when the stress was in the typical position, which is the first syllable. The second finding was that when unstressed syllables were altered, infants' preference for deviant forms over unfamiliar words tended to appear only in later trials.

So, there is a degree. The familiar trials and words were recognized the fastest. They were, of course, known words. Within the unfamiliar types, there were two. One was the altered, deviant form, and the other was actually unfamiliar but real word. Now they wanted to figure out if there was a difference between the deviant words and the unfamiliar normal words.

What they found out was that sometimes the preference for the deviant forms, when compared to unfamiliar words, only built up in the later trials. So, in the initial stages, the differences were less; as the child grew more familiar with the experiment, a preference became visible. This suggests that although deviant forms were recognizable in some cases, it took longer to recognize them because, you know, they were looking at the stress pattern and whatever, so it took them some time. Thus, the overall finding suggests that infants accurately retain the phonological features of the onset consonants in at least some cases and some words, because that is what appears to be the cue on the basis of which they understand. Though mispronunciation does not bar recognition altogether, because they also did, they found the deviant words; they could recognize the deviant words.

There were many other studies that followed on the basis of this kind of finding. A rather well-known study on Dutch-learning 11-month-old infants showed knowledge of both syllable-initial and syllable-final consonants in monosyllabic words. In the previous study, we examined the syllable-initial stress pattern, which is an important indicator. In the other study, conducted in 2005, they found that both syllable-initial and syllable-final consonants had an impact. Another study is quite striking because it negates all the other findings.

So, what they found was that 9-month-olds did not show a preference for canonically produced familiar words over unfamiliar words, canonically produced as in the normal words. So, the table talked about, you know, is pronounced as table rather than sable. So, they did not find any preference for the canonical pronunciation over the unfamiliar one, which is a very interesting finding; hence, I have added it here. But this kind of finding is rare; there are very few. So, by 11 months, infants seem to overcome these limitations and are able to recognize words independently of their surface forms.

So, they are able to segment words that exemplify both predominant and uncommon stress patterns. So, it is not only the stress pattern that governs my language, but even if the same word appears in a twisted stress pattern, I will still be able to find out; I will be able to understand. Now, children can learn, so what is the trajectory? One of the ideas is that familiarization aids in form and meaning mapping. So, once you get used to the word more and more, and then you cross domain mapping, you can do it, and eventually, you will understand what the word means. So, children can learn a word form first phonetically and then add meaningful content to this form as the situation allows.

As the child is more exposed to a higher number of scenarios where they see the same word being used for the same referent repeatedly, the mapping gets solidified in their mind. So, this was shown by a number of studies in which familiarization seemed to be an important predictor of infants learning words and their meanings. So, a couple of the ones I have added here are the most important findings.

So, the period is 7. So, we have already seen 7.5 months, then 10 to 11 months, and so forth. So, 10 to 11 months is a very crucial time that reflects a series of transitions in how word forms are represented in memory. So, word forms are defined as phonological units that are later associated with the lexical entries. During this period, infants become aware of the repetition of words in different contexts, as I just mentioned.

Now, this in turn helps them map. So, in other words, they become aware of the recurrence of words as lexically equivalent units over and over in different situations and with different people, but the same unit is being produced again and again, and it always refers to the same kind of thing; you know, it maps onto the same referent. Then they realize that this is a word and that this is the meaning of the word. Now, from what form of representation, this is how it is represented in their minds. Now, it is not exactly clear how this transition happens and how word forms complete words.

However, there are, of course, many theories. Now, a few of them have added that this is probably the trajectory through which they understand things. Some factors that have been identified and proven through various studies are what I have added here. So, the frequency

in the input that we talked about is before. So, depending on the number of words and the kind of words that are frequent in the environment, they will learn them first, and eventually, they will be able to map those words to their meanings and denotations faster; that is one. Pre-exposure to word forms before a word learning task often occurs when children go through a familiarization phase in the experiments.

So that kind of pre-exposure also helps. Inclusion of word units, word-like units in varying frames, and the inclusion of the prosodic undulation associated with infant-directed speech are important. So, these are some of the factors that have been put forward. Now, while the child is busy mapping between forms and meanings, the forms also change slightly across speakers and scenarios, and so forth. There are two things that happen at the same time: generality and specificity. Generality basically refers to the need to generalize across situations, people, and various aspects, whether they are emotional, gender-related, or otherwise.

So, memories for words have to be sufficiently broad to incorporate the rampant variability in natural discourse and to normalize for accents, different voices, emotions, and other factors. So, they need to understand that across all of these factors, this particular thing remains invariant; this particular acoustic signature remains invariant, and the meaning also remains the same. That is on one hand, but on the other hand, memories have to be sufficiently specific to not incorrectly equate minimal pairs or tolerate mispronunciations. Now, this is the problem: this is the dilemma the child probably faces. So, there are these slight changes across speakers and situations, but the slight changes might also lead you to a minimal pair.

I talked about the pan and fan earlier, so how the child creates the balance is a very interesting problem to solve. Therefore, the learners have to negotiate the tension between the generality and specificity of representation in a way that allows their phonological definition of a word to correspond precisely to a semantic definition. So, all of these basically mean how and where they draw a boundary, where the phonological difference in the acoustic signatures, you know, ceases to remain the same word and turns into a different word that, in that tussle, they have to overcome. Now, the last part of a word structure is the phonological form; then the meaning, and now we are talking about the grammatical structure. Now, words are not just meaning-bearing units; they are also the raw material that grammar manipulates.

So, once you have the words, we then use those words in different positions; you know, create sentences, and then we can change the sentences from simple assertive sentences to interrogative sentences and so on. So, that is the manipulation that grammar allows; that is what the child also has to figure out if they know, like really know, a word. This is what

they have to be aware of as well. So, lexical and grammatical acquisition are often found to be fundamentally intertwined. However, the nature of this complex relationship is not yet fully known; it is still being debated.

There are many studies. The older studies, which depended on diary entries, are famously called "diary studies." The time when the experimental paradigms were still not in use. From those days, the reports came that the first 40 to 50 words learned by children mostly belong to the noun class. Then they learn the nouns first, followed by the other word classes. So, within nouns, these are the types of nouns that they learn in the initial stages.

So, people, objects, toys, vehicles, body parts, and animals are understandable because they play with toy animals, play with other kinds of toys, and are also taught body parts, such as ears and all of that. So, there are all those rhymes about eyes, ears, hands, and legs. So, these are the things that they learn first. So, the first 40 to 50 words are typically made up mostly of nouns. Now, one of the most well-known studies from this time is about an 11-month-old boy named Ted.

His progress was tracked over a period of 8 months, starting when he was 11 months old, and his vocabulary of 43 words included 31 nouns. So, that is an example of the predominance of nouns in an infant's vocabulary when he or she is starting to speak in words. However, children differ in terms of their tendency to use utterances; not all children start to speak very clearly in nouns, verbs, and adjectives. Some children also speak in terms of chunks—memorized chunks that they mispronounce.

So, for example, what that means is "awgone" for "all gone," and so on. So, there are two kinds of patterns that children typically follow. Some learn neatly, and you know neatly learned words; some of them learn in phrases. So, from there, we come to the theory of types of learning that was put forward by O'Grady in 2005. The first kind of learning he calls analytical. Basically, what happens is that children break down the speech stream into small parts and focus on learning individual words, and that is when they learn a number of nouns, and so on.

So, they usually produce more nouns; children who use this learning strategy produce short and clearly articulated one-word utterances. Remember, this is not an either-or kind of scenario. Children might follow a mixture of both, but it is predominance that we are talking about. It is not as if some children speak only in nouns while others use only phrases; it's not like that.

They have a predominance. So, some children have a predominant nature of using a specific type of learning, which is the analytic type. So, they tend to produce more focused

single words, which are typically nouns. So, parents' speech is considered important in this case, especially if they use a "what is this?" kind of game. This kind of game is very common; it is one that parents play with children.

In fact, they are trying to indirectly teach children the names of various objects. That is how noun acquisition actually happens in a very typical setup. So, what is this? This is a toy. What is that? That is a ball. What is that? That is, you know, a tree something like this. So, when this kind of wordplay is very common in this kind of game in households where parents indulge more in this, the idea is that children tend to learn more words.

The other kind of learning is called gestalt learning, where children who favor this pattern usually memorize and produce large chunks of speech, typically a phrase. So, bye-bye, and you know various kinds of things. So, this is also called expressive, as the production in this case would focus more on activities or relations. Bye-bye, then going out, something, some of this kind of thing, no more to eat, as some common expressions favored by children in this case. Of course, they will not get the pronunciation correct in the beginning, but eventually, they will learn.

So, this is another kind of learning. Then, there is another idea of fast mapping. Fast mapping is not exactly a theory. This is an observation that, irrespective of their type of learning and the learning techniques they prefer, children are generally rather fast at learning new words—very fast. So, this rapid learning of words for this purpose means mapping the sound form of the word onto the denotation, the referent, and the meaning; this is what we call fast mapping, mapping words onto the sound and the meaning. So, in one particular study, the 3- and 4-year-old children were asked to "bring a hexagon, not a triangle." So, there were hexagons and triangles, and the instruction was, "bring me a hexagon, not a triangle.

" These children already knew what a triangle was. So, they knew that if it is not a triangle, the only other thing that must be in the environment is a hexagon. Even if they had never heard of the word hexagon or seen it, they could still bring the referent correctly. So, that is what we mean by fast mapping. So, both the word and the object were novel to the children, but they could map them immediately.

There is this chromium experiment as well that we will see. So, now children are at a juncture where they need to map word forms to meanings as well as figure out their grammatical properties. Children will now need to navigate a number of issues before they finally get to it. Now, these issues are two of the most important issues, called the reference problem and the extension problem, which we will take up in the next lecture. So, this is where we complete the first part of Module 5.

Eventually, in the next lecture, we will discuss the two different problems of this mapping.
Thank you.