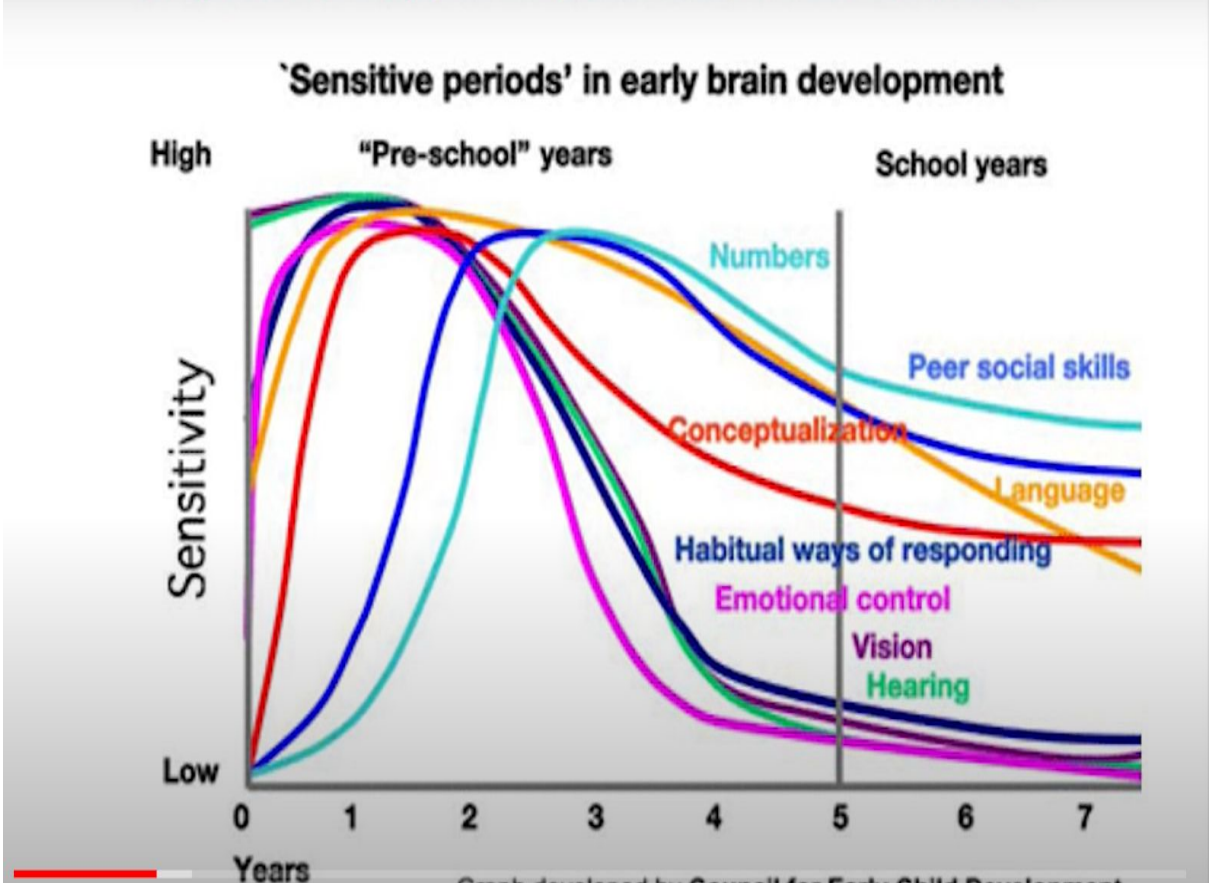
Tejesh Vaish

Answer-1

Children acquire **syntactical knowledge** mainly through **learning** as any other kind of **behaviour**.

However, there are arguments presented both in favour and against the idea. Kindly present **your view** of the same with **concrete examples**.



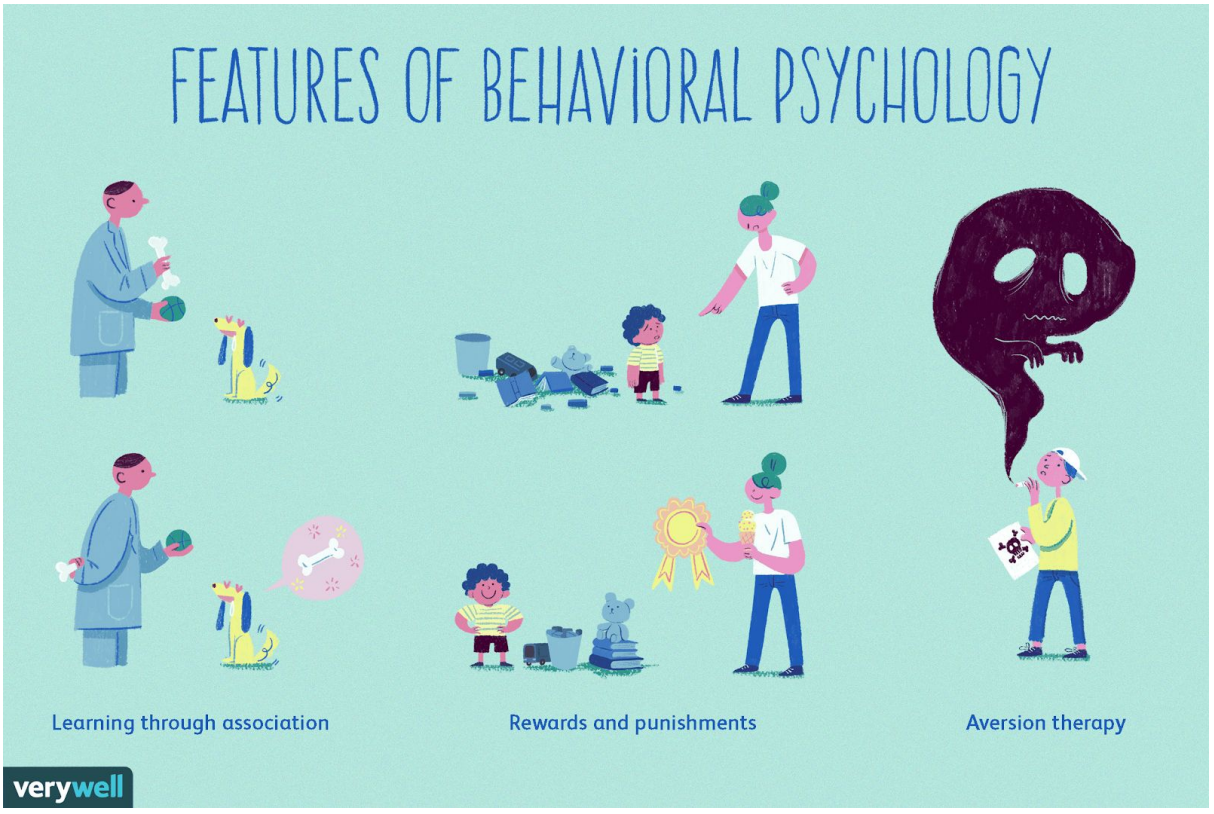
This graph represents various cognitive and behaviours of the human child with the peak of their growth.
The yellow line is representing the language growth pace concerning time.

Just by seeing this graph, one can confidently say that acquisition of language takes place just like learning of any other human behaviour because every additional behavioural growth follows the same pattern like that.

Let's begin by answering some basic questions by comprehensible text:p
What is human behaviour?
The latent and expressible capacity for mental, social and physical activity during the lifetime! For example, memory, judgement, etc.
The figure below lists many types of human behaviours and

communication is one of them. We learn them just the way we learn other behaviours, as with time our cognitive ability increases and the number of synapses in our brain increases, we improve our syntactic knowledge too.
What is syntactic knowledge?
It is about the rules that govern the words. The language is simply a system of symbols and rules. Now, how are words combined to create meaning or to convey a particular kind of message?
For example- "Rita runs with Sita", how do we combine the four words, to convey different kinds of messages, what do we add, what do we

subtract, what kind of variations we bring in, what are the rules that are used here, that is Syntax!



In the [citation(i)], it is mentioned that behaviourists support that children usually learn language by **two** ‘social paths’, either by interaction without a reward and just by association, secondly with the help of reward!

From the age of 24 months, only children start uttering short sentences. They begin creating a lot of spontaneous speech, and gradually these approximations improve day by day. Then it comes to a point where it reaches the level of an adult.

What are the challenges in the age of 18 months to 24 months when they can use almost grammatical phrases?

How do the children acquire the skill to form grammatically correct phases, at what point does it start setting in?

The need to know three things to start forming grammatically correct sentences,i.e. Word categories, morphological structure, and phrase structure knowledge!

I believe that there is both some innate ability and social-culture interaction and nurture, which paves the way for language acquisition.

They acquire syntactic knowledge by gradually discerning from the systematic input. They get a lot of information, and they analyse a **lot** of input.

They analyse the patterns in the input, and they incrementally use the pattern in their daily speech. They are gradually approaching a point, where their speech is also error-free.

The left picture shows the experiment in which a child is shown to try different possibilities and then select the best possible one to light up the blicket. This experiment

Shows that a child has cognitive abilities to learn from statistical data and make conclusions about them. This behaviour of a child also indicates how their syntactic knowledge increases with increase in their cognitive abilities and other behaviours!

I agree somewhat that child's innate knowledge of words categories will be the same as that of adults know, but it seems too far stretched :p

It's seen that children **don't** replace a noun with a generic substitute freely.

Children word categories are probably based on the concrete semantic properties of those particular objects. This theory is more probable than the grammatical theory.
For example, the semantic properties of moving my hand are something different than the semantic properties of dogs for the child.
It is challenging to assume that children already know something about these categories.

The category structure developed by children reflects the kind of language the child is exposed to, because there is variation, concerning the kind of language the child is exposed. We can say that this is not innate.
For example-- a child's understanding of the world depends on their language, and there are so many languages and cultures in the world. Then we are saying that this cannot be innate, because anybody born in any culture can be raised by people, who speak a very different language, and then it will create a little bit of a problem!

The categories structure that children develop reflects the kind of language that the child is exposed to and the likelihood of different words appearing in different contexts rather than predetermined categories! The same word can also be used as different categories, which will create a problem for the child if he is born with something like LAD.

Now, coming to Morphological knowledge, the different versions of the same words, we have to know the relationship between the other words, the child needs to see the relationship between these versions. Also, be able to produce it at the appropriate time in the proper place. This would be possible with the help of morphological knowledge.

An interesting question arises, How do children learn such morphology?
A simple answer would be that they just pick it up quickly.
But, then we see that children make a lot of errors with verbs they come up with new verbs forms.
For example-child usually say “I thoughted of sleeping”.
These examples imply that children make some over regularisation on their limited input!
This is probably because the child is making an effort to create such a speech; they are coming with their ideas!

It is **not plausible** that children suddenly from the eureka moment start applying the rule. It happens in the way that the children only gradually learn to mark out words, using the regular past tense, and later increase the use of regular tense, and progressively they start using more often.

Regularisation of the past tense verb has found to occur more in some contexts. So, in some contexts, they know that it will fit it rightly, and they use it generally, and in some other contexts, they are more hesitant in using these kinds of verbs.

The child now has some degree of word category knowledge. He also has some idea of morphological sense as well.
The only thing that is left is that he starts using that word and, the variation of the word that the child has learned in the **longer utterance**, in the larger strands of speech input he received!
It is not very easy. It requires figuring out so many rules discussed above! This is a pretty complicated task.
But, they do it by the age of 2, 2.5-3 years of age.

The biggest **drawback** of the nativist view is that it **can’t** explain the children coming with ungrammatical sentences!

Learning phase structure rule is based on the statistical analysis of the input children receive.
From the trimester to the 18 months of age, the children are very good at finding the pattern they are exposed to, the same way a child figures out

the rules of grammar, just by analysing the grammar and knowledge that the child is exposed too.

Children phase structure mirrors the frequency of words that they are exposed to, the way children learn the language, represent the kind of language they receive, and reflect the type of output they give.
By learning this input, they are making out, how does the language work.

Syntactic knowledge is learnt just like any other human behaviour is undoubtedly a topic of debate due to innate vs behaviourist stances.

The **Learning** perspective seems much more suitable to me, cause it indicates that we humans have this unique ability to transform our brain at any point of life. We are born as almost **blank** slates!

We can learn all sorts of skills, as our cognitive abilities begin to increase from the time we are born, we witness more and more input data, which fuels our knowledge and influences us!
We are a social being. We are making hundreds of inventions daily, there are millions of research papers out there, which proves that we humans have this capability to find new unknown and achieve what seemed impossible in the past!

Study of the brain, i.e. psychology has revolutionised the way we used to look at the world, the debate that how is syntactic knowledge is answered by 100s of theorists, and we will be getting the most reliable hypothesis someday!

On poetic note :p,
We die every day as we close our eyes and reborn the next morning again when we wake up. Cause?
Our brain has changes every night!

What do you think, is there any end to learning anything?

It may look like there is, but you and I all are every day learning new rules, new words, new theories, we are evolving with faster than ever rate! Language as a whole is one of the parts which develops and transforms with it!

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1)Children's Acquisition of Syntactic Knowledge Rosalind Thornton, Associate Professor, Department of Linguistics, Macquarie University https://doi.org/10.1093/acrefore/9780199384655.013.72

2)Friederici, A. D., Chomsky, N., Berwick, R. C., Moro, A., & Bolhuis, J. J. (2017). *Language, mind and brain. Nature Human Behaviour, 1(10), 713–722.* doi:10.1038/s41562-017-0184-4

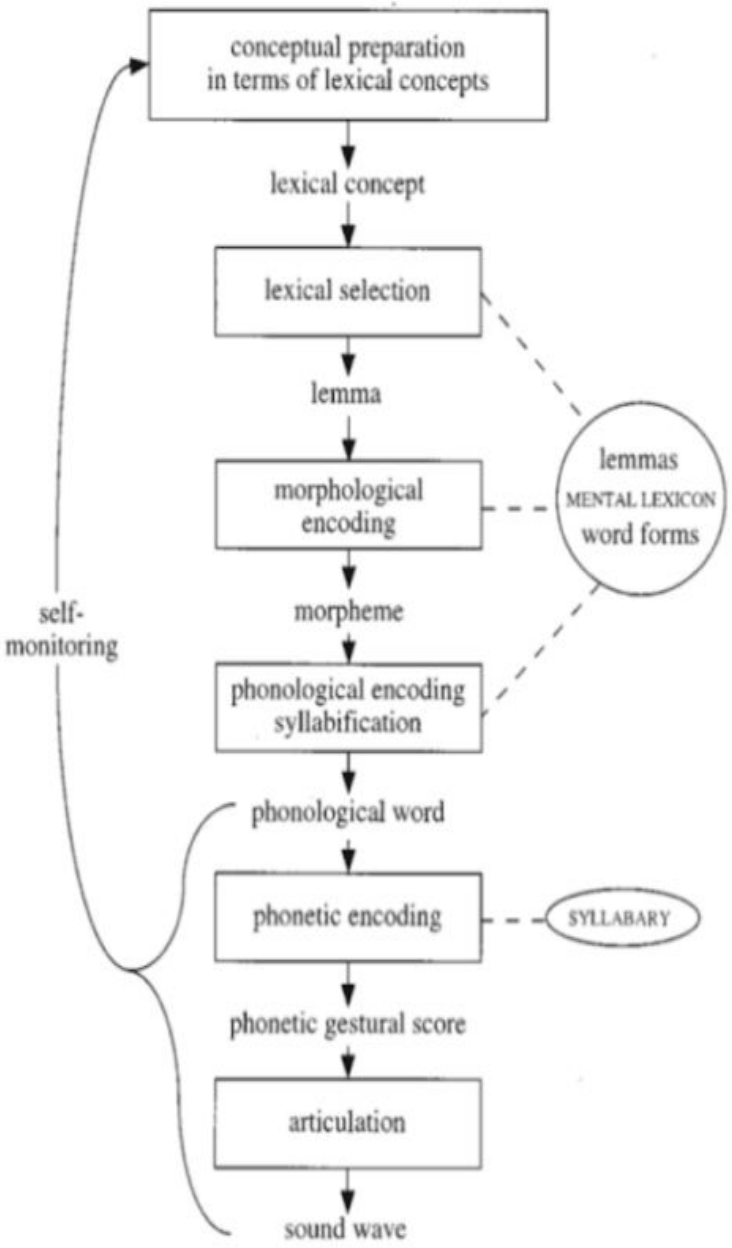
3)The book: ROGER BROWN URSULA BELLUGI Harvard University **Three Processes in the Child's Acquisition of Syntax**

4)Making sense of syntax – Innate or acquired? Contrasting universal grammar with other approaches to language acquisition
Author: Christian Kliesch

Answer-2

Freud viewed speech errors as a **window** into the unconscious mind, while **Dell** viewed speech errors as consequences of the **productivity** of the language. Which of the two views is **more plausible**?

How are speech errors **indicative** of the speech production process. Explain in **detail** with **concrete examples.**



I will be mostly following **weaver++** model of speech production which in brief describes how we produce speech by starting from thinking of something to say, to finally saying it, in a set of many different processes! These mental processes create a sort of sequence, and it is what brought in the wanting to know the accuracy or functioning of the model. We have techniques like conceptualisation, formulation, articulation, where the conceptualisation to formulation is itself embedded with many

different mental processes in a series of steps, which signifies that the system is very algorithmic sort of manner!
Significant sources of evidence come, when we want to theorise how speech is produced, usually comes from the place, in seeing people that what kind of errors are they making.

There were many experiments conducted by various researchers which prove different stages of the speech production process! Here are some pictures to summarise it!

Studies showing phonological facilitation by semantically activated nontarget words

Experiment(s)	*Task*	*Semantically activated lexical item:*	*Phonological facilitation observed in:*
Peterson & Savoy (1998)	Cued response: After picture presentation, either name the picture or a visually presented word	Near-synonym of picture name (e.g., 'sofa' for 'couch').	Naming latency of visually presented word phonologically related to near synonym of picture name (e.g., naming of target 'soda', similar to 'sofa').
Cutting & Ferreira (1999); Taylor & Burke (2002)	Picture naming during auditory picture-word interference	Semantic associate of distractor (e.g., 'ball,' a formal dance, for distractor 'dance').	Picture naming latency of homophone of semantic associate of distractor (e.g., target 'ball', a toy, is a homophone of 'ball' a formal dance).
Damian & Martin (1999); Starreveld & La Heij (1995, 1999); Taylor & Burke (2002)	Picture naming during auditory or orthographic picture word interference	Mixed (semantic-phonological) neighbor of picture target (e.g., 'calf' for target 'camel').	Picture naming latency of target[1] (Damian & Martin, 1999; Starreveld & La Heij, 1995; Taylor & Burke, 2002); target accuracy (Starreveld & La Heij, 1999).
Costa, Caramazza, & Sebastián-Gallés (2000); Gollan & Acenas (2004)	Picture naming	Cognate (phonologically similar translation) of target (e.g., for target Spanish 'gato' 'cat,' Catalan cognate 'gat').	Picture naming latency of target (Costa et al.); target accuracy (Gollan & Acenas)
Morsella & Miozzo (2002); Navarrete & Costa (2005)	Picture naming during picture-picture interference	Phonologically related non-target picture (e.g., 'bell' for target 'bed').	Picture naming latency of target[2]

TABLE 2
Studies showing phonological inhibition by semantically activated nontarget words

Experiment(s)	*Task*	*Semantically activated lexical item:*	*Target phonologically inhibited by:*
Jescheniak & Schriefers (1998)	Picture naming during auditory picture-word interference	Phonologically dissimilar near-synonym of picture name (e.g., 'sofa' for 'couch')	Distractor, dissimilar to target, but phonologically related to near-synonym of picture name (e.g., 'soda', similar to 'sofa' but not target 'couch').
Hermans et al. (1998); Costa et al. (2003)	Picture naming during auditory picture-word interference	Non-cognate translation equivalent (e.g., Dutch 'berm' for English target 'mountain')	Distractor, dissimilar to target, but phonologically related to non-cognate translation equivalent (e.g., 'bench', similar to 'berm' but not target 'mountain').[3]
Jescheniak et al. (2005)	Picture naming during auditory picture-word interference	Phonologically dissimilar basic or subordinate level label for picture (in subordinate or basic level naming context; e.g., 'fish' in context where 'shark' is appropriate)	Distractor, dissimilar to target, but phonologically related to basic or subordinate level label (e.g., 'finger,' similar to 'fish' but not target 'shark').

[3] Note that Hermans et al. (1998) interpreted this inhibition as arising at the L-level.

If we look at the speech output of an individual or set of individuals for some amount of time, what kind of errors are we most likely to find out?

And more importantly, what do those types of errors signify?
What do we get in these types of errors, what are each of these error types telling us about the speech production process!
The sources of these errors will tell us the way the speech production works.

Let's first take a look at the tip of the tongue. Lot of time it happens, that when we ask someone the name of the famous place in the city, in most of the cases, we would be able to tell where the actual thing is easy!
But a lot of times, despite knowing where the shop is located, like ‘it's beside nankari old school, there's also a juice shop there’, in very much detail, we will be able to describe the name of the location, can think of it, in our minds, but it would become challenging.
This phenomenon is referred to as the tip of the tongue phenomenon!
TOT is a diagnostic of how the speech production process works!

Now, I will try to correlate the tip of the tongue phenomenon with the levelt’s models.
Speech errors are an exciting category of errors, cognitive error!
Freud's concept of looking at speech error is a window to our unconscious mind!
One of his exciting theory, that most of our mental capability, i.e. mind, only a tiny portion of that is available to us consciously, and a considerable amount of that mind is unconscious. Part of it is subconscious. The excellent analogy would be that only the tip of the iceberg is available to us.
According to Freud, our subconscious has a lot of experiences in it, like grief.
He believes when people make speech errors, that indicates what is wrong in their subconscious or unconscious mind!
One of the funny examples would be, I went there to a birthday of a guy, whom I didn’t like, and he had been going through a terrible day, and after seeing him, I said “ how can I make this worse?” instead of saying “how can I make this better?” :p

This speech error was a window to my unconscious mind, and it revealed my real inner thought, that I might have suppressed, to live peacefully around him in this society.
Modern theories of speech production, **don't believe i**n this theory of Freud now!
They suggest that speech errors reflect breakdowns in the various processes of the speech production process, which very much proves the correctness of weaver++ model and nothing more than that!
We have an idea and want to speak about it. The speech error will fit somewhere right somewhere in this sequence of events, and not really in our subconscious mind or somewhere.
Aforementioned is different from Freud's Idea.

According to data and research made, speech errors are not random. Speech errors are very systematic. They occur in very fixed and predictable patterns, which are diagnostic, of what would be going in our heads!

For example, a slip of the tongue phenomenon occurs in a very systematic pattern which could be matched to a set of stages of productivity of language.
We create new things all the time. We wanted to say something else, but we said something else, it was also a novel thing!
For example, when someone coined the word "Mumma", remember in olden days, in India, we used to say "Ma" then it became "Mumma" and "mum". The different words for relations like "jiju", these must-have also been produced in the same way, and I am pretty sure, some it will become "juju" :p, hail! Speech error!

Word errors sometimes create syntactic novelties, morphological errors sometimes create novel words and sound errors novel but phonological legal combinations of phonemes, it's all real, it's just a manufacturing process! The only difference here is the speech being produced, so it's very much expected that 1 in 1000 products will be defected by simple probability!

Each of these kinds of errors provides information about how the different components of the speech production model are working. If something faulty appears and we can predict from the speech error, that where exactly the breakdown occurs.

Sometimes, people substitute one word for another, famously called semantic substitution. If they are placed under a lot of pressure, time-bound conditions, or when they are terrified of talking to a person or when they are very nervous when they are not physically alright.

In these kinds of sceneries, sometimes substitutions will happen, where semantic substitution like for example, if we are thinking about the dinosaurs but suddenly lizards crosses our mind, although they both come from the same families, that may be the reason for this error.

This error is referred to as semantic substitution, replacing the target word with another word coming from semantic related to the target word.

This type of semantic substitution error most likely reflects the conceptual preparation or lexical selection component of the speech production process.
So, suppose we have to guess where the problem might have happened. In that case, it will probably be at the level of lexical selection if we went on to select the linguistic concept for the dinosaur, but mistakenly chose the concept of lizards. Then we finally said lizard instead of the dinosaur, everything else in the process remains error-free.

If I would have taken which sir you had taken in the class, then the below figure beautifully summarises my point! The cat and Rat lemma clashes with each other and a cascading interference effect takes place between the competing lemmas and then finally the phonemes of the Rat are selected instead of a cat. That is how this type of error proves the lemma level!

Figure 1A

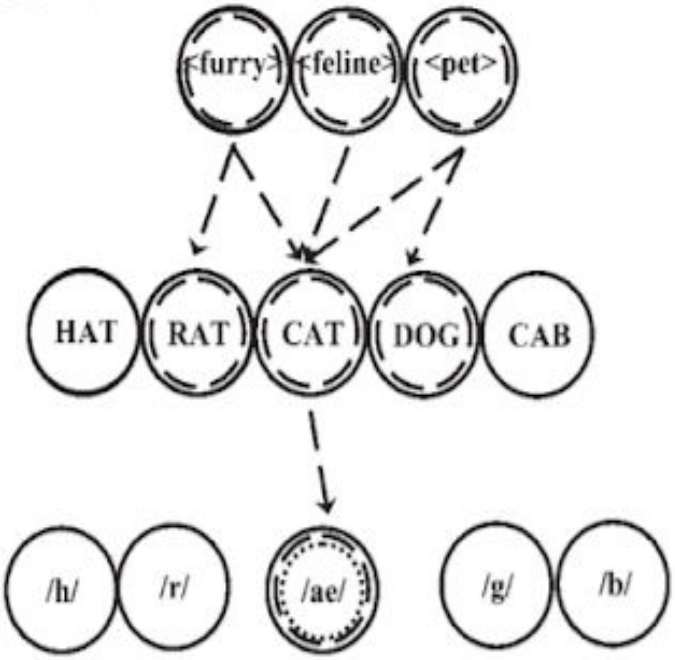


Figure 1B

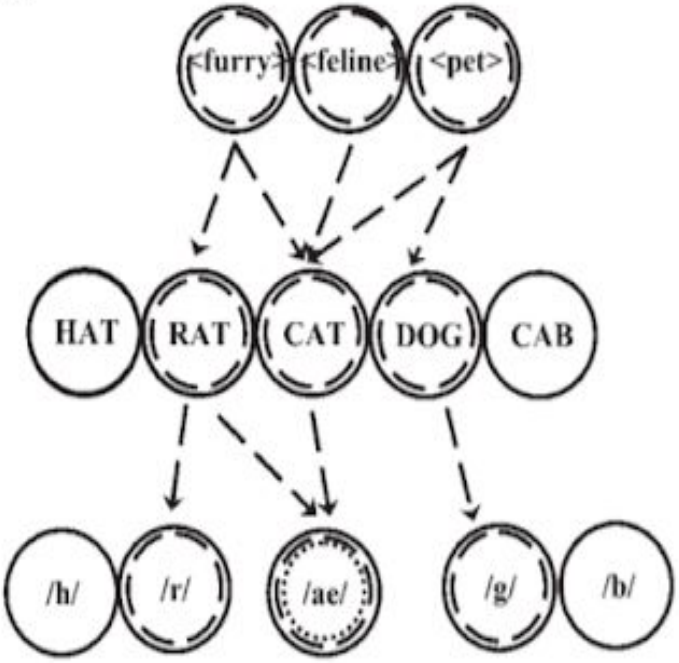


Figure 1 (above and opposite). Schematic depictions of four theoretical positions regarding interaction within the speech production system. The first set of units denotes lexical semantic representations (amodal representations of the meaning of lexicalised concepts). The second denote L-level units (word representations mediating the mapping between the other two representational levels). The third set denotes phonological representations (sublexical

Figure 1C

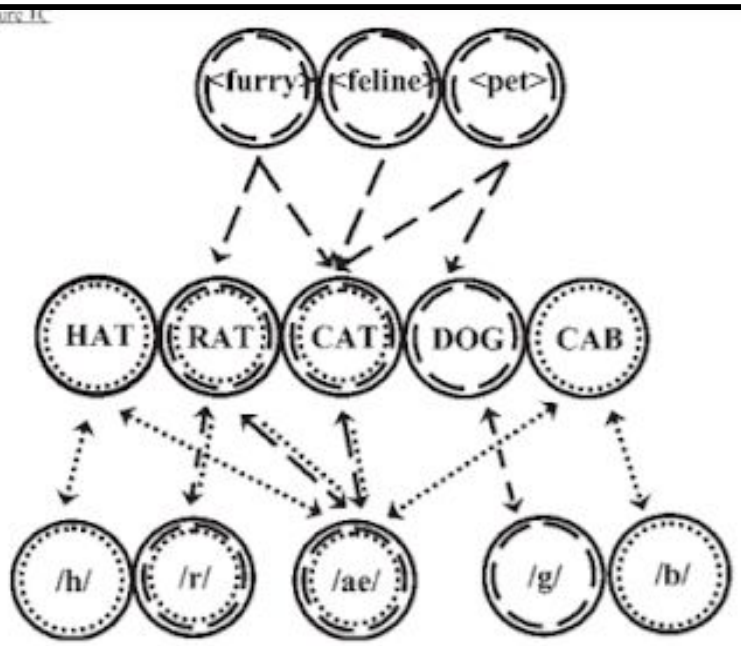
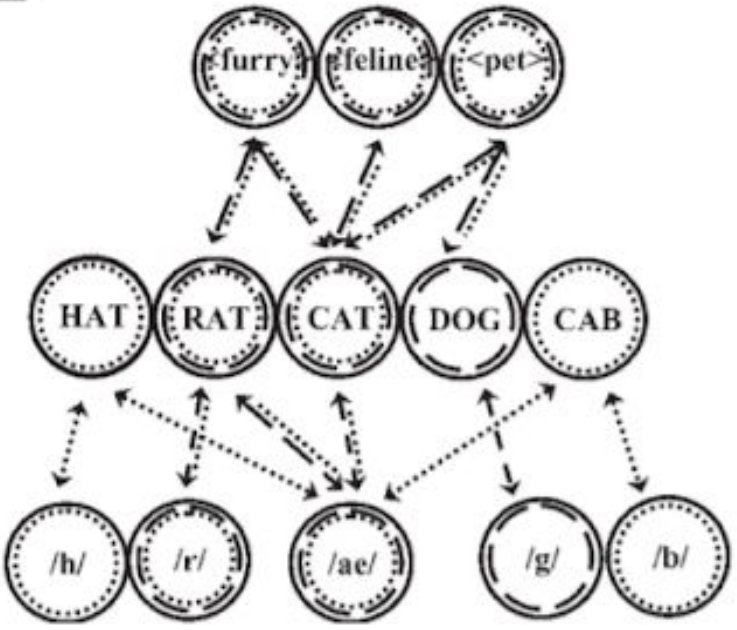


Figure 1D



A. Theory with no cascading activation or feedback. Multiple semantic competitors are activated at the L-level, but only the target activates its phonological representation.
B. Theory with cascading activation from the L-level to phonological representations. Semantic competitors activate their phonological representations.
C. Theory with feedback from phonological representations to the L-level. Phonological neighbours of the target are activated at the L-level; through cascading activation, these phonological neighbours activate their phonological representations.
D. Theory with feedback from the L-level to semantics. Activation differences based on L-level and/or phonological distinctions are transmitted back to semantic representations.

Semantic substitution can be thought of reflecting breakdown in

conceptual preparation.
For example, an individual has mistakenly focused on the wrong concept, the mind is somewhere else, and that's why he selects the wrong word.
Semantic substitution can also suggest how non-linguistic components are related to each other and how the activation of those concepts is tied to the activation of lemma!

Semantic network theory - a fascinating approach which explains how the different concepts in mind are linked to each other is by virtue of relationship!

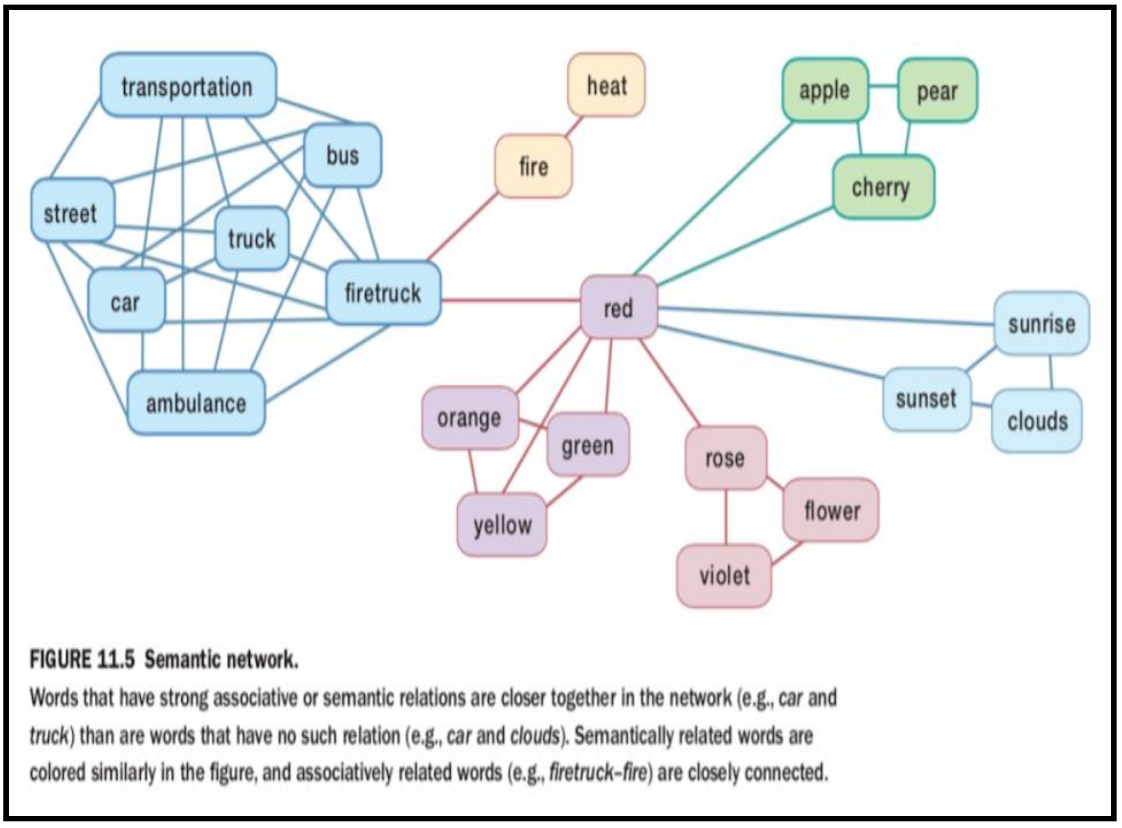


FIGURE 11.5 Semantic network.
Words that have strong associative or semantic relations are closer together in the network (e.g., *car* and *truck*) than are words that have no such relation (e.g., *car* and *clouds*). Semantically related words are colored similarly in the figure, and associatively related words (e.g., *firetruck–fire*) are closely connected.

It might be the case that there are these concepts, which are related to each other in some sense because we were going to select one concept, by mistake, we choose the related concept, a semantically related concept!

Weaver++ says maybe concepts are stored in long term memory in networks. He believes that concepts are stored in long term memory as networks or graphs of networks, in these networks, the concepts that have similar meaning will be closer together, or connected. The

concepts which have very different, are further apart, or probably not even related to each other, as a result, when we thought of dinosaurs, the activation might have spread on to other related concepts like lizards, crocodiles, etc. These are probably related by semantic.

To select the correct lemma, we needed to ignore the chosen concept and focus on the target concept.
Semantic substitutions might be seen as lemma selection errors!
In the previously mentioned example, the dinosaur lemma was to be selected. Still, by mistake, we picked the lemma of lizard, which in turn resulted in us saying the associated concept, lizard instead of a dinosaur.

When its come to the speaker to choose the lemma for further processing, the speaker will determine the target lemma mostly. Still, probably, but probably once a week, a speaker mistakenly picks the wrong lemma due to time pressure or nervousness, and which selects in speech error.

Other kinds of error reflect a breakdown in other speech production processes.
For example- Sound exchange error - exchanging the phonemes of the words. Like ‘big feet’ and ‘fig bit’, this created a sound exchange.

This error is probably an error at a point, where we are near a phonological end, in the last parts of the weaver++ cycles.

One example which my father used to say to me is “Kacha papad” “pakka papad” repeatedly, and after 2-3 repetitions these use to mix up like “pakka Kacha” pakch papad” :P

These kinds of errors can be observed in labs when participants are judged under time-bound conditions and on accuracy.

When we give participants a highly timed task for us to work with, how are the participants going to do it? Sometimes, the error will be of the semantic type, and sometimes they will be sound exchanges!

Dell's production model says positional constraints the way individual phonemes are activated and inserted into the phrase. We triggered the sounds, we organised the sounds into syllable sized frames and also decided the order in the strict left to right pattern.
We have a scenario, where we have two sounds of the first syllable and two sounds of the second syllable.
There are many numbers of Frames that can be activated at one time, and one activates the phonemes to be inserted in the frame are activated and are marked with the order tag, like which is 1st and which is 2nd phoneme.
Because two syllabus frames are activated simultaneously, two phonemes, which have first-order tags are also activated simultaneously, and sometimes, the production system mistakenly confuses the two and exchanges their position. Typically, the activation level of two first phonemes usually differs a little bit, so we do not make this error, but sometimes we are too nervous or excited, we mix them two and cause this error.
Most of the errors respect the positional constraint.

Word exchange error - here we exchange the entire word in the sentence, I mostly make this error!
According to frame and slot models, speech involves a degree of planning, so when we plan, we lay out a framework for an entire clause and sentence, as we are looking for a particular set of words and the precise form that we need to produce.
The frame is made of slots, and each slot is labelled for the kind of word which will come there.
Word exchange happens when more than one candidate is activated simultaneously; more than one word can have the same tag and started simultaneously. So, the chance of the word exchange error will increase!

According to contemporary production theories by dell and levelt's, TOT occurs when we have accessed the correct lemma, but we are unable to

activate the phonological parts fully. E.g.” What was that boy name, who got the recommendation of ark Verma sir, his hair was like me, his glasses were also like me, but what was his name”:p
TOT experiences are evidence for a distinction between semantic and phonological activation! Thus paves the way for weaver ++ models!
All of the lemma parts is one, and the phonological part is the second part of the production model.

Study in the picture naming experiment proved that people do activate different concepts at about the same pace, but concepts they are less familiar or used to, take longer!
Which implies that people's response is affected more by how often they produce particular sounds and less frequently by the concept or lemma part.
Concepts are judged against each other to select the best possible idea, shown by the picture-naming task!
The semantic relationship produces one pattern, and phonological relationship creates different relationships.

I conclude by saying that People in experiments were fast in confirming whether they are familiar with a particular image or not, but when they were asked to name it, they needed a lot more time!

This difference in time-taken implies that there is a clear distinction between phonological and lemma/semantic states of the weaver++ model!
And these processes seem to be semi-independent processes.

We have come across many speech errors and how they relate to the different set of processes!

All the evidence and research show that Dell's hypothesis is much more plausible than Freud's one, but as observed in real life, we often speak our subconscious mind sometimes, so it's not flawed too.

Various theories by Dell on speech error and many different kinds of errors paved the way into the whole new horizon to prove the correctness of this grand speech production model!

Different speech error made it clear to us that is some definite mechanism which has been followed, and errors were caused due to some fault in those processes!

It was indeed a remarkable journey to go through so many articles, research papers and then made such beautiful observations.

Citations:-

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Answer-3

Speech production and comprehension are inextricably **linked** with each other.

Elaborate the statement with **concrete examples**.

In recent times, Speech production and comprehension were seen to be quite different in the account of language processing!

But, now through new research and technologies, we are beginning to understand that producing and understanding are interwoven.

And the surprising fact is that it is this interweaving between the two that enables us, humans, to communicate and understand each other easily. Production and comprehension are like forms of action and action perception.

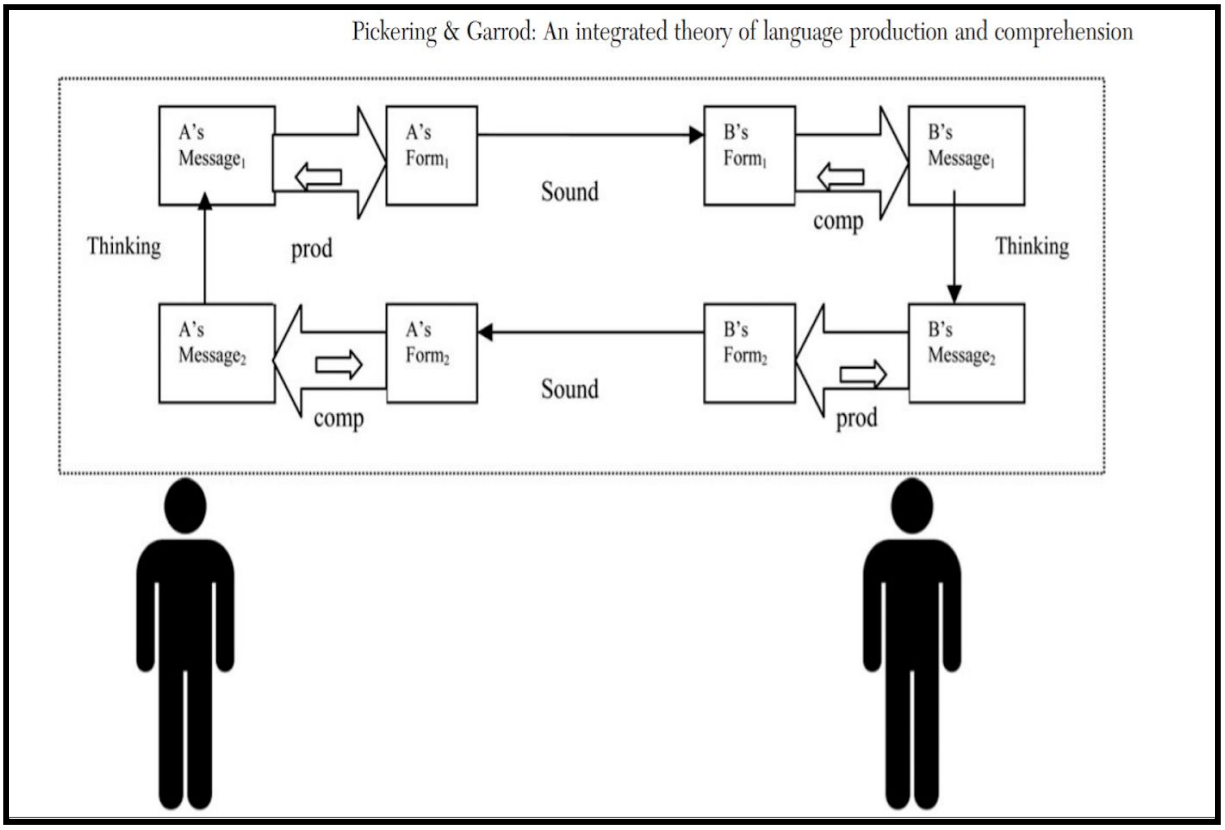
We will see that people construct a forward model of their action before they execute those actions, and perceivers of others actions imitate those actions and then construct forwards of those actions!

The process is sort of cyclical, going from idea to articulation, we go to physical sound.

Listener task is to listen to that sound and comprehend it, the first part is speech production and the second part of the cycle is speech comprehension.

Communication is like a loop.

Speech production is a sophisticated process. It takes around 100 muscles to be managed to articulate without an error to speak the indented idea!



The traditional model of communication between A and B
(comp: comprehension, prod: production)

The motory theory is closely related to speech perception. It says that Gestures are fundamental because different people have different voices and can create different types of signature voices.
Liberman says it is better to go by motor movement than sound.
The gestures are indeed what matters. It will decide whether the speech would be identifiable, recognisable and discreetly different from each other.
The speech perception is based on our perception of these moto acts which decide these gestures.

According to motor theory, if we could make out what gestures were used to create such a sound, once we figure out the gesture, then we can do inverse research to find out the intended word instead of physically listening to the word. We will be closer to understanding the real speech than on relying on sound.

For hypothetical example: I remember in one of the best cartoons named Ninja Hattori, he had a ninja technique, through which he could find out what the other person was saying, just by looking at the gestures(mouth in the cartoon) that that person must be saying! This example correctly shows what is implied by the motory theory of perception. It so elegantly indicates that if we normal humans, not ninja :p, can find out all the gestures the person uses to create that sound then we can also comprehend others' speech production without physically listening to it!

There is some motor activation during speech perception, some of which is articulator-specific

Broca's area in the human brain is responsible for the production of speech, all articulatory processes. If there is damage in Broca's area, then we will not be able to produce speech naturally.
Neuroimaging research, Broca's area is also active, while someone is listening to speech, that is very much like what mirror neurons would do!

While somebody is listening to someone else speak, it is also making out how he should be able to talk the same way. Thanks to mirror neurons.
Mirror neurons could be the neurological basis of the motor system. It is the system that helps us understand gestures to make that particular sound.

Mirror neurons could fire when an individual produces a particular set of phonemes OR hears the same set of phonemes, providing the bridge between perception and production of speech, or speaking or listening to somebody!
Non-invasive Experiments have found out that motor neurons do participate in speech perception!
The representations of speech gestures must be in some sense, stored in the brain part that controls the articulatory movement, i.e., Broca's area roughly!
The parts of the brain that control articulation in the front part of the brain and premotor cortex, when we perceive speech!

Mirror neuron theory argues that mirror neurons are the neural mechanism that establishes the relation between heard speech and the motor representation that produce speech!
Mirror neurons have also found monkey equivalent motor cortex, so this somewhat confirms that the human brain also has this kind of system, but more specialised as compared to monkey neurons.

Some mirror neuron theorists argue that mirror neurons must be playing a significant role in modern humans **because our speech production and perception have evolved from more manual gesture systems!**

Initially, when we started to make manual gestures, or make tools that led to making gestures and that eventually led to vocal gestures. Making gestures is very sophisticated done by a mirror neuron.

They probably help us understand speech too!
Various studies have found that humans do have mirror neurons!
In a study conducted by pulvermuller and colleagues, participants listened to syllables, which resulted from bilabial stops or alveolar stops on listening trials.
Their brain activities were recorded using fMRI and neuroimaging.
Listening to speech causes activity on both sides of the participant's brain in the motor cortex of the participant's frontal lobes, those areas which were involved in the silent production! And these activities were dependent on the type of sounds they hear.

The motor theory explains these differences, the same area which was involved in producing was also involved in perception!
When they suspended brain activity in the motor cortex, the perception of speech was also deficit!

Another example would be of the child! From the last trimester of pregnancy, the child starts comprehending the speech in some sense, he continually learns from those input data and builds the knowledge of the language in his mind, as he approaches 2-years of age, he starts speaking words of the shorter utterance. From that point onwards, he

continuously refines his speech to perceive and to produce. He repeats the learning and practising cycle!

These explain the interlink between production and comprehension.

Let’s go by the general theory of speech perception. It also very well explains that the common characteristic of human and non-human speech productions and perception; these processes are not that special and don't require unique parts to do the magic.
As it is not dependent on gestures, so it is not available for criticism!

Ganong Effect in speech perception, if we are hearing and we have no clear idea of the word, we are more likely to take actual words than non-words, this is very much equivalent to **speech erro**r in speech production.

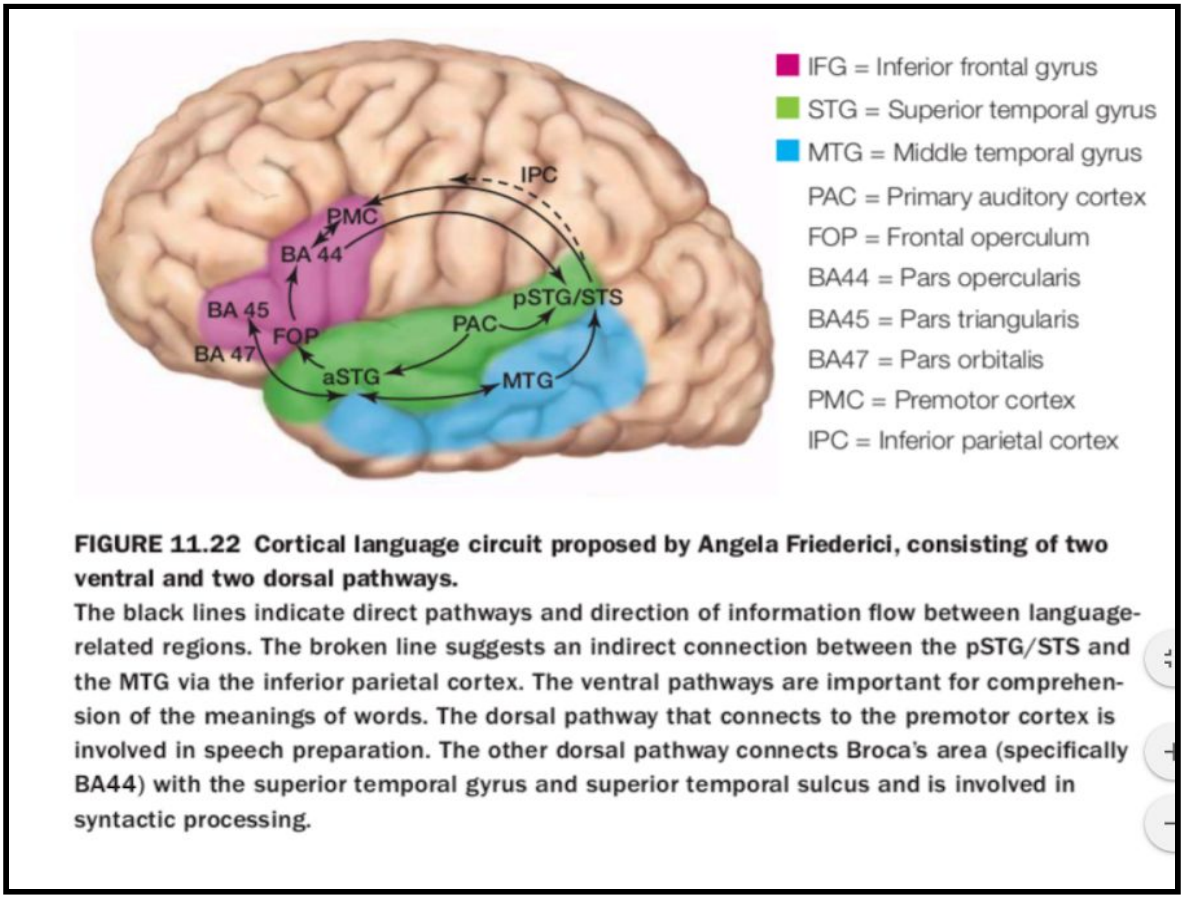


FIGURE 11.22 Cortical language circuit proposed by Angela Friederici, consisting of two ventral and two dorsal pathways.
The black lines indicate direct pathways and direction of information flow between language-related regions. The broken line suggests an indirect connection between the pSTG/STS and the MTG via the inferior parietal cortex. The ventral pathways are important for comprehension of the meanings of words. The dorsal pathway that connects to the premotor cortex is involved in speech preparation. The other dorsal pathway connects Broca's area (specifically BA44) with the superior temporal gyrus and superior temporal sulcus and is involved in syntactic processing.

.
The above figure is just to illustrate how different parts of the brain are involved in speech production and comprehension!

Two ventral pathways, involved in the **comprehension of the meanings of words**, connect the posterior temporal lobes with the anterior temporal lobe and the frontal operculum. Ventral pathways are supposed to be Two dorsal pathways connecting the posterior temporal lobes to the frontal lobes. One of these links to the motor cortex, and is involved in the preparation of **speech utterance**.
The other dorsal pathway connects the Broca's area with the STS and the STG and is supposed to be involved with aspects of **syntactic processing.**

Only when we realise that language is a computational cognitive system will we be able to explore its neural mechanisms fruitfully.

Silbert et al.'s(5) found an extensive and substantial bilateral network of brain regions active during production and comprehension.
These regions comprise both traditional language-related networks and traditional non-linguistic networks,i.e. Regions commonly associated with mentalizing.
He also found the considerable degree of both overlap and coupling between the regions of speech production and comprehension!

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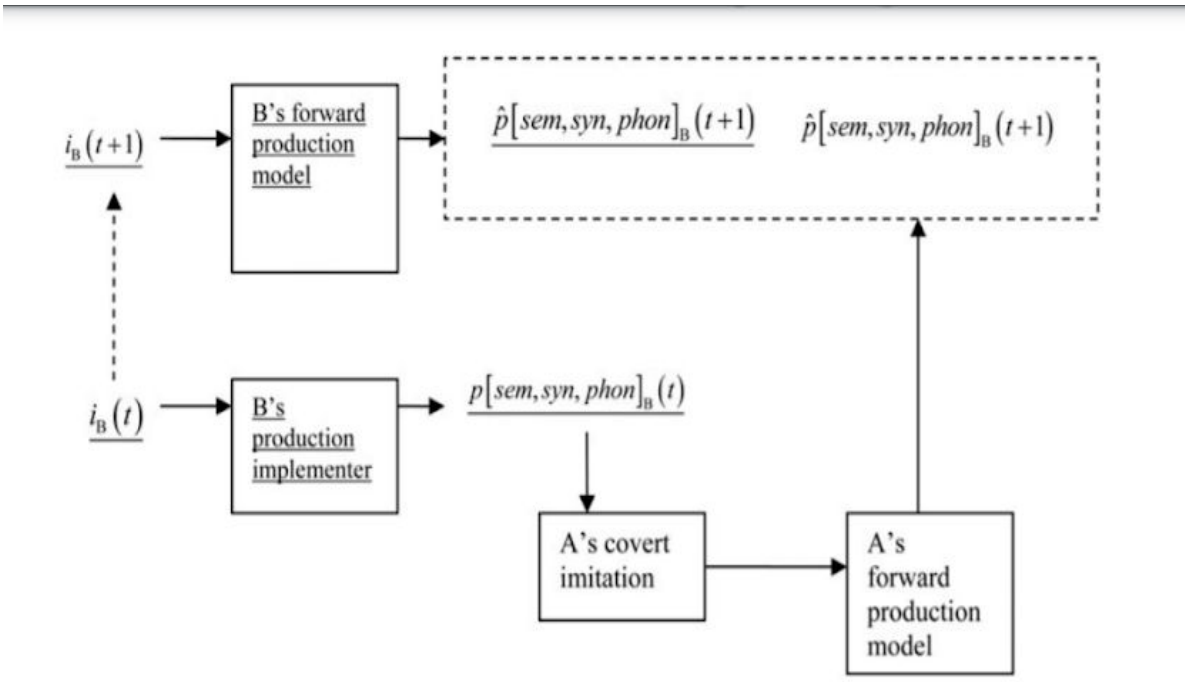
Another evidence is of Silbert et al.'s study, which clearly shows **the tight coupling between much of production and comprehension**, which clearly contrasts with the traditional assumption that these processes are separate.

All of these experiments tell us that the **motor cortex** is generating some activity in response to **speech perception**.

Traditionally language is thought to be separate processing “streams” for production and comprehension.

The language was thought to be “Cognitive Sandwich”, which is incompatible with demands of communication and data, which clearly shows that production and comprehension are tightly **interwoven.**

The complex figure below concisely explains my point!



The speakers use forward models to predict aspects of their upcoming utterances, and listeners **imitate** speakers. Then themselves use forward models based on their potential utterances to **predict** what the speaker is likely to say!

This is **crucial** because it explains the remarkable rapidity of production and comprehension, which provides the basis for a psychological account of human communication!

https://sci-hub.se/https://doi.org/10.1073/pnas.1417917111,this is pretty impressive 2- paper review, which gives tons of evidence that comprehension and production are interlinked.

Thank you for giving this much time in going through my answers and this excellent opportunity to do this course under you, I learnt a lot, and will also try my best to rock in psy770 ^_^ I hope I have done justice to this vast endsem!
Keep well and Safe :)
Tejesh Vaish

Citations:-

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Martin J. Pickering Department of Psychology, University of Edinburgh, Edinburgh EH8 9JZ, United Kingdom martin.pickering@ed.ac.uk
http://www.ppls.ed.ac.uk/people/martin-pickering
Simon Garrod University of Glasgow, Institute of Neuroscience and Psychology, Glasgow G12 8QT, United Kingdom

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Martin J. Pickering and Simon Garro

3)“Well, that’s one way”: Interactivity in parsing and production doi:10.1017/S0140525X12002592 Christine Howes, Patrick G. T. Healey, Arash Eshghi, and Julian Hough

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