

Language and its Applications

LT5903



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Lecture 8: Language Acquisition

Lecture plan

- Pragmatics review
- Theories of language acquisition
- Research methods
- Empirical study
- Short break (15 mins)
- Group discussion on HW8

Pragmatics review

The study of **the way people use language** in actual conversations.

sentence v.s. utterance: phrasal expressions v.s real events

type of contexts

- **linguistic:** what preceded a particular utterance in a discourse
- **situational:** information about the world in which the discourse is uttered
- **social:** information about the relationships between the people speaking and hearing the utterances

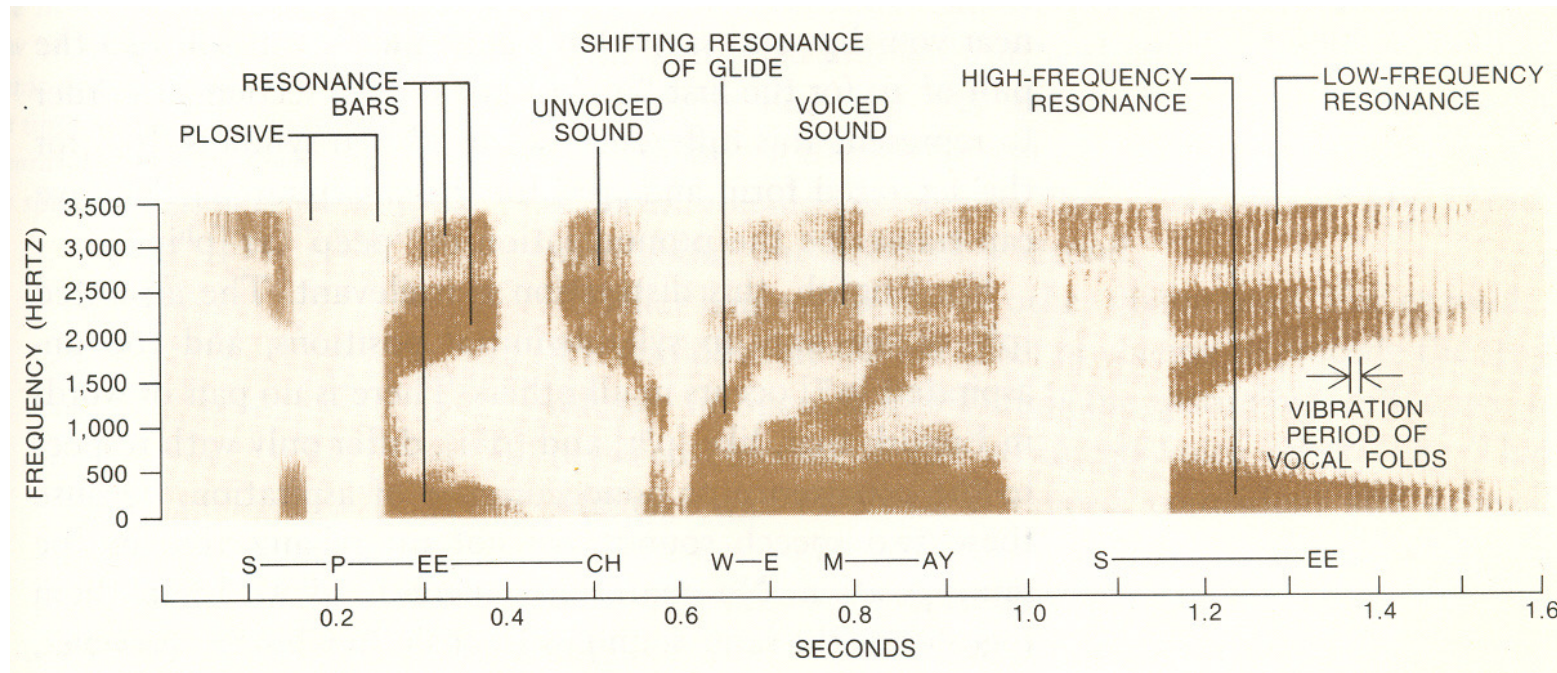
Grice's Maxims: The speaker follows them in being **cooperative**, and the hearer assumes that the speaker is following them

- **Quality:**
 - Do not say what you believe to be false
 - Do not say that for which you lack adequate evidence
- **Relevance:** Be relevant
- **Quantity:**
 - Make your contribution as informative as required
 - Do not make your contribution more informative than is required
- **Manner:**
 - Avoid obscurity of expression; Avoid ambiguity; Be brief; Be orderly

The problem of language acquisition

Children learn to understand and speak language in the first few years of their life.

The data:



How children acquire language?

The Innateness Hypothesis

Language ability is innate in humans

Universal Grammar (UG): the theoretically inborn set of structural characteristics shared by all languages (Chomsky, 1986)

Lenneberg's characteristics of **biologically controlled behaviors:**

1. The behavior emerges before it is necessary.
Children learn to speak before 24-month-old, long before the need for survival.
2. Its appearance is not the result of a conscious decision.
Children do not decide to learn a native language.
3. Its emergence is not triggered by external events.
Language is not learned as a result of triggering events.
4. Direct teaching and intensive practice have relatively little effect.
Language is not taught, and intensive teaching doesn't have much effect.
5. There is a regular sequence of "milestones" as the behavior develops.
Children master linguistic skills in a certain order.
6. There is likely to be a **critical period** for the acquisition of the behavior.
The critical period for language acquisition: from birth to the onset of puberty.

Milestones of language acquisition

Approximate Age**Language and Communicative Developments**

1 month

- Cry to express displeasure and make other throaty sounds.
 - Look at their parents when being talked to.
-

2–3 months

- Turn their eyes and later their heads to look for sounds and voices.
 - Cry differently depending on their need and begin to make other noises, like gurgling, squealing, and chuckling.
 - Smile and make noises in response to familiar faces and voices.
 - Begin cooing, especially palatal-like sounds like [j], [ɲ].
-

4–5 months

- Begin to make consonant sounds in addition to their vowel-like cooing, especially sounds like [m], [b].
 - Can laugh and begin to try to copy sounds they hear.
-

6 months

- Respond to sounds by making sounds.
- String vowels together in vocalizing and also produce syllables, especially sequences such as [ma], [ba], [da], [di].¹
- Practice turn-taking and respond to their own name.

Milestones of language acquisition

7–9 months

- Respond to familiar words and try to copy sounds and gestures.
 - Begin repeated or canonical babbling, including strings like [mamama] and [dadada].
 - Begin to use intonational patterns in their babbling.
 - Understand “no” when directed at them and begin to respond to simple verbal commands.
-

10–11 months

- Begin variegated babbling, with sequences like [bugabimo].
 - Understand “bye-bye” and can wave “bye.”
 - *Mama* and *dada* begin to become real words meaningfully associated with mother and father.
-

12 months

- May say a few words and exclamations in addition to *mama* and *dada*, such as *no*, *go*, *bye*, *uh-oh!*
 - Can use other simple gestures, such as shaking their head for “no.”
 - Can understand the meanings of several words and recognize objects by name, and can respond to simple requests.
-

Critical period: The case of Genie

Genie ("the feral child") was found in 1970 when she was nearly **14 years old**.



Imitation theory

Children learn language by listening to speech around them and reproducing what they hear.

However:

1. children's speech differs from adults:

"Mummy **tie** shoe."

"hitt**ed**", "go**ed**"

2. children can speak novel sentences

Reinforcement theory

Children learn to speak like adults because they are rewarded when they use the right forms and are corrected when they use wrong forms.

However, adults often do not correct grammatical errors and children seem impervious to correction.

Child:	Nobody don't like me.
Mother:	No, say "nobody likes me."
Child:	Nobody don't like me. (repeated 8 times)
Mother (now exasperated):	Now listen carefully! Say, "Nobody likes me."
Child:	Oh! Nobody don't likes me.

Active construction of a grammar theory

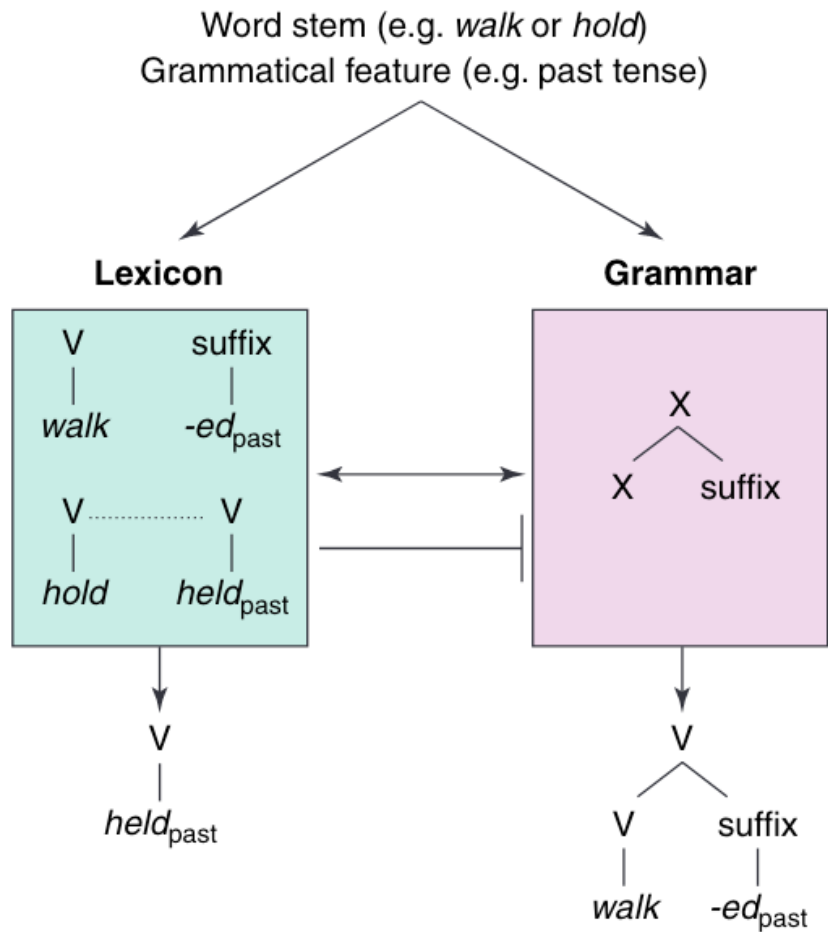
Children invent the rules of grammar themselves. The ability to develop the rules is innate.

Acquisition of past tense in English:

- phase1: add -ed to form past tense
 - eat**ed**, go**ed**, need**ed**, walk**ed** → **overgeneralization**
- phrase2: modify the rules to add additional forms
- → children's mistakes are expected to occur and follow non-regular patterns.

Acquisition of English past tense

Pinker and Prince (1988): The dual-route model



Used for:

roots, idioms, irregulars,
some regulars

Form of computation:

lookup, association

Subdivision of:

declarative memory

Associated with:

words, facts

Principal substrate:

temporo-parietal cortex

phrases, sentences, any
regular form

combination, unification

procedural system

rules, skills

frontal cortex, basal ganglia

Connectionist theories

Children learn language by creating neural connections in the brain. Connections have different strengths and language acquisition involves adjusting the strengths of the connections.

Acquisition of past tense in English:

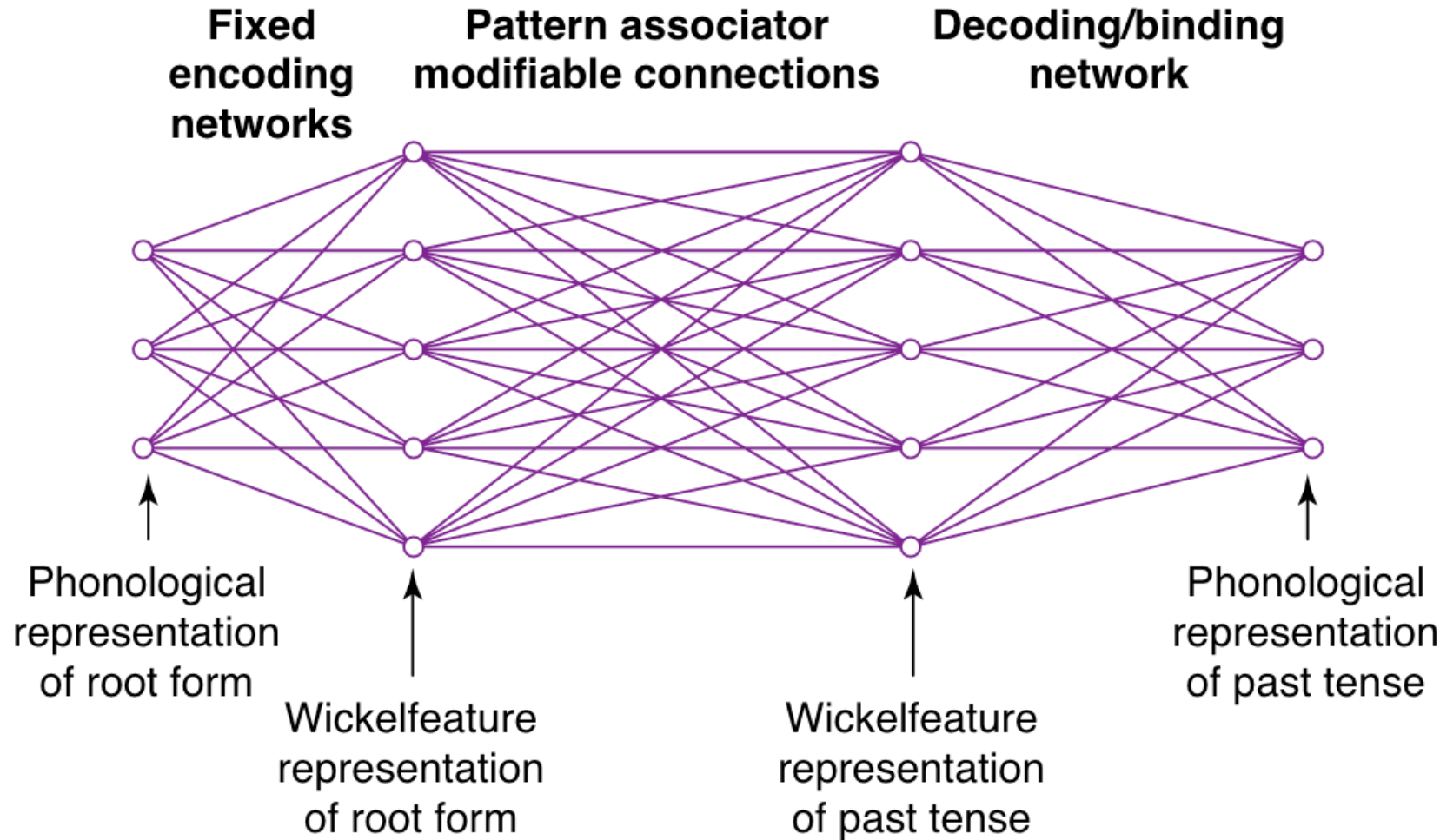
There are more regular past tense verbs so the connection between *-ed* and verbs is stronger

needed, walked → eated, goed

→ children's mistakes are due to statistical patterns in the data

Acquisition of English past tense

Rumelhart and McClelland (1986): The connectionist model



Model:

The input to the model are root forms and the output are past-tense form. The model learns by adjusting the weights to match the correct past-tense form.

Results:

The model can capture regular and irregular inflections

Social interaction theory

Children acquire language through social interaction.

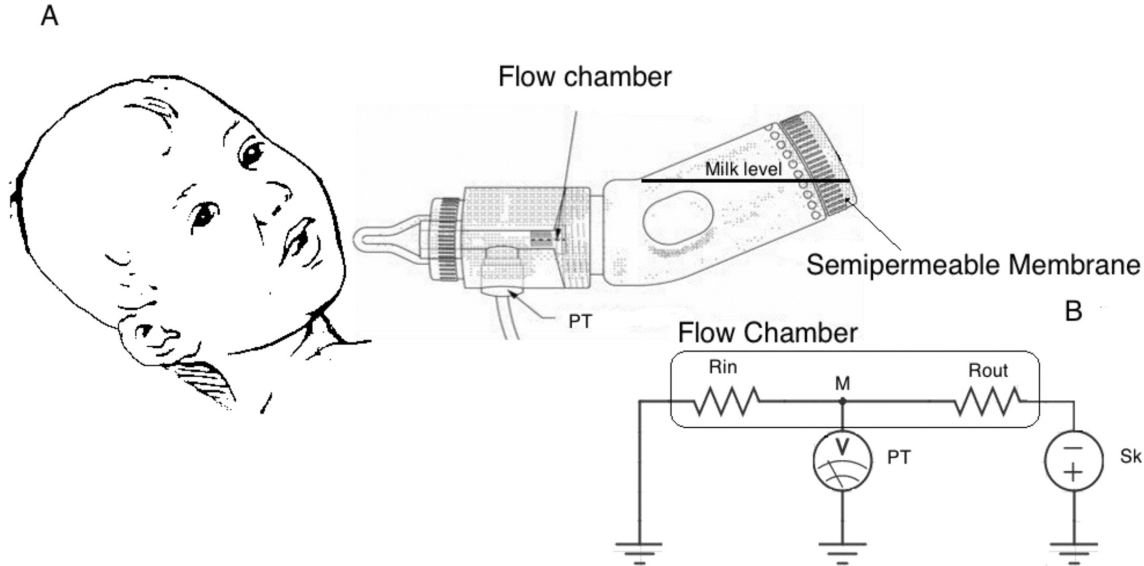
child-directed speech: slow, high-pitched, exaggerated intonation, repetitions, simplified vocabulary and syntax.

See the birdie? Look at the birdie! What a pretty birdie!

Has it come to your attention that one of our better-looking feathered friends is perched upon the windowsill?

Research methods

High-amplitude sucking (HAS): new-borns



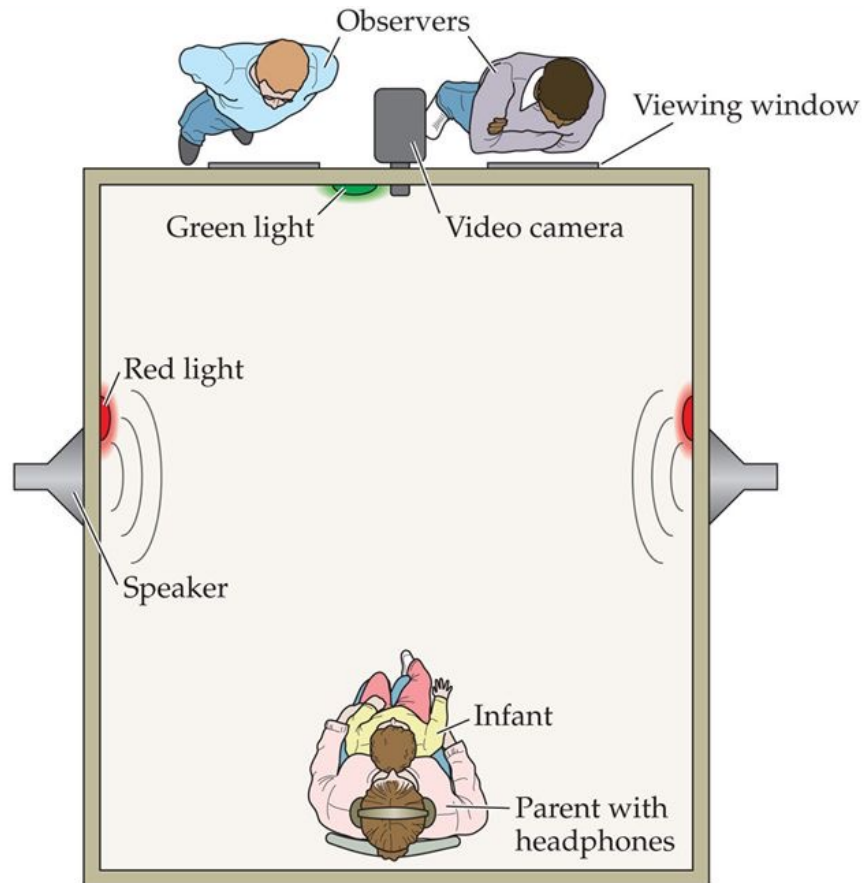
Pacifier connected to a sound-generating system

Babies suck often because they are interested in hearing new noise.

- **sucking rate slows down**
 - familiarized with the sound
- **change the sound, sucking rate goes up**
 - can discriminate the two sounds

Research methods

Head-turn preference paradigm (HTPP): 5-18 months



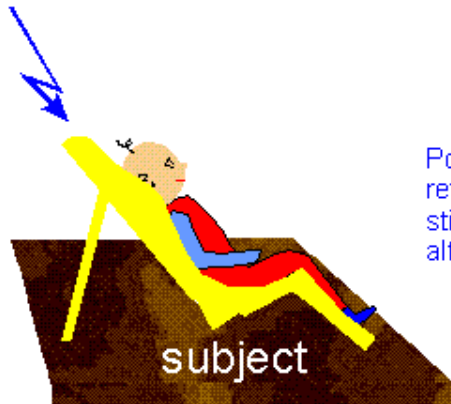
Babies look to the speaker where a sound is played

- **shorter looking time**
→ familiar sounds
- **longer looking time**
→ novel sounds

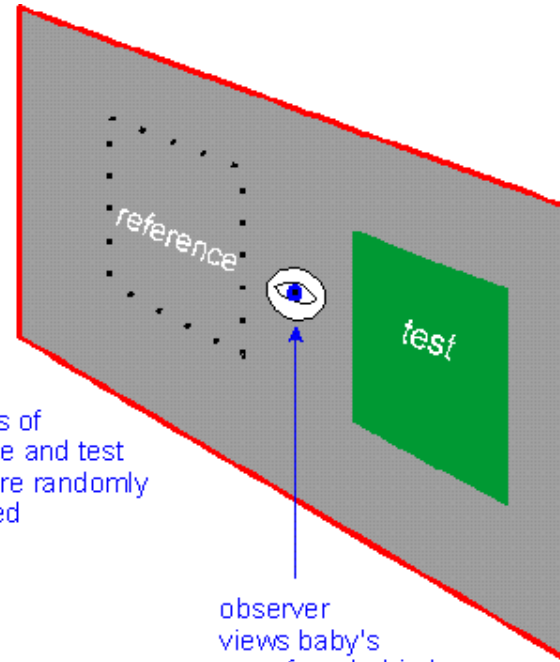
Research methods

Preferential looking: 5-18 months

Although the baby here is shown in an infant seat, in some experiments adults hold the babies, in their laps.



Positions of reference and test stimuli are randomly alternated



observer views baby's eyes from behind stimulus card through peep hole (which is smaller than that illustrated)

Babies look at the picture that is associated with the sound

- "mummy"
→ picture of mom
- "daddy"
→ picture of dad

Research methods



Research methods

Corpus analysis: The CHILDES database

<https://chilDES.talkbank.org/>



CHILDES is the child language component of the TalkBank system.

System	Database	Programs
<u>**Ground Rules**</u>	<u>**Index to Corpora**</u>	<u>CLAN</u>
<u>Contributing New Data</u>	<u>Browsable Database</u>	<u>XML creator</u> and <u>XML Schema</u>
<u>IRB Principles</u>	<u>TalkBankDB database search</u>	<u>Related Software</u>
	<u>Hints on Downloading</u>	

Transcripts of conversations between children and adults

Empirical study: Word segmentation

Saffran et al. (1998)

Hypothesis:

Children learn to segment word from continuous speech streams using the **transitional probability (TP)** from one syllable to another.

pre-tty-ba-by: *ba* seldom follows *tty*, so there must be a word boundary between *tty* and *ba*.

Experiment: Head-turn preference

24 8-month-old, listened to a continuous speech stream consisting of **four three-syllable nonsense words** for about **2 minutes**, and listened to either “words” or “nonwords” during testing

train: ...*pabikutibudugunatipapikudutigu*...

test: *pabiku* (“words”), *tibudu* (“nonwords”)



Results:

Infants listened to “nonwords” longer

Empirical study: Word segmentation

Yang (2004)

Does TP work in segmenting real words?

Training data: random sample from the CHILDES corpus

- 226178 words, consisting of 263 660 syllables

Model: computing TP between pairs of syllables.

Test: syllable sequences

Results:

low precision (41.6%) and recall (23.3%)

Precision: No. of correct words/No. of all words identified by the model

Recall: No. of words correctly extracted by the model/No. of actual words

Adding knowledge about stress to the model: words have one primary stress limits the search for word boundary between two syllables that both bear primary stress, for example, between the two a's in the sequence '*language**acquisition*'.

Results: high precision (73.5%) and recall (71.2%)

To do

Assign yourself to the correct group under A8!

Do HW8

Read:

This lecture: **File** Ch8

Next lecture: **File** Ch9