Language Acquisition (and Research Methods)

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LING001 Lecture #3

January 27, 2020

Announcements

- Add deadline is tomorrow; we will be issuing permits **as space allows** tomorrow morning.
  - Both the course and Friday's recitation are already overfull

- "How to Perusall" now available on the course website
  - Download option must remain off

- **Study guide** and **practice questions** will be posted by Wednesday each week. Solutions will be released by **Saturday.**

How to do well this week

- Do the assigned reading (~1 hour)

- Attempt the practice problems (~2 hours)
  - Go to recitation!

- Briefly review the past study guides (~20 min)

Recap

- Language as a biologically determined behavior
  - It happens to everyone
  - It follows its own schedule (critical period)

- This week we'll talk more about how language is acquired and the research methods we use to study babies and kids!

How much of language do we have to learn, and how much is built in?

Do they learn through imitation?

recording natural speech (corpus analyses)

- CHILD: My teacher **holded** the baby rabbits and we patted them.
- ADULT: Did you say your teacher held the baby rabbits?
- CHILD: Yes.
- ADULT: What did you say she did?
- CHILD: She **holded** the baby rabbits and we patted them.
- ADULT: Did you say she held them tightly?
- CHILD: No, she **holded** them loosely.

Do they learn from correction?

McNeill (1966)

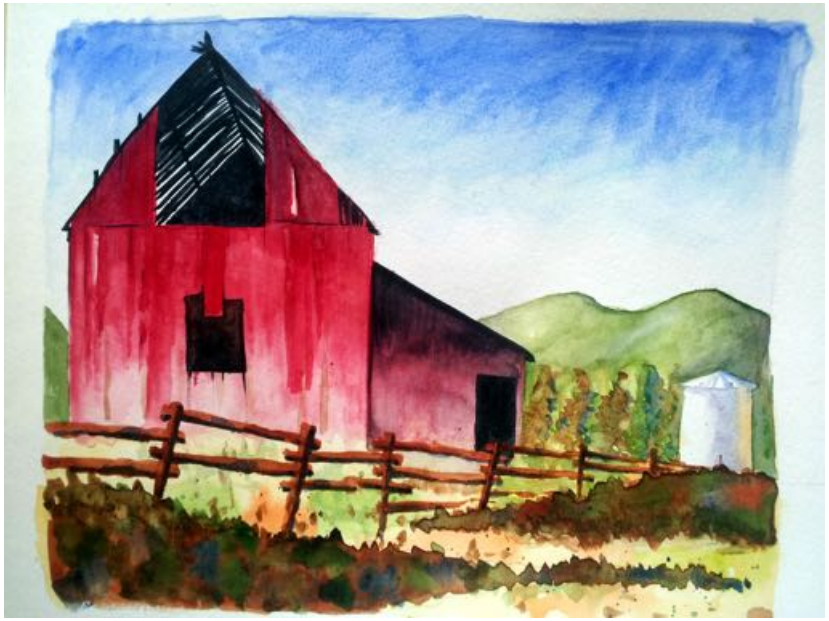
- CHILD: Nobody **don't** like me.
- MOTHER: No, say "nobody likes me."
- CHILD: Nobody **don't** like me.

  (exchange repeated 8x)

- MOTHER: Now, listen carefully; say "Nobody likes me."
- CHILD: Oh, nobody **don't** likes me.

Do they learn by analogy?

I painted the red barn.

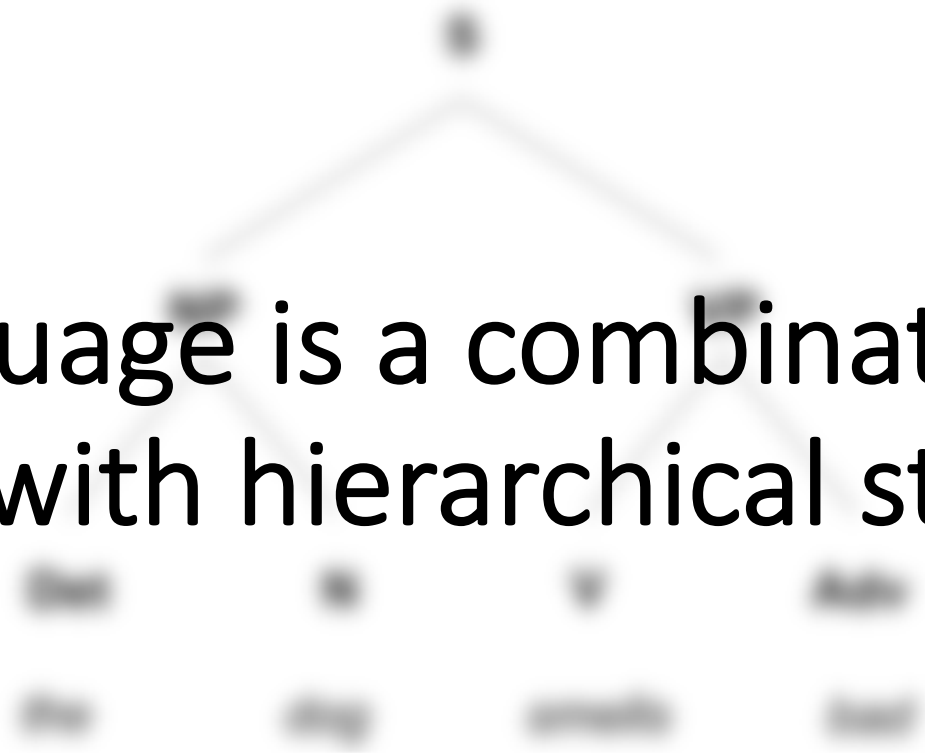


I painted the blue barn.

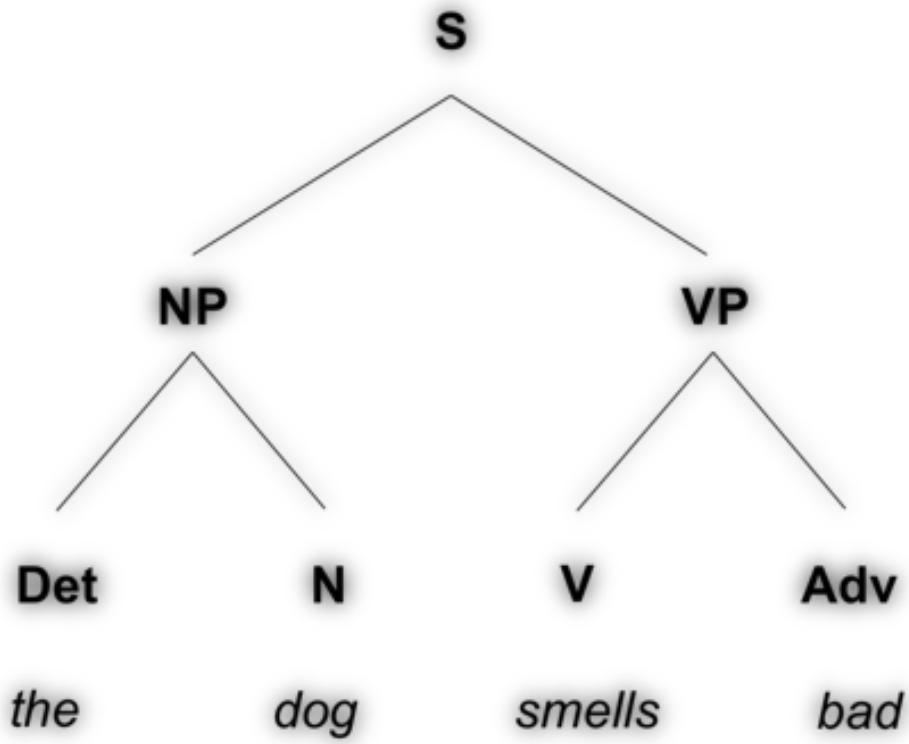
[video: Lila Gleitman and Noam Chomsky explain why not]

We know WHAT they are learning: rules

- We have lots of evidence that children acquire something like rules
  - Children overgeneralize rules in their productions (Brown 1973, Marcus et al. 1992, Pinker 1995, Yang 2002, Maslen et al. 2004) [video: overgenearlizations]
  - And they apply these rules to novel words in experiments (e.g. Berko, 1958) [video: the wug test]



Language is a combinatorial system with hierarchical structure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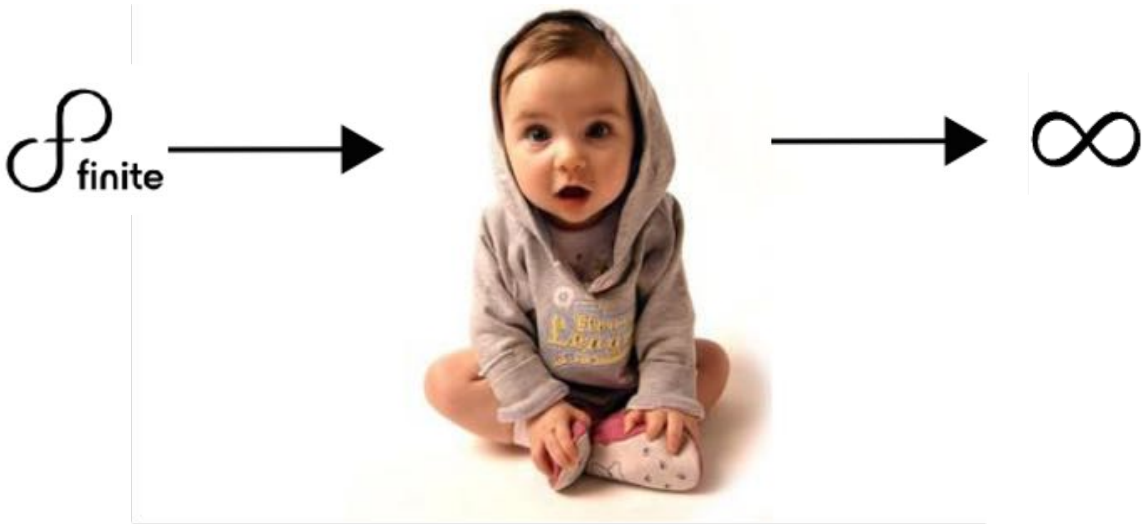
The problem of acquiring language



"Many curves can be drawn through a set of points, many laws are consistent with a set of observations, and many grammars are consistent with a set of sentences." - Pinker

Constraints on language acquisition

- The problem becomes more tractable if the possible hypotheses (or grammars) are constrained.
- How can we do this?
  - We assume the child comes equipped with **innate** learning biases.

What things are children born with and
what do they have to learn?

Are we born knowing the sounds of our language?

Werker and Tees (1984)

- English has two liquid consonants (”r” and “l”), Japanese has one
  - Japanese speakers have difficulty distinguishing the English sounds.

- Are you born knowing the sounds of your language? or do you learn this from experience. If the latter, how long does it take you to learn it?

- Test people at various ages to see when they can tell the difference.
  - easy with adults (which sound was it? – be at chance?)
  - but how can you ask this of babies? (conditioned head turn procedure)

Are we born knowing the sounds of our language?

Werker and Tees (1984)

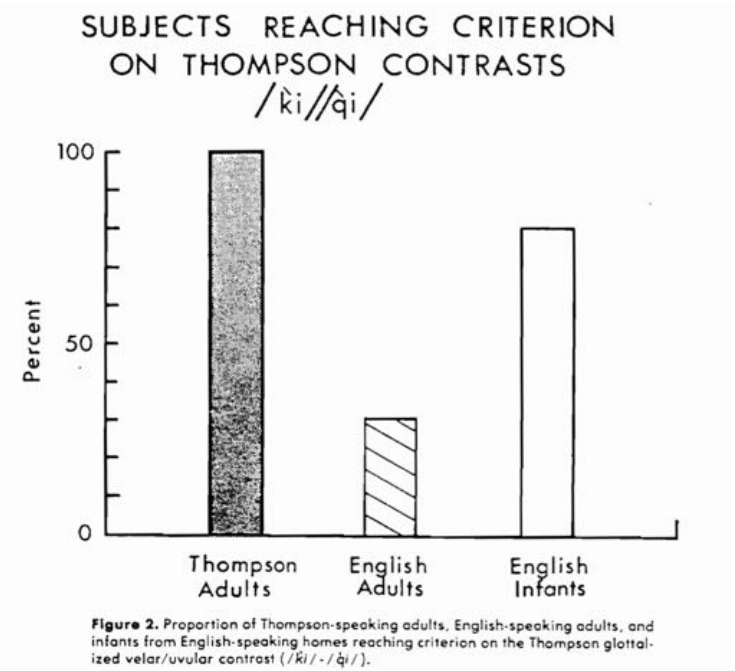


Figure 2. Proportion of Thompson-speaking adults, English-speaking adults, and infants from English-speaking homes reaching criterion on the Thompson glottalized velar/uvular contrast (/kì/-/qì/).

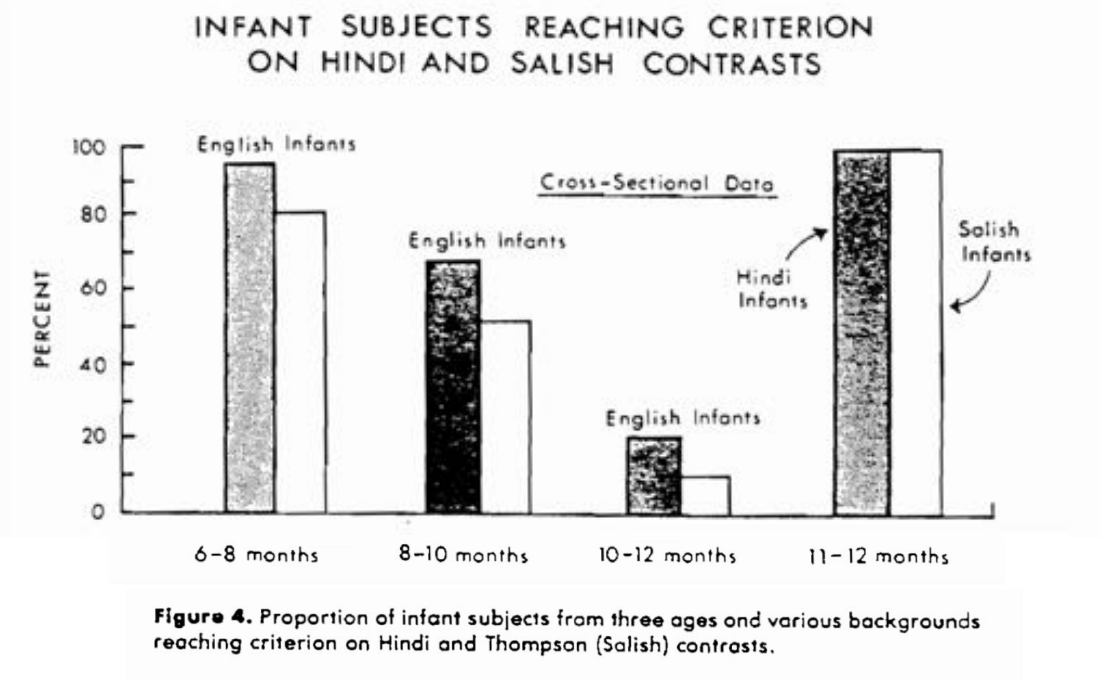


Figure 4. Proportion of infant subjects from three ages and various backgrounds reaching criterion on Hindi and Thompson (Salish) contrasts.

[video: Janet Werker explains the procedure]

Constraints on word learning

The whole object assumption

“gavagi”

Quine (1960)

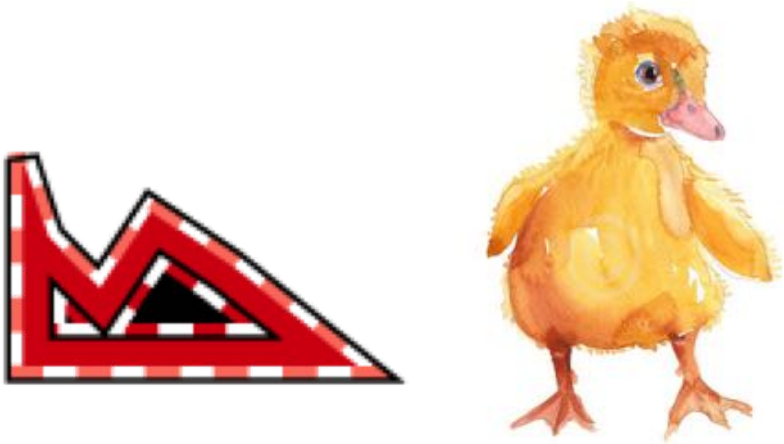
“gavagi”

Markman & Wachtel (1988)

Constraints on word learning

The mutual exclusivity principle

Clark (1990), de Villiers and de Villiers (1992), Markman (1991)



“point to the dax”

Constraints on word learning

The shape bias

Landau, Smith & Jones (1988)

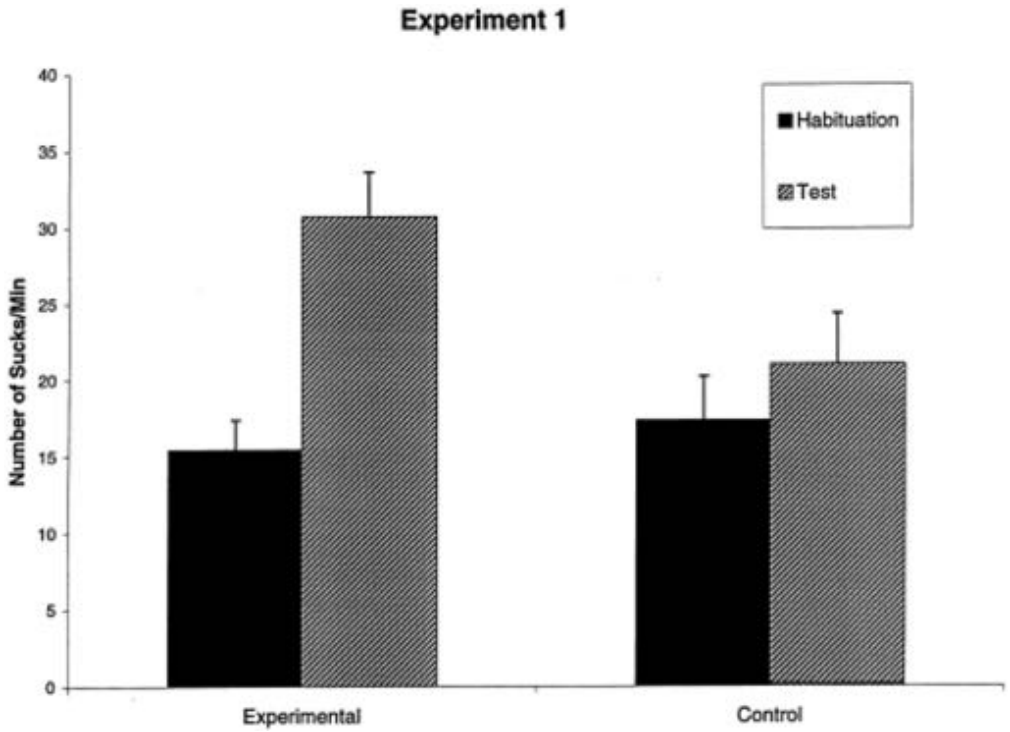
"this is a dax"

"show me the dax"

[video: object selection task]

Learning biases in brand new babies

Shi, Werker & Morgan (1999)



[video: high amplitude sucking procedure]

So far…

What are we investigating?	How do we investigate it? (experiments)
Imitation/Correction/Analogy	Natural language analyses • Spontaneous productions/corpus analysis • Looking to language for the limits of a theory
Rule learning	• Spontaneous productions (overgeneralizations) • The “wug” test
Speech sound discrimination	• Conditioned head turn procedure
Constraints on word learning	• Object selection task (forced choice)
Learning biases in the newborn	• High-amplitude sucking

When do children learn grammar?

Word order

The boy kicked the ball.

SUBJECT

OBJECT

[video: Kathy Hirsh-Pasek and Roberta Golinkoff explain the preferential looking paradigm]

Constraints on processing distance

Santelmann & Jusczyk (1998)

The dog is barking at the moon.

*The dog can barking at the moon.

The dog is loudly barking at the moon.

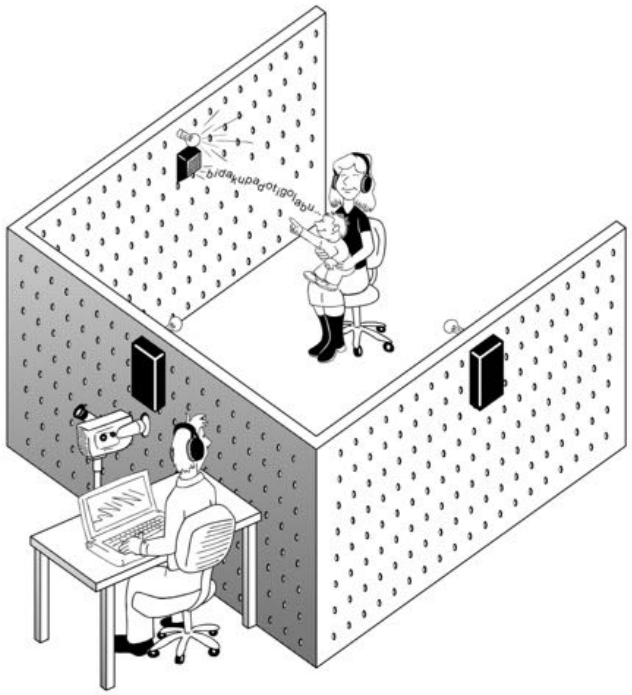
*The dog can loudly barking at the moon.

The dog is quite loudly barking at the moon.

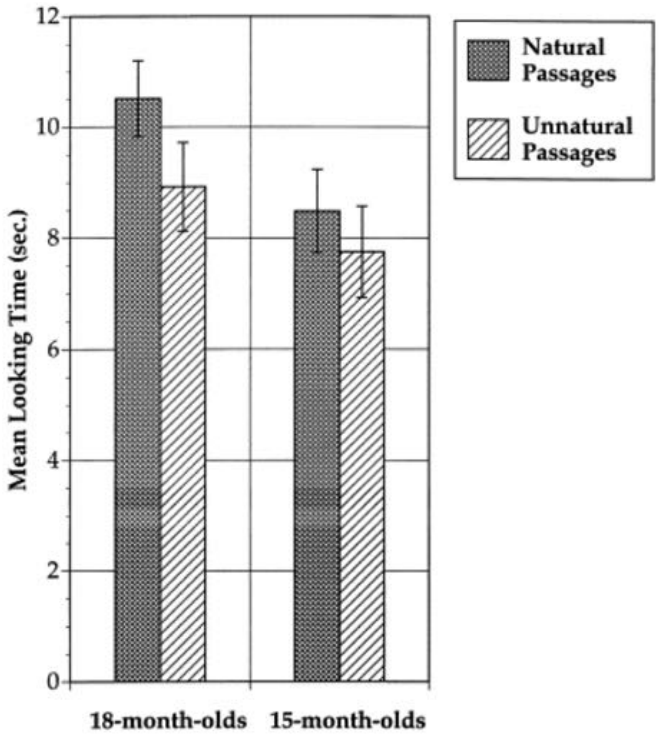
*The dog can quite loudly barking at the moon.

Constraints on processing distance

Santelmann & Jusczyk (1998)



[video: head turn preference]



Language universals and cognitive biases

- Languages are quite different from each other, but some linguistic properties are common to all languages.
- These shared properties suggest that humans have cognitive biases that shape the kinds of structures humans are able to learn.
- One way we can investigate these biases to ask how certain properties are distributed across the world's languages.

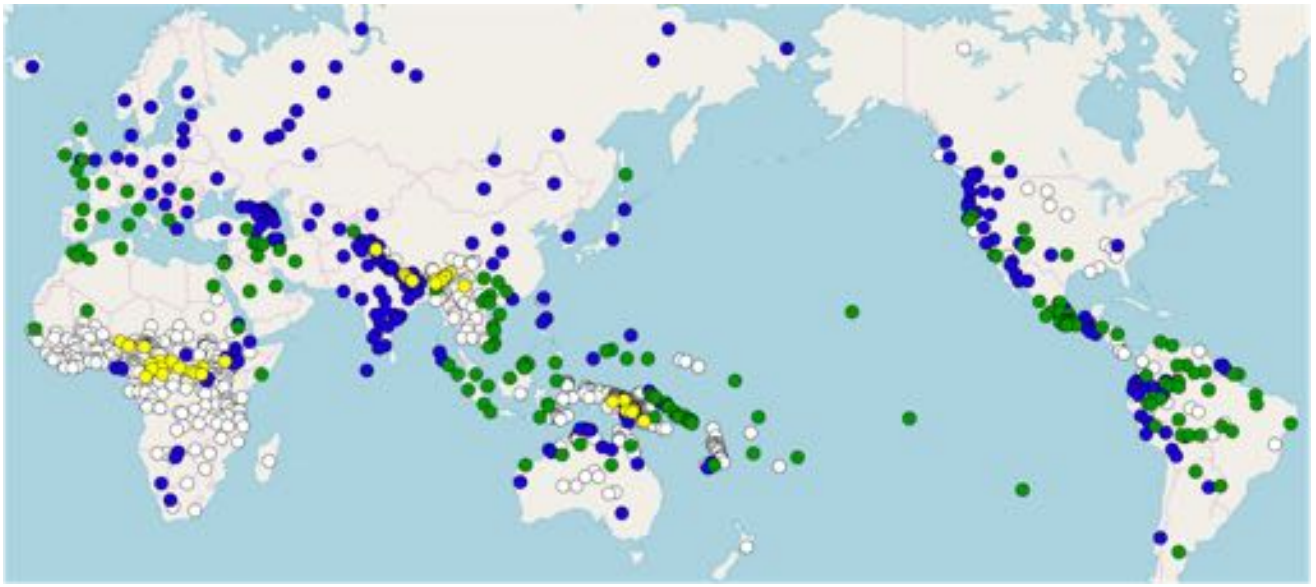
Bias for harmony patterns

- For example, languages like to put modifiers on the same side of the noun.
  - In English, we put them before the noun (aka: pre-nominal)

red balloon one balloon

adjectives go before the noun so do numerals

Bias for harmony patterns



[link to: The World Atlas of Language Structures Online]

Order of Numeral and Noun / Order of Adjective and Noun	Number of languages
Noun-Numeral / Noun-Adjective	509
Numeral-Noun / Adjective-Noun	251
Numeral-Noun / Noun-Adjective	168
Noun-Numeral / Adjective-Noun	37

HARMONIC

NON-HARMONIC

Test bias using artificial grammars

Culbertson & Newport (2017)

- Results: adults maintain whatever pattern they were exposed to, but the youngest children overwhelmingly prefer harmony.

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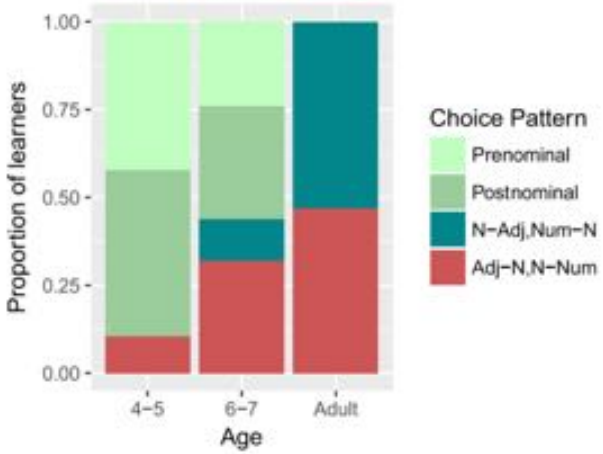
little kids change it to a harmonic language



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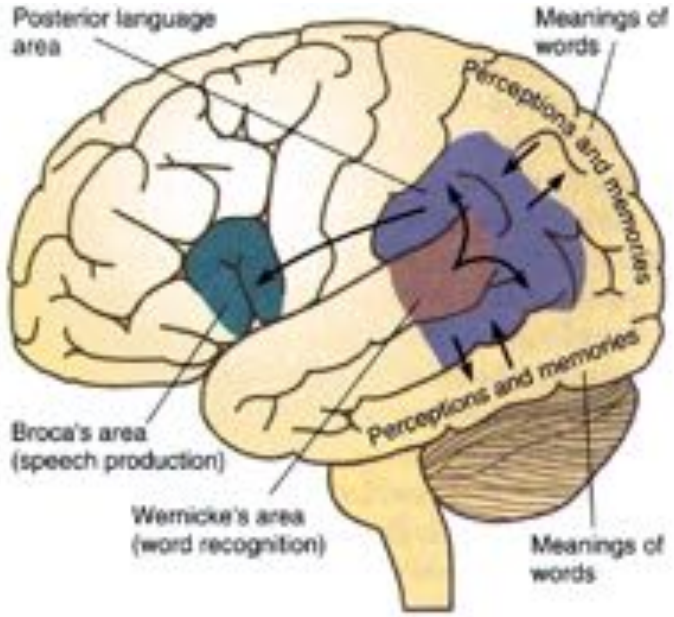
expose them to a non-harmonic language

Figure 2. Proportion of learners in each age group who prefer each of the four possible patterns.

What about their brains?

- Where is language learned in the brain?
  - Left-lateralized
- Are there constraints on what parts of the brain can learn language?
  - Look at language reorganization after a stroke.



What about their brains?

e.g. Staudt, et al. (2002) and many others

- In adult stroke survivors: where does language go when the left-lateralized language network is damaged?
  - Answer: in the mirror-image locations on the right side!
  - But there are still impairments (their brains are "set in its ways"; not as plastic as kids)

work in progress by Newport and colleagues (Georgetown University)

- In perinatal stroke survivors (baby has a stroke in the womb): where does language go if the left-side is damaged?
  - Answer: the mirror-image locations on the right side!
  - And children have very little impairment.

[NOTE: Figures removed due to sharing permissions.]

Summary

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Constraints on word learning	• Object selection task (forced choice)
Learning biases in the newborn	• High-amplitude sucking
Word order	• Preferential looking
Constraints on processing distance	• Head-turn preference
Language universals and cognitive biases	• Typological patterns across languages • Artificial language learning
Brain basis of language	• Brain imaging and patient studies

Thanks are in order!

The majority of the video demonstrations in this talk came from The Human Langauge series (part 3) produced by Gene Searchinger and The Baby Human series (episode: To Talk) produced by the Discovery Channel. The head-turn preference procedure video comes from Peter Juscyzk's Infant Language Lab at Johns Hopkins (circa 1999).

Much of this content is available for educational use via YouTube (links included throughout this talk).

A very **special thanks to the pioneering researchers** in Language Acquisition whose creative experimental methods have allowed us to ask such questions of babies and children. Especially (but not limited to) Lila Gleitman, Jean Berko-Gleason, Janet Werker, Ellen Markman, Jill de Villiers, Kathy Hirsh-Pasek, Roberta Golinkoff, Peter Jusczyk (and many more researchers not featured in this talk).