First Language Acquisition - Words

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COGS 4780

Acquisition of words

- With sounds in place and the ability to separate out words, the learning of words and their meanings can come next
- They understand that sets of sound consistently and systematically go together and can recognize these sets as patterns
- Linking those consistent patterns with consistent meaning is an entirely different step

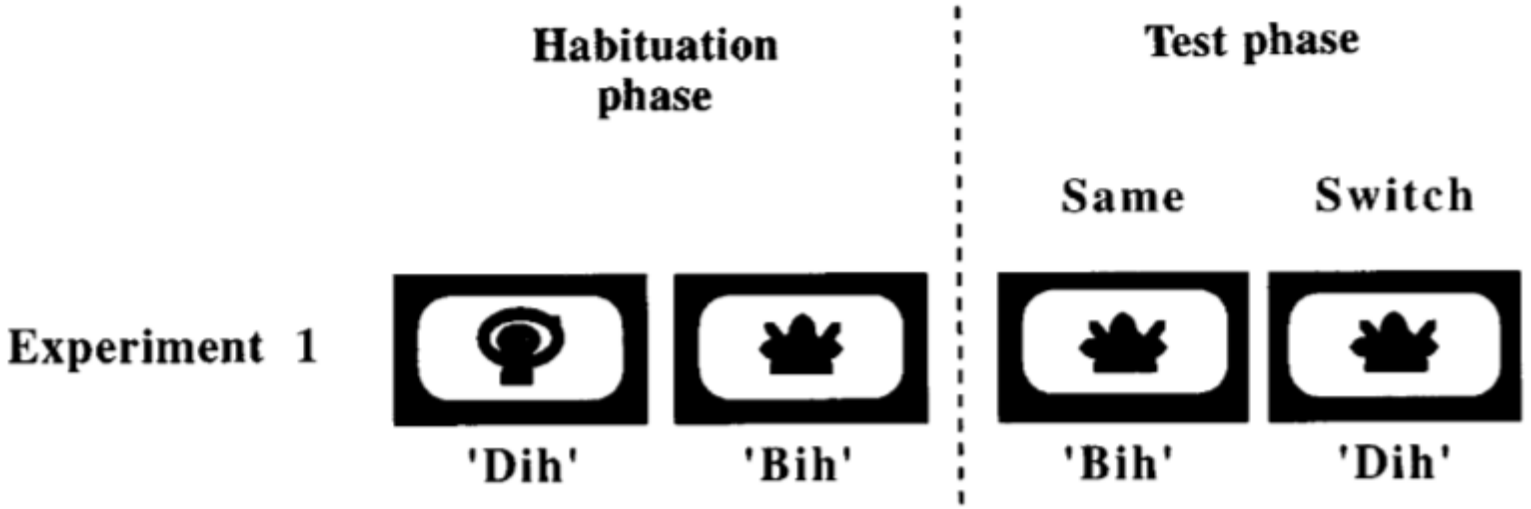
Switch task

- Switch task used to measure word learning in infants (Stager & Werker 1997)

- 14 month olds will look longer at “switch” trials, suggesting word learning

Switch task

- Switch task used to measure word learning in infants



- Not the case for “dih” vs “bih”

Switch task

- Switch task used to measure word learning in infants
- They're capable of distinguishing between [b] and [d]
  - But apparently not *bih* and *dih*

- Possible explanation: when vocabularies are small, less detail goes into a **lexical representation** (long term memory)
  - If you only know a few words, you can probably tell them apart without highly-specific phonetic information
    - More efficient to leave that information out
  - As you get older, you know more words and the need for detailed representations becomes necessary to distinguish all the words

Switch task

- Switch task used to measure word learning in infants
- They're capable of distinguishing between [b] and [d]
  - But apparently not *bih* and *dih*

- Another explanation: their lexical representations are complete and detailed, they're just easily confused and bad at retrieving those representations
  - Adults seem to also be bad at distinguishing similar-sounding pseudo words if they only hear them once or twice
  - And children can distinguish similar words if they're already familiar with one of them (like *dog* vs. *bog*)

Switch task

- 17 month olds exposed to 2.5 minutes of artificial language (Estes et al. 2007)
- After that, did a switch task
  - Half of the words were words from the sound clip
  - The other half were nonwords that appeared across boundaries in the clip
  - Words learned easier than nonwords
    - Evidence that children can take those sound segments and use them to help with learning meaning

Acquisition of words

- Babies seem to naturally know that new words typically refer to a full object – **whole-object bias**
  - Non-linguistically, babies as young as 3 months seem to understand objects
- This provides an advantage towards figuring out what new words are referring to
- But it makes learning categories more difficult
  - The word “dog” doesn’t just apply to this one dog present in the environment but rather every dog in every environment

Acquisition of words

- **Underextension** – applying the word to too small of a reference set (e.g., only this dog is “dog”)
- **Overextension –** applying the word to too large of a reference set (e.g., every brown animal is “dog”)

Acquisition of words

- Children collect evidence from incoming speech and seemingly can make decisions about the right category level with only 3 references (Xu & Tenenbaum 2007)
- Forming categories is fairly difficult

APPLE

PRESENT

DRINK

BED

GAME

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Acquisition of words

- Forming categories is fairly difficult
- In fact, it seems like words themselves help children group items into categories (Waxman & Markow 1995)

toma

toma

toma

toma

Acquisition of words

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Acquisition of words

- Forming categories is fairly difficult
- In fact, it seems like words themselves help children group items into categories (Waxman & Markow 1995)

toma

gluggo

ponkus

eebo

Acquisition of words

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Acquisition of words

- Forming categories is fairly difficult
- In fact, it seems like words themselves help children group items into categories (Waxman & Markow 1995)
- Still unclear exactly how infants know how to do this

Acquisition of words

jaf

Acquisition of words

jaf?

Social cues

- An important link here is that language use comes from *people*
- A swan isn’t inherently a swan, a swan is a swan because we call it a swan
- So the ability to understand intentions may play a role here
- Most elements of full Theory of Mind (ToM) don’t develop until around ~4
  - But some predecessor elements emerge earlier and these may help children learn language
    - **Joint attention**

Social cues

- If children hear a word spoken over a loudspeaker in the presence of an object, they won't use that information to learn the name of that word (Baldwin et al. 1996)
  - Perhaps after ~2 years they can learn from overhearing
- They will if the word is spoken by a person in the room with them
- Children also seem to understand adult reactions to objects (Tomasello & Barton 1994)
  - An adult says "let's look for the toma" and lifts objects from 5 different buckets
    - 4 objects the adult is unsatisfied and puts it back in the bucket
    - 1 objects the adult is satisfied and exclaims "ah!"
  - Children will learn that that 1 object is "toma"
- Associative learning + understanding intentions = word learning

Syntactic bootstrapping

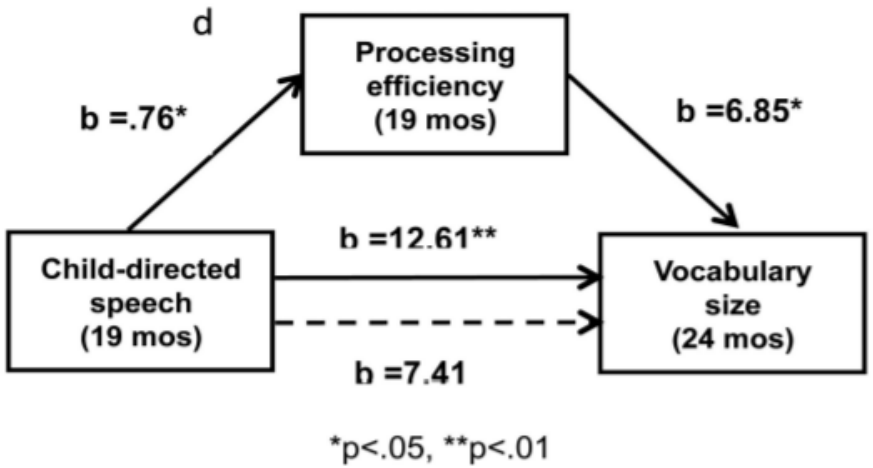
- Nouns seem to be the easiest for children to learn, so how do they go about learning other grammatical categories?
- Some basic understanding of morphosyntax seems to help here – **syntactic bootstrapping**
  - Verb endings (like -*s*, -*ing*, -*ed*) are attached to verbs
  - Function words help us learn categories
    - “this is a todd” vs. “this is Todd”

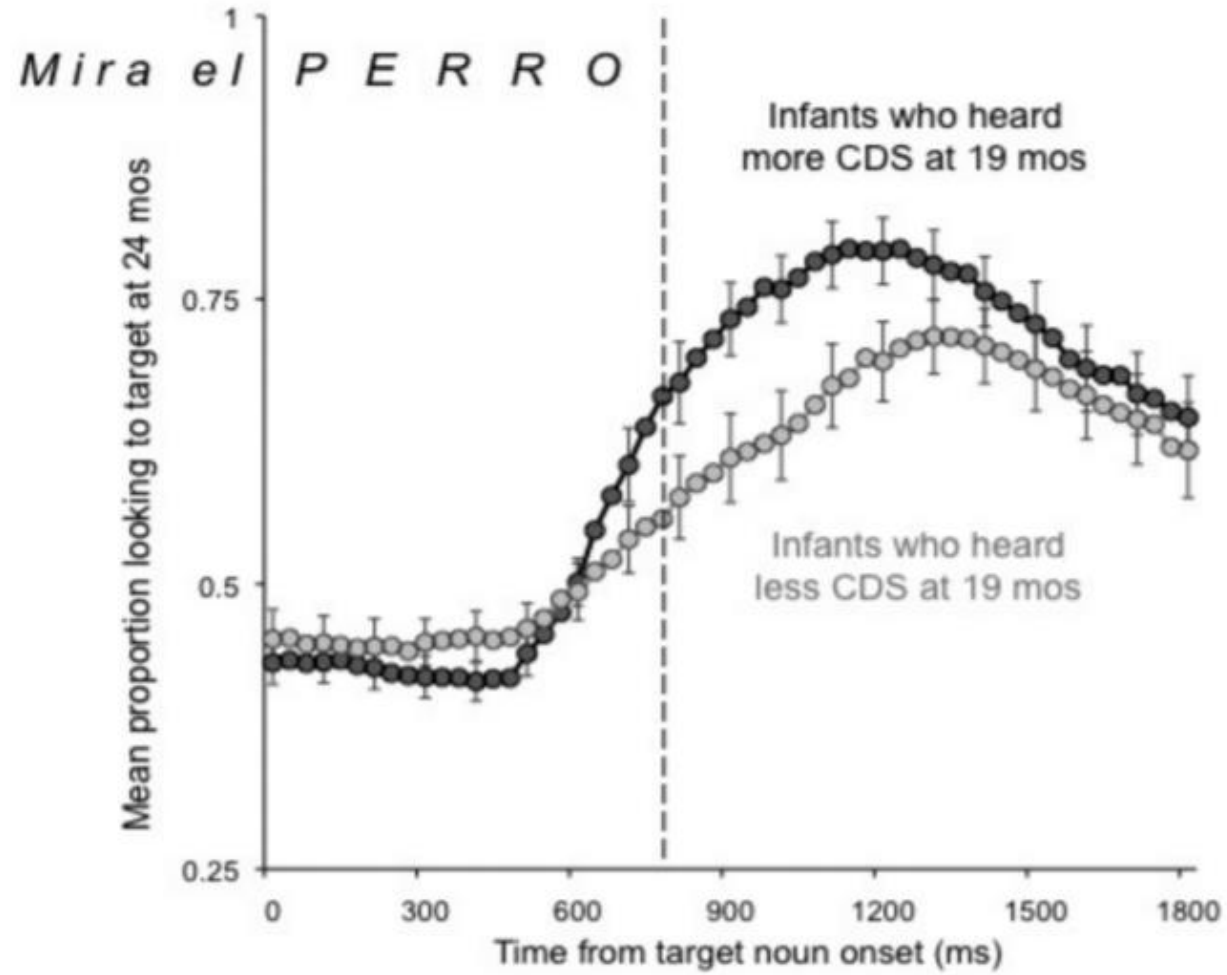
Input matters - quantity

- Children that are exposed to lots of language in the home develop larger vocabularies (Hart & Risley 1995)
  - That exposure correlates with parents' socioeconomic status, education level
  - Lower socioeconomic status → less language input → slower vocabulary learning → literacy skills gap

Input matters - quality

- Child-directed speech activates joint attention and can increase learning
- Varied input helps expose infants to a range of words and sentence structures and types (correlates with quantity)
  - Books tend to involve more varied words and sentences types than spoken language (Montag et al. 2015), so reading to even very young children will help their language learning abilities





Talking to children matters: Early language experience strengthens processing and builds vocabulary

Adriana Weisleder and **Anne Fernald**
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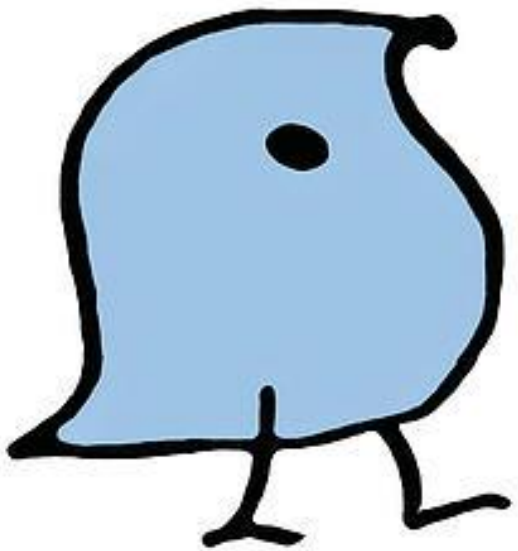
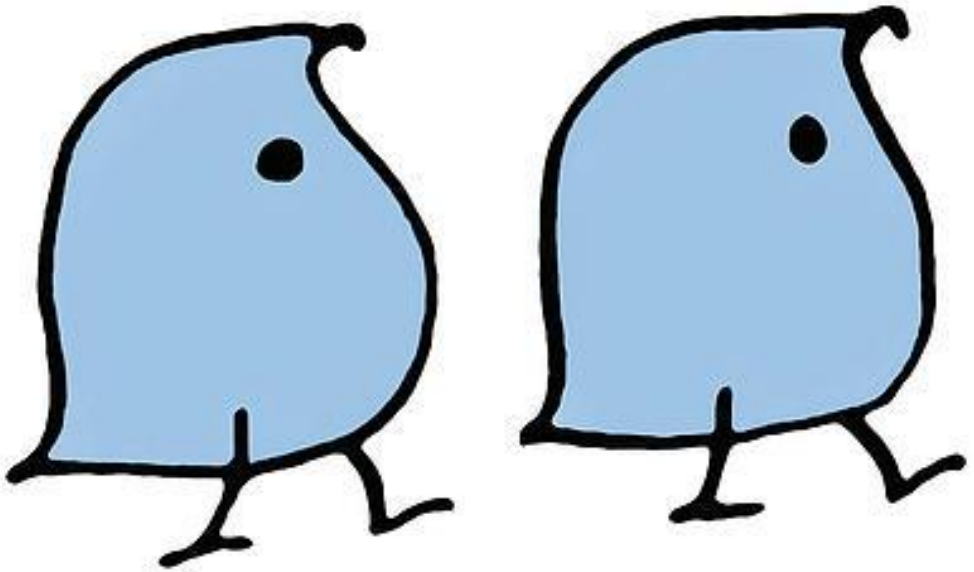
Input to intake

- Enhanced linguistic input yields better **linguistic intake** (what the child actually processes and internalizes)
- The more language a child knows, the easier it becomes for them to learn even more language
  - Improved ability to segment words in speech → improved learning of words
  - Improved syntactic boostrapping → improved learning of words
  - Improved learning of words → improved learning of new words

Learning morphology



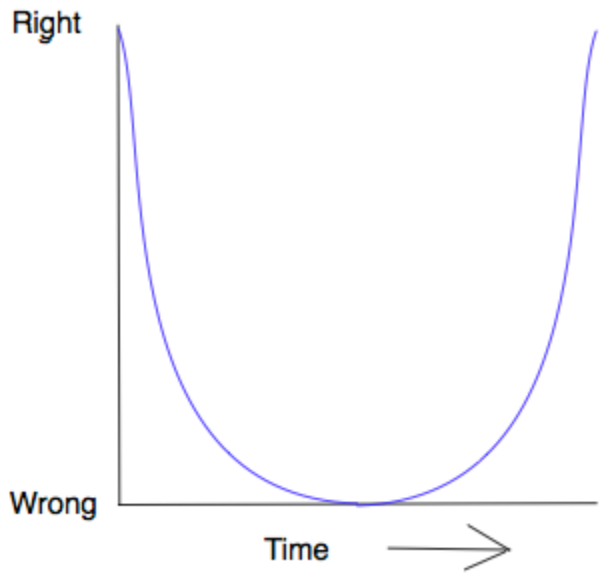
THIS IS A WUG®



NOW THERE IS ANOTHER ONE
THERE ARE TWO OF THEM
THERE ARE TWO _____

Learning morphology

- Wug test (Berko 1958) demonstrates that children can apply morphological knowledge in new instances
- The typical morphological pattern is one of **overregularization**
  - U-shaped learning:



Learning morphology

- Wug test (Berko 1958) demonstrates that children can apply morphological knowledge in new instances
- The typical morphological pattern is one of **overregularization**
  - U-shaped learning:
  - Children will at first produce a morpheme correctly, likely through repetition/imitation
  - Then they will learn the pattern and start overextending it, applying in cases where it shouldn’t be used
  - Then they learn the exceptions and return to correct productions

Learning morphology

Child: My teacher holded the baby rabbits and we patted them.

Mother: Did you say your teacher held the baby rabbits?

Child: Yes.

Mother: What did you say she did?

Child: She holded the baby rabbits and we patted them.

Mother: Did you say she held them tightly?

Child: No, she holded them loosely.

(Cazden 1972)

Learning morphology

- Two accounts of this learning pattern

- Producing regular forms involves the assembly of parts according to **abstract rules**, producing irregular forms involves retrieving items from memory
  - Two different psychological mechanisms underlying these processes
  - Those rules can either be UG-style innate or picked up through learning of these abstract general rules

Learning morphology

- Two accounts of this learning pattern

- Producing regular forms is also a process of memorization, and the extension happens by **analogy**
  - walk : walked :: bring : bringed

Learning morphology

- Even the irregulars demonstrate some patterns
  - blow/blew, grow/grew, throw/threw, know/knew
  - If regulars and irregulars come from fundamentally different systems, how can we explain the above pattern?
  - Or the fact that it’s not snow/snew or crow/crew?

Learning morphology

- A **connectionist** account (Rumelhart & McClelland 1986) abandons the idea of learning rules and favors the idea of learning probabilistic associations
- Given a verb stem, what's the most probable past tense form?
- A computational model built on these principles (and, perhaps, a human language learner) will be bad at first but improve performance over time
- Irregular forms get learned via statistical analogy over time

- Substantial critiques of this model (Pinker & Prince 1988)

Learning morphology

- A stronger claim is that that same system is used to learn the *regular* forms, too
  - We'll follow up with this next class

- Is learning of grammar **rule-based** or **statistical** in nature?

Reading for next time