Ling 240 Lecture #21

Language Acquisition #3
Agenda for today

• brief review of yesterday’s lecture
• More on learning of Subj-Aux Inversion and Crain & Nakayama study
• More on syntax learning in children
Brief review
Linguistic knowledge

• lexicon
• phonology
  – categories (phonemes)
  – phonological rules
• morphology (derivational, inflectional)
• syntax
  – phrase structure rules
  – transformations
• semantics
Task

• discriminate human voices from other noises
• abstract away differences in pitch (male, female diffs), volume, speed
• identify phonemes of target language
• learn to produce speech sounds (control airflow, timing of vocal cords, articulators)
• decode continuous speech signal into discrete words
Task (continued)

• combine sounds to make words
• combine morphemes to make words
• combine words to make phrases and sentences
Primary Linguistic Data (PLD)
Stages of Acquisition
Linguistic Stages

• Children all go through the same basic stages (though timing may vary)
# Pre-linguistic Stages

<table>
<thead>
<tr>
<th>Age</th>
<th>Production</th>
<th>Perception/Comprehension</th>
</tr>
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<tbody>
<tr>
<td>4-5 mo.</td>
<td>Babbling</td>
<td>Notices distinct phonemes from other languages</td>
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<tr>
<td>6-8 mo.</td>
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</table>
Linguistic Stages

10-18 mos

*one-word stage*

50% describe objects

*dog (not animal or poodle)*

50%

request for action: *up, open*

modifiers: *allgone, hot, more*

routines: *hi, bye-bye*
Linguistic Stages

10-18 mos one-word stage

Phonology:
  • no longer “Universal Listeners”
  • Syllables: CV

Syntax:
  • know word order (English SVO)
    (e.g., Hirsh-Pasek & Golinkoff)
## Linguistic Stages

<table>
<thead>
<tr>
<th>18 mo-2 yr</th>
<th>2 word stage</th>
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</thead>
<tbody>
<tr>
<td>all dry</td>
<td>all messy</td>
</tr>
<tr>
<td>Daddy sit</td>
<td>I go</td>
</tr>
<tr>
<td>siren bye-bye</td>
<td>see kitty</td>
</tr>
<tr>
<td>more milk</td>
<td>Mommy shoe</td>
</tr>
<tr>
<td></td>
<td>boot off</td>
</tr>
<tr>
<td></td>
<td>more bubbles</td>
</tr>
<tr>
<td></td>
<td>no bed</td>
</tr>
</tbody>
</table>
Linguistic Stages

2-5 years

• Vocabulary spurt
• longer utterances
• greater grammatical complexity
Linguistic Stages

Sequence of Negation formation:
1. no drink milk; no baby sleep
2. Baby no sleep; Me no drink milk
3. Baby won’t sleep; Me not hungry
4. I’m not hungry
rule learning
Mental grammar

• innate component + learned component

• Rule system – Do children have rules? If so, how do children learn rules?
Children as rule maker

- Children regularize the language input a lot

- This is seen in overgeneralization phenomena
U-shaped learning in past tense

- Stage 1: walked, played, came, went
- Stage 2: walked, played, comed, goed, holded
- Stage 3: walked, played, came, went, held

- memorization \(\rightarrow\) **overgeneralization** \(\rightarrow\) learn which verbs are irregular
Acquisition of rules: a theoretical model

+ PLD of English = Mental Grammar of English

+ PLD of Spanish = Mental Grammar of Spanish

+ PLD of Japanese = Mental Grammar of Japanese

...
Acquisition of rules: a theoretical model

\[ X + PLD_{LG} = MG_{LG} \]

\[ X = \text{the child’s contribution to the acquisition of } MG_{LG} \]

The task: to specify each element in the formula: \( X, PLD, \) and \( MG. \)
child grammar and linguistic principles
Structure-dependent rules

• Move the first auxiliary to the front.
  → Structure-independent rule

• Move the highest auxiliary to the front.
  → Structure-dependent rule
Which one is “the auxiliary” when there are more than one aux?

(7)  Mary is saying that she will leave.

(7’) Is Mary saying that she will leave?

(7”*) Will Mary is saying that she leave?
Crucial data

(8)  The child who was watching TV is crying.

(8’) *Was the child who watching TV is crying?

(8”) Is the child who was watching TV crying?

- “Move the first” hypothesis failed!
Summary: Adult Mental Grammar of English

• English SAI rule: Move the highest aux.
• Mental Grammar only allows the structure-dependent version of the rule.
PLD of English on SAI
The acquisition of SAI

• What kind of linguistic data is available to children acquiring SAI?
The CHILDES database

- A huge database of spontaneous speech by young children (age 2 – 6) in various languages

- Transcriptions of parent-child linguistic interactions

- What kinds of questions do children hear from adults?
The crucial data

- The distinction between the first vs. the highest of SAI

*Is the boy who was watching TV crying?*

- Must involve (more than) two auxiliaries
- The highest one ≠ the first one
- The highest, not the first, is moved.
Legate and Yang (2002)

- Child: Adam (2;7 - )

- Total parental utterances: 46,499
- Number of questions: 20,651

- The crucial sentences: 0
So…

• The PLD of English does not involve the crucial data to distinguish the first vs. the highest

• Therefore, both are completely compatible with the PLD.

• Therefore, the PLD does not tell children that “move the first” is wrong.
Summary

- English PLD does not involve the crucial data to distinguish “move the first” vs. “move the highest”

- Both structure-independent and structure-dependent versions of SAI are compatible with PLD.
the learner’s contribution
So far…

• Adult SAI rule: structure-dependent (“move the highest”)

• PLD: compatible with both structure-dependent and independent rules

• Question: How do we avoid the structure-independent rule?
The formula

\[
\begin{align*}
\text{X} & + \\
\text{PLD}_{\text{ENG}} & = \\
\text{MG}_{\text{ENG}}
\end{align*}
\]

*Structure-independent

Structure-dependent

Structure-independent

Structure-dependent

*Structure-independent

The learner must **know** that structure-independent rules are not allowed.
The poverty of stimulus argument

• PLD is compatible with both structure-dependent and structure-independent versions of SAI

• Still, adult Mental Grammar only allows the structure-dependent version (“Move the highest”)

• (Adherence to) structure-dependence must be a part of innate linguistic knowledge.
The poverty of stimulus argument

• Pointing out a gap between PLD and adult MG

• Arguing that the gap must be filled by X – innate knowledge that children bring to language acquisition
Crain and Nakayama 1987
Do children ever consider “move the first” rule?

• **Null-hypothesis:** children do not have innate grammatical knowledge that makes them ignore structure-independent rules.

• Prediction: children should consider the “move the first” rule, because the rule is simple and perfectly compatible with their experience.
Crain and Nakayama 1987

• “Elicited production” experiment

• Participants: English-speaking children (N=30, Age: 3;2 – 5;11)

• Group 1: 3;2 – 4;7 (Mean 4;3)
• Group 2: 4;7 – 5;11 (Mean 5;11)
Hey Tommy, look at this! Look at this picture!
Hey Tommy, look at this! Look at this picture!
What do you see Tommy?
A boy and a girl...
Yes, a boy and a girl!
Tommy, do you think the girl is tall?
Tommy:

Noooo! She is not tall!
Yeah I agree...but I wonder what Jabba would say...
Hey Tommy, why don’t you ask Jabba if the girl is tall? Ask Jabba if the girl is tall!
Is the girl tall?
He was right! Tommy, give him a strawberry!
Elicitation

• The experimenter never uses questions with SAI

*Do you think the girl is tall?*

*Ask Jabba if the girl is tall!*
Materials

• Pretest sentences
  a. The girl is tall
  b. The man is tired
  c. The pig next to the tree is red
Materials

• Test sentences
  a. The dog that is sleeping is on the blue bench.
  b. The ball that the girl is sitting on is big.
  c. The boy who is watching Mickey Mouse is happy.
  d. The boy who is unhappy is watching Mickey Mouse.
  e. The boy who is being kissed by his mother is happy.
  f. The boy who was holding the plate is crying.
“Ungrammatical” questions

- We are interested in whether children consider the “move the first” rule...

- *Is the boy who ___ watching MM is happy?*
  → structure-independent, or “TYPE III” error
“Ungrammatical” questions

• “Good” results
  Children never made any ungrammatical questions at all.

• Even stronger results
  Children made various ungrammatical questions, but they never made TYPE III errors.
Results I: did they make ungrammatical questions?

• YES.

<table>
<thead>
<tr>
<th></th>
<th>Grammatical</th>
<th>Ungrammatical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I</td>
<td>81</td>
<td>31 (38%)</td>
</tr>
<tr>
<td>Group II</td>
<td>87</td>
<td>70 (80%)</td>
</tr>
<tr>
<td>Total</td>
<td>168</td>
<td>101 (60%)</td>
</tr>
</tbody>
</table>

Note: Group 1 = mean age 4;3, Group 2 = mean age 5;3
What kind of ungrammatical questions did they make?

• Type I / “prefix” error

*Is the boy who is being kissed by his mother is happy?
What kind of ungrammatical questions did they make?

- Type II / “restarting” error

*Is the boy that is watching MM, is he happy?
Are there any Type III / “structure-independent” errors?

- *Is the boy who ___ watching MM is happy?*

<table>
<thead>
<tr>
<th>Group</th>
<th>Type I</th>
<th>Type II</th>
<th>Type III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I</td>
<td>30 (60%)</td>
<td>10 (20%)</td>
<td>0</td>
</tr>
<tr>
<td>Group II</td>
<td>9 (53%)</td>
<td>5 (29%)</td>
<td>0</td>
</tr>
</tbody>
</table>
Children never made Type III errors.

- That would suggest they never consider structure-independent movement rules: “move the first”.

What is the source of other errors?

- Type II: performance errors, adults do the same thing
What is the source of other errors?

• Type I errors
  *Is the boy who is being kissed by his mother is happy?

• Possibility #1: Just adding is to the original sentence (Japanese-style question formation)
What is the source of other errors?

• Type I errors
  *Is the boy who is being kissed by his mother is happy?

• Possibility #2: Copying is rather than moving it
“Copying” rule?

• Structure-independent copying rule
  “Copy the first aux”

• Structure-dependent copying rule
  “Copy the highest aux”

• Most of the test sentences involve two identical auxiliaries, so we cannot determine which one was copied…
So far…

• We have confirmed that children never consider structure-independent movement rules.

• However, there is still a possibility of structure-independent copying rule…
Revised test sentences

a. The boy who is happy can see Mickey Mouse.

b. The boy who is unhappy should fix his TV set.

c. The boy who can see Mickey Mouse is happy.

d. The boy who should be working is asleep.
Participants

• The child who made Type I errors in the previous experiment.
Possible sources

• “Copy the first aux” (S1)

• “Prefix is” (S2)

• “Copy the highest aux (S3)
Possible errors

The boy who is happy can see MM.

S1: Is The boy who is happy can see MM?

S2: Is The boy who is happy can see MM?

S3: Can The boy who is happy can see MM?
Possible errors

The boy who *can* see MM *is* happy.

S1: *Can* the boy who *can* see MM *is* happy.

S2: *Is* the boy who *can* see MM *is* happy.

S3: *Is* the boy who *can* see MM *is* happy.
Did they make structure-independent copying errors?

• **NO.**

• Total number of Type I errors – 11, but no clear S1 errors

• No Type III errors, again.
So now…

• We have confirmed that children never consider structure-independent rules.
Do children ever consider “move the first” rule?

• Null-hypothesis: children do not have innate grammatical knowledge that makes them ignore structure-independent rules.

• Prediction: children should consider the “move the first” rule, because the rule is simple and perfectly compatible with their experience.
Innate linguistic knowledge, or UG

• Structure-dependence is not a rule; it is a constraint on rules.

• UG restricts the range of possible rules that children consider in the course of language acquisition (rather than directly providing rules themselves)
Tomorrow

- Critical period (Genie video)
- Read Jackendoff Ch9, Curtiss paper (they are actually on the readings page…)
- HW5 (the last one!) will be assigned
Bonus lecture!
Language Acquisition

• We discussed in syntax that there are universal constraints on sentence interpretation

• How do we test what kind of interpretations children entertained?

• Truth Value Judgment Task

(cf. question-after-the-story task by De Villiers in the video)
Principle C
A Constraint on Interpretation

John thinks that he is a great cook
A Constraint on Interpretation

John thinks that he is a great cook

He thinks that John is a great cook
A Constraint on Interpretation

John thinks that he is a great cook

He thinks that John is a great cook
A Constraint on Interpretation

John thinks that he is a great cook

He thinks that John is a great cook
A Constraint on Interpretation

John thinks that he is a great cook

He thinks that John is a great cook
A Constraint on Interpretation

a. While John was reading the book, he ate an apple

b. While he was reading the book, John ate an apple

c. John ate an apple while he was reading the book

d. *He ate an apple while John was reading the book
A Constraint on Interpretation

a. While John was reading the book, he ate an apple

b. While he was reading the book, John ate an apple

c. John ate an apple while he was reading the book

d. *He ate an apple while John was reading the book
A Constraint on Interpretation

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b. While he was reading the book, John ate an apple

c. John ate an apple while he was reading the book

d. *He ate an apple while John was reading the book
A Constraint on Interpretation

S
 /  
NP John  VP
     /  
   V  NP
    ate the apple
A Constraint on Interpretation

S

S'

while he was reading the book

S

NP
John

VP

V
ate

NP
the apple
A Constraint on Interpretation

```
S
  └── S'
      ├── Comp while
      └── S
          ├── NP he
          └── VP
              └── was reading the book
      └── S
          └── NP John
              └── VP
                  └── V ate
                      └── NP the apple
```
A Constraint on Interpretation

\[
\text{S} \\
\text{NP} \quad \text{VP} \\
\text{John} \quad \text{V} \quad \text{NP} \\
\text{ate} \quad \text{the apple}
\]
A Constraint on Interpretation

S

NP
John

VP

V
ate

NP
the apple

S'

while he was
reading the book
A Constraint on Interpretation

\[ \text{S} \]
\[ \text{NP} \quad \text{VP} \]
\[ \text{NP} \quad \text{VP} \quad \text{VP} \]
\[ \text{NP} \quad \text{VP} \quad \text{NP} \quad \text{VP} \quad \text{NP} \quad \text{VP} \]
\[ \text{V} \quad \text{ate} \quad \text{NP} \quad \text{the apple} \quad \text{Comp} \quad \text{while} \quad \text{S' } \quad \text{S} \]
\[ \text{while} \quad \text{S} \quad \text{NP} \quad \text{he} \quad \text{VP} \quad \text{was reading the book} \]
A Constraint on Interpretation

While John was reading the book, he ate the apple
While he was reading the book, John ate the apple
A Constraint on Interpretation

John ate the apple while he was reading the book
He ate the apple while John was reading the book
A Constraint on Interpretation

• A name must not be bound (c-commanded by an NP and be coreferential with it)

• ‘Principle C’ (Chomsky 1981)
**A Constraint on Interpretation**

a. While John was reading the book, he ate an apple

b. While he was reading the book, John ate an apple

c. John ate an apple while he was reading the book

d. *He ate an apple while John was reading the book

Hard to learn from input (even if there is any relevant input)
Language Acquisition

• Young children never say sentences like this, and probably almost never hear them

• Question is: what meanings do children allow?

• Strategy: set up a situation in which the relevant meaning is present -- can a child associate that meaning with the relevant sentence?

• Truth Value Judgment Task
Truth Value Judgment Task

“I know what happened in this story…”
Truth Value Judgment Task

Principle C in children:
English - Crain & McKee (1985)
Russian - Kazanina & Phillips (2001), etc.
“Hello, Eeyore! I see that you’re reading a book.”
“What a fine-looking apple.”
“No, Pooh. You can’t eat the apple - that’s my apple.”
“Ok, I’ll have to eat a banana instead.”
“Ok, Pooh. I’ve finished reading. Now you can read the book.”
“Great. Now that Pooh is reading the book, I can eat this delicious apple.”
“I shouldn’t be such a greedy donkey - I should let Pooh eat the apple.”
“I suppose I have to eat a banana instead.”
“Here you are, Pooh. You can have the apple.”
“Oh, I’m such a lucky bear! I can read the book, and I can eat the apple, at the same time.”
Apple is eaten up.
OK, that was a story about Eeyore and Winnie-the-Pooh. First Eeyore was reading the book and then Winnie-the-Pooh was reading the book. I know one thing that happened...

While Pooh was reading the book, he ate the apple.
OK, that was a story about Eeyore and Winnie-the-Pooh. First Eeyore was reading the book and then Winnie-the-Pooh was reading the book. I know one thing that happened...

While he was reading the book, Pooh ate the apple.
OK, that was a story about Eeyore and Winnie-the-Pooh. First Eeyore was reading the book and then Winnie-the-Pooh was reading the book. I know one thing that happened...

Pooh ate the apple while he was reading the book.
OK, that was a story about Eeyore and Winnie-the-Pooh. First Eeyore was reading the book and then Winnie-the-Pooh was reading the book. I know one thing that happened...

He ate the apple while Pooh was reading the book.
A Constraint on Interpretation

a. While John was reading the book, he ate an apple — yes!
b. While he was reading the book, John ate an apple — yes!
c. John ate an apple while he was reading the book — yes!
d. *He ate an apple while John was reading the book — no!
How the Task Works

• Child is not being judged
• Identical story for all test sentences
• Avoids child’s ‘yes’ bias - child shows knowledge by answering “no”
• Story favors the ungrammatical meaning
• Story is set up to make “no” answer felicitous
How the Task Works

- Child is not being judged
- Identical story for all test sentences
- Avoids child’s ‘yes’ bias - child shows knowledge by answering “no”
- Story favors the ungrammatical meaning
- Story is set up to make “no” answer felicitous
How the Task Works

• Child is not being judged
  – child understands that (s)he is helping the experimenter to test a puppet (e.g. Kermit)
  – child does not feel that (s)he is being tested, and so feels under less pressure
  – child’s response is very simple yes/no
How the Task Works

• Child is not being judged
• Identical story for all test sentences
• Avoids child’s ‘yes’ bias - child shows knowledge by answering “no”
• Story favors the ungrammatical meaning
• Story is set up to make “no” answer felicitous
How the Task Works

• Identical story for all test sentences
  – only difference is in the final sentence that Kermit utters
  – if children respond differently to the different test sentences, this can’t be due to any differences in the stories
How the Task Works

- Child is not being judged
- Identical story for all test sentences
- Avoids child’s ‘yes’ bias - child shows knowledge by answering “no”
- Story favors the ungrammatical meaning
- Story is set up to make “no” answer felicitous
OK, that was a story about Eeyore and Winnie-the-Pooh. First Eeyore was reading the book and then Winnie-the-Pooh was reading the book. I know one thing that happened...

He ate the apple while Pooh was reading the book.
How the Task Works

• Child is not being judged
• Identical story for all test sentences
• Avoids child’s ‘yes’ bias - child shows knowledge by answering “no”
• Story favors the ungrammatical meaning
• Story is set up to make “no” answer felicitous
OK, that was a story about Eeyore and Winnie-the-Pooh. First Eeyore was reading the book and then Winnie-the-Pooh was reading the book. I know one thing that happened...

He ate the apple while Pooh was reading the book.
OK, that was a story about Eeyore and Winnie-the-Pooh. First Eeyore was reading the book and then Winnie-the-Pooh was reading the book. I know one thing that happened...

He ate the apple while Pooh was reading the book.
How the Task Works

• Child is not being judged
• Identical story for all test sentences
• Avoids child’s ‘yes’ bias - child shows knowledge by answering “no”
• Story favors the ungrammatical meaning
• Story is set up to make “no” answer felicitous
Making “no” answers possible

He ate the apple while Pooh was reading the book.
...aka: Plausible Denial

He ate the apple while Pooh was reading the book.
Plausible Denial

He ate the apple while Pooh was reading the book.
Plausible Denial

He ate the apple while Pooh was reading the book.

TRUE - but ungrammatical
Plausible Denial

He ate the apple while Pooh was reading the book.

TRUE - but ungrammatical

He ate the apple while Pooh was reading the book.
Plausible Denial

He ate the apple while Pooh was reading the book.

TRUE - but ungrammatical

He ate the apple while Pooh was reading the book.

Eeyore
Plausible Denial

He ate the apple while Pooh was reading the book.

TRUE - but ungrammatical

He ate the apple while Pooh was reading the book.

Eeyore Grammatical - but FALSE
Plausible Denial

He ate the apple while Pooh was reading the book.

**TRUE - but ungrammatical**

He ate the apple while Pooh was reading the book.

**Eeyore Grammatical - but FALSE**

clearly FALSE, since it *almost* happened, but then didn’t
“Great. Now that Pooh is reading the book, I can eat this delicious apple.”
“I shouldn’t be such a greedy donkey - I should let Pooh eat the apple.”
“I suppose I have to eat a banana instead.”
3-4 Year Old English Speakers

a. While John was reading the book, he ate an apple

b. While he was reading the book, John ate an apple

c. John ate an apple while he was reading the book

d. *He ate an apple while John was reading the book
Definitely Hard to Observe

a. While John was reading the book, he ate an apple — yes!
b. While he was reading the book, John ate an apple — yes!
c. John ate an apple while he was reading the book — yes!
d. *He ate an apple while John was reading the book — no!

Works for English, Italian, Russian etc.
Definitely Hard to Observe

a. While John was reading the book, he ate an apple  
   yes!

b. While he was reading the book, John ate an apple  
   yes!

c. John ate an apple while he was reading the book  
   yes!

d. *He ate an apple while John was reading the book  
   no!

It’s a good thing that it’s a Universal constraint!
Interim Conclusion

• Structural relations such as c-command can explain a variety of syntactic constraints

• …including some constraints which may apply across all languages of the world

• Universal constraints may not need to be learned

• Children know ‘Principle C’ before age 3, i.e. as early as it has been possible to test
English vs. Russian

• Russian shows two constraints that look very similar on the surface - they prevent a pronoun from coreferring with a later NP
• One is universal…
  One is specific to Russian (and a few others)

→ English and Russian parameter settings differ

(Kazanina & Phillips 2001)
a. While John was reading the book, he ate an apple...yes!
b. While he was reading the book, John ate an apple...no!
c. John ate an apple while he was reading the book...yes!
d. *He ate an apple while John was reading the book...no!

(Kazanina & Phillips 2001)
5-6 Year Old Russian Speakers

a. While John was reading the book, he ate an apple — yes!
b. While he was reading the book, John ate an apple — no!
c. John ate an apple while he was reading the book — yes!
d. *He ate an apple while John was reading the book — no!

(Kazanina & Phillips 2001)
3 Year Old Russian Speakers

a. While John was reading the book, he ate an apple  
   yes!

b. While he was reading the book, John ate an apple  
   yes!

c. John ate an apple while he was reading the book  
   yes!

d. *He ate an apple while John was reading the book  
   no!

(Kazanina & Phillips 2001)
English kids vs. Russian kids

• Russian shows two constraints that look very similar on the surface - they prevent a pronoun from coreferring with a later NP
• One is universal…
  One is specific to Russian (and a few others)
• At age 3, Russian children know the Universal constraint, but not the Russian-specific constraint
• At age 3, Russian and English children behave alike!

(Kazanina & Phillips 2001)