Psych 56L/ Ling 51: Acquisition of Language

Lecture 12

Development of Morphology & Syntax I

Announcements

- HW2 due today
- Review questions for syntax and morphology available
- HW 3 available (begin working on it): due 3/1/11

Adult Knowledge: The Target State for Morphology

Words and word parts

The smallest unit manipulated by the rules of syntax is *not* a single word. Instead there are units smaller than words that play a role, called morphemes.

One goblin.
Two goblins. goblins = goblin + s =  + plural

Morpheme = smallest unit of meaning

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Bound morpheme = morpheme that can't stand on its own - it must be attached to something

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One goblin.
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Free morpheme = morpheme that can stand on its own - it does not need to be attached to another morpheme

Types of Morphology

Inflectional morphology: adds grammatical information, but does not change the word's category (nouns stay nouns, verbs stay verbs, etc.)

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He shrugs. shrugs = shrug + s =  + present tense

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One goblin.
Two goblins. goblins = goblin + s =  + plural

He shrugs. shrugs = shrug + s = + present tense
He shrugged. shrugged = shrug + ed =  + past tense

Types of Morphology

Derivational morphology: forms a new word, potentially changing the word's category (nouns become adjectives, verbs become nouns, etc.)

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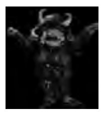
goblinish goblinish = goblin + ish =  + similar to

Types of Morphology

Derivational morphology: forms a new word, potentially changing the word's category (nouns become adjectives, verbs become nouns, etc.)

goblin
goblinish   goblinish = goblin + ish =  + similar to

shrug
shrugger   shrugger = shrug + er =  + one who does that action

Crosslinguistic Comparison

English does not have a rich morphological system, compared to other languages. Instead, English mostly relies on word order to indicate who did what to whom.

Languages like Hungarian, however, rely more on morphology.

"The boy gave a book to the girl."

A	fiú	könyvet	adott	a	lánynak.
The	boy	a book+ACC	gave	the	girl+DAT

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Inflectional morphology: ACC = accusative case = direct object (thing given)

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Inflectional morphology: DAT = dative case = indirect object (recipient of giving)

Morphology Recap

Morphology refers to how words are put together to convey meaning.

The smallest units of meaning are morphemes, which can be smaller than a whole word.

Some morphology can change the category of a word (derivational), while other morphology does not (inflectional).

Languages vary on how rich their system of morphology is. Children must learn how their language puts words together, and what types of meaning can be conveyed via morphology.

Adult Knowledge: The Target State for Syntax

Creativity of Human Language

Ability to combine signs with simple meanings to create
(1) Utterances with complex meanings
(2) Novel expressions
(3) *Infinitely* many

Sentences never heard before...
"Some tulips are starting to samba on the chessboard."

Sentences of prodigious length...
"Hoggle said that he thought that the odiferous leader of the goblins had it in mind to tell the unfortunate princess that the cries that she made during her kidnapping from the nearby kingdom that the goblins themselves thought was a general waste of countryside ..."

An Account That Won't Work

"You just string words together in an order that makes sense"

In other words...

"***Syntax*** is determined by ***Meaning***"
(The way words are put together is determined solely by what they mean)

Syntax is More than Meaning

Nonsense sentences with clear syntax

Colorless green ideas sleep furiously. (Chomsky)
A verb crumpled the ocean.
I gave the question a goblin-shimmying egg.

…which are incomprehensible when the syntax is nonsense
*Furiously sleep ideas green colorless.
Ocean the crumpled verb a.
*The question I an egg goblin-shimmying gave.

Syntax is More than Meaning

Famous nonsense sentences with clear syntax

'Twas brillig and the slithy toves
Did gyre and gimble in the wabe;
All mimsy were the borogroves,
And the mome raths outgrabe

Beware the Jabberwock, my son!
The jaws that bite, the claws that catch!
Beware the Jubjub bird, and shun
The frumious Bandersnatch!"

Lewis Carroll, *Jabberwocky*

Syntax is More than Meaning

'It seems very pretty,' she said when she had finished it, 'but it's RATHER hard to understand!' (You see she didn't like to confess, even to herself, that she couldn't make it out at all.) 'Somehow it seems to fill my head with ideas -- only I don't exactly know what they are! However, SOMEBODY killed SOMETHING: that's clear, at any rate -- '

Syntax is More than Meaning

And these same nonsense sentences with nonsense syntax are incomprehensible…

'Toves slithy the and brillig 'twas
wabe the in gimble and gyre did...

Syntax is More than Meaning

Ungrammatical sentences that make perfect sense

Jareth put the cape on.
Jareth put on the cape.

Jareth put it on.
*Jareth put on it.

Syntax is More than Meaning

Ungrammatical sentences that make perfect sense

Sarah gave a ring to the Wiseman.
Sarah gave him a ring.

Sarah donated a ring to the Wiseman.
*Sarah donated him a ring.

Syntax is More than Meaning

Ungrammatical sentences that make perfect sense

Jareth made Hoggle leave.
Jareth let Hoggle leave.
Jareth saw Hoggle leave.
*Jareth wanted Hoggle leave.

*Jareth made Hoggle to leave.
*Jareth let Hoggle to leave.
*Jareth saw Hoggle to leave.
Jareth wanted Hoggle to leave.

Syntax is More than Meaning

Cross-language Variation

If syntax was entirely determined by meaning, then we should not expect to find syntactic differences between languages of the world….but we do see variation.

English:	Sarah	sees	that book.
Korean:	Sarah	ku chayk	poata.
	Sarah	that book	see

Syntax is More than Meaning

Cross-language Variation

If syntax was entirely determined by meaning, then we should not expect to find syntactic differences between languages of the world….but we do see variation.

English:
Baso put the money in the cupboard.

Selayarese (spoken in Indonesia):

Lataroi	doe	injo	ri	lamari	injo	i Baso.
put	money	the	in	cupboard	the	Baso

So…what does determine how you string words together?

Answer: Syntax!

(That is, our knowledge of the possible *forms* of sentences in our language.)

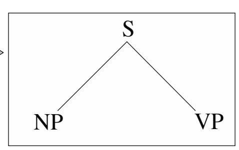
"***Syntax*** is determined by ***Meaning***"
(The way words are put together is determined solely by what they mean)

A Template

A sentence consists of a Noun Phrase followed by a Verb Phrase

S --> NP VP   Phrase Structure Rule

Phrase Structure Tree



A Template

Noun Phrase	Verb Phrase
Hoggle	slept
The chicken	tricked the guards
Seven goblins	left
Sarah	said that Ludo thought that pixies were nasty
A feeling	kicked the bucket
The strangest story that you ever did hear	got drunk on dwarf wine

A Template

Noun Phrase

- Hoggle
- The chicken
- Seven goblins
- Sarah
- A feeling
- The strangest story that you ever did hear

Verb Phrase

- slept
- tricked the guards
- left
- said that Ludo thought that pixies were nasty
- kicked the bucket
- got drunk on dwarf wine

6 Sentences

A Template

Noun Phrase

- Hoggle
- The chicken
- Seven goblins
- Sarah
- A feeling
- The strangest story that you ever did hear

Verb Phrase

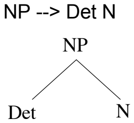
- slept
- tricked the guards
- left
- said that Ludo thought that pixies were nasty
- kicked the bucket
- got drunk on dwarf wine

36 Sentences

A Template

Noun Phrase

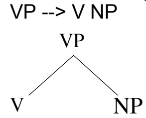
NP --> Det N



NP --> N

Verb Phrase

VP --> V NP



VP --> V

A Tiny Little Grammar

5 Rules

S --> NP VP

NP --> Det N

NP --> N

VP --> V NP

VP --> V

9 Words

Det: *the, four, some*

N: *goblins, crystals, peaches*

V: *understood, ate, approached*

468 Sentences

A Tiny Little Grammar

5 Rules

S --> NP VP

NP --> Det N

NP --> N

VP --> V NP

VP --> V

30 Words

Det: *the, four, some + 7 more*

N: *goblins, crystals, peaches* + 7 more

V: *understood, ate, approached + 7 more*

122,100 Sentences

Embedded Sentences

Additional VP Rule

Hoggle thought Sarah ate the peach.

VP → V S

Sentence-inside-a-sentence
Recursion

Ludo said Hoggle thought Sarah ate the peach.

The fairy claimed Ludo said Hoggle thought Sarah ate the peach.

The Wiseman's birdhat hoped the fairy claimed Ludo said Hoggle thought Sarah ate the peach.

Infinitely many sentences can be generated!

Complementizer

Complementizer (Comp): words like THAT, IF, and WHETHER that allow one sentence to be the subject or object of another sentence

Hoggle realized **that** Sarah ate the peach.
Whether Sarah ate the peach didn't matter.

S' → Comp S
VP → V S'
S → S' VP

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Example of Recursion 1:
S expands to include S'
S' expands to include S

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S' → Comp S
VP → V S'
S → S' VP

Example of Recursion 2:
S expands to include VP
VP expands to include S'
S' expands to include S

A Slightly Bigger Grammar

9 Rules

S --> NP VP
S --> S' VP

NP --> Det N
NP --> N

VP --> V NP
VP --> V
VP --> V S
VP --> V S'

S' --> Comp S

Sentences it can generate:

Hoggle likes jewels.

A Slightly Bigger Grammar

9 Rules

$\boxed{\text{S --> NP VP}}$
S --> S' VP

NP --> Det N
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Sentences it can generate:

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S --> NP VP

NP --> N VP --> V NP

A Slightly Bigger Grammar

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S --> NP VP
S --> S' VP

NP --> Det N
NP --> N

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VP --> V
VP --> V S
VP --> V S'

S' --> Comp S

Sentences it can generate:

Hoggle likes jewels.

S --> NP VP

NP --> N   VP --> V NP

N   V NP

Hoggle   likes jewels.

A Slightly Bigger Grammar

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NP --> Det N
NP --> N

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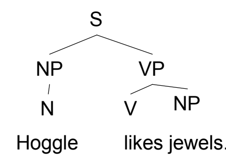

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Sentences it can generate:

Sarah thought that she solved the Labyrinth.

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Sarah   thought   S' --> Comp S

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Sentences it can generate:

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NP --> N   VP --> V S'
N   V   S'
Sarah   thought   Comp S
that

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Sentences it can generate:

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Sarah   thought that   S

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Sentences it can generate:

Sarah thought that she solved the Labyrinth.

S --> NP VP
NP --> N   VP --> V S'
N   V   S'
Sarah   thought that   S --> NP VP

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Sarah thought that she solved the Labyrinth.

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NP --> N   VP --> V S'
N   V   S'
Sarah   thought that   NP VP
NP --> N   VP --> V NP

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Sentences it can generate:

Sarah thought that she solved the Labyrinth.

S --> NP VP
NP --> N   VP --> V S'
N   V S'
Sarah   thought that NP VP
NP --> N   VP --> V NP
N   V NP
she   solved

A Slightly Bigger Grammar

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N   V S'
Sarah   thought that NP VP
NP --> N   VP --> V NP
N   V NP
she   solved
NP --> Det N

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N   V S'
Sarah   thought that NP VP
NP --> N   VP --> V NP
N   V NP
she   solved
Det   N
the Labyrinth

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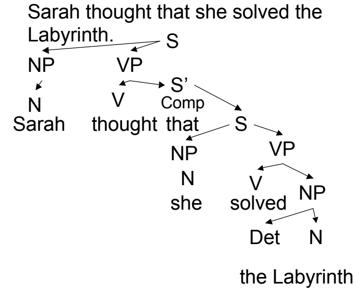

Figuring out structure: bottom-up

9 Rules

S --> NP VP
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Sarah thought that Hoggle was a cheat.

Figuring out structure: bottom-up

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NP
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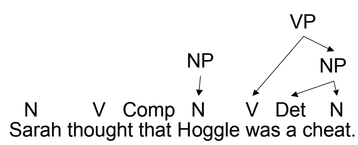

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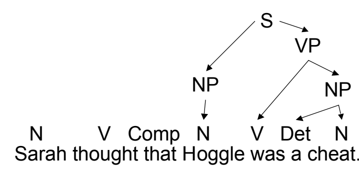

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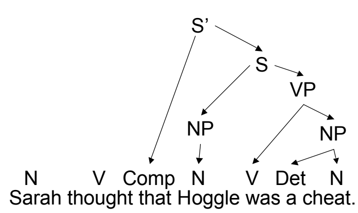

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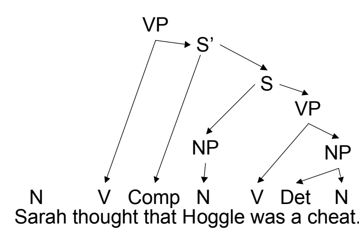

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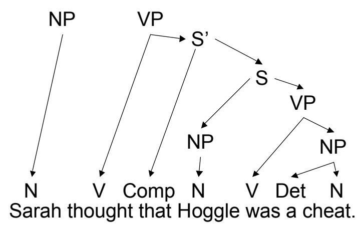

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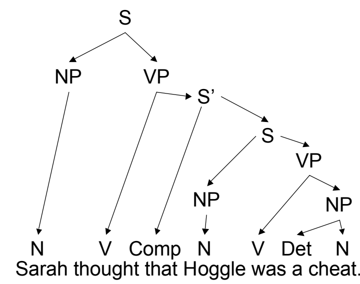

Syntax Recap

The structure of language (syntax) involves more than simply the meaning of the words. It involves rules about how the words themselves are allowed to go together.

It isn't enough to know the list of possible sentences in the language. Because adults can generate novel sentences and sentences of infinite length, adults need to know a generative rule system.

Adults know (unconsciously) a system of rules for generating the word orders they use. A fairly small set of rules can generate a fairly large set of sentences.

Questions?

You should be able to answer up through question 3 on the review questions, and up through question 2 on HW3.