

BIG ISSUES IN PSYCHOLINGUISTICS:

1. Innate specialized language abilities
vs. general cognitive abilities
2. Modularity vs. interactivity
3. Rule-based vs. connectionist

Reinforcement?
(Brown, Cazden & Bellugi, 1969)

Eve's mother curling Eve's hair

Eve: "Her curl my hair"

Mother: "That's right."

Eve, pointing to lighthouse: "There's the animal farm"

Mother: "No, that's a lighthouse."

Brown (1969)

“It seems then to be truth value that chiefly governs explicit verbal reinforcement by parents. Which renders mildly paradoxical the fact that the usual product of such a training schedule is an adult whose speech is highly grammatical but not notably truthful.”

IMITATION
Transcripts of Roger Brown, 1966

Child: Nobody don't like me.

Mother: No, say "nobody likes me."

Child: Nobody don't like me.

(Eight repetitions of this dialogue follow.)

Mother: No, now listen carefully: say "nobody likes me."

Child: Oh! Nobody don't likes me.

Infinitely long sentences

1. Susan thinks that Bill is a liar.
 2. Tom believes that Susan thinks that Bill is a liar.
 3. Jane knows that Tom believes that Susan thinks that Bill is a liar.
 4. Mike thinks that Jane knows that Tom believes that Susan thinks that Bill is a liar.
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What is the role for imitation? Previously learned associations?

WORD CLASS GRAMMAR

Example

The dog left.

The dog with the brown spots left

The dog with the brown spots on the right
ear left.

The dog with the large brown spots on the
right ear left

Rule

Det N V

Det N Prep Det Adj N V

Det N Prep Det Adj N prep Det Adj N V

Det N Prep Det Adj Adj N prep Det Adj
N V

Some reduction in number of rules. Can fill in many different words for each word class.

Elements involving Ns

Det N - a book, the steak

Det Adj N - a difficult book, the delicious steak

Det Adj Adj N - the delicious, juicy steak

Adj N - dirty dishes

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General rule

PP: Prep NP

Another general rule:

NP: (det) (adj*) N PP

or

NP: NP PP

The difficult book with complicated derivations

Phrase Structure Rules

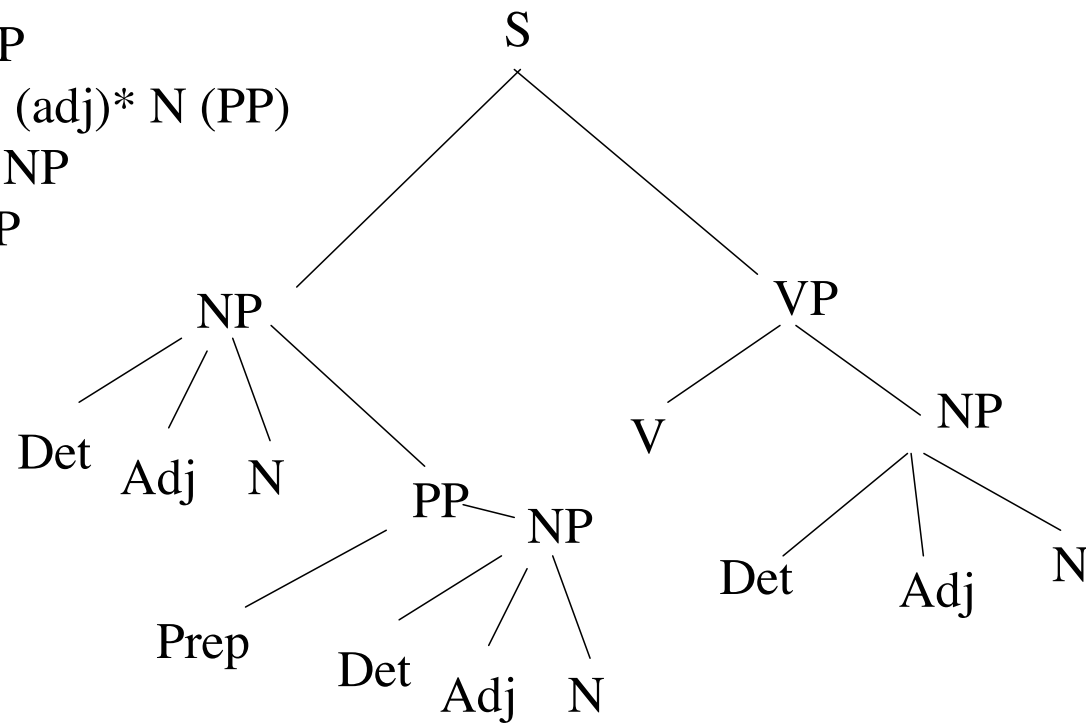
“The difficult book with the complicated derivations puzzled the new students”

S: NP VP

NP: (det) (adj)* N (PP)

PP: Prep NP

VP: V NP



Recursion

NP: Det (Adj)* N (PP)

PP: PP NP

The little girl in the house down the street by the old
mill ...

Another example:

Jim believes that Mary is brilliant.

Karen thinks that Jim believes that Mary is brilliant.

S: NP VP

VP: V S'

S': comp S

Sentences with related meanings:

Active-Passive

The car struck the pedestrian -> The pedestrian was struck by the car

Negative:

Mary walks home on Wednesdays -> Mary doesn't walk home on Wednesdays

Questions:

My dog ate the hamburger on the coffee table - > Did my dog eat the hamburger on the coffee table?

Nothing in phrase structure rules says that these are related.

Transformations

A new type of rule that takes one structure, moves elements, and adds or deletes elements.

What would transformational rule for question look like?

Ate -> did eat

(My dog did eat the hamburger on the coffee table.)

Move “did” to front before NP.

(Did my dog eat the hamburger on the coffee table?)

Deep Structure vs. surface structure

For both active and passive, “deep structure” more like active, declarative sentence

To get passive, apply transformation to active

Evidence for difference between deep and surface

- a. Two structures, one meaning: My dog ate the hamburger. The hamburger was eaten by my dog.
- b. One structure, two different meanings
Visiting relatives can be boring.

Implications for Innateness

3-4 yr old children produce quite complex sentences:
Passives, questions, negatives

Implies mastery of difficult phrase structure rules,
transformations (in tacit fashion)

Therefore, capacity for acquiring syntax must be innate

Derivational Theory of Complexity

Base form: Active declarative affirmative sentence

Comprehension involves undoing transformations, getting back to base form.

Thus, the more transformations that are applied, the more complex the sentence and the more difficult to understand

- | | |
|---------|---|
| Base | My dog ate the hamburger on the coffee table. |
| 1 trans | My dog didn't eat the hamburger on the coffee table. |
| 2 trans | The hamburger on the coffee table wasn't eaten by my dog. |
| 3 trans | Wasn't the hamburger on the coffee table eaten by my dog? |

Problems with DTC

1. Made incorrect predictions in some cases

The boy was hit vs. The boy was hit by the car.

2. Hard to know when a transformation is there that needs to be undone

The cat was chased by the dog -> The dog chased the cat.

The horse was led by the barn. -> The barn led the horse?

3. Children don't acquire general rules suddenly. E.g. may acquire passive only for certain action verbs (hit, eat) not for cognitive verbs (e.g., remember, like)

3. Linguistic theory kept changing

Only transformation in Chomsky's latest theory is:

Move α : move anything anywhere

Current Approaches

Information Processing:

Series of mental steps involved in all language comprehension, production (as in picture naming) - not tied to any particular linguistic theory

Two approaches:

1. Logical, symbolic approach
2. Connectionist approach

Symbolic Rules vs. Connectionist Approaches

Example: past tense learning

<u>Present</u>	<u>Past</u>	<u>Present</u>	<u>Past</u>	<u>Present</u>	<u>Past</u>
walk	walked	grab	grabbed	nod	nodded
dash	dashed	lag	lagged	pit	pitted
dip	dipped	judge	judged	goad	goaded

Exceptions: give - gave, is - was, go - went, hit- hit, ride -road

Symbolic Rule

Past tense = present tense + [d]

Pronunciation of [d] depends on final phoneme in present tense:

Voiced (b,d,g,v,z,etc) - “d”

Voiceless (p,t,k,f,s, etc) - “t”

(t,d) = “id”

Plus memorization of irregulars

Child acquisition stages for past tense

1. Correct use of some highly frequent irregular forms: did, went, rode
2. Correct formation of regular past tense, overregularization of irregular: “I goed to the store,” “She hitted the doll,” “ He rided his bike”
3. Gradual acquisition of irregular forms

Symbolic Account

1. Child first learns highly frequent words, which are mainly irregular (no pattern)
2. Then infers abstract rule (implicitly)
3. Over-applies rule to all verbs (overregularization)
4. Gradually learns all exceptions to the rule

Connectionist Account
(Rumelhart & McClelland, 1986)

Learn an association between present and past tense forms in neural network.

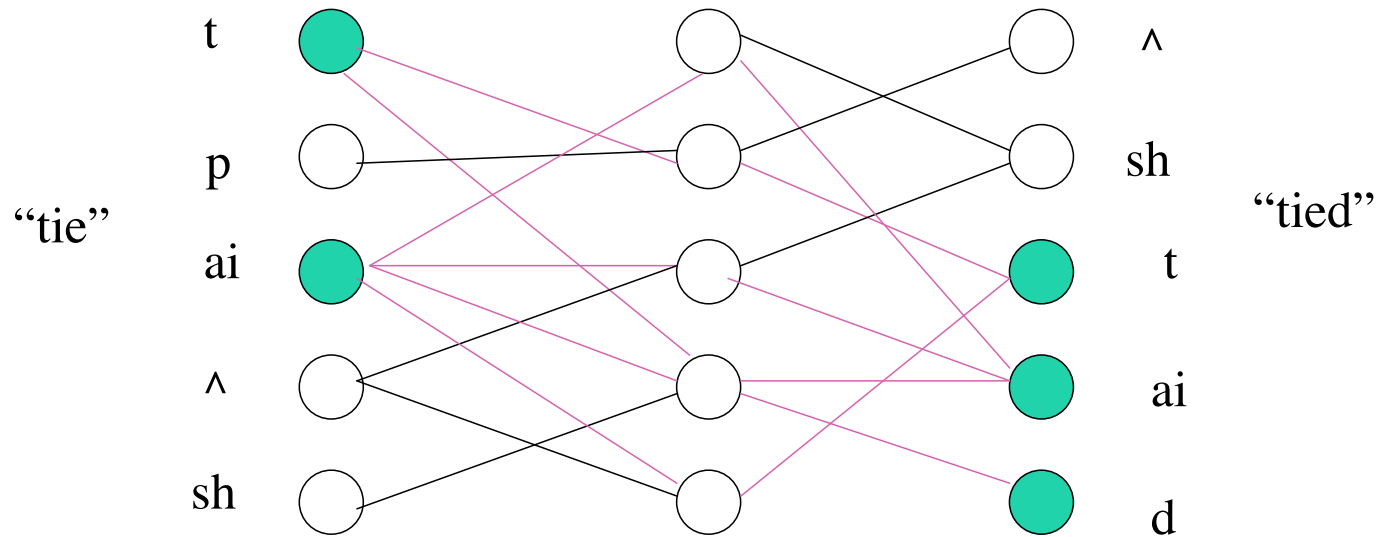
Experience strengthens connections.

Both regular and irregular forms learned in the same network.

Phonemes
Present tense

Hidden
Units

Phonemes
Past tense



Connection strengths modified through feedback

Advantages:

1. Provides a learning mechanism absent in rule-based
2. Parsimonious - one system for regulars and irregulars

Problems:

1. What plays the role of teacher in everyday life?
2. Model reproduces three stages only through ad-hoc modification - mostly regular verbs presented first
3. Model produces strange output for some novel verbs