

# Psycholinguistics

Linguistics 101 (Bruening)

November 28, 2006

## 1 Final Exam

- At least half the questions will be ones that have appeared on quizzes already.

## 2 Language Acquisition

- Grammar: A system in an individual's mind/brain that enables them to combine sounds and words into an infinite number of utterances.
  - How does this system get there?
  - Is it innate?
  - Is it learned from the environment?
  - How does it develop/mature (or does it)?
- Learning a language as an adult is very hard (and errors differ qualitatively from children's errors).
- *Critical age* in language acquisition.
- Chaffinches: if not exposed to chaffinch song within 10 months, do not acquire it.
- It is thought that language acquisition is genetically determined to take place in a specified pattern of development, like walking.
- **Evidence for a Critical Period: Feral Children**
  - Children raised in extreme isolation, e.g. "feral children."
  - Example: Genie.
  - Discovered in 1970;
  - Had been locked in isolation from 18 months until almost 14 years old.
  - Syntax and morphology never developed.
  - Lots of words, but telegraphic:
    - \* Man motorcycle have.
    - \* Genie full stomach.
    - \* Genie bad cold live father house.
    - \* Want Curtiss play piano.
    - \* Open door key.
- **Evidence for a Critical Period: Deaf children**

- Deaf children born to hearing parents often receive delayed language exposure (parents do not know sign language).
- Early and late learners of sign language do not differ in vocabular size or knowledge of word-order constraints (very regular in ASL);
- But they do differ in production and comprehension of morphologically complex signs.

### 3 Language Disorders

- Developmental disorders: the genetic basis of language, modularity.
- Dyslexia: a developmental disorder that seems to affect the perception of certain acoustic attributes; it also causes difficulties in learning to read.
- Hereditary.
- **Specific Language Impairment (SLI)**
- SLI is also genetic (runs in families).
- Acquired impairments (e.g., brain damage) also show that language can be affected to the exclusion of other systems.

#### Double Dissociation

- The converse situation also occurs:
- Mental retardation with intact language abilities.
- Laura and Christopher:
- Severely impaired cognitive abilities (IQs around 40, 65);
- Cannot perform numerical calculations, cannot perform basic tasks;
- But appear to have intact language abilities.
- Christopher seems to have super ability: has learned around 20 different languages.

#### The Case of Christopher (Smith and Tsimpli 1995):

- Born 1962, diagnosed as brain-damaged at age of six weeks.
- Has been in institutions his whole life; can't take care of himself.
- Scores very low on non-verbal tests but average or above average on verbal tests (Columbia Greystone Mental Maturity Scale: mental age of 9.2 and IQ of 56).
- Does very poorly on simple number tests (e.g., judges a wire with beads on it to have more beads if the beads are just spread out more).
- Fails to impute appropriate beliefs to others: Hide a toy with Christopher and a child watching, have child leave, then re-hide the toy, Christopher says that she would look in the new hiding place.
- But performs slightly above average on tests in English, German, French, Spanish, also speaks Greek.
- Has some knowledge of Danish, Dutch, Finnish, French, German, Modern Greek, Hindi, Italian, Norwegian, Polish, Portuguese, Russian, Spanish, Swedish, Turkish, and Welsh.

- Different language families: Indo-European, Uralic (Finnish), Turkic;
  - Different word orders: SVO, VSO (Welsh), SOV (Hindi and Turkish), mixed (German, Modern Greek);
  - Different scripts: Greek, Cyrillic, Devanagari.
- Learns languages very quickly: A few days before appearing on Dutch television, he was given a grammar and dictionary; on the program he was able to converse almost fluently.
  - Very good at word games like anagrams, can read and write backwards and upside down;
  - But can't play tic-tac-toe (can't even draw the board) or checkers.
  - Normal grammaticality judgements:
    - (1) What did John seem to have forgotten to remind Mary to bring?
    - (2) \* My shoes is dirty. → My shoes are dirty.
    - (3) \* This is the girl that I saw her with John at the cinema.  
→ This is the girl that I saw with John at the cinema.
    - (4) \* What did Susan buy clothes and?
    - (5) \* Which student do you think that could solve the problem?  
→ Which student do you think could solve the problem?
  - But can't understand irony or sarcasm, metaphors, jokes, metalinguistic negation, or rhetorical questions:
    - (6) \* Goliath wasn't tall, he was a giant.
  - Researchers decided to give him a new language to learn, Berber (Tarifit dialect).
    - (7) Yesha Mohand tafirast.  
ate Mohand pear  
'Mohand has eaten the pear.'
  - Exposed to both written and spoken form.
  - Christopher enthusiastic, drew parallels to Arabic, figured out subject agreement system and was able to inflect new verbs appropriately after only a few minutes.
  - Correctly assumed that Berber allows subject drop, even though he wasn't shown any examples; gave following for the given English:
    - (8) Tewsht tazet i Mohand. (C)  
2MS-give-2MS fig to Mohand  
'You gave the fig to Mohand.'
  - **Impossible language: Epun**
  - Gave him a made-up language that has features not found in natural languages; also gave it to four normal undergraduate students:
    - Fairly normal verb morphology, which Christopher learned easily and enthusiastically;
    - Arithmetic emphasis rule: attach suffix *-nog* to third word, no matter what it is; if sentence has fewer than three words, put form *nogin* at the end.

- (9) Fa zaddil-in ha-bol-u-**nog** guv.  
the man-Nom Past-go-3MS-**Emph** yesterday  
'The man did go yesterday.'

- Christopher failed to learn this rule and instead did what natural languages do: either always attached the suffix to the verb, or interpreted whatever word it was attached to as emphasized. (Undergraduates couldn't figure this rule out either.)
  - Negation rule: SV(O) = positive, VS(O) = negative; Christopher couldn't do it, translated incorrectly from English into Epun, and incorrectly from Epun into English, but undergraduates figured it out and did it correctly.
  - Past tense rule: put object at beginning of sentence. Again, Christopher couldn't do it, but undergraduates had no problem.

Conclusions:

- Modularity: Language separate from general intelligence or cognitive abilities.
- Language at least partly innate: language faculty in brain restricted to certain types of rules, those which occur in natural languages.

## 4 Language in the Brain

- Language as cognition: Mental grammar in each person's head; to the extent that people's grammars overlap enough to permit communication, they are speaking the same language.
- Grammar in the mind = in the brain (?)
- What do we know about language in the brain?

1. Evidence for how language is represented in the brain:

(a) Disorders + autopsy (or imaging, more recently)

- Aphasia (brain damage)
- Developmental disorders (SLI, dyslexia)
- Surgical removal of parts of the brain (removing the right side in adults spares language, removing the left side results in severe language disfunction)
- Split brain patients

(b) Brain imaging studies

(c) Dichotic listening: right ear (= left hemisphere) advantage for language

2. Double dissociation

(a) Language impaired but nothing else is impaired

(b) Other cognitive faculties impaired but language is intact

3. Some findings:

(a) Modularity (general feature of brain, shown by e.g. man with rod through skull)

(b) Lateralization and localization: Left hemisphere, Broca's and Wernicke's Areas.

(c) Aphasic sign language speakers show same kinds of impairments; not tied to modality.

- (d) Different aspects of language selectively impaired; language is itself modular.
- (e) Developmental disorders (SLI, dyslexia) are hereditary (genetic).
- (f) Strong modularity: Laura and Christopher—severely mentally retarded, but intact language (even super language).
- (g) Language  $\neq$  communication: some of these people cannot communicate at all, but have perfect language abilities.

## 5 Language Processing

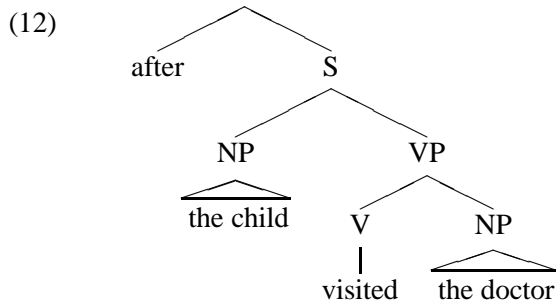
- Adult language use is *rapid*, *incremental*, and *effortless*.
- These observations tell us that we're looking for something special and specialized.
- What is the form of this special, specialized cognitive process?

Examples showing that language use is *rapid* and *incremental*:

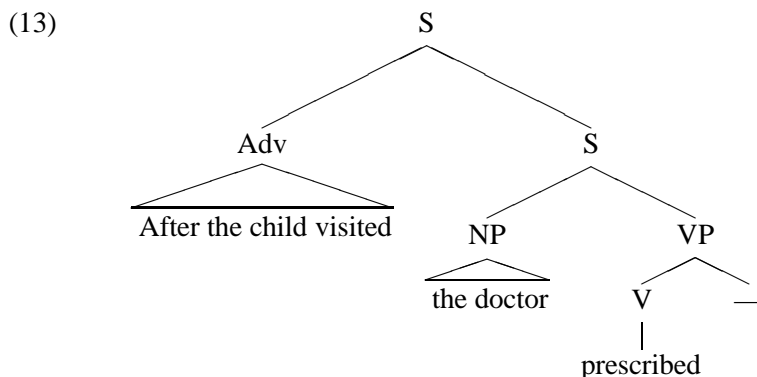
- *Garden Path Phenomena*

- (10) The cotton clothing is made of comes from Mississippi.
- (11) After the child visited the doctor prescribed antibiotics.

- At some point in reading these sentences you realize you had misparsed and have to reparse.
- The fact that you have to do this shows that you initially constructed a representation and meaning for this sentence, unconsciously, without waiting for more input that would confirm or disconfirm it.
- That is, you rapidly parse a sentence as you get input, constructing a representation incrementally.



*Oops!* Reanalyze:



### Questions in Processing

- How does the parser work?
- What decisions does it make?
- What does it base those decisions on?
  - Lexical properties of incoming words?
  - Frequency of occurrence?
  - Structural preferences/grammatical principles?

Some current theories posit movement and an abstract remnant (a *trace*) in cases where surface position does not coincide with interpretation:

- (14) You'll have trouble understanding *some examples*.  
 (15) *Some examples* you'll have trouble understanding *t*.  
 (16) *Which examples* will we have trouble understanding *t*?

Comprehension experiments find effects of dependencies between the moved position and the trace position:

- (17) *Who* could the little child have forced *t* to sing those French songs for Cheryl last Christmas?  
 (18) *Who* could the little child have forced us to sing those French songs for *t* last Christmas?

- Experiments show difficulty with us in 18, because the reader/listener is trying to find a place for *who*.
- Linguistic theories have to posit a relation between a moved phrase and its original position; psycholinguistic experiments find effects of this relation as well.

## 6 Language Production

### 6.1 Components of the Production System

#### Lexical Access

- Have an intended *meaning*, need to access the correct *form*

#### Syntactic Structure

- Have to create a syntactic structure to convey the intended meaning
- Syntactic structure has to be appropriate to lexical items
  1. Might project structure from syntactic information of lexical entries;
  2. Or might create structure into which compatible lexical items are inserted.

### 6.2 How Might We Investigate Production?

1. Errors, self-correction
2. Tip-of-the-tongue phenomena
3. Impaired production (aphasia)
4. Recall/repetition experiments

### 6.3 Lexical Selection Errors

- (19) **Form:**
- “She must be a very *morbid* lady.” (married)
  - “Sesame Street crackers” (sesame seed crackers)
  - “I don’t want to run the risk of ruining what is a lovely recession.” (recession; George Bush, 1992)
- (20) **Meaning:**
- “I think my *foot* just ran over it.” (tire)
  - “At low speeds it’s too light.” (heavy)

### 6.4 Lexical Retrieval

- Errors of *form* show few *meaning* errors;
- Errors of *meaning* show few *form* errors.

This suggests discrete meaning and form components in production.

- (21) Two-Step Lexical Retrieval Hypothesis
- Meaning recovers lexical entry without information about form  
*error at this step = meaning error*
  - Lexical entry links to entry with information about form  
*error at this step = form error*
- (22) Errors = selection of neighbor in similarity space defined by organizing principles of the system

### 6.5 Organizing Principles: Form

Errors of form governed by:

1. Segmental similarity at onset;
2. Stress position;
3. Length in syllables;
4. Overall segmental similarity.

A theory of the way lexical entries are organized by form must account for these patterns.

### 6.6 Errors Across Lexical Items

- (23) Phonological
- “You have hissed my mystery lectures. In fact, you have tasted the whole worm.” (Spooner)
  - “Children interfere with your nife lite.” (night life)
- (24) Morphological
- “With our hand on our heads we’ll. . .” (hands on our head)
  - “... in case she decide to hits it.” (decides to hit it)
  - “She’s already trunked two packs.” (packed two trunks)
- (25) Word Level
- “We’ll sit around the *song* and sing *fires*.”
  - “Stop beating your *brick* against a *head* wall.”

## 6.7 Fromkin's Six-Stage Model

(Fromkin 1971)

1. Identification of meaning
2. Selection of a syntactic structure with slots for words
3. Generation of intonation contour
4. Insertion of content words
5. Formation of affixes and function words
6. Specification of phonetic segments

### Evidence for Ordering

- **Intonation precedes word insertion:**

- Substitution leaves prosody intact:

(26) "Stop beating your brick against a head wall."

- Must *precede*, because stressed items are the ones most often involved in errors.

- **Word insertion precedes morphology:**

(27) "She's already trunk-ed two pack-s." (pack-ed two trunk-s)

(28) "An anguage lacquisition" (a language acquistion)

- **Phonetic specification follows affixation**

(29) "It certainly run outs fast." (out[s] vs. run[z])

## References

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