

#1 - Linguistics & Psycholinguistics Competence & Performance Systems

A. Standard Assumptions

- Steps in comprehending are different from grammatical derivation

(1) What do you think that Bill knows Sue likes?

- (2) a. What do you think that Bill knows Sue ...
b. Do you think that Bill knows Sue ...

- Parsability and grammaticality are independent

- (3) a. The witness who the lawyer who the president hired bribed kept her silence.
(multiple center embedding)
b. The boat floated down the river sank.
(‘garden path’ sentence: main verb-reduced relative ambiguity)

- (4) a. * Who do you think that Bill knows that likes Sue?
(that-trace violation)
b. *The collector donated the museum a painting.
c. * That’s the guy I wanna push my sled.

(CBS Winter Olympic Coverage, 2/6/98)

- Conclusion: independent systems of the mind/brain

| | |
|----------|--|
| Grammar | responsible for grammaticality judgments |
| Parser | responsible for sentence comprehension |
| Producer | responsible for sentence production |

B. Competence and Performance

Different uses of competence/performance distinction

- (5) a. Competence–Performance I
The distinction between the mechanisms implicated in linguistic behavior and linguistic behavior itself.

“We thus make a fundamental distinction between *competence* (the speaker-hearer’s knowledge of his language) and *performance* (the actual use of language in concrete situations).” (Chomsky 1965, p.4)

- b. Competence–Performance II
The distinction between specialized mechanisms for comprehension and production of language and a central repository of linguistic knowledge.

“To avoid what has been a continuing misunderstanding, it is perhaps worth while to reiterate that a generative grammar is not a model for a speaker or hearer. It attempts to characterize in the most neutral possible terms the knowledge of the language that provides the basis of actual use of language by a speaker-hearer. When we speak of a grammar generating a sentence with a certain structural

description, we mean simply that the grammar assigns this structural description to the sentence. When we say that a sentence has a certain derivation with respect to a particular generative grammar, we say nothing about how the speaker or hearer might proceed, in some practical or efficient manner, to construct such a derivation. These questions belong to the theory of language use – to the theory of performance.” (Chomsky 1965, p.9)

- c. Competence–Performance III
The distinction between the capacities of a grammar with bounded and unbounded resources respectively.
- d. Competence–Performance IV
The distinction between what is computed and how it is computed, borrowed from formal theories of computation.

‘...it is worth taking some time to discuss the implications of the *a priori* distinction between linguistic competence—our knowledge of the language, and performance—how we use this knowledge. Indeed, there is much confusion in the literature about whether or not such a distinction is necessary, desirable, or even meaningful. In fact, the distinction is a formal property of any processing system: inherent to any process is both a declarative semantics, a characterization of *what* the process computes, and an operational semantics, a specification of how the declarative specification is used, thereby realising a particular algorithm. That is, the process is characterised by the conjunction of a declarative specification and some operational semantics.’ (Crocker 1996, *Computational Psycholinguistics*: pp. 8–9).

C. Basis for Fractionation of Language Systems

- Reason #1: Grammar lacks basic characteristics needed for sentence recognition

- (6) a. John read the news that his company was about to lay off 5000 workers.
- b.
- | | | |
|------|-----|----------|
| A. | S | NP VP |
| B. | VP | V NP |
| C. | NP | Det N' |
| D. | N' | N that S |
| | | |
| E. | N | John |
| F. | V | read |
| G. | Det | the |
| H. | N | news |
| etc. | | |

Analysis-by-synthesis: recognize sentence by generating a sentence that matches the input. Very little to constrain random search for structure to match input sentence.

Analysis-by-analysis: recognize sentence by ‘running the grammar backwards’. Recognizing rule outputs made difficult by right-branching structures, transformations and deletions.

- (7) a. *Wh-movement*
- | | | |
|---|-------|---|
| X | wh-NP | Y |
| 1 | 2 | 3 |
| 2 | 1 | 0 |
| | | 3 |

b. *VP-ellipsis*

| | | | | |
|---|-----------------|---|-----------------|---|
| X | VP ₁ | Y | VP ₂ | Z |
| 1 | 2 | 3 | 4 | 5 |
| 1 | 2 | 3 | 0 | 5 |

Condition: VP₁ = VP₂

[Note: these arguments not specific to 1960s-style transformational grammar alone.]

- Reason #2: Lack of evidence for effects of transformational complexity on comprehension

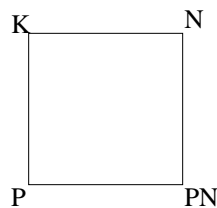
Origin of the *Derivational Theory of Complexity (DTC)*:

‘The psychological plausibility of a transformational model of the language user would be strengthened, of course, if it could be shown that our performance on tasks requiring an appreciation of the structure of transformed sentences is some function of the nature, number and complexity of the grammatical transformations involved.’ (Miller & Chomsky 1963: p. 481)

Mehler 1963; Miller & McKean 1964: transform-and-match task

- | | | | |
|-----|----|--|--------------|
| (8) | a. | the secretary has typed the paper | K (kernel) |
| | b. | the paper has been typed by the secretary | P (passive) |
| | c. | the secretary has not typed the paper | N (negative) |
| | d. | has the secretary typed the paper | Q (question) |
| | e. | hasn't the secretary typed the paper? | NQ |
| | f. | the paper hasn't been typed by the secretary | PN |
| | g. | has the paper been typed by the secretary | PQ |
| | h. | hasn't the paper been typed by the secretary | PNQ |

(9)



McMahon 1963: truth value judgment task

- | | | | | |
|------|----|-----|-----------------------------------|------------|
| (10) | a. | i. | seven precedes thirteen | K (true) |
| | | ii. | thirteen precedes seven | K (false) |
| | b. | i. | thirteen is preceded by seven | P (true) |
| | | ii. | seven is preceded by thirteen | P (false) |
| | c. | i. | thirteen does not precede seven | N (true) |
| | | ii. | seven does not precede thirteen | N (false) |
| | d. | i. | seven is not preceded by thirteen | PN (true) |
| | | ii. | thirteen is not preceded by seven | PN (false) |

McMahon 1963; Gough 1965, 1966: truth value judgment with pictures

Savin & Perchonock 1965: memorize sentence plus word-list, recall task

Transformations that reduce perceptual complexity

- (11) a. The first shot the tired soldier the mosquito bit fired missed.
 b. The first shot fired by the tired soldier bitten by the mosquito missed.
- (12) a. I gave a complete set of the annotated works of H.H. Munro to Felix.
 b. I gave to Felix a complete set of the annotated works of H.H. Munro.

Slobin 1966: Effects of reversibility on truth-value judgments to pictures

- (13) a. The dog is chasing the cat. K (rev.)
 b. The cat is being chased by the dog. P (rev.)
 c. The dog is not chasing the cat. N (rev.)
 d. The cat is not being chased by the dog. PN (rev.)
- e. The girl is watering the flowers. K (non-rev.)
 The flowers are watering the girl.
 f. The flowers are being watered by the girl. P (non-rev.)
 The girl is being watered by the flowers.
 g. The girl is not watering the flowers. N (non-rev.)
 The flowers are not watering the girl.
 h. The flowers are not being watered by the girl. PN (non-rev.)
 The girl is not being watered by the flowers.

(14)

| | Reversible | | Passive | | | Non-reversible | | Passive | |
|----------|------------|------|---------|----|----------|----------------|------|---------|----|
| | -N | +N | -P | +P | | -N | +N | -P | +P |
| Negative | -N | 1.02 | 1.16 | | Negative | -N | 0.75 | 0.75 | |
| | +N | 1.40 | 1.49 | | | +N | 1.05 | 1.03 | |

- (15) a. the red house is on fire < the house which is red is on fire (Fodor & Garrett 1967)
- b. Pablo looked the number up < Pablo looked up the number (Bever, Fodor, Garrett & Mehler 1967)
- c. Slowly, Gustav opened the door < Gustav opened the door slowly (Bever & Mehler 1967: cf. Bever 1968)
- d. John swims faster than Bob < John swims faster than Bob swims (Jenkins, Fodor & Saporta 1965)
- e. Fido was kissed < Fido was kissed by Tom (Fodor & Garrett 1967b)
- f. Sleeping dogs are unlikely to bark < That sleeping dogs bark is unlikely. (Fodor, Bever & Garrett 1974)
- g. It is obvious that dogs are man's best friend < That dogs are man's best friend is obvious. (Fodor, Bever & Garrett 1974)

Construals of DTC

- (16) a. *Derivational operations add to perceptual complexity*
Parsing involves recapitulating the grammatical derivation of a sentence; additional derivational operations are a source of increased perceptual complexity.
- b. *More derivational steps means greater perceptual complexity*
Sentences with more derivational steps are perceptually more complex than sentences with fewer derivational steps.
- c. *Perceptual complexity is determined by derivational complexity*
The perceptual complexity of a sentence is entirely a function of its derivational history.

Click-dislocation studies

- (17) a. In her hope of marrying An/na was impractical.
#
- b. Harry's hope of marrying An/na was impractical.
#
- (18) a. The commander defied them/the troops to go.
b. The commander desired them/the troops to go.
- (19) a. * For them to go was defied by the commander.
b. For them to go was desired by the commander.
- (20) a. The general defied the t/roops to fight.
#
- b. The general desired the t/roops to fight.
#

- Reason #3: Evidence for representations and strategies in perception and production not found in grammatical analyses.

Heuristics for identifying sentence structures

- (21) a. NP - V - NP = subject verb object
NP - V = subject verb
- b. Bill remembered [the answer he had given to the judge] was inconsistent.
- c. While Mary was mending the sock fell off her lap.
- d. The boat floated down the river sank.
- e. The horse raced past the barn fell.

Structural Complexity Reducing Strategies, e.g. Local Attachment

- (22) a. # John said Fred will leave yesterday.
c. # Joe looked the friend who had smashed his new car up.
d. # I met the boy who Sam took to the park's friend.
e. # The girl applied for the jobs that was attractive.

- Reason #4: Apparent dissociations of tasks in language breakdown

Dissociations of grammaticality judgments and comprehension in agrammatism.
Dissociations of comprehension and production in Conduction Aphasia.

- Reason #5: View of grammar as (elegant) recursive definition of well-formed sentences

“The moral of this experience is clear. We made progress by separating the question of what people understand and say from how they understand and say it. The straightforward attempt to use the grammatical model directly as a processing model failed. The question of what humans know about language is not only distinct from how children learn it, it is distinct from how adults use it. In retrospect, this should not have been a surprising result. It is a philosophical truism that there is a difference between knowing *that* X and knowing *how to* X – knowing that a sound sequence is an arpeggio on a French horn is quite different from playing one. Musical knowledge may inform both performers and listeners about the structure inherent in their shared experience, but the knowledge does not describe the actual experiential processes. The same distinction is true of linguistic knowledge.” (Bever 1988, pp.129-130)

- Reason #6: Grammatical yet incomprehensible, comprehensible yet ungrammatical sentences

- (23) a. Who do you think left the room?
b. *Who do you think that left the room?
- (24) a. * John donated the museum a painting.
b. *John reported the police an accident.
- (25) a. * The committee have decided to invite Perot.

- Reason #7: Speakers who have the same ‘knowledge’ of a language, but differ in their ability to process the language.

D. Prerequisites for a unified system

#1: Incremental grammar

#2: Specific processes of grammar should find counterparts in production & perception

#3: No domain-specific principles (e.g. complexity measures used to resolve ambiguities)

#4: No genuine dissociations of production/perception/grammar in language breakdown

#5: Analysis-by-synthesis – knowledge-that *is* knowledge-how, e.g. determining grammaticality involves running through steps involved in perceiving sentence.

#6: Account of comprehensible-yet-ungrammatical sentences required

Leading questions in a fractionated view of language

- a. Linguistic competence system responsible for language acquisition solution
- b. Linguistic competence system not responsible for ensuring tractable use
- c. Nature of slave-systems a separate question, as is how they access grammar
- d. Task of assigning well-formedness judgments is a mystery