Understanding Sentences

Chapter 8 (pp. 279-288)

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Factors in Visual Word Recognition
- Frequency and orthographic neighborhood effects.

The Role of Context in Visual Word Recognition
- Top-down information from sentence (semantic) context.

Model of Visual Word Recognition:
- A Connectionist Model (Seidenberg & McClelland, 1989)

Dyslexia and Word Recognition
- Phonological Dyslexia: high-frequency > low-frequency.
- Surface Dyslexia: regular > irregular.
The Immediacy of Interpretation

Sentences are interpreted as completely as possible as each word is processed.

Each word in a sentence is immediately integrated syntactically and semantically with previous words → incremental interpretation.

Evidence for the immediacy of interpretation:

Garden-Path Sentences (syntactic ambiguity)
The Immediacy of Interpretation

A. The policeman told about the accident left quickly.

B. The policeman that was told about the accident left quickly.

C. The policeman was told about the accident and left quickly.
Two Approaches to Sentence Processing

**Modular Approach:**
- Initial lexical access and initial syntactic parsing are autonomous.
- No initial effect of semantic context.
- Information only flows bottom-up.

**Interactive Approach:**
- Interactive lexical access and syntactic parsing.
- Prior semantic context affects lexical access and syntactic parsing.
- Information flows both bottom-up and top-down.
The Modular Approach

Lexical Access → Syntactic Parsing → Semantic Processing

Input (words) → (interpretation) Output
The Interactive Approach
Methods for Studying Sentence Processing

**Off-line Methods:**
- Sentence paraphrasing.
- Complexity/grammaticality ratings.

**On-line Methods:**
- Word-by-word reading times.
- Word-by-word grammaticality judgments.
- Lexical decision → semantic priming.
  - Listening to sentences - words presented on a screen.
- Eye movements during reading/listening.
- ERP brain-wave recordings during reading/listening.
- fMRI brain activations during reading/listening.
Complexity Effects in Sentence Processing

Complex sentences take longer to process.

- The cat that the dog that the mouse bit chased ran away.
- The mouse bit the dog that chased the cat that ran away.

The complexity of a sentence affects how its “goodness" is rated.

Grammatical sentences are rated better than ungrammatical sentences.
Complexity Effects and Grammaticality (I)

1. The apartment that the maid who the service had sent over was cleaning every week was well decorated.

2. The apartment that the maid who the service had sent over was well decorated.

   is grammatical,     is not.
Gibson & Thomas (1999) used an off-line grammaticality judgment task to look complexity effects on grammaticality.

Rating results:

Ungrammatical sentences (2) were rated no worse than their grammatical counterparts (1).
A Connectionist Model of Recursive Sentence Processing

next word

Lexical items

Hidden

Lexical Items

Context

current word  previous internal state

Christiansen & MacDonald (2009)
Grammar for Generation of Training Sentences

S → NP VP "."  
NP → PossP N  
NP → N rel  
NP → N PP  
NP → N "and" NP  
NP → N  
VP → V(c) "that" S  
VP → V(t) NP  
VP → V(o) (NP)  
VP → V(i)  
rel → "who" VP  
rel → "who" NP V(tlo)  
PP → prep locN (PP)  
PossP → (PossP) N Poss
Christiansen & MacDonald (2009) suggest that the Gibson & Thomas (1999) results are dependent on using an off-line task.

Prediction: 1 (g) should be rated worse than 2 (ug).
On-Line Grammaticality Judgment Experiment

Materials
- Same as in Gibson & Thomas (1999)

Method
- Word-by-word center presentation (self-paced).
- At each point in a sentence, subjects judged whether what they have seen so far was grammatical or not.
- Following presentation of each sentence, subjects rated the sentence on a 7-point scale. 7 = bad English.

Subjects
- 36 native speakers of English.
SRN Predictions

\[ p < .0001 \]

Mean GPE Sentence Scores

Human Ratings

Mean Rating (7 = Bad)

2 VPs

3 VPs

$p < .0001$

Network Predictions and Human Ratings

Next Class
Processing Syntactic Ambiguities

Chapter 8 (pp. 289-306)

- Garden path sentences
- Modular accounts
- Interactive accounts
- Rapid information integration in sentence processing.