Dependency Establishment Process: Numeral quantifier and its host-NP in Japanese

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1.

Problem

Previous studies

Does the processor store any element in working memory? if so...

Especially in a head-final language, the processor must store enormous number of unintegrated elements

Present study

Proposal

Dependecy Establishment Process (DEP):
process that the processor determines linguistic relationship between two syntactic elements

ERP components reflecting DEP
sustained left anterior negativity (LAN)
: cost for storage of filler in working memory
P800
: cost for integration of two syntactic elements

Predictions: Exp 1

The processor must store only a necessary element for the DEP.
The "judgment" process is necessary to determine whether the element is required to be stored.

Results of Exp 1: P2

(3a): san-satsu three-volumes
(3b): kinoo yesterday

The anterior negativity elicited at the frontal region compared to (3b)/kinoo in the time window 300-500ms/sec.

F3: F(1, 105)=4.82, p<.05; F4: F(1, 105)=4.13, p<.05

Results of Exp 1: P2~P6

The anterior negativity elicited at P2 continued until the input of P6.

To comprehend the sentence, in both cases, we must capture the relationship between the two elements (i.e., the quantifier and its host-NP).

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Results of Exp 1: P6

A P600-like component was elicited in (3a)’zasshi-o’ when P6 appeared compared to (3b)’zasshi-ō’ [F(1, 15)=4.40, p<.05].

Discussion 1

- When the numeral quantifier appears, a processor stores it until encountering an appropriate candidate for integration.
- When a candidate as host-NP appears, an Integration occurs.

numeral quantifier → host-NP

anterior negativity

duration of the negativity

Remaining problem of Exp 1

- Two separable subprocesses prior to the “integration” process?
  1) "Judgment to begin the DEP" and
  2) "storage an unintegrated element" to solve this problem

- the process that requires "judgment" process, but not "storage" process.

Discussion 2

- In Exp 2, owing to its word order, the processor can integrate the two elements without the storage process as opposed to the case in Exp 1.

The short anterior negativity seems to reflect the process that the processor begins the DEP between the two elements.

This result suggests that the “appearance” of the negativity is separable from the “duration” of it.

Experiment 2

- To illustrate that there are two separable cognitive processes, such as "judgment to begin the process" and "storage an unintegrated element"

Summary

- DEP
  - judgment
    - anterior negativity
  - storage
    - duration of the anterior negativity
  - integration
    - P600