

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

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Dependency 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

P600

: cost for **integration** of two syntactic elements

Experiment 1

- Is the dependency of a numeral quantifier and its host-NP established in on-line processing as well as the filler-gap dependency?

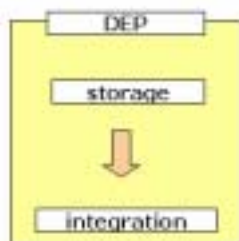
(3)

a. P1 P2 P3 P4 P5 P6 P7 P8
gakusei-ga san-satsu kinoo atoarashi kombini-de zasshi-o katta
student-NOM three-volumes yesterday at store magazine-ACC bought
"A student bought three magazines at the new store in the neighborhood."

b. P1 P2 P3 P4 P5 P6 P7 P8
gakusei-ga kinoo kinoo atoarashi kombini-de zasshi-o katta
student-NOM yesterday yesterday at store-LOC magazine-ACC bought
"A student bought a magazine at the new store in the neighborhood yesterday."

Problem

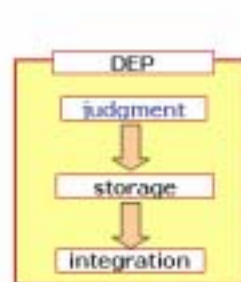
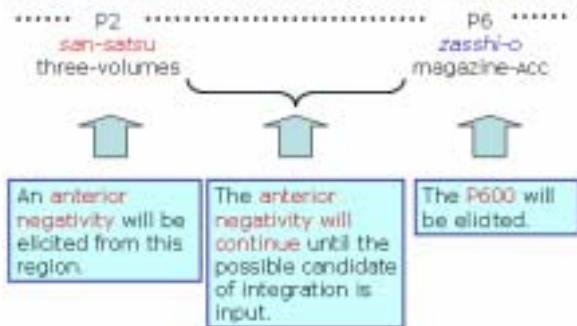
- Previous studies



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

Predictions: Exp 1



to avoid the overload of working memory...

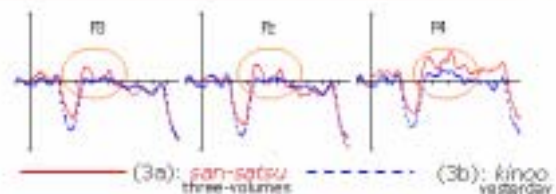
The processor must store only a **necessary element** for the DEP.

The "judgment" process is necessary to determine whether the element is required to be stored.

- Present study

Proposal

Results of Exp 1:P2



(3a)'san-satsu' elicited negativity at the frontal region compared to (3b)'kinoo' in the time window 300-500msec.

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

Numeral quantifier and its host-NP in Japanese

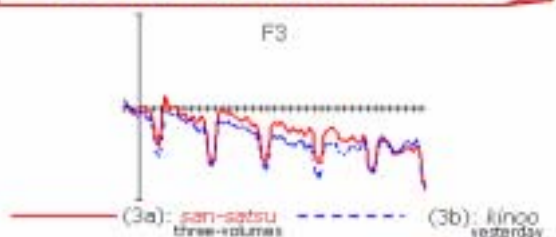
The positions of numeral quantifier and its host-NP are relatively free.

(1) Gakusei-ga san-satsu kinoo atoarashi-de zasshi-o katta
student-NOM three-volumes yesterday at store magazine-ACC bought
"Yesterday a student bought three magazines at the store."

(2) Gakusei-ga zasshi-o kinoo atoarashi-de san-satsu katta
student-NOM magazine-ACC yesterday at store three-volumes bought

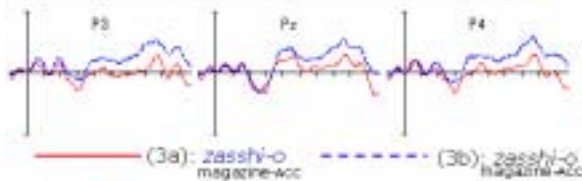
To comprehend the sentence, in both cases, we must capture the relationship between the two elements (i.e., the quantifier and its host-NP).

Results of Exp 1: P2~P6



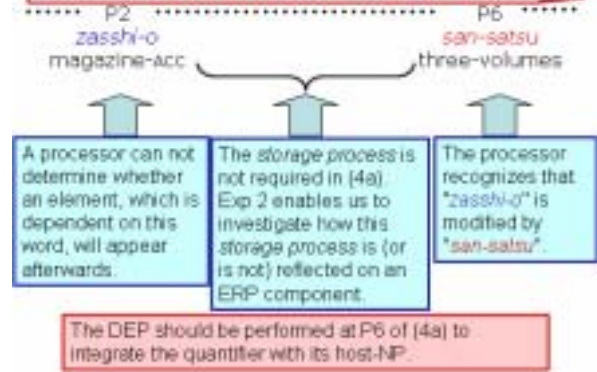
The anterior negativity elicited at P2 continued until the input of P6.

Results of Exp 1: P6



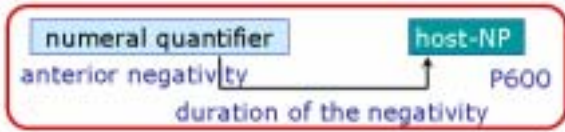
A P600 like component was elicited in (3a)/*zasshi-o* when P6 appeared compared to (3b)/*zasshi-o* [$F(1, 15)=4.40, p<.05$].

Predictions: Exp 2

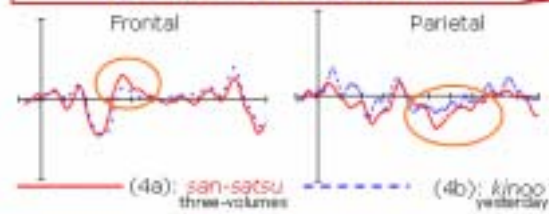


Discussion 1

- 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.



Results of Exp 2: P6



- In frontal region, an anterior negativity was elicited when '*san-satsu*' appeared in (4a). This negativity, however, did not continued.
- In parietal region, a late positive component was elicited in (4a).

Remaining problem of Exp 1

- Two separable subprocesses prior to the "integration" process?
 - "judgment to begin the DEP" and
 - "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"

(4)

| | | | | | | | | |
|----|-------------------|-----------------|-----------------|-----------------|-------------------|------------------|----------------|----|
| a. | P1 | P2 | P3 | P4 | P5 | P6 | P7 | P8 |
| | <i>gakusei-ga</i> | <i>zasshi-o</i> | <i>kinjo-no</i> | <i>atarashi</i> | <i>kombini-de</i> | <i>san-satsu</i> | <i>katta</i> . | |

| | | | | | | | | |
|----|-------------------|-----------------|-----------------|-----------------|-------------------|--------------|----------------|----|
| b. | P1 | P2 | P3 | P4 | P5 | P6 | P7 | P8 |
| | <i>gakusei-ga</i> | <i>zasshi-o</i> | <i>kinjo-no</i> | <i>atarashi</i> | <i>kombini-de</i> | <i>kinoo</i> | <i>katta</i> . | |

Summary

