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# Effects of Syntactic Information on Ambiguous Japanese Verbs in Sentence Comprehension Using a Cross-modal Priming Task

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This research demonstrates syntactic effects in Japanese, an S-O-V language, based on the constraint-based lexicalist approach (MacDonald, et al., 1994)<sup>1</sup> In particular, the effect of a post-positional particle on the semantic access of sentence-final ambiguous verbs in two kinds of sentences, (a) S-ga-V sentences (subject, subjective postpositional particle, and ambiguous verb) and (b) O-wo-V sentences (object, objective post-positional particle, and ambiguous verb), will be demonstrated. A cross-modal priming paradigm was used in which a target noun was visually presented one-syllable before the end or immediately after the end of a sentence-final verb presented auditorily. One target was related to the verb in the S-ga-V sentence, another target was related to the verb in the O-wo-V sentence, and a third target was unrelated.

## Method

**Subjects.** Sixty undergraduate students were randomly assigned to two groups of equal size. All were native Japanese speakers.

**Experimental Design.** The two groups differed in the ISIs between an ambiguous verb (a prime word), which is the final word of an auditorily presented sentence, and a visually presented target word. In the first group (the N-ISI condition), the target was presented one syllable before the end of the ambiguous verb (mean ISI = -126 ms,  $SD=32$ ). In the second group (the 0-ISI condition), the target was presented immediately after the ambiguous verb. The within-group factor was the relatedness between the ambiguous verb and the target word based upon the word-association norms of ambiguous verbs in Japanese. This factor consists of the syntactically and semantically related condition, the semantically related condition and the unrelated condition.

**Materials.** Eighteen ambiguous verbs that can take both subjective and objective postpositional particles were selected from the norm, in which subjects wrote words corresponding to a given ambiguous verb alone, or presented with a postpositional particle. These verbs have two, three or four syllables (mean=3.06,  $SD=.73$ ).

Based on preliminary research, thirty-six S-ga-V and O-wo-V sentences were constructed as auditory stimuli. These subject and object words were not semantically related to the prime or the target words.

<sup>1</sup> I thank Alan H. Kawamoto for helpful comments.

**Apparatus.** The experiment was controlled by two 486 CPU computers (NEC PC-9801 FA). Auditory stimuli were digitally recorded by a female speaker and later presented from a SONY headphone using a 16-bit sound card with 16 kHz digital sampling. Each naming response was recorded using a voice key and a SONY DAT.

**Procedure.** Subjects were instructed to comprehend the sentence that was presented from the headphone, and to read quickly and accurately the word that was presented on the computer screen.

## Results and Discussion

The mean naming latency and its  $SD$  for each experimental condition are shown in Table 1. All pronunciation errors were truncated from the data analysis. The naming latency data were subjected to a mixed two-way ANOVA. Only the main effect of the prime-target relatedness was significant ( $F(2,116)=51.53, p<.001$ ). Tukey's  $WSD$  multiple comparisons showed that the syntactic and semantic condition was significantly faster than the semantic condition ( $p<.01$ ). Furthermore, these two conditions were significantly faster than the unrelated condition (both  $p<.01$ ).

These priming effects demonstrate that, one syllable before the end of an ambiguous verb and immediately after the presentation of an ambiguous verb, both the syntactically-related and syntactically-unrelated semantically relevant words are activated, but the activation levels of syntactically related targets are higher than those of syntactically-unrelated targets.

Table 1. Means for naming latencies (with  $SD$ , in ms).

	Condition	Mean ( $SD$ )	Priming
N-ISI	Syntactic & Semantic	506 (65)	58
	Semantic	530 (65)	35
	unrelated	564 (112)	
0-ISI	Syntactic & Semantic	533 (90)	49
	Semantic	553 (92)	29
	unrelated	582 (94)	

## References

- MacDonald, M.C., Pearlmuter, N.J., & Seidenberg, M. S. (1994). Lexical nature of syntactic ambiguity resolution. *Psychological Review, 101*, 673-703.