

## Comprehension of Japanese sentences including adjective-noun phrases

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This study investigated comprehension processes of Japanese sentences which included an adjective-noun phrase. Specifically, we examined whether evaluation of a consistent semantic relation between an adjective and a noun in a sentence of reading material was suspended until the argument structure of the sentence was constructed. Twenty-three participants read two types of sentences: acceptable sentences that contained a plausible adjective-noun phrase, and unacceptable sentences that contained an implausible adjective-noun phrase. In comparison with the acceptable sentences, phrase-by-phrase reading time for the unacceptable sentences was prolonged not only at the position of adjective-noun phrase but also at the position of the verb that constructed the propositional representation of the sentence. This result suggests that evaluation of a semantic relation of an adjective-noun phrase is postponed until the coherent argument structure is constructed.

**Key words:** sentence comprehension, adjective-noun phrase, propositional representation

A Japanese sentence such as “警官が子犬を恐れた (A police officer was afraid of a puppy)” often causes a negative reaction by a reader, but a sentence such as “臆病な警官が子犬を恐れた (A cowardly police officer was afraid of a puppy)” does not. The difference in the reaction to these sentences depends on whether the attributive adjective “cowardly” modifies the noun “police officer” in the noun phrase (Murphy, 1990). According to Murphy (1990), an adjective modifies a noun by altering a schema in some way, and the schema can be described as a structured set of slots and fillers. Within this framework, the reason for the awkwardness evoked by the sentence mentioned above can be attributed to the idea that the schema of a police officer may have a PERSONALITY slot with *brave* as a default value. However, in the second example, the adjective “cowardly” replaces the value of the PERSONALITY slot with *cowardly*. The readers therefore evaluate “a

cowardly police officer” as one who could plausibly be afraid of a puppy. Consequently readers find the sentence “a cowardly police officer was afraid of a puppy” as believable.

According to the proposal that sentence comprehension is a process of construction of propositional representations, readers must judge the plausibility of concepts of adjective-noun combinations as either a subject or object of the predicate. We therefore examined whether evaluation of a consistent semantic relation between an adjective and a noun in a sentence was suspended until the argument structure of the sentence was constructed. To examine this possibility we compared the comprehension of two types of sentences that had the same syntactic structure but with a different semantic relation in the adjective-noun phrase. One sentence was acceptable and included a plausible adjective-noun phrase: “優しい警官が冗談を言う (A gentle police officer tell a joke)”. The other sentence was unacceptable and included an implausible adjective-noun phrase: “厚い警官が冗談を言う (A thick police officer tell a joke)”. We compared the reading times at the verb where the

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propositional representation of the sentence was constructed. If judgment of the consistency of the adjective-noun phrase was suspended the reading time of unacceptable sentences, compared with the reading time of acceptable sentences, would be prolonged at the verb.

### Methods

**Material** The reading material was Japanese sentences consisting of an adjective-noun phrase, a bare noun phrase, and a verb. The adjective-noun phrase was either the subject or the object of the sentence. A verb is usually placed at the final position in Japanese sentences. The word order was "subject-object-predicator(verb)". In the present experiment complex sentences were used so that the reading process at the position of verb could be determined. A complex sentence consists of a complement sentence (that is, a sentence of reading material) followed by a main sentence. For example, the reading material sentence "優しい警官が冗談を言う" was followed by the main sentence "と佐藤さんが聞いた". Two lists of the experimental material were created. Each list consisted of 40 reading material sentences based on a 2 (acceptability: acceptable vs. unacceptable)  $\times$  2 (position of the adjective-noun phrase: subject vs. object) factorial design (10 sentences per condition), and 20 filler sentences (half of them were ungrammatical).

**Procedure** In every trial, a sentence was presented phrase-by-phrase: a phrase appeared and remained on the screen until a following phrase was added to it when the participant pressed the space bar of the keyboard. A microcomputer measured the interval from the appearance of a phrase to the key press for the next phrase. Each main sentence ended in a verb and the participants made a response to indicate whether the sentence made sense. Twenty three students participated.

### Results and Discussion

Table 1 lists the mean reading times for the adjective-noun phrases, the bare noun phrases, and the verbs of the reading material sentences. A 2 $\times$ 2

Table 1

The mean reading times (in millisecond) for the adjective-noun phrases, bare noun phrases and verbs.

Acceptability	adj.-n Position	Mean Reading Times (SD)		
		Subject	Object	Predicator
Acceptable	Subject	1048 (376) 優しい警官が	735 (138) 冗談を	638 (113) 言う
	Object	707 (275) 女性が	918 (323) 暗い道を	674 (160) 帰る
Unacceptable	Subject	1106 (441) 厚い警官が	844 (208) 冗談を	694 (171) 言う
	Object	661 (191) 女性が	1052 (372) 強力な道を	758 (196) 帰る

ANOVA was calculated for each mean reading time. A marginally reliable main effect of acceptability ( $F_{\text{subject}}(1, 22)=4.74$ ,  $p < .05$ ;  $F_{\text{item}}(1, 18)=3.70$ ,  $p < .07$ ) was observed for the adjective-noun phrases. For the reading material sentences the verb displayed a reliable main effect of acceptability ( $F_{\text{subject}}(1, 22)=7.75$ ,  $p < .05$ ;  $F_{\text{item}}(1, 18)=11.10$ ,  $p < .01$ ). These results indicated that in comparison to the acceptable sentences, the phrase-by-phrase reading time of the unacceptable sentences was prolonged not only at the adjective-noun phrase but also at the verb, where a propositional representation of the sentence must be constructed. This result supported the prediction that the evaluation of a consistent semantic relation in an adjective-noun phrase was suspended until the argument structure of the sentence was constructed. The findings suggest that readers depend on a grammatical category of words and on the syntactic information of a sentence to combine the arguments with the predicate. In addition readers use the meaning of words and their knowledge of the world to construct coherent argument structures.

### References

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