Grammatical objects in Japanese: object, scrambled object and topic-object

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Abstract

This psycholinguistic study examined native Japanese speakers' reading of sentences that included three different types of grammatical objects, which were objects in the default position in a sentence, scrambled objects, and topic-objects. The results indicated that sentences with objects in the default position were read significantly faster than the other two. This outcome can be attributed to the word order, namely, SOV versus OSV. OSV sentences with scrambled objects or topic-objects were read slower than sentences in the default SOV order. In particular, participants' reading significantly slowed when they were presented with subject nouns appearing after scrambled objects or topic-objects.

Keywords: Japanese, Object, Topic, Scrambling, Word order.

Introduction

The present study reports a psycholinguistic experiment on native Japanese speakers' reading of grammatical objects in three different types, namely, objects positioned in the default position, scrambled objectspositioned at the beginning of a sentence, andtopic-objectspositioned at the beginning of a sentence. By default, grammatical objects are positioned after grammatical subjects and before verbs. Thus, the default order of words in Japanese sentences is Subject-Object-Verb (SOV), as illustrated in the example below.

John-GA Mary-O hometa.
English translation: 'Johnpraised Mary.'

As shown above, Japanese utilizes particles to express grammatical categories of noun phrases. The particle *GA* marks a grammatical subject, and the particle *O* marks a grammatical object. After the noun phrases with particles, a verb is positioned at the end of the sentence. This is the basic structure of a Japanese sentence.

The presence of particles enables nouns to be listed in a relatively free order (while the verb is fixed at the end of the sentence). This is because particles indicate the noun's grammatical categories (e.g., subject, object), regardless of their positions in a sentence. For example, the object in the sentence (1) can be positioned before the subject, which constructs an irregular OSV order without changing the sentential meaning, as shown below.

Mary-O John-GA hometa.
English translation: 'Johnpraised Mary.'

This movement of phrases is called 'scrambling', and the fronted object in the sentence (2) is a scrambled object. For the scrambled OSV sentences, Mazuka, Itoh and Kondo's experiment showed that native Japanese speakers' reading of scrambled sentences slowed down when they read the subject nouns that came after objects[1]. Also, Hayashibe, Sano, Hakuta and Otsu's research observed that native Japanese children below the age of five often misinterpreted scrambled OSV sentences as if they were SOV sentences[2-5]. However, Otsu's experiment from the same study found that native Japanese children accurately interpreted scrambled OSV sentences when the scrambled objects appeared in a preceding context, as shown below[5].

Kooen-ni *duck*-GA imashita. *Sono duck-O turtle-GA oshimashita.*
English translation: 'There was a duck at the park. A turtle pushed that duck.'

According to Chomsky, a movement such as scrambling occurs only when it is necessary for some reason[6]. Based on Otsu's above study, in the case of Japanese scrambling, a nounneeds be moved to the front in order to connect the current sentence and its preceding context. This operation of fronting grammatical objects is similar to passive sentences in English. In passivized sentences in English, grammatical objects in the default order move to the front and become grammatical subjects when they appear in a preceding context and are the main theme of the entire discourse (e.g., '*The mother scolded her son.*' becomes 'The son stole money. *He was scolded by his mother.*'). Keenan called this movement 'foreground operation', which foregrounds the fronted entity[7]. Both scrambling and passivization construct irregular word orders.

In addition to scrambling, an extragrammatical factor constructs another type of OSV word order. Japanese has a noun-phrase category, topic, independently from grammatical categories such as subject or object. A topic is 'what the sentence is about', which is typically placed at the beginning of a sentence to present the main topic of the sentence[8]. In Japanese, a topic noun is expressed by the particle, *WA*. This topic-particle*WA* replaces *GA* or *O* when a subject or object is the topic of the sentence, as shown below.

Grammatical Subject = Topic
John-WA Mary-O hometa.
English translation: 'JohnpraisedMary.'

Grammatical Object = Topic
Mary-WA John-GA hometa.
English translation: 'JohnpraisedMary.'

The sentence (4a) is an example of the case where the grammatical subject is the topic (i.e., topic-subject), and the sentence (4b) is an example of the case where the grammatical object is the topic (i.e., topic-object). The topic-subject maintains the default SOV order, but the topic-object constructs an irregular OSV order.

Also, a topic usually refers to an entity that appears in a preceding context, as shown in an example below[9].

Mary-GA party-NI kita.
English translation: 'Mary came to a party.'
Mary-WA John-GA shootaishita.
English translation: 'John invited Mary.'

In the second sentence above, 'John invited Mary', 'Mary' is a topic, and it appears in the preceding sentence 'Mary came to a party'. A possible problem in comprehending sentences with a topic is that the topic particle *WA* by itself does not inherently indicate its grammatical category as topic-subject or topic-object. In fact, topic-*WA* in actual Japanese dialogues or conversations are more frequently topic-subjects than other types of topics[10,11]. Due to this frequency difference, any type of topic-*WA* might be initially interpreted as a topic-subject. This possibility is further supported by the fact that any topic-*WA* tends to be positioned at the beginning of a sentence, which is similar to the grammatical subject position. Therefore, readers of a topic-object (or any non-subject topics) would have to reanalyze it after they initially misinterpret it as a topic-subject.

This section reviewed three different ways to present grammatical objects, which are object-*O* in the default position as in (1), sentence-initial scrambled object-*O* as in (2), and sentence-initial topic-object-*WA* as in (4b). The present study conducted an experiment to compare native Japanese speakers' reading of these different versions of objects. Specifically, participants read sentences that included these different objects. Sentence reading times were then measured to identify those with which different type(s) of object(s) were relatively faster or slower to be parsed.

Methodology

An experiment was conducted in a self-paced word-by-word reading paradigm by using E-Prime, an experimental software. In the self-paced reading task, participants read sentences word-by-word by pressing the space bar to get to the next word displayed on the computer screen. As mentioned, the test sentences used in the experiment included either one of the three grammatical objects: object with the particle *O* in default position such as (1), scrambled object with the particle *O* at the beginning of the sentence such as (2), or topic-object with the particle *WA* at the beginning of the sentence such as (4b). Also, an introduction sentence preceded all the test sentences. The introduction sentences included the nouns that appeared as objects in the following test sentences, as shown below.

Introduction sentence: Test sentence: Ken-GA party-NI kita.
Naomi-GA Ken-O shootaishita. (object in default positon),
Ken-O Naomi-GA shootaishita. (scrambled object),
Ken-WA Naomi-GA shootaishita. (topic-object).
English translation: 'Ken came to a party. Naomi invited Ken.'

Each test sentence was followed by a yes-no comprehension question in order to ensure that participants accurately comprehended the given sentences. All the grammatical objects in test sentences were Japanese names, no pronounwas used, and all the sentences were presented in Japanese. There were 13 test sentences for each type of object (provided with different introduction sentences). Thus, a total of 39 different test sentences were prepared for the experiment. The testsentences were mixed among 70 distractor sentences, and all were presented to participants in a random order.

Nineteen native Japanese speakers participated in the experiment for a single session lasting approximately 20 minutes. The experiment was carried out with each participant viewing the sentences presented on a computer screen. During the experiment, the participants first received the welcome message and instruction on the computer screen and proceeded to the practice block by hitting the space bar. The practice block provided four practice questions in order to familiarize the participants to the self-paced reading task. After the participants finished the practice questions, they received the end-of-practice message, and they were allowed to proceed to the actual experiment, again by hitting the space bar. After participants read each test sentence, a yes-no comprehension question was given, which was answered by hitting "1 (yes)" or "2 (no)". The experimental software measured the participants' reading times of each word in the test sentences that included the target grammatical objects. By examining the reading times of the entire sentence (e.g., *Naomi-GA Ken-Oshootaishita* 'Naomi invited Ken') as well as the first word (e.g., *Naomi-GA*), the second word (e.g., *Ken-O*), and the verb (e.g., *shootaishita*), the author investigated which sentence with what types of objects wereread faster or slower, and at what word in the sentence participants' reading slowed.

Results and discussion

Prior to the analysis of the results, the reading-time data from one participant, whose accuracy for the comprehension question was below 70%, was removed. This was because the low accuracy rate shouldindicate that the participant did not seriously attempted to comprehend the given sentences in the experiment. With this removal, the mean reading times foreach entire sentence and for each word, are summarizedin Table-1.

An ANOVA test was performed to examine whether the reading times differedbetween the object-types at statistically significant levels. Sentences with each type of objects were pairwise-compared for the reading times of the entire sentence, the first word, the second word, and the verb.

Analysis for sentential reading timesdetected significant differences between conditions. Sentences with objects in the default position were read significantly or marginally significantly faster than sentences with scrambled objects [$F(1.17) = 3.526$, $p = .078$] and than sentences with topic-objects [$F(1.17) = 5.376$, $p = .033$]. On the other hand, there was no significant difference between sentences with scrambled objects and sentences with topic-objects [$F(1.17) = .239$, $p = .631$]. The reading times ofeach word revealed at which point in the sentence participants' reading slowed. Regarding the reading times of first words, the outcomes were the opposite to the sentential reading times. The first words in sentences with objects in the default position were read significantly slower than the first words in sentence with scrambled objects [$F(1.17) = 7.911$, $p = .012$] and those in sentences with topic-objects [$F(1.17) = 4.474$, $p = .049$]. There was no significant difference between sentences with scrambled objects and sentences with topic-objects [$F(1.17) = .036$, $p = .852$]. In contrast, analyses of the reading times of the second words reflected the outcomes of sentential reading times. The second words in sentences with objects in the default position were read significantly faster than the second words in sentences with scrambled objects [$F(1.17) = 5.903$, $p = .026$] and than those in sentences with topic-objects [$F(1.17) = 7.921$, $p = .012$]. There was no significant difference between sentences with scrambled objects and sentences with topic-objects [$F(1.17) = .000$, $p = .996$].The reading times of the verbs showed the same trends as those for the entire sentence and the second word. The verbs in sentences with objects in the

default position were read significantly faster thanthe verbs in sentences with scrambled objects [$F(1.17) = 4.584$, $p = .047$] and than those in sentences with topic-objects [$F(1.17) = 6.062$, $p = .025$]. Again, there was no significant difference between sentences with scrambled objects and sentences with topic-objects [$F(1.17) = .477$, $p = .499$]. In sum, the reading-time data showed differences between sentences with objects in the default position versus sentences with scrabbled objects and those with topic-objects, while there was no difference between sentences with scrambled objects and sentences with topic-objects throughout, as illustrated in Figure-1.

After participants read introduction sentences (e.g., 'Ken went to a party.'), they saw the first words of the test sentences. Among the first words, scrambled objects (e.g., *Ken-O*) and topic-objects (e.g., *Ken-WA*) were read faster than the subject-nouns (e.g., *Naomi-GA*) in sentences with objects in the default positionpossibly because the participants have seen the scrambled-object entity and topic-object entity in the preceding context (e.g., *Ken* went to a party. *Ken-O/WA…*), while the subject noun in sentences in the default word order was a new entity in the given discourse (e.g., Ken went to a party. *Naomi-GA…*). However, when encountering the second words, unlike the first words, the participants read the objects in default position (e.g., Ken went to a party. Naomi-GA *Ken-O…*) significantly faster than the other two (e.g., Ken went to a party. Ken-O/WA *Naomi-GA…*), which is consistent with Mazuka, Itoh and Kondo's study. This outcome is attributable to the word order, namely, default SOV order versus irregular OSV order. Sentences with objects in the default position were in the SOV order, which were read faster than the sentences with scrambled objects or topic-objects in the OSV order. When reading the irregular OSV sentences, parsers may store the sentence-initial grammatical object in their working memory, and then retrieve it after they read the grammatical subject. This store-retrieval task is unnecessary when reading default SOV sentences, and the extra task slowed down the participants' reading, as reflected in the slower reading times for the second word in sentences with scrambled objects and topic-objects. This slowed reading also appeared for verbs, possibly because the process of retrieving objects was still ongoing when reading verbs, i.e., a spillover effect.

Table-1: Reading times of test sentences (milliseconds).

| Test sentence (e.g., 'Naomi invited Ken')	First word	Second word	Verb
Sentence with object in default position (e.g., *Namio-GA Ken-O shootaishita*) 2817.91	Subject (e.g., *Naomi-GA*) 840.50	Object (e.g., *Ken-O*) 793.94	Verb (e.g., *shootaishita*) 1183.48
Sentence with scrambled object (e.g., *Ken-O Naomi-GA shootaishita*) 3073.95	Scrambled object (e.g., *Ken-O*) 738.29	Subject (e.g., *Naomi- GA*) 971.33	Verb (e.g., *shootaishita*) 1364.34
Sentence with topic-object (e.g., *Ken-WA Naomi-GA shootaishita*) 3163.94	Topic-object (e.g., *Ken-WA*) 748.65	Subject (e.g., *Naomi- GA*) 971.61	Verb (e.g., *shootaishita*) 1443.68
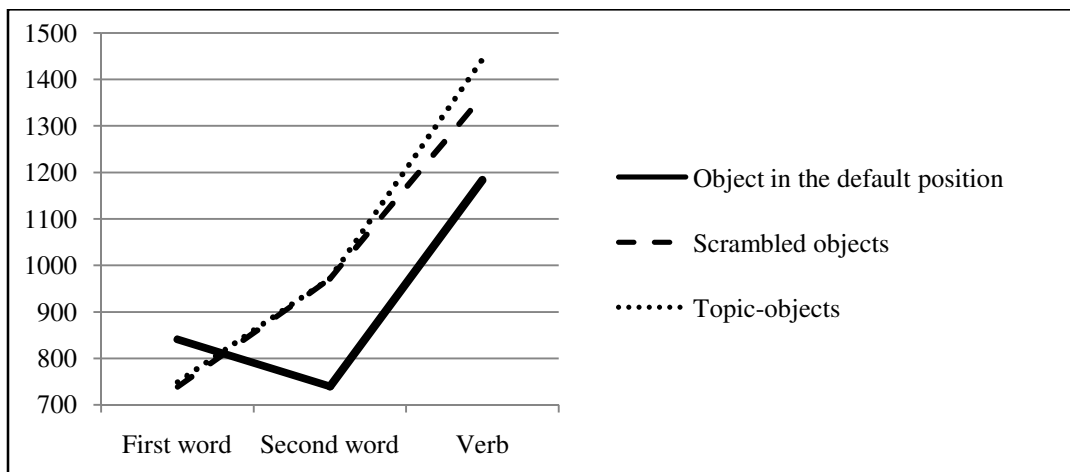
Figure-1: Reading times of each word in the test sentences (milliseconds).

Conclusion

The present study revealed that OSV sentences with scrambled objects and with topic-objects are read slower than SOV sentences in the default word order. This reading-time difference between SOV and OSV appeared in spite of the presence of preceding contexts, contradicting Otsu's study. The results lead us to a question for a future study. That is, in what situation objects are scrambled or topicalized. Specifically, what types of preceding context triggers scrambling or topicalizing objects, and in what types of sentences. The present study did not specify types/contents of the preceding context and the test sentences, e.g., the preceding context describes an event, and the test sentence states a consequent result of the event ('John got the highest score at the exam. Mary praised John.'); preceding context introduces an entity, and test sentence provides an explanation of the entity ('John came to a party. Mary invited John.'), etc. There may have been different results if the types of preceding contexts and test sentences had been specified, and this study awaits a follow-up study to examine this issue.

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