

Semantic Property in Scrambled Constituents: The Case of Objects in Japanese Transitive Clauses

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Abstract

While several studies have found syntactic and pragmatic properties in scrambled constituents, little is known regarding the connection between semantics and word order. In the present study, a corpus analysis was performed to assess if semantic roles affect word order. Objects in SOV and OSV clauses were classified in accordance with their semantic role, demonstrating that objects whose semantic role was a path appeared more often in OSV clauses than in SOV clauses. The results are discussed in terms of the *action chain model* in cognitive grammar (Langacker 2008), which posits that the weaker the interaction between the subject and object is, the easier it is to place the object before the subject; objects whose semantic role is a path have a weaker interaction with the subject, which results in a relatively high frequency of paths in OSV clauses. Consequently, the strength of the interaction between a subject and object may be regarded as a semantic property in scrambled constituents.

1 Introduction

Scrambling, a form of syntactic operations, has been considered a stylistic rule applied optionally; thus, it has no semantic value. However, many studies have found syntactic and pragmatic properties in scrambled constituents, demonstrating that scrambling is not merely a stylistic rule. However, no semantic properties except for animacy have been found in them, which ensures that scrambling is semantically vacuous. Are there any other semantic properties in scrambled constituents? Resolving this question would help deepen our understanding of word order.

1.1 Scrambling and its syntactic and pragmatic properties

While there is an almost fixed word order in some languages, the word order in other languages is relatively free. One such language is Japanese. With the exception of the verb, which must be placed at

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the end of a clause, the language has a free word order. For instance, although the two sentences in (1) differ in relation to the order of the subject and object, grammatically, they are perfect. In Japanese, a subject and an object are marked by the nominative case marker *ga* and the accusative case marker *o*, respectively. Therefore, the word order of (1a) is subject–object–verb (SOV) and that of (1b) is object–subject–verb (OSV). Although the SOV word order is considered the canonical word order of Japanese, the OSV word order is also allowed.

- (1) a. *John-ga Mary-o ketta.*
 John-NOM Mary-ACC kicked
 ‘John kicked Mary.’
 b. *Mary-o John-ga ketta.*
 Mary-ACC John-NOM kicked
 ‘John kicked Mary.’

In theoretical linguistics, the phenomenon of free word order in Japanese has been explained by *scrambling* (Fukui 1993; Kuroda 1988; Nemoto 1999; Saito 1985), a syntactic operation proposed by Ross (1967). Scrambled sentences (sentences with a non-canonical word order) are considered to be derivations of the corresponding sentence with the canonical word order. For example, in (1b), the object has been moved before the subject. Therefore, it is a derivation from (1a). Although scrambling is a form of movement, it varies from other forms of movement, such as the *wh*-movement and topicalization in English. The crucial difference is that scrambling has no semantic value unlike other movements because it is merely a *stylistic rule* applied optionally (Saito 1989).

If scrambling is a stylistic rule, there will be no linguistic properties in scrambled constituents. However, several studies including text analyses, corpus analyses, and experiments have demonstrated two linguistic properties of scrambled constituents (Amatani 2010; Asahara et al. 2018; Bock & Irwin 1980; Dryer 1980; Ferreira & Yoshita 2003; Hawkins 1994; Yamashita 2002; Yamashita & Chang 2001). Yamashita (2002) referred to these as syntactic and pragmatic properties or *heaviness* and *referentiality*. Heaviness means that a scrambled constituent is often syntactically *heavy* in that it contains a subordinate clause and typically has much content. Referentiality means that scrambled sentences are often *given* in that they contain a determiner or an anaphor; in other words, they refer to something that was directly mentioned in the preceding context or inferable from it. These properties demonstrate that scrambling is not merely a stylistic rule but it occurs when a constituent is either heavy or given.

The sentences in (2) demonstrate the syntactic property in English, which has the *short before long* preference. The canonical order in (2a) becomes very awkward when the noun phrase “a song” is placed after the prepositional phrase “with friends” in (2b). However, if the noun phrase is modified, such as increasing its length as in (2c), the scrambled order becomes more acceptable or even preferable to its canonical counterpart.

- (2) a. Bill sang a song with friends.
- b. # Bill sang with friends a song.
- c. Bill sang with friends a song that was written by a famous guitar player from Texas.

(Yamashita & Chang 2001: B46)

The sentences in (3) are examples of referentiality or the *given before new* preference. The word order in (3b) is not canonical but acceptable because “the kitchen” is given information and “a dead rat” is new. As evidence for this explanation, the sentence in (3c) is awkward even though it has the same structure as (3b). This is because the subject refers to the speaker, who is always taken as given.

- (3) a. A dead rat lay in the middle of the kitchen floor.
- b. In the middle of the kitchen floor lay a dead rat.
- c. ?* In the middle of the kitchen floor lay I.

(Langacker 2008: 80–81)

1.2 Semantic properties in scrambling

While several studies have demonstrated the syntactic and pragmatic properties of scrambled constituents, the connection between word order and semantic statuses, such as the semantic role or animacy, has not been explored to a large extent. Payne (1992) even suggested that there will be no language if an essentially semantic principle governs most order facts for major constituents of the clause. In conjunction with the notion that scrambling has been considered semantically vacuous, there seems to be no doubt that scrambling is a meaningless operation.

However, studies have revealed a semantic property of word order: *animate before inanimate*. Cooper & Ross (1975) suggest that animate nouns tend to precede inanimate nouns in conjunctions whose form is relatively frozen such as *men and machines*. Byrne & Davidson (1985) found that children are more likely to recall noun phrase conjunctions correctly when the referent of the first conjunct is animate than when it is inanimate. Finally, Tanaka et al. (2011) demonstrated in an experiment that when Japanese native speakers recalled transitive sentences, they are more likely to assign animate entities earlier positions in the sentence than inanimate entities.

More importantly, Nakamoto et al. (2006) experimentally demonstrated the relationship between word order and sentential meanings. They employed Japanese ditransitive sentences which were composed of a single verb (V) and three noun phrases: subject (S), direct object (DO), and indirect object (IO). The sentences in (4) are examples thereof. (4a) and (4b) mean caused motion and caused possession, respectively, dependent on the semantic role of the indirect object. The indirect object in a caused motion sentence is a *goal*; therefore, the sentence means that the direct object is moved to the place denoted by the indirect object. In (4a), for example, the dictionary was moved from somewhere to the bookshelf. Conversely, the indirect object in a caused position sentence is a *recipient*. Thus, a caused

possession sentence means that the indirect object ends up possessing the direct object. In (4b), Kaori’s friend possessed a pen because of her act of lending.

- (4) a. *Fumie-ga hondana-ni zisyo-o modosita.*
 Fumie-NOM bookshelf-DAT dictionary-ACC returned
 ‘Fumie returned the dictionary to the bookshelf.’
 b. *Kaori-ga tomodati-ni pen-o kasita.*
 Kaori-NOM friend-DAT pen-ACC lent
 ‘Kaori lent a pen to her friend.’

(Nakamoto et al. 2006: 342)

Nakamoto et al. (2006) conducted two experiments, the results of which are shown in Table 1. In the first experiment, the participants were shown a single verb and three noun phrases in random order. After a short delay, they were asked to recall the verb and three noun phrases and enunciate them in a natural sentence format. Although the participants recalled the phrases in the order S–DO–IO–V for the caused motion sentences more often than for the caused possession sentences, they recalled them in the order S–IO–DO–V for the caused possession sentences more often than for the caused motion sentences. Because Nakamoto et al. (2006) used different verbs for the sentences denoting caused motion and caused possession, the results may have been not due to the sentential meanings but due to the meaning of the verbs. However, the same results were revealed in the second experiment where the same verbs were employed for both types of sentences. Consequently, these results demonstrate that word order correlates with sentential meanings.

Table 1: Results of the two experiments in Nakamoto et al. (2006)

		S–IO–DO–V (%)	S–DO–IO–V (%)
Experiment 1	Caused motion	47	53
	Caused possession	77	23
Experiment 2	Caused motion	32	68
	Caused possession	70	30

1.3 Do semantic roles affect word order?

There is another interpretation possible for the results of the experiments by Nakamoto et al. (2006). As mentioned above, whether a Japanese ditransitive sentence means caused motion or caused possession depends on the semantic role of the indirect object, which, in turn, depends on animacy: the indirect object in a caused motion sentence is inanimate (e.g., bookshelf) and that in a caused possession sentence is animate (e.g., Kaori). Therefore, it is likely that the participants produced caused possession sentences more often in the S–IO–DO–V to place the animate noun (indirect object) before the inanimate noun (direct object). Thus, in essence, the results of the experiments may be referred to as the animate

before inanimate preference.

The present study aims to assess if preferred word orders vary in accordance with semantic roles. However, because the semantic role of the indirect object in a ditransitive sentence is based on animacy, ditransitive sentences are not adequate for the study. Therefore, instead of ditransitive sentences, the present study will analyze transitive sentences, whose canonical word order is SOV and scrambled order is OSV. The hypothesis is that if semantic roles affect word order, the frequency of each semantic role is different between the canonical word order and scrambled word order. To test this hypothesis, a corpus analysis was performed, wherein transitive clauses whose word order was either SOV or OSV were collected and the objects in the clauses were classified based on its semantic role.

2 Corpus analysis

The purpose of the corpus analysis in this study was to test whether the frequency of semantic roles of objects in the SOV word order and the OSV word order was different. In this section, the materials and methods employed in the corpus analysis are outlined.

2.1 Clause sampling

I first searched the *Balanced Corpus of Contemporary Written Japanese* (BCCWJ)¹ for the word sequences of either (5a) or (5b), using *Chunagon*, which is a web-based interface of the BCCWJ.

- (5) a. [...] *ga* [at most 9 words] N-*o* V [...]
- b. [...] *o* [at most 9 words] N-*ga* V [...]

More than 100,000 concordance lines were found for each of the sequences. I downloaded just 100,000 concordance lines for each sequence because more than 100,000 concordance lines cannot be downloaded simultaneously in *Chunagon*. Subsequently, I arranged the concordance lines in random order and manually sampled 150 active voice clauses, the syntactic structure of which was either (6a) or (6b). Clauses that could not be scrambled because of their syntactic structure were removed.

- (6) a. [...] NP-*ga* (AdvP) (Indirect Object) NP-*o* V [...]
- b. [...] NP-*o* (AdvP) (Indirect Object) NP-*ga* V [...]

To avoid sampling clauses with an excessively heavy subject or object, I set a search criterion so that the first case marker appeared within 11 words from the second case marker, limiting the number of words comprising the second noun phrase (the subject in an OSV clause/the object in an SOV clause) to at most 10. The number of words comprising the first noun phrase (the object in an OSV clause/the subject in an SOV clause) was also limited to up to 10 words by manually removing clauses containing

¹ This corpus comprises 104 million words and includes genres, such as general books, magazines, newspapers, business reports, blogs, internet forums, textbooks, and legal documents among others (Maekawa et al. 2014).

a subject or an object that consisted of more than 10 words.

2.2 Classification of objects

The objects in the sampled clauses were classified based on the classification proposed by Nihongo Kizyutu Bunpoo Kenkyuukai (2009), which classified objects marked by the accusative case marker *o* into the three semantic roles: patient, source, and path.² Because it did not clearly define these semantic roles, I defined them according to its descriptions (Table 2).

Table 2. Definition of the three semantic roles

Semantic role	Definition
Patient	The entity, the form, location, or surroundings of which is changed by the subject
	The entity that is produced or perceived by the subject
	The entity upon which a physical, mental, or verbal act by the subject is carried out
Source	The location or entity from which the subject moves
Path	The location through which the subject moves
	The period that the subject spends

The objects of the sentences in (7) are examples of the three semantic roles. In (7a), the object Mary is a patient because she experienced the kicking action performed by the subject John. In (7b), the object *ie* (house) is a source because it is the starting point of the subject’s movement. Finally, the object *kawa* (river) is a path in (7c) because it is the place where the subject swam.

- (7) a. *John-ga Mary-o ketta.*
 John-NOM Mary-ACC kicked
 ‘John kicked Mary.’
- b. *John-ga ie-o deta.*
 John-NOM house-ACC left
 ‘John left his house.’
- c. *John-ga kawa-o oyoida.*
 John-NOM river-ACC swam
 ‘John swam in the river.’

The objects were also classified based on referentiality and animacy. Referentiality is whether an object contains a word whose referent is only identified from the previous context, such as “*kare*” (he). Animacy is whether an object is animate. In addition, heaviness was calculated by averaging the

² Nihongo Kizyutu Bunpoo Kenkyuukai (2009) does not refer to a patient, path, and source as semantic roles. However, they can be identified with semantic roles.

numbers of words that built up objects. In this study, words were counted based on the divisions of words in the BCCWJ. Punctuation marks were not counted.

3 Results

The results of the classification of objects based on their semantic roles are presented in Table 3. In both word orders, the most frequent semantic role was the patient. There was only one clause whose object was a path. An important finding is that the objects whose semantic role was a path appeared more often in the OSV word order than in the SOV word order.

Table 3. Results of the classifications of objects based on their semantic role

	Patient	Source	Path
SOV	147	1	2
OSV	121	0	29

The results of heaviness, referentiality, and animacy are displayed in Table 4. On average, the objects in the OSV clauses were approximately two words longer than those in the SOV clauses. While there was no difference in animacy, there was a significant difference in referentiality.

Table 4. Results of the classifications of objects based on the other properties

	Heaviness	Referentiality	Animacy
SOV	2.03	10	12
OSV	4.29	44	12

I performed a general linear analysis using R (R Core Team 2019). I entered semantic role (patient or path), heaviness (the number of words comprising the object), referentiality (given or new), and animacy (animate or inanimate) into the model as fixed effects. There was only one object whose semantic role was a source, and thus, source was removed from the analysis. Finally, the p -values were obtained by likelihood ratio tests of the full model with the effect in question against the model without the effect in question.

The results of the general linear analysis are displayed in Table 5. Semantic role, heaviness, and referentiality were statistically significant ($p < .01$), but animacy was not significant ($p = .41$).³

³ This result was not in accordance with the animate before inanimate preference. However, it supports Imamura's (2019) suggestion that the effects of animacy are so weak that they can work only in psycholinguistic experiments in which other factors are controlled.

Table 5. Results of the general linear analysis

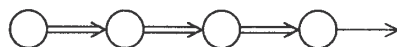
	Estimate	Std. Error	<i>t</i> -value	<i>p</i> -value
Semantic role	0.433	0.076	5.704	$p < .01$
Heaviness	0.095	0.010	9.817	$p < .01$
Referentiality	0.387	0.060	6.487	$p < .01$
Animacy	0.070	0.085	0.822	$p = .41$

4 Discussion

The results of the current corpus analysis support the hypothesis that the frequency of each semantic role is different between the SOV word order and the OSV word order: paths appeared more often in the OSV clauses than in the SOV clauses. Since other properties were analyzed simultaneously, it is rather certain that semantic roles also affect word order. Importantly, the results do not mean that paths prefer the OSV word order to the SOV word order because the OSV word order is much rarer than the SOV word order; essentially, both patients and paths prefer the SOV word order to the OSV word order. Therefore, before considering what causes the difference in the frequency of the semantic roles, I will discuss why the SOV word order is generally preferred over the OSV word order.

Not only Japanese but most of the world languages have been considered to prefer the SO word order to the OS word order (Greenberg 1963). This well-known *subject before object* preference has been verified by large-scale investigations (Dryer 2013; Hammarström 2016). However, the preference has not been of great interest to theoretical linguistics. For instance, some studies have assumed that all the world languages share the same underlying basic word order of either SOV (Haider 2000) or SVO (Broekhuis 2008; Kayne 1994). To the best of my knowledge, however, no study has predicted that word orders where the object precedes the subject are the underlying basic word order. Consequently, the reason why the subject precedes the object in most languages has not been explained.

A naive but reasonable explanation for the subject before object preference is that word order has an iconic relation with the sequence of the described event. In a transitive sentence, the subject and the object are typically an agent and a patient or theme, respectively, of the event described in the sentence. Considering that a transitive event begins with an agent's action, the SO word order is more natural than the OS word order. This explanation can be elaborated by the *action chain model* in cognitive grammar (Langacker 2008). Action chain is a series of forceful interactions, each involving the transmission of energy from one participant to the next, as depicted in Figure 1.

Figure 1. Action chain (Langacker 2008: 356)

The action chain functions as the prototype for clausal elements and is a major factor in determining

their structural arrangement. For example, consider the event in which Floyd used a hammer to break a glass. This event is seen as an action chain in which Floyd transfers energy to a hammer and the hammer, in turn, transfers it to a glass. Each of the three sentences in (8) denotes different portions of the action chain. In (8a), the entire action chain is described. In (8b), the transmission of energy from the hammer to the glass is described, but Floyd's relation to the hammer is not described. Finally, in (8c), the transmission of energy is not described.

- (8) a. Floyd broke the glass with a hammer.
 b. A hammer broke the glass.
 c. The glass broke.

(Langacker 2008: 369)

The subject is typically the starting point and the object is the end point of the chain. The SO word order is thus more natural than the OS word order as it concurs with the action chain. In other words, the subject before object preference is motivated by the interaction between the subject and object.

If this is the case, it is predicted that the weaker the interaction between the subject and object is, the easier it is to place the object before the subject. This is what the present study has found: objects whose semantic role is a path appeared more often in the OSV word order than in the SOV word order because they generally have a very weak interaction with the subject in that they are a location where the subject performs the action denoted in the verb rather than a participant which interacts with other participants.⁴ Consequently, the strength of the interaction between the subject and the object can be a semantic property in scrambled constituents.

5 Conclusion

To assess if scrambled constituents have any semantic properties other than animacy, a corpus analysis was performed in which objects in SOV or OSV clauses were classified in accordance with their semantic role. The results revealed that objects whose semantic role was a path appeared more often in the OSV word order than in the SOV word order. These results can be explained by employing the action chain model, which posits that the weaker the interaction between the subject and object is, the easier it is to place the object before the subject. Objects whose semantic role is a path have a weaker interaction with the subject, which results in a relatively high frequency of paths in OSV clauses. Therefore, the results of the present corpus analysis revealed that scrambling is not a semantically vacuous operation; it has a semantic property: the weaker the interaction between the subject and object is, the easier it is to place the object before the subject.

⁴ In fact, cognitive grammar distinguishes a location and a participant based on whether they interact with other participants.

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「かきまぜ」の意味的特性
—日本語他動詞の目的語を例に—

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要旨

日本語の語順は比較的自由であり、それは「かきまぜ (Ross 1967)」と呼ばれる移動規則によって説明されてきた。かきまぜは任意に適用される「文体上の規則」であり、意味的には無目的の操作である。したがって、基本語順文と対応するかきまぜ文の間には、意味的な違いはないとされる (Saito 1989)。しかし、実際にかきまぜ文に意味的特性が見られないかに関しては、十分な調査がなされていない。

本研究では、語順と意味役割の関係を調べるためにコーパス調査を実施した。『現代日本語書き言葉均衡コーパス』から SOV 語順もしくはそのかきまぜ語順である OSV 語順の節を収集し、その目的語を意味役割に基づき「対象／起点／経過域」のいずれかに分類した。その結果、経過域を意味する目的語は SOV 語順よりも OSV 語順においてより多く見られることが明らかになった。

この結果は、認知文法 (Langacker 2008) における「行為連鎖モデル」から説明することができる。このモデルでは、事態をある参与者から別の参与者へのエネルギーの伝達として捉える。目的語が対象である場合、主語から目的語への強いエネルギーの伝達があり、このエネルギーの伝達が SO 語順を強く動機づけていると考えられる。一方、目的語が経過域を意味する場合、主語から目的語へのエネルギーの伝達は非常に弱く、SO 語順が強く動機づけられない。したがって、経過域を意味する目的語は対象を意味する目的語に比べて、主語に前置されることが認可されやすく、結果として OSV 語順でより多く観察されたのであると考えられる。

本研究の結果は「主語と目的語の相互作用の度合い」がかきまぜの意味的特性となり得ることを示唆しており、かきまぜが意味的には無目的の操作であるという従来の見解に再考の余地を与える。また、かきまぜの言語的特性としてはこれまでに「統語的特性」と「語用論的特性」が指摘されていたが (Yamashita 2002)、かきまぜの分析は意味も含め多角的な視点から行われる必要があることが示唆される。