A processing-typological and pedagogical approach to English relative clauses: A case of Japanese EFL learners

博士論文

A processing-typological and pedagogical approach to English relative clauses: A case of Japanese EFL learners

（処理類型論と外国語教育学による英語関係節へのアプローチ

―日本人英語学習者の事例―）

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Chapter 1. Introduction

Traditionally it has widely been believed that language learners acquire a new feature by connecting a formal cue (or cues) to a target function (or functions). The results of our experiments with Japanese EFL learners lends support to our assumption that acquisition is a hearer's creation of a new semantic structure when s/he applies a semantic structure s/he knows well to an unfamiliar utterance and finds it entailing weak semantic fit. This assumption accords with that held in Radical Construction Grammar (Croft 2001) for its explanation of semantic structures and cross-linguistic generalizability. The pedagogical implication will be that language education should provide a learner with opportunities to create a new semantic structure when s/he finds the structure s/he has already acquired is semantically inapplicable to the current utterance s/he hears.

1.1 The status quo of Japanese EFL learners

Suwabe et al. (1980) investigated Japanese third-year junior high school students in regard to how they analyzed the internal structures of complex NPs with postpositive modifiers. Complex NPs with prepositional and participial phrases were used for the test items. They asked 386 students to insert "is" to a proper position so that they would make a meaningful sentence. In Examples (1) and (2) below, the copula should be placed right after the complex NP, i.e., *a student from America* in (1) and *the man waiting for a bus* in (2). The black triangles below show typical errors that more than half of the 368 students made:

Assignment: Insert "is" to an appropriate position to make a meaningful sentence.
Examples of typical errors:

(1) A student from America in our city.
▲
error（55.7%）

(2) The man waiting for a bus reading a newspaper.
▲
error（82.0%）

Suwabe et al. (1980) remark that students tended to insert "is" after the sentence-initial NP which looked like the subject of the sentence. This suggests that students were unable to recognize *a student from America* and *the man waiting for a bus* as a complex NP respectively.

Kimura and Kanatani (2006) collected longitudinal data in order to identify how long it takes for Japanese EFL students to acquire target features from the time of initial introduction in classrooms. They continuously observed the same population of some 150 students for nearly three years with tests conducted three times with intervals. The target feature was "complex NPs including prepositional phrases as postpositive modifiers" such as *the flower on the desk*. The target feature was introduced in the earlier semester in the first year.

Examples (3) below is a test sentence. The assignment was to transform it into an affirmative sentence. If the student recognized *the flower on the desk* as a complex NP, s/he was supposed to make such a response as (4). Example (5) shows a typical error, which shows the test taker fails to recognize *the flower on the desk* as a complex NP:

Assignment: change into an affirmative sentence
(3) Is the flower on the desk beautiful?
(4) correct response: The flower on the desk is beautiful.
(5) typical error: *The flower is beautiful on the desk.

Table 1 gives the results of the tests. Each score represents a mean percentage of correct responses.

Table 1. Percentages of correct responses

1st year	2nd year	3rd year	
earlier semester	2nd semester	1st semester	3rd semester
(initial instruction)	73%	54.5%	49.3%

Table 1 shows that the results got worse as time passed. From this, Kimura and Kanatani observed that it seems difficult for students to acquire NPs with prepositional phrases as postpositive modifiers.

From the time of Suwabe et al. (1980) through that of Kimura and Kanatani (2006), Japan's English education had dramatically changed. The introductions of foreign assistant language teachers and audio visual apparatus are good examples. However, it seems as difficult as ever for Japanese EFL students to acquire the internal structure of complex NPs with postpositive modifiers. They find great difficulty in comprehending and acquiring a fairly simple structure consisting of a head noun followed by a prepositional phrase. Thus, they will find greater difficulty with more complex structures such as complex NPs with full-fledged or reduced relative clauses, which are also postpositive. As a matter of fact, in a production task we conducted, 15 of the 25 Japanese EFL college students placed English full-fledged relative clauses *before* the head noun. They were majoring in the English language and literature (Morimoto and Horie 2009). They might have been affected by the prenominal Japanese relatives and the errors of the college students, in turn, might have resulted from their long-standing inability to recognize a complex NP as a unit since their junior high school days.

The findings raised above indicate that Japanese EFL learners find difficulty in recognizing a complex NP as a unit. A unit in this case means two things. One is that the modifying clause is subordinated to the head noun. That is to say, the relative clause becomes part of the NP governed by the head noun. The other is that a complex NP behaves in a sentence as if it were a single noun. For example, the complex NP *the flower on the desk* is moved to the front in Example (4) above. In other words, relative clauses function as adjectives in the same way as plain adjectives such as beautiful, cold, and etc. are adjectives. The above pieces of evidence make us suspect that Japanese EFL students fail to recognize a relative clause-including NP as a unit and that Japan's English education fail in making them recognize that.

1.2 Teaching of relative clauses in Japan

Before discussing the effect of instruction on students' recognition of complex NPs as a unit,

we have to see whether Japan's English education has an intention to guide them to there at all. The six boxes below contain illustrations of relative clauses found in authorized English textbooks for junior high schools in Japan. Each one of the boxes is allocated to one publisher's text book. The present author added bold types to the kanji characters ('説明する' or '説明を加える') for 'to explain' in the boxes:

Columbus 21
(光村図書 'Mitsumuratosho' 2006)

The *person* **who** encouraged me is my grandfather.
人を**説明する**言い方(who を使って)
(a way of explaining a person using *who* (p.47))

I have to take *the exams* **which** are coming up.
ものを**説明する**言い方 (which を使って)
(a way of explaining a thing using *which* (p.47))

which は、修飾される名詞が「もの」のときに用いられます。
(*which* is used when the modified noun stands for a thing.) (p.50)
修飾する節で which が目的語の働きをする
(・・・が ～する もの)
(*which* plays the role of object in the modifying clause (a thing which・・・ does ～))
The language **which** we are learning is English.
The learning + We are learning *it*. (p.50)

修飾する節で which が主語の働きをする
(～する もの)
(*which* plays the role of subject in the modifying clause (a thing which does ～))
This is the picture **which** was taken at UCLA.
The picture + *It* was taken at UCLA (p.50)

New crown 3 English series
(三省堂 'Sanseido' 2006)

a book
a book **that** is good for children
I have a book **that** is good for children.
that を使って人や物を**説明する**とき[1]
(when you explain a person or a thing using that [1])
(p.52)

the letter
the letter **that** Miki received yesterday
This is the letter **that** Miki received yesterday.
that を使って人や物を**説明する**とき[2]
(when you explain a person or a thing using that[2])
(p.53)

a teacher **who** lives in Australia
Mr.Miller is a teacher **who** lives in Australia.

a speech **which** became famous
This is a speech **which** became famous.
which を使って人や物を**説明する**とき[1]
(when you explain a person or a thing using which [1])
(p.54)

the book
the book **which** I read last night
This is the book **which** I read last night.
which を使って人や物を**説明する**とき[2]
(when you explain a person or a thing using which [2])
(p.55)

New horizon English course 3
(東京書籍 'Tokyoshoseki' 2006)

I bought a book in the United States.
This is **a book I bought** in the United States.

I bought book の語順を変えて a book I bought とすると、「私が買った本」という意味になる。
(If you change 'I bought a book'into 'a book I bough' by changing the word order, it will mean 'a book I bought.') (p.58)

Carson is the scientist **who** wrote Silent Spring.
「を書いた科学者」という意味になる。
人について**説明を加える**ときは、関係代名詞の who を使う。
(The meaning is 'the person who wrote ….' When you give an explanation about a person, you should use the relative pronoun *who*.) (p.59)

This is a movie **that [which]** makes us happy.
物について**説明を加える**ときは関係代名詞の that または which をつかう。
(When you give an explanation about a thng, you should use the relative pronoun *that* or *which*) (p.60)

This is the book **that** she wrote last year.
a book she wrote のような場合 *that* を入れることもできる。
(In such cases as *A book she wrote*, you can insert *that* in it.) (p.61)

One world English course 3
(教育出版 'kyoikushuppann' 2006)

「人/もの」に**説明を加える**文のしくみ (p.81)
(A system of sentences which provide explanations to a' perspn' or a'thing') (p.81)

that を入れて文を加えます (p.82)
(to add a sentence by inserting *that*.)
The armor = **that** he was wearing saved his life。
This is the vacation = **that** you want to take.

which でつないで「もの」を**説明します**(p.82)
(to explain a 'thing' by connecting (the clauses) with *which*.)
This was an experience = **which** changed his life
He started fund = **which** would help children.

who でつないで「人」を**説明します**(p.82)
(to explain a 'person' by connecting (the clauses) with *who*.)
He is a hero = **who** has run in many difficult marathons
He is a man = **who** never quits

which や *who* は「人/もの」と「**説明**」をつなぐはたらきをしているんだね。
(*which* and *who* functions as connecters which join 'a person/a thing' with an 'explanation.')

Sunshine English course 3
(開隆堂'Kairyudo' 2002)

名詞＋節 (前の名詞を**説明する**節)
This is the book I got in France. (p.62)

関係代名詞 (**説明する**文の中で、主語の代わりに使われる場合)
(Relative pronoun (used in place of the subject in the modifying sentence)
1「人」の場合 (in case of a person)
I know a boy. He is from France.
→ I know a boy **who** is from France.
2「もの」などの場合 (in case of a thing, etc.)
Did you read the letter ? It came yesterday.
→ Did you read the letter **which** came yesterday? (p.70)

関係代名詞 (**説明する**文の中で、目的語の代わりに使われる場合)
(Relative pronoun (used in place of the object in the modifying sentence)

1「人」の場合 (in case of a person)
This is the boy. I met him at the party.
→ This is the boy **that** I met at the party.

2「もの」などの場合 (in case of a thing, etc.)
This is the watch. I bought it yesterday.
→ This is the watch **which** [**that**] I bought yesterday. (p.78)

Total English 3
(学校図書 'gakkoutosho' 2008)

We need a person **who** speaks English and Japanese.
関係代名詞 who を使って「～する･・・(人)」と言う
(Using the relative pronoun *who* , you can say 'a (person) who does ～') (p.44)

I received a letter **which** was written in English.
関係代名詞 which を使って「～する ・・・(物・事)」と言う
(Using the relative pronoun *which*, you can say 'a (thing) which does ～') (p.45)

I received a letter **that** was written in English.
関係代名詞 that を使って「～ ・・・(人・物・事)」と言う
(Using the relative pronoun *which*, you can say 'a (person or thing) which does ～') (p.46)

Five of the six test books use the phrase ‘setumeisuru’(‘to explain’) or ‘setumei-o kuwaeru’(‘to add an explanation to’) in defining the function of relative clauses. In real life situations, one explains something using some phrases, clauses, or sentences. In these situations, the word which is explained and the clause which is used for the explanation have nothing to do with each other. Students would not even imagine from the phrase ‘setumeisuru’(‘to explain’) that the noun ‘explained’ subordinates the clause used for the explanation and the newly born unit behaves as if it were a single noun in a sentence.

Other trends we find in the textbooks are that they emphasize the positions of relative markers with bold types, etc., while indicating relative positions between the modified noun, relative marker and the modifying clause with some devices such as arrows, and underlines. These suggest that the writers of the textbooks apparently posit that mere the presence, relative position, and contiguity of certain formal properties will directly relate learners to the meaning of a syntactic structure which is composed of those formal properties. This position is in line with external functionalism, one of the mainstream trends of functionalist theories that postulates direct mappings between items on the formal and functional levels. Trends of functionalist theories will be explained in Chapter 2 and 4. It is natural that the current methods of language teaching are under the influence of external functionalism since it formed a mainstream of language acquisition in the 80 and 90s. However, we hold a different view. As mentioned at the outset of the thesis, we think that language acquisition takes place when a hearer imposes an old semantic structure of his/hers on a construction new to her/her. A semantic problem contingent with the imposition guides him/her to create a new semantic structure so that it will agree with the new construction.

1.3 Purpose and significance of the study

The present study aims to testify the following hypotheses. First, language acquisition in general

is a hearer's creation of a new semantic structure when s/he applies a semantic structure s/he knows well to an unfamiliar utterance and finds it entailing weak semantic fit. Second, the above hypothesis will hold true for Japanese EFL learners' acquisition of full-fledged English relative clauses. The previous studies and rationales on which these hypotheses stand will be explained in 2.5 and 3.1.

Note that "full-fledged relative clause" is a term that refers to relative clauses consisting of a subject NP and a tensed verb, which is often mentioned as "non-reduced relative clause" Full-fledged relative clause is a counterpart structure to "reduced relative clause," which consists of a participle and modifiers in many cases.

As the illustrations of relative clauses in the textbooks shows, Japan's English education is apparently designed to lead students to learn formal properties and its meanings corresponding to them. Following this, acquisition means reinforcing the correspondences and enlarging them in number. On the other hand, there are few studies focusing on the roles that semantic cues play in L2 acquisition. The method of the main experiment, i.e., Experiment 2 is intended to isolate the process in which Japanese EFL learners use semantic cues in comprehending relative clauses, which will provide implications about the teaching of relative clauses to Japanese EFL learners.

1.4 The organization of the thesis

Chapter 2 will be devoted to previous studies providing us with rationales for the present thesis. Chapter 3 will report the methods and results of the two sessions of pencil-and-paper experiments on the acquisition of English full-fledged relative clauses with Japanese college students learning English. Chapter 4 will discuss the results of the experiments in view of Radical Construction Grammar. Chapter 5 will present the conclusion and future prospects.

Chapter 2. Previous studies

In Chapter 2, we will present an overview of preceding studies relevant to the current study. These studies pertain to our interest in the acquisition of English relative clauses ("relatives" for short) by Japanese learners

We made reference to a variety of previous studies that we viewed as reporting important facts on the acquisition of complex NPs in L1 and L2. These studies provide empirical evidence about how L1 speakers and L2 learners analyze sentences including complex NPs. Some of these studies examine young children, others adults. Some deal with L1 acquisition, others L2 acquisition. Some focus on full-fledged relatives, others reduced relatives. We compared the findings on different subjects, figuring out our prediction on Japanese learners' acquisition of English relatives.

We selected studies from a wide range of fields which appeared to be important for the following hypotheses, which have been mentioned in 1.3 and will be explained in detail in 2.5.

First, language acquisition in general is a hearer's creation of a new semantic structure when s/he applies a semantic structure s/he knows well to an unfamiliar utterance and finds it entailing weak semantic fit. Second, the above hypothesis will hold true for Japanese EFL learners' acquisition of full-fledged English relative clauses.

The rationales underlying these hypotheses have inductively developed. We related pieces of evidence found in the variety of previous studies. We place emphasis on inductive ways of theorizing not in the sense of recommending far-fetching irrelevant fragments of evidence. The essence of an inductive theory lies in its empirical nature: every phase on the development of an inductive argument requires logical support by empirical evidence. Considering this respect, we chose previous studies that provide evidence drawing on which we developed our own rationales: L1 children and L2 learners acquire complex structures such as relative clauses in a similar way; the analysis of complex NPs is dependent on semantic information, whether they

are full-fledged relatives, reduced relatives, or prepositional phrase-including NPs. These rationales enabled us to design the experiments and make predictions on the results.

It should be noted that it is widely acknowledged that process of acquisition of the first and second languages are different in many aspects (Ellis 1994: 105-109). We do not intend to postulate that native children and L2 learners follow the same route to acquisition. We only suppose that the highly complex structures of relative-clause including sentences may restrict the variety of strategies that L1 and L2 learners can use for the comprehension and acquisition of them. This can be compared to mountain climbing. In climbing a low, easy mountain, there are a variety of routes leading to the summit from a variety of directions. In climbing a high, difficult mountain, climbers starting from a variety of directions will converge into one particular route leading to the summit.

It also should be noted that there are studies on L2 acquisition of English by foreign people in including Japanese. Doughty (1991) focuses on the effect of meaning-oriented instruction but does not treat semantic information as direct cues for syntactic analysis. Other studies (Izumi 2002, Izumi 2003 etc.) do not treat semantic factors as central issues. For this reason, we do not touch on them in this chapter in spite of their potential import in respective fields. Rutherford (1983), Gass (1983) and Eckman et al. (1988) will be mentioned in Chapter 3.

Chapter 2 is organized in the following way. Section 1 reviews some studies suggesting that the Japanese language is relatively productive in the relativizability (the number of relativizable positions) and the frequency of the use of relatives compared among languages in the world. Section 2 refers to some experimental studies suggesting that L1-English children and adult Japanese L2-English learners tend to make the same errors: the misinterpretation of a relative clause-including sentence as coordinate clauses. Section 3 accounts for the argument that semantic properties affect the initial syntactic analysis in sentence processing. Section 4 will be devoted to making overviews of the two mainstream trends of functionalist theories (external and integrative functionalism) and explain models which typically represent them.

2.1 Relative clauses in L1 Japanese and English

In this section, we will present an overview of grammar and performance of Japanese relative clauses. The acquisition of L2 features is often discussed in terms of language transfer: 'second language learners often "transfer" elements of their native language (NL) onto the speech patterns of the target language (TL) (Gass 1983: 69).' Typologically speaking, Japanese and English are very different. The two languages contrast in major characteristics: SOV vs. SVO, postpositional vs. prepositional, prenominal vs. postnominal relatives. These do not necessarily mean that it is difficult for speakers of a language of one type to master a language of the other type. Language transfer is not so simple a mechanism as to permit us to assert that similarities and differences between the native and target languages immediately reflect the ease and difficulty of L2 learning; we will try to present some evidence to dismiss the plausible explanation that English relatives are difficult for Japanese learners because relative clause constructions are absent or scant in L1 Japanese. The grammar, use, and acquisition of Japanese relatives will be explored in this section.

2.1.1 Relativizable positions of Japanese

The number of relativizable positions provides evidence in support of the productivity of Japanese relative clauses. The term of "relativizable positions" refers to a set of grammatical roles that the head noun (or NP) can play in the relative clause. For example, the complex NP, *the fish which John caught* is headed by *fish* which is relativized on the object: the "object" is one of the relativizable positions in English. Keenan and Comrie (1977) assume six relativizable NP positions and a hierarchical order among them: the Noun Phrase Accessibility Hierachy (AH) is a cross-linguistically applicable principle:

(1) Accessibility Hierarchy (AH)

SU > DO > IO > OBL > GEN > OCOMP

Keenan and Comrie postulate "if a language can relativize any position low on the AH, then it

can relativize all higher positions (ibid: 68).” As regards the six relativizable NP positions, English makes all six NP positions relativizable while Japanese makes five relativizable and leaves one (OComp) controversial. Cross-linguistically, English and Japanese are ranked among those languages with a relatively rich set of relativizable positions (ibid: 76-79). Therefore, it would be irrelevant to assume that the Japanese learners’ difficulty in acquiring English relative clauses derives from the absence or sparsity of the target feature in the grammar of the mother language.

2.1.2 Use in L1 Japanese

The last subsection proves that Japanese grammar is relatively productive in relativization. This does not necessarily guarantee that Japanese is productive in the use of relative clauses in performance.

There is a study which presents evidence for frequent use of relative clauses in Japanese. Wang, Horie, and Pardeshi (2009) compared the Japanese and Mandarin languages in terms of how relative clauses are used in these languages on the basis of text frequency. This particular comparison is interesting in three ways. First, Japanese makes five NP positions relativizable with the other one (OComp) remaining controversial while Mandarin Chinese renders all the six relativizable. (Keenan and Comrie 1977: 76-77). Second, Japanese and Mandarin Chinese are at the opposite ends of the continuum of word order typology: SOV with postpositions versus SVO with prepositions. These combinations are common ones in the world’s languages. Third, with regard to the position of relative clauses to the head noun, the prenominal position of Japanese relative clauses is common in OV languages whereas the prenominal position of Chinese relative clauses is exceptionally rare in VO languages. In sum, the typological patterns of Japanese referred to in these three respects are all common among OV languages. By contrast, the equivalent typological patterns of Chinese mentioned in the first and second respects are common among VO languages while the peculiarity of the typological pattern of Chinese in the

third respect is noteworthy. The comparison of Japanese and Mandarin Chinese will, thus, shed light on the effect of the rare position of Chinese relative clauses on the use of relative clauses in performance.

Wang, Horie, and Pardeshi (2009) compared the frequency of noun modifying constructions (NMCs for short) in Mandarin Chinese and Japanese, which include relative clauses as their main subtype. It was found that, when Japanese novels are translated into Chinese by a native speaker of Chinese, the number of NMC tokens in the original Japanese novels decreased approximately to the half (Table 1). The decrease can be attributed to the tendency for Japanese NMCs to be translated into non-NMC constructions in Chinese. Conversely, the number of NMC tokens increased by approximately 60% (Table 2) when a Chinese novel was translated into Japanese. The increase arguably resulted from the Japanese translator's creation of Japanese NMCs out of non-NMC constructions in the original Chinese novel.

Table 1. Frequency of Noun Modifying Constructions: Japanese Novels vs. Chinese Translations

	Japanese original	Chinese translation
"Kokoro"	623	317
"Kitchen"	166	83

Source: Wang, Horie, and Pardeshi (2009: 219) modified by Morimoto

Table 2. Frequency of Noun Modifying Constructions: Chinese Novel vs. Japanese Translation

	Chinese original	Japanese translation
"Zhengzhuan"	61	115

Source: Wang, Horie, and Pardeshi (2009: 219 and 221) modified by Morimoto

The apparently less frequent use of Chinese NMCs than Japanese equivalents may result from the typologically rare combination of SVO order and the prenominal relatives of Chinese. This combination entails the disadvantage of having a relative clause between the matrix verb and its

object when the relative clause modifies the matrix object; it results in the S V Rel O order. This ordering may make it difficult to process the matrix VP because of the intervening relative clause. The "Verb-Object Bonding" is a principle proposed by Tomlin (1986). According to the principle, languages tend to inhibit other sentential elements to be located between matrix verb and its object. It is presumably the prenominal position of Mandarin Chinese NMCs that deters Chinese-speaking people from using NMCs frequently. The other typological features of Mandarin Chinese (the first and second respects above) seem to be optimal for sentence processing in general and never to have deterrent effects on the frequent use of NMCs. On the other hand, Japanese is free from any typological feature counterproductive to the use of relative clauses.

2.1.3 Emergence of relative clauses in early childhood

We will discuss another phenomenon about native children's early utterances of relative clauses. We will review a couple of studies indicating that Japanese is no less productive than English in the acquisition of relative clauses. Diessel and Tomasello (2000) and Ozeki and Shirai (2007) are case studies that recorded and analyzed English- and Japanese-speaking children's early spontaneous utterances of relative clauses respectively. It would be meaningful to compare these studies because the methodology of the latter was devised with a view to making comparisons with the former.

According to Diessel and Tomasello (ibid), three of the four English-speaking infants started to spontaneously utter relative clause constructions before their third birthday and the remaining one before her fourth birthday. The authors observed that the majority of earliest relative clause-including utterances start with a presentational copular clause followed by an relative clause including an intransitive verb. For example:

(2) That's doggy *turn around*. (Nina1;11)" (ibid: 139).

The counterpart study by Ozeki and Shirai (2007) reports on five Japanese-speaking young

children. Relative clause constructions emerged in their spontaneous speech between 1;10 and 2;9 years of age. With respect to the position of the relative clause in the main clause, approximately one-third of their earliest relative clauses modified an isolated head noun (phrase) and another one-third modified the matrix subject. When it comes to the role of the head noun in the relative clause, each of the top three roles in the Accessibility Hierarchy, namely, SU, DO, and OBL roles, added up to roughly one-third of the whole relative clause-including utterances. These findings apparently contradict the Noun Phrase Accessibility Hierarchy if the Hierarchy is supposed to be in proportion to the order of ease of acquisition. The authors account for this in terms of the characteristics of Japanese relative clause constructions, arguing that the Japanese relative clauses are actually "attributive clauses" which do not require syntactic operations such as gapping and movement, not being constrained by syntax.

Although the Japanese- and English-speaking children revealed considerably different patterns of development in their early utterances of relative clauses, both Japanese and English children started to use relative clauses at almost the same age. In addition, both learned to get more than one NP positions relativized right after their first use of relative clauses. The overall results indicate that Japanese is no less productive than English in terms of the emergence of the constructions in early childhood.

The last three subsections observed Japanese relative clauses with respect to the grammar (§2.1.1), use (§2.1.2), and acquisition (§2.1.3). The findings provide partial support to our assumption that Japanese is no less productive than English in the grammar, use, and acquisition of relative clause constructions. This assumption, in turn, serves as a rationale on which to defy the plausible explanation that English relative clauses are difficult for Japanese learners because Japanese is less productive than English in the grammar, use, or acquisition of relative clauses.

2.2 The conjoined-clause analysis

The term, conjoined-clause analysis was coined by Tavakolian (1981). It originally refers to errors of comprehending a relative clause-including sentence as two simplex sentences. Tavakolian used the term specifically for such errors made by English-speaking children. In this article, for convenience, the term will also be used for errors of the same kind made by Japanese learners of L2 English, which are investigated in Flynn (1989). The comparison of the results of these studies seems to imply similarities between the L1 and the L2 acquisition process.

2.2.1 English-speaking children

In this subsection I will review an experimental study probing into how English-speaking children interpret relative clause-including sentences on the way to the acquisition of them.

Tavakolian (1981) assumes that children utilize systematic strategies at each point on the way to adult grammar: children use these interim strategies when they encounter with unfamiliar structures in input, applying the rules of more familiar and easier structures to them. Tavakolian argues that these systematic errors help children restrict the number of possible hypotheses about the structures of the given language.

Relative clause-including sentences are normally classified into several types according to the location of the head noun in the matrix clause and the role of the extracted head noun in the subordinate clause. Types of relative clauses are characterized on the basis of these two respects and they are termed and symbolized in the following way. As for the location of the head noun in the matrix clause, a relative clause modifying the matrix subject is referred to as "a relative clause in the matrix-subject position," so a relative clause modifying the matrix object is referred to as "a relative clause in the matrix-object position." As for the role of the head noun in the relative clause, a relative clause relativized on the subject is referred to as "a subject-extracted relative clause," so a relative clause relativized on the object is referred to as

"an object-extracted relative clause."

The model examples (3)-(6) below are model sentences representing the four types of relative clauses: the former letter stands for the function of the head noun in the main clause and the latter the function of the relativized NP in the relative clause:

(3) SS: The sheep that knocks down the rabbit stands on the lion.
(4) SO: The lion that the horse kisses knocks down the duck.
(5) OS: The lion stands on the duck that bumps into the pig.
(6) OO: The horse hits the sheep that the duck kisses.

The conjoined-clause analysis allows the child to interpret a relative clause-including sentence as "conjoined clauses." The term "conjoined clauses" refers to two finite clauses juxtaposed as equivalents such as *John plays baseball and I play tennis*. A conjoined-clause analysis postulates the (erroneous) application of the first clause subject to the second clause subject. This is possible only when the subject of the second clause is phonetically missing in the hearer's structural interpretation. Let us see how the conjoined-clause analysis work in the model sentences of (3)-(6). In this thesis, "U" put in front of a string indicates that the string represents a hearer's or a reader's understanding of the meaning of a stimulus string. Thus, "U" stands for "understood meaning."

(3) SS: The sheep that knocks down the rabbit stands on the lion.
(7) the conjoined-clause Analysis on (3):
U: The sheep knocks down the rabbit *and the sheep* stands on the lion.

In case of the conjoined-clause analysis on the SO type relatives, it depends on the hearer which of the two NPs in the first clause (the lion or the horse in (4)) functions as the first clause subject. The choice of the second-clause subject, in turn, depends on the choice of the first-clause subject. Two patterns of the conjoined-clause analysis can be figured out for an SO relative as in (8):

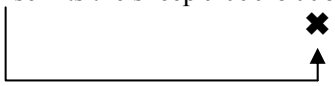
(4) SO: The lion *that the horse kisses* knocks down the duck.

(8) the conjoined-clause analysis on (4):
U: The horse kisses the lion *and the horse* knocks down the duck. or
U: The lion kisses the horse *and the lion* knocks down the duck.

(5) OS: The lion stands on the duck *that bumps into the pig*.
(9) the conjoined-clause analysis on (5):
U: The lion stands on the duck *and the lion* bumps into the duck.

Situations are different for the OO-type relatives than for the other types. The second clause subject is not missing. The linear NV sequence in the second clause will be interpreted as functioning as the subject and verb even by young children. The existing subject of the second clause will discourage the first-clause subject to be applied to the second-clause subject:

(6) OO: The horse hits the sheep *that the duck kisses*.



For this reason, Tavakolian posits that the OO-type relatives are less suitable for the conjoined-clause analysis than for other types of relatives (ibid: 177). She, nonetheless, argues for the possibility for the conjoined-clause analysis to be applied to the OO-type relatives, pointing out, "The preverbal NP in the second clause is analyzed as the object of the second verb.(ibid: 177)" This is represented in (10):

(6) The horse hits the sheep *that the duck kisses*.
(10) the conjoined-clause analysis on (6):
U: The horse hits the sheep *and the horse kisses the duck*.

We are skeptical of systematic use of this "conjoined-clause analysis": if children employs the analysis such as (10), it results not from a systematic interim strategy but from a random matching of NPs in the input. One can see that the NV sequence in the second clause in (6) is analyzed as OV in (10): the true second-clause subject *the duck* in (6) becomes the second-clause object in (10). Even young children are unlikely to do this analysis because English is rigidly SVO in basic word order.

Let us now turn to the method and the results of the experiment of Tavakolian (1981). The participants were 3 to 5-year English-speaking children. The experiment was conducted in an interview with individual children. They each were asked to hear a relative clause-including sentence and express their comprehension of them. The test sentences consisted of four types of relative clauses.

The child was asked to act out his/her comprehension by expressing "who did what to whom" with a set of toy animals: the actor, action, and object in the main and relative clause respectively. In recording and analyzing the children's performance, the researcher denoted the three NPs in each test sentence with 1, 2 and 3 from left to right as (7) below shows. In Table 3, each sequence of four numerals, with a comma in the middle, stands for the animals which the child had chosen as the actor and object of the first and the second clause. In Table 3, The underlined sequences are correct responses and the ones in bold type are those responses that can be seen as results of the conjoined-clause analysis.

If the child acts out his/her correct comprehension of the stimulus (7), the performance is recorded as 12, 23. By contrast, if s/he applies the first-clause subject to the second with the conjoined-clause analysis, it will be recorded as 12, 13.

1 2 3
(7) OS: The lion pushes the deer that kisses the rabbit.

We have compiled Table 3 by modifying the results shown on page 172-174 of Tavakolian (1981).

There are several points to note about Tavakolian's findings.

First, the relatively high percentage (78%) representing correct analysis for the SS relatives includes some covert errors deriving from the conjoined-clause analysis: as the author herself pointed out, not only a correct interpretation but the conjoined-clause analysis resulted in the response 12, 13. The response 12, 13 occurred even if the child interpreted "The sheep that

knocks down the rabbit that stands on the lion" as "U: The sheep that knocks down the rabbit *and the sheep* stands on the lion." Thus the value for 12, 13 (78%) cannot be taken as it is.

Table 3. Distribution of responses.

SS	1		2		3
	The sheep that knocks down the rabbit stands on the lion.				
	Results.	**12,13**	12,23	21,23	12,32	others
		78%	10%	3%	3%	7%
SO	1		2		3
	The lion that the horse kisses knocks down the duck.				
	Results	21,13	**21,23**	**12,13**	13,23 ….	
		21%	**21%**	**31%**	17%	
OS	1		2		3
	The lion stands on the duck that bumps into the pig.				
	Results.	12,23	**12,13**	12,31	12,32,	21,23 …
		19%	**63%**	7%	4%	3%
OO	1		2		3
	The horse hits the sheep that the duck kisses.				
	Results	12,32	**12,13**	12,31	12,12,	12,23 …
		38%	**19%**	22%	4%	4%

Note: underlined numerals= correct response;
bold numerals= the conjoined-clause analysis (the standard version)
Source: Tavakolian 1981, Tables 8.3-8.6 on pages 172-174.

Second, in case of the SO relative exemplified in Table 3, either *the lion* or *the horse* can be the NP that the child may apply to the second-clause subject incorrectly with the conjoined-clause analysis. Thus, both 21, 23 and 12, 13 obtain as results of the conjoined-clause analysis. Thus the percentage of the conjoined-clause analysis for SO relatives is presented as the aggregate of these two patterns: 21%+31%=52%.

Third, the lowest value of the conjoined-clause analysis assigned to the OO relatives (19%) is to be explained in terms of the unsuitability of the conjoined-clause analysis for the OO relative; OO relatives, unlike the other types of relatives, lack an NP in the postverbal position in the second clause; any strategy for OO relatives fails to create an interpretation consisting of a couple of complete finite clauses.

In discussing Table 3, the points mentioned in the last paragraph have to be taken into account; the values given to SS and OO relatives are to be examined with care. On the other hand, the values given to the SO and OS relatives are more reliable. 53 percent given to the SO relatives and 63 percent to the OS relatives are supposed to be sheer values based on the tokens of the conjoined-clause analysis. Judging from these reliable values, the seemingly correct responses to the SS relatives 12, 13, i.e., 78 % may include those covertly erroneous responses gained through the conjoined-clause analysis.

Let us recall Table 3 above. Tavakolian (1981) critically comments on problems involved in her own experiment. These comments seem to be closely related to our points of the present study. Tavakolian poses a question of whether her experimental device successfully isolates the information she tries to elicit. As has been mentioned above, children were asked to hear a relative clause-including sentence and report their understanding of two sets of actor-object relationships using toy animals. These relationships were expected to be found in the main and relative clause. The underlined sets of four numerals in Table 3 represent correct responses. The correct response 12, 13 for the SS type, which is underlined in Table 3, is deemed to be correct. But this may happen to derive from either a relative clause or the conjoined-clause analysis. Tavakolian states:

> "…many children derive the correct response to SS relatives by utilizing the conjoined-clause analysis, which also happens to provide the correct response. (Tavakolian 1981:175)"

The example below shows a subject-extracted relative clause in the matrix subject position (SS

for short).

1 2 3

(3) The sheep that knocks down the rabbit stands on the lion.

(11) S[NP[The sheep that knocks down the rabbit] stands on the lion]].

(12) S[S[The sheep that knocks down the rabbit] S[△ stands on the lion].

A child's 12, 13 response to the stimulus (3) may come from either an interpretation of it as (11) or (12). The interpretation (11) represents a correct relative-clause analysis while (12) derives from the conjoined-clause analysis. These two different analyses result in the same response of 12, 13 in the method of reporting of two actor-object relationships. Thus, in Table 3, the 12, 13 response to SS relatives, which added up to 78% of the total responses, may include responses resulting from the conjoined-clause analysis. This comment on the methodology indicates that the correct types of responses do not guarantee the child's correct comprehension of a complex NP as far as the SS-type items are concerned.

2.2.2 Japanese-speaking adults' learning of L2 English

Flynn (1989) conducted an experiment with adult ESL learners focusing on their acquisition of English relative clauses. The participants' native languages were Spanish, Japanese, and Chinese. Flynn was interested in how the head-initial/head-final parameter of the L1s affects the L2 learning of head-initial English relatives. Thus, it is significant that the three native languages have different combinations of basic word order and head-directionality.

The participants were asked to repeat orally-presented relative clause-including sentences. This was designed on the ground that the successful repetition proves successful syntactic comprehension. The test sentences consisted of four relative clause types: SS, SO, OS and OO.

The results revealed systematic patterns of errors. The most salient one was the "conversion to coordination," which can be seen as another formulation of "the conjoined-clause analysis" originally coined by Tavakolian (1981).

Stimulus: (13) The policeman questioned the man who carried the baby.
Response: (14) The policeman questioned the man and carried the baby.
(15) The policeman questioned the man *and the policeman* carried the baby.

The responses (14) and (15) above show the conversion of the relative clause-including sentence to coordinate clauses. Flynn interprets these responses as resulting from erroneous application of the first-clause subject to the second-clause subject. As for the incidence of these errors, Japanese and Chinese ESL learners made a significantly larger number of "conversion-to-coordination" errors than Spanish ESL learners. Flynn explained this in terms of the head-direction parameter: the opposite head directionality between the mother and target languages lead to the difficulty in acquiring the L2 relatives, causing Japanese and Chinese learners to depend more heavily on the strategy of "conversion-to-coordinate clauses."

Table 4. Conversion to coordination (Flynn 1989: 126)

Language group	Spanish	Japanese	Chinese
Low	20%	29%	16%
Mid	6%	13%	12%
High	3%	9%	7%
Overall	10%	17%	12%

Source: Flynn 1989: 126

2.2.3 Universal tendency toward simplex-sentence analysis

The above-mentioned adult Japanese ESL learners and English-speaking children share one trait. They tend to analyze a relative-clause including sentence as two simple coordinate sentences. For example, those who analyzed (13) as (14) or (15) must have analyzed *the man who carried the baby* as U: *the policeman carried the baby*. Tavakolian's "conjoined-clause analysis" and Flynn's "conversion to coordinate clauses" can be seen as a consequence of the imposition of a simplex-sentence analysis on the relative clause-containing region of a relative clause-including sentence.

English-speaking children and Japanese ESL learners seem to use this particular strategy at a stage of their L1 and L2 development respectively. If this error is an interim rule for English speaking children on the way to the rule of complex NP formation, the persistently remaining errors of Japanese learners are not a detrimental habit to prevent or eliminate but an essential process on the way to the full mastery of the target structure.

Therefore, Japanese ESL learners are in need of proceeding from main-clause to complex-NP analysis just as L1 English children do. It is assumed that an interim strategy in L1 development will be useful for L2 learners of the language if the interim strategy is rule-governed, not random associations of constituents.

Tavakolian observes that "An underlying assumption of this study is that children will rely on the grammatical rules they already possess in an attempt to process difficult or unfamiliar constructions (Tavakolian 1981:169)." One question arises in relation to Japanese EFL learners' acquisition of English relative clauses: what is the factor that makes it so difficult for native English-speaking children to comprehend relative clauses-including NPs that they seek recourse to the conjoined-clause analysis? It seems natural to postulate that, if a certain linguistic feature is difficult for native children, then it is difficult for L2 learners as well. So it will be of help to identify the factor that lead native English-speaking children to resort to the conjoined-clause analysis. This may help identify what factor contributes to the difficulty that Japanese EFL learners find in acquiring English relative clauses. What is it? A clue seems to lie in the fact that both native English-speaking children and Japanese EFL learners exploit the conjoined-clause analysis. What is it for? Or what does it avoid?

We assume that, syntactically speaking, native English children and Japanese ESL learners find difficulty in the projection of the mother NP node to bind the head NP and the relative. This requires a heavy processing load in three ways. First, the parser has to process a couple of finite clauses at a time: the main and relative clauses. Second, the parser has to project and keep open

up to some point an additional NP node binding the head NP and the relative clauses. Third, the projection of mother NP node entails derivation of the relativized NP from its original position. The conjoined-clause analysis is, by contrast, free from these operations. It can be carried out with processing from left to right. The projection of the mother NP node is an operation that English-speaking children, and perhaps Japanese ESL learners, failed to do for some period.

2.2.4 Prior knowledge and cognitive abilities

There are a couple of differences between Japanese adult EFL learners and L1-English children in the acquisition of relative clauses. First, the prior knowledge of relative clauses differs. At the initial stage of relative clauses acquisition, the L1-English children (Tavakolian, ibid) must have had no, or at most, rudimentary knowledge of semantic and syntactic features of relative clauses, though they were exposed to input of relative clauses. The Japanese adult L2-English learners (Flynn, ibid), on the other hand, must have fully acquired relative clauses in their infancy since relative clause constructions do exist and are frequently used in L1 Japanese (§2.1.1 and §2.1.2). The Japanese L2-English learners, therefore, had much chance to make use of their previously acquired L1 knowledge for the acquisition of L2 English relative clauses. In contrast, L1-English children were acquiring relative clause constructions for the first time.

Second, maturation in cognitive abilities differs. In experiments in general, when test materials featuring relative clauses were presented, adult L2 learners were cognitively mature enough to comprehend and produce the highly complex NPs while the L1 children were too young to do so. In addition to the biologically developed cognitive abilities, the knowledge about the target structure obtained through education has to be taken into account. Cook (1973: 14) makes a remark on possible effects of education on second language learning, stating “few adults have not been taught the foreign language by one method or another….” Considering the social and economical situations in and surrounding Japan in the 1980s, the Japanese ESL learners studied

by Flynn (1989) are supposed to have had received EFL education at home and ESL education in the US. It is, thus, highly plausible that the Japanese adult learners had explicit knowledge of the postnominal position of English relative clauses.

In sum, the prior L1 knowledge and the adult cognitive faculty backed by L2 instruction must have favored Japanese L2-English learners over the L1-English children. The reality is, nonetheless, that all the L1-English children acquired the target structure in a few years whereas many Japanese L2-English adults were failing to do that for years.

2.3 Syntactic analysis

In the previous sections, we presented some evidence that Japanese is never less productive in the grammar, use, and acquisition of relative clause constructions. We also introduced our view that Japanese adult ESL learners and English-speaking young children share one type of errors: the conjoined-clause analysis.

In this section we will consider the validity of non-morphosyntactic information as cues for relativization. We assume that not only native English speakers but Japanese EFL learners can use non-morphosyntactic information as cues for subordinating a clause to the preceding noun. This assumption is based on the observations that Japanese EFL learners and L1-English children use the same interim strategy in comprehending relative clause-including sentences.

2.3.1 Strength of formal cues for relativization

The conjoined−clause analysis was performed in similar ways by the immature L1 and L2 English users. This appears to imply that overt relative markers (relative pronouns and complementizer (that)) are not salient enough for immature hearers to link them to a particular syntactic analysis, namely, relative clause constructions. As for the English-speaking children, it is least probable that their failure in comprehending relative clause constructions result from their lack in the

knowledge of relative clause constructions. We make this assumption on the basis of the following findings. Diessel and Tomasello (2000) observed that English-speaking children started to spontaneously utter relative clause constructions at the latest when they were three years old. If it were supposed that those English-speaking children studied by Tavakolian (3-5 years) developed at the same rate as Diessel and Tomasello's children did, they must have had knowledge of relative clause constructions. Putting these findings together, conjoined-clause analysis is not attributable to the children's total lack of the knowledge of relativization but to some problems in performance of sentence comprehension.

English relative clause constructions are formally distinguished from their corresponding simplex sentence. For example, the relative clause construction "the boy who caught a fish" is formally distinct from a simplex sentence "the boy caught a fish" by means of the relative marker *who*. Likewise, "the fish which the boy caught" is formally distinct from "the boy caught a fish" by means of the relative marker, which is often omitted when the object is relativized on. In English, an object-extracted relative clause with its relative marker omitted provides no other cue than the head-initial word order in order to distinguish itself from a simplex sentence.

We should think of the possibility that immature hearers use semantic information for comprehending the relative-clause including sentences if these formal devices such as relative markers and the postnominal positions are not useful for immature hearers such as native English children and L2 learners.

In this thesis, the term "semantic property" is often used as a concept contrastive to "syntactic property." We use the term "semantic property" to refer to lexically indexed semantic properties that regulate the relationships between individual verbs and nouns. We, thus, assume the semantic properties in themselves constrain matches between verbs and nouns. We also assume these matches are constrained by real-life contexts in on-line sentence processing.

Viewed in this light, "semantic property" is dependent on "thematic roles."

It is acknowledged that thematic roles are a set of semantic properties associated with individual verbs reserved in the lexicon (Jackendoff 1975, 1987, Dowty 1991, Primus 1999). There are controversies over whether thematic roles affect syntactic decisions on the first pass of left-to-right sentence processing. Some researchers argue for theories of syntactic autonomy which rule out the intervention of lexically based syntactic expectations, (i.e. thematic roles) in the initial analysis of an input (Fodor 1978, Frazier and Fodor 1978, Fodor and Frazier 1980, Frazier and Rayner 1982, Clifton et al. 1984, Ferreira and Clifton 1986). Others permit thematic roles to affect the initial syntactic analysis (MacWhinney 1987: 281, Trueswell et al. 1994, Hawkins 1999: 248).

2.3.2 Syntactic autonomy

With regard to the issue of the relation between semantic properties and syntactic analysis in real-time sentence processing, there is an old interest in how the continuation and closure of a higher node is related to those of lower ones. This issue has often been discussed regarding closure principles. Kimball's (1973: 36) "Closure principle" is virtually an "early closure principle", which is put in (16) below. He emphasizes the compatibility between his "Closure principle" and "Right Association", another principle of his in (17) below, saying "Closure operates the same as right association (ibid: 37)." As far as the example (18) is concerned, this assumption is correct; the mother VP node governed by *knew* is closed as soon as *the girl* is parsed because of the immediate attachment of *the girl* to the mother VP node, without waiting for the following words to keep the VP node open.

(16) Closure: A phrase is closed as soon as possible, i.e., unless the next node parsed is an immediate constituent of that phrase. (Kimball 1973: 36)

(17) Right Association: Terminal symbols optimally associate to the lowest nonterminal node. (Kimball 1973: 24)

(18) They knew the girl was in the closet. (ibid: 36)

Frazier and Fodor (1978) proposed a two-stage parsing model (21), consisting of the principles of Late Closure (19) and Minimal Attachment (20) operating on the third principle of the "first stage parser's limited view (Fodor and Frazier 1980: 439)." Below is the explanation of how the principle of Minimal Attachment works in on-line sentence processing under the constraints of the "first stage parser's limited view."

(19) Late closure: When possible, attach incoming lexical items into the clause or phrase currently being processed (i.e., the lowest possible nonterminal node dominating the last item analyzed) (Frazier and Rayner 1982: 180)

(20) Minimal attachment: Attach incoming material into the phrase-marker being constructed using the fewest nodes consistent with the well-formedness rules of the language. (ibid)

(21) A new two-stage parsing model: The first stage parser assigns lexical and phrasal nodes to substrings of roughly six words. The second stage parser then adds higher nodes to link these phrasal packages together into a complete phrase marker. (Frazier and Fodor 1978: 291)

In (22) and (23) below, the human parser prefers to attach the phrase in italics not to the nearest preceding NP (*book* in (22), *boy* in (23)) but to the matrix verb (*bought* in (22), *told* in (23)). This takes place because the attachment of the currently parsed phrase to an existing NP node inevitably requires the projection of an additional NP node, while the attachment to an existing VP node does not entail the projection of a new node. The preference for the syntactic structure with a smaller number of non-terminal nodes is referred to as Minimal Attachment. However, in cases where the Minimal Attachment site (*took* in (24)) is far to the left from the currently parsed phrase (in italics in (22)-(24)) beyond the "first stage parser's limited view (Fodor and Frazier 1980: 439)", the human parser is free from Minimal Attachment and prefers a lower, rightmost attachment site (*gift* in (24)).

(22) Joe bought the book *for Susan*. (Fodor and Frazier 1980: 440)

(23) they told the boy *that the girl liked* the story. (a tree diagram in ibid: 428)

(24) Joe took the book that I had to include in my birthday gift *for Susan*. (ibid: 441)

Frazier and Fodor proposed the original concept (1978: 299) of Late Closure and argued for its compatibility with Kimball's Right Association, which Kimball's associated with his own "Early Closure" principle. Frazier and Fodor's (1978) two-stage parsing model appears powerful; their invention of the "first parser's limited view" provides an excellent explanation about how their Late Closure (Frazier and Fodor 1978: 299) is not opposed to, but compatible with Kimball's (1973: 24) Right Association. These seemingly incompatible strategies are made reciprocally supplementary under the constraints of the "first parser's limited view." Actually, as discussed by Frazier and Fodor (ibid: 299), attaching the coming phrase to the existing rightmost node results in keeping the higher mother node open whether it is a VP or NP node. Let us see how Right Association interacts with Late Closure with the examples of (25) and (26). In (25) there are two possible attachment sites for *in the forest*, one of which is a VP node governed by *lives* and the other is an NP node governed by *lake*. Attaching *in the forest* to the existing rightmost *lake* (Right Association) results in continuing the mother VP node governed by *lives* and the mother NP node governed by *house* at the same time (Late Closure). But actually in (25), however, *by the lake* attaches not to *lives* but to *house* despite Minimal Attachment. This is because *by the lake* is semantically more congenial to *house* than *lives*. Example (26) is a case where there are two possible attachment sites for *on her hair*, both of which are NP nodes. One is the NP node governed by *girl* and the other is that governed by *ribbon*. Attaching *on her hair* to the rightmost *ribbon* keeps open the mother NP node governed by *girl* (Late Closure). Examples (25) and (26) indicate that Right Association leads to Late Closure. This is true of an attachment site functioning as either a VP (25) or NP (26) node.

(25) John lives in a house by the lake *in the forest*.

(26) The girl with a ribbon *on her hair* …

Frazier and Fodor's (1978) and Fodor and Frazier's (1980) two-stage parsing model attribute syntactic decisions mainly to the syntactic complexity and length; the number of non-terminal

nodes for Minimal Attachment concerns syntactic complexity; "the first parser's limited view" is nothing other than length. Complexity and length may be *formal* properties of language. Semantic properties are not viewed as central players in the two-stage parsing model. In (27), *to Mary* is properly attached to *the letter* rather than to the mother NP node binding *the note, the memo, and the letter* or than to the matrix VP node governed by *read*; those higher VP or NP nodes are too far from the currently parsed phrase *to Mary* beyond "the first parser's limited view." But the example (28) entails a revision due to the semantic incongruity between the *newspaper* and *to Mary*, resulting in attaching *to Mary* to the highest VP or NP node. A semantic property surely affects the syntactic analysis of (28). It should be noted that the intervention of a semantic property is not in the first but second pass of the left-to-right processing in (28). As far as the initial syntactic analysis is concerned, the principles of Minimal Attachment and Late Closure appear to reject all possibilities of the intervention of semantic elements in the first-pass syntactic analysis.

(27) John read the note, the memo, and the letter *to Mary*. (Frazier and Fodor 1978: 297)

(28) John read the note, the memo, and the newspaper *to Mary*.(ibid)

The garden-path theory is based on the three strategies of Frazier and Fodor's (1978) two-stage parsing model. They are Minimal Attachment, Late Closure and the Sausage Machine, the last of which regulates the former two. The garden-path theory claims that "the human sentence-parsing mechanism copes with the temporary ambiguities of natural language by initially pursuing just a single analysis of some portion of the sentence" (Frazier and Rayner 1982: 178). What make it possible to "initially pursue just a single analysis" may be the clear-cut relations between the three strategies in two-stage parsing model.

The strategies of Minimal Attachment, Late Closure and the Sausage Machine appear to be formal in nature in that they correspond to complexity (number of non-terminal nodes), height

(continuation of current structure results in downward growth of branches in a tree diagram), and length or distance (the first parser's limited window). We suppose this fact guarantees the theory-internal consistency of putative syntactic autonomy in that "Initially pursuing just a single analysis (Frazier and Rayner 1982: 178)" is possible by making syntactic decisions drawing exclusively on formal aspects of language. In other words, more than one possible readings arise simultaneously if the human parser permits formal (i.e., surface syntax) and semantic properties to interact in the initial analysis.

The question of whether or not semantic properties affect the initial syntactic decision directly concerns the problem of whether the string which is currently being processed is a simplex sentence or a relative clause-including NP. The following sections review two experimental studies dealing with this problem.

2.3.3 Evidence for syntactic autonomy

Ferreira and Clifton (1986) claim that they have successfully found experimental evidence for the autonomy of syntactic processing: the first pass of the syntactic processing refers only to syntactic information; non-syntactic information, e.g., information about thematic roles or discourse structures are used only in mending a breakdown caused by a local ambiguity. This assumption is based on the principle of Minimal Attachment. We suppose the theory-internal consistency of putative syntactic autonomy requires one-to-one mapping of formal cues onto syntactic structure; the syntactic autonomy is essential to the principle of Minimal Attachment. In other words, the results of the analysis will not necessarily support the syntactic structure with the smallest number of non-terminal nodes if the initial analysis permits the interaction between morphosyntactic and semantic information.

Ferreira et al.'s (1986) advances an argument in favor of syntactic autonomy as follows. The segments consisting of the contiguous regions of c-2, c-1, and c of (29) and (30) are reduced

relative-containing NPs. The sentence-initial noun is animate in (29) while inanimate in (30). Ferreira et al. measured reading times spent on individual regions of (29) and (30).

c-2 c-1 c c+1

(29) The defendant / examined / by the lawyer / turned out to be unreliable.

(30) The evidence / examined / by the lawyer / turned out to be unreliable.

There are two significant findings. One is that the reading time spent on the c-1 region of (30) was longer than that on (29). The other is that the times spent on the c regions were identical for (29) and (30). Ferreira et al. interpreted these results in the following way. It is true that the extra time spent on the c-1 region of (30) is due to the inanimacy of *evidence*. The parser was unable to find an NP that can be the subject of *examined* because the verb requires an animate subject. This semantic incongruity must have forced the parser to take longer time to process the c-1 region (*examined*) of (30) than that of (29). It does *not* mean, however, that, in (30) the parser decided to analyze *examined* as the modifier to the preceding noun while the parser was processing the c-1 region (*examined*).

The above interpretation is based on the reading times spent on the c region. The measured reading time spent on the c region (*by the lawyer*) of (29) logically equates with the whole amount of time required for a revision from the main-clause to the reduced-relative analysis. This is because in the preceding region c-1 (*examined*) of (29), the parser must have followed a single analysis, i.e. the main-clause analysis. The time required for this analysis is shorter than any other possible analysis because of the semantic congruity between an animate noun *defendant* and *examined.* The revision in (29), therefore, must have been initiated only after the parser has reached the c region (*by the lawyer*). It is, thus, specifically important that the identical reading time was measured for the c-region (*by the lawyer*) of (29) and (30). The measured reading time for the c region (*by the lawyer*) of (30) can be thought of as long enough to initiate and complete the revision. Thus in (30), it was *not* before the parser has reached the c region (*by the lawyer*) that the sentence-initial NV sequence started to be analyzed as a reduced-relative clause. This

interpretation of the results led the authors to conclude that the first pass syntactic analysis does not use the semantic properties in analyzing the sentence-initial NV sequence as a reduced relative-containing NP, instead of as a simplex sentence. Ferreira et al. claim that the results have provided firm evidence in support of syntactic autonomy.

2.3.4 Counterevidence

Trueswell et al. (1994) pointed out a defect of the design of test sentences devised by Ferreira et al., casting doubt on the alleged evidence for syntactic autonomy. The central criticism of Trueswell et al.'s is paraphrased as follows. Ferreira et al.'s test sentences included pairs of sentences arranged at a random order. A pair is consisted of a sentence like (29) and (30). For readers' convenience (29) and (30) are shown again.

c-2 c-1 c c+1
(29) The defendant / examined / by the lawyer / turned out to be unreliable.
(30) The evidence / examined / by the lawyer / turned out to be unreliable.

c-2 c-1 c c+1
(31) The tramp / smelled / by the dog / was lying on the sidewalk.
(32) The trash / smelled / by the dog / was lying on the sidewalk.

As is discussed in the last subsection, a semantic property is the factor that contrasts (29) and (30). The contrast is whether or not the sentence-initial NV sequence can be analyzed on the first pass as an SV sequence. This is dependent on the sentence-initial N is animate or not; animacy is one of the most frequently accessed types of semantic properties for syntactic analysis. Ferreira et al. did adopt several pairs of test sentences like (31) and (32) in the same way as they used (29) and (30). The defect was that the pair (31) and (32) are *not* an equivalent pair to the pair of (29) and (30): the verb *examine* does not have an "ergative" reading but *smell* does, that is, the verb *smell* has an intransitive reading along with a transitive reading. Thus, the string *the trash smelled* can naturally continue in such a way as a simplex sentence, for example, "The trash smelled sweet."

As a result, the combination of *the trash* and *smelled* provides a cue in support of an intransitive, or main-clause reading. Thus, the parser processing (32) gains a cue for a transitive, i.e., a reduced-relative reading for the first time when it has reached the c region (*by the lawyer*). Consequently, it provides no evidence for the autonomy of syntactic analysis that the time needed for the c region (*by the lawyer*) was identical for the (32)-type and the (31)-type sentences. This is because neither sentences like (31) nor (32) include any such factor as triggers a reduced-relative reading as early as in the c region (*smelled*).

Trueswell, et al. (1994) modified Ferreira et al.'s (1986) test sentences, devising and conducting their own experiments. Experiment 1 of Trueswell et al. (1994), which we review in detail here, exploited test sentences including such sentences as (29) and (30) used in Ferreira et al.'s (1986). The modification was to preclude verbs with an "ergative" reading. Thus, the verbs like *smell* were not included in Experiment 1 of Trueswell et al.'s. The results were strikingly different than Ferreira et al.'s. The mean first-pass reading time spent on the c-1 (past participial) was identical for (29)- and (30)-type sentences. The mean first-pass reading time spent on the c (by- phrase) was significantly longer for (29)-type sentences than for (30)-type sentences. These results indicate that the reduced-relative analysis occurred in the c region (by-phrase) of (29)-type sentences whereas it arose in the c-1 region (past participial) of (30)-type sentences. It follows that semantic properties had constraint on the first-pass syntactic analysis as to whether the NV sequence is a main clause or a reduced-relative construction.

Trueswell, et al.'s (1994) findings are important in that they indicate that semantic properties can be used for initial syntactic analysis in general. They are all the more important for us in that the linguistic material chosen for the experiments was reduced relatives. The findings suggest that the possibility that the comprehension of not only reduced-relative constructions but also full-fledged-relative constructions is affected by semantic information at the stage of first-pass analysis. This is because both reduced relatives and full-fledged relatives require an identical

process: subordination of an adjectival modifier with a complex internal structure to the head NP.

2.4 Two mainstream trends of functionalism

In the previous subsections, we saw that there are controversies over whether or not semantic information affects the first-pass syntactic analysis. The hypotheses for this thesis posit that the use of semantic information helps Japanese EFL learners acquire full-fledged English relative clauses. In designing experiments for testifying these hypotheses, functionalist theories are more likely to be in line with our hypotheses than theories of syntactic autonomy since the former permit non-morphosyntactic elements to intervene in initial syntactic analysis while the latter do not. Newmeyer (2000: 10) defines functionalism as follows:

> …form is so beholden to meaning, discourse, and processing that it is wrong-headed to specify the distribution of the formal elements of language by means of an independent set of rules or principles. …

Then, how do those non-morphosyntactic elements such as meaning, discourse, and processing are related to formal elements in sentence processing and language acquisition? The hypotheses of this thesis permit semantic problems in sentence processing play a central role in acquisition. Thus, it is important to know how semantic and formal cues are used in acquiring new structures. In accessing this problem, it is of help to overview two major trends in functionalist theories. According to Newmeyer's (2000) categorization, one of them is referred to as "external functionalism" and the other as "integrative functionalism." The contrast of "external" and "integrative" functionalism will play a central role in our discussion on Japanese learners' L2 learning of English relative clause constructions and pedagogical issues of it. How the two trends of functionalism relate to Japanese EFL learners' learning of relatives will be discussed in Chapter 4 with reference to the results of the experiments.

2.4.1 External functionalism

From the 1980s, the main stream trend of functionalist theories was "external functionalism." Newmeyer (2000: 14) concisely defines it, stating:

> In most external functionalist approaches, it is assumed that the links between form on the one hand and meaning and use on the other are 'natural' ones."

Newmeyer (ibid) classifies the Competition Model of Bates and MacWhinney (1989) into "external functionalism." This appears quite reasonable since this remark of Newmeyer's accords with Bates and MacWhinney's (1987: 163) comment on their Competition Model, stating:

> Direct Mapping
> Only two levels of processing are specified in this performance model: a *functional* level (where all the meanings and intentions to be expressed in an utterance are represented) and a *formal* level (where all the surface forms or expressive devices available in the language are represented). Mappings between these levels are said to be direct.

It appears that Newmeyer's *form* corresponds to Bates and MacWhinney's *formal level* and Newmeyer's *meaning and use* are equivalent to Bates and MacWhinney's *functional level*.

The Competition Model accounts for children's acquisition of their mother language and the final state of the mother language as a result of development of children in what forms they map onto what functions. Thus, the Competition Model deals with the acquisition of mother languages, not with L2 acquisition. Researchers of L1 acquisition (e.g., Chen 1998), thus, made use of the model for their studies on L1 acquisition of various languages since the Competition Model copes with cross-linguistic variation of mappings of forms onto meanings.

Let us briefly see the essence of the Competition Model as a well-known example of external functionalism.

According to MacWhinney (1987), functionalist theories of sentence processing place emphasis on the association of semantic properties encoded in lexical items (e.g., individual verbs or nouns, etc.) in the lexicon (e.g., MacWhinney 1987: 261). This is because functionalism

postulates that “meaning guides the child in the acquisition of grammar (ibid: 254).”

MacWhinney’s (ibid: 265) view of syntactic decisions is expressed in his Competition Model. According to the Competition Model, a syntactic decision is made by the competition between candidate functions. This competition is carried out by the mapping between two separate levels. The system is driven by the mapping between formal level and functional level. The mapping results in the competition between candidate functions. The candidate function backed by relatively the strongest set of cues wins out in the competition. Let us process “the boat sinks” using the Competition Model.

(33) the boat sinks

R: roles / C: cue

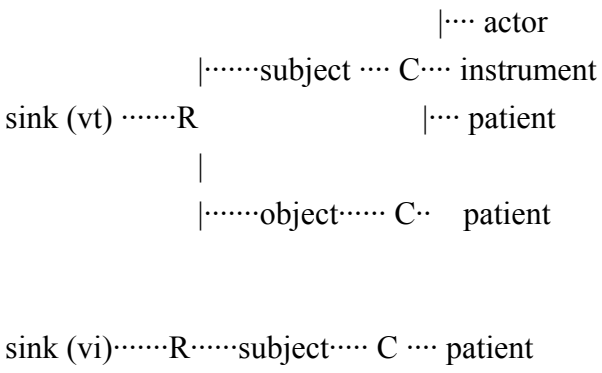


Figure 1. the competition between two candidate forms of “sink.”
Source: MacWhinny (1987: 265), slightly modified by the current author.

There are a couple of candidate functions for the string “the boat sinks”: One candidate function is dependent on a transitive verb “sink” and the other an intransitive verb “sink.” Let us perform the competition using the string, “the boat sinks.” Word order, agreement, and animacy cues will be used. Thus, the mapping will be carried out between the formal level consisting of word order, agreement, and animacy cues and the functional level consisting of two candidate functions of transitive and intransitive readings of “sink.”

Let us see in detail how each cue on the formal level supports the two candidates on the functional level in comprehending *the boat sinks*. The presence of an NP in the pre-verbal position is a word order cue, which supports the assignment of the grammatical subject role to the NP. The "s" attached to the verb stem "sink" is an agreement cue which also backs the assignment of a grammatical subject role to *boat*. Thus, the preverbal position of "the boat" and "s" attached to the verb stem are cues cooperating for the assignment of the grammatical subject role to "the boat." On the other hand, inanimacy of the noun *boat* supports the assignment of a patient (or experiencer) role to *boat*. In addition, the absence of an NP in the postverval position is in support of the intransitive reading of "sink." In this way, word order, agreement and animacy cues facilitate an intransitive reading in processing the string "the boat sinks."

Figure 2 below is a simplified illustration of how mapping between formal and functional levels takes place in comprehending the string *the boat sinks*:

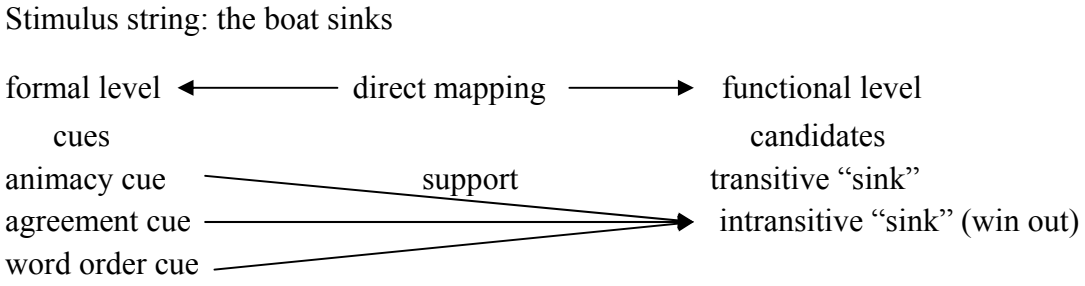


Figure 2. Competition between candidate functions

In the case of *the boat sinks*, the three types of cues cooperatively support the intransitive reading of "sinks." In other cases, it is possible for different cues to support different candidates. For example, in the case of the string *the cupboard pushed John,* an animacy cue supports the assignment of a patient role to *the cupboard* because it is inanimate. On the other hand, a word order cue supports the assignment of an agent role to *the cupboard* because it is in the preverbal position:

Stimulus string: the cupboard pushed John.

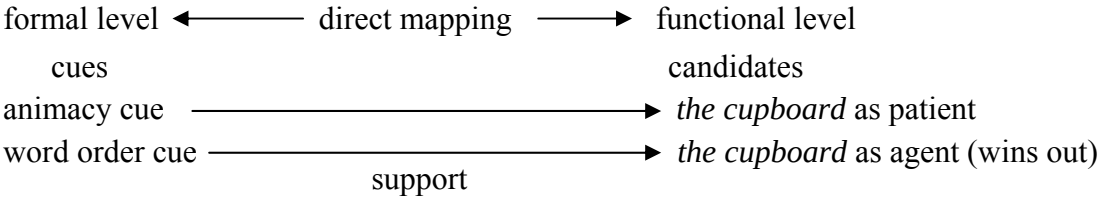


Figure 3. Competition between candidate functions

The animacy and word order cues support different candidates. Two types of cues are competing. In the English language, word order cues are stronger than animacy cues. Therefore, the candidate function "*the cupboard* as agent" wins out.

The Competition Model is important for our interest in the formation of complex NPs in sentence comprehension. This is because the Competition Model concerns the problem of how semantic cues are used in real-time sentence processing. Animacy cues are categorized into semantic cues. Word order and morphological cues are classified into formal cues. In §2.3.4, we saw Trueswell et al. demonstrate that semantic information affects the reduced-relative analysis in the first-pass analysis. The finding of this fact seems to owe much to the assumption that semantic cues cooperate with or compete against formal cues on the same level. This assumption is represented in the illustrations of the Competition Model given in Figure 1 and 2 above, where the semantic (animacy) and formal (word order and agreement) cues gain entry to the same level.

2.4.2 Integrative functionalism

Integrative functionalism is a counterpart trend to external functionalism. Newmeyer (2000: 16) precisely points out the difference between these trends, stating:

> Integrative functionalists are typically unwilling to distinguish between the functional role that a linguistic element might perform vis-à-vis other linguistic elements with which it is associated and the external functional motivation for that element. In this respect they differ dramatically from external functionalists.

Unlike external functionalism, integrative functionalism does not separate the formal and

functional levels of processing. Furthermore, it denies the existence of direct mappings, i.e., correlations between forms and functions, which is the central concept of external functionalism. We will discuss the method and results of our pencil-and-paper experiments on the basis of Radical Construction Grammar, which is a well-known example of integrative functionalism. Croft (2001: 203) posits:

> ・・・ the only syntactic structure in constructions is the part-whole relation between the constructions and its elements. ・・・

We will have detailed discussions on what *constructions* refer to in Chapter 4. It is important that Radical Construction Grammar approves semantic relations between components that compose the semantic structure of a construction of an utterance but disapproves of syntactic relations between elements playing any roles in understanding the meaning of an utterance.

This view of Radical Construction Grammar agrees with our belief in language acquisition that acquisition takes place when an immature hearer has found the difference between the two meanings. One is the strange meaning which s/he has obtained by imposing a structure familiar to him/her on an utterance which contains a structure s/he has not yet acquired and the other is the meaning that the same structure familiar to him/her would normally produces.

This putative acquisition process above can be put as follows using the terms of Radical Construction grammar. Acquisition takes place when the immature hearer has decided to alter the semantic relations between components which s/he has applied to an utterance and found it is impossible to do so without changing the semantic relations. In this process, syntactic relations between elements have never been accessed.

Up to here in Chapter 2, we have seen the existence of a tendency for both English-speaking children and Japanese adult L2 learners of English to interpret a relative-including sentence as coordinate simplex sentences. For example “the lion stands on the duck that bumps into the pig” as “U: the lion stands on the duck *and the lion* bumps into the pig” by English-speaking children

(Tavakolian 1981) and "the policeman questioned the man who carried the baby" as "the policeman questioned the man *and the policeman* carried the baby" by Japanese L2-English adults (Flynn 1989).

We have also seen semantic properties do influence the first-pass analysis of reduced-relative constructions. The semantic anomaly concurring with the initial attempt to analyze the sentence-initial NV sequence as a simplex sentence directly leads to the reduced-relative analysis of it, e.g. "the evidence examined (Trueswell et al. 1994)". In other words, the projection of the mother NP node dominating a complex NP is triggered on the first-pass analysis by semantic information, not by morphosyntactic information.

These outcomes seem to imply that formal properties, word order and relative marker that discriminate a relative clause construction from a main-clause construction ("the fish which I caught" from "I caught a fish"), are not effective at least for immature hearers and readers, whether they are native speakers or L2 learners. This assumption is all the more plausible due to the existence of Japanese L2-English learners who made the same errors as the L1-English children; the fact that the fully developed adult cognitive abilities appear to be useless for them to be aware of the formal cues for relative clause constructions. Furthermore, those Japanese L2-English learners must have had a chance to have access to their own knowledge of Japanese relative clause constructions which they had had acquired in their infancy. These facts are listed in the following way. (34) is concerned with the English language itself. (35) and (36), on the other hand, are concerned with the faculties of Japanese EFL learners.

(34) the existence of formal properties specifically indicating relative clause constructions
(35) the Japanese ESL learners' knowledge of equivalent structures of the L1
(36) the Japanese ESL learners' fully developed adult cognitive abilities

This consequently implies that the causative factor leading substantially all English-L1 children to perceive a string as a relative clause-including NP and ultimately to acquire the relative clause construction is *something other than* the sensitivity to formal cues which are supposed to occur

with the development of adult-like cognitive abilities.

We have also seen the typical examples of external and integrative functionalism. The difference between two mainstreams will concern how to devise the experiments which will be introduced in Chapter 3 and how to interpret the results of them.

2.5 The hypotheses

We mentioned the hypotheses for the study briefly in 1.3 and at the beginning of this chapter, which are repeated below.

Ⅰ. Language acquisition in general is a hearer's creation of a new semantic structure when s/he applies a semantic structure s/he knows well to an unfamiliar utterance and finds it entailing weak semantic fit.

Ⅱ. The above hypothesis will hold true for Japanese EFL learners' acquisition of full-fledged English relative clauses.

The first hypothesis above is based on Tavakolian's (1981: 169) remark:

Children will rely on the grammatical rules they already possess in an attempt to process difficult or unfamiliar constructions, even though these already existing rules may be inappropriate for the data at hand.

We assume that the reliance on "the grammatical rules they already possess" will often lead to semantic problems when it is applied to a "difficult or unfamiliar construction" that it should not be applied to. Examples (37)-(39) show how Hypothesis Ⅰ works on a coordinate-clause construction as "a semantic structure s/he knows well" (38) and a relative-clause construction as "an unfamiliar utterance" (37):

(37) a unfamiliar utterance:
John knows a girl who plays baseball.

(38) a semantic structure a leaner knows well
Mary went to Paris and (Mary) met her uncle.

(39) weak semantic fit
U: John knows a girl *and John* plays base ball.

An immature hearer will interpret (37) as (39) by imposing the semantic structure of (38) on (37).

This strategy results in assigning *John* to the actor of *play baseball* in (39), which apparently contradicts the speaker's intention expressed in (37). If the hearer happens to know the semantic problem with his/her own interpretation (39) in some way or another, s/he will abandon the imposition of (38) on (37). S/he will, then, figure out another semantic structure that will cause no semantic problem if applied to (37). This may be a complex-NP structure with a relative clause. In this way, we suppose, the weak semantic fit or semantic problem contingent with the hearer's initial analysis will encourage acquisition or, at least, help find evidence for acquisition.

There is a difference between Tavakolian's remark and our Hypothesis I. "The grammatical rule they already possess" in Tavakolian (1981: 169) is changed into "a semantic structure s/he knows well" in our Hypothesis I. We suppose the basis on which an immature hearer tests his/her hypothesis about an unfamiliar utterance is a semantic rather than a formal structure, as far as highly complex structures such as relative clauses are concerned. This derives from the findings of Trueswell et al. (1994), indicating that semantic information affects the formation of a complex NP with a reduced relative on the first-pass analysis. In this way, the central concepts of the hypotheses consist of the imposition of the conjoined-clause analysis on complex NPs such as relative clauses and the impact of semantic information on the formation of complex NPs in sentence comprehension. We suppose these assumptions hold true for both native children and L2 learners as far as the target feature is as highly complex as relative clauses.

In this chapter, we overviewed positions that permit semantic information to affect the first-pass analysis and those that disallow it to do so. The study conducted by Trueswell et al. strongly suggests that semantic information affects native English adults' comprehension of reduced relative clauses. We suppose the results can be applied to Japanese EFL learners' comprehension and acquisition of full-fledged relative clauses. This idea will lead to conducting experiments for investigating Japanese EFL learners' use of semantic information for comprehending full-fledged relative clauses. The two mainstream functionalist models reviewed

in this chapter will serve for the discussion on the results of the experiments in Chapter 4.

Chapter 3. Semantic information for relativization in comprehension

In Chapter 3 We will report on a case study that we conducted with Japanese college students learning English as a foreign language. The case study consisted of two kinds of pencil-and-paper experiments. The purpose of the experiments is to see whether or not and how semantic information has an impact on the comprehension and acquisition of English relative clauses. We chose college students as participants in order to explore how learners with years of EFL learning perform the tasks. Ideally it may have been desirable to observe non- English-major students. However, we decided that the differing sensitivity to English would not crucially affect the results of our investigation. The two sessions of the pencil-and-paper experiments were labeled as Experiment 1 and Experiment 2.

Section 3.1 will be devoted to accounting for the Rationales of the experiments we conducted with Japanese college students learning English. Section 3.2 will present an explanation of the overall design of the experiments. Section 3.3 will report the method and results of Experiment 1. Section 3.4 will focus on the method of Experiment 2. Section 3.5 will report the results of Experiment 2.

3.1 Rationale of the case study

This section reports a study which we conducted with Japanese EFL learners in order to explore the kinds of strategies they need to learn to acquire English relative clause constructions. For the sake of convenience, we label the study reported in this section as “the case study” We focus on full-fledged relative clauses here. A full-fledged relative clause refers to an adjectival modifier in the form of a finite clause that attaches to the preceding head noun.

As have been mentioned in 1.3 and 2.5, the present study aims to test the following hypotheses:

I . Language acquisition in general is a hearer’s creation of a new semantic structure when s/he applies a semantic structure s/he knows well to an unfamiliar utterance and finds it entailing weak semantic fit.

Ⅱ. The above hypothesis will hold true for Japanese EFL learners' acquisition of full-fledged English relative clauses.

We will see in detail in this chapter how these hypotheses relate to the purpose of the experiments and the design of them.

We assume semantic factors to be crucial for Japanese EFL learners to acquire full-fledged relative clauses. We will examine the contribution of semantic properties to syntactic analysis. Semantic anomaly often occurs when an immature hearer wrongly interprets a relative clause-including sentence as two coordinate clauses. Let us look at a simple example. If an immature hearer is unable to attach a relative clause to the head noun, s/he is expected to resort to the conjoined-clause analysis, that is, s/he will analyze (1) as (2):

(1) John hugs a cat that eats mice.
(2) U: John hugs a cat *and John* eats mice.

One can see that the immature hearer of (1) is wrongly applying the first-clause subject *John* to the missing second-clause subject. This is the systematic rule of the conjoined-clause analysis, which we saw in Chapter 2. The conjoined-clause analysis (2) includes the semantic anomaly "John eats mice." We expect this anomaly to solicit the hearer to abandon her/his initial analysis and do away with the anomaly by figuring out a new interpretation—one that would be formed by creating a complex NP by subordinating *that eats mice* to *cat*. This assumption rests on the following two facts presented in the previous studies that we have reported earlier in this thesis. First, both Japanese EFL learners and English-speaking children were observed to impose conjoined-clause analysis ((2) below) on relative clause-containing sentences ((1) below) (as mentioned in §2.2.1 and §2.2.2). Second, it was observed that English-speaking adults relied on semantic properties in analyzing an NV sequence as a reduced relative construction ((5) below). The semantic properties used are weak semantic fit that occurs if one analyzes the sequence as a simplex sentence ((6) below) (reported in §2.3.4).

We supposed that Japanese EFL learners would make use of semantic anomaly for their

acquisition of full-fledged relative clauses in the same way as English-speaking adults make use of semantic anomaly for their comprehension of reduced relatives including past participles:

(1) John hugs a cat that eats mice.
(2) the conjoined-clause analysis imposed on (1):
U: John hugs a cat *and John* eats mice.

(3) an NP with a full-fledged relative clause:
a cat that eats mice ….
(4) simplex-sentence analysis imposed on (3)
U: *John* eats mice ….

(5) an NP with a reduced relative clause:
the evidence examined (NP)
(6) simplex-sentence analysis imposed on (5)
U: the evidence examined … (S+V)

Here, a couple of questions arise. First, is it possible for hearers to process full-fledged relative clauses with strategies used which the English-speaking hearers used specifically for processing reduced relatives in Trueswell et al. (1994). Second, do strategies used specifically by native English-speaking adults transfer to Japanese EFL learners?

In regards to the first question, we should refer to two aspects in which the conjoined-clause analysis differs from the simlex-sentence analysis imposed on reduced-relative analysis.

First, the conjoined-clause analysis and the simplex-sentence analysis differ in terms of the number of clauses involved in the analysis. Specifically, the conjoined-clause analysis refers to the analysis of a sentence including a full-fledged relative clause as two coordinate clauses, while the simplex-sentence analysis involves an analysis of a complex NP as a single simplex sentence. These two types of erroneous interpretations seem to be distinct from one another. However, they originate from a single strategy. The conjoined-clauses analysis is illustrated in (1) and (2) above. One can see that the misanalysis comes from an attempt to analyze the underlined sequence in (1) as that in (2). This is a misanalysis of the complex NP as a simplex sentence. Meanwhile, the simplex-sentence analysis imposed on a reduced relative-including NP is illustrated in (5) and (6).

This also involves a misanalysis of a complex NP as a simplex sentence.

Thus, both the conjoined-clause analysis imposed on a relative clause-including sentence and a simplex-sentence analysis imposed on a reduced relative construction can be seen as originating from a single misanalysis of a complex NP as a simplex sentence. These two types of a hearer's initial analysis, therefore, can play the same roles in bringing a hearer to use weak semantic fit as a cue for relativization. Syntactically speaking, relativization is the projection of a mother NP node binding the head noun and modifying clause.

Second, full-fledged relative clauses have been studied with both Japanese ESL learners (Flynn 1989) and L1-English children (Tavakolian 1981) in terms of the imposition of the conjoined-clause analysis while reduced relatives have been studied only with English-speaking adults (Ferreira and Clifton (1986) and Trueswell et al. (1994)). However, there is currently no study that has studied Japanese EFL learners' acquisition of English reduced relatives with past participles. It is, thus, yet unknown how Japanese EFL learners process reduced relatives. Ideally, we should conduct a study with Japanese EFL learners on what strategies they use in acquiring reduced relatives. This is, however, unrealistic from the viewpoint of acquisition order: it is least probable that English-speaking children (and probably Japanese EFL le**a**rners) acquire reduced relatives containing past participles before they acquire full-fledged relative clauses. In fact, the English-speaking children (2;8 to 4;3 years of age) observed by Diessel (2004: 139) produced virtually no reduced relatives containing past participles with the exception of a few highly routinized forms (e.g. a doggie *named* Skipper). Thus, it is unnecessary to carry out a study with Japanese learners on how they process reduced relatives with past participles specifically when the learners are still on their way to acquiring full-fledged relative clauses.

In regards to the question as to whether or not adult native English speakers' strategies can be used by Japanese EFL learners, we would like to refer to an experimental study dealing with L1 children and L2 adults. It reveals similarities in the process of their acquisition of ambiguous

structures. Let us take a look at part of this study (Cook 1973). Model examples (7) and (8) below are formally identical but they have different actors for the infinitive verb *bite*. It is *the duck* in (7) and "an anonymous third party person" in (8). Cook investigated how native English-speaking children and foreign learners of L2 English acquire strategies for choosing the actor of *bite*. He observed that both native children and foreign adults started with taking the formal subject *duck* as the actor of *bite* for (7) and (8). Next they chose the actor in a haphazard manner. Finally they started to use semantic information for the choice of the actor of *bite*. He concluded that native children and foreign adults characteristically share the ability of using semantic information for syntactic analysis.

(7) The duck is happy to bite.
(8) The duck is easy to bite.

In sum, the above-mentioned findings on the L1 and L2 acquisition of full-fledged and reduced relatives in L1 and L2 acquisition are related in the following manner. First, conjoined-clause analysis on full-fledged relative clauses and simplex sentence analysis on reduced relatives derive from a single processing strategy: the imposition of a simplex sentence analysis on a complex NP. Second, L1-English children presumably acquire full-fledged relative clauses before they acquire reduced relatives containing past participles. Third, L1 children and adult L2 learners develop their ability of using semantic properties for syntactic analysis in similar ways. Taking these three observations into account, we consider it quite legitimate to carry out a study based on the following assumption.

We assume Japanese EFL learners use semantic information for the syntactic analysis of full-fledged relative clauses. Furthermore, we expect them to use semantic information in the same way as native English speakers use it. Native English speakers were observed to use weak semantic fit for the syntactic analysis of reduced relatives. Weak semantic fit was observed to occur when a native speaker of English analyzed the complex NP consisting of the head noun and

a past participle (e.g., the evidence examined…) as a simplex sentence (Trueswell et al. 1994). The native English speakers make use of semantic properties for the analysis of reduced relatives. In other words, a reduced relative-including NP gives rise to an erroneous simplex-sentence analysis, which often entails weak semantic fit, leading to the correct comprehension of the complex NP. It could follow that simplex-sentence analysis, as part of the conjoined-clause analysis, is responsible for the acquisition of complex NP in general.

This claim is based on our postulation of the processing of complex NPs in general. We suggest that it is semantic information as well as surface forms that solicits a hearer to make a decision on attaching a modifying clause to the modified noun. Semantic information in this case refers to semantic anomaly contingent on a Minimal Attachment analysis. (See §2.3.2. for the definition of Minimal Attachment) The conjoined-clause analysis of a relative clause-including sentence and the simplex sentence analysis of a reduced relative are similar to the strategy of Minimal Attachment (MA) with respect to the selection of syntactic structure. The complex-NP analysis needs a larger number of non-terminal nodes than its corresponding conjoined-clause or simplex-sentence analysis. (See §2.3.2 for the definition of Minimal Attachment). The complex-NP analysis referred to here is the analysis of ultimately non-ambiguous structures such as full-fledged or reduced relative clauses.

There are, on the other hand, cases that require analysis of ultimately ambiguous structures. These structures have surface forms which can ultimately be analyzed either as a complex NP or as a verb and an adverbial modifier to it if semantic information is not used. Examples (9) and (10) below have identical surface forms. The number of non-terminal nodes is larger for (9) than (10). Taraban and McClelland ((1988) cited in Caron (1992): 107) found the reading time for (10)-type sentences, which correspond to the principle of Minimal Attachment, is longer than for type (9) sentences:

(9) John ordered a pizza with pepperoni.
(10) John ordered a pizza with enthusiasm.

Neither the surface forms nor the number of non-terminal nodes provides any cues in support of the complex-NP analysis of (9). Semantic properties are the only cues for subordinating *with pepperotini* to *pizza*. More significant is that the shorter reading time for (9) than (10) indicates that the semantic properties were used not for the revision of the Minimal Attachment analysis but for the first-pass analysis.

Findings reported up to here in this subsection indicate that semantic properties can trigger native English-speaking hearers to attach past participles or prepositional phrases to the head noun, completing a complex noun phrase. We assume that the use of semantic properties for these analyses can be applied to the syntactic analysis of other types of complex NPs, such as NPs including full-fledged relative clauses. Furthermore, we postulate that not only native English speakers but Japanese EFL learners can make use of semantic properties for relativization because both were observed to impose the conjoined-clause analysis on full-fledged relative clause-including sentences (Tavakolian 1981, Flynn 1989). The imposition of conjoined-clause analysis provides opportunities to create semantic anomaly that solicits the hearer to attach the relative clause to the head noun.

3.2 The overall design of the case study

The purpose of the present study, the case study, was to explore what kinds of strategies Japanese adult EFL learners can use to acquire English full-fledged relative clauses. The case study consisted of two parts. In the first part, the participants were asked to look at a picture and complete a sentence with a full-fledged relative clause using given words. The test used in the first part will be labeled as Experiment 1. In the second part, the same participants were asked to complete a grammaticality judgment test. The test used in the second part will be labeled as Experiment 2. Experiment 1 was intended to gather basic data on the current state of acquisition of English relative clauses. Experiment 2 was the main part of the case study, which was designed

to elicit data on the use of semantic properties for the acquisition of full-fledged relative clause -including sentences.

29 people participated in this experiment, all of whom were female Japanese second-year college students majoring in English language and literature at a college in Sendai city, Japan. Their age varied from 19 to 20 years old except for one participant who was 25. According to *the course of study for Senior High School* issued by the Ministry of Education, Culture, Sports, Science, and Technology (1999), which was applied to almost all the participants, they were supposed to have studied English for at least 5 years in junior and senior high school. At college they had been specializing in English for one year and 3 months. None of them had stayed in an English-speaking country for more than two months. The critical items of Experiment 1 and 2 are listed in Appendix 1 and the test sheets used for Experiment 1 and 2 are found in Appendix 4. In Appendix 4, there are some signs which were added after the tests were conducted. The item numbers of critical items are shown in bold type and the types of relative clauses are added near the item numbers of critical items.

3.3 Individual tasks

3.3.1 Experiment 1

All 29 participants completed the pencil-and-paper task of describing given pictures using given words. The complete test can be found in Appendix 4.

Our focus in this test was to look at NPs containing full-fledged relative clauses (i.e. finite relative clauses). As has been explained in §2.2.1, full-fledged relatives are normally classified into several types according to the location of the head noun in the matrix clause and the role of the extracted head noun in the subordinate clause. These types are symbolized by two capital letters. For example, SO stands for a sentence including an (direct) object-extracted relative clause located in matrix subject position. This study treats only subject- and object-extracted relative clauses. The relatives extracted from less frequent positions such as indirect object,

oblique, genitive and comparative were not dealt with. The types examined in this study were, therefore, SS, SO, OS and OO.

12 items in our focus area (henceforth critical items), mixed with 12 distracters, were presented to participants. The four types of relatives, SS, SO, OS and OO, were evenly distributed amongst the 12 critical items. Thus, each of the four types had three test sentences. Each item involved a task of seeing a picture and describing it using five units of words or phrases given in the bracket. The complementizer *that* was included as a relative marker in the bracket of all items. Examples (11) to (14) below show test sentences with the units correctly reordered in the brackets.

(11) SS: They boy [that / wore / a cap / kicked / the ball].

(12) SO: The tree [that / Tom / cut down / fell on / Mike].

(13) OS: Yuko [wiped / the statue / that / stood / in the park].

(14) OO: Bill [sold / the vegetables / that / Mary / grew].

The critical items and distracters were presented in a randomized order. The participants were instructed to use all units given in the bracket, write with a ballpoint pen and cross letters for correction instead of using an eraser. They were told to move to Experiment 2 when having finished all items in Experiment 1. The written materials for Experiment 1 and Experiment 2 were printed on the same set of papers. No time limit for completion of the test was set and participants' responses were not timed.

Japanese translation was given to some words in test sentences which seemed to be difficult for the participants. The translation was written in the space beside the test items. We chose words that seemed to need to be translated with reference to our experience in the pilot studies, which had been conducted with almost the same population of students. Giving translation into Japanese may decrease the credibility of the elicited data but it seems pragmatically useful in that it helped them concentrate on the task in hand. The Japanese translation was omitted in test

sentences shown in the chapters. Test items with the translation are found in Appendix1 and 4.

3.3.2 Results of Experiment 1

In rating the results, one point was given to one correct response to one item. There were three test items for each of the four relative types, so the maximum score allocated to one relative type obtained by one participant was three. Table 1 gives mean scores for the four types of relatives. The mean scores ranked from the lowest to the highest are as follows: SO < SS < OO < OS. Note that the difference between OS and OO was relatively small.

Table 1. Mean scores for the 4 types of relative clauses

SS	SO	OS	OO
2.31	2.03	2.79	2.72

Table 2 below gives values statistically indicate between-type differences in Experiment 1.

Differences between groups were tested by a one-way analysis of variance (ANOVA), followed by a multiple-comparison Tukey's post-hoc tests, with $p < 0.05$. Analysis of variance (one-way) showed that the difference between the four relative types was significant ($p = .002 < 0.05$). Post-hoc Tukey' tests showed that the difference between the SO type and OS type was significant ($p = 0.005 < 0.05$), as well as between the SO type and OO type ($p = 0.014 < 0.05$). On the other hand, no significant difference is found between the SO type and SS type ($p = 0.609 > 0.05$). The difference between the SS and the OS type ($p = 0.143 > 0.05$), between the SS and the OO type ($p = 0.258 > 0.05$), and between the OS and the OO type ($p = 0.990 > 0.05$) was not significant respectively.

Table 2. Between-type difference. *p*-value with Tukey HSD.

relative type	SS	SO	OS	OO
SS				
SO	.609			
OS	.143	.005*		
OO	.258	.014*	.990	

Table 3 gives a breakdown in terms of the number of participants who gave a correct response to each item.

Table 3. No. of participants who gave correct responses

RC Type	SS			SO			OS			OO		
Item No.	1	2	3	1	2	3	1	2	3	1	2	3
No. of participants giving a correct response (out of 29)	23	23	21	23	20	16	27	27	27	26	26	27
Total No. of correct responses (out of 87)	67			59			81			79		

3.3.3 Discussion on Experiment 1

According to the mean scores in Table 1, the four types of RCs can be ranked hierarchically from the lowest to the highest as follows: SO < SS < OO < OS. This order coincides largely with the difficulty order on which researchers such as MacWhinney (1987), Lewis (1996), and Gibson (1998) base their theories. Their theories basically determine the processing difficulty of relative clause constructions according to the number of incomplete dependencies at the maximum point. A dependency refers to the relation between items in a syntactic structure which are obligatory for each other to maintain well-formedness. Examples (15) to (18) below show the dependencies involved in the four types of relatives. Incomplete dependencies are maximized in number at the point of the italicized word. For example in (15), *Tom* is the position of maximum incomplete dependencies. The matrix subject *tree* expects a verb and it is fulfilled by *fell.* The complementizer *that* is referential with the position from which the head noun is extracted and it is fulfilled by ϕ . The subordinate subject *Tom* requires a verb and it is fulfilled by *cut*:

(15) SO: The tree that *Tom* cut down ϕ fell on Mike. 3

(16) SS: The boy *that* wore a cap kicked the ball. 2

(17) OO: Bill sold the vegetables that *Mary* grew ϕ . 2

(18) OS: Yuko wiped the statue *that* stood in the park. 1

Below is the difficulty order predicted by the number of incomplete dependencies:

(19) SO (3) > SS (2) = OO (2) > OS (1)

This resembles the ranking found in Table 1: from the lowest to the highest, SO < SS < OO < OS. This resemblance seems to imply that the factors that determine the difficulty of relative clause-including sentences are similar for English-speaking people and Japanese EFL learners. As we have seen, the difficulty order for native English speakers in (19) is based on the number of incomplete dependencies at the maximum point. Incomplete dependencies, in other words, regarded as the number of "local thematic violations" (Gibson 1998: 6). Therefore, if Japanese EFL learners reveal an identical or similar difficulty-ranking pattern as shown in (19), it follows that the Japanese EFL learners process relative clause-including sentences by matching the assigner (verbs) and receivers (nouns) of thematic roles just as native English speakers do. Thematic roles are semantic properties that certain verbs can assign to certain nouns. This matching process is carried out by accessing the semantic properties lexically indexed in individual verbs and nouns. Thus, it is important to carry out a study investigating the roles of semantic properties, in other words, thematic relations in Japanese EFL learners' acquisition of relative clauses.

3.4.1 Rationale of Experiment 2

Findings in Experiment 1 indicate that Japanese EFL learners process full-fledged relative clauses in the same way as native English-speaking hearers do in that the number of incomplete dependencies affects native English speakers and Japanese EFL learners in a similar way when

processing relative clauses. As the model examples (15)-(18) above show, incomplete dependencies are substantially unfulfilled expectations of thematic-role assignment. Thus, it follows that both native English speakers and Japanese EFL learners use semantic properties in processing relative clause-including sentences. This assumption permits us to carry out a study on whether Japanese EFL learners make use of semantic properties in analyzing sentences including full-fledged relative clauses. Experiment 2 was intended to serve this purpose.

We posit that the comprehension of relative clause constructions specifically means the attachment of a subordinate clause to the head noun. Syntactically speaking, this operation is equivalent to the projection of a mother NP node dominating a complex NP. Unfortunately, this viewpoint is often missing in the instruction of English relative clause given to Japanese EFL learners. For example, an authorized textbook for junior high schools in Japan (*cf.* Chapter 1) defines the relative marker as the starting point of "explanation about" the preceding noun. This definition lacks the concept of a complex NP, encouraging the student to analyze the main and relative clause independently without subordinating the relative clause to the head noun. Moreover, it is not exclusive to Japan's EFL education to underestimate the recognition of relative clause constructions as complex NPs.

Early studies on L2 acquisition of English relative clauses tended to see relative clause constructions as being composed of two independent clauses, connected to each other by a special device, not necessarily as complex NPs. For example, a well-known article on L2 acquisition of English relative clauses by Gass (1983), reported that both the Accessibility Hierarchy and native language facts determine the extent of difficulty that L2 learners find and the transferability of L1 features on the learning of target L2 features. Data in support of this analysis were collected from a grammaticality judgment test of L2 learners of English. Her test focused on four grammatical points: "relative clause marker omission," "pronoun retention," "relative clause marker selection," and "adjacency." Whether or not readers successfully attached the relative clause to the head noun,

was not included in the test. Furthermore, Eckman (1988), who dealt with foreign learners' production of English relative clauses, found that the acquisition of relatively marked type of relatives on the scale of Accessibility Hierarchy (See §2.1.1 in this thesis) contribute to maximal generalization of learning. He asked L2-English learners to combine two sentences with a relative pronoun. The main interest of his was whether or not the learner could locate the modifying clause in the correct position, i.e., right after the head noun. These early studies seem to have provided a theoretical basis on which the Japanese textbooks define the English relative pronouns as a "starter of explanation."

In this way, early studies viewed the L2 acquisition of English relative clauses as a strategy for connecting two clauses rather than as the formation of a complex NP. This trend dates back to studies on the L1 acquisition of English relative clauses from the 1970s. Researchers of L1 acquisition (e.g., Sheldon 1974, Tavakolian 1981, Corrêa 1995) judged children as having correctly comprehended an relative clause-including sentence if they were able to correctly identify the two actor-act-object relationships. For these researchers, to comprehend a relative clause-including sentence is to comprehend two sets of "who did what to whom." Less emphasis is placed on the formation of complex NPs in evaluating learners' comprehension of relatives. These researchers probably considered it sufficient to identify two actor-act-object relationships in hearing a relative clause-including sentence probably because they consider it sufficient in real-life situations. An argument such as this is quite foreign to the present author. We consider it dangerous to judge a hearer as having acquired relative clauses by means of asking her/him to point out two actor-act-object relationships among the NPs of a relative clause-including sentence. This is because it is possible for a hearer to correctly point out two actor-act-object relationships without recognizing the head noun and relative clause as forming a complex NP. The correct choice of two actor-act-object relationships is quite likely to result from the conjoined-clause analysis or from haphazard choices of NPs in the sentence.

If a hearer is unable to subordinate the clause to the preceding noun, s/he will adopt a coordinate-clause analysis instead. In the case of the relative-clause including sentence (20), the semantic anomaly resulting from the conjoined-clause analysis imposed on it ("U: John eats mice" in (21)) will lead him/her to the correct comprehension shown in Table 4:

(20) OS: John hugs a cat that eats mice
(21) the conjoined-clause analysis imposed on (20):
U: John hugs a cat *and John* eats mice

(22) OS: John knows a girl that plays baseball.
(23) the conjoined-clause analysis imposed on (22):
U: John knows a girl *and John* plays baseball.

Table 4. Final identification of actor, act and object for (20)

	actor	act	object
1st clause	John	hug	cat
2nd clause	*cat*	eat	mice

Table 5. Final identification of actor, act and object for (22)

	actor	act	object
1st clause	John	know	girl
2nd clause	*John*	play	baseball

This (Table 4) coincides with what the speaker tries to convey. In the case of the sentence (22), which has quite the same formal structure as (20), the conjoined-clause analysis imposed on it will be (23). There is no semantic anomaly that inhibits *John* from being interpreted as the actor of *play baseball*. Thus, the same hearer may end with the interpretation in Table 5, which may cause serious problems in real-life situations because the meaning expressed in Table 5 contradicts what the speaker intends to convey. This is why we judge a hearer as having perceived a relative clause construction only when s/he has subordinated the clause to the preceding noun, constructing a complex NP.

3.4.2 Method of Experiment 2

Experiment 2 was intended to investigate the possibility for Japanese EFL learners to make use of semantic properties in perceiving and acquiring English relative clause constructions.

The 29 participants taking part in Experiment 1 individually proceeded to Experiment 2 when they thought they had finished Experiment 1. Thus, it follows that if a participant spent too much time on Experiment 1, she had to start Experiment 2 long after the others started it. No participant, however, was observed to have used too much time for Experiment 1, or run short of time for doing Experiment 2.

We targeted full-fledged relative clauses and used the same four-type classification that was used in Experiment 1: the SS, SO, OS, and OO types.

(24) SS type-A version :
The nurse that took care of John { ア. started a business..
イ. and started a business

(25) SS type-B version:
The man that looked into the binoculars { ア and found a tiger.
イ. found a tiger.

(26) SO type-A version:
The bird that John caught { ア. and laid eggs
イ. laid eggs.

(27) SO type-B version:
The money that John stole { ア. got to the boss.
イ. and got to the boss.

(28) OS type-A version:
The hunter shot { ア. the rabbit that had long ears.
イ. the rabbit that ate mice.

(29) OS type-B version:
The child got on { ア. the truck that wanted candies.
イ. the truck that brought candies.

The tasks comprised a grammaticality judgment test. A test sentence was suspended at a certain point in the middle of the sentence and branched into two alternative sequences. The participants were asked to judge one of alternatives as correct. They were informed beforehand that one of

the two choices was correct and the other wrong. They were also informed of the criteria they were supposed to base their judgment on. Specifically, they were told that one of the alternatives would end up with either grammatical deviance or semantic abnormality. It does not follow that there were two bases on which the participant had to rely on in judging each sentence because either grammatical deviance or semantic abnormality can be reached in the test question by means of a single semantic strategy. This will be explained in further detail later. Participants were asked to express their judgment by marking one of the two Japanese characters, either "ア [a]" or "イ [i]," which were put in front of the individual alternative sequences, marking their starting point.

A total of 16 critical test sentences, mixed with 32 distracters, were presented to participants. The 16 critical items were evenly distributed among the four types. Thus, four items were allocated to each type of relative clause. Of the four items in each type of relative clause, two were designed as the A version and two as the B version. The A and B versions differed in whether or not the test sentence contained a trick for inducing the participant to use semantic properties on syntactic analysis.

Japanese translation was given to some words in test sentences which seemed to be difficult for the participants. The detailed procedure for providing translation was the same as that for Experiment 1, which has been explained in §3.3.1.

Let us see the basic design of the elicitation devices for the SS-, SO- and OS-type relatives. The basic design of the OO-type relatives will be seen later in this subsection. The mechanisms differentiating the A and B test question versions were constructed on a single principle across the SS-, SO- and OS-type relative types: the A version items were intended to trigger relativization in sentence comprehension while the B version items were not. The mechanism of the test items for the OO type was different than those for the other types because the conjoined-clause analysis is unsuitable for the OO-type relative clauses, which has been

mentioned in §2.2.1.

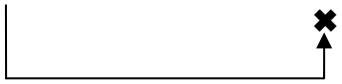
In an A version item for the SS-, SO- and OS-type relative clauses, the participant would be aware of semantic anomaly irrespective of whether she completed the test sentence with "ア" or "イ" if s/he was imposing a conjoined-clause analysis on them. From this point on, she would make some effort at judging one of the alternatives as correct since s/he had been informed that one was correct and the other was wrong. She would then be aware that she could eliminate the semantic anomaly by subordinating a finite clause to the preceding noun. In this way, an A version item contained a trick for inducing the participant to attach a clause to the preceding noun. This trick holds across the A version items of the SS, SO, and OS types. In a B version item in the SS-, SO-, and OS-types, the participant would find semantic congruity irrespective of whether she completed the test sentence with "ア" or "イ" even if the participant imposed a conjoined-clause analysis on them. Therefore, participants had to do the task at random across the B version items of the SS, SO, and OS types.

As far as the SS-, SO-, and OS-type test items are concerned, we predicted the following results. Participants would do the A-version items better than chance if they employed the conjoined-clause analysis because of the device providing her with semantic anomaly as a cue for relativization. On the other hand, participants would have to make decisions at random for the B-version items if they employed the conjoined-clause analysis because the B-version items involved no semantic cues for relativization. Thus, we predict the overall results would be significantly better for the A version items than for the B version items, which should hold across the SS, SO, and OS relative types.

The elicitation device for the OO-type relatives is distinct from that for the other three types. Unlike the other three types of relatives, the OO-type relatives are said to be less suitable for the conjoined-clause analysis. This is because the hearer (or the reader) cannot apply the first clause subject to that of the second. The second-clause subject is not missing; it occupies the position

where it should be as the subject of a finite clause:

(35) Cathy ate the fish that Ms.Clinton grilled ϕ .



An OO-type relative-clause including sentence has a complete SVO structure in the first clause and an SV structure in the second. In a C version item, one of the alternatives includes an NV sequence which will be analyzed as an SV sequence. In (31)-(ア), *Ms.Clinton grilled* will be read as an SV sequence. The other alternative, *the mountain cooked* in (31)-(イ), contains an NV sequence which is semantically anomalous as an SV sequence. In a D version item, the NV sequences in both alternatives pass for an SV sequence. Both *Mary hated* in (32)-(ア) and *Tom beat* in (32)-(イ) pass for SV sequences. Thus, at the point of *hated* and *beat*, it is impossible for the participant to obtain a deterministic cue for judging one of the alternatives as correct or wrong unless she identifies the gap in the postverbal position as referential not with John but with *the rumor*.

(31) OO-type C version:

Cathy ate { ア. the fish that Ms.Clinton grilled.
イ. the fish that the mountain cooked.

(32) OO-type D version:

John heard { ア. the rumor that Mary hated.
イ. the rumor that Tom beat .

3.4.3 Devices for individual relative types

Let us now examine the elicitation devices for the individual SS, SO, OS, and OO relative types. As for the SS, SO and OS types, half of the test items belong to the A version and the other half to the B version. The A and B versions were designed for a common purpose and on the same principle across the three relative types; to explore whether the participant would use semantic problems derived from her/his conjoined-clause analysis for relativization. However,

the design of the A and B versions as an elicitation device varied among the three relative types. As for the OO type, the items were distributed into halves to the C and D versions. The purpose and principles of the test items for the OO type differ from those for the other types. The designs of individual relative types will be explained in further detail in the following subsections.

3.4.4 SS-type relatives

(24) SS type-A version :

The nurse that took care of John { ア. started a business. / イ. and started a business.

(25) SS type-B version:

The man that looked into the binocular { ア and found a tiger. / イ. found a tiger.

As was mentioned in the previous subsections, the SS-type relatives refer to subject-extracted relative clauses in the matrix subject position. The test sentences of the A and B versions in this relative type devote the sentence-initial region to a relative clause-including NP. In both A and B versions, one of the alternative sequences is prefixed with *and* followed by a verb phrase while the other contains the same verb phrase only. Thus, the sentence-initial clause and alternative sequences of the A and B versions were made up of equivalent formal units. A participant who had already acquired English relative clauses would recognize the sentence-initial clause in both A and B versions as the matrix subject if she correctly attached the relative clause to the preceding noun. She would then search for a predicate VP that follows the matrix subject, resulting in choosing "ア" for the A version above and "イ" for the B version shown above.

Some participants were expected to impose the conjoined-clause analysis on the items of SS relatives. A covert trick underlying the A and B version was intended to explore whether the participant makes use of the semantic anomaly contingent with the conjoined-clause analysis. Thus, the A and B versions are significantly different for only those who commit the error of

conjoined-clause analysis. Examples (34) and (35) below show the conjoined-clause analysis imposed on the A version (24) and the B version (25) respectively. Thus, (34) and (35) are notions expected to occur in the participant's mind. As has been mentioned in § 2.2.1, in this thesis, 'U' put in front of a string indicates that the string represents not spoken or written language but a hearer's or a reader's understanding of the meaning of a stimulus string. Thus, 'U' stands for 'understanding.'

(24) SS-type A version :
The nurse that took care of John { ア. started a business.. / イ. and started a business

(34) the conjoined-clause analysis on (24):
U: The nurse took care of John *and the nurse* started a business.

(25) SS-type B version:
The man that looked into the binocular { ア and found a tiger. / イ. found a tiger.

(35) the conjoined-clause analysis on (25):
U: The man looked into the binocular *and the man* found a tiger.

The conjoined-clauses analysis (34) awkwardly links the propositions expressed in the first and second clause. The coherence between these two propositions seems not to be strong enough to be juxtaposed as coordinate clauses, thus resulting in semantic anomaly. The conjoined-clause analysis (35), on the other hand, naturally links the propositions expressed in the first and second clause. They are in a coordinate relation. In this way the tricks underlying the A and B version would lead the participant to behave differently in the A and B versions. In the A version, the participants would be aware of the weak coherence resulting from her/his own conjoined-clause analysis (34) and find it possible to eliminate the weak coherence by compiling the proposition expressed in the sentence-initial clause into a complex NP. This idea, then, leads her to subordinate *took care of John* to *nurse* as a modifier. Now that the sentence-initial clause is a single NP, the following sequence has to be a predicate VP. The participant finally would

choose "ア," which is free of "*and*" put in front of the sequence. In the B version the same participant would find difficulty in deciding whether to choose "ア" or "イ." This is because in (35), the propositions expressed in the first and second clause are in a coordinate relation. There is no semantic problem in (35). The participant would obtain no impetus for relativization, resulting in having to choose "ア" or "イ" at random.

Expecting the elicitation devise to work well, we predicted that the results of the SS-type relative clauses would turn out significantly better for the A version items than that for the B version items.

3.4.5 SO-type relatives

(26) SO-type A version:

The bird that John caught { ア. and laid eggs. / イ. laid eggs.

(27) SO-type B version:

The money that John stole { ア. got to the boss. / イ. and got to the boss.

SO-type relatives refer to the object-extracted relative clauses in the matrix subject position. The elicitation device for the SO-type relative clauses was designed basically in the same way as it was for the SS-type relative clauses, which was explained in the § 3.4.4. It was designed so that the semantic anomaly would lead to relativization if the participant tried to use the conjoined-clause analysis. There was one point where the items for the SS- and SO-type relatives differed. In terms of the role of the NP extracted from the relative clause, the SS-type relatives included subject-extracted relative clauses while the SO-type relatives included object-extracted relative clauses. Just as with the SS type, the sentence-initial regions of the SO-type sentences carried a relative clause-including NP and branched into alternative sequences. One of the alternative sequences started with *and* followed by a verb phrase while the other consisted of the same verb phrase only. If a participant had already acquired English

relative clauses, she would be aware of the fact that the sentence-initial clause comprises a relative clause-including NP and that it was the matrix subject. Thus, she would need a predicate VP following it because she knew that *and* attached to the alternative sequence is superfluous. Following this, she would choose "イ" for the A version (26) and "ア" for the B version (27). Other participants would complete test sentences with alternative sequences and impose the conjoined-clause analysis on them. This would occur in the same way in both the A and B versions. The conjoined-clause analysis imposed on (26) is expressed verbally as (36) and that imposed on (27) as (37):

(26) SO-type A-version:
The bird that John caught { ア. and laid eggs / イ. laid eggs.

(36) the conjoined-clause analysis on (26):
U: John caught the bird *and John* laid eggs.

(27) SO-type B version:
The money that John stole { ア. got to the boss. / イ. and got to the boss.

(37) the conjoined-clause analysis on (27):
U: John stole the money *and John* got to the boss.

Example (36) involves apparent semantic anomaly while (37) is semantically congruous. For (36) the participant would solve the problem by compiling the proposition expressed in the sentence-initial clause, i.e. U: *John caught the bird* into a complex NP. This would result in the interpretation of the region as U: the bird that (which) John caught. By doing so, it would not be *John* but *the bird* that *laid eggs* and the semantic anomaly would be done away with. Knowing that the complex NP in the sentence-initial clause has to function as the matrix subject, she would need a predicate VP as the matrix VP. Thus, the *and* prefixed to one of the alternatives would turn out superfluous and "イ" would be judged as correct for the A version (26). When it comes to the B version item (27), the propositions expressed in (37) are harmonious. She would

not need to change anything in it, and the B-version item would be judged based on a guess.

The mechanism expounded in the above paragraph allowed us to predict that the results of the SO-type relatives would turn out significantly better for the A version items than for the B version items.

3.4.6 OS-type relatives

(28) OS-type A version:

The hunter shot { ア. the rabbit that had long ears. / イ. the rabbit that ate mice.

(29) OS-type B version:

The child got on { ア. the truck that wanted candy. / イ. the truck that brought candy.

OS-type relatives refer to subject-extracted relative clauses in the matrix object position. The test sentence was suspended at a certain point in the middle of it and branches into two alternative sequences. The correct response to the test item (28) was "ア" and that to (29) was "イ." We postulated that a participant would impose the conjoined-clause analysis on the OS-type relatives if s/he had not acquired English relative clauses. We also postulated that the conjoined-clause analysis would entail weak semantic fit in some relative clause-including sentences. We devised the test sentences on the rationale that the participants would try to eliminate the weak semantic fit by abandoning their conjoined-clause analysis and attaching the second clause to the preceding noun.

Below are the model examples of the conjoined-clause analysis imposed on the OS-type A-version item (28) above. The OS-type A-version item (28) would be interpreted as (38) and (39) if the participant imposed the conjoined-clause analysis on it:

OS-type A version

(28) OS-type A version:

The hunter shot { ア. the rabbit that had long ears. / イ. the rabbit that ate mice.

(38) The conjoined clause analysis on (28)-(ア):
U: The hunter shot the rabbit *and the hunter* had long ears.

(39) The conjoined clause analysis on (28)-(イ):
U: The hunter shot the rabbit *and the hunter* ate mice.

If the participant completed the test sentence (28) by choosing (ア) and imposed the conjoined-clause analysis on it, her/his interpretation would be like (38), which involves weak coherence. The test sentence (28) completed with (イ) would be like (39) if the conjoined-clause analysis was imposed on it. This also would end up with weak coherence. Thus, the participant would face weak coherence no matter which alternative she chose for (28) as long as she was imposing the conjoined-clause analysis on the completed sentence. We supposed that this situation would contribute to bringing the participant to seek a solution of the weak coherence in some way or another because she had been told that one of the alternatives was correct and the other wrong. We hoped that the participant would solve the problem by abandoning her conjoined-clause analysis and reorganizing one region of the sentence into a complex NP. She would then be aware that attaching the sentence-final clause to the preceding noun would make a semantically congruous NP if she had chosen (ア) while it would not if she had chosen (イ). That is "U: the rabbit that (which) had long ears" resulting from (38) is a semantically natural NP while "U: the rabbit that (which) ate mice" resulting from (39) is strange. In this way an OS-type A-version item would lead participants to attach the postnominal clause to the preceding noun by making them aware of the weak coherence resulting from their conjoined-clause analysis. On the other hand, OS-type B-version items were free of such devices for encouraging relativization. The OS-type B-version item (29) would be interpreted as (40) and (41) if the participant imposed the conjoined-clause analysis on it:

OS-type B-version
(29) OS type-B version: The child got on { ア. the truck that wanted candies. / イ. the truck that brought candies.

(40) The conjoined clause analysis on (29)-(ア)
U: The child got on the truck *and the child* wanted candies.

(41) The conjoined clause analysis on (29)-(イ)
U: The child got on the truck *and the child* brought candies.

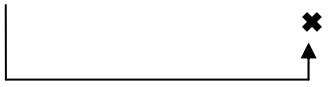
The model examples of the conjoined-clause analysis (40) and (41) contain no serious semantic anomaly. The participant would be satisfied with these erroneous interpretations of her own. She would, thus, be forced to choose either (ア) or (イ) by comparing (40) and (41) with reference to her personal knowledge of the world. In this process the participant would feel no need for abandoning her conjoined-clause analysis and restructuring part of the test sentence into a complex NP with a relative clause.

In brief, if a participant employed the conjoined-clause analysis, the OS-type A version and the OS-type B version would cause weak semantic fit that would lead the participant to abandon the conjoined-clause analysis and analyze a region as a complex NP, while the OS-type B-version items would be free of such semantic problem and make the participant satisfied by her own conjoined-clause analysis. We predicted that the results of the OS-type items would be better for the A-version items than for the B-version items.

3.4.7 Block against the conjoined-clause analysis

The elicitation device for OO-type relatives was distinct from that of the other three types. As Tavakolian has pointed out, OO-type relatives are less suitable for the conjoined clause-analysis. This is because the hearer (or the reader) cannot apply the first-clause subject to that of the second, as the second clause subject is not missing. It occupies the position where it should be as the subject of a finite clause:

(42) Cathy ate the fish that Ms.Clinton grilled ϕ .



To get around this obstruction against the conjoined-clause analysis, Tavakolian (1981) figured out a couple of "modified versions", so to speak, of her own conjoined-clause analysis.

She argues that some children employed these "modified versions" in comprehending the OO-type relatives. In this subsection we will discuss the plausibility of the "modified versions" and another type of coordinate-clause analysis which we claim some children may have imposed on the OO-type relatives in Tavakolian's experiment.

In the previous subsections we have discussed examples of the conjoined-clause analysis imposed on the SS-, SO- and OS-type relatives:

(43) SS: The sheep that knocks down the rabbit △ stands on the lion.

(44) SO: The lion *that the horse kisses* △ knocks down the duck.

The lion *that the horse kisses* △ knocks down the duck.

(45) OS: The lion stands on the duck *that* △ *bumps into the pig*.

The model examples shown above are categorized into the "standard version," so to speak, of Tavakolian's (1981) conjoined-clause analysis: the application of the first-clause subject to the *missing* subject of the second clause. For convenience, we will label this as the "standard version" of the conjoined-clause analysis, which was observed by Tavakolian (1981) for the SS-, SO-, and OS-type relatives. On the other hand, Tavakolian claims she has found other types of coordinate-clause that her participants used exclusively for the OO-type relatives. She explains this finding in terms of her observation that the "standard version" of the conjoined-clause analysis is less suitable for the OO-type relatives. We will label the strategies observed to be used for the OO-type relatives as "modified versions" of the conjoined-clause analysis. Tavakolian acknowledges these "modified versions" as rule-governed conjoined-clause analysis (ibid: 179)

simply because the first-clause subject is referential with a second-clause constituent. We, however, regard Tavakolian's "modified versions" as patterns of random association of nouns and verbs in input. This will be explained later. Based on Tavakolian's observations, we assume a couple of "modified versions" of the conjoined-clause analysis for the OO-type relatives, which we will label as the "modified version 1" and "modified version 2" respectively.

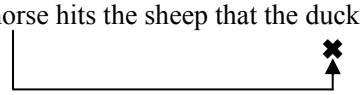
3.4.8 The "modified version 1" of the conjoined-clause analysis

1 2 3

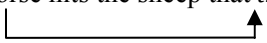
(46) stimulus: OO: The horse hits the sheep that the duck kisses.

(47) "standard version" of the conjoined-clause analysis:

The horse hits the sheep that the duck kisses.



(48) modified version 1: The horse hits the sheep that *the duck kisses*.



O V

The example (46) above is an OO-type relative and (48) shows the "modified version 1" of the conjoined-clause analysis imposed on (46). Tavakolian argues that some children imposed the "modified version 1" on OO-type relatives as a systematic interim rule. As shown in (48), the relative subject *the duck* receives an object role from *kissed* and the first-clause subject intervenes in the second clause as the subject of it. This strategy needs to strip the genuine second-clause subject *the duck* of the subject role and assign an object role to it instead.

Part of Table 3 in §2.2.1 is repeated as Table 6 below. Tavakolian argues that those who gave the **12,13** response (see Table 6 below) to the test sentences like (46) interpreted them as (48) and she qualifies it as the conjoined-clause analysis. That is, 19 % of the children in Tavakolian's research were observed to do this analysis:

Table 6. Distribution of responses to OO-type relative clauses.

OO	1	2	3		
(46) The horse hits the sheep that the duck kisses.					
Results	<u>12,32</u>	**12,13**	12,31	12,12,	12,23 …
	38%	**19%**	22%	4%	4%

Note: underlined numerals= correct response;
bold numerals= the conjoined-clause analysis (the standard version)
Source: Tavakolian 1981, Tables 8.3-8.6 on pages 172-174.

We are skeptical of Tavakolian's acknowledgement of the "modified version 1" as a conjoined-clause analysis on the OO-type relatives. We simply posit that native English-speaking hearers never analyze the NP in the preverbal position as the object of the verb even if the object is missing in the postverbal position. This is because, in linear processing from left to right, the parser has already analyzed the clause-initial NV sequence as an SV structure in the first-pass analysis. It is after this analysis has been finished that the object is found missing in the postverbal position. If this early determination of sentence structure, i.e. NV as SV, fails, processing English sentences without backtracking is almost impossible since the English language lacks explicit case markers. In other words, Tavakolian's argument for the "modified version 1" postulates backtracking with which the missing object in the second-clause postverbal position cancels the subject role which has already been assigned to the second-clause preverbal NP, followed by the application of the first-clause subject to the second-clause subject. And then the assignment of the object role to the NP in the second-clause preverbal position takes place. This sort of backtracking is too complicated to be a systematic rule-governed strategy. If a child carries out this strategy, there must be a random association of sentential constituents.

We posit that children are capable of implementing rule-governed interim strategies within the first-pass analysis. Rules of this kind, therefore, have to be simple enough to be implemented in the left-to-right linear processing. We also posit that, even if some strategies are observed at a

more-than-chance rate after the first-pass analysis breaks down, they are not rule-governed strategies but haphazard performances instead. We take this position because backtracking makes sentence processing too complex and young children are assumed to be incapable of systematically using strategies such as backtracking.

3.4.9 The "modified version 2" of the conjoined-clause analysis

The conjoined-clause analysis refers specifically to the interpretation of the phonetically null *subject* of the second clause as being referential with the subject of the first clause, which is imposed on a relative clause-including sentence by immature hearers or readers. That is, the referential relation is permitted exclusively between the subject of the first and second clause: i.e., "subject-subject" reference.

According to the proponents of Universal Grammar (e.g. Klein 1995), its principles restrict the kinds of hypotheses that a child can make about the structure of his/her own language. According to this view, a child assumes an interim rule about a difficult or unfamiliar structure he/she has heard and the rule has to be one found in adult grammar of the given language. Thus, the child could never hypothesize a deviant grammar. All that a child can do is to impose a rule, which in itself conforms to adult grammar, on a sequence to which it should ***not*** be applied. Tavakolian's position does not draw such strong conclusions about what a child can or cannot do, although she admits that there are specific universal principles that restrict children's hypotheses about difficult unfamiliar structures in input. She regards the conjoined-clause analysis as one of these universal principles which she claims she has identified with her experiment. We are not proponents of universal grammar but we do agree with Tavakolian's (1981) remark in that specific principles limit the number and kind of hypotheses that children make about difficult or unfamiliar structures in input and this facilitates acquisition. We support this position in terms not of universal principles but of sentence processing. We assume that children do not hypothesize

interim rules that are deviant from adult grammar of the language simply because deviant rules are too complicated for children to use systematically. This is a problem of sentence processing. We use the term "systematic use" to refer to a hearer's act of trying to find a principle according to which s/he can determine whether a certain rule which s/he knows applies to a certain sequence in input.

From this point of view, we will cast doubt on Tavakolian's "modified version 2" of the conjoined-clause analysis, which permits the referential relation between the first-clause subject and the second-clause object. The "modified version 2" will be explained in detail in this subsection. According to adult English grammar, the referential relation across the first and second clauses holds between constituents of the same kind. Children's coordinate-clause analysis imposed on a relative clause-including sentence depends on genuine coordinate-clause structures for the regulations of referential relations between NPs across clauses:

(49) John swims and △ runs

(50) John bakes △ and eats bread.

(51) John bakes △ and Mary eats bread.

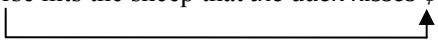
Example (49) above shows a "subject-to-subject" referential relation in which the first-clause subject applies to the missing second-clause subject. Examples (50) and (51) show "object-to-object" referential relations in which the second-clause object applies to the missing first-clause object. The identification of the referential relation is more difficult for (51) than for (50) in that actors of *bakes* and *eats* are different referents in (51) while they are the same referent in (50). These relations offer rationales on which the conjoined-clause analysis rests. Tavakolian's claim of her discovery of "one such intrinsic principle (Tavakolian 1981: 167)" derives from the well-formedness of the referential relation illustrated in (49) above. The well-formedness of (49) makes it legitimate for children to impose the principle of (49) on relative clause-including

sentences in input. In this way, the interim rule has to conform to adult grammar even if the child imposes it on strings in input which s/he should not.

In addition to the "modified version 1" that we have examined in the previous subsection, Tavakolian recognizes another "modified version" of the conjoined-clause analysis that can be imposed on OO-type relatives. We will label it as "the variant version 2" for convenience:

(52) stimulus sentence: The horse hits the sheep that *the duck kisses* ϕ .

(53) modified version 2: The horse hits the sheep that *the duck kisses* ϕ .



Unlike the "modified version 1," the "modified version 2" interprets the clause-initial NV sequence in the second clause according to the canonical word order. In (53), for example, *the duck kisses* in (52) is analyzed as an SV structure. This entails, therefore, an unfulfilled expectation of an object noun in the postverbal position of *kisses,* which is a transitive verb. The model example (53) shows that the first-clause subject is applied to the gap in the postverbal position in the relative clause. Thus, the "modified version 2" can be referred to as a "subject-to-object reference" relation. This strategy is found in Table 3 in §2.2.1, part of which is repeated as Table 7 below. The strategy shown with an arrow in (53) corresponds to the 12, 31 response in Table 7.

The "modified version 2" might have derived from the relatively high percentage (22%) of the 12, 31 response performed on the OO-type relatives. The "modified version 2" expands the area for the conjoined-clause-clause analysis to the "subject-to-object" reference. This may contradict Tavakolian's claim regarding the principled nature of children's grammar, which states "children are not just randomly associating nouns phrases and verbs to assign a meaning to those relative clauses they do not fully comprehend (Tavakolian 1981: 179)." She views the "subject-to-object" reference on OO-type relatives as exceptional, arguing the absence of an NP in the postverbal position makes the "standard version" of the conjoined-clause analysis

("subject-to-subject" reference) unfit for OO relatives. In the end, it was the empirical evidence that led Tavakolian to acknowledge the "modified version 2," as 22% of the responses to the OO-type relatives were allocated to 12-31, namely, "subject-to-object" references.

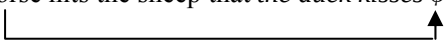
Table 7. Distribution of responses to OO-type relative clauses.

OO	1	2	3		
(52) The horse hits the sheep that the duck kisses.					
Results	<u>12,32</u>	**12,13**	12,31	12,12,	12,23 …
	38%	**19%**	22%	4%	4%

Note: underlined numerals= correct response;
bold numerals= the conjoined-clause analysis (the standard version)
Source: Tavakolian 1981, Tables 8.3-8.6 on pages 172-174.

Despite Tavakolian's inclusion of the "modified version 2" in the category of rule-governed strategies (Tavakolian 1981: 179), we are skeptical of its systemicity. We will demonstrate theoretical rationales indicating that the "subject-to-object" reference relation requires processing strategies too complicated to pass for a systematic interim rule. Example (53) is repeated below:

(53) modified version 2: The horse hits the sheep that *the duck kisses* ϕ .



First, it must be difficult for a gap and its referential NP to receive different grammatical roles across clauses. If the putative strategy of the "subject-to-object" reference is employed for the stimulus sentence in (54), the first-clause subject *the horse* has to be referential with the gap ϕ following *kisses*, which functions as the direct object of *kisses*. This process seems to be too complicated to be a systematic rule; *the horse* has initially been analyzed as the subject of the first clause. It is unrealistic to assume young hearers are capable of adding a different role to *the horse* while keeping its initial role alive.

Second, it is true that the different roles can be assigned to a single referent in some cases in

natural language but the processing difficulty contingent with them is much smaller than the amount that the putative "modified version 2" entails. We will reinforce this argument of ours by comparing the processing strategies required for the putative "modified version 2" of the conjoined-clause analysis in (53) and those required for the grammatical sentence (55), which also involves the assignment of different roles to a single referent:

(54) John loves Mary but she hates him.

(55) The women washed the shirts and they washed well.

In (53) the gap ϕ has to be identified as *the horse*, which means that *the horse* and the gap ϕ are counted as a single referent in the discourse. The referential relation illustrated with an arrow in (53) is a putative one proposed by Tavakolian. Is this possible in natural language? It is true that there are examples in adult grammar in which different grammatical roles are assigned to a single referent across clauses in a single sentence.

In (54), the second-clause subject *she* is referential with the first-clause object *Mary*. A same referent receives different grammatical roles across clauses. There are a couple of pieces of explicit evidence in support of this reference. They are the preverbal position of *she* and the case explicitly marked on it.

There is, however, a case where a referent receives different grammatical roles across clauses without explicit case-marking. The example (55) includes a so-called ergative verb *wash*. English ergative verbs assign the NP in the preverbal position either an agent or patient role. Native English-speaking adult hearers interpret *they* in (55) as being referential not with *the women* but with *the shirts* (personal correspondence). This no doubt comes from a systematic rule. It involves the assignment of different grammatical roles to a single referent across clauses: *the shirts* is the object in the first clause while it is the subject in the second. Attention has to be paid to the fact that there are two role-assigners in (55) while there is virtually a single assigner in (55). *The horse* in (53) receives different roles from different verbs: a subject role from *hits* in

the first clause and an object role from *kisses* in the second. The role assignment in (55), on the other hand, is carried out by a single ergative verb *wash*. This difference makes (55) much simpler than (53) in terms of discourse structure. The virtually simpler structure of (55) can be explained in the following way as well. Syntactically speaking, the single referent *the shirts* and *they* receive different formal roles of "object" and "subject" in the first and second clause respectively. Semantically speaking, however, these two NPs receive a patient role from the transitive *washed* in the first clause and a patient role form the intransitive *washed* in the second clause. This is made possible by the special role-assigning capability of ergative verbs.

Furthermore, both (53) and (55) involve the assignment of different roles to a single referent across clauses while gap-identification is included exclusively in (55) only. It is in itself a difficult analysis to assign different roles to a single referent across clauses. The difficulty must increase in (53) where the referential position is a gap. The difficulty must be moderate in (55) where a pronoun is present in the referential position. This is because a pronoun locates itself in a position in canonical word order while a gap requires the identification of the moved NP.

As we have seen in this subsection and 3.4.8, the "modified versions" of the conjoined-clause analysis entail processing strategies too complicated for young children to use as rule-governed interim strategies. The complexity of these "modified versions" can be evaluated on the basis of conformity to and deviation from the ultimate adult grammar. The "modified version 1" analyzes the NV sequence in clause-initial position in the second clause as an OV sequence, which almost never occurs in adult English grammar. The "modified version 2" assigns different grammatical roles to a single referent across clauses. This does not occur in adult grammar either, unless the referent takes the form of a case-marked pronoun as in *John loves Mary but she hates him* or the referent receives different grammatical roles from an ergative verb as in *The women washed the shirts and they washed well*. The "modified versions" can be viewed as implausible not only by deviation from adult grammar but also by processing difficulty. These

grammatical and processing factors combined, make it difficult for young children to make use of the "modified versions 1 and 2" as rule-governed strategies. We assume what children actually do are random associations of sentential elements in input even if they frequently engage in the "modified versions."

3.4.10 The "object-to-object" coordinate-clause analysis

In the previous subsections (§3.4.8 and §3.4.9), we cast doubt on Tavakolian's approval for the "deviant versions" of the conjoined-clause analysis, which contradicts her own belief in "one intrinsic principle" that constrains possible hypotheses that children make about difficult or unfamiliar structures. We support the idea of the constraints on possible hypotheses about interim rules in terms not of UG but of sentence processing, assuming that interim rules entail great processing difficulty if they are deviant from adult grammar. In this subsection, we propose the grammatical well-formedness and processing facility of the "object-to-object" reference rule that native children and L2-English learners may impose on OO-type relatives.

Logically speaking, there are several types of coordinate-clause analyses conforming to the ultimate state of adult English grammar that could be suitable for referential relations across clauses, such as "subject-to-subject," "object-to-object", "oblique-to-oblique" and so on. Strangely enough, Tavakolian identified only the "subject-to-subject" reference, which was specifically referred to as the "conjoined-clause analysis." She did not touch on the possibility of a coordinate-clause analysis with an "object-to-object" reference relation: the reference made across the same kind of constituents, conforming to adult English grammar. On the other hand, she conceded that the "subject-to-object conference" applies to OO-type relatives, which apparently deviates from adult English grammar.

(56) stimulus: the sheep jumps over the rabbit that the lion stands on.
1 2 3

(57) the "modified version 2": subject-to-object reference

s[s[the sheep jumps over the rabbit that]s[the lion stands on △]]

(Tavakolian, ibid: 179, the number in parentheses altered by the present author)"

(58) the "object-to-object" coordinate-clause analysis analysis

s[s[the sheep jumps over the rabbit] that S[the lion stands on △]]

It may be unfair to miss the possibility of coordinate-clause analysis with the "object-to-object" reference. The "object-to-object" reference involves an error made by a child in comprehending the OO-type relatives. It refers to the hearer's erroneous interpretation of applying the first-clause object to the second-clause object. If a child has not acquired relative-clause constructions, s/he is expected to interpret (56) as (58) above, which in turn is represented as (59).

(59) U: The sheep jumps over the rabbit *and* the lion stands on the *rabbit*."

As (58) shows, the missing object of the second clause is referential with the object of the first clause. The strategy illustrated in (58) is found in Table 3 in §2.2.1, which is repeated as Table 8 below. The comprehension of the OO-type relatives in this way falls into the 12, 32 column in Table 8. It shows 38% of children reported their recognition of the two actor-act-object relationships with toy animals, which were numbered from 1 to 3 as shown in Table 8 below. Table 8 represents part of Table 3 in §2.2.1.

The fact is that the method of acting out with toys cannot distinguish between the errors of "object-to-object" coordinate-clause analysis as shown in (58) and the correct attachment of the relative clause to the head noun as far as the OO-type relatives are concerned. Thus, the 12, 32 responses to the OO-type relatives, which is qualified as the correct response, may include covert errors with the coordinate-clause analysis which applies the object of the first clause to the

missing object of the second.

Table 8. Distribution of responses to OO-type relative clauses.

OO	1	2	3		
	The horse hits the sheep that the duck kisses.				
	Results	<u>12,32</u>	**12,13**	12,31	12,12,	12,23 …
		38%	**19%**	22%	4%	4%

Note: underlined numerals= correct response;
bold numerals= the conjoined-clause analysis (the standard version)
Source: Tavakolian 1981, Tables 8.5 on page 173

The "object-to-object" coordinate-clause analysis seems to be more plausible than the "subject-to-object" reference in a couple of ways. First, the "object-to-object" coordinate-clause analysis conforms to adult grammar. This is based on genuine coordinate-clause including sentences. In "John bakes △ and eats bread," △ and *bread* are coreferential. Second, the distance between the existent constituent and its phonetically null referential site is smaller in "object-to-object coordinate-clause analysis (58)" than in "subject-to-object conference (57)."

The preceding paragraphs have discussed the possibilities of coordinate-clause analyses other than the "standard" conjoined-clause analysis. We do not deny the fact that some children engage in some types of coordinate-clause analysis that are deviant from adult grammar, for example, "modified versions 1 and 2." Tavakolian acknowledges these as rule-governed strategies. We are, however, skeptical about the sistemicity of these "modified versions." As mentioned in the previous subsection, we regard these "modified versions" as resulting from random association of NPs and verbs in input rather than from systematic interim rules. On the other hand, we are interested in the possibility that some of Tavakolina's children may have imposed the "object-to-object" coordinate-clause analysis on OO-type relatives if they gave the 12, 32 response (see Table 8).

We designed the elicitation device for the OO-type relatives with reference to the possibilities

of the “modified versions 1 and 2” of the conjoined-clause analysis, which Tavakolian recognizes as rule-governed strategies, and the “object-to-object” coordinate-clause analysis, which we propose.

3.4.11 Elicitation device for OO-type relatives

There were a total of four test items for the OO-type relatives. These were mixed with test items for the other types of relatives and distracters. They were presented to participants in random order. The 4 test items consisted of two versions. Of the four, two were categorized into the C version and the other two into the D version. The two versions were intended for comparison but the results did not serve for quantitative analysis. They were used for qualitative analysis instead. Specifically, the C and D versions were intended to examine how the “object-to-object” coordinate-clause analysis relates to the attachment of the relative clause to the preceding noun in the matrix object position.

(31) OO-type C version

Cathy ate { ア. the fish that Ms.Clinton grilled.
イ. the fish that the mountain cooked.

(32) OO-type D version

John heard { ア. the rumor that Mary hated.
イ. the rumor that Tom beat.

Let us look at the mechanisms installed in the C-version items. The model examples (60) and (61) below are test sentences of the OO type-C version completed with the alternative sequence (ア) and (イ) respectively. Thus, if participants were able to attach the sentence-final NV sequence to the preceding noun, they would immediately judge (ア) as correct and (イ) as wrong. If participants were unable to subordinate the relative clause to the head noun, they would compare (60) and (61) before thinking of imposing the conjoined-clause analysis or other types of coordinate-clause analysis on them. One can easily see the sentence-final NV sequence

is semantically fit in (60) while it is anomalous in (61). Thus, most participants were expected to jump to the conclusion that (ア) was correct and (イ) was wrong for the C-version item. In the following model examples, the region containing semantic anomaly will be underlined.

(60) OO type-C version completed with (ア):
Cathy ate the fish that Ms.Clinton grilled.

(61) OO type-C version completed with (イ)
Cathy ate the fish that <u>the mountain cooked</u>.

The participant as a reader would be able to make this judgment whether she analyzed the sentence-final NV sequence correctly as a subject and a verb or simply as a set of two words consisting of a noun and verb. Even if the participant took the NV sequence as a set of a noun and verb and assigned roles randomly to them, she would find no other role-assignment than *Ms.Clinton grilled* as the subject and verb. Thus, it was possible for a participant reader to judge (60) as correct and (61) as wrong if she was able to use animacy cues, even if she was unable to use the word order cue that maps a linear NV sequence onto SV. Table 9 below shows that a random role-assignment to the NV sequence makes it possible to judge (60), i.e., the choice of (ア) as correct. The rightmost column shows that there is only one semantically possible analysis and it is "U: Ms. Clinton grilled."

The analysis in this table is made on the assumption that participants have not acquired English reduced relatives. The combination of *the mountain* and *cooked* would neither be an SV nor an OV sequence even if the ridged word order rules of English were removed.

We expected that all or almost all participants would judge (ア) as correct and (イ) as wrong in C-version items. It should be noted that, even if this prediction turns out to be true, we can not be sure whether participants have made use of word order (NV as SV) or animacy (you cannot cook Ms Clinton) cues in making their judgment.

Table 9. Possible patterns of random role-assignment

sentence-final sequence	assignment of roles	interpretation	semantic congruity
(60) Ms.Clinton grilled	subject + verb object + verb	Ms.Clinton grilled grilled Ms.Clinton	fit anomalous
(61) the mountain cooked	subject + verb object+ verb	the mountain cooked cooked the mountain	anomalous anomalous

As mentioned on page 84, it was likely for participants to compare (60) directly to (61). It was unlikely for them to apply any type of coordinate-clause analysis to (60) and (61). The sequence of the *mountain cooked* included in (61) is salient enough to judge it as wrong on the spot. In the interest of fair comparison, let us observe the possible consequences of the three types of coordinate-clause analysis imposed on them. The three types of coordinate-clause analyses of (60) are illustrated in (62)-(64) and those of (61) are illustrated in (65)-(67). In the examples of the possible interpretations of C-version items in (60)-(67), the regions containing semantic anomaly are underlined.

(60) OO type-C version completed with (ア):
Cathy ate the fish that Ms.Clinton grilled.

(62) "variant version 1" imposed on (60):
U: Cathy ate the fish and Cathy grilled Ms. Clinton.

(63) "variant version 2" imposed on (60):
U: Cathy ate the fish and Ms.Clinton grilled Cathy.

(64) "object-to-object" coordinate-clause analysis imposed on (60)
U: Cathy ate the fish and Ms.Clinton grilled the fish.

(61) OO type-C version completed with (イ)
Cathy ate the fish that the mountain cooked.

(65) "variant version 1" imposed on (61)
U: Cathy ate the fish and Cathy cooked the mountain.

(66) “variant version 2” imposed on (61)
U: Cathy ate the fish and the mountain cooked Cathy.

(67) “object-to-object” coordinate-clause analysis imposed on (61)
U: Cathy ate the fish and the mountain cooked the fish.

The examples (62)-(64) are three interpretations that we expected participants to make if they applied the three types of coordinate-clause analysis to (60). The three types were the “variant versions 1 and 2” of the conjoined-clause analysis, and the “object-to-object” coordinate-clause analysis. The underlined regions in (62) and (63) show regions that contain semantic anomaly. On the other hand, one can see the completed sentence (60) is free from any semantic anomaly whether it is correctly comprehended as a relative clause-including sentence or it is misinterpreted with an “object-to-object” coordinate-clause analysis imposed on it as in (64). The correct comprehension of (60) and a misinterpretation of it (64) consist of the same set of actor-act-object relationships which are semantically congruous. Thus, the choice of (ア) as correct does not necessarily need subordinating *that Ms. Clinton grilled* to *fish*. In other words, the search for an NP that would fulfill the gap following *grilled* would not necessarily result in relativization in sentence comprehension. It would end up in the “object-to-object” coordinate-clause analysis. The “object-to-object” coordinate-clause analysis (64) would lead the participant to judge (ア) as a correct choice.

Let us move to the D-version items for the OO-type relatives. The model examples (68) and (69) below are test sentences of the OO-type D-version items completed with the alternative sequence (ア) and (イ) respectively. Thus, participants would first compare (68) and (69) regardless of whether or not the participant was able to attach the relative clause to the preceding noun:

(68) OO type-D version completed with (ア)
John heard the rumor that Mary hated.

(69) OO type-D version completed with (イ)
John heard the rumor that Tom beat.

One can see that the sentence-final NV sequence in either (68) *Mary hated* or (69) *Tom beat* contain no semantic anomaly. Thus, unlike the C version, the local analysis of the sentence-final NV sequence would not provide any evidence for judgment in D-version items and the global analysis of the whole sentence was necessary. The global analysis might result in either relativization or coordinate-clause analysis.

If the participant was able to comprehend the second clause as a relative clause, she would immediately judge (ア) as correct and (イ) as wrong. The syntactically correct comprehension of a relative clause-including sentence involves the assignment of an object role to the extracted noun by the relative verb. In the sentence completed with (ア), which is illustrated in (68), *the rumor* receives an object role from *hate*. On the other hand, in the sentence completed with (イ), which is illustrated in (69), *the rumor* receives an object role from *beat*. The noun *rumor* is natural as the object of *hate* but it is anomalous or at best very awkward as the object of *beat*. This contrast would lead the participant to choose (ア) as correct if the participant could subordinate the relative clause to the head noun.

If the participant was unable to comprehend the second clause as a relative clause, she would employ one or more of the three types of coordinate-clause analysis that we have seen in previous subsections. The three types of coordinate-clause analyses of (68) are illustrated in (70)-(72) and those of (69) are illustrated in (73)-(75). In the examples of the possible interpretations of D-version items in (68)-(75), the regions containing semantic anomaly are underlined, just as in the examples of the C-version items.

(68) OO type-D version completed with (ア)
John heard the rumor that Mary hated.

(70) "variant version 1" imposed on (68)
U: John heard the rumor and John hated Mary.

(71) "variant version 2" imposed on (68)
U: John heard the rumor and Mary hated John.

(72) “object-to-object” coreference imposed on (68)
U: John heard the rumor and Mary hated the rumor.

(69) OO type-D version completed with (イ)
John heard the rumor that Tom beat.

(73) “variant version 1” imposed on (69)
U: John heard the rumor and John beat Tom.

(74) “variant version 2” imposed on (69)
U: John heard the rumor and Tom beat John.

(75) “object-to-object” coordinate-clause analysis imposed on (69)
U: John heard the rumor and Tom beat the rumor.

The participants were expected to do one or more of the coordinate-clause interpretations illustrated in (70)-(72) and (73)-(75) for judging a D-version item. What is significant is that semantic anomaly would occur with the “object-to-object” coordinate-clause analysis only, which is depicted in (75), as far as coordinate-clause analysis on the D-version item is concerned. The underlined region in (75) contains the semantic anomaly of taking *the rumor* as the object of *beat*. This semantic anomaly is identical to that involved in the correct comprehension of the D-version item completed with (イ) shown in (69): the combination of *beat* and the *rumor* as an act-object relationship can result from either the correct interpretation of (69) as a relative-clause including sentence or the “object-to-object” coordinate-clause analysis illustrated in (75).

Let us now look at all interpretations from (68) through (75) that we postulated for the D-version item. One can see that semantic anomaly was expected to occur only when (イ) was chosen. Choice (ア) was free from semantic anomaly. The interpretations (68), (72), (71), and (72) are free of underlines as they are free of semantic anomaly. The semantic anomaly results exclusively from choosing (イ) and the anomaly takes place between *beat* and *rumor* in both (69) and (75). In order to find this anomaly it is not necessary to attach *Tom beat* to *rumor* as a modifier; the imposition of the “object-to-object” coordinate-clause analysis is enough. This

means there are three preconditions for participants to make a correct choice for D-version items (and for C version items as well). First, the participant needs to interpret the sentence-final NV sequence as an SV sequence. Second, she needs to be sensitive to the transitivity of the verbs *hated* and *beat*. This is necessary for her to expect an object noun that follows each verb in sentence-final position. This expectation would not be fulfilled unless she identified a gap there. Third, she needs to know the gap following the sentence-final verb is referential not with the first-clause subject (*John*), but with the first-clause object (*the rumor*).

These three preconditions relate to the factors contrasting in the C- and D- version items of the OO-type relatives. The C-version and D-version are different in terms of how many of the three preconditions the participant has to meet to make a correct judgment. The C-version item (31) and the D-version item (32) are repeated below:

(31) OO type-C version

Cathy ate { ア. the fish that Ms.Clinton grilled.
イ. the fish that the mountain cooked.

(32) OO type-D version

John heard { ア. the rumor that Mary hated.
イ. the rumor that Tom beat.

A C-version item (31) requires the participant to meet only the first precondition in order for her to make a correct judgment. That is, it is enough to analyze the sentence-final NV sequence as an SV structure, since the analysis of *Ms.Clinton grilled* as an SV structure would lead to a correct judgment. As mentioned in the previous paragraph, a D-version item requires the participant to fulfill all the three preconditions for her to perform it successfully. She had to analyze the sentence-final NV sequence as an SV structure, expect an object noun, and identify the first-clause object as being referential with the sentence-final gap. One can see that the fulfillment of only the first and second preconditions is not enough for the choice of (ア) as correct in performing a D-version item as in (32). It is not until the participant meets the third

precondition that she becomes aware of the anomaly of taking *rumor* as the object noun of *beat*.

As we have seen, there were four test items for the OO-type relatives. Of the four, two were C-version items and the other 2 were D version items. One of the two D-version items has been presented as a model example (32). The other D-version item is shown in (76) below. These D-version items were intended to examine the OO-type relatives, so the second-clause verb of each item had to be transitive. Due to transitivity, the participant reader can expect an object noun in the postverbal position. The transitivity of the second-clause verb was a central factor in the design of test items on OO-type relatives. The second-clause verbs in item (32) were free from problems. The verbs *hate* and *beat* are purely transitive. Item (76), however, included a problem. The second-clause verb *hide* in (ア) can be used as intransitive:

2 test items categorized to OO-type D-version

(32) John heard { ア. the rumor that Mary hated.
イ. the rumor that Tom beat.

(76) Steve wanted { ア. the money that the daughter hid.
イ. the money that the daughter visited .

A Japanese EFL learner may interpret "hid" in (76) as intransitive, resulting in interpreting the clause as "… the daughter hid herself." If this happens, the participant expects no object noun to follow "hid," and would find no gap following *hid*. This means that she would not be guided to attach the second-clause to the head noun nor would she impose the "object-to-object" coordinate-clause analysis. Furthermore, she would not encounter any cues for converting his/her coordinate-clause analysis to a relative-clause analysis. Of course, a native speaker of English would never fail to analyze *hid* in (76) as transitive because it lacks a locative adverbial following it, such as "behind the tree," which is essential for "hide" to be intransitive. Nonetheless, Japanese EFL learners may mistake the *hid* in (76) as intransitive because of his/her lack of developed English ability. It was unfortunate that we missed taking the intransitive reading of *hid* into

account. We should have adopted a pure transitive verb instead of *hid*, which is ambiguous in transitivity. We should consider this drawback in design in analyzing the results.

As mentioned in §3.4.2, participants were asked to choose one of the alternative sequences that they judge as correct from either a semantic or grammatical point of view. Thus, there existed two criteria for performing the choice: grammar and semantics. One of the alternatives was grammatically deviant in the SS- and SO-type items, and semantically abnormal in the OS- and OO-type items. As have been mentioned, the test items were randomly presented, so that the participant had to make either a grammatical or a semantic judgment for individual items. If they always had to pay attention to grammatical and semantic features simultaneously, it would likely have confused them. However, from the viewpoint of test takers who were on their way to the acquisition of English relative clauses, all test items were made so that they could perform them with only semantic strategies. In all items, semantic anomaly was programmed to arise when she imposed a coordinate-clause analysis on the relative clause-including sentence. At this point, she would be induced to obviate the semantic anomaly by abandoning the coordinate-clause analysis and by attaching the relative clause to the head noun. In this way, the encounter with the semantic anomaly contingent on her/his coordinate-clause analysis would lead her/him to relativization. In short, the judgment of the SS- and SO- type items required paying attention to grammatical features of test sentences in the final stage of judgment. The early stages leading to this judgment were, however, dependent solely on semantic features.

There should be an account of the method of the grammaticality judgment. Experiment 2 adopted a test of making a binary choice. It is similar to *Preference Choice* which was among the several types of grammaticality judgment tests introduced in Ellis (1991: 171). *Preference Choice* is accounted for as follows:

> · · the learner is provided with a pair of sentences and is asked to judge which sentence "seems better." Again, there is the possibility of a third option- "they seem the same."

The test used for Experiment 2 differs from *Preference Choice* in that it was free of the third option. We did not prepare the third option because it was likely to allow the participant to choose it without being forced to exert her potential ability to be aware of the semantic anomaly resulting from coordinate-clause analysis. The participant manifests this potential ability by exerting persevering efforts only when put under the condition that one of the alternatives is guaranteed to be correct and the other wrong.

3.5 Results of Experiment 2

Table 10 gives mean scores for the four types of relative clauses. The elicitation device varied for each type, so it is impossible to compare the results between the different relative types. Comparison was possible only between the two versions of the same type. Table 11 gives a breakdown in terms of the number of participants who gave a correct response to each item.

Table 10. Mean scores for the 4 types of relatives

relative type	SS		SO		OS		OO	
version	A	B	A	B	A	B	C	D
mean score (out of 2)	1.79	1.34	1.76	1.69	1.76	1.62	1.97	1.10
sd	0.506		0.458		0.833			
p (two valued)	0.000*		0.424		0.380			
t- value	4.770		0.812		0.891			

Table 11. No. of participants who gave correct responses

relative type	SS				SO				OS				OO			
version	A		B		A		B		A		B		C		D	
Item No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
No. of participants giving a correct response (out of 29)	27	25	21	18	27	24	24	25	26	25	24	23	29	28	20	12
Total No. of correct responses (out of 87)	52		39		51		49		51		47		57		32	

In rating the results, one point was given to one correct response to one item. A total of four relative types were investigated. They were SS, SO, OS, and OO types. For each of these types,

two test item versions were devised, so that there were a total of eight versions. Two test items were prepared for each version, so there were a total of 16 critical items. These critical items were presented to participants mixed with 32 distracters in random order. In Table 10, the test items for the SS, SO, and OS types had A and B versions. The A and B versions of these three types were fit for statistical comparison in with the same relative type. The statistical difference was determined by a two-sided paired *t* test. A difference of $p < 0.05$ was considered significant. Statistic difference was found between the A and B versions for the SS-type ($p = 0.000 < 0.05$). The difference between the A and B types for the SO type ($p = 0.424 > 0.05$) and for the OS-type ($p = 0.380 > 0.05$) was not significant.

The C and D versions for the OO-type relatives were designed for qualitative analysis. As we predicted, the C-version items were performed almost perfectly. On the other hand, the D-version items were performed poorly. The mean score for the D-version was barely above half (1.10 out of 2).

In light of our interest in the effect of semantic factors on relativization in sentence comprehension, the above results can be interpreted as follows. As for the SS-type relatives, semantic problems resulting from the conjoined-clause analysis had some effect on the relativization. When it comes to the SO- and OS-type relative clauses, the semantic problems did not contribute to relativization. In comprehending sentences including OO-type relative clauses, participants seemed to have found considerable difficulty in recognizing the relative-clause including region as a complex NP.

These findings lead us to make the following observations. First, semantic factors can be used as strategies for forming complex NPs in comprehending SS-type relative clauses. Second, semantic factors do not trigger the formation of complex NPs in comprehending SO- and OS-type relative clauses. Third, errors of coordinate-clause analysis including the conjoined-clause analysis did not appear to be employed for the OO-type relatives. These

observations are made on the assumption that the elicitation devices worked successfully in isolating the kinds of information that we wanted.

In the next chapter, we will have detailed discussion on how the findings above relate to the following hypotheses, which have been mentioned in 1.3, 2.5 and 3.1.

Ⅰ. Language acquisition in general is a hearer's creation of a new semantic structure when s/he applies a semantic structure s/he knows well to an unfamiliar utterance and finds it entailing weak semantic fit.

Ⅱ. The above hypothesis will hold true for Japanese EFL learners' acquisition of full-fledged English relative clauses.

Chapter 4. Discussion on the results and pedagogical implications

In this chapter we will discuss whether or not, or to what extent the results of Experiment 2 support the above hypotheses, which have been mentioned in 1.3, 2.5, 3.1 and 3.5.

Ⅰ. Language acquisition in general is a hearer's creation of a new semantic structure when s/he applies a semantic structure s/he knows well to an unfamiliar utterance and finds it entailing weak semantic fit.

Ⅱ. The above hypothesis will hold true for Japanese EFL learners' acquisition of full-fledged English relative clauses.

These hypotheses derive from the following rationales which draw on previous studies mentioned in Chapter 2. First, the recognition of a complex NP in sentence comprehension in English is often dependent on the verbs' semantic constraints rather than on formal markers. Second, the formation of a relative clause-including NP in sentence comprehension is specifically dependent on weak semantic fit resulting from the hearer's error of analyzing it as a simplex sentence (*cf.* §2.3.2 and *cf.*§2.3.4). This particular error leads to the wrong analysis of a relative-clauses including sentence as coordinate clauses, in other words, conjoined-clauses.

In testifying the hypotheses, we will discuss whether our elicitations devices have isolated what we wanted to know and, if they have what the results mean. The specific viewpoints are the effects of the semantic factors on the learners' analysis of relative-clause including sentences and the effect of semantic problems contingent on participants' coordinate-clause analysis.

The subsections of this chapter are organized in the following way. Subsection 4.1 to 4.4 will be devoted to the results of individual relative types, SS, SO, OS, and OO in Experiment 2. Subsection 4.5 will review the results in light of two functionalist models.

4.1 SS-type relatives

As mentioned in Chapter 3, the results of the SS-type relatives in Experiment 2 turned out by

far better for the A-version (mean=1.79) than for the B version (mean=1.34). The extent of this difference was significant on a statistical scale (p = .000 〈 0.05 by the two-sided t test). This difference strongly supports our prediction that the results of the SS-type relative clauses would turn out significantly better for the A-version items than for the B-version items. We will discuss these results in regard to the conjoined-clause analysis (*cf*. §2.2.1 and §3.4.4). Participants may have used the conjoined-clause analysis in judging the test sentences for the SS-type relatives.

SS-type relatives refer to subject-extracted relative clauses in the matrix subject position. The tricks underlying the test sentences were intended to cause the A version to have better results than the B version when a participant imposed the conjoined-clause analysis on the test sentences. As mentioned in detail in §2.2.1 and §3.4.4, the coordinate-clause analysis is specifically carried out by incorrectly applying the first-clause subject to the missing subject of the second clause.

(1) SS-type A version: The nurse that took care of John { ア. started a business.. / イ. and started a business }

(2) SS-type B version: The man that looked into the binocular { ア and found a tiger. / イ. found a tiger. }

The mean score of the A version was significantly better that that of the B version. This result supports our prediction in 3.4.4. The rationale for this prediction is as follows. If the participant had not yet acquired English relative clauses, the interpretations of the A-version test sentence (1) would converge into one interpretation such as in Example (3) below, regardless of whether the participant chose (ア) or (イ). The interpretation of the B-version item (2) would converge in a single analysis such as Example (4) below irrespective of whether the participant chose (ア) or (イ):

(3) the conjoined-clause analysis imposed on the A-version item:
U: The nurse took care of John *and the nurse* started a business

(4) the conjoined-clause-analysis imposed on the B version:
U: The man looked into the binocular *and the man* found a tiger.

Example (3) shows the conjoined-clause analysis imposed on the A-version item. The semantic coherence between the two events in (3) is rather weak. It is vague as to how the first event relates to the second. Example (4) shows the conjoined-clause analysis imposed on the B-version item. The two events described in (4) are strongly coherent. They clearly represent a relation of cause and effect. We supposed that the weak coherence between the two events in (3) would urge participants to compile the first clause of (3), U: *the nurse took care of John*, into a complex NP, U: *the nurse that (who) took care of John*. By contrast, the strong coherence between the two events in (4) would make participants satisfied with the conjoined-clause analysis and do nothing to it.

Let us look at the cases regarding (1) SS-type A version, which is repeated below. It is possible, regardless of whether the participant imposed a conjoined-clause analysis on the test sentence completed with "ア" or "イ," her wrong interpretation converged into a single analysis such as (7).

(1) SS-type A version: The nurse that took care of John { ア. started a business.. / イ. and started a business }

(5): (1) completed with "ア"
The nurse that took care of John started a business.

(6): (1) completed with "イ"
The nurse that took care of John and started a business.

(7): the conjoined-clause analysis imposed on (5) and (6):
U: The nurse took care of John *and the nurse* started a business.

Let us now look into the mechanism of the conjoined-clause analysis that Japanese EFL learners applied to the completed sentences (5) and (6). An immature learner appeared to have missed the complementizer *that*, taking the sentence-initial NVN sequence (N: The nurse, V: took care of, N: John) as a simplex sentence (Tavakolian 1981: 168). There was a formal

difference between the completed sentences (5) and (6). The conjunction *and* was absent in (5) while it was present in (6). It is possible that if the participant was not mature enough to make use of this formal difference for her judgment, she interpreted each of the alternative sequences (*started a business* in (5) and *and started a business* in (6)) as coordinate with its preceding clause. This strategy would result in the inference that the missing subject of the second clause of (5) and (6) was referential to the first-clause subject *John* in the same way for (5) and (6). As a result, the final interpretations of (5) and (6) may have turned out as semantically identical as shown in (7).

When the participant had interpreted (5) and (6) as identical in meaning, she was faced with a problem. Having been informed that one of the alternatives was correct and the other was wrong, she was sure that there must be a cue with which to judge one of them as correct or wrong. At first she was unable to find any semantic difference between her own interpretations of (5) and (6) since they had converged into (7).

As we have seen, Example (7) is the conjoined-clause analysis on the A-version test sentence, regardless of whether the participant completed it with (ア) or (イ). In (7), two clauses were connected by the conjunction *and*. The notion of *and* derived from the conjoined-clause analysis. A participant's inability to subordinate a clause to the preceding noun might have created two independent simplex sentences, which in turn, she had to relate in some way or another. Then, the participant thought of connecting them with *and* because a coordinate-clause structure was familiar to and easier for her. This assumption comes from a remark on L1 learning by Tavakolian (1981: 169). She states, "…children will rely on the grammatical rules they already possess in an attempt to process difficult or unfamiliar constructions…" In the conjoined-clause analysis, the hearer breaks down a relative clause-including sentence into two coordinate clauses with *and* in between. Thus, the involvement of *and* in the interpretation is a central element of the conjoined-clause analysis. In this respect, the semantic properties associated with *and* are

important in evaluating the possible strategies co-occurring with the conjoined-clause analysis.

In cases where the concept of *and* is brought into the learner's interpretation with the conjoined-clause analysis, either of the two meanings below is likely to be applied simply because they are among the most frequently used meanings of *and*. The definitions (8) and (9) below are excerpts from a well-circulated English-English dictionary:

(8) to link two statements about actions or events, when the second happened later in time than the first. EG *He opened the car door and got out…*・・・

(9)・to link two clauses when the second clause is a result of the first clause.・・・EG. *Do as you're told and you'll be all right.*・・・(Collins COBUILD English Language Dictionary 1987: 48)

Thus, the conjunction *and* posited between two finite clauses often refers to order of events (8) or cause and effect (9).

Let us return to the test item on the SS-type A-version. The test item and the test sentences completed with the alternatives are repeated below:

(1) SS-type A version
The nurse that took care of John { ア. started a business..
                                 { イ. and started a business

(5): (1) completed with "ア"
The nurse that took care of John started a business.

(6): (1) completed with "イ"
The nurse that took care of John and started a business.

(7): U: The nurse took care of John *and the nurse* started a business.

It is possible that the participant was now stuck on the two sentences (5) and (6), which had been completed with the alternative sequences of (ア) and (イ). These completed test sentences had converged in a unitary interpretation of (7). Thus, the participants found no semantic difference between (5) and (6). Under this situation, she had to look for a difference between the consequence of the choice of (ア) or (イ) since it had been guaranteed that one of the alternatives was correct and the other was wrong. Despite her effort she was unable to find any

difference between the consequences of the choice of (ア) and (イ), i.e. (5) and (6).

The participant might have begun to become aware that coherence was weak between the two events in (7), which represent her conjoined-clause analysis, as the nurse's job of taking care of his/her patient and the nurse's commencement of a business are events that usually occur in different contexts. It is possible that the weak coherence between the two events in (7) forced the participant to rethink her own conjoined-clause analysis: she might have thought she had to do something in order to retrieve coherence across the two events in (7). In other words, she disallowed herself to impose the conjoined-clause analysis unless the two events in it were in such a relation as can be linked naturally with *and*, whose main functions are to represent "order of events" or "cause and effect." The participant's recognition of coherence between the two events appeared to play a central role in solving the problem.

At this point, the participant might have been still unsure what to do to her own conjoined-clause analysis of (7), which did not provide her with any cues for differentiating (ア) and (イ). The weakness in coherence in (7) is a matter of degree. Example (7) is wrong as an interpretation of the given sentence but it is possible for native English speakers to use the conjunction *and* in the way as it is used in (7). Thus, the sentence in (7) in itself is grammatical. However, the relation between the two events in the sentence is not as coherent in (7) as it is in (10):

(7) U: The nurse took care of John and the nurse started a business.
(10) The nurse took care of John and he left hospital in a week.

This is probably because the conjunction *and* in (10) represents both "order of events" and "cause and effect" at the same time while the conjunction *and* in (7) encodes the "order of events" meaning only.

Now that the participant was aware of the weak coherence between the two events in her own conjoined-clause analysis, she had to cope with it. Formal cues such as the relative marker and

postnominal position of the relative clause were still meaningless for participants who had not yet acquired English relatives. All they could do was manipulate the semantic structure they had created, i.e., the conjoined-clause analysis, without making reference to formal cues such as the relative marker, the postpositional position of the relative clause and the formal difference between the alternatives (ア) and (イ).

The conjoined-clause analysis (7) was a concept that had arisen in the participant's mind while the test sentences completed with (ア) and (イ), which were given as (5) and (6) above, were visible entities printed on the test paper. The participant could compare these printed strings with her own conjoined-clause analysis (7) in her mind:

The crucial fact is that the participant was unfamiliar with the function of *that* as a relative marker, while she was familiar with the function of *and* as a conjunction which represents "order of events" or "cause and effect". It is possible that this imbalance made her aware of the fact that the meaning of her conjoined clause analysis (7) was identical with the written sequence (6) while it was different from the other written sequence (5). The completed sentence (5) lacked the conjunction *and*, which plays a central role in the conjoined-clause analysis. At this moment, the participant began to pay careful attention to the weak coherence that she had found about her own the conjoined-clause analysis. She began to become aware that she was able to do away with the weak coherence by compiling the first clause of (7), i.e., U: *the nurse took care of John*, into a complex NP:

(7) U: The nurse took care of John *and the nurse* started a business.

(11) the first clause of (7), which had been forcibly compiled into a complex NP:
U: the nurse who (or that) took care of John

The first clause of (7) is U: *The nurse took care of John*. This can be changed into an NP, "U: the nurse who (or that) took care of John." Of course, U: *The nurse took care of John* can also be changed into "U: John, whom the nurse took care of." The latter is less plausible for its

complexity. Thus, the participant presumably chose to make the subject-extracted relative: "U: the nurse who took care of John."

It is necessary to explain why a hearer or reader can eliminate the weak coherence from his/her conjoined-clause analysis by reorganizing part of his/her interpretation into a complex NP. As we have seen, the conjoined-clause analysis is characterized by the meaning of the conjunction *and*. It juxtaposes two events in a relation such as "order of events," or "cause and effect," and so on. Thus, the extent of coherence between the two events in a conjoined-clause analysis appears to be in proportion to the extent to which they are naturally combined with *and*. Thus, the reader or hearer can totally eliminate the weak coherence from his/her conjoined-clause analysis by removing the concept of *and* from his/her interpretation. This can be realized by compiling one of the two propositions in the conjoined-clause analysis into a complex NP and embedding it in the other. This simply means making one of two equal things belong to the other. There is no longer a concept of *and* in the newly made structure and no need for evaluating the extent of coherence between the two events. Examples (7) and (11) above represent the participant's notions. These notions are not necessarily verbally represented. It is possible that these notions are represented in her mind with the help of her L1 Japanese.

Having compiled the first clause of her conjoined-clause analysis into a complex NP headed by *nurse*, the participant might have been feeling she had done away with the weak coherence.

After changing the former half of (7) into a complex NP (11), there still remained an assignment for the participant to carry out. She had to choose (ア) or (イ) as correct. The alternative sequences are repeated as (12) below:

(11) the initial region of (7), which had been forcibly compiled into a complex NP:
U: the nurse who (or that) took care of John

(12) (ア) started a business.
(イ) and started a business.

It was a very complicated task to connect the participant's newly-occurred analysis (11) with one of the alternatives in (12). However, it might not have been so difficult for the participant since she was allowed to see (12) in written form. At this point, she recognized *the nurse* in (11) as the matrix subject of the whole sentence because of what she had done to the first clause of (7). That is to say, she had compiled it into a complex NP. Due to the sentence-initial position of the complex NP, she naturally thought of it as the matrix subject. Then, she considered the verb included in the alternatives: *started* had to be the matrix verb. Japanese learners' sensitivity to the SVO basic order of English (Rutherford 1983: 367) seemed to have made it possible to recognize the sentence-initial NP as the matrix subject and the following verb as the matrix verb. Once the participant had recognized *started* as the matrix verb of the whole sentence, it had to contiguously follow the matrix NP. Then, she found the conjunction *and* attached in front of *started* in (12)-イ superfluous, judging the alternative (ア) as correct and (イ) as wrong for the test item on the SS-type A version item.

In the case of the SS-type B-version item (2), which is repeated below, the conjoined-clause analysis imposed on the test sentence completed with (ア) and (イ) might have converged into a single interpretation, shown in (15), as well as an A-version item. This happened because the participant was unable to see the semantic difference between the test sentences completed with (ア) and (イ) because she interpreted the first clause of the test sentence as a simplex sentence regardless of whether she chose (ア) or (イ); they converged in a single analysis, "U: the man looks into the binocular." This error might have forced the participant to misinterpret the following alternatives as coordinate with the preceding part irrespective of whether or not *and* was in the initial position of the alternatives.

(2) SS type-B version: The man that looked into the binocular { ア and found a tiger. / イ found a tiger.

(13) the test sentence completed with (ア):
The man that looked into the binocular and found a tiger.

(14) the test sentence completed with (イ):
The man that looked into the binocular found a tiger.

(15) the conjoined-clause analysis imposed on the SS-type B-version item
U: The man looked into the binocular *and the man* found a tiger.

In the conjoined-clause-clause analysis (15) made from the B-version item, the two events were semantically in a coherent relation. The two events met preconditions required to be regarded as representing "order of events" and "cause and effect" at the same time. A participant may have analyzed a B-version item such as (2) in the following way if she had not yet acquired English relative clauses. It is possible that the participant was satisfied by her own conjoined-clause analysis (15) and found no semantic difference between the test sentences completed with (ア) and (イ), even if they were visible in the form of written materials. Supposedly, the participant had to choose one of the alternatives by guessing.

In sum, we consider that a participant processed the A- and B-version items for the SS type in the following way if she had not acquired English relative clauses.

In doing the SS-type A-version items, the participant might have found weak coherence between the two events in her conjoined-clause analysis (7). She tried to do away with the weak coherence by forcibly compiling the first clause of her conjoined-clause into a complex NP containing a relative clause (11). She appeared to have known the complex NP had to be the matrix subject because of its sentence-initial position. Thus, she knew that the complex NP had to be followed by the predicate VP. Finally, she decided to choose one of the alternatives which was free of *and* as correct because a predicate VP never starts with *and*.

In doing the SS-type B-version items, the participant might have found strong coherence between the two events in her conjoined-clause analysis. This would have induced her to make the judgment at random.

We have so far discussed the results of the SS-type relatives in detail. The mean score was

by far better for the A version than for the B version. This was because the two events in participants' conjoined-clause analysis on the A version items suffered from weak coherence while the B-version items enjoyed strong coherence. It is possible the weak coherence between the two events made participants reorganize the first clause of the conjoined-clause analysis into a complex NP for A-version items but this did not happen to B-version items because the strong coherence in the conjoined-clause analysis satisfied participants.

4.2 SO-type relatives

We saw the results of the SO-type relatives of Experiment 2 in Chapter 3. Let us briefly repeat them here. The results of the SO-type relatives in Experiment 2 turned out slightly better for the A-version items (mean=1.76) than B-version items (mean=1.69) but the difference was not large enough for the two-sided *t* test to find a statistically significant difference ($p = .424 > 0.05$). This result did not support our prediction that the results of the SO-type relatives would turn out significantly better for the A version items than for the B version items.

(16) SO-type A-version:
The bird that John caught { ア. and laid eggs / イ. laid eggs.

(17) the conjoined-clause analysis on (16):
U: John caught the bird *and John* laid eggs.

(18) SO-type B version:
The money that John stole { ア. got to the boss. / イ. and got to the boss.

(19) the conjoined-clause analysis on (18):
U: John stole the money *and John* got to the boss.

As mentioned in §2.2.1, SO-type relatives may yield two patterns of conjoined-clause analysis. In order to make the comparison easy, we will adopt NPs that are semantically distinguishable from each other for Examples (20)-(22). They are *waitress*, *policeman* and *pistol*.

The stimulus sentence (20) may be interpreted as (21) or (22). They both are conjoined-clause analysis. The first pattern (21) wrongly interprets the relative subject *policeman* as the first-clause subject and consequently misinterprets *the waitress* as the first-clause object. The second pattern (22) wrongly interprets *the waitress* as the first-clause subject and consequently misinterprets the relative subject *the policeman* as the first-clause object. In both patterns, the misanalyses are carried out within the complex NP in the stimulus sentence by associating the NPs in it with the verb *questioned* in different ways:

(20) the stimulus SO-type relative:
The waitress that the policeman questioned had a pistol.

(21) the conjoined-clause analysis on SO type, the first pattern:
U: The policeman questioned the waitress and the policeman had a pistol.

(22) the conjoined-clause analysis on SO type, the second pattern:
U: The waitress questioned the policeman and the waitress had a pistol.

These two patterns abide by the rule of the conjoined-clause analysis, according to which the first-clause subject has to be applied to the missing subject of the second clause. In this sense, the conjoined-clause analysis depicted in (21) and (22) are both "standard" versions of conjoined-clause analysis.

Unfortunately, due to limited time for the test session, we treated only the former pattern, which is given as (21) above, in Experiment 2. We chose the former pattern since we thought it more probable to occur than the latter, since the intact linear NV sequence (*the policeman questioned*) in the stimulus sentence (20) is likely to be interpreted as the subject and verb of the first sentence. In natural situations, it is up to hearers or readers to decide on which of the two possible patterns of conjoined-clause analysis, i.e., (21) or (22), they will choose to impose on the current relative-clause including sentence. We intentionally led participants in one direction in their choice between the two patterns of the conjoined-clause analysis. We expected the NPs with certain semantic characters to induce participants to exclusively choose the first pattern, i.e.

(21), of the conjoined-clause analysis. For example in (16), the first-clause subject is intended to be John, not the bird:

(16) SO-type A-version:
The bird that John caught　ア. and laid eggs
イ. laid eggs.

This is realized because *John* can catch *the bird* but *the bird* cannot catch *John*. This trick is installed in all four test items for the SO-type.

According to our common sense intuition, the weak semantic fit resulting from the conjoined-clause analysis on A-version items appears much more severe for the SO-version than for the SS-version. Compare (3) and (17) below.

(1) SS type-A version :
The nurse that took care of John { ア. started a business. / イ. and started a business.
(3) the conjoined-clause analysis on SS type-A version (1):
U: The nurse took care of John *and the nurse* started a business.

(16) SO-type A-version:
The bird that John caught { ア. and laid eggs / イ. laid eggs.
(17) the conjoined-clause analysis on SO-type A-version (16):
U: John caught the bird *and John* laid eggs.

The conjoined-clause analysis imposed on the SO-type A-version item, which is given as (17) above, involves a proposition that is opposed to our common sense plausibility: "U: John caught a bird *and John* laid eggs." On the other hand, the conjoined-clause analysis imposed on the SS-type A-version item, which is given as (3) above, is "U: The nurse took care of John *and the nurse* started a business." The coherence between the two events is weak in (3) but the problem of coherence seems much more severe in (17) than in (3).

The A-version items of both the SS- and SO-types were devised so that errors of the conjoined-clause analysis would result in weak semantic coherence, which was hoped to urge

participants to compile the first clause of the conjoined-clause analysis into a complex NP. For example, U: *The nurse took care of John* (3) would be compiled into a complex NP *the nurse who (that) took care of John* and U: *John caught the bird* (17) into a complex NP *the bird which (that) John caught*. The B-version items of the SS-type and SO-type items were free from such tricks. As mentioned above, the semantic fit between the two events in the conjoined-clause analysis on the A-version item was much weaker for the SO-type than for the SS type. That is, we expected that the elicitation device of the SO-type relatives would work out better than that of the SS-type relatives. However, unexpected results came out. In the SS-type, the mean score for the A-version items was far better than the B-version items (p=.000). In the SO-type, the mean score for the A-version was slightly better than the B version, which did not show statistically significant difference (p =.424 > 0.05).

The most plausible explanation for this phenomenon can be given in terms of a defect inherent in the written test materials. In (16) below, *The bird*, occupying the sentence-initial position, is too salient.

SO-type A-version items:

(16) The bird that John caught { ア. and laid eggs / イ. laid eggs.

(18) The dog that John kept { ア. barked at Mary. / イ. and barked at Mary.

It is possible that even if the participant started with the conjoined-clauses analysis and misinterpreted the first clause as "John caught the bird," *The bird* in the sentence-initial position came in her sight and received an agent role from the second-clause verb *laid*. This resulted in the interpretation that "John caught the bird and *the bird* laid eggs," in which there was strong coherence between the two events. The conjoined-clause analysis and the semantic incoherence contingent did not occur. The standard conjoined-clause analysis is performed by applying the phonetically existing first-clause subject to the second-clause subject which is phonetically

missing, in the case where stimulus sentences are phonetically presented. Thus, for those who employ the conjoined-clause analysis, the sentence-initial position is the strongest cue to be mapped onto the common subject of the first and second clauses.

If the test had been conducted with listening materials, the results of the SO-type might have turned out different. In a hearing test, incoming words fade away one by one from memory. Thus, when the listener has interpreted the initial region of (16) as "John caught the bird" with the conjoined-clause analysis, he/she has no means by which to remember the sentence-initial noun *bird*. Thus, in a hearing test, the participant might apply the first-clause subject *John* to the second-clause subject according to the regular strategy of the conjoined-clause analysis. This might make the listener aware of the semantic anomaly he/she has made. Since *John* cannot lay eggs, he/she abandons her conjoined-clause analysis, compiling the sentence-initial region into a complex NP.

The second possibility concerns animacy cues. The two A-version items for the SO relatives are shown below:

SO-type A-version:

(16) The bird that John caught { ア. and laid eggs / イ. laid eggs.

(18) The dog that John kept { ア. barked at Mary. / イ. and barked at Mary.

It is possible that the participant chose the agent of the second- clause verb (*laid* in (16) and *bark at* in (18)) by means of animacy cues. In (16), when the processer had reached *laid*, the strongest candidate for the second-clause subject was *John* according to the standard conjoined-clause analysis because *John* was the fixed first-clause subject. The first-clause subject under the rule of conjoined-clause analysis is *John*. When *John* was applied to the second-clause subject, the second clause was "John laid eggs." This goes against our common sense plausibility and the participant would thus compile the first clause into a complex NP, trying to do away with the

semantic anomaly. However, if the animacy cue had overridden the rule of the standard conjoined-clause analysis in choosing the agent of *laid*, *the bird*, not *John* would be chosen as the agent of *laid.* There was no semantic anomaly in "U: John caught the bird and the bird laid eggs."

The same mechanism might have worked on the other A-version item (18). In choosing the agent of *bark at,* the semantic plausibility might have ousted the standard rule of the conjoined-clause analysis, which says that the first-clause subject should be applied to the second-clause subject. The standard conjoined-clause analysis, "U: John kept the dog and John barked at Mary," involved a very weak semantic fit and the participant was expected to eliminate it by compiling the first-clause *John kept the dog* into a complex NP U: *the dog John kept*. However, when the processer had reached *barked at*, the human-nonhuman cue appeared to have affected the choice. The processer might have chosen *the dog* as the agent of *barked at* without making reference to the standard rule of the conjoined-clause analysis. The participant searched for the agent of *barked at* by means exclusive to the lexical properties of *bark*. This allowed the human-nonhuman cue to immediately assign *the dog* to the agent of *bark*. The participant's final and wrong interpretation resulted in "U: John kept the dog and the dog barked at Mary," which included no semantic problem and no clue for the correct comprehension of the relative clause.

Let us analyze the phenomenon in more detail using the item (16) as an example:

(16) The bird that John caught { ア. and laid eggs / イ. laid eggs.

We failed in inducing participants to employ the conjoined-clause analysis for the SO-type relative. Participants appeared not to analyze the meaning of the whole sentence across clauses, but to search for the agent noun of the verb *laid eggs.* This failure seemed to result from our initial attempt to induce participants to choose one particular pattern from the two possible

patterns of conjoined-clause analysis for the SO type. As has been explained, we intentionally controlled the semantic properties of the nouns included in the test sentences so that participants might choose the first (21) of the two patterns produced by the conjoined-clause analysis. Examples of the two patterns are repeated as (21) and (22) below.

(20) the stimulus SO-type relative:
The waitress that the policeman questioned had a pistol.

(21) the conjoined-clause analysis on SO type, the first pattern:
U: The policeman questioned the waitress and the policeman had a pistol.

(22) the conjoined-clause analysis on SO type, the second pattern:
U: The waitress questioned the policeman and the waitress had a pistol.

Let us look into the other SO-type A-version item (18), which is repeated below.
The first-pattern conjoined-clause analysis on (18) is "U: John kept the dog and John barked at Mary." In order to induce participants to undergo this particular misanalysis, the two NPs in the first clause were made to semantically contrast.

(18) The dog that John kept { ア. barked at Mary.
                            { イ. and barked at Mary.

In (18), the contrast of a non-human versus a human noun was expected to force participants to choose John as the first-clause subject and the dog as the first-clause object. It seemed that we successfully guided participants to choose the first-pattern conjoined-clause analysis with the tricks we had installed in the test sentences. However, these tricks backfired on the original purpose, allowing participants to impose the conjoined clause analysis, just as in the case of the other item (16). The elaborately prepared semantic contrast between the NPs in the first clause appeared to deter participants from employing the conjoined-clause analysis and immediately choose the only possible noun as the agent of *laid eggs*: not *John* but *the bird*. In other words, the agent of the verb *laid*, which had to be the second-clause subject as well, appeared to be

chosen not by means of the imposition of a rule-governed strategy on the whole sentence across clauses but by the direct matching of the VP *laid eggs* and the candidate NPs, *the bird* and *John*. As a result, the *bird* was chosen as the agent of *laid*.

Thus, the conjoined-clause analysis that we had expected, "John kept the dog and John barked at Mary" could not have been employed. Consequently, the formation of a complex NP for the purpose of eliminating the semantic anomaly included in "John kept the dog and John barked at Mary" was predestined to fail.

(16) The bird that John caught { ア. and laid eggs / イ. laid eggs.

The cause of the failure appeared to be that we set control over semantic properties of the NPs in order for the relative subject, e.g., *John* in (16), to be chosen as the first-clause subject. One could argue that this intentional control resulted in the failure of obtaining the intended significant difference between the results of the A and B versions. Unlike the test sentence for the SO-type relatives, those used for the SS-type relatives were free from the constraints on the selection of the agent for the second-clause verb. Below are the two A-version test items for the SS-type relatives. In (1), either of the two NPs in the first clause, *the nurse* or *John*, can equally be expected to be analyzed as the agent of the second-clause verb *started*. No intentional semantic constraints are projected on participants' selection of the agent of *started*. Likewise, in the other A-version item for the SS-type relative (19), either of the two NPs in the first clause, *the teacher* or *the boy*, can be selected as the agent of the second-clause verb *met*.

(1) SS-type A-version item:
The nurse that took care of John { ア. and started a business. / イ. started a business.

(19) SS-type A-version item:
The teacher that scolded the boy { ア. and met the principal. / イ. met the principal.

What was unfortunate was that we had missed an important principle regarding the difference

between the intrinsic structures of the SS and SO types. We have pointed out above that the elicitation device for the SO-type failed because we had adopted NPs with specific semantic features for the first clause. We did that in order to induce participants to choose the relative subject (e.g., *John* in (16)) as the first-clause subject, which in turn, resulted in letting them choose the agent of the second-clause verb, drawing exclusively on the semantic fit with the second clause VP (e.g., *laid eggs* in (16)) without imposing the conjoined-clause analysis on the whole stimulus sentence.

However, the SS-type items included intentional control over the first-clause NPs as the SO-type did. The SS-type items, (1) and (19) above include semantic constraints on the selection of the first-clause subject. In (1) *the nurse* was much more likely to be the first-clause subject than *John* because not only because of its sentence-initial position, but also of the role-assignment idiosyncratic to the first-clause verb *took care of*. Likewise in (19), *the teacher* was more likely to be selected as the first-clause subject than *the boy* due to the role-assignment of *scolded*.

What was different in the case of the SO-type was the fact that in the SS-type items, the constraints on the selection of the first-clause subject did *not* block the free selection of the agent of the second-clause verb. Let us examine this with examples, under the assumption that the readers are subject to errors with the conjoined-clause analysis. In the SS-type item, (1) below, the semantic properties of *the nurse* and *John* lead *the nurse* to be chosen as the first-clause subject but these semantic properties do not enable readers to choose the second-clause subject with reference exclusively to the semantic properties of the VP *started a business*:

(1) SS-type A-version item:

The nurse that took care of John { ア. and started a business. / イ. started a business.

(16) SO-type A-version item:

The bird that John caught { ア. and laid eggs / イ. laid eggs.

That is, the lexical properties of *started* are not enough to make readers choose one of the two NPs, *the nurse* or *John*, as the agent of *started*. Both "the nurse started a business" and "John started a business" are semantically fit. In the SO-type item (16) above, the semantic properties of *the bird* and *John* induce readers to choose *John* as the first-clause subject. Up to this point, the same tricks are at work on the SS- and SO-type test items in the same way. Both in (1) and (16), the first-clause subject and object are predetermined by the semantic matches between the verb and the NPs in the first clause. When it comes to the second clause, in (1), the choice of the agent of *started a business* is dependent on the reader's preference but in (16), the agent of *laid eggs* is predetermined by the semantic fit between *laid eggs* and the *bird*. We believe that it is crucial for participants to freely choose the second-clause subject in order for them to employ the conjoined-clause analysis. This was realized in the elicitation device for the SS type but was not in that for the SO type. What is important seems to be keeping the first-clause NPs semantically bias-free for role-assignment by the second-clause verb. This was suggested by the fact that the significant difference between A and B versions was successfully obtained for the SS type but was not for the SO type. The most important moment in the implementation of the conjoined-clause analysis is the moment when the hearer applies the first-clause subject to the missing second-clause subject. In this crucial moment, the design of the SO type inhibited participants from exerting their intrinsic ability to choose the second-clause subject by means of their interim rule, which might have been the conjoined-clause analysis.

The success in the SS type and failure in the SO type appear to suggest that different results might have been obtained if the elicitation device for the SO type had been designed differently. That is to say, the A and B versions for the SO type might have revealed significant difference if participants had been allowed to choose the second-clause subject freely.

This subsection examined the two possible explanations of our failure in inducing participants to carry out the standard-version conjoined-clause analysis.

The first explanation was that even if the first-pattern conjoined-clause analysis for the SO type had been chosen, with the relative subject (*John*) as the first-clause subject, it did not apply to the second-clause subject. Instead of the NP, which had been chosen as the first-clause subject (*John*), the sentence-initial NP (*the bird*) was applied to the second clause subject because of its salient position. The NP in the sentence-initial position is most likely to be mapped onto the common subject across clauses.

(16) The bird that John caught { ア. and laid eggs / イ. laid eggs.

If this happened, the analysis turned out to be, "U: John caught the bird *and the bird* laid eggs," which included no semantic problem for triggering relativization.

The second explanation was that that the selection of the second-clause subject might have been cued not by the rule of the conjoined-clause-analysis but by matching the second-clause VP (*laid eggs*) directly with NPs (*the bird*, *John*) in the first clause one by one. If this happened, the analysis turned out to be, "U: John caught the bird *and the bird* laid eggs," which appeared to satisfy the participant and make him/her do nothing.

Although we failed to obtain statistically significant results for the SO-type relatives, the failure appeared to reveal the cause of our failure and what is important in designing elicitation devices for learners' strategies. Too much control over the variables may hinder participants' spontaneous use of strategies. We postulate that participants might have employed the conjoined-clause analysis for the SO-type relatives and reorganized part of it into a complex NP had we presented test sentences that would permit participants to spontaneously choose the second-clause subject.

4.3 OS-type relatives

We saw the results of the OS-type relatives of Experiment 2 in §3.5. For convenience, we will

briefly repeat them here. The mean score for the A-version items was 1.76 and 1.62 for the B-version items. Participants did the A-version items slightly better than B-version items but a two-sided *t* test found no statistically significant difference between the two ($p = .380 > 0.05$). This result did not support our prediction that the results of the OS-type items would be better for the A-version items than the B-version items.

(23) OS-type A version:

The hunter shot { ア. the rabbit that had long ears. / イ. the rabbit that ate mice.

the conjoined clause analysis imposed on (23)

with (ア):U: The hunter shot the rabbit *and the hunter* had long ears.

with (イ):U: The hunter shot the rabbit *and the hunter* ate mice.

(24) OS-type B version:

The child got on { ア. the truck that wanted candies. / イ. the truck that brought candies.

the conjoined clause analysis imposed on (24)

with (ア):U: The child got on the truck *and the child* wanted candies.

with (イ):U: The child got on the truck *and the child* brought candies.

The A and B versions for the-OS type were intended to have different results if participants imposed conjoined-clause analysis on each of the alternative test sentences.

As (23) above shows, as long as the conjoined-clause analysis was imposed on the test sentences completed with (ア) and (イ), an OS-type A-version test sentence was expected to result in weak coherence regardless of whether it was completed with (ア) or (イ). On the other hand, (24) above shows the consequences of the conjoined-clause analysis imposed on an OS-type B-version test sentence. The test sentence was expected to have semantic congruity regardless of whether it was completed with (ア) or (イ). In doing an OS-type A-version item, participants were expected to make effort to do away with the weak coherence and finally solve the problem by reorganizing part of the completed test sentence into a complex NP including a relative clause. This was to lead participants to judge (ア) as correct and (イ) as wrong. In doing

an OS-type B-version item, participant were expected to be satisfied with their conjoined-clause analysis. This was to lead participants to make a judgment at random. Therefore, we expected a better result for the A-version than for the B-version.

We will now discuss why we failed to obtain the results we had predicted. One possibility is that Japanese EFL learners did not employ the conjoined-clause analysis in an attempt to comprehend OS-type relatives. Without the implementation of the conjoined-clause analysis, our elicitation device for the OS-type could not isolate the information we wanted. However, we posit that Japanese EFL learners do perform the conjoined-clause analysis on OS-type relatives because there were two participants who provided data that strongly suggest that Japanese EFL learners do, especially when they are on their way to acquiring English relative clauses. In evaluating their performance, the participants' current proficiency level was crucial.

Table 1 below gives the scores of the two participants, referred to as Participant No. 3 and Participant No.16 here, in Experiment 1, in which participants were asked to make relative-clause including sentences. They were the worst two among the 29 participants in terms of the total score of the four types of relatives. The mean score of the 29 participants was 9.86 out of the maximum score 12. However, in Experiment 1, Participant No.3 gained only three points, earning the rank of 29th out of 29, and Participant No.16 obtained only four points out of 12, making her 28th out of 29.

Table 1. Two participants on the four types of relatives in Experiment 1

	SS	SO	OS	OO	total	place
Participant No.3	1	0	1	1	3	29th / 29
Participant No. 16	1	1	1	1	4	28th / 29

Table 2 below shows the two participants' results of the OS-type relatives in Experiment 2. Both of them gained two points for the A-version items but nothing for the B-version items. This pattern of score distribution ideally represents our prediction that the results of the OS-type items would be better for the A-version items than the B-version items. It should be noted that

the score of the B version items does not have to be zero to be regarded as fit for our prediction because B-version items were predicted to be performed at random.

Table 2. Two participants on OS-type relatives in Experiment 2

	A-version		B-version	
	Item 1	Item 2	Item 1	Item 2
Participant No.3	1	1	0	0
Participant No. 16	1	1	0	0

It seems strikingly significant that the two particular participants who had the lowest scores in Experiment 1 revealed this pattern of scoring for the OS type in Experiment 2 since the OS-type relatives are generally considered to be the easiest of the four relative types for hearers to process. The degree of difficulty in processing relative clauses is esteemed by the number of incomplete dependencies at the maximum point, as discussed in §3.3.3. Table 3 shows OS-type relatives carry the fewest incomplete dependencies and are the easiest.

Table 3. The number of incomplete dependencies at the maximum point (*cf.* §3.3.3)

SS	SO	OS	OO
2	3	1	2

Certain data on L1 acquisition of English relatives also implies that OS is the easiest type. Diessel and Tomasello (2000), which has been mentioned in §2.1.3, observed English-speaking children's early spontaneous utterances of relative-clause including sentences. The authors characterized the earliest utterances in the following way:

> More precisely, we argue that the earliest relative clauses used by English-speaking children are propositionally (i.e., semantically) simple. They consist of presentational copular clause and a relative, which usually includes an intransitive verb. (Diessel and Tomasello 2000: 133)

Below is an example of a child's utterance:

(25) Here's a tiger *that's gonna scare him* (Nina 3;1) (ibid: 135)

Note that the example utterance above includes a transitive verb in spite of the authors' observation that the relative includes an intransitive verb. In any case, Example (25) shows that English-speaking children's earliest utterances of relatives belong to the OS type if the complement NP following the copula is viewed as an object of the copula in a broad sense. The fact that OS-type relatives are acquired earliest by English-speaking children indirectly implies that OS-type is easier to process than any other type of relative clause.

We have seen a couple of pieces of evidence that the OS-type is the easiest of the four types. The first argument draws on the number of incomplete dependences. The second derives from observation of English-speaking children's early utterances of relative clauses. These pieces of information appear to be in support of the postulation that OS-type is the easiest type of relative clauses to acquire.

Thus, there are two crucial facts regarding the results of the OS-type relative clauses in Experiment 2. One was that the two particular participants who gained the lowest scores in Experiment 1 showed the pattern of scoring that we predicted. The other was that OS-type relative clauses seem to be the easiest of the four types of relatives in terms of syntactic structure and acquisition order. This seems to imply that L2 learners who were about to acquire English relative clauses, which had to be the OS-type, judged test sentences drawing on their interpretations resulting from conjoined-clause analysis. This appears to imply that the use of semantic information resulting from hearers' or readers' conjoined-clause analysis on the OS-type relatives may form the threshold level toward the acquisition of various types of relative clauses.

We now have to discuss why we failed to obtain the statistically significant results we had predicted despite the relatively simple and easy structure of the OS-type relatives. One of the causes might have been methodological problems of the elicitation device. Let us see in what ways the elicitation device for the OS-type might have been too complicated as compared with

that for the SS-type. First, the alternative sequences, (ア) and (イ), in the SS type involved salient formal difference: one of them had *and* in the initial position while the other was free of it. The alternatives appeared completely distinct from each other when participants were trying to judge them. The paired alternative sequences, (ア) and (イ), in the OS type involved no salient formal difference equivalent to those in the SS type. The difference between the alternatives in the SO-type items was semantic in nature. Participant had to think about *had long ears* in (ア) and *ate mice* in (イ) for a long time in (23) below, in an attempt to find the difference, only to find that the difference was purely semantic. It requires high cognitive faculty and 'patience' to choose one of the alternatives without any salient formal difference from the other, which was the case with the OS-type test items.

(1) SS-type A version: The nurse that took care of John { ア. started a business.. / イ. *and* started a business

The conjoined-clause analysis imposed on (1):
U: The nurse took care of John *and the nurse* started a business.

(9) OS-type A version:
The hunter shot { ア. the rabbit that had long ears. / イ. the rabbit that ate mice.

(23) The conjoined-clause analysis imposed on (9)-(ア)
U: The hunter shot the rabbit *and the hunter* had long ears.

The conjoined-clause analysis imposed on (9)-(イ)
U: The hunter shot the rabbit *and the hunter* ate mice.

Second, an OS-type item was made so that individual alternatives would result in semantically different conjoined-clause analysis. Example (9) above shows that test sentences completed with (ア) and (イ) correspond to different conjoined-clauses analyses. The SS-type test sentence, on the other hand, converged in a single semantic conjoined-clause analysis, regardless of whether (ア) or (イ) was chosen as the sequence to the initial common region. In doing an OS-type item, the choice of the alternatives had to be carried out by comparing the two different conjoined-clause analyses. On the other hand, in doing an SS-type item, the choice

could be made by examining the single conjoined-clause analysis imposed commonly on the test sentences completed with the alternatives of (ア) and (イ). In addition, the difference between the alternatives, (ア) and (イ), was simple. It was the presence and absence of *and* in front.

In this way, the procedure required for doing the OS-type items was much more complicated than that required for the SS-type items. This was apparently a methodological drawback, which made the inherently simple structure of OS-type relatives look more complicate in doing the tasks that we devised for the OS-type relatives.

In summary, we saw the possible explanations of our failure in obtaining significantly better results for the A version than for the B version of the OS-type relatives. The cause of the failure seems mostly due to the methodological problem in the design of the elicitation device. Despite failing to obtain the predicted results with the whole population of participants, the results from Participant N.3 and No.16 seem to support our prediction of the use of semantic anomaly resulting from the conjoined-clause analysis. They were the lowest two in the results of Experiment 1, and showed the results for the OS-type in Experiment 2 that we had predicted.

4.4 OO-type relatives

We have reported the results of the OO-type relatives of Experiment 2 in §3.5. For convenience, we will briefly repeat the here. The mean score for the C-version items was 1.97 and 1.10 for the D-version items, out of a maximum score of 2. As mentioned in the preceding chapter, the C and D versions for the OO-type relatives were designed for qualitative analysis, so statistical tools were not used for the analysis of these results. The fact that participants did the C-version items almost perfectly supports our prediction. How we evaluate the mean score of 1.10 for the D-version items will be one of the central issues in this subsection.

(26) OO type-C version

Cathy ate { ア. the fish that Ms.Clinton grilled.
イ. the fish that the mountain cooked.

(27) OO type-D version

John heard {ア. the rumor that Mary hated.
イ. the rumor that Tom beat.}

First, we will overview the results of the C and D versions. The results for the C-version were almost perfect. Out of the 29 participants, 28 performed the two test items of the C-version correctly and the other participant did one item correctly and the other incorrectly.

The almost perfect performance of the C-version items has to be analyzed with reference to three preconditions. The preconditions were outlined in §3.4.11 in order to determine what were needed to make correct judgments on the C and D version items for the OO type. Table 4 below gives the summaries of them.

Table 4. The three preconditions to interpret the OO-type items

First:	Ability to interpret the sentence-final NV sequence as an SV sequence
Second:	Sensitivity to the transitivity of the second-clause verb
Third:	Knowing the gap following the sentence-final verb is referential not with the first-clause subject, but with the first-clause object

In the case of the C version, the semantic anomaly involved in one of the two alternatives was highly salient. In Example (26) above, the sentence-final NV sequence *the mountain cooked* in (イ) was found anomalous at a glance. This device was expected to bring participants to immediately judge (イ) as wrong and (ア) as correct. In terms of the three preconditions in Table 4 above, the correct judgment could be made by means of the First precondition only. It should be noted that the sentence-final NV sequence *Ms.Clinton grilled* in (ア) in (26) could be analyzed as the subject and verb with animacy cues only. Even if a participant was unable to map the linear NV word order onto a subject and its verb, she was still able to analyze it as a subject and its verb using animacy cues lexically indexed in the noun and verb. Another point to be noted about the C version (26) is that although almost all participants recognized the sentence-final sequence *Ms.Clinton grilled* as a subject and its verb, it is not yet known whether

or not they found *grilled* as transitive, nor is it known whether or not they searched for the object noun that was missing in the postverbal position. In other words, participants could recognize *Ms.Clinton grilled* as an SV, even if the object noun was missing in the postverbal position. A final point to note concerns participants' patience. The NV sequences crucial for the judgments were *Ms.Clinton grilled* and *the mountain cooked*, which were located in the sentence-final position. That is, they were inside of the alternative sequences, (ア) and (イ) themselves. Participants were shown to have made efforts to pay attention to the end regions of branched sequences to compare them. This was proven by the fact that almost all participants made correct responses to the C-version items. This fact is significant in discussing the results of D-version items. Participants were assumed to make the same degree of effort in judging D-version items as in judging C-version items. Thus, one could argue that the results obtained for the D-version items came not from random guessing, but from patient examination of the test sentences, including the final regions of branched sequences.

Let us now move to the D-version items. One can know at a glance that the D-version items were much more difficult than the C-version items. A D-version item is repeated below:

(27) OO type-D version

John heard { ア. the rumor that Mary hated.
イ. the rumor that Tom beat.

The sentence-final NV sequences, *Mary hated* in (ア) and *Tom beat* in (イ), themselves provided no cues for deciding on which of the alternatives would result in a semantically fit sentence. Participants were required to search for the object nouns which were missing in the postverbal positions of *hated* and *beat*. A participant could reach the correct judgment even if she was aware that the object of *hated* and *beat* was not *John* but *the rumor*. This judgment was possible even if she was not subordinating the relative clause to the preceding noun. That is, if she employed the "object-to-object" coordinate-clause analysis, taking *the rumor* as the object of the sentence-final verbs, she would be able to judge (イ) as wrong because one cannot "beat a

rumor" in normal circumstances in the real world. Thus, it is possible that participants were led to make correct judgments on D-version items by either correct comprehension of the relative clause constructions or the application of the "object-to-object" coordinate-clause analysis. However, it turned out that participants performed the D-version items poorly. The mean score for the three D-version items 1.10 out of the maximum 2 was much lower than we had expected. Due to the nature of binary-choice tests, the considerably low mean score of 1.10 out of 2 makes us to suspect that participants guessed the answer for the D-version items. However, this does not seem to be the case. It is highly improbable that participants guessed the answer to D-version items at random because the same participants examined the alternative sequences in doing the C-version items. The test items were presented on the test paper in random order. Participants presumably paid attention to the alternative sequences (ア) and (イ) and tried to compare them with the same degree of patience in doing the C and D versions. If they did so, the mean score of 1.10 out of 2 for the D-version items provides us with precious information about the strategies that participants may have used for the OO-type relative clauses.

Let us look at another set of data that indicates how significant it was for us to have obtained the mean score of 1.10 out of 2 for the D-version items in Experiment 2.

Table 1 from §3.3.2 is repeated as Table 5 below. Table 6 is a breakdown of the OO-type in Table 5. In Experiment 1, participants were asked to produce relative clause-including sentences to describe given pictures. This type of production task does not appear to be easy but participants did them quite well. Table 5 gives the mean scores of the four types of relatives in Experiment 1. There were three test items per type, so individual mean scores in Table 5 are out of the maximum of three points. The mean score 2.72 for the OO type is higher than the others except for the OS type, which is slightly higher than the OO type. Table 6 gives the results of the OO type, which shows that most participants did very well except for a few:

Table 5. Mean scores for the 4 types of relative clauses

SS	SO	OS	OO
2.31	2.07	2.79	2.72

Table 6. Total number of correct responses to OO type in Experiment 1

Item 1	Item 2	Item 3
26	26	27

These data from Experiment 1 show that the OO-type relative clauses were easier than other types for most of the participants and that more than 90 % of the production tasks for the OO type were performed correctly.

Compared with the good results of the production tasks for the OO type in Experiment 1 and the almost perfect performance of the C-version items for the OO type in Experiment 2, the mean score of 1.10 out of the maximum 2 for the OO-type D-version items was strikingly low. We will analyze the results in detail in terms of semantic anomaly contingent with possible types of coordinate clause analysis imposed on the test sentence, in the hopes of identifying what this low score means, The three preconditions for carrying out the three types of coordinate-clause analysis are repeated below in Table 7. Table 8 and 9, further below show whether or not semantic anomaly arises with specific types of coordinate-clause analysis and which of the three preconditions have to be fulfilled to implement individual types of coordinate-clause analysis. Note that in the rightmost column in Table 8 and 9, F stands for the First, S for the Second, and T for the Third precondition defined in Table 7.

Table 7. The three preconditions to interpret the OO-type items

First:	Ability to interpret the sentence-final NV sequence as an SV sequence
Second:	Sensitivity to the transitivity of the second-clause verb
Third:	Knowing the gap following the sentence-final verb is referential not with the first-clause subject, but with the first-clause object

Table 8. Analyses of the D-version sentence completed with (ア)

(28) OO type-D version completed with (ア): (28) John heard the rumor that Mary hated.			
analysis	interpretation	semantic anamaly	precondition needed to do this analysis
correct comprehension of (28) above	(30) U: John heard the rumor that Mary hated.	−	F, S, T
"variant version 1" imposed on (28)	(31)U: John heard the rumor and John hated Mary.	−	S
"variant version 2" imposed on (28)	(32)U: John heard the rumor and Mary hated John.	−	F, S
"object-to-object" imposed on (28)	(33)U: John heard the rumor and Mary hated the rumor.	−	F, S, T

Note: in the rightmost column, F stands for the First, S for the Second, T for the Third precondition in Table 7

Table 9. Analyses of the D-version sentence completed with (イ)

(29) OO type-D version completed with (イ): John heard the rumor that Tom beat.			
analysis	interpretation	semantic anomaly	precondition needed to do this analysis
correct comprehension of (29) above	(34) U: John heard the rumor that Tom beat.	+	F, S, T
"variant version 1" imposed on (29)	(35) U: John heard the rumor and John beat Tom.	−	S
"variant version 2" imposed on (29)	(36)U: John heard the rumor and Tom beat John.	−	F, S
"object-to-object" imposed on (29)	(37) U:John heard the rumor and Tom beat the rumor.	+	F, S, T

Note: in the rightmost column, F stands for the First, S for the Second, T for the Third precondition in Table 7

One can see from these tables that the fulfillment of all three preconditions leads directly to the correct choice of the alternative. The contrast is clear. The interpretations (30) and (33) in

Table 8, which are performed on the test sentence completed with (ア), require all three preconditions and do not carry any semantic anomaly. On the other hand, the interpretations (34) and (37) in Table 9 which are performed on the test sentence completed with (イ), also require all three preconditions and entail semantic anomaly.

This means that if a participant fulfilled all three preconditions, the choice of (イ) would immediately lead to a semantically anomalous interpretation while the choice of (ア) would give rise to a semantically fit interpretation. In other words, the fulfillment of all three preconditions was necessary, and sufficient to successfully choose the correct alternatives, (ア) and (イ). The fulfillment of all three preconditions requires the identification of the object NP of the sentence final verbs, *hated* and *beat*. It does not necessarily requires the formation of a complex NP including a relative clause. Thus, a correct choice in a D-version item could be obtained by either correct comprehension of relative clause construction, or by "object-to-object" coordinate-clause analysis.

The low mean score for the D version items seems to suggest that participants generally did not employ the "object-to-object" coordinate-clause analysis, which we suggested as a promising strategy that would guide L2 learners to the acquisition of the OO-type relatives.

(27) OO type-D version

John heard { ア. the rumor that Mary hated.
イ. the rumor that Tom beat.

The absence of the "object-to-object" coordinate-clause analysis implies several possibilities. First, participants could have been insensitive to the transitivity of verbs. This is not very plausible since L1 Japanese is an accusative language, and semantically corresponding transitive and intransitive verbs have different forms in almost all cases in Japanese. For example, kowasu ('to break (vt)') and kowareru ('to break (vi)') have different forms. A purely transitive verb like *hate* is likely to urge Japanese learners to search for its object noun. Second, participants could have been sensitive to the transitivity of the sentence-final verbs and might have searched for the

object noun. They may have searched for the object noun not with a rule-governed strategy, but at random. This seems to be the most plausible explanation. In Example (27) above, participants might have searched for the object noun of *hated* and *beat* respectively. It is possible that they identified *John* as the object of these verbs. This particular strategy produces interpretations illustrated in (32) in Table 8 and (36) in Table 9. These interpretations contained no semantic anomaly and provided the participant with no information leading to correct judgment. The strategy of applying the first-clause subject to the second-clause object is unlikely to be a rule-governed strategy. Grammatically speaking, a referential relation between different types of roles is deviant from the adult grammar. In addition, searching for a missing object noun across two clauses headed by different subjects (*John-Mary* with (ア), *John-Tom* with (イ) in (27)) in is very complicated in terms of sentence processing. Well-formed English sentences do not require a strategy as complicated as the one illustrated in (32) in Table 8 and (36) in Table 9. If a language learner is observed to employ this strategy, it could not be a systematic strategy, but the result of random association of verbs and NPs. The implementation of this association of the missing object to the matrix subject appears to be a random strategy that treats the two clauses as independent of one another. Thus, it does not involve the impetus to trigger the hearer or reader to reorganize part of the two coordinate clauses into a complex NP because the two clauses are semantically separated from the beginning. No conjoined-clause analysis would have occurred here.

The first thing that learners have to do to comprehend an OO-type relative is to identify the missing object of the relative-clause verb. This does not necessarily require the relativization of the target noun on the object. That is to say, the identification of the missing object in its canonical position is not sufficient, but is a necessary condition, for analyzing the structure of a complex NP including a relative clause in sentence processing. The implementation of the "object-to-object" coordinate-clause analysis leads the leaner to identify the missing object. If a

participant did this, she was able to judge the D-version items correctly, as we saw above. The considerably low mean score for the D-version strongly suggests that participants did not implement the "object-to-object" coordinate-clause analysis, nor the relativization of the object. This was probably because it was difficult to find a referential relation between objects across clauses, especially when actors of the two clauses are different and the referent noun precedes the gap.

As long as learners do not systematically impose any type of coordinate-clause analysis on the OO-type relatives, it would be futile to expect learners to be guided to the acquisition of the OO type by a semantic problem contingent with their coordinate-clause analysis.

The almost perfect performance of the C-version items and the unexpectedly low mean score of the D version items seem to suggest that compiling an NP and a clause following it into a complex NP *in itself* may be a strategy for learners to obtain a semantically fit interpretation for OO-type relative clauses. In this respect, the OO-type relatives differ from the other types of relatives.

Example (38) below can induce a learner to interpret it in three different ways, as represented in (38-a)-(38-c), if she has not acquired English relative clauses:

(38) Steve wanted the money that the daughter hid.
(38-a) Steve wanted the money *and* the daughter hid *herself*.
(38-b) Steve wanted the money *and* the daughter hid *Steve*.
(38-c) Steve wanted the money *and* the daughter hid *the money*.

These examples are derived from random association of constituents, not from rule-governed strategies. However, these random associations themselves require heavy processing. As mentioned in the previous paragraph, the identification of the missing object in the postverbal position requires the examination of semantic fit across clauses with different actors, and all candidate referents precede the gap. It might be easier for the learner to compile the second clause of the stimulus sentence into a complex NP than employ any type of coordinate-clause

analysis, such as in (38-a)-(38-c). Jumping directly to relativization without employing coordinate-clause analysis is plausible specifically in the case of OO-type relatives. This is made possible by the rich information that the hearer or reader has gained when she decides where to attach the sentence-final SV sequence, which is the relative clause. At the point of the encounter with the sentence-final verb in an OO-type sentence, the first clause, i.e. the matrix clause has been presented in perfect form and the second-clause subject and verb are presented in a complete form except for the missing object. Pieces of information given by these intact forms limit the possible interpretations of who does what to whom. In this situation with OO-type relatives, the reorganization of the latter half of the sentence into a complex NP seems to be easier.

4.5 The Competition Model and Radical Construction Grammar

In 2.4 we saw the two trends of functionalist theories. In this section, we will see how the results of the experiments are explained by the two positions. The results of the SS-type showed significant difference between the A and B versions while the results of the SO type did not. The elicitation device for the SS type succeeded while that for the SO type failed. The elicitation device for the SS type succeeded probably because some semantic factor(s) affected the results and that for the SO type failed to do so. There was no formal difference between the A and B versions in both the SS and SO type, so some semantic factor(s) was responsible for the significant difference between the A and B versions in the SS type. In an attempt to isolate the types of semantic information that trigger Japanese EFL learners to comprehend and acquire full-fledged relative clauses, we need to overview models that treat relations between formal and semantic factors and between semantic factors themselves. Specifically we will review two functionalist models, i.e. the Competition Model and the Radical Construction Grammar in the following section.

4.5.1 Merits of the Competition Model

The Competition Model (Bate and MacWhinney (1987), MacWhinney (1987)) was introduced in §2.4.1 as a typical and well-known model of external functionalism. External functionalism separates formal and functional levels and views language acquisition as the learning of links between individual items of the two separate levels. The Competition Model is useful for studies on L2 acquisition for two reasons. First, it can account for children's changes in their choice of cues with age. This makes it possible to provide detailed accounts for what cues on the formal level are mapped onto what candidate structures on the functional level in individual stages of development. Second, it can cope with cross-linguistic variation in how much weight to attach to individual types of cues. These characteristics of the Competition Model help identify the problems of L2 learning and solutions to them because the investigation of use of cues in mappings casts light on individual learners on different levels of L2 learning, taking their L1 backgrounds into account.

In this subsection, we will consider the merits and demerits of the Competition Model as a tool for investigating Japanese EFL learners' acquisition of English relative clauses and also as a model example of external functionalism.

We find two merits with the Competition Model which appear to be useful for developing our postulation that semantic information plays central roles in the comprehension and acquisition of relative clauses.

First, the use of semantic cues (e.g. animacy) and formal cues (e.g. word order, agreement) on the same level enables the Competition Model to predict which cue has an effect on the mapping earlier than others. Let us see an example of this merit using the string "the boat sinks," which MacWhinney used as an example for explaining the Competition Model (see §2.4.1).

Figure 1 below shows with arrows the earliest points at which each cue has an effect on the mapping onto function, that is to say, onto the syntactic decision between a transitive and an

intransitive reading. These points are not the moments at which each cue is found but the points at which the mapping onto function comes into play. Interestingly enough, the cue which has the earliest effect on the syntactic decision is not a formal but a semantic cue: as early as at the point of the verb stem of "sink", the inanimacy of "boat" comes into play as a decisive cue in support of an intransitive reading, which also predicts the absence of an object NP in the postverbal position. The agreement cue that consequently supports the intransitive reading comes at the point of the suffix 's', followed by the word order cue: the absence of an object NP in the postverbal position, which ultimately determines an SV structure, consolidating the intransitive reading:

(39) the boat sink-s (NP－)
↑ ↑ ↑
An Ag W

An: Animacy cue in effect
Ag: Agreement cue in effect
W: word order cue in efect

Figure 1. Points at which each cue comes into play

In this way, the competition Model can predict an early effect of a semantic cue on syntactic analysis. This helps us reinforce our postulation that semantic information plays central roles in the comprehension and acquisition of English relative clause constructions by Japanese EFL learners.

Second, according to the Competition Model, properties or information are not predetermined to fall into one of the two levels, i.e., formal and functional levels. For example, semantic cues (e.g., animacy cues) can coordinate with or compete against formal cues (e.g., word order, morphological cues, etc.) on the formal level to be mapped onto the functional level. Bate and MacWhinney (1987: 163) state:

> The principle of direct mapping does *not* require that the relationships between form and function stand in a one-to-one relation. Rather, direct mapping means that it is possible for languages to integrate on a single level cues that refer to different data types. In sentence comprehension, the parser is able to consider compounds or configurations of lexical semantic cues (e.g., animacy), morphological cues (e.g., agreement markers), word order cues (e.g., preverbal position), and intonational cues (e.g., contrastive stress). …

In §2.3.4, we saw Trueswell et al. (1994) demonstrated that semantic information affects the analysis of a reduced-relative construction on the first-pass analysis. This was observed in an experiment which was designed on the assumption that animacy and word order cues can have an effect on syntactic analysis simultaneously from the same level. The rationale underlying Trueswell et al.'s method and the results obtained with it appear to be successfully explained by the Competition Model, although Trueswell et al. do not directly mention the Competition Model in their article. This takes place at the point of *examined* in (40).

(40) The evidence examined by the lawyer turned out to be unreliable.
N V

At the point of *examined* in (40), the existence of a sentence-initial NV sequence is a word order cue that supports the analysis of the NV sequence as a main-clause SV structure. At the point of *examined*, the inanimacy of *evidence* comes into play. An inanimate NP cannot be the actor of the verb *examine* and defies the analysis of the NV sequence as a main-clause SV structure. That is to say, a word order and an animacy cue compete at the point of *examined*. Figure 2 shows that the animacy cue (inaimacy of *examined*) and word order cue (sentence-initial NV sequence) support different candidates. Amazingly enough, the candidate supported by the animacy cue, i.e. the reduced-relative reading wins the competition against the other candidate supported by the word order cue:

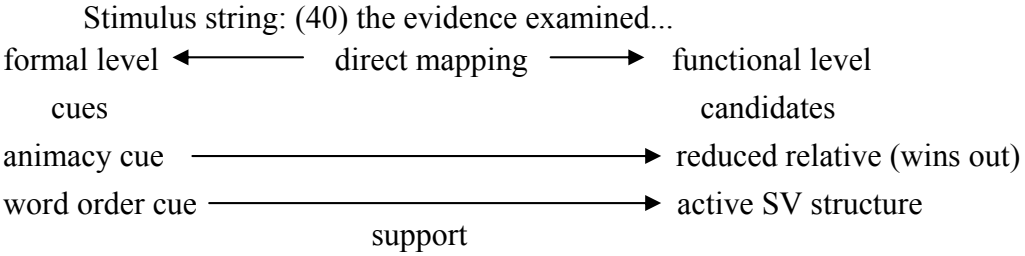


Figure 2. Competition between candidate functions

In general, the relative strength of word order cues is postulated for the English language. In addition, reduced relatives are considered to be acquired after maturation because they are absent in the recoded samples of utterances made by young children except for some routined patterns

(Diessel and Tomasello (2000)). Language learners are said to rely on semantic cues in early stages of acquisition and learn to rely more on word order cues with maturation. Thus, it is striking that the mature English speakers allowed a semantic cue to win against a word order cue in comprehending a reduced relative. In this way the competition Model provides detailed explanation of the mechanism in which semantic cues are used for the initial syntactic analysis. This specifically important to our interest in that the use of semantic cues for the comprehension of reduced relatives appears to have a chance to be applied to the use of semantic cues for the comprehension of full-fledged relative-clause constructions.

On the other hand, the demerit of the Competition Model is that it clearly separates the two levels that are mapped onto each other. The two separate levels are the formal and functional levels (Bates and MacWhinney 1987: 166). This position is so firm as to define the formal and functional levels as *principles* of *semantic connectedness* and *positional pattering* respectively:

> ・・・ the child appears to be guided by two principles in deciding what to correlate with what. One principle is that of semantic connectedness. The other is positional pattering. Together, these two principles tightly delimit the scope of the co-occurrence patterns that the learner considers. At the same time, by examining formal correlations between items that are positionally connected and semantically related, the learner can acquire the basic form-form correlations of the language. ・・・ (ibid: 166)

The competition Model posits that mappings for sentence comprehension are carried out mainly between two separate levels. This is referred to as the "vertical mappings." Figure 3 below illustrates the possible types of mappings posited by Bates and MacWhinney (1987: 166):

direct vertical correlations — between forms and functions

horizontal correlations { between forms themselves / between functions

Figure 3. Three types of correlations (mappings)

One can see from Figure 3 that Bates and MacWhinney categorize correlations, i.e. mappings between forms and functions as "vertical correlations" and correlations between forms themselves and between functions themselves as "horizontal correlations." Thus, the Competition Model

approves the existence of mappings between functions themselves, which we place emphasis on. The horizontal correlations appear to imply that the Competition Model approves the existence of mappings between semantic properties, semantic information and semantic structures. These are supposed to be fall into the "horizontal correlations" according to the categorization in Figure 3.

We do place emphasis on the roles that "horizontal correlations" play, especially the roles that function-function mappings play in language acquisition. The main interest of this thesis is the effect of weak semantic fit (or weak coherence) resulting from the conjoined-clause analysis on the formation of a complex NP in comprehension. This process, we postulate, can be seen in terms of mappings between semantic properties, semantic information and semantic structures. The weak semantic fit (weak coherence) is probably a kind of semantic information and the acquisition of a complex-NP structure is realized by the creation of new semantic structure. Thus, the processing strategies we examined in Chapter 4 were nothing other than a function-function mapping. This can be categorized into the "horizontal correlations" according to the Competition Model.

It is true that the Competition Mode approves the existence of mappings between semantic items, i.e., function-function mappings, referring to them as the *horizontal correlations* but the model allows them to play minor roles in merely supporting the major roles played by the *vertical correlations* which refer to form-function mappings. Bates and MacWhinney (1987: 166) emphasize:

> It is important to remember that, although the system is capable of acquiring a complex set of horizontal correlations, the mappings that drive the system are the vertical correlations. Horizontal correlations are acquired in the service of supporting the system of vertical correlations. ・・・ (ibid: 166)

As repeatedly mentioned, we attribute Japanese EFL learners' acquisition of full-fledged relatives to semantic problems resulting from their own conjoined-clause analysis. This view postulates that function-function mappings, i.e., horizontal correlations, play main roles in driving learners into acquiring relatives. Our view of language acquisition contrasts with that of Bates and MacWhinney's, which disallows horizontal correlations, including function-function mappings, to

play major roles in language acquisition.

Our view of Japanese EFL learners' acquisition of English relatives can be illustrated in Figure 4 below if it is accounted for by the Competition Model:

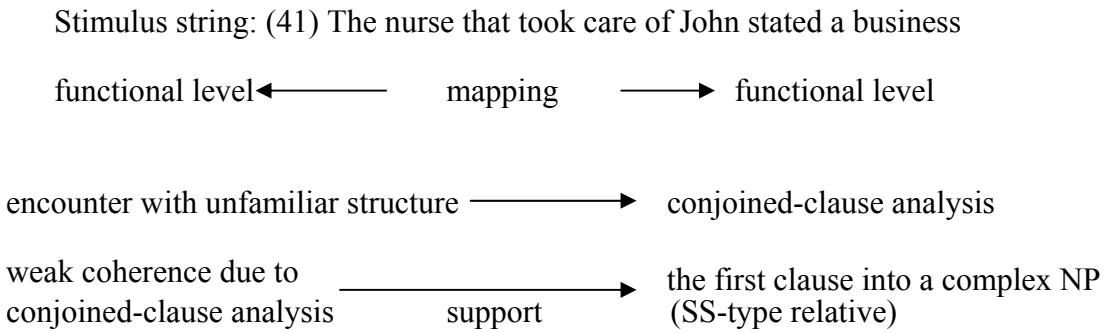


Figure 4. Japanese EFL learners' acquisition of English SS-type relative

One can see from Figure 4 that the mappings that drive the system are the function-function mappings. The two candidate functions are in the rightmost column. They are the conjoined-clause analysis and "the first clause into a complex NP." These candidate functions are supported by cues in the leftmost column respectively. What is significant is that both the cues and the candidates are on the functional level. No formal cues intervene in the process. Note that these candidates do not come into existence simultaneously. The conjoined-clause analysis arises first and then a semantic problem due to it gives rise to "the first clause into a complex NP." Thus, the competition between these two candidates occurs only after the latter candidate has emerged. After all, a competition between the two candidates takes place.

4.5.2 Problems with the Competition Model

In the previous subsection (§4.5.1), we saw merits and a demerit of the Competition Model with regard to our postulation that semantic problems due to the conjoined-clause analysis promotes Japanese EFL learners' acquisition of full-fledged relatives. One merit was that the Competition Model can explain which of the cues comes into effect earlier than others in sentence processing.

The other merit was that the Competition Model allows semantic (e.g., animacy) cues to work with formal cues (e.g., word order, morphology) on the same side of the two levels. These merits help posit that semantic cues often affect syntactic decisions earlier and more effectively than formal cues do. The demerit was that the Competition Model postulates two separate levels of processing and assigns central roles to form-function mappings, allowing function-function mappings to play merely supportive roles in acquisition. This contrasts with our postulation that semantic problems due to the conjoined-clause analysis should play important roles in Japanese EFL learners' acquisition of full-fledged relatives.

The Competition Model postulates "direct mappings" between formal and functional levels. (*cf.* §2.4.1) The acquisition of "direct mappings" is supposed to be driven mainly by form-function mappings. Form-form or function-function mappings play merely supportive roles. Then, what comprise "direct mappings"? Bates and MacWhinney emphasize that form-function mappings are composed not of one-to-one but of many-to-many correlations between items on the two levels and various types cues (semantic and formal) can gain entry to either levels in individual mappings (ibid: 163, 166). These explanations seem to imply that Bates and MacWhinney base their model on general cognitive principles and learning strategies built on them (MacWhinney 1987: 250-251). Thus, according to the Competition Model, the answer to the above question would be "general cognitive principles."

It seems unlikely that "general cognitive principles" will explain away the following question. How do native children and L2 learners know what forms are mapped onto what functions? External functionalist theories postulate that formal and functional levels of processing are separate from one another and the mappings are carried out mainly between items on these two levels. Thus, "general cognitive principles" that make "direct mappings" take place are composed of the reinforcement of "connections" between items on the formal and the functional level. However, the original question still seems to remain: How do children know what formal

cues mean? How does a person imagine the whole shape and actions of the animal when he has found a footprint of an elephant if he has never seen or heard of an elephant? The footprint is a formal cue and the imagination of the shape and actions of the footprint-maker is a function.

We believe that it is the theory of Radical Construction Grammar advanced by Croft (2001) that solves the above-mentioned problem and provides logical support for our view of Japanese EFL learners' acquisition of full-fledged relatives: use of semantic problems due to the conjoined-clause analysis. In the next subsection, we will see how the theory of Radical Construction Grammar explains the significant difference observed for the SS-type items in Experiment 2.

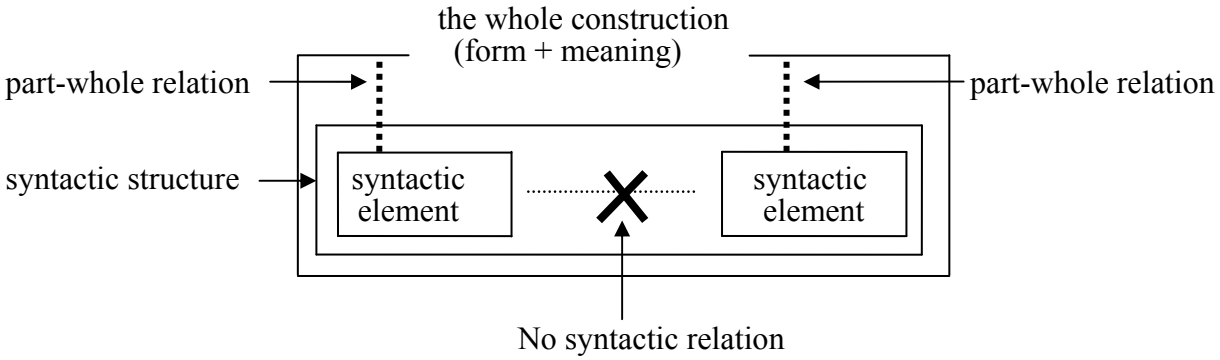
4.5.3 Semantic and syntactic relations in Radical Construction Grammar

Tavakolian (1981) argues that young L1 children relies on their familiar structures they have fully acquired when they encounter with structures unfamiliar to them, so they sometimes impose structures they know very well on stimulus sentences that are too difficult for them. This appears to imply the following assumptions. The semantic structure that a mature hearer represents about the sentence s/he has heard will be identical to the semantic structure that the speaker intends to convey with an utterance, if s/he has spoken correct language. On the other hand, the semantic structure that an *immature* hearer represents about the sentence s/he has heard may be different from the speaker's intention. This difference, or gap, may serve as a chance for the immature hearer to acquire the unfamiliar structure. Acquisition requires a revision her/his initial representation of semantic structure drawing on her/his familiar structure. That is, the acquisition is realized when the immature hearer has successfully represented a second (or revised) semantic structure about the same stimulus sentence. Thus, an acquisition model has to provide an account of how the semantic structure about the same stimulus sentence shifts from the initial to the second representation in an immature hearers' mind.

This is possible for a theory of syntax if it is robust enough to explain what makes the immature hearer abandon her/his initial representation and adopt a second representation. We think that Radical Construction Grammar is suitable for explaining the acquisition process of relative clauses. This is because we posit that semantic cues such as weak semantic fit, weak coherence, semantic anomaly, etc. resulting from the conjoined-clause analysis make the immature hearer to abandon her/his initial representation of the semantic structure about the speaker's utterance and figure out another semantic structure which is free from semantic problems.

Radical Construction Grammar excludes the reliance on syntactic relations between syntactic elements in the process of understanding of the meaning of a sentence. On the other hand, Radical Construction Grammar emphasized the reliance on the relations between semantic components composing the semantic structure that the hearer represents about a speaker's utterance. This indicates that Radical Construction Grammar permits the hearer to move from the initial to the second representation of the semantic structure about the same input by only changing the semantic relations between semantic components without taking the syntactic relations between syntactic elements into account. This trait of Radical Construction Grammar is of great help to providing a powerful rationale for explaining the method and results of the experiments in for this thesis.

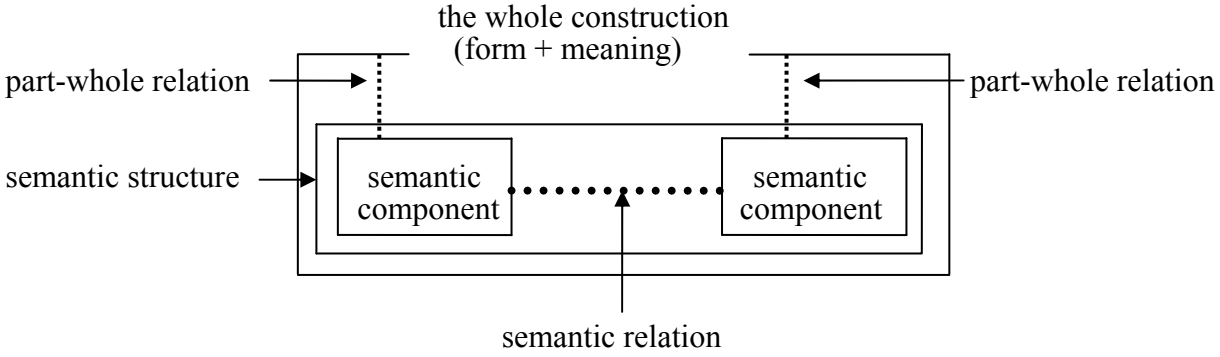
Croft (2001: 25) posits that "the part-whole structure of constructions" is the only syntactic structure that Radical Construction Grammar needs. The part-whole relations are assumed between a construction and its syntactic elements. On the other hand, there is no syntactic relation between syntactic elements. Figure 5 shows these relations:



Source: Figure1.6. (Croft 2001: 21) and Figure 6.1 (ibid: 204), modified by the current author drawing on the explanations given in the volume by Croft

Figure 5. Part-whole relation between syntactic elements and the construction

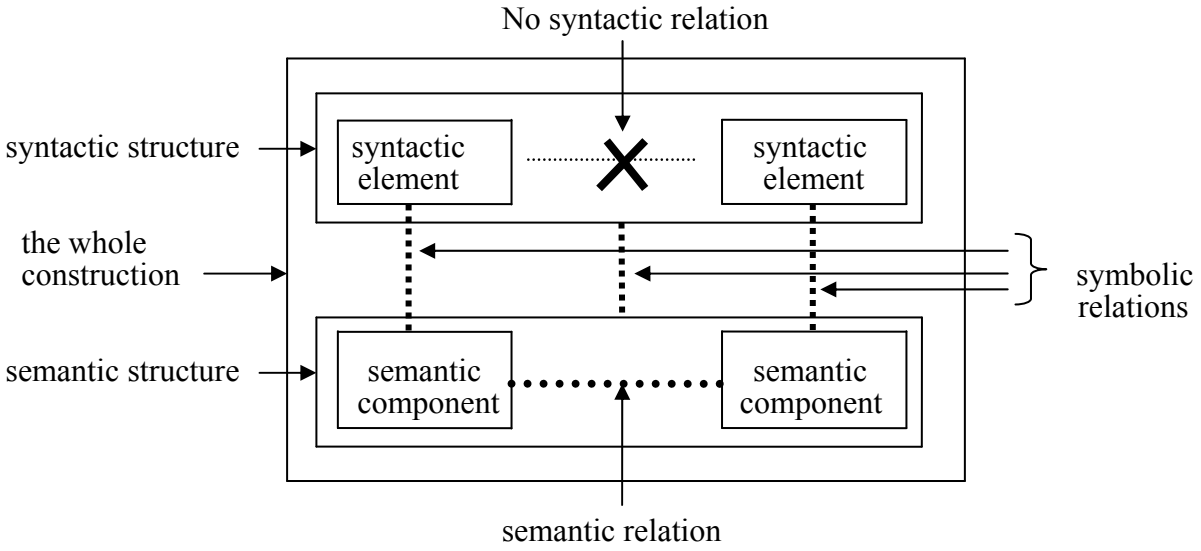
On the side of the semantic structure of the same construction, semantic components are parts of the whole construction just as syntactic elements are parts of the same construction:



Source: Figure1.6. (Croft 2001: 21) and Figure 6.1 (ibid: 204), modified by the current author drawing on the explanations given in the volume by Croft

Figure 6. Part-whole relation between semantic components and the construction

One thing different is that there is a semantic relation between the semantic components. One can see from Figure 5 and 6, there is no relation between syntactic elements while there is a relation between semantic components. This imbalance makes it impossible to assume “direct mappings” between the syntactic and semantic structures of the same construction.



Source: Figure1.6. (Croft 2001: 21) and Figure 6.1 (ibid: 204), modified by the current author drawing on the explanations given in the volume by Croft

Figure 7. Imbalance between the syntactic and semantic structure of a construction

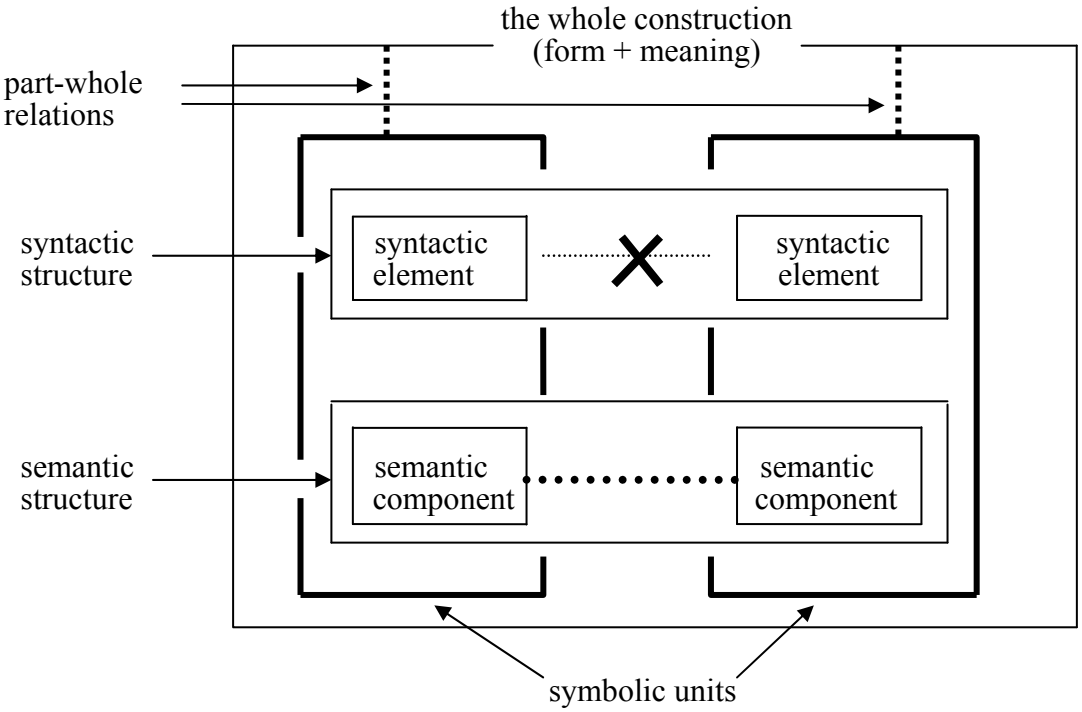
According to the Competition Model, direct mappings were possible between the syntactic and semantic structures of a construction since the Model approves the existence of syntactic relations between elements, which Bates and MacWhinny called "horizontal correlations between forms themselves" (Bates and MacWhenny 1987: 165-166). Within the system of the Radical Construction Grammar, pairings (i.e., correlations or mappings) between the syntactic and semantic structures cannot be built. Consequently, pairings between their syntactic elements and semantic components cannot be built, either. This is because there is no syntactic relation between syntactic elements. Symbolic relations are the only relations that can be built between the syntactic and semantic structures and between their syntactic elements and semantic components, which are represented with thick broken vertical lines in Figure 7. What symbolic relations represent will be explained later. Without any syntactic relations between syntactic elements, individual syntactic forms have no means by which to relate themselves to something else in the construction. Individual syntactic elements are left isolated and the forms attached to them are paired with nothing in the construction. This mechanism of Radical Construction

Grammar coincides with our original question mentioned above. How do native children and L2 learners know what forms are mapped onto what functions? This question can be compared to another question. How does a person imagine the whole shape and actions of the animal when he has found a footprint of an elephant if he has never seen or heard of an elephant?

Radical Construction Grammar provides an excellent explanation to these questions of ours. The explanation will be given by identifying what the "symbolic" relations in Figure 7 are composed of. Because of the absence of syntactic relations between syntactic elements, there are no relations between the syntactic and semantic structures and between their elements and components. However, syntactic elements are part of the whole construction in Figure 5 and semantic components are part of the same construction in Figure 6. This seems to indicate that the syntactic elements and semantic components of a construction belong to the same construction. There is part-whole relation linking the syntactic elements to the whole construction on one side, and there is part-whole relation linking the semantic components to the same whole construction on the other. This follows that these parts of the same construction comprise "symbolic units," which are depicted as boxes drawn with thick solid lines in figure 8:

One can see from Figure 8 that the entity that holds the part-whole relation between the symbolic units and the whole construction is the semantic relation depicted by a horizontal thick broken line. Syntactic relations play no roles in postulating units as parts of a construction because there is no relation between syntactic elements.

One can see by comparing Figure 7 and 8 that the three vertical thick broken lines in Figure 7 are represented by the "symbolic units" in Figure 8. This means that the "symbolic relations" between the syntactic and semantic structures and between their elements and components in Figure 7 comprise "symbolic units" in Figure 8. The "symbolic units" in Figure 8, in turn, comprise the part-whole relation of the units and the construction:



Source: Figure1.6. (Croft 2001: 21) and Figure 6.1 (ibid: 204), modified by the current author drawing on the explanations given in the volume by Croft

Figure 8. Symbolic units of a construction

This part-whole relation is based on the fact that both the syntactic elements and semantic components are part of the same construction.

In this way, the system of Radical Construction Grammar is motivated by the symbolic relations between syntactic and semantic structures. The symbolic relations consist of symbolic units, which are parts of the construction. What is important is the fact that the part-whole relation between the symbolic units and the whole construction are built not on syntactic relations between syntactic elements but on semantic relations between semantic components. This is because there are relations between semantic components but no relations between syntactic elements. Thus, within the system of the Radical Construction Grammar, sentence-processing is carried out by accessing semantic relations between semantic components without accessing syntactic relations between syntactic elements. The latter is viewed as nonexistent.

The mechanism of Radical Construction Grammar is of great help to our postulation about Japanese EFL learners' acquisition of relatives all the more because it posits "nesting" of constructions. Croft (2001: 203) states:

> ・・・ the part-whole structure of constructions can be nested. For example, the elements of a clause include phrases that denote the participants in the event denoted by the clause. ・・・

As is generally acknowledged, syntactically speaking, relative clause constructions are typical examples of nested structures. Thus, Radical Construction Grammar appears to account for the acquisition of nested structures of relative-clause including sentences without making access to syntactic relations.

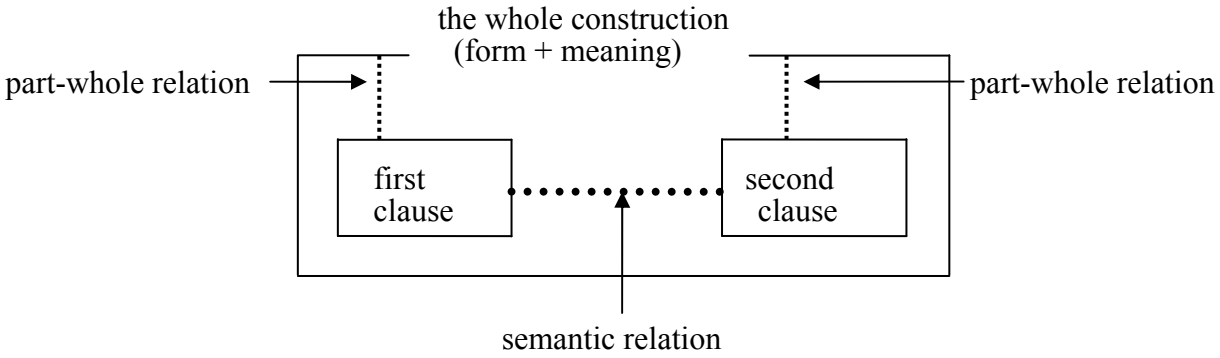
Let us see how the conjoined-clause analysis changes into a relative-clauses analysis in Radical Construction Grammar. We will use a SS-type relative as an example. Figure 9 and Example (43) represent an ideal part-whole structure that two conjoined clauses may have. On the other hand, Example (44) is the conjoined-clause analysis wrongly imposed on the stimulus sentence (42). Figure 9 deals only with semantic components. Syntactic elements are omitted there. Thus, the first and the second clause in the boxes stand for semantic components which are part of the construction as a whole.

(42) stimulus:
The nurse that took care of John started a business.

(43) John ate too much *and* △ turned his stomach.

(44) the conjoined-clause analysis on (42):
U: The nurse took care of John *and the nurse* started a business.

In order to evaluate his/her own conjoined-clause analysis in (44), the hearer (or reader) accesses to his/her own knowledge of the semantic structure of conjoined-clauses when the hearer applies it to a proper utterance. This is possible because conjoined-clauses are already a familiar structure for the hearer. Example (43) includes between-clause relation that the immature hearer is familiar with. This relation in (43) is illustrated in Figure 9:

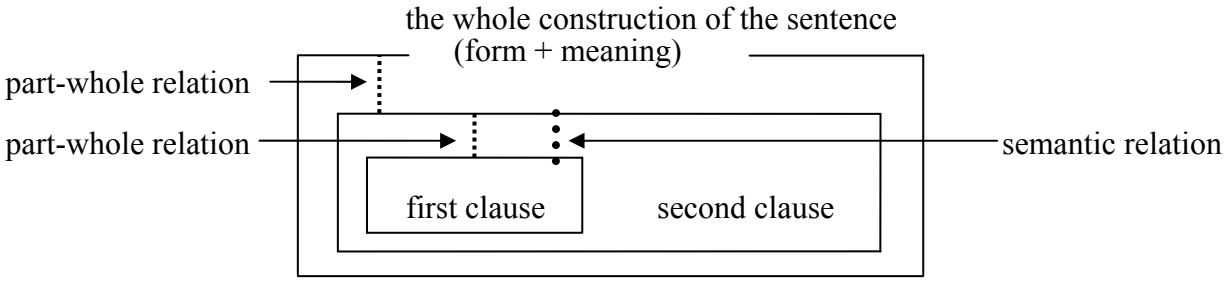


Source: Figure1.6. (Croft 2001: 21) and Figure 6.1 (ibid: 204), modified
by the current author drawing on the explanations given in the volume by Croft

Figure 9. Part-whole relations of a construction ideal for a conjoined-clause analysis:
The first and second clauses as semantic components

The horizontal thick broken line in Figure 9 represents the semantic relation between the two clauses. It is a semantic relation intrinsic to normal conjoined-clauses as (43). The semantic relation between the first and the second clause has to have strong coherence according to the hearer's own knowledge. In (44), however, the semantic relation between the first and the second clause has merely weak coherence because the conjoined-clause analysis has been imposed on a stimulus that it should not be applied to. From the viewpoint of the immature hearer, s/he must be feeling that s/he has failed to gain strong coherence from his/her own interpretation (44). The coherence in (44) is much weaker that that the immature hearer usually gain from normal conjoined clauses such as (43).

The hearer's conjoined-clause analysis (44) on the stimulus sentence (42) disagrees with his or her knowledge of the semantic structure of the conjoined-clause analysis in Figure 9. The former lacks the proper coherence that the latter requires. This makes him/her to decide to abandon the interpretation (44) altogether. In other words, he/she has come to want another interpretation that does *not* require such a semantic relation and such part-whole structures that are represented in Figure 9. Then, s/he figures out a different semantic relation between the two semantic components and part-whole relations that can be built on a new semantic relation. The new semantic relation and part-whole relations are given in Figure 10:



Source: Figure1.6. (Croft 2001: 21) and Figure 6.1 (ibid: 204), developed by the current author drawing on the explanations given in the volume by Croft

Figure 10. Nested part-whole relations of constructions: The first and second clauses as *semantic components*

The semantic relation and part-whole relations in Figure 10 are possible because the constructions of Radical Construction Grammar can be nested (Croft 2001: 203). The first clause as a semantic component has become part of the second clause as a semantic component. After one semantic component has become part of the other, a semantic relation between them is still present, which is depicted with a thick vertical broken line in Figure 10.

One problem has not yet been solved. The target semantic structure of the stimulus sentence has to correspond to the meaning of "subject-extracted relative in the matrix subject position." The semantic relation between the components gives neither the role of the head noun in the relative clause nor the position of the head noun in the matrix clause. It shows no more than a relation in which the first clause has become part of the second. The semantic relation depicted in Figure 10 appears to be powerless in leading the hearer to the understanding of the meaning of the stimulus sentence. However, in the process with Radical Construction Grammar, it is not necessary to access the syntactic relation between syntactic elements, such a relation as can be denoted as "subject-extracted relative in the matrix subject position." The stimulus sentence (42) is an SS-type relative. How does the hearer get to the meaning of an SS-type relative without examining the syntactic relations such as "subject-extracted relative in the matrix subject position"? As far as the semantic relation between components is concerned, the part-whole structure in Figure 10 results from the meaning of the conjoined-clause analysis (44), it is less

plausible that the second clause becomes part of first clause, e.g., “U: The nurse who started a business took care of John.” This interpretation seems to require a complex manipulation of the meanings of the stimulus sentence, which contradicts the “order of events” given by *and*. Nor is it less plausible the object of the second clause is modified by the first clause even if the first clause becomes part of the second clause as in Figure 10. It would have the meaning “U: The nurse started a business which the nurse took care of.” In this analysis, *John* has been disappeared. Thus, as far as the part-whole relation illustrated in Figure 10, no other meaning than “U: The nurse that took care of John started a business” will be obtained.

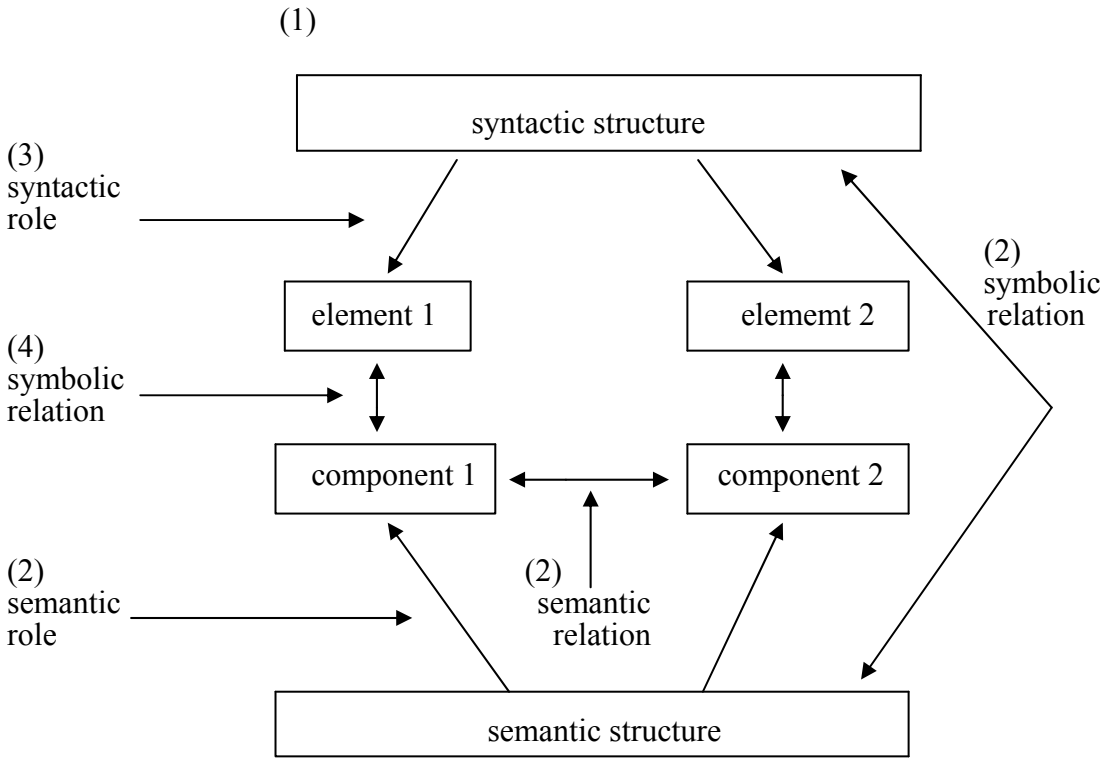
(42) stimulus:
The nurse that took care of John started a business.

(43) John ate too much *and* △ turned his stomach.

(44) the conjoined-clause analysis on (42):
U: The nurse took care of John *and the nurse* started a business.

This surprisingly accords with the process advanced by Radical Construction Grammar illustrated in Figure 11 below. In Figure 11, the process of understanding of the meaning of an utterance proceeds from (1) to (4). One can see that a semantic relation is determined between the components at the stage (2) while no syntactic relation is supposed between the elements. Notice that, at the same time when a semantic relation is built between the components at the stage (2), a semantic role is assigned to each component. This coincides with the observation we made above. The semantic relation between the components, i.e., the first and second clauses, is determined in Figure 10. That is to say, the first clause has become part of the second clause. The semantic relation between the two components is a part-whole relation. At this point, no syntactic relations such as “subject-extracted” or “in the matrix subject position” are examined. However, for the reasons mentioned above, no other meanings than “U: The nurse who took care of John started a business” can result from the part-whole relation illustrated in Figure 10.

This stands for the meaning of "a subject-extracted relative in the matrix subject position." That is, semantic roles that each component receives are determined by accessing the semantic relation between components, which is nothing other than the part-whole relation (a nester structue) depicted in Figure 10. This seems to be an example of the second stage (2) in Figure 11. The access to the semantic relation coincides with the assignment of semantic roles to the components (down on the left in Figure 11):



Source: Figure 6.1. Croft 2001: 204.

Figure 11. The internal structure of a construction without syntactic relation

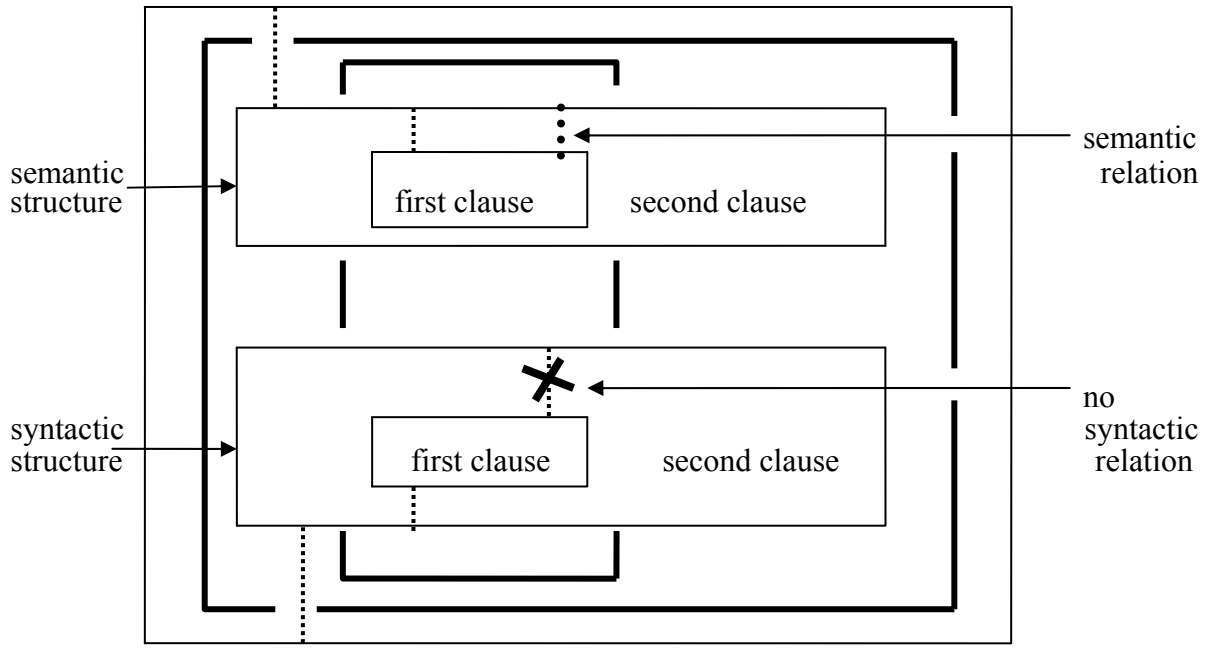
Furthermore, in Figure 11, the assignment of semantic roles to components occurs at the second stage prior to the assignment of syntactic roles to the elements at the third stage (3). This suggests how important it is in the process to access a semantic relation between components. This also seems to support the results of the SS-type relatives in Experiment 2. In doing the A-version items, the weak coherence between the clauses in the conjoined-clause analysis

appeared to induce the participant to figure out a new part-whole relation between the clauses, which might have resulted in the better results for the A-version items than for the B-version items. This appeared to be implemented by determining a part-whole relation between two clauses, i.e., two semantic components. This is because no specific information was presented in the test sentences for deciding on what role to assign to which NP in what position of the matrix clause.

Let us now review the hearer's understanding of the meaning of the stimulus sentence (42) up to this point in light of Radical Construction Grammar. The conjoined-clause analysis (44) was the hearer's own interpretation of (42) in the mind. This had to be abandoned because the relation between the semantic components in (44) was weaker than that of the construction of the properly used conjoined-clause analysis in his/her memory given in (43) and Figure 9, which was already familiar to him/her. Thus, s/he has figured up another semantic relation between semantic components, which is shown in Figure 10. So far at this point, the hearer has represented an initial and a revised understanding of the meaning of the stimulus sentence by accessing semantic relations between semantic components only. This has entailed the revision from the part-whole relations in Figure 9 to those in Figure 10. This means that setting a part-whole relation between the components (e.g., one becomes part of the other) almost automatically assign semantic roles to the components as far as the part-whole relation is made by revising a conjoined-clause analysis. Thus, syntactic relations between syntactic elements have never been referred to.

At the next stage of the analysis, the hearer or reader has to relate the nested part-whole constructions in Figure 10 above to some forms. That is to say, meanings will be related to forms. In Figure 12, the box labeled "semantic structure" corresponds to the components in Figure 10. Back to Figure 12, the nested semantic components in the semantic structure can project nested symbolic units, which are depicted as boxes with thick solid lines. Thanks to the

semantic relation between the first and second clause as semantic components, which is depicted with a thick vertical broken line, the nested symbolic units can pair the part-whole relations of the semantic components with the part-whole relations of the syntactic elements, which result in having nested structures. In this way, the revised relation between the semantic components, which is depicted with a thick vertical broken line in Figure 12, is related to a syntactic structure by means of the symbolic units.



Source: Figure1.6. (Croft 2001: 21) and Figure 6.1 (ibid: 204), modified by the current author drawing on the explanations given in the volume by Croft

Figure 12. Symbolic units of the construction

In Figure 12, understanding of the meaning of a stimulus sentence is carried out by accessing the relation between semantic components of the semantic structure. These semantic components are part of the construction as a whole. Symbolic units can pair the semantic and the syntactic structure because the semantic components and the syntactic elements are part of the same construction as a whole. Thus, symbolic relation between the semantic and syntactic structures

is realized by symbolic units that encompass the semantic and syntactic structures. In this way, the entities of the symbolic units are semantic components, syntactic elements being part of the same construction as a whole. Throughout the process, relations between syntactic elements have not been accessed.

4.5.4 Language acquisition in view of Radical Construction Grammar

In the preceding subsection, we saw how Radical Construction Grammar explains Japanese EFL learners' acquisition of full-fledged relatives with reference to the method and results of the pencil-and-paper experiment for this thesis. Radical Construction Grammar can explain the process in which a participant abandons her/his initial conjoined-clause analysis and figures out relative-clause analysis. We posit that this shift of interpretation of a stimulus sentence is the core part of the process of acquisition. A model is required to explain two things about this shift. First, it has to explain what cues trigger the shift. Second, it has to identify on what part of the hearer or reader's initial analysis the cues has an effect on.

We posited that the hearer or reader compares the meaning of the conjoined-clause analysis he/she has just imposed on a relative clause-including sentence with the meaning of the conjoined-clauses analysis which the hearer stores in his/her mind. The hearer finds the former and the latter meaning are different. The latter is the standard because the latter represents cases where the conjoined-clause analysis is applied to proper utterances. The latter makes the hearer aware that the former is semantically problematic. This awareness of the semantic problem with the initial analysis works as a cue that triggers the shift.

This initial analysis is a conjoined-clause analysis. The two semantic components in conjoined-clauses have to be in a relation of strong coherence. The relation has to be "cause and effect," "order of events" or "juxtaposition." A conjoined-clause analysis wrongly applied to a relative-clause including sentence would not result in such strong between-clause coherence as

that s/he usually recognizes when s/he hears normal conjoined clauses. S/he becomes aware that a conjoined-clause analysis is inapplicable to the current utterance and s/he has to look for a new semantic structure that is applicable to the current utterance. The relation between the two semantic components, i.e., two clauses, is changed from coordination to subordination. One is subordinated to the other.

In this way, a semantic problem with the conjoined-clause analysis works as a cue for the revision of it and the cue affects the semantic relation between the semantic components of the initial analysis. So Radical Construction Grammar meets the two requirements for explaining language acquisition mentioned above.

However is it possible to acquire a target L2 feature only by using a semantic cue on a relation between semantic components of the initial analysis? The answer is yes. Radical Construction Grammar will permit acquisition of a new construction by changing the semantic relation between semantic components of an old construction which has already been acquired because Radical Construction Grammar permits understanding of the meaning of an utterance with reference to semantic relations between semantic components only. Furthermore, in order to acquire relative clause construction, the immature hearer does not need to change the meanings of individual clauses of the conjoined-clause analysis. The two clauses can take part in the target relative-clause construction as semantic components with their original meanings kept intact.

A new construction can be acquired by changing the relation between the semantic components of an old construction without changing the meanings of the individual semantic components themselves. This is the change from the construction illustrated in Figure 9 into that illustrated in Figure 10. One can see from these Figures that only the relation between the semantic components has been changed. Nothing else has been changed. The mere acquisition of the relation between semantic components will trigger the acquisition of the corresponding

syntactic structure by means of the symbolic unites that bridge the semantic and syntactic structure, which are illustrated in Figure 12.

In this subsection, we discussed the results of Experiment 2 in light of Radical Construction Grammar. It seems that the results are explained by Radical Construction Grammar in that semantic relations between components and part-whole structures of a construction are main role players in processing in Radical Construction Grammar. Thanks to the heavy weight placed on semantic relations and semantic structures, Radical Construction Grammar appears cross-linguistically generalizable. This is because syntactic structures are language-particular whereas semantic structures are universal. Thus, it is likely to cater for explaining L2 acquisition as well.

In chapter 4, we discussed the method and results of the experiment 2 in light of the following hypotheses.

Ⅰ. Language acquisition in general is a hearer's creation of a new semantic structure when s/he applies a semantic structure s/he knows well to an unfamiliar utterance and finds it entailing weak semantic fit.

Ⅱ. The above hypothesis will hold true for Japanese EFL learners' acquisition of full-fledged English relative clauses.

The results of the SS type turned out statistically highly significant. The elicitation device for the SS type seemed to be reliable. As regards the alternatives (ア) and (イ), there was no other difference than the absence and presence of *and*. When it comes to the A and B versions, there was no formal difference. The only difference between the A and B versions was whether or not there would be weak coherence if participants imposed conjoined clauses analysis. Thus, the highly significant results of the SS type are based on a reliable elicitation device and strongly support the hypotheses Ⅰ and Ⅱ above.

As for SO and OS type, the defects of the elicitation devices seemed to result in the failure to obtain the results we had predicted. In the SO type, participants appeared to select the actor of

the second-clause verb by means not of the conjoined-clauses analysis but of random association of the second-clause verb with the first-clause NPs. In the OS type, the alternatives of (ア) and (イ) were composed of different content words, which seemed to have made the procedure too complicated for participants to carry out.

However, two participants revealed the results we had predicted for the OS type. The two students had gained the lowest scores in Experiment 1 and the OS type is generally regarded as the easiest type (*cf.* §3.3.3). This appears to imply that the elicitation device for the OS type worked well for the learners on the threshold level to acquiring English relative clauses. This piece of evidence may lead to the verification of the hypotheses Ⅰ and Ⅱ by improving the elicitation device for the OS type.

As for the OO-type relative clauses, the considerable low mean score for the D version seems to imply the following act of many participants who had not acquired English relative clauses. Participants tended to identify the missing object of the second-clause verb as referential with the first-clause subject, instead of the first-clause object. In other words, "the modified version 2" advanced by Tavakolian (*cf.* §3.4.9) occurred but "the object-to-object coordinate-clause analysis" that we propose did not, though we regard "the modified version 2" as a result not of a systematic interim rule but of random association of verbs and nouns. This means that the acquisition of the OO-type relatives proceed from the "the modified version 2" of the conjoined-clause analysis directly to the recognition of a complex NP including a relative clause, not by way of "the object-to-object coordinate-clause analysis." The intact SVO structure in the first clause and the SV structure in the second appear to enable hearers or readers to have rich information about "who does what to whom" and carry out relativization relatively easily. In this respect, the acquisition of the OO-type relative clauses are not necessarily triggered by semantic problems resulting from the wrong imposition of coordinate-clause analysis on full-fledged relative clauses. It seems premature for the moment to draw some implications from

the results of OO-type in Experiment 2 regarding how the results are related to the hypotheses Ⅰ and Ⅱ.

The above interpretations of the results of individual types of relatives are in line with the theory of Radical Construction Grammar, in which semantic relations between semantic components play a central role in understanding of the meaning of an utterance.

Chapter 5. Conclusion

5.1 Summary

Japanese learners of L2 English find great difficulty in acquiring English relative clauses. Five of six authorized English textbooks for Japan's junior high schools define relative clauses as "setsumei" ('explanation') of the head noun. The recognition of a complex NP in sentence comprehension does not seem to be placed emphasis on. Furthermore, the textbook writers appear to assume that formal cues such as word order and relative marker can be mapped directly onto the function of the recognition of complex NPs without permitting semantic cues to play roles in processing.

We believe that an immature hearer acquires a new structure by means of a strange meaning resulting from his/her imposition of a semantic structure s/he knows well on a speaker's utterance the hearer cannot understand. The hearer will search for a new semantic structure that would produce no strange meaning when applied to the same utterance. In order to testify this assumption, we conducted experiments with Japanese college students.

In the discussions on the results of Experiment 2, we accounted for the significant difference between the A and B versions of the SS type in terms of the effect of weak coherence contingent on participants' conjoined-clause analysis. The success in the SS-type may have been due to the simple design of the elicitation device. Had we prepared test items for the SO and OS types as simple as that for the SS type, we would have obtained significant results from the SO and OS types as well. What was notable was the existence of two students who recoded the worst and the second worst scores in Experiment 1 and manifested the patterns of results that we had predicted for the OS type in Experiment 2. This suggests that the use of semantic information is important for those who are on the threshold level of acquisition because the OS type is generally considered to be the easiest type to process. The OO-type relatives are supposed to be

less suitable for the conjoined-clause analysis because the second-clause subject is in the canonical position. Unlike the other types of relatives, the first clause maintains its intact form and the second-clause subject and verb keep a linear sequence. These conditions will provide participants with rich information about "who does what to whom" in the two clauses. The considerably low mean score for the D version seemed to suggest that many participants did not resort to the "object-to-object coordinate-clause analysis." Instead, the learners appeared to choose to recognize a complex NP with a relative clause as a strategy for creating a meaningful interpretation for the stimulus sentence. This seems to be possible thanks to the rich information mentioned above.

The results of the experiments appear to lend partial support to our initial hypotheses:

Ⅰ. Language acquisition in general is a hearer's creation of a new semantic structure when s/he applies a semantic structure s/he knows well to an unfamiliar utterance and finds it entailing weak semantic fit.

Ⅱ. The above hypothesis will hold true for Japanese EFL learners' acquisition of full-fledged English relative clauses.

The theoretical frameworks of Radical construction Grammar allow us to interpret the results of the pencil-and-paper experiments in such a way as we did in the above paragraph, which in turn, leads us to conclude that the results lend partial support to our initial hypotheses.

In Chapter 4, we showed Radical Construction Grammar excellently explains how the revision of an immature hearer's initial interpretation is cued by a semantic problem (in (3) below) resulting from his/her imposition of a structure familiar to him/her (2) on a more difficult structure (1).

(1) stimulus:
The nurse that took care of John started a business.

(2) normal conjoined-clause analysis
John ate too much *and* △ turned his stomach.

(3) the conjoined-clause analysis imposed on (1):

U: The nurse took care of John *and the nurse* started a business.

First, Radical Construction Grammar explains how the immature hearer notices the semantic problem resulting from his/her imposition of the conjoined-clause analysis on a relative-clause including sentence. The awareness of the weak semantic fit is raised by a comparison. The hearer compares the coherence in the conjoined-clause analysis imposed on the stimulus which it should not to be imposed on and the coherence in normal conjoined-clause sentences which the hearer is familiar with. The former type of coherence is found in (3) and the latter type in (2). The immature hearer becomes aware that s/he has failed to obtain strong coherence s/he usually gains from normal conjoined-clause sentences. Radical Construction Grammar explains how the immature hearer can carry out this comparison. All s/he has to do is examine semantic relations between components. Thus, an immature hearer can implement the comparison and find a semantic problem even if s/he knows nothing about what forms are paired with what meanings in the target language

Second, Radical Construction Grammar explains how the immature hearer solves the semantic problem mentioned above. Radical Construction Grammar makes it possible for an immature hearer to easily abandon the semantic structure s/he has initially adopted and figure out a new semantic structure that is free from the semantic problem. This is possible with Radical Construction Grammar because the immature hearer can do so by changing the semantic relation between the components only, with the individual meanings of the components kept intact.

Third, Radical Construction Grammar explains why L2 learners can acquire L2 rules which have different syntactic structures than those of their L1. With Radical Construction Grammar, the hearer can understand the meaning of an utterance by accessing semantic relations between components only. S/he does not need to access syntactic relations between elements. Syntactic relations between elements are language-particular while semantic relations between

components are universal. Semantic relations postulated by Radical Construction Grammar are cross-linguistically general because they consist of part-whole relations between components. L2 learners can process and acquire L2 constructions by using part-whole relations between semantic components which they originally possess in their L1.

5.2 Pedagogical implications

It is difficult for Japanese EFL learners to acquire English postpositive modification. Syntactically speaking, the difficulty consists in the inability to recognize the internal structure of complex NPs including postpositive modifiers. In authorized textbooks, the function of relative clauses is defined as "explaining the head noun" and the formal cues such as positions of the modifier, relative marker and head noun are emphasized. The textbook writers seem to place minor emphasis on leading students to recognize the fact that the head noun and relative clause are composing a complex NP and it behaves as if it were a single noun in a sentence. The treatment of complex NPs in Japan's English education seems to result from a belief that students can relate formal cues directly to proper functions without being helped by semantic information. We are skeptical of direct mappings between items on the formal and functional levels.

We believe a new construction is acquired when an immature hearer compares two meanings. One is the meaning resulting from his/her wrong imposition of a construction s/he knows well on an unfamiliar sentence. The other is the meaning obtained by his/her correct application of the same construction to an easy sentence. Of course, the latter meaning is the baseline for him/her. When the hearer finds the former meaning is semantically strange, s/he will look for quite a new construction which is likely to produce a natural meaning when applied to the unfamiliar sentence. This is acquisition.

This can be compared to a story which we have made. There was a hunter who was good at

shooting small boars with his short spears. One day he happened to encounter with a big boar and he shot his short spear against it but the short spear broke in two. He thinks of using longer spears and made some. One day he successfully shot a big boar with his new long spear. It was the experience of breaking his short spear that led him to *acquire* a longer spear.

Belief in direct mappings between forms and functions underestimates opportunities for learners to find their old construction useless for interpreting an unfamiliar sentence and look for a new construction for themselves which is likely to be fit for the unfamiliar sentence. With such an opportunity, a discovery of a new construction, i.e. acquisition takes place by changing the part-whole relation of a construction that the learner has already acquired.

In classrooms, it is necessary to prepare an opportunity for students to use a construction which they know well for an unfamiliar sentence only to get a strange meaning. Compared to the story above, "a construction which the students know well" is "a small boar." "An unfamiliar sentence" is "a big boar" and "a strange meaning" is "the broken short spear." Just as the hunter was inspired to make a longer spear by the experience of breaking his short spear, so a language learner will be inspired to acquire a new construction by an experience of getting a strange meaning. One example of this is a strange meaning resulting from the imposition of the conjoined-clause analysis on an unfamiliar sentence, that is, a relative clause-including sentence.

It would be desirable to prepare a stimulus sentence that will induce learners to impose a construction s/he knows well on it. If s/he finds a weak semantic fit or incoherence with the meaning resulting from the imposition, s/he will look for another construction which is likely to create a plausible meaning for the unfamiliar sentence.

In preparing stimulus sentences for students aiming at such effects as mentioned above, one thing should be noted. The semantic contrasts between the nouns should not be too clear. Example (5) will entail weak semantic fit if the conjoined-clause analysis is imposed on it. This is because the semantic contrast between the first-clause NPs, *the nurse* and *John*, is not one-sided

in the competition for the actor of *started a business.* In contrast, at a glance of the stimulus sentence (4), students will select *the cat* as the actor of *eats mice*, so that the interpretation will be suitable to their common sense intuition. In other words, students cannot apply the first-clause subject *John* to the missing second-clause subject depending on the rule of the standard conjoined-clause analysis. Thus, a conjoined-clause analysis such as "U" of (4) will not occur. Students jump to the analysis "John hugs a cat *and the cat* eats mice." In (5), there is not strong semantic contrast between *the nurse* and *John* as the actor of *started a business*, so students will impose the conjoined-clause analysis on (5) and find the weak coherence in "U" of (5). This will inspire them to acquire a new construction, i.e., a complex NP including a relative clause.

(4) John hugs a cat that eats mice.
conjoined-clause analysis imposed on (4)
U: John hugs a cat *and John* eats mice.

(5) The nurse that took care of John started a business.
conjoined-clause analysis imposed on (5)
U: The nurse took care of John *and the nurse* started a business.

The results of the experiments and the related discussions from the viewpoints of Radical Construction Grammar seem to lend partial support to our initial hypothesis Ⅰ that language acquisition in general is a hearer's creation of a new semantic structure when s/he applies a semantic structure s/he knows well to an unfamiliar utterance and finds it entailing weak semantic fit. The results also lend partial support to our hypothesis Ⅱ that hypothesis Ⅰ will hold true for Japanese EFL learners' acquisition of full-fledged English relative clauses. Classroom L2 instruction and textbooks should adopt these points of view in selecting model sentences for practice and in evaluating errors resulting from students interim strategies depicted in hypothesis Ⅰ.

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References

Bates, Elizabeth and Brian MacWhinney. (1987) Competition, variation, and language learning. In: Brian MacWhinney (ed.) *Mechanisms of language acquisition,*157-193. Hillsdale: Lawrence Erlbaum Associates Publishers.

Bates, Elizabeth and Brian MacWhinney. (1989) Functionalism and the competition model. In: Brian MacWhinney and Elizabeth Bates (eds.) *The crosslinguistic study of sentence processing* 3-73. Cambridge: Cambridge University Press.

Caron, Jean. (1992) *An introduction to psycholinguistics*. (Original French title: *Précis de psycholinguistique*) Trans. Tim Pownall. New York: Harvester wheatsheaf.

Chen, Shu-hui Eileen. (1998) Surface cues and the development of given/new interpretation. *Applied Psycholinguistics* 19: 553-582.

Clifton, Charles, Jr., Lyn Frazier, and Cynthia Connie. (1984) Lexical expectations in sentence comprehension. *Journal of verbal learning and verbal behavior* 23: 696-708.

Cook, Vivian J. (1973) The comparison of language development in native children and foreign adults. *International Review of Applied Linguistics* 11: 13-28.

Corr□a, Letícia M. (1995) An alternative assessment of children's comprehension of relative clauses. *Journal of psycholinguistic research* 24: 183-203.

Croft, William. (2001) *Radical construction grammar*. Oxford University Press.

Diessel, Holger and Michael Tomasello. (2000) The development of relative clauses in spontaneous child speech. *Cognitive Linguistics* 11: 131-151.

Dieseel, Holger. (2004) *The acquisition of complex sentences.* Cambridge University Press.

Dowty, David. (1991) Thematic proto-roles and argument selection. *Language* 67: 547-619.

Doughty, Catherine. (1991). Second language instruction does make a difference. *Studies in Second Language Acquisition* 13: 431-469.

Eckman, Fred R., Lawrence Bell, and Diane Nelson. (1988) On the generalization of relative clause instruction in the acquisition of English as a second language. *Applied Linguistics* 9: 1-20.

Ellis, Rod. (1994) *The study of second language acquisition*. Oxford University Press.

Ellis, Rod. (1991) Grammaticality judgments and second language acquisition. *Studies in Second Language Acquisition* 13: 161-185.

Ferreira, Fernanda and Charles Clifton Jr. (1986) The independence of syntactic processing. *Journal of Memory and Language* 25: 348-368.

Flynn, Suzanne. (1989) Spanish, Japanese and Chinese speakers' acquisition of English relative clauses: new evidence for the head-direction parameter. In: Kenneth Hyltenstam and Loraine K. Obler (eds.) *Bilingualism across the lifespan*. 116-131. Cambridge University Press.

Fodor, Janet Dean. (1978) Parsing strategies and constraints on transformations. *Linguistic Inquiry* 9: 427-473.

Fodor, Janet Dean and Lyn Frazier. (1980) Is the human sentence parsing mechanism an ATN ? *Cognition* 8:

417- 459.

Frazier, Lyn and Janet Dean Fodor. (1978) The sausage machine: A new two-stage parsing model. *Cognition* 6: 291-325.

Frazier, Lyn and Keith Rayner.(1982) Making and correcting errors during sentence comprehension: eye movements in the analysis of structurally ambiguous sentences. *Cognitive Psychology* 14: 178-210.

Gass, Susan. (1983) Language transfer and universal grammatical relations. In: Susan M. Gass and Larry Selinker (eds.) *Language transfer in language learning,* 69-82. Rowley: Newbury House Publishers.

Gibson, Edward. (1998) Linguistic complexity: locality of syntactic dependencies. *Cognition* 68: 1-76.

Hawkins, John A. (1999) Processing complexity and filler-gap dependencies across grammars. *Language* 75: 244-285.

Izumi, Shinichi. (2002) Output, input enhancement, and the noticing hypothesis: an experimental study on ESL relativization. *Sudies in Second Language Acquisition* 24: 541-577.

Izumi, Shinichi. (2003) Processing difficulty in comprehension and production of relative clauses by learners of English as a second language. *Language learning* 53: 285-323.

Jackendoff, Ray. (1975) Morphological and semantic regularities in the lexicon. *Language* 51: 639-671.

Jackendoff, Ray. (1987) The status of thematic relations in linguistic theory. *Linguistic Inquiry* 18: 369-411.

Sinclair, John et al.(eds.). (1987) *Collins COBUILD English Language Dictionary*. William Collins Sons & Co Ltd.

Keenan, Edward. L. and Bernard Comrie. (1977) Noun phrase accessibility and Universal Grammar. *Linguistic Inquiry*8: 63-99.

Kimball, John. (1973) Seven principles of surface structure parsing in natural language. *Cognition* 2: 15-47.

Klein, Elaine C. (1995) Evidence for a 'wild' L2 grammar: when PPs rear their empty heads. *Applied Linguistics* 16: 87-117.

Lewis, Richard L. (1996) Interference in short-term memory: The magical number two (or three) in sentence processing. *Journal of Psycholinguistic Research* 25: 93-115.

MacWhinney, Brian. (1987) The Competition Model. In: Brian MacWhinney (ed.) *Mechanisms of language acquisition,* 249-308. Hillsdale: Lawrence Erlbaum Associates Publishers.

Morimoto, Satoshi and Kaoru Horie. (2009). Japanese learners' construal of English relative clauses: A processing typological account. In: Vicky Man (ed.) *Selected papers from the 2007 annual research forum of the linguistic society of Hong Kong*, 95-107.

Newmeyer, Frederick J. (2000) *Language form and language function*. The MIT Press.

Ozeki, Hitomi and Yasuhiro Shirai. (2007) The consequences of variation in the acquisition of relative clauses: An analysis of longitudinal production data from five Japanese children. In: Yoshiko Matsumoto, David Y. Oshima, Orrin W. Robinson and Peter Sells (eds.). *Diversity in language: Perspectives and implications*. CSLI Publications.

Primus, Beatrice. (1999) *Cases and thematic roles*: *ergative, accusative and active.* Tubingen: Max Niemeyer Verlag.

Rutherford, William E. (1983) Language typology and language transfer. In: Susan M. Gass and Larry Selinker (eds.) *Language transfer in language learning*, 358-370. Rowley: Newbury house publishers.

Sheldon, Amy. (1974) On the role of parallel function in the acquisition of relative clauses in English. *Journal of Verbal Learning and Verbal Behavior* 13: 272-281.

Tavakolian, Susan L. (1981) The conjoined-clause analysis of relative clauses. In: Susan L.Tavakolian (ed.) *Language acquisition and linguistic theory*, 167-187. Cambridge: The MIT Press.

The Ministry of Education, Culture, Sports, Science, and Technology (文部科学省). (1999) *The course of study for Senior High School* (高等学校学習指導要領)

Tomlin, Russell S. (1986) *Basic word order: Functional principles*. London: Croom Helm.

Trueswell, John C, Michael K. Tanenhaus and Susan M. Garnsey. (1994) Semantic influences on parsing: Use of thematic role information in syntactic ambiguity resolution. *Journal of Memory and Language* 33: 285-318.

Wang, Luming, Kaoru Horie, and Prashant Pardeshi. (2009) Toward a functional typology of noun modifying constructions in Japanese and Chinese: A corpus-based account. In: Shunji Inagaki et al. (eds.) *Studies in Language Sciences* 8: 213-228. Tokyo: Kuroshio Publishers.

Works written in Japanese

木村恵、金谷憲. (2006) 「英語の句構造にする日本人中学生の理解度調査：「導入」から「定着」までの時差を特定する試み」『関東甲信越英語教育学会紀要』第20号: 101-112) (Kimura, Megumi and Ken Kanatani. (2006) An investigation of Japanese Junior High School students' comprehension of the structures of English phrases: An attempt to determine the length between the time of teaching and acquisition. *Kantoukoushinetsu eigokyouikugakkai kiyou dai* 20 *gou*:101-112)

諏訪部真、小森忠、中村安男、西沢照夫、堀内一穂、吉沢邦夫、和田宏一. (1980) 「誤答分析の実際 —中学３年生の主語把握(Ⅱ) — 」『中部地区英語教育学会紀要』第 10 号: 15 - 20 . (Suwabe, Makoto, Tadashi Komori, Yasuo Nakamura, Teruo Nishizawa, Kazuho Horiuchi, Kunio Yoshizawa and Koichi Wada. (1980) A practice in error analysis: Under- standing of subjecthood by 3rd grade junior high school students (II)). *Chubuchiku Eigokyouiku Gakkai Kiyou dai* 10 *gou*: 15-20.)

Authorized English text books in Japanese junior high schools

Columbus 21 English course 3. (2006) Tokyo: Mitsumuratosho.

New crown English series 3. (2006) Tokyo: Sanseido.

New horizon English course 3. (2006) Tokyo: Tokyoshoseki.

One world English Course 3 (2006) Tokyo: Kyoiku Shuppan

Sunshine English course 3. (2002) Tokyo: Kairyudo.

Total English 3. (2008) Tokyo: Gakkoutosho.

Appendix 1: Critical items for Experiment 1 and 2

SS

(1) The boy (that / wore / kicked / a cap / the ball)　*wear-wore-worn　～を身につける

They boy / that wore a cap kicked the ball.

(2) The girl (the man / that / had / long hair / spoke to)

The girl / that had long hair spoke to the man.

(3) The woman (a baby / the bus / that / held / got on)

The woman / that had a baby got on the bus.

SO

(4)　The tree (Tom / fell on / that / cut down / Mike)

The tree / that Tom cut down fell on Mike.

(5) The words (hurt / said / John / that / Mary)　*hurt-hurt-hurt ～を傷つける

The words / that John said hurt Mary.

(6) *cart 荷車

*slope　坂*roll　転がる

The cart (the slope / pushed / the woman / that / rolled down) *roll　転がる

The cart / that the woman pushed roled down the slope.

OS

(7)*sandbag サンドバッグ　　*hang-hung-hung　ぶら下がる

John (that / kicked / from the tree / the sandbag / hung down)

John / kicked the sandbag that hung down from the tree.

(8) Yuko (wiped / that / stood / in the park / the statue) *wipe ぬぐう　* statue 銅像

Yuko / wiped the statue that stood in the park.

(9) The girl (on the river bank / picked / the flowers / grew / that) *river bank 河原

The girl / picke the flowers that grew on the bank.

OO

(10).*erase ~を消す

Daisuke (Suzan / erased / saw / the chalkboard / that)　*chalkboard 黒板

Daisuke / erased the chalkboard that Suzan saw.

(11) Bill (grew / sold / that / Mary / the vegetables)

Bill sold the vegetables that Mary grew.

(12) Mary (that / Bob / cooked / the spaghetti / liked)

Mary liked the spaghetti that Bob cooked.

Experiment 2

SS-A

(1) The nurse that took care of John　ア. and started a business.　*business　事業
イ. started a business.

(2) The teacher that scolded the boy　ア. and met the principal.　*scold　～をしかる
イ. met the principal.　*principal　校長

SS-B

(3) The man that looked into the binocular　ア. found a tiger.　*binocular 双眼鏡
イ. and found a tiger.

(4) The man that needed money　ア. stole the purse.　*steal-stole-stolen 盗む/　*purse　財布
イ. and stole the purse.

SO-A

(5) The bird that John caught　ア. laid eggs.　*lay-laid-laid ～を産む
イ. and laid eggs.

(6) The dog that John kept　ア. barked at Mary.　*barked at ～にほえる
イ. and barked at Mary.

SO-B

(7) The money that John stole　ア. and got to the boss.　*steal-stole-stolen 盗む
イ. got to the boss.

(8) The books that John read　ア. supported Obama.　*Obama 米国の大統領候補者
イ. and supported Obama.

OS-A

(9) John watched　ア. the volcano that bore a child.　*volcano 火山 *bear-bore-borne～を産む
イ. the volcano that caused earthquakes.　*cause～を引き起こす

(10) The hunter shot　ア. the rabbit that had long ears.　*hunter　猟師
イ. the rabbit that ate mice.　*mouse（単）－mice（副）ねずみ

OS-B

(11) The child got on　ア. the truck that wanted candies.　*candies　お菓子
イ. the truck that brought candies.　*truck トラック

(12) The girl went into　ア. the shop that sold cigarettes.
イ. the shop that ate some cakes.

OO-C

(13) John checked　　ア. the water that the music washed.　　*check ～を調べる

イ. the water that the cows drank.

(14) Cathy ate　　ア. the fish that Ms.Clinton grilled.　　*grilled ～を焼く

イ. the fish that the mountain cooked.

OO-D

(15) Steve wanted　　ア. the money that the daughter hid.

イ. the money that the daughter visited .

(16) John heard　　ア. the rumor that Mary hated.　　*rumor うわさ

イ. the rumor that Tom beat.　　*beat-beat-beaten なぐる

Appendix 2: Results of Experiment 1

	1	2	3		4	5	6		7	8	9		10	11	12	
	SS	SS	SS	SS	SO	SO	SO	SO	OS	OS	OS	OS	OO	OO	OO	OO
student																
No.1	1	1	1	3	1	1	0	2	1	1	1	3	1	1	1	3
No.2	0	0	0	0	0	0	0	0	0	1	1	2	1	1	1	3
No.3	1	0	0	1	0	0	0	0	0	0	1	1	0	0	1	1
No.4	1	0	0	1	1	1	1	3	1	1	1	3	1	1	1	3
No.5	0	1	0	1	1	1	0	2	1	1	0	2	1	1	1	3
No.6	1	1	1	3	1	1	0	2	1	1	1	3	0	0	1	1
No.7	0	1	1	2	1	1	1	3	1	1	1	3	1	1	1	3
No.8	1	1	1	3	1	1	0	2	1	1	1	3	1	1	1	3
No.9	1	1	1	3	1	1	0	2	1	1	1	3	1	1	1	3
No.10	1	1	1	3	1	1	1	3	1	1	1	3	1	1	1	3
No.11	0	1	0	1	0	0	0	0	1	1	1	3	1	1	1	3
No.12	0	0	0	0	0	1	0	1	1	1	1	3	1	1	1	3
No.13	1	1	1	3	1	0	1	2	1	1	1	3	1	1	1	3
No.14	1	1	1	3	1	0	1	2	1	1	1	3	1	1	1	3
No.15	1	1	1	3	1	1	1	3	1	1	1	3	1	1	1	3
No.16	0	1	0	1	1	0	0	1	1	0	0	1	1	0	0	1
No.17	1	1	1	3	1	1	1	3	1	1	1	3	1	1	1	3
No.18	1	1	1	3	1	1	0	2	1	1	1	3	1	1	1	3
No.19	1	1	1	3	1	1	1	3	1	1	1	3	1	1	1	3
No.20	1	1	1	3	1	1	1	3	1	1	1	3	1	1	1	3
No.21	1	1	1	3	1	1	1	3	1	1	1	3	1	1	1	3
No.22	1	0	0	1	0	0	0	0	1	1	1	3	1	1	0	2
No.23	1	1	1	3	1	0	1	2	1	1	1	3	0	1	1	2
No.24	1	1	1	3	1	1	1	3	1	1	1	3	1	1	1	3
No.25	1	0	1	2	1	1	1	3	1	1	1	3	1	1	1	3
No.26	1	1	1	3	1	1	1	3	1	1	1	3	1	1	1	3
No.27	1	1	1	3	1	1	1	3	1	1	1	3	1	1	1	3
No.28	1	1	1	3	1	1	0	2	1	1	1	3	1	1	1	3
No.29	1	1	1	3	0	0	1	1	1	1	1	3	1	1	1	3
	23	23	21	67	23	20	16	59	27	27	27	81	26	26	27	79

Appendix 3: Results of Experiment 2, part 1

	1	2		3	4		5	6		7	8	
	SS:A	SS:A	SS:A	SS:B	SS:B	SS:B	SO:A	SO:A	SO:	SO:B	SO:B	SO:B
student												
No.1	1	1	2	1	1	2	1	1	2	1	1	2
No.2	0	1	1	0	0	0	0	0	0	0	1	1
No.3	1	1	2	0	1	1	1	0	1	0	1	1
No.4	1	1	2	1	1	2	1	0	1	1	0	1
No.5	1	1	2	1	1	2	1	1	2	1	1	2
No.6	1	1	2	1	0	1	1	1	2	1	1	2
No.7	1	1	2	1	0	1	1	1	2	0	1	1
No.8	1	1	2	1	1	2	1	1	2	1	1	2
No.9	1	1	2	1	1	2	1	1	2	1	1	2
No.10	1	1	2	0	1	1	1	0	1	1	1	2
No.11	1	1	2	0	0	0	0	1	1	0	0	0
No.12	1	1	2	0	1	1	1	1	2	1	1	2
No.13	1	1	2	1	0	1	1	1	2	1	1	2
No.14	1	1	2	1	1	2	1	1	2	1	1	2
No.15	1	1	2	1	1	2	1	1	2	1	1	2
No.16	1	1	2	0	1	1	1	1	2	1	0	1
No.17	1	1	2	1	1	2	1	1	2	1	1	2
No.18	1	1	2	1	0	1	1	1	2	1	1	2
No.19	1	1	2	0	1	1	1	1	2	1	1	2
No.20	1	1	2	1	1	2	1	1	2	1	1	2
No.21	1	1	2	1	1	2	1	1	2	1	1	2
No.22	1	1	2	1	0	1	1	0	1	1	0	1
No.23	0	1	1	0	0	0	1	1	2	1	1	2
No.24	1	1	2	1	0	1	1	1	2	1	1	2
No.25	1	1	2	1	1	2	1	1	2	1	1	2
No.26	1	1	2	1	0	1	1	1	2	1	1	2
No.27	1	1	2	1	0	1	1	1	2	1	1	2
No.28	1	0	1	1	1	2	1	1	2	0	1	1
No.29	1	1	2	1	1	2	1	1	2	1	1	2
	27	28	55	21	18	39	27	24	51	24	25	49

Appendix 3: Results of Experiment 2, part 2

	9	10		11	12		13	14		15	16	
	OS:A	OS:A	OS:	OS:B	OS:B	OS:B	OO:C	OO:C	OO:	OO:D	OO:D	OO:
student												
No.1	1	1	2	1	1	2	1	1	2	1	0	1
No.2	1	1	2	1	1	2	1	1	2	0	0	0
No.3	1	1	2	0	0	0	1	1	2	0	0	0
No.4	1	0	1	1	1	2	1	1	2	0	1	1
No.5	1	1	2	1	1	2	1	1	2	1	0	1
No.6	1	0	1	0	1	1	1	1	2	0	1	1
No.7	1	1	2	1	1	2	1	1	2	1	0	1
No.8	1	1	2	1	1	2	1	1	2	1	0	1
No.9	1	1	2	1	1	2	1	1	2	1	1	2
No.10	1	1	2	1	1	2	1	1	2	1	0	1
No.11	1	1	2	1	1	2	1	1	2	0	1	1
No.12	1	1	2	1	1	2	1	1	2	1	1	2
No.13	1	1	2	1	1	2	1	1	2	1	1	2
No.14	1	1	2	0	1	1	1	1	2	1	0	1
No.15	1	1	2	1	1	2	1	1	2	0	0	0
No.16	1	1	2	0	0	0	1	1	2	0	1	1
No.17	1	1	2	1	1	2	1	1	2	1	1	2
No.18	1	1	2	1	1	2	1	1	2	1	1	2
No.19	1	1	2	1	1	2	1	1	2	0	0	0
No.20	1	1	2	1	0	1	1	1	2	1	1	2
No.21	1	1	2	1	1	2	1	1	2	1	0	1
No.22	1	0	1	0	0	0	1	0	1	1	1	2
No.23	1	1	2	1	1	2	1	1	2	1	1	2
No.24	1	1	2	1	1	2	1	1	2	1	0	1
No.25	1	1	2	1	0	1	1	1	2	1	0	1
No.26	1	1	2	1	1	2	1	1	2	1	0	1
No.27	1	1	2	1	1	2	1	1	2	1	0	1
No.28	1	1	2	1	0	1	1	1	2	1	0	1
No.29	1	1	2	1	1	2	1	1	2	0	0	0
	29	26	55	24	23	47	29	28	57	20	12	32

Appendix 4 All test items of Experiment 1 and 2.

英文法の習熟度に関するアンケート

学生番号　　お名前

1. 次の質問にお答えください。

A. 現在の年齢をお書きください。（　　）歳

B. 海外居住経験について以下の質問にお答えください。選択肢には○をつけてください。

(1) 外国に２ヶ月以上滞在したことが（ ある / ない ）

(2) (1)で「ある」と答えられた方は、以下の質問にお答えください。

(3) 滞在された国はどこですか。（国名　　）

(4) どのくらいの期間滞在されましたか。（　　）年（　　）か月間。

(5) そのとき何歳でしたか。（　　）歳から（　　）歳まで。

(6) そのとき通っていた学校は、

（ 現地の人々の学校 / 日本人学校 / その他（　　））

****

2.

① （　　）内の語句を並べ替えて、絵の内容を**過去の**出来事として表す英文を完成してください。

② （　　）内では、文頭に来る語も小文字で示してあります。

③ 解答欄には(　　) 内の語句だけを書いてください。

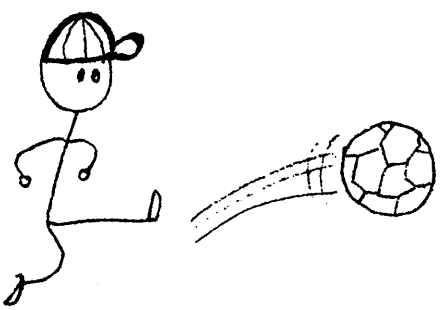
④ 配布された青のボールペンで記入してください。書き直すときは二重線で訂正してください。

(1)

(hard / be / to)

Kentaro studied _____ a doctor.

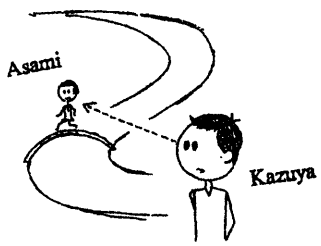
(2)
SS



(that / wore / kicked / a cap / the ball)　*wear-wore-worn　～を身につける

They boy _____ .

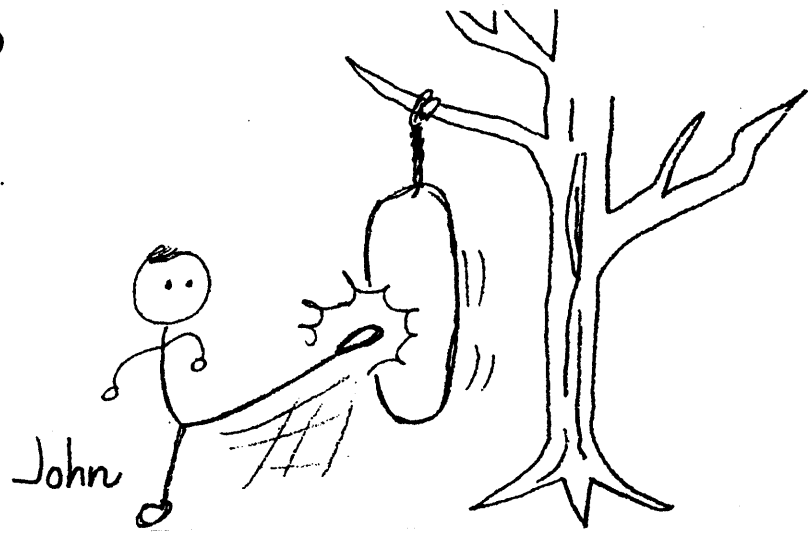
(3)



(saw / Asami / crossing)

Kazuya _____ the bridge.

(4)
OS



(that / kicked / from the tree / the sandbag / hung down)

*sandbag サンドバッグ　*hang-hung-hung　ぶら下がる

John _____

_____.

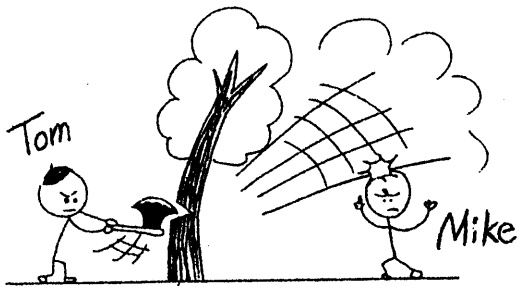
(5)

(Kaori / heard / sing)

Makoto _____ .

★裏へ進んでください

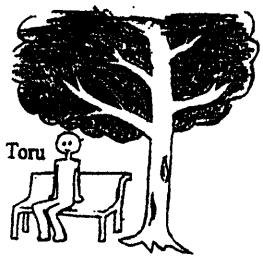
(6)
SO



(Tom / fell on / that / cut down / Mike)

The tree _____.

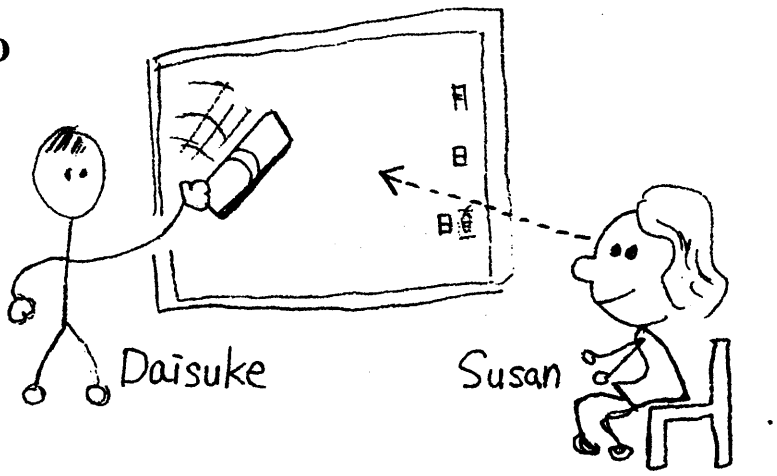
(7)



(on / was / sitting)

Toru _____ the bench under the tree.

(8)
OO

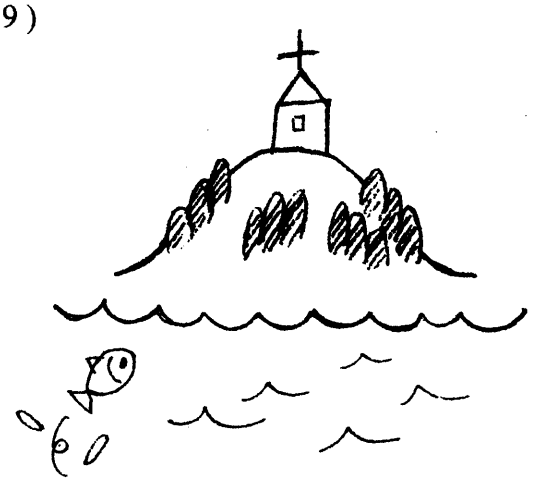


*erase ~を消す

(Suzan / erased / saw / the chalkboard / that) *chalkboard 黒板

Daisuke _____.

(9)



(the hill / on / near)

There was a church _____ the sea.

(10)

SS

(the man / that / had / long hair / spoke to)

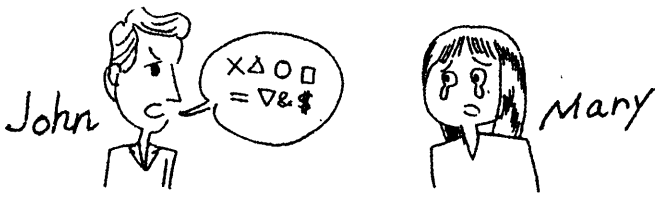
The girl _____.

(11)

(was / to / difficult)

It _____ speak English.

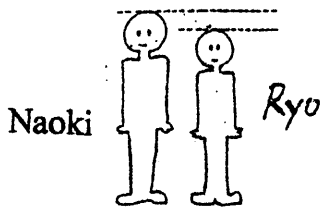
(12)
SO



(hurt / said / John / that / Mary)　*hurt-hurt-hurt ～を傷つける

The words _____ .

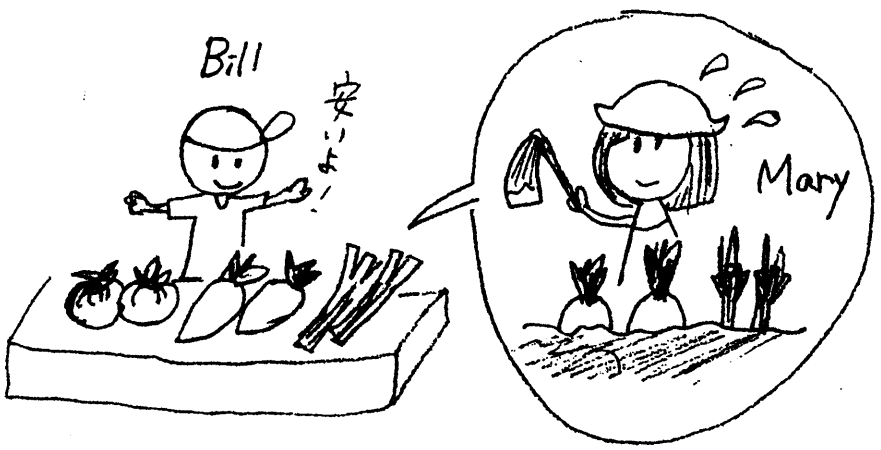
(13)



(than / was / taller)

Naoki _____ Ryo.

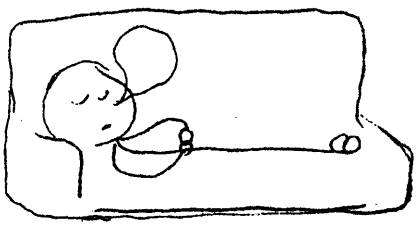
(14)
OO



(grew / sold / that / Mary / the vegetables)

Bill _____ .

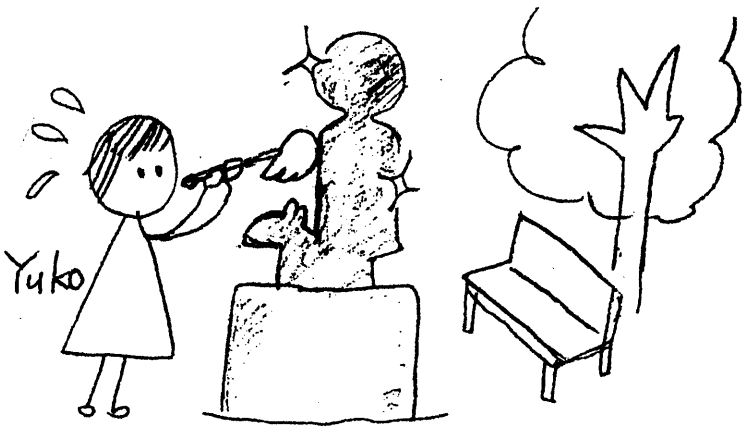
(15)



(was / on / sleeping / the sofa)

George _____.

(16)
OS



(wiped / that / stood / in the park / the statue) *wipe ぬぐう * statue 銅像

Yuko _____.

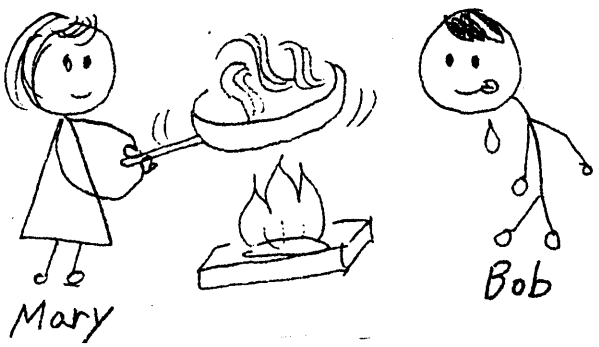
(17)

(reading / was / a book)

Hanako _____ in the library.

★裏へ進んでください

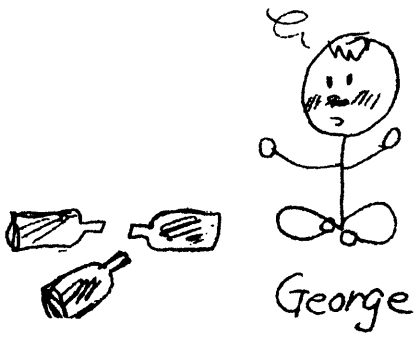
(18)
OO



(that / Bob / cooked / the spaghetti / liked)

Mary _____ .

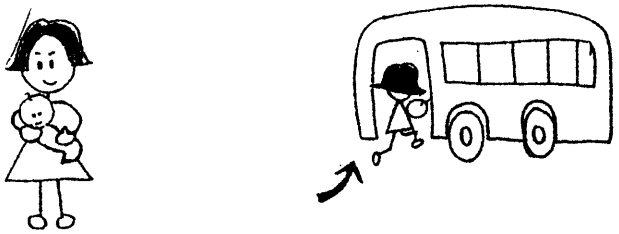
(19)



(bottles / drank / three / of beer)

George _____.

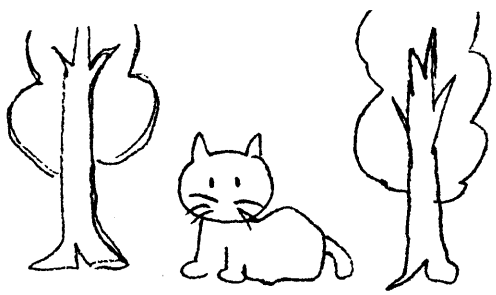
(20)
SS



(a baby / the bus / that / held / got on)

The woman _____.

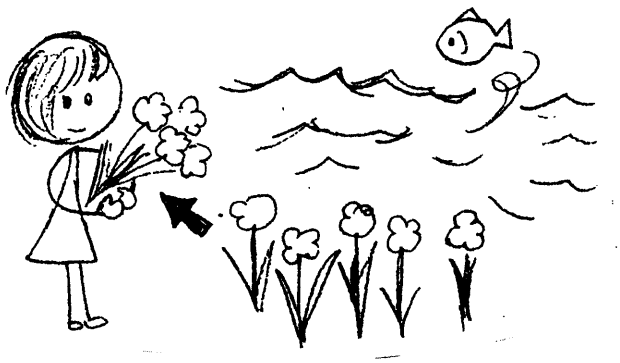
(21)



(a cat / was / the trees / between)

There _____.

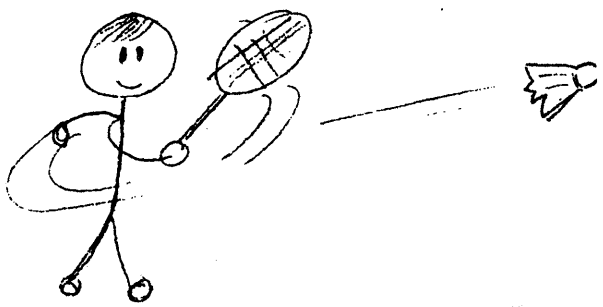
(22)
OS



(on the river bank / picked / the flowers / grew / that) *river bank 河原

The girl _____.

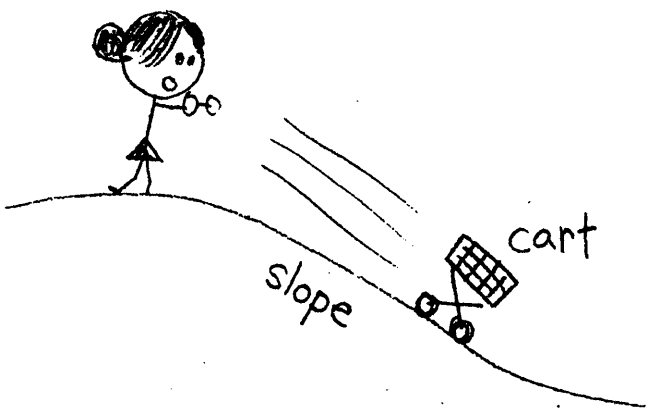
(23)



(badminton / was / playing)

The boy _____.

(24)
SO



*cart 荷車
*slope 坂

(the slope / pushed / the woman / that / rolled down) *roll 転がる

The cart _____

_____.

3. 英語として正しいと思う方の記号に○をつけてください。

ペアを成す２個のうち、必ず１つは正しく、一つは誤りです。

「誤り」とは

＊文法的に間違っている場合：(誤)John swam got to the island.　(正) John swam **and** got to the island.

＊世の中の常識に明らかに反する場合：　(誤) Taro ate the cat.　(太郎は猫を食べた。)

●スペリングのことは、考えなくて良いです。

(1) John ate the beef { ア. and died. / イ. died.

(2) The man that looked into the binocular { ア. found a tiger. / イ. and found a tiger.　*binocular 双眼鏡
SS-B

(3) The boy sang the song { ア. and the girl played the piano. / イ.the girl played the piano.

(4) The nurse that took care of John { ア. and started a business. / イ. started a business.　*business 事業
SS-A

(5) Mr. Edward brought a boy { ア. introduced him to us. / イ.and introduced him to us.

(6) The lightning struck { ア. the horse that carried a bell. / イ. the horse that read many books.　*lightning 稲妻

(7) Bob walked { ア. and / イ.with } the old woman that cooked breakfast.

(8) The tree that John planted { ア. and grew 10 m. / イ. grew 10 m.

(9) Susan cried { ア. for / イ.and } the nurse came.

(10) The child got on { ア. the truck that wanted candies. / イ. the truck that brought candies.　*candies お菓子　*truck トラック
OS-B

(11) Hanako turned off the radio { ア. and left home. / イ. left home.

(12) John checked { ア. the water that the music washed. / イ. the water that the cows drank. } **OO-C**　*check ～を調べる

(13) George put on his hat { ア. said goodbye. / イ. and said goodbye. }

(14) The money that John stole { ア. and got to the boss. / イ. got to the boss. } **SO-B**　*steal-stole-stolen 盗む

(15) Emi swam { ア. and / イ. from } her brother on the shore.

(16) Steve wanted { ア. the money that the daughter hid. / イ. the money that the daughter visited . } **OO-D**

(17) The girl said goodbye { ア. that / イ. and } got on the train.

(18) The girl that knew the secret { ア.and spoke about it. / イ. spoke about it. }　*secret 秘密

(19) Julia ran { ア. to / イ. and } John stood by the gate.

(20) The girl went into { ア. the shop that sold cigarettes. / イ. the shop that ate some cakes. } **OS-B**

(21) The car ran over a cat { ア. crashed into the house. / イ. and crashed into the house. }

(22) The books that John read { ア. supported Obama. / イ. and supported Obama. } **SO-B**　*Obama 米国の大統領候補者

(23) Jiro opened the door { ア. and / イ. without } said hello.

(24) John watched { ア. the volcano that bore a child. / イ. the volcano that caused earthquakes. } **OS-A**　*volcano 火山 *bear-bore-borne～を産む *cause～を引き起こす

★裏へ進んでください

(25) Paul smiled { ア. and / イ. at } Kate.

(26) The woman that voted for Obama { ア. made a speech. / イ. and made a speech. } *Obama 米国の大統領候補者

(27) The ball flew over the fence { ア. and broke the window. / イ. broke the window. }

(28) The bird that John caught { ア. laid eggs. / イ. and laid eggs. } *lay-laid-laid ～を産む
SO-A

(29) Mr.Goodman visited Kyoto { ア. and ate sukiyaki. / イ. ate sukiyaki. }

(30) John heard { ア. the rumor that Mary hated. / イ. the rumor that Tom beat. } *rumor うわさ *beat-beat-beaten なぐる
OO-D

(31) The girl played the piano { ア. got the first prize. / イ. and got the first prize. }

(32) Cathy ate { ア. the fish that Ms.Clinton grilled. / イ. the fish that the mountain cooked. } *grilled ～を焼く
OO-C

(33) Liz liked the musician { ア. went to his concert. / イ. and went to his concert. }

(34) Bob watched { ア. the program that the car bought. / イ. the program that Madonna liked. }

(35) Hanako came { ア. for / イ. and } singing karaoke.

(36) Andrew sold { ア. the houses that the computer boiled. / イ. the houses that Mr.White built. } *boil ～をゆでる

(37) Kate danced with the girl { ア. in / イ. that } played the piano.

(38) The hunter shot { ア. the rabbit that had long ears. *hunter 猟師
OS-A イ. the rabbit that ate mice. *mouse (単) −mice (副) ねずみ

(39) Paul washed the dishes { ア. that / イ. and } Mike cleaned the room.

(40) The man that needed money { ア. stole the purse. *steal-stole-stolen 盗む/ *purse 財布
SS-B イ. and stole the purse.

(41) Natalie worked { ア. for / イ. from } the man.

(42) Napoleon attacked { ア. the castle that walked into the city. *castle 城
イ. the castle that looked over the city. *look over ～を見下ろす

(43) John bought a car { ア. that / イ. and } Nancy sold.

(44) The letters that John wrote { ア. and relieved Mary. *relieve ～を安心させる
イ. relieved Mary.

(45) The woman made a dress { ア. gave it to Mary.
イ. and gave it to Mary.

(46) The dog that John kept { ア. barked at Mary. *barked at ～にほえる
SO-A イ. and barked at Mary.

(47) The student studied hard { ア. and became a doctor.
イ. became a doctor.

(48) The teacher that scolded the boy { ア. and met the principal. *scold ～をしかる
SS-A イ. met the principal. *principal 校長

ご協力ありがとうございました

Publications

森本智、堀江薫 (2007)「日本人英語学習者による英語の関係節習得:主文動詞句の処理能率の観点から」池上嘉彦、他編『日本認知言語学会論文集』第7巻:12-22. (Morimoto, Satoshi and Kaoru Horie. (2007) (The acquisition of English relative clauses by Japanese EFL learners: In view of the processing efficiency of matrix verb phrase. In: Yoshihiko Ikegami et al. (eds.) *Proceedings of the seventh annual meeting of the Japanese cognitive linguistics association*.)

堀江薫、森本智 (2007)「言語学名著再読 - 15、グリーンバーグ『言語の普遍法則』」大修館編、『言語』2007年3月号: 100-105. (Horie, Kaoru and Satoshi Morimoto. (2007) Review of masterpieces of linguistics: 15, Greenberg's *Universals of language*. *Gengo* 36, 3: 100-105)

Morimoto, Satoshi and Kaoru Horie. (2009). Japanese learners' construal of English relative clauses: A processing typological account. In: Vicky Man (ed.) *Selected papers from the 2007 annual research forum of the linguistic society of Hong Kong*, 95-107.

森本智、堀江薫 (2009)「日本人英語学習者の英語関係節習得:後置修飾の処理に必要な方策の解明とその教授法」原口庄輔、他編『日本英語学会第26回大会 (筑波大学) 研究発表論文集』181-188. (Morimoto, Satoshi and Kaoru Horie. (2009) Japanese learners' acquisition of English relative clauses: Strategies needed for postpositive modification and pedagogy. In: Shosuke Haraguchi et al. (eds.) *Papers from the twenty-sixth conference of the English Linguistic Society of Japan*)