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**Processing empty subjects in Japanese: Implications for the
transparency hypothesis**

Sakamoto, Tsutomu, Ph.D.

City University of New York, 1991

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PROCESSING EMPTY SUBJECTS IN JAPANESE:
IMPLICATIONS FOR THE TRANSPARENCY HYPOTHESIS

by

TSUTOMU SAKAMOTO

A dissertation submitted to the Graduate Faculty in
Linguistics in partial fulfillment of the requirements for the
degree of Doctor of Philosophy, The City University of New
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1991

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Abstract

PROCESSING EMPTY SUBJECTS IN JAPANESE: IMPLICATIONS FOR THE TRANSPARENCY HYPOTHESIS

by

Tsutomu Sakamoto

Adviser: Professor Janet Dean Fodor

This thesis concerns how "transparent" the relation is between the parser and the grammar with respect to filler-gap associations. Some previous research has argued for non-transparency, but this would be an unwelcome finding which should not be accepted without further investigation. If non-transparency is correct, it would invalidate a whole line of psycholinguistic research in which the representations assigned to sentences by the parser are taken as revealing the representations assigned to sentences by the mental grammar.

Transparency is not necessarily threatened by processing strategies which are applied when the input is ambiguous and the grammar provides no relevant information. However, a processing strategy which denies available grammatical information is non-transparent. It has been proposed by some researchers that the processor for English does not accept an empty category as the filler (controller) for another empty category (the Lexical Filler Only

hypothesis, or LFO). Since the grammar of English does permit empty category fillers, LFO would be a non-transparent strategy.

LFO is not supported by the experiments reported here on gap-filling in control constructions in Japanese. Because Japanese is a verb-final language, an empty subject in a subordinate clause will be encountered by the processor before it encounters a verb which carries information that determines the controller of the empty category. The experimental results on Japanese processing reported here show a constant preference for object control in both the Subject-Object word order, and the Object-Subject word order. On the standard assumption that scrambling of word order leaves a trace, this consistency of object controller preference suggests that the trace is recognized by the processor as a legitimate controller.

Alternative explanations are considered (e.g. a preference for GOAL controllers), but these also are compatible with the transparency hypothesis. The findings for English can also be explained on the assumption of transparency, and universal processing strategies.

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CHAPTER 1

Introduction

One of the most controversial and interesting issues in recent psycholinguistic research is how a parser fills a gap, that is, how it assigns an interpretation to a syntactic constituent which is phonetically null. The present thesis concerns how "transparent" the relation is between the parser and the grammar with respect to filler-gap associations. Berwick and Weinberg (1984) characterize "transparency" as "the condition that the logical organization of rules and structures incorporated in a grammar be mirrored rather exactly in the organization of the parsing mechanism" (p.39).¹ Thus, the question raised here is how the parser use (or does not use) grammatical information in filling a gap.

An interesting claim is made by Frazier, Clifton, and Randall (1983, henceforth FCR) and Clifton and Frazier (1986, henceforth CF). They argue that the application of control information (which determines the "controller" of the empty subject of the subordinate clause: the main clause

subject or the main clause object; see Section 4.1) by the parser is delayed relative to the application of structural information, and that during this delay (Neither FCR nor CF say how long the delay is; this is 'an open question' according to FCR (p.217).) the "Most Recent Filler Strategy" (henceforth MRFS) applies. This strategy picks up a potential filler nearest to a gap. Furthermore, it is implied that the parser does not recognize a gap as a possible filler for another gap. Consider the following examples:

- (1) Everyone liked the woman who_i the little child_j started [PRO_j to sing those stupid French songs for trace_i last Christmas].
- (2) Everyone liked the woman who_i the little child forced trace_i [PRO_j to sing those stupid French songs last Christmas].

When we process these sentences by filling these gaps (trace and PRO)², we comprehend that the person who is understood as singing is the little child in (1) and the woman in (2). FCR/CF call a sentence like (1) a "Recent Filler" sentence, and a sentence like (2) a "Distant Filler" sentence, since the little child is closer to the empty subject (PRO) than woman (or the relative who) is.³ Henceforth, these two types of sentence are referred to as a RF and a DF sentence respectively.

The experimental results by FCR/CF (which is presented

in Section 2.1) showed that (2) required more processing time than (1). They explained this findings using MRFS: since the most recent lexical filler the little child selected for PRO by this strategy turns out to be an incorrect filler in (2), as the parser subsequently recognizes, when the delayed control information is eventually applied, or when the end of the sentence disambiguates it, as the reflexive does in (3) below.

(3) This is the girl_i who_i John_j persuaded trace_i [PRO_i to wash herself_i every day].

Note that if MRFS recognized the trace as a filler for the empty subject (PRO), the prediction would be that (2) should not be difficult to process, because the trace (which is coindexed with the woman via the relative pronoun "no") is the correct filler for PRO in this case.

To summarize: FCR and CF made the following three claims for English (see Section 2.1 for more detailed discussion).

(4) Three Hypotheses proposed by FCR/CF

- (i) Control information is delayed in processing.
- (ii) MRFS applies during the delay.
- (iii) The parser does not know that an empty category can be the antecedent for PRO.

All three of these assumptions are crucial to the explanation that FCR/CF give for their experimental findings: RF sentences were always processed faster than DF sentences. Hypothesis (iii) is tacitly presupposed, not discussed. We could refer to (iii) as the "Lexical Fillers Only" (LFO) hypothesis. Contrary to this hypothesis, an alternative hypothesis would claim that the parser knows that an empty category also can be the antecedent for PRO. This alternative hypothesis could be referred to as the "Empty Fillers Also" (EFA) hypothesis. Note that since Universal Grammar and the grammar of English do allow an empty category to be the antecedent of PRO, an LFO parser exhibits a non-transparent relationship (in this respect) with the grammar; an EFA parser would be transparent.

Whether or not (i) and (ii) are correct is a matter of secondary concern for the purposes of this dissertation. Our primary interest is in (iii): the LFO hypothesis, which is a matter of serious concern to theoretical psycholinguistics, because of the fact that it implies a non-transparent relationship between the parser and the mental grammar. If non-transparency is correct, it would mean that conclusions about the properties of the grammar could not be drawn from observations about processing. Thus, FCR/CF's adoption of LFO to account for their experimental results threatens to invalidate a whole line of psycholinguistic research in which the representations

assigned to sentences by the parser are taken as revealing the representations assigned to sentences by the mental grammar. (For a recent example, see Bever and McElree, 1988.)

The FCR/CF account assuming LFO is not the only one compatible with the FCR/CF data. Alternative accounts have been given by Crain and Fodor (1985), Ford and Dalrymple (1988), Fodor (1988), and Nicol (1988), which do not have this unwelcome non-transparency consequence. Although these studies show that the FCR/CF explanation assuming (i)-(iii) need not be the correct one, there is very little evidence so far that it actually is false.

A useful step in evaluating (iii) is to de-couple it from (i), which is not known to be true independently of the FCR/CF research whose interpretation is disputed. This can be done in a verb-final language such as Japanese, because there the word order is sufficient to insure that the processor encounters the empty subject (PRO) before encountering the information that determines its controller.

See Kuno (1973) for typological characteristics of the structure of Japanese. Kuno lists some features of Japanese contrasting to those of English: word order (i.e. Japanese as an SOV Language); the optionality of the subject, object, and other elements in the sentence; polite and honorific expressions; the adversity passive; and others. Nakayama (1988) emphasizes five characteristics of Japanese: Head-

last word order; Case particles; WH in situ; Scrambling; and Empty Pronouns. See Shibatani (1990, especially Chapter 11) for more on this topic.

For Japanese, in a sentence with "S - O - [PRO V] - V" order, MRFS predicts a parsing preference for object controllers. Then, if the object is fronted, to give "O_i - S - trace_i - [PRO V] - V", the combination of MRFS and LFO predicts a parsing preference for a subject controller, since the subject is the most recent lexical filler for PRO. Note that if we assume that object fronting leaves no trace (see Section 4.3), it is again predicted by MRFS that the subject is the preferred controller. Thus, a shift in response from object preference to subject preference, as the constituent order is changed, is crucial for the FCR/CF hypotheses.

In fact, the data on Japanese processing that I will present in this dissertation show a constant preference for object control. One cannot immediately conclude from this that LFO is false, but it can be concluded that either MRFS or LFO is false. Hence, to the extent that it is legitimate to generalize about parsing across languages, it can be concluded that the FCR/CF account of the English results is not correct.⁴

If it is LFO that is false, the FCR/CF threat to transparency between the parser and the grammar is eliminated: an empty category (trace) can be a possible

filler, and the processor knows that this is so. Now, consider the possibility that MRFS is false. For example, the parser's strategy in cases of temporary ambiguity might be to favor an object controller regardless of its position, or to favor a subject in all cases, or some thematic role such as THEME, GOAL, or etc. Then, there is no reason to assume LFO. FCR/CF needed to assume LFO only in order to explain why, if the parser favors recent fillers for PRO, it has trouble with constructions like (2) above where the most recent filler (trace) is correct. If there is no recency preference, then there is nothing that needs to be explained away by appeal to LFO.

In short: on the basis of the Japanese results to be presented here, it can be argued that either LFO is false, or MRFS is false and there is no reason to think LFO is true. Either way, transparency is defended (at least for the present) from the threat to it posed by the FCR/CF experiments on English. This does not mean that transparency is true, but it recommends itself on methodological grounds, so presumably we should continue to assume it until there is some good reason not to.

The general organization of this thesis is as follows: In Chapter 2, we will discuss the psycholinguistic background to the three hypotheses proposed by FCR/CF. In Section 2.1, we consider some problems related to MRFS. In

Section 2.2, we will consider some previous discussions of the data presented by FCR/CF. Section 2.3 will point out the possibility of a more fruitful way of examining MRFS and LFO, by using Japanese as the target language.

In Chapter 3, we will present our experiments on filler-gap relations in Japanese. A pre-test and a pilot study established the basis for the subsequent main experiments. Experiment 1 was designed to test whether the MRFS effect can be observed in Japanese control sentences. The sentences in this experiment have the basic "Subject - Object - Verb" order and embedded sentences nominalized by a nominalizer koto. Consider the following example:

- (5) Taroo-ga Hanako-ni [PRO Tookyoo-e iku] koto-o
 -NOM -DAT Tokyo-LOC go fact-ACC
 susumeta.
 recommended
 'Taroo recommended Hanako the fact that PRO goes to
 Tokyo.'

Here, the whole embedded clause 'PRO Tookyoo-e iku' is nominalized by adding the nominalizer koto.

The experimental sentences in Experiment 2 have the same word order as those in Experiment 1, but have nominal expressions. Consider the following example:

- (6) Taroo-ga Hanako-ni [PRO Tookyoo iki]-o susumeta.
 -NOM -DAT going-ACC recommended
 'Taroo recommended Hanako PRO going to Tokyo.'

Here, 'ik-i' (going) is a deverbal nominal which is derived from the verb 'ik-u' (to go). Morphologically, 'ik-' is the verb stem, and '-i' and '-u' are suffixes indicating 'nominal' and 'non-past tense' respectively. Both the 'nominalized expression' and the 'nominal' are the direct objects (marked with the particle -o) of the main verb susumeta (recommended) in the above examples.

Experiment 3 used sentences with the opposite word order, i.e. Object-Subject, in nominals of the same type as those in Experiment 2 (e.g. 'Hanako_i-ni Taroo-ga trace_i [PRO Tookyoo iki]-o susumeta.' (To Hanako, Taroo recommended PRO going to Tokyo.)). Some follow-up tests were conducted to resolve some issues of interpretation of the results of these main experiments.

Together, the results of these experiments seem to rule out, for Japanese, the FCR/CF account of how MRFS applies in English. If we can assume that the parser for English and the parser for Japanese do not differ with respect to such fundamental characteristics as LFO versus EFA (though they may perhaps differ with respect to low level strategies), then this suggests that the FCR/CF account is not plausible for English either. Some alternative explanations for the English results are considered.

Chapter 4 concerns theoretical linguistic aspects of the issue. Section 4.1 is an introduction to the idea of empty category. Section 4.2 is devoted to discussion of

empty subjects in Japanese. In Section 4.3, we will discuss trace in Japanese 'scrambling' constructions. The discussions in this chapter are mainly based on the Government and Binding (GB) framework (see Chomsky 1981). This is not because other theoretical frameworks such as GPSG or LFG are not worth considering, but because a common ground is needed to discuss the psycholinguistic problem, and GB theory serves as a common base for much current linguistic research.

Footnotes to Chapter 1

1. This is a definition for "type transparency" between types of grammar and parser rules. On the other hand, "token transparency" concerns the relation between rules of the grammar-parser pair. Here, we use the term "transparency" to mean "type transparency".

The issue of transparency is related to the distinction between competence and performance. See also the "Strong Competence Hypothesis" of Bresnan and Kaplan (1982): "the competence hypothesis postulates an isomorphic relationship between the different knowledge components and is thus the strongest and simplest hypothesis that one could adopt" (p.xix).

2. trace is a trace of the fronted element the girl via the relative pronoun who. Thus, this is called a WH-trace.

PRO is an empty subject of the infinitival clause. See Chomsky's (1982) "Extended Projection Principle". In the theories of Generalized Phrase Structure Grammar (GPSG) and Lexical Functional Grammar (LFG), the phonetically null subject (PRO) is not postulated. A semantic rule is assumed to determine the interpretation of the "missing subject". See Bresnan (1982) and Gazdar, Klein, Pullum, and Sag (1985) for detailed discussion of this issue.

3. I shall continue to use the FCR/CF terminology ('Distant Filler' and 'Recent Filler') to refer to these sentences, but it should be noted that this terminology presupposes an analysis that I take issue with in the discussion that follows. See also Fodor (1988, p.146, Footnote 21).

4. On the issue of the universality of the parsing mechanism, see Frazier (1987), Frazier and Rayner (1988), Hawkins (1990), and Inoue (1991).

CHAPTER 2

Psycholinguistic Background

In this chapter, we survey various arguments concerning the three hypotheses proposed by FCR/CF (see (4) on p.3). Section 2.1 introduces the concept of MRFS, and points out some problems concerning it. In Section 2.2, we examine previous discussions of the FCR/CF data. In Section 2.3, we discuss the testability of MRFS with delayed control information in Japanese.

2.1 Most Recent Filler Strategy (MRFS)

In FCR's Experiment 1, subjects were instructed to read sentences presented one word at a time on a CRT screen. At the end of the sentence, subjects were required to answer whether they understood the sentence ("got it") or whether they had to go back and re-read it ("missed it"). Reaction Time (RT) and the percentage of successful understanding were computed. A sample of the experimental sentences is shown below (see FCR p.203).

- (1) Recent Filler, Ambiguous
 Everyone liked the woman who_i the little child_j
 begged [PRO_i to sing those stupid French songs for
trace_i last Christmas].
- (2) Recent Filler, Unambiguous
 Everyone liked the woman who_i the little child_j
 started [PRO_i to sing those stupid French songs for
trace_i last Christmas].
- (3) Distant Filler, Ambiguous
 Everyone liked the woman who_i the little child begged
trace_i [PRO_i to sing those stupid French songs last
 Christmas].
- (4) Distant Filler, Unambiguous
 Everyone liked the woman who_i the little child forced
trace_i [PRO_i to sing those stupid French songs last
 Christmas].

FCR examined three other types: (i) the relative pronoun who is omitted, (ii) the final phrase last Christmas is omitted, and (iii) both of them are omitted. In all four types, the results showed that DF (Distant Filler) sentences such as (3) and (4) above require longer processing time and have a lower percentage of successful understanding than RF (Recent Filler) sentences such as (1) and (2) above. This is true for sentences containing both ambiguous and unambiguous matrix verbs. The overall results can be shown as follows (see FCR p.203):

(5) Table 1: Overall difference between RF and DF sentences in FCR Experiment 1

Sentence Type	RT(msec.)	"got it" responses
DF	1165	66 %
RF	1071	78 %
Difference	94	-12 %
p-value	p<0.05	p<0.01

FCR claim that the human processing system employs the "Most Recent Filler Strategy" (MRFS), which is stated as follows (p.196):

- (6) MRFS: During language comprehension a detected gap is initially and quickly taken to be co-indexed with the most recent potential filler.

Because of this strategy, RF sentences such as (3) and (4) are claimed to be harder to comprehend than DF sentences such as (1) and (2) above. MRFS assigns the recent filler the child to the gap after the verb begged in both (1) and (3). The second gap after for in (1) will be filled with the remaining possible filler, i.e. who (associated with the relative head the woman). The parser has no difficulty in processing this sentence. But (3), on the contrary, is difficult. At the end of the sentence, (3) has no gap to be filled with the potential filler who (and the relative head the woman). Thus, the parser must go back to the gap

position after begged and cancel the recent filler, so that the distant filler can fit there. This error-and-correction process ("garden path") is claimed to be the cause of the longer processing time in (3) than in (1).

FCR imply that MRFS applies only when the parser does not have reliable information about the correct filler for a gap. But they argue that control information carried by a verb is delayed, so MRFS applies until the control information becomes accessible. If control information preceded MRFS, there would be no difference of processing time in the unambiguous sentences such as (2) and (4) above. The control property of the verb started requires that the empty subject of the subordinate clause be interpreted as coreferential with the subject of the matrix clause, the child, and the control property of the verb forced demands that the empty subject of the subordinate clause should be interpreted as being coreferential with the object of the matrix clause, a trace coindexed with the woman. Thus, the control properties of these verbs could have uniquely determined the possible filler for the gap in the embedded clause.

FCR's experimental findings, contrary to the above prediction, showed that constructions such as (4), i.e. unambiguous DF, require longer processing time than constructions such as (2), i.e. unambiguous RF. Furthermore, this complexity difference is comparable in

size to the difference between temporarily ambiguous constructions such as (1) and (3). Consider the following table (cf. FCR p.204):

(7) Table 2: RT differences of Ambiguous and Unambiguous sentences in FCR Experiment 1 (% of correct response is in the parenthesis)

	DF	RF	DF - RF
Ambiguous	1174 (63%)	1073 (77%)	101 (-14%)
Unambiguous	1155 (69%)	1068 (78%)	87 (-9%)
Ambiguity effect (Amb - Unamb)	19 (-6%)	5 (-1%)	14 (-5%)

It will be clear that the ambiguity effect (i.e., the difference between ambiguous constructions and unambiguous constructions) is rather small. (For discussion of this point, see Fodor (1988) which is reviewed in Section 2.2.3.) Thus, FCR propose that "the unambiguous sentences act as if they are ambiguous because they are effectively ambiguous due to the delayed use of semantic control information" (p.211). They conclude that "readers use control information only after they have applied the Most Recent Filler strategy" (p.205).

A question arises concerning the extent of influence of MRFS. Does it precede access of all information in the grammar about empty categories: their existence as well as the determination of their antecedents? If the parser does

assign the analysis that FCR assume to sentence (4), then it seems to be ignoring subcategorization information, because there must be two gaps after the verb forced: one for a direct object of the verb and one for the subject of the subordinate clause. But FCR assume only one gap between forced and to. Thus, for FCR, subcategorization information apparently has to be suppressed in applying MRFS.

CF give a different explanation from FCR concerning the gaps in (4).¹ They say, "We do assume that verb subcategorization information is consulted early in sentence comprehension ... , and thus that a verb such as forced will be understood as requiring a direct object" (p.213). Therefore, CF present an example comparable to (4) as follows:

- (8) (=CF's (2b))
 That's the girl that the woman had forced ___ ___ to
 sing last Christmas.

First, a gap is postulated after the verb forced, because this transitive verb requires an object. Then, another gap is postulated at the position preceding to sing by a general assumption that every clause has its own grammatical subject even if it is non-overt (this is the "Extended Projection Principle"; see Chomsky, 1982, p.10). Thus, there are two gaps postulated, and these will need two fillers.

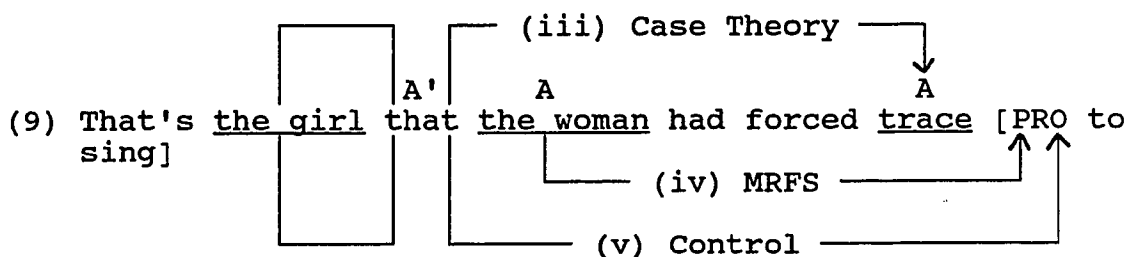
Suppose that, because of MRFS, the most recent filler the woman is assigned to the first gap. However, CF say that "the object gap is in an argument position that must receive case marking (Chomsky, 1981). Such gaps can take as fillers only NPs in nonargument position, which in our sentences amounts to the relative pronoun or the head of the relative clause" (p.213). Owing to this Case Theory information, CF assume that the parser can reject this filler assignment and can assign the more distant but correct filler which is in a non-argument position, i.e. the girl.²

CF apparently assume that, after this assignment of the correct filler to the first gap, MRFS assigns the most recent filler the woman to the second gap.³ This assignment is incorrect. Eventually, control information is consulted to correct this mis-assignment of MRFS, but the temporary error will have made the processing of this sentence difficult. Thus, control information is supposed to be delayed in processing (8). Therefore, the parsing operations proposed by CF seem to be as follows:⁴

- (i) Use subcategorization information to detect an object gap.
- (ii) Use a general syntactic assumption to reveal a subject gap.

- (iii) Consult Case Theory to establish the filler for the first gap.
- (iv) Apply MRFS to select a filler for the second gap (incorrect) in (8).
- (v) Use control information to revise filling of the second gap.

Let us represent the operations assumed by CF in a schematic way as follows (where A = Argument, A' = Non-Argument):⁵



However, it appears that there are some linguistic flaws in this analysis. First, the real controller for PRO should be the trace. This trace is a gap whose filler is the relative pronoun that, which is coindexed with the girl. If the relative pronoun that directly controls PRO, as is shown in (9), it contradicts one of the characteristic properties of the control relation; the controller must be the subject or object of the next higher clause (see Section 4.1 for more detailed discussion of control). Consider the following example from Manzini (1983):

- (10) (=Manzini's (18))
 *Mary_i said that John asked Bill [_s PRO_i to behave herself]].

As can be seen in the above sentence, the NP Mary, which is not in the next higher clause above PRO, cannot be a controller. Thus, the relative pronoun that in (9) cannot control PRO, because this pronoun is not an argument in the next higher clause above PRO. Then, the only potential controllers are the woman and the trace. Thus in step (v) which results in correct filling of the PRO, we must assume, contrary to CF, that the trace is assigned as the filler for PRO.

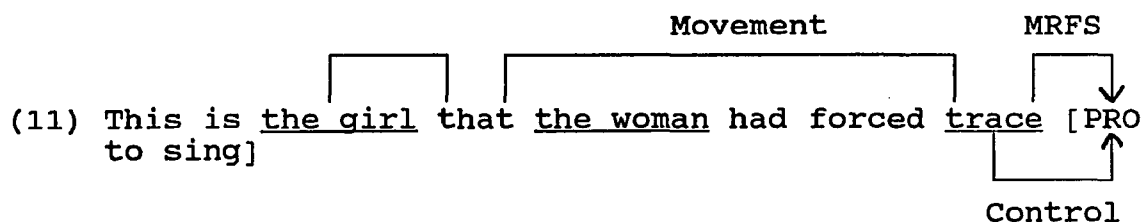
The second point we should notice is that the "most recent filler" for PRO should be the trace, not the woman. The trace, as can be seen from the representation in (9), immediately precedes PRO; no other NP is closer to PRO. Nevertheless, MRFS seems to ignore the trace as a potential filler. One explanation is LFO (Lexical Filler Only); only a lexical filler can serve as a filler. But another explanation for this might be that the trace is not perceptually salient, because it is phonetically null (empty). FCR assume that MRFS "is itself just a special case of a more general strategy of assigning the most salient potential filler to a gap" (p.187). Recency is, of course, considered as the "most powerful variable affecting salience" (p.219). FCR argue that the relative pronoun is

also one of the variables which makes a filler more salient, because the effect of DF versus RF sentences is reduced when the relative pronoun is present (differences between DF and RF were 49 msec of RT and 6% of 'got it' response) compare to when it is not present (differences were 140 msec and 16%). That is, FCR assume that the effect of MRFS is somewhat masked, since the 'distinct' filler is more salient in both DF and RF sentences when the relative pronoun is present.

If the parser 'thinks' that salience is linguistically relevant to identification of an antecedent, then this 'salience hypothesis' is a matter of concern, since it would constitute transparency between the parser and the grammar. However, a more natural construal of the salience hypothesis is that it is merely related to a performance problem (see Fodor (1988) that is reviewed in Section 2.2.3). That is, the parser, knowing that empty categories can be antecedents, finds it difficult to spot them because of their low salience. Then, the salience hypothesis offers a perfectly adequate reconciliation of the processing difficulty of the force-type sentences and the transparency of parser and grammar. LFO is not needed. And notice that then there is no need to posit MRFS, since it merely predicts the same as grammatical information does (in English, for all verbs except those like promise, which have not been experimentally tested). Since FCR/CF do claim that

their data require assumption of MRFS, we can conclude that they did not intend any such 'performance problem' version of LFO. But it might nonetheless be correct.

Considering the discussions above, the correct representation of (9) should be as follows:



Both MRFS and control information tell us that the trace is the real filler for PRO. Therefore, there should be no difficulty for the parser in filling the gap, if the parser uses grammatical information correctly, and if MRFS takes a trace as a filler.

The fact that these sentences are difficult to process therefore cannot be explained by a delay of control information and MRFS, unless the parser is unaware of the basic fact that empty categories can be antecedents for other empty categories. At least on GB assumptions, a long-distance WH-dependency cannot be processed without positing a trace in each intermediate COMP position (see Berwick and Weinberg, 1985). CF admit that WH-dependencies are processed accurately, and all the data support this. But this means that the human parser does know that a gap can be

a filler for a WH-trace. So the FCR/CF hypothesis for PRO becomes quite ad hoc: the parser does not know that an empty category can be the controller for PRO. Other explanations for the difficulty of these sentences have been proposed, and will be discussed in the following subsection.

Which of these two representations ((9) or (11)) is the one that the human parser actually computes? To assume (9) is to accept non-transparency, because the parser ignores the grammatical information that a trace can be a filler. On the contrary, if we can prove that the trace is the filler for the gap as is represented in (11), the transparency hypothesis will be defended from the attack based on LFO.

Remember that the FCR/CF argument consisted of three hypotheses; (i) verb control information is delayed, (ii) during this delay MRFS applies, and (iii) an empty category (trace) is not recognized as a possible filler in applying MRFS. What we are really interested in is the interaction of (ii) and (iii). But in the FCR/CF experiments, the evidence for (ii) and (iii) is bound up with the assumption of (i), for which there is no independent evidence. If (i) were false, the interpretation of the data as support for (ii) and (iii) would crumble. So we would like to test (ii) and (iii) independently of (i). There is no way in English of doing so, because the control information carried by the verb precedes a PRO gap. If the control information were

not delayed, there would be no opportunity for MRFS to apply. In Section 2.3, we will discuss how MRFS can be tested in Japanese, in which a verb is located at the end of a sentence. There is no need to rely on an unconfirmed assumption of (i) in Japanese. Whether (i) is true or false, verb control information is not available until after the PRO gap, and so there is clearly an opportunity for MRFS to apply if it is going to.

2.2 Discussions of MRFS

In this section, we will examine four studies critical of the FCR/CF proposals: Crain and Fodor (1985), Ford and Dalrymple (1988), Fodor (1988), and Nicol (1988).

2.2.1 Crain and Fodor

Crain and Fodor (1985) present some reasons for doubting the validity of FCR's explanation of the data. The Crain and Fodor paper was a response to an early version of the FCR paper which implied that MRFS governs the filling of WH-trace. Crain and Fodor wanted to establish that WH-trace is correctly filled by reference to grammatical information, without reliance on a heuristic strategy. However, the evidence they presented for this is also relevant to evaluation of the later CF version of the FCR proposal, in which it applies only to PRO, not to WH-trace.

Crain and Fodor emphasize the difference in the number of gaps between RF sentences and DF sentences at the crucial position after the matrix verb.⁶ That is, while RF sentences contain only one gap after the main verb, DF sentences contain two gaps after the main verb. Consider the example (9), which is reproduced below:

(12) This is the girl that the woman had forced ___ ___ to sing last Christmas.

In the above example, the processor must find and fill two gaps in close succession. Crain and Fodor claim that this double gap configuration imposes significant demands on the parser, especially because the two gap filling operations are not independent. The parser must detect the first gap and fill it with the appropriate antecedent, and then must detect the second gap and fill it with a filler (=the first gap) that immediately precedes the second gap. Thus, Crain and Fodor's parser recognizes the gap as a filler. This explanation of the difficulty of the double gap construction opposes to the FCR/CF's LFO hypothesis.

Crain and Fodor conducted an experiment using materials similar to FCR's but using WH-questions instead of relative constructions. As in FCR, four patterns of experimental sentences were constructed, i.e. ambiguous RF and DF

questions, and unambiguous RF and DF questions. The declarative counterparts of these questions were used as control sentences, so that differences in plausibility or lexical accessibility between sentences could be factored out of the results, to give a clearer view of the effects of the different filler-gap patterns. A sample of the experimental sentences is shown below (NP stands for those stupid French songs, and PP stands for last Christmas):

- (13)a. (=Crain and Fodor's (21): unambiguous RF)
Who could [the little child] have started ___ to sing
NP for ___ PP?
- b. (=Crain and Fodor's (23): declarative control)
[The little child] could have started ___ to sing NP
for Cheryl PP.
- (14)a. (=Crain and Fodor's (22): unambiguous DF)
Who could the little child have forced ___ ___ to sing
NP for Cheryl PP?
- b. (=Crain and Fodor's (24): declarative control)
The little child could have forced us ___ to sing
NP for Cheryl PP.
- (15)a. (=Crain and Fodor's (25): ambiguous RF)
Who could [the little child] have begged ___ to sing
NP for ___ PP?
- b. (=Crain and Fodor's (27): declarative control)
[The little child] could have begged ___ to sing NP
for Cheryl PP.
- (16)a. (=Crain and Fodor's (26): ambiguous DF)
Who could the little child have begged ___ ___ to sing
NP for Cheryl PP?
- b. (=Crain and Fodor's (28): declarative control)
The little child could have begged us ___ to sing NP
for Cheryl PP.

In the questions ((a) sentences), Crain and Fodor refer to two gap positions; the early and late positions. The former is immediately after the main verb, and the latter is after the preposition for in the subordinate clause. Thus, DF questions contain two gaps at the early position and have no gap but the noun phrase Cheryl at the late position (see (14a) and (16a)). RF questions have one gap at the early position and one at the late position (see (13a) and (15a)). Crain and Fodor's experiments employed a self-paced word-by-word reading task.

The FCR/CF hypothesis claims that the grammatical information relevant to the gap-filling procedure is temporarily ignored so that a Recent Filler analysis (i.e., MRFS) applies in all cases. This predicts that both the unambiguous DF question (14a) and the ambiguous DF question (16a) should be processed in the same way at the early gap position, and both should be processed as easily as RF questions at that position. Furthermore, at the late gap position, both unambiguous and ambiguous DF questions should be more difficult than RF questions, since the late gap position in a DF question actually contain a lexical NP Cheryl that will force the parser to go back and revise its analysis.

Contrary to the above predictions, the results of the experiment showed that at the early gap position, the unambiguous DF questions were significantly harder than the

ambiguous DF questions. At the late gap position, the ambiguous DF questions were significantly harder than their corresponding declarative sentences, but the unambiguous DF questions were not significantly harder than their corresponding declarative sentences. From these experimental findings, Crain and Fodor concluded that there was a garden path at the early gap position only in the ambiguous DF questions, not in the unambiguous ones. In the unambiguous DF questions, the two successive gaps at the early gap position were correctly identified and filled. Thus, the grammatical information that disambiguates the unambiguous questions was apparently accessible to the parser.

To summarize: the Crain and Fodor experimental findings showed that, compared to the ambiguous DF question, the unambiguous DF question was difficult to process at the early gap position, and easy to process at the late gap position. Crain and Fodor claim that the plausible explanation is that grammatical information was being used to establish the sequence of two adjacent gaps at the early gap position and to fill them correctly. As a possible reason for the processing difficulty of DF sentences relative to RF sentences, even when unambiguous, they point to the sequence of two gaps in the DF sentence. (In the system of GPSG, as Crain and Fodor mention, the difference is between no gap in the RF sentences and one gap in the DF

sentences.) They note that (i) the phrase marker is locally more complex on the DF analysis, (ii) the semantic processing load could be greater at the early gap position for the DF analysis than the RF analysis if there is little or no delay between syntactic processing and semantic processing. They argue that MRFS exists only as an ambiguity resolution strategy for ambiguous sentences, where the grammar fails to provide relevant information about the relation between fillers and gaps.

2.2.2 Ford and Dalrymple

Ford and Dalrymple (1988) also doubt whether the data presented by FCR really lead to the conclusion that verb control information is initially ignored by the parser. FCR claim that the effect of the RF construction is the same for both ambiguous and unambiguous verbs, and likewise for the DF construction, because the unambiguous cases are effectively ambiguous due to delay in the use of verb control information. Ford and Dalrymple argue that only when subcategorization information is ignored by the parser, is it possible for the parser to analyze unambiguous cases in the same way as ambiguous cases. There is evidence that subcategorization information is not delayed in processing (see Clifton, Frazier and Connine, 1984 and Tanenhaus, Stowe and Carlson, 1985, though see Mitchell, 1987). Therefore, Ford and Dalrymple argue that it is not tenable to claim

that ambiguous and unambiguous cases are treated in the same way by the parser, and that then there are no grounds for claiming that verb control information is delayed.

Considering the above problems, Ford and Dalrymple propose an alternative explanation which does not assume the delay of control information. That is, they claim that the Subject control form of verbs is preferred over non-Subject control forms. What they call the "Subject control form of verb" is a case in which the subject of the infinitival clause is identical with the subject of the main clause (see (17) and (19) below). The "non-Subject form" means that the subject of the infinitival clause is identical with something other than the subject of the main clause (the trace that is the main clause object in this case, see (18) and (20) below). Ford and Dalrymple give the following representations, for the sentences used in FCR's experiment (Ford and Dalrymple's (13), (14), (15), and (16) respectively). The marked gap in all cases is a WH-trace. There is no PRO-gap in accord with a GPSG analysis (see Footnote 2 in Chapter 1).

- (17) Subject control
 I liked the woman; who the girl begged to sing those songs for ____.
 (Semantics: Subject of to sing is the same as the Subject of begged)

- (18) non-Subject control
 I liked the woman, who the girl begged ____, to sing those songs.
 (Semantics: Subject of to sing is the same as the Object of begged)
- (19) Subject control
 I liked the woman, who the girl started to sing those songs for ____.
 (Semantics: Subject of to sing is the same as the Subject of started)
- (20) non-Subject control
 I liked the woman, who the girl forced ____, to sing those songs.
 (Semantics: Subject of to sing is the same as the Object of forced)

All of FCR's RF cases are Subject control cases, predicted to show easier processing than FCR's DF cases which are non-Subject control cases. Ford and Dalrymple did not conduct their own experiment to support this claim, since it predicts just what FCR and Crain and Fodor found, i.e. greater difficulty for the so-called DF sentences.

Ford and Dalrymple do not explain why Subject control should be preferred over non-Subject control. But they suggest that in order to achieve Subject control in (20) the parser must construe the verb forced as passive (e.g. 'I liked the woman who the girl forced to sing those songs hated'), which conflicts with the active sentence structure being assigned. They state: "Since the sentence up to the point of the verb [forced] would presumably have been analyzed as active and not passive, the parser would probably not pursue a passive analysis using the Subject

control form, but the search for a Subject control form of the verb may increase processing time" (p.70).

Ford and Dalrymple's proposal predicts that force-type sentences should be difficult at the end of the sentence, since the passive interpretation of forced in (20) is acceptable until the period at the end shows it is wrong. Thus, their proposal is not compatible with Crain and Fodor's data indicating that the processing difficulty in the force sentence occurs right after the verb force, not at the end of the sentence (as it would if there were a garden path). Furthermore, a general preference for Subject control sentences makes it puzzling that English should contain so many Object control verbs like force and so few Subject control transitive verbs such as promise.

2.2.3 Fodor

Fodor (1988) argues that there could be five possible interpretations (Hypotheses A, B1, B2, C1, and C2) for the difficulty of processing unambiguous DF sentences.

Hypothesis A concerns "Delay of Subcategorization Information". The subcategorization error means that the parser omits the direct object of forced as is shown below:

- (21) (=Fodor's (8))
 This is the woman who_i the child_j forced [gap_j to speak].??!!

This subcategorization error inevitably causes a control error, since the subject of the matrix clause the child is the only possible filler for the empty subject of the embedded clause. Thus, we can learn nothing about how the parser deals with control information concerning the processing of unambiguous DF sentences. Fodor mentions, however, that if subcategorization information is temporarily ignored by the parser, Hypothesis A is a healthy competitor for any hypothesis concerning control information.

Hypotheses B1 and B2 involve "Delay of Case and Theta Theory Principles". In the following example, the error occurs in indexing of the WH-trace:

- (22) (=Fodor's (10))
 This is the woman who_i the child_j forced trace_j [PRO_i to speak].

Here, Fodor mentions that there are two possible versions of this error; hypothesis B1 and B2. Hypothesis B1 assumes that the trace has not been identified as a WH-trace by the parser, while Hypothesis B2 assumes that the trace has been identified as a WH-trace but simply misfilled.

The direct object position is governed by the main clause verb forced so that Case and Theta-role are assigned by this verb. An empty category with both Case and Theta-role must be a WH-trace, since an NP-trace and PRO cannot

have Case. Thus, if the parser failed to distinguish a WH-trace from other empty categories, it must have overlooked Case information.

If a WH-trace is recognized by the parser, then the filler can have neither Case nor Theta-role, because the WH-trace already has Case and Theta-role. Case and Theta-role assignment occur only once for each argument. Thus, the filler must be who which is in the pre-sentential COMP position. If the parser fails to assign this filler to the WH-trace, then the parser must have ignored Case and Theta Theory principles.

Fodor notes that both FCR and CF admit that the parser recognizes a WH-trace as such and that the only potential filler for the WH-trace is in COMP position. If the WH-trace is correctly filled by its proper antecedent, then the parser's error must concern PRO. The two versions of Hypothesis C concern "Delay of Principles of Government or of Control Information" which is related to the PRO error. Consider the following example:

- (23) (=Fodor's (11))
 This is the woman who_i the child_j forced trace_i [PRO_j to speak].

Here, PRO is incorrectly associated with the subject of the main clause. As the reason of this PRO error, Hypothesis C1 assumes that the parser may fail to distinguish between PRO

and NP-trace. Then, the parser would wrongly take the subject to be the filler, because the empty subject (NP-trace), in a construction such as "John seems to Mary [NP-trace to be rich]", is always related to the main clause subject. While PRO is ungoverned, NP-trace is governed. Then, if the parser fails to distinguish between PRO and NP-trace, it must have ignored government information. Fodor mentions that this government error is a PRO error, but it is not control error.

Hypothesis C2 assumes that PRO is recognized as such but it is misfilled. This hypothesis seems to be the most compatible with FCR/CF's claim that control information is delayed and MRFS is applied to select an incorrect filler. However, Fodor argues that the combination of these assumptions concerning control information and MRFS is inconsistent. Consider the following example:

(24) (=Fodor's (3) on P.138)
 This is the woman who_i the child forced trace_i [PRO_i to speak].

Here, MRFS must select the correct filler (i.e. the trace), because the most recent filler for PRO is the trace (see the discussions in Section 2.1). Thus, Fodor claims that if the parser makes a mistake, there must be a reason other than MRFS. What is a plausible candidate for this reason? Fodor suggests that the parser may overlook the object as a

possible filler because the object is an empty category. The grammar requires the existence of the empty filler as is shown in the above example. Thus, Fodor argues that postulating a parsing mechanism that does not admit the empty filler "would amount to giving up our general working hypothesis that the information about the language which the parser uses in making its decisions about input consists of the mental "competence" grammar" (p.147).

Fodor mentions that the parser may ignore empty categories as possible fillers because they are not salient as lexical fillers are. FCR/CF also argue that salience is an important factor for selection of fillers, and that recency is one of the most plausible salience factors. Fodor notes, "Perhaps empty categories are nonsalient in general, or perhaps the empty direct object of force in the DF construction is especially nonsalient because it is only just in the process of being assigned its own filler when it has to be used as filler for the PRO" (pp.147-8). However, these salience explanations assume that "the parser does the wrong thing even though it knows perfectly well what is the right thing to do" (p.148). Thus, Fodor claims that this salience-based version of Hypothesis C2 sheds no light on linguistic competence because the parser's error is regarded as a mere performance error.

Because of the existence of these alternative explanations of the data, Fodor notes that the delayed use

of control information is not positively proved, contrary to FCR/CF's claim. However, she is careful to point out that the opposite is not proved either: "nothing here proves that the parser does have immediate access to all information in the grammar" (p.149).

Furthermore, Fodor notes that the phenomenon that the DF sentences are harder to process than the corresponding RF sentences (this is called the "DF effect") may not be due to a garden path effect but to a complexity effect. A complexity rating experiment was conducted as a pilot study. A DF or RF question was presented and the "complexity of its meaning" was rated on 5-point scale. The results showed a persistent complexity in the DF sentences compared to the RF sentences. Fodor mentions three possible reasons for this result. The first possibility, which seems not so plausible, is that the DF sentences are not fully grammatical, because "it is conceivable that natural languages generally disfavor extraction of or from a nonfinal constituent" (p.152). However, concerning grammaticality judgments on FCR sentences, CF Experiment 2 showed that both unambiguous DF and RF sentences have the same acceptance rate (65%), so that Fodor considers that the unambiguous DF sentences are equally grammatical as the unambiguous RF sentences.

The second possibility is that the syntactic processing is hindered by the interaction of WH-movement and the

binding of PRO. The garden path explanation given under Hypothesis C2 says that the incorrect filler is assigned to PRO because the correct filler is not easily accessible to the parser. The complexity explanation assumes that the parser takes the extra trouble to find the correct filler.

The third possibility is that the interlocked filler-gap problem mentioned above afflicts the semantic processing instead of the syntactic processing. Fodor mentions there are two versions of this possibility. The first one is that this pattern of filler-gap relation complicates the derivation of a representation of meaning from the syntactic structure. The second is to consider that the difficulty does not just come from computing the meaning of the DF sentences but comes from representing its meaning.

Fodor presents the following table to consider the question whether the DF effect is really a garden path effect (see also Table 2 in Section 2.1).

(25) Table 3: Schematic Processing Difficulty Data
(=Fodor's Table I)

	DF	RF	DF effect (=DF-RF)
Ambiguous	a	b	x
Unambiguous	c	d	y
Ambiguity effect (=Ambig - Unambig)	v	w	z

Here, the DF effect for the ambiguous sentences (i.e., $x > 0$)

in the above table) is assumed to result from the usual garden path effect. This asymmetry of difficulty arises because the parser prefers one analysis (RF analysis in this case) over another (DF analysis in this case). Fodor argues that the interesting finding of the FCR/CF experiments is the DF effect for the unambiguous sentences (i.e., $y > 0$). FCR (pp. 207-8, p.211) claim that the DF effect is of equal size for the ambiguous and unambiguous sentences, thus that both DF effect have the same source, i.e., garden path. If this line of argument is correct, z must be zero because x is claimed to be the same as y : " $x - y = z = 0$ ".

Furthermore, the ambiguity effect for both the DF and RF sentences should be zero, since FCR claim that unambiguous sentences are effectively ambiguous due to the delayed use of control information: " $a - c = v = 0$ ", since " $a = b$ ", and " $b - d = w = 0$ ", since " $b = d$ ". However, Fodor argues that "the potentially informative combination of $v, w, z = 0$ that would support the garden path hypothesis is not clearly demonstrated by these (i.e., FCR/CF) experiments" (p.164).

Thus, it is not clear whether the DF effect for the unambiguous sentences (i.e., $y > 0$) is really due to a garden path. Even if it is, it still remains unclear whether the garden path is due to delayed access to grammatical information rather than to a temporal ambiguity of the structure (e.g. forced can be interpreted either as the past tense or as the past participle). Even if it is,

we still do not know which grammatical information is delayed, since there are (at least) five possible explanations (Hypotheses A, B1, B2, C1, and C2) as discussed above.

2.2.4 Nicol

Nicol (1988) does not challenge FCR's hypothesis that control information carried by a verb is delayed in processing a sentence. However, she argues that this does not make it plausible that the parser immediately assigns an antecedent (whether it is the correct one or not) to PRO, as MRFS claims it does.

Nicol assumes that a parser is responsible only for structure building necessary for syntactic analysis of a given sentence. She accepts a parsing strategy such as the "Late Closure" strategy, according to which a parser will try to incorporate as much material as possible into the current clause, rather than begin a new clause. This is supposed to be responsible for the garden path effect observed in the following example:

(26) While Mary was mending the socks fell on the floor.

Note that the "Late Closure" strategy predicts erroneous structure building by the parser.

Nicol claims that though the "Late Closure" strategy

may be useful to the parser, the parser does not need MRFS, because "determining the antecedent of PRO has no bearing on subsequent syntactic analysis" (p.41). Therefore, she proposes that the assignment of the antecedent for PRO need not occur immediately, although PRO is eventually identified later in processing.

In order to prove her point, Nicol conducted some experiments using an on-line technique called "cross-modal priming". This technique is called "cross-modal", because it requires a subject to listen to an auditorily presented sentence, and make a response (naming or lexical decision) to a visually presented letter string. For more details of this experimental technique, see Swinney, Onifer, Prather, and Hirshkowitz (1979). Consider the following examples and results from Nicol's Experiment 1 ([1], [2], and [3] are probe points, [3] is 300 msec. downstream from the point [2]; see Nicol p.25-26):

(27) That's the actress, that the dentist, from the new medical center in town

a) [1] had invited t_i PRO_i to [2] go to [3] the party.

DF:30

75*

57*

RF: 6

4

12

b) [1] had hesitated PRO_j to [2] go to [3] the party with t_j .

DF:12

71*

48

RF:28

36

21

The targets were words semantically associated with the actress and the dentist and control words matched in length

and frequency to these associates. It is considered that there is a priming effect when the average RT for associates is significantly faster than that for control words. And this priming effect is taken to indicate that there is "reactivation" of the previously appeared NP. The asterisk in the above examples indicates a significant reactivation effect.

The results show that there is no clear reactivation of the recent filler (the dentist), either in the DF sentence (27a) or in the RF sentence (27b). (We will soon talk about the problem why the incorrect filler (distant filler) is activated in (27b) at point [2].) In (27a), the distant filler (the actress) is the correct filler for PRO. The data show that the correct distant filler is reactivated at the probe point [2] and this reactivation continues to the point [3]. However, it is not clear whether this reactivation is really related to PRO, since the point [2] is preceded by the sequence of the two gaps (i.e. trace and PRO) and the distant filler is correct for both, as is pointed by Crain and Fodor (1985). In order to detach the PRO activation from the trace activation, Nicol used the following "active - passive" pair (the probe points [2] - [5] are respectively 500, 1000, 1200, and 1500 msec. downstream from the point[1]; see Nicol p.39-40):

(28)a. The actress invited the dentist_i from the new
 medical center in town PRO_i
 to [1] go to the pa[2]rty at the [3] mayor's [4] house [5].
 DF:21 0 28 24 31*
 RF:-10 15 37* 77* 6

b. The actress_i was invited by the dentist from the new
 medical center in town PRO_i
 to [1] go to the pa[2]rty at the [3] mayor's [4] house [5].
 DF:19 -8 29 32* 40*
 RF:19 31 48* 2 -3

Nicol argues that "the lack of significant priming for the first two probe points is clear evidence that PRO does not cause immediate reactivation of its antecedent" (p.40).

Thus, it can be assumed that the reactivation effect right after the "trace - PRO" combination in (27a) is caused by the reactivation of the antecedent of the trace.

Now, it has to be explained why priming of the distant filler was observed immediately after the PRO-gap in (27b) in which no trace-gap exists. This is a reactivation of an incorrect filler. If the verb subcategorization information is unavailable to the parser, then a trace-gap would be erroneously postulated so that the distant filler could be reactivated. However, Nicol proposes an alternative which is that "priming of the distant antecedent following intransitive verbs is entirely due to the subset of verbs which take inanimate noun phrase complements" (p.27). Two types of intransitive verbs were used in the experiment: (i) verbs which do not take NP complements; (ii) verbs which can take (usually) inanimate NP complements (thus, animate NPs

the actress and the dentist are unsuitable as the complements for these verbs). Nicol claims that the reactivation of the incorrect distant filler is due to the fact that the second type of verbs do actually subcategorize for a noun phrase. She points out that the priming effect was greater after the second type of intransitive verbs than the first type.

In (28) above, the recent filler was reactivated at the probe point [3], in both DF and RF constructions. In the RF sentence (28a), this RF reactivation continues to point [4] and changes to DF reactivation at point [5]. In the DF sentence (28b), the RF reactivation changes to DF reactivation at point [4] and this continues to point [5]. In either case, however, both recent and distant fillers are reactivated. Thus, Nicol states: "Consider again the differences between the pattern of reactivation for trace and PRO: immediate reactivation of the correct antecedent for trace; delayed reactivation of all previously mentioned referents for PRO" (p.47).

As a reason for the lack of immediate reactivation of the antecedent of PRO, Nicol points out the indeterminacy of the antecedent for PRO. Nicol claims that the antecedent of PRO cannot be syntactically determined, and even control information carried by a verb is unreliable.⁷ Therefore, the parser needs knowledge about more than syntactic

structure to determine the most appropriate candidate among all the possible antecedents. Nicol suggests that this knowledge may be related to a higher level of processes, perhaps "inferential processes". (See Section 4.1 on the nature of control.)

If a PRO-gap does not have to be filled immediately, unlike a trace-gap, there should be no difference of processing difficulty between RF and DF sentences. As a possible explanation for the finding by FCR, i.e. RF sentences are easier to process than DF sentences, Nicol points out that the stranded preposition (e.g. "...those songs for...") in RF sentences may facilitate comprehension of this type of sentence. She argues that this stranded preposition serves as a disambiguating cue that makes it clear what the role of the woman is in an RF sentence like "Everyone liked the woman_i who the little child_j begged PRO_j to sing those songs for t_i". Nicol assumes that the role assignment cue makes processing easier, because the final comprehension of a given sentence involves understanding of the roles played by NPs in that sentence. Since FCR's tasks were post-sentential, Nicol's point may be right. However, it predicts that the difficulty in DF sentences should occur late in the sentence, while Crain and Fodor's self-paced reading data suggested that for the unambiguous DF sentences the difficulty occurs at the early gap position.

Bever and McElree (1988) conducted an experiment

employing a probe recognition "priming" technique which is different from the "cross-modal priming" technique used in Nicol's experiments. Here, a sentence is presented on a CRT screen, one phrase at a time, each time the subject pushes the button. At the end of the sentence, a probe word appears on the screen. The subject is required to decide whether the probe word was contained in the sentence just presented. The time needed to answer the question was measured. The following five types of sentences were tested (Bever and McElree's (1) to (5)):

(29): Nonanaphor construction

The astute lawyer who faced the female judge hated the long speech during the trial.

(30): Pronoun construction

The astute lawyer who faced the female judge hoped he would speak during the trial.

(31): PRO construction

The astute lawyer who faced the female judge strongly hoped [PRO] to argue during the trial.

(32): NP-raising construction

The astute lawyer who faced the female judge was certain [e] to argue during the trial.

(33): Tough-movement construction

The astute lawyer was hard for the judge to control [e] during the very long trial.

The probe word was astute. The results are shown below:

(34) Results of Bever and McElree's Experiment 1

	RT (msec.)	Error Rate (%)
(i) Nonanaphor	1050	12
(ii) Pronoun	930	6
(iii) PRO	960	15
(iv) NP-raising	920	7
(v) <u>Tough</u> -movement	870	7

Bever and McElree claim that the pronoun he in (30) accesses its antecedent and refreshes the salience of the probe word contained in the antecedent NP. The results demonstrated that PRO has a longer reaction time and a higher error rate than traces (an NP-trace in (32), and a WH-trace in (33)).⁸ Bever and McElree argue that this difference is related to a difference in the formal properties of their relations to their antecedents. That is, while "movement traces are roots of chains with their antecedents as heads, in which the trace position defines the thematic role, and the phrase structure configuration of the sentence specifies the relation between the trace and its antecedent", "PRO is not in a chain with its antecedent, as reflected in the fact that the antecedent is assigned a thematic role by the matrix verb, whereas PRO itself is assigned a separate thematic role by the complement verb" (p.37). It is

claimed, thus, that traces have a tighter relation with their antecedents than PRO does, with respect to phrase structure construction and thematic relation, and hence that traces activate their antecedents more quickly and accurately than PRO does. Thus, Bever and McElree's experimental results accord with the Nicol's finding that the reactivation of PRO is slow and nonspecific.

2.2.5 Discussion

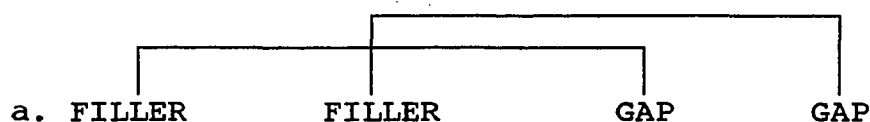
From the previous discussions, we can see that there is more than one coherent answer to the question whether control information is delayed or not, and the question whether MRFS exists or not. As for the first point, Crain and Fodor and Ford and Dalrymple argue that the experimental data do not force the conclusion that control information is delayed. However, Nicol's more recent data suggest that it might be. Fodor argues that even if some linguistic information is delayed, there are various possibilities concerning what kind of information is delayed. As for the second point, Crain and Fodor argue that MRFS does exist but only for ambiguous cases but not in unambiguous cases, while Nicol notes that her data showed no sign of any strategy for filling PRO, ambiguous or unambiguous, until a full second after the gap. Thus, there appears to be more than one possible account of the processing of control constructions in English, and the data do not clearly support the FCR/CF

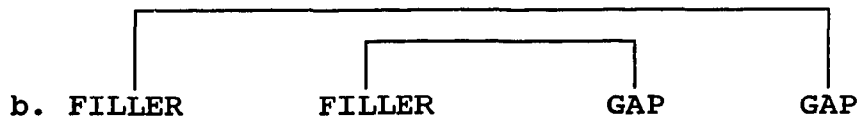
account.

Note that there is no way of examining MRFS and LFO (the claim that a gap cannot be a filler for PRO in English) independently of the issue of delayed accessibility of verb control information. In the following section, we consider the possibility of solving this dilemma by examining Japanese.

It is, of course, not necessarily true that the same parsing strategies are applied to all languages. For example, it would be possible that MRFS is applied in processing English because it is usually correct in English, since English happens to have very few subject control verbs that have objects. (Or, is it the case that there are few such verbs because of MRFS?) However, MRFS is claimed to be a natural strategy, because "there is linguistic evidence for the existence of a strategy of assigning the most recent filler to a gap" (FCR, p.194). One evidence is the "Nested Dependency Constraint": many languages place restrictions on intersecting filler-gap dependencies as in (35a) below but not on nested filler-gap dependencies as in (35b) below (cf. Fodor (1978)).

(35) (=FCR's (7))





FCR also claim that "developmental evidence exists for a strategy akin to the strategy of assigning the most recent filler to a gap" (p.195). Consider the following example:

(36) (=FCR's (9a))
 John promised Bill to grab the jewels.

Concerning this example, C. Chomsky (1969) has reported that young children systematically misinterpret Bill as the subject of to grab. FCR argue that this misinterpretation is caused by "the Minimum Distance Principle, in which the noun phrase nearest the complement verb is interpreted as its subject" (p.195).

As is discussed above, MRFS is proposed and motivated by FCR/CF as a very general strategy. Therefore it would be expected to apply equally in all languages. If it is false for Japanese, this will be a reason for caution in assuming it for English.

2.3 Testability of MRFS in Japanese

Let us consider some further examples of control in English:

(37) John_i promised Mary_j [PRO_{i/*j} to go to Tokyo].

(38) John_i persuaded Mary_j [PRO_{*i/j} to go to Tokyo].

Superficially, these two sentences have the same structure, i.e. "NP - V - NP - [PRO - to - V]". In other words, the linear sequence of the elements and their structural positions are the same; only the control status of the verb alters. Between these two constructions, there is a clear asymmetry of subject-object controller selection. According to MRFS, (37) should be harder to process than (38), because the distant filler John must fill the gap (PRO) in (37).

It would be potentially very informative to conduct an experiment using these types of sentences, because we can easily detect which of these two lexical NPs is preferred as the filler for PRO. Since no trace is involved in the above constructions, we can test whether MRFS is the correct strategy without considering whether the parser recognizes trace as a possible filler. However, it is almost impossible to obtain a significant result from comparing these two types of sentence. The reason is very simple; in English, there are few verbs such as promise, which can take both an object NP argument and a sentential argument together but exhibit subject control.

Now, let us consider the following examples in Japanese (koto is a nominalizer that nominalizes a verb or a sentence):

- (39) Taroo_i-ga Hanako_j-ni [PRO_{i/*j/k} Tokyo-e iku]
 -NOM -DAT -LOC go
 koto-o yakusokusita.
 fact-ACC promised
 'lit. Taroo promised Hanako the fact that PRO goes to
 Tokyo.'
- (40) Taroo_i-ga Hanako_j-ni [PRO_{*i/j/k} Tokyo-e iku]
 -NOM -DAT -LOC go
 koto-o susumeta.
 fact-ACC recommended
 'lit. Taroo recommended Hanako the fact that PRO goes
 to Tokyo.'

Here, we assume the empty subject in the above examples is PRO following Hasegawa (1984-5).⁹ In (39), the subject of the embedded sentence (PRO) is understood as coreferential with the subject of the matrix sentence, Taroo (or possibly a third party; see Footnote 9), but not with the object of the matrix clause. On the other hand, in (40), the subject of the embedded sentence (PRO) is understood as coreferential with the object of the matrix sentence Hanako (or a third party), but not with the subject of the matrix clause. As in the English example, between these two Japanese constructions there is a clear asymmetry of antecedent selection.

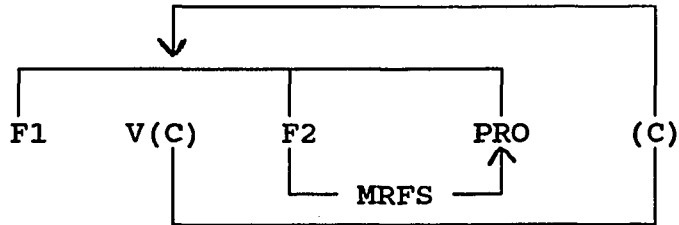
Thus, we will call the constructions such as (39) Subject Control or "S-control" constructions, and the constructions such as (40) Object Control or "O-control" constructions. Note that the S-control verb and the O-

control verb appear in otherwise identical constructions. Like promise in English, the subject control verb yakusokusita has an object (in the dative case). In Japanese, there are many S-control verbs like yakusokusita, as well as many O-control verbs like susumeta.

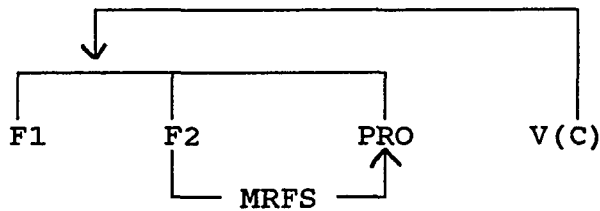
According to MRFS, then, (39) should be more difficult than (40) to process, because MRFS works incorrectly in (39), i.e. the most recent filler Hanako is not the proper filler in this case. In Japanese, it is not necessary to suppose that control information is delayed in access; it simply does not exist when a parser encounters a gap to be filled. Thus, we can examine whether MRFS applies, independently of issues about how control information is mentally stored and accessed. In other words, Japanese allows us to test whether MRFS exerts its power before a parser gets control information, because the filler-gap relation precedes a verb carrying control information. If MRFS is not operative in this situation, it is implausible to argue that it is operative in sentences in which control information is potentially available to the parser.

The difference between English and Japanese constructions relevant to our discussion could be schematized as follows (where F = Filler, C = Control Information):

- (i) A schema for English proposed by FCR/CF (see examples (37) and (38))



- (ii) A schema for Japanese according to FCR/CF proposal (see examples (39) and (40))



The arrows in the schemata represent the proposed way of applying the control information. In the representation (i), it is assumed that the application of the control information is postponed until after the application of MRFS. This postponed control information is eventually applied to determine the correct filler (F1 or F2). In the representation (ii), on the contrary, the control information is inherently delayed because the verb which carries it is sentence-final.

In summary: In Japanese MRFS can be tested independently from any hypothesized delay in the parser's access of control information, because a verb carrying control information is located at the end of a sentence so

that no control information is available for the parser when it encounters a gap. In other words, control information in Japanese is so late that if there is a gap-filling strategy, it should be clearly observable.

NPs in Japanese are fairly freely exchangeable. (Basically, their thematic roles are determinable from their case markings.) This means that we can exchange the positions of recent and distant fillers, and create a new recent filler which was a distant filler. Then, we can test whether the parser selects the new recent filler, which was a distant filler previously, or whether it takes the trace of the original recent filler to be the filler. Admittedly, the relevant trace in the FCR/CF experiments was a WH-trace whose antecedent was fronted by WH-movement, while the trace resulting from NP 'scrambling' in Japanese might be different (see Section 4.3 for this issue). But FCR/CF's LFO hypothesis should still be applicable to it unless they wish refine their hypothesis to: the parser can recognize an empty category as an antecedent for a gap unless the empty category is WH-trace or the gap is PRO. But this lacks generality and hence lacks plausibility.

In short, two questions will be addressed in this thesis. First, "Is MRFS a legitimate strategy for a language other than English?" Second, "Does the processor know that a gap can be a filler?" These two questions are of interest in themselves but also, as we have noted, they

are important to the issue of how transparent the relation is between the parser and the grammar. In the next chapter we will argue, on the basis of experimental findings about Japanese processing, that at least one of MRFS and LFO is false for Japanese, and that this constitutes a challenge to the FCR/CF argument for non-transparency in the processing of English.

Footnotes to Chapter 2

1. Half of CF's experimental sentences were the same as FCR's experimental sentences (relative clause), and the other half were the same as the experimental sentences (questions) used by Crain and Fodor (1985); see Section 2.2.1. Some of the real examples tested in the experiment are shown below (Verb options are indicated between + signs, and distant filler/recent filler options or the preposition needed to construct the recent filler option are indicated between # signs.):

(i) The mayor is the crook the police chief +expected/ordered/decided+ to leave town #with# after the scandal.

(ii) Who could the little child have +begged/forced/started+ to sing those stupid French songs #for Cheryl/for# last Christmas?

2. It is pointed out by Robert Fiengo (personal communication) that the doubly case positions would not suffice to rule out PRO as the filler of trace in a sentence such as below:

(i) *I tried PRO to force t to leave.

Here, PRO can be the filler of trace, because PRO does not have Case. Thus, Fiengo suggests that the more general account of the violation should be based on Theta-theory or Principle C rather than Case Theory.

3. This is the most recent lexical filler, but is not in fact the most recent filler; see discussion below.

4. We are not claiming that CF assume the parser actually operates in this order. We cannot order the operations in any general way. It depends on what occurs next in any particular sentence. What we are claiming here is that CF assume the following five steps whatever the actual order of them may be.

5. Although this is the sentence that CF used to prove their point, note that the actual experimental sentences do not contain a relative pronoun, as is shown in the above examples in Footnote 2. The relative pronoun that in this example is treated as if it were the antecedent.

6. Crain and Fodor presented two other reasons for doubting FCR's explanation of the data. However, these reasons are related to MRFS as a strategy for filling wh-gaps, but the application of MRFS to wh-gaps was denied later in CF. Crain and Fodor's experiment also included what they call

"Late wh-Gap" sentences, which were also concerned with the filling of wh-gaps, and became irrelevant to the debate once CF restricted MRFS to PRO. As noted at the beginning of Section 2.1, there is a big difference between FCR and CF concerning the treatment of wh-gap. In FCR, MRFS is supposed to be a very general strategy that applies to any gap, but in CF the application of MRFS is restricted to the empty subject (PRO) so that this strategy is less general compared to the previous definition.

7. Consider the following examples:

- (i)a. John hired Bill PRO to placate Susan.
- b. John hired Bill PRO to look after Susan.

Nicol argues that the rationale clause in (ia) requires PRO to be coindexed with the subject John, whereas in the purpose clause like (ib), PRO is coindexed with the object Bill.

Nicol also points out the controller changes when the subordinate clause is passivized. Observe the following examples:

- (ii)a. John promised Bill PRO to go.
- b. John promised Bill PRO to be allowed to go.

In both (i) and (ii), the verb alone cannot determine whether the subject or the object is the controller. See Section 4.1 for more extensive discussion on control phenomena.

8. Chomsky (1977) argues that Tough-movement involves an underlying WH-movement. Thus, the structure directly underlying (i) is assumed to be (ii) below.

- (i) (=Chomsky's (121))
 John is easy (for us) [to please]
- (ii) (=Chomsky's (126))
 John is easy (for us) [_S, [who for] PRO to please t]

9. The properties of PRO in Japanese may not be exactly identical with that in English. Specifically, constructions like (39) and (40) seem to allow what I will call a 'third party interpretation'; that is, the empty subject can be interpreted as referring to an individual not mentioned in the matrix clause, but understood as part of the discourse context. In this respect, the Japanese constructions are different from the English counterparts.

Note also that object controllers in Japanese are marked with dative, and in English they are accusative. Except for the third party interpretation and dative marker,

however, the pattern of interpretation of these Japanese constructions is identical with the English counterparts. The existence and import of third party interpretations will be discussed later especially in Sections 3.7.4, 3.7.5, and 4.2.

CHAPTER 3

Experiments

A series of experiments was conducted in order to get clues to answer the questions raised in the previous chapter. Note that in describing these experiments, we will make certain linguistic assumptions: (a) that the empty subject in the sentences tested is PRO; (b) that the 'scrambling' of subject and object in Japanese consists of the movement of the object leaving a trace which is comparable to the WH-trace considered in FCR/CF's experiments. At the end of this chapter, we will examine whether these assumptions are essential to the broader conclusions we wish to draw. And in the following chapter, we will consider the linguistic evidence for and against them.

First, a pre-test and a pilot study were conducted to establish the control status (S-control or O-control) of various Japanese verbs.¹ Experiment 1 then examined how a parser processes a sentence with an empty subject of a

subordinate clause with unmarked word order in the main clause, i.e. subject preceding object, with an S-control verb or an O-control verb. Experiments 2 and 3 were conducted to find out what will happen when word order is changed, i.e. when the positions of the subject and object are exchanged so that the subject is now the most recent potential lexical filler, though the trace of the object would be more recent still.

3.1 Pre-test

3.1.1 Overview

The purpose of this pre-test was to discriminate S-control verbs from O-control verbs, so that they could then be used in the subsequent experiments. Verbs receiving inconsistent responses could be discarded. Though the classification was rather clear to the intuition of the experimenter (see discussion below), a native speaker of Japanese, it was considered important to confirm the stability of this classification across a population of linguistically naive subjects, comparable to those who participated in the main experiments.²

3.1.2 Method

Subjects:

Ten native speakers of Japanese (five male, five female, mean age: 28.6 years, mean term of stay in U.S.: 3.2 years) performed this test.

Design and Materials:

The verbs tested here were selected in the following way:

(i) First, the experimenter consulted with a Japanese dictionary and picked out verbs that can satisfy V_2 in the construction shown in (1) below. This produced approximately 200 verbs that seem to be eligible as control verbs.

(1) NP_1 -ga NP_2 -ni [PRO V_1] koto-o V_2
 -NOM -DAT fact-ACC

(ii) From this set, the experimenter selected 40 verbs as good candidates for being S-control verbs, and 40 for O-control verbs (listed in Appendix A). Let us call these two verb sets Group-A and Group-B respectively. The experimenter consulted his own intuitive judgement in choosing these 80 verbs.³

The pre-test was conducted as follows: The following sentence (2) with each of the 80 verbs at the sentence final position was presented auditorily.

(2) Taroo-ga Hanako-ni Tokyo-e iku koto-o V
 -NOM -DAT -LOC go fact-ACC

The experimenter read a sentence containing one of the 80 control verbs, and the subject was asked to answer which of the two people (i.e. Taroo or Hanako) mentioned in the sentence is supposed to go to Tokyo. Exactly equal numbers of S-control and O-control sentences were presented in a pseudo random order to avoid biasing subjects' responses. The same materials were presented to each subject. Subjects were instructed as follows:

"In the following sentences, two persons are involved, that is, Taroo and Hanako. One of them is going to Tokyo. Listen to the sentences carefully and tell me as soon as possible who is going to Tokyo."

There are three possible answers concerning who is going to Tokyo in the above construction: Taroo, Hanako, or some third person (e.g. Jiroo).⁴ However, subjects were asked to decide whether Taroo or Hanako is supposed to go to Tokyo in the sentences involving these 80 verbs, because this pre-test aimed to establish which of the two overt

antecedents is preferred in the experimental sentences. Note that our ultimate purpose of the main experiments is to examine whether this antecedent preference can be changed by repositioning of subject NP and object NP.

3.1.3 Results

Results are shown in Table 1 below. The Consistency Score (CS) indicates the percentage of subjects whose judgement agreed with the experimenter's classification of the verbs as S-control or O-control.⁵ Groups A and B consist of respectively potential S-control verbs and potential O-control verbs tested in the pre-test. See Appendix A for more detailed description of the data.

Table 1: Mean Consistency Score (CS) for verbs in the pre-test

Type	CS (%)
Group A	90.8
Group B	97.5
Difference	-6.7

3.1.4 Discussion

As a general tendency, Group-B has the higher consistency score than Group-A. Some sentences are inconsistent concerning the judgement among subjects. It is

worth considering briefly the verbs for which a high proportion of subjects' judgments differed from those of the experimenter and/or were inconsistent across subjects. For example, it is noticed that a verb with a low consistency score is a verb with negative meaning such as kyozetusita (refused) or ambiguous meaning such as syoodakusita (consent). If Taroo refused to go to Tokyo, actually Taroo did not go to Tokyo. In the Japanese statement that Taroo consented to go to Tokyo to Hanako, it is ambiguous whether Taroo or Hanako would go to Tokyo.

In most cases, however, the judgments were consistent among subjects. 25 (62.5%) out of 40 Group-A verbs had 100% S-control responses. 33 (82.5%) out of 40 Group-B verbs had 100% O-control responses. If we include verbs with 90% consistency (i.e. only one out of ten subjects disagreed with the others), then Group-A has 28 verbs that were reliably judged to be S-control verbs, and Group-B has 37 verbs that were reliably judged to be O-control verbs.

Additional criteria for verb selection for the subsequent experiments concerned the length of each verb. Since the main experiments measure response time to sentences containing these verbs in the final position, it will be important to eliminate any possible effect on response of verb length. The syllabic structure of Japanese is different from that of English. I followed the

conventional way of counting syllables (or "morae").⁶

I tried to restrict the number of syllables in both Group-A and Group-B verbs to between 4 and 7. Note that each verb included a suffix (-ta or -da) of one syllable. Two verbs were dropped from the Group-A list, because they contained too many syllables (9 syllables) or too few syllables (3 syllables). Thus, 23 verbs remained in Group-A. The mean number of syllables in these verbs was 5.434. Then, 23 verbs were selected from Group-B, which have 100% consistency among subjects, and such that the mean number of syllables matches that of Group-A, i.e. 5.434. The final outcome was thus 46 verbs (23 each for S-control and O-control verbs) to use in the pilot study. These are the verbs marked with "*" in the data listed in Appendix A.⁷

3.2 Pilot Study

3.2.1 Overview

The purpose of this experiment was to make a preliminary estimate of whether it is possible to obtain reaction time differences for processing S-control and O-control sentences.

3.2.2 Method

Subjects:

Ten subjects, native speakers of Japanese, not including subjects in the pre-test, participated in this experiment (six male, four female, mean age: 31.6, mean term of stay in U.S.A.: 2.3 years).⁸ Four sentences were given as practice before the actual experiment began in order to have subjects get used to the experiment. A short break was inserted in the middle of the experiment in order to alleviate subjects' fatigue. The experiment took approximately 30 minutes.

Equipment:

Because the voice decoder equipment used in the main experiments was not available during the pilot study, the experimenter had to rely on a somewhat primitive "push button" method to measure response time to each sentence. That is, subjects were instructed to listen to a tape recorded sentence, comprehend it, and then say a person's name while simultaneously pushing a button that was connected to a timer. The instructions given to subjects were almost the same as those in the pre-test except that the additional task of pushing the button was included.

This method is less accurate than a voice activated timing apparatus. Furthermore, the sentences presented

consisted of experimental sentences only, without any fillers to provide variety in the input, in order that there should be time to present all the sentences in one session. The 46 sentences, containing the control verbs identified through the pre-test, were recorded in random order on a cassette tape. At the end of each sentence, a 1000 Hz tone was placed on the tape which was inaudible to subjects. This tone triggered a millisecond timer which was stopped when a subject pushed the response button.

Design and Materials:

Two examples of the sentences used in the pilot study are shown below:

- (3) Taroo-ga kinoo-no yuugata Hanako-ni Tookyoo-e iku
 -NOM yesterday's evening -DAT -LOC go
 koto-o yakusokusita.
 fact-ACC promised
 'lit. Last evening, Taroo promised Hanako to go to
 Tokyo.'
- (4) Hanako-ga kinoo-no yuugata Taroo-ni Tookyoo-e iku
 -NOM yesterday's evening -DAT -LOC go
 koto-o susumeta.
 fact-ACC recommended
 'lit. Last evening, Hanako recommended Taroo to go to
 Tokyo.'

Two factors were varied. One factor is the S-control/O-control status of the main verb. The other is the identity of the main clause subject, i.e. whether Taroo or Hanako is the subject of the sentence.⁹ Only these two names were

used, and both appeared in every sentence. In order to eliminate the effects of a possible response bias based on a preference for one name or the other, half of the S-control sentences had Taroo as their main clause subject, and the other half had Hanako as their main clause subject. Similarly, half of the O-control sentences had Taroo as their main clause subject, and the other half had Hanako as their main clause subject. See Appendix B for the sentences tested in the pilot study.

3.2.3 Results

The results are given in Table 2. (RT = Response time (msec), CS = Consistency Score, STD = Standard Deviation for RT). See Appendix C for the data for each verb.

Table 2: Results of Pilot Study

Verbs	RT(msec)	CS(%)	STD
S-control	439	94	227
O-control	509	87	291
Difference	-70	7	-64
p-value	p=.004 F(1,9)=14.577		

3.2.4 Discussion

Overall, the S-control sentences were responded to more quickly than the O-control sentences. The difference of RT

between them was 70 msec, and this was significant. This result seems to suggest that O-control sentences are more difficult than S-control sentences in processing. The difference of Consistency Score between them showed the same tendency.¹⁰ A natural explanation would be that subjects tended to assume S-control when no information was available, and then had to correct this assumption on encountering the verb at the end of an O-control sentence. On the basis of these pilot results, then, it would seem that MRFS does not apply in Japanese.

However, it is impossible to draw a decisive conclusion from these data, because they show such great variability. Note the large standard deviations and large differences among RTs.¹¹ No doubt, this variability is due at least in part to the inaccuracy in measuring response time. Informally, it seemed clear that some subjects answered before pushing the button, and others pushed the button before answering. It should also be noted that the general tendency in this pilot study for S-control sentences to be easier than O-control sentences is contrary to the result of the pre-test, where O-control verbs were slightly more consistently identified than S-control verbs. Therefore, no clear conclusions can be drawn from these preliminary studies. What has been established is only that Japanese

speakers can reliably identify many S-control and O-control verbs, and that they can reveal this knowledge by answering a question, under time pressure in the experimental situation. Thus, the way is paved to the main experiments.

3.3 Design and Materials for the Main Experiments

Experimental materials for the main experiments consisted of 24 S-Control and 24 O-Control sentences. These sentences were created by the combination of appropriate verbs in a sentence with potential controllers (Japanese personal names), and some adverbial phrases. Each of these components is considered below.

3.3.1 Verbs Examined

Verbs used in the main experiments were almost identical to those in the pilot study. However, some verbs with longer processing times and lower consistency scores in the pilot study were replaced by other verbs. In the group of S-control verbs, four verbs hanasita (tell), iisibutta (hesitate to say), siraseta (inform), and tutaeta (report) were dropped. Instead, three verbs with 90% consistency score in the pre-test were included in the list for the main experiments. They are happyoosita (announce), koohyoosita (announce officially), and damatteita (keep silent). Further, a verb with many syllables aimainisiteita (make

vague) and a verb with few syllables wabita (apologize) were included. Here, the length in syllables of each verb does not meet our prior numerical criterion (4-7 syllables), but together they would not perturb the mean number of syllables across all S-control verbs. These two verbs had 100% consistency score in the pre-test. Thus, we have 24 verbs used as S-control verbs in the main experiments.

For the same reason, in the group of O-control verbs, four verbs hantaisita (oppose), kinsisita (prohibit), kitaisita (expect), and syootisita (agree) were dropped from the list. In order to get the same number of verbs as in the group of S-control verbs, the experimenter randomly chose five verbs from the remaining pool of 14 O-control verbs with more than 90% consistency score in the pre-test. They are yooboosita (demand), unagasita (urge), motometa (ask), mitometa (admit), and makaseta (entrust).

Thus, we have 24 verbs in each group for the main experiments. The mean consistency score tested in the pre-test for the selected verbs as S-control verb was 98.75%. The mean for the selected verbs as O-control verb was 99.58%. The difference (.83%) is so small that the way of selecting these verbs is not expected to influence the results of the experiment.¹² The mean syllable length for S-control verbs was 5.833, and that for O-control verbs was 5.25. This did not constitute a significant difference:

$F(1,23)=2.413, p=.134.$

Consequently, 48 sentences were constructed as experimental sentences. Another 48 sentences were interspersed among the target sentences to disguise the purpose of the experiment. The characteristics of these filler sentences are described later in Section 3.3.4. These 96 sentences were divided into two lists, to be presented in two sessions. Subjects were presented 4 practice sentences before the timed experiment began, then 4 "warm-up" sentences which were not included in the data, and then 48 experimental sentences interspersed with 48 filler sentences, in each session. Thus, 104 sentences in total were given to each subject at one session. A short break was inserted between the two sessions to alleviate subjects' fatigue.

3.3.2 Name Sets

Six names were used in the main experiments. They were selected by the criterion that they must be familiar to native Japanese speakers, and should be easy to recognize and pronounce. Furthermore, there were some technical restrictions on the names, because we were using a "voice decoder" to measure response time. Names beginning with a vowel cannot be precisely detected by the machine. Thus, the names had to begin with a consonant. Among consonants, stops and affricates are best detected by the machine.

Therefore, I decided to use the following three pairs of names for the main experiments:

	NP1	-	NP2
(i)	Tosio	-	Junko
(ii)	Kooiti	-	Tamae
(iii)	Jiroo	-	Kazumi

In Experiments 1 and 2, the position of NP1 and NP2 is fixed as it is, regardless of their grammatical function (e.g. Subject, Object, etc.). In Experiment 3, the order of NP1 and NP2 is reversed; NP2 precedes NP1. The first name in each pair is a male name, and the second one is a female name. The two names included in a pair are fairly dissimilar phonologically so that subjects can easily identify the difference between them. The three pairs of names were used equally often throughout the experiment, in random order.

3.3.3 Verbs and Adverbial Phrases

In order to differentiate the sentences from each other as far as possible, adverbial phrases were inserted in certain positions. Furthermore, these adverbial phrases play important roles concerning the processing of these experimental sentences. This will be explained soon.

Let us first consider the S-control and O-control sentences. Both have the sentence construction shown below:

(5) NP1 - Adv1 - NP2 - [Tookyoo-e - V1] - Adv2 - V2

NP1 is the subject (a nominative marked with "-ga"), and NP2 is the object (a dative marked with "-ni"). V2 is one of the SC or OC verbs.

Both Adv1 and Adv2 modify V2. Adv1 is one of the following three time adverbials: kinoo (yesterday), ototoi (the day before yesterday), and sensyuu (last week), or three locative adverbials: kissaten-de (at the cafe), kaisya-de (at the company), and ofisu-de (at the office). Adv1 also serves the important role of making the distant/recent difference bigger, so that if MRFS is true, it will be likely to have a significant effect in these sentences. The FCR formulation of MRFS does not make it clear whether the degree of preference for a recent rather than a distant filler should depend on the extent to which they differ in recency. But including Adv1 is a safeguard in case it does. (Future experiments could use longer intervening phrases if deemed necessary.)

There are also six different adverbs in the position of Adv2. They are three manner adverbials: hakkirito (clearly), seisikini (formally), and wazato (purposely), and three instrumental adverbials: denwa-de (by phone), denpoo-de (by telegram), and tegami-de (by mail). Adv2 also serves the important function of giving the parser time to apply its strategy (if any) between the discovery that there is an

empty subject and encountering the matrix verb. (A longer adverbial phrase might be tested in future experiments if needed to obtain significant results.)

V1 is the verb of the embedded sentence, and consists of one of two verbs, i.e. iku (to go) and ryokoosuru (to travel). Since half of the embedded verbs are iku, we avoided using this verb in the instruction to subjects; instead we used iru (to be) which can indicate the resultant situation of both iku (to go) and ryokoosuru (to travel). Thus, we did not ask "Who is supposed to go to Tokyo", but "Who is supposed to be in Tokyo" throughout the experiments. Following are some examples of S-Control and O-Control types:

(6) S-Control:

Tosio-ga kissaten-de Junko-ni Tookyoo-e
 -NOM cafe-at -DAT -LOC
 ryokoosuru koto-o wazato himitunisiteita.
 travel fact-ACC purposely kept secret
 'lit. At the cafe, Tosio purposely kept secret from
 Junko to travel to Tokyo.'

(7) S-Control:

Kooiti-ga sensyuu Tamae-ni Tookyoo-e
 -NOM last week -DAT -LOC
 iku koto-o tegami-de tutaeta.
 go fact-ACC mail-by notified
 'lit. Last week, Kooiti notified Tamae by mail to go to
 Tokyo.'

(8) O-Control:

Jiroo-ga ofisu-de Kazumi-ni Tookyoo-e
 -NOM office-at -DAT -LOC
 ryokoosuru koto-o seisikini meizita.
 travel fact-ACC formally ordered
 'lit. At the office, Jiroo formally ordered Kazumi to
 travel to Tokyo.'

(9) O-Control:

Jiroo-ga ototoi Kazumi-ni Tookyoo-e
 -NOM the day before yesterday -DAT -LOC
 iku koto-o denwa-de aigansita.
 go fact-ACC phone-by implored
 'lit. The day before yesterday, Jiroo implored Kazumi
 by phone to go to Tokyo.'

3.3.4 Filler sentences¹³

Filler sentences were included to provide variety and to conceal the purpose of the experiment from subjects' awareness. Filler sentences had to be such as to permit an answer to the question: "Who is supposed to be in Tokyo?". Also, it is important not to bias subject's responses to either the S-control or O-control sentences. So, in one type of filler sentences, the subject of the sentence was the person who is supposed to be in Tokyo, and in the other type, the person denoted by the object is considered to be in Tokyo.

In the main experiments, two types of subject filler sentences were used: conjunction and purpose sentences, and two types of object filler sentences were used: lexical causative and morphological causative. Therefore, we have four types of sentences: experimental = S-control (SC) and O-control (OC); fillers = subject filler (SF) and object filler (OF).

3.3.4.1 Subject Filler Sentences

The first type of subject filler sentences (SF1; a conjunction) has the following construction:

- (10) [NP1 - Adv1 - Tookyoo-e - V1], [NP2 - Adv2 - Adv3 - V2]

NP1 is the subject of the first conjunct, and NP2 is the Topic (marked with "-wa") of the second conjunct. Adv1 and Adv2 are chosen from the following set of instrumental adverbials: basu-de (by bus), kisya-de (by train), and hikooki-de (by plane). These two adverbs are, of course, different in one sentence. Adv3 is one of the following locative adverbials: Kyooto-e (to Kyoto), Oosaka-e (to Osaka), and Nagoya-e (to Nagoya). (These three place names are very familiar in Japan.) VP1 and VP2 are selected from a set of three verbs of motion, i.e. ryokoosuru (travel), syuppatusuru (leave for), and dekakeru (go out). Both verbs in the same sentence are the same, although V1 is in a gerundive form and V2 is in a past form. Following are some examples of this type:

- (11) Jiroo-ga basu-de Tookyoo-e ryokoosi,
 -NOM bus-by -LOC traveled
 Kazumi-wa hikooki-de Nagoya-e ryokoosita.
 -TOP plane-by -LOC traveled
 'Jiroo traveled to Tokyo by bus, and Kazumi traveled to
 Nagoya by plane.'

- (12) Kooiti-ga hikooki-de Tookyoo-e syuppatusi,
 -NOM plane-by -LOC left for
 Tamae-wa basu-de Oosaka-e syuppatusita.
 -TOP bus-by -LOC left for
 'Kooiti left for Tokyo by plane, and Tamae left for
 Osaka by bus.'

In these examples, the correct answer to "Who is supposed to be in Tokyo?" is the subject NP Ji-roo in (11) and Kooiti in (12).

The other type of subject filler sentence (SF2; a purpose construction) has the following form:

- (13) NP1 - [Adv1 - NP2 - V1] - Adv2 - Tookyoo-e - V2

NP1 is the subject and NP2 is the object (an accusative marked with "-o"), and they follow the pattern of the name sets discussed above. Adv1 is one of the following three manner adverbials: kokorokara (heartily), nantokasite (by all means), and muriyari (forcefully). Adv2 is one of the following three time adverbials: kinoo, ototoi, and sensyuu, which are the same as Adv1 in the SC and OC types.

V1 is chosen from the following three verbs: yorokobasu (please), komaraseru (embarrass), and okoraseru (make angry). V2 is selected from the following three verbs: iku (go), syuppatusuru (leave for), and dekakeru (go out). Some examples of this type are shown below:

- (14) Kooiti-ga muriyari Tamae-o okoraseru
 -NOM forcefully -ACC make angry
 tameni ototoi Tookyoo-e dekaketa.
 in order to the day before yesterday -LOC went out
 'lit. The day before yesterday, Kooiti went out to
 Tokyo in order to forcefully make Tamae angry.'
- (15) Jiroo-ga nantokasite Kazumi-o komaraseru
 -NOM by all means -ACC embarrass
 tameni sensyuu Tookyoo-e syuppatusita.
 in order to last week -LOC left for
 'lit. Last week, Jiroo left for Tokyo in order
 to by all means embarrass Kazumi.'

In these examples, the correct answer to "Who is supposed to be in Tokyo?" is the subject NP Kooiti in (14) and Jiroo in (15).

3.3.4.2 Object Filler Sentences

The first type of object filler sentence (OF1; a lexical causative construction in which the main verb itself has the sense of causative) has the following structure:

- (16) [NP1 - Adv1 - NP2 - Adv2 - Tookyoo-e - V]

NP1 is the subject and NP2 is the object (an accusative marked with -o), and they follow the name set pattern as usual. Adv1 is one of the following three locative adverbials: Kyooto-kara (from Kyoto), Oosaka-kara (from Osaka), and Nagoya-kara (from Nagoya). These place names are the same as those in Adv3 in SF1 type sentences, although the particle is different (-kara vs. -e). Adv2 is

selected from the following three instrumental adverbials:
basu-de, kisya-de, and hikooki-de, which are the same as
 Adv1 and Adv2 in SF1.

V is one of the following three verbs, which have some
 causative sense lexically: okurikomu (send), hakensuru
 (dispatch), and tukainidasu (send on an errand). Some
 examples of this type are shown below:

(17) Jiroo-ga Kyooto-kara Kazumi-o
 -NOM from -ACC
 kisya-de Tookyoo-e tukainidasita.
 train-by -LOC sent on an errand
 'Jiroo sent Kazumi on an errand to Tokyo from Osaka
 by train.'

(18) Tosio-ga Nagoya-kara Junko-o
 -NOM from -ACC
 basu-de Tookyoo-e okurikonda.
 bus-by -LOC sent
 'Tosio sent Junko to Tokyo from Nagoya by bus.'

In these examples, the correct answer to "Who is supposed to
 be in Tokyo?" is the object NP Kazumi in (17) and Junko in
 (18).

The other type of OF sentence (OF2; a morphological
 causative construction) is created by adding to a verb a
 causative morpheme -(s)ase, and has the following form:

(19) NP1 - Adv1 - [NP2 - Adv2 - Tookyoo-e - V]-(s)ase

NP1 and NP2 follow the same pattern as those in OF1 type
 sentences. Adv1 is one of the following three time

adverbials: kinoo, ototoi, sensyuu, which are the same as those in Adv1 in SC and OC types and Adv2 in SF2 type. Adv2 is chosen from the following three instrumental adverbials: basu-de, kisya-de, and hikooki-de, which are the same as those in Adv1 and Adv2 in SF1 type sentences and Adv2 in OF1 sentences. V is a causative form of the following three verbs: iku, syuppatusuru, and dekakeru, which are the same as those in V1 in SC and OC types, and V1 and V2 in SF1, and V2 in SF2. Some examples of this type are given below:

- (20) Tosio-ga kinoo Junko-o
 -NOM yesterday -ACC
 kisya-de Tookyoo-e syuppatu-sase-ta.
 train-by -LOC leave for-CAUS-PAST
 'Yesterday, Tosio had Junko leave for Tokyo by train.'
- (21) Jiroo-ga sensyuu Kazumi-o
 -NOM last week -ACC
 basu-de Tookyoo-e dekake-sase-ta.
 bus-by -LOC go out-CAUS-PAST
 'Last week, Jiroo had Kazumi go out to Tokyo by bus.'

In these examples, the correct answer to "Who is supposed to be in Tokyo?" is the object NP Junko in (20) and Kazumi in (21).

3.3.5 Design and Summary

The overall experimental sentences thus consist of 24 S-control sentences and 24 O-control sentences as well as 48 filler sentences, for a total of 96 sentences. These were used to create four different presentation "scripts" where

each script consisted of six SC (S-control) sentences, six OC (O-control) sentences, six SF (Subject Filler) sentences, and six OF (Object Filler) sentences. Thus, each script contained 24 sentences. Consider Script-1 first. The four types of sentences (i.e. SC, OC, SF, and OF types) were pseudo-randomly ordered in Script-1, with the consideration that every four sentences must contain all the four types of sentences. Three pairs of names were pseudo-randomly scattered throughout Script-1 sentences so that each type of six sentences contain the same number of instances of each name pair. Namely, each of six SC, OC, SF, and OF sentences contains two "Tosio-Junko", two "Kooiti-Tamae", and two "Jiroo-Kazumi" pairs respectively.

Script-2 was formed by reversing the order of occurrence of subject and object control sentences in Script-1. For example, where Script-1 had SC-OF-OC-SF, Script-2 had OC-SF-SC-OF. Note that the change from Script-1 to Script-2 is just a change of order of presentation of whole sentences, not a change in the internal structure or order of a sentence itself. The name set in Script-2 was the same as that in Script-1.

In Script-3, the occurrence of SC and OC types were the exact reverse of Script-1, although the SF and OF sentences were the same as those in Script-1. For instance, when Script-1 had SC-OF-OC-SF, Script-3 had OC-OF-SC-SF; that is, only control sentences were changed and filler sentences

remained unchanged. Thus, Script-3 was the same as Script-1 except for the final verb of the SC and OC sentences. This means that a SC verb appears in exactly the same sentential environment as an OC verb. In other words, there are two identical sentences except for the final verb being S-control verb or O-control verb. To get Script-4 from Script-2, the same procedure as to get Script-3 from Script-1 was applied. Thus, when Script-2 had OC-SF-SC-OF, Script-4 had SC-SF-OC-OF.

In each script, the correct answers were balanced across the names. That is, Tosio, Kooiti, and Jiroo were each four times the correct answer in the subject position in each script. Junko, Tamae, and Kazumi were each four times the correct answer in the object position in each script.

See Appendix D for how verbs and adverbs are distributed across scripts. The sentences for the practice session and "warm-up" at the beginning of the experiment are also included. All the experimental and filler sentences for Experiment 1 are shown in Appendix E.

3.4 Experiment 1

3.4.1 Overview

This experiment was conducted to test whether the MRFS effect can be observed in Japanese control sentences. The sentences tested in this experiment were similar to those in the pilot study, but with addition of adverbial phrases to increase the distance of the distant filler, and to increase the extent of a garden path if it occurs. Filler sentences were also presented to disguise the purpose of the experiment from subjects, and to prevent satiation on the control construction which could prevent normal processing. Using the verbs examined in the pre-test and the pilot study, we can expect that subjects will generally be able to process S-control and O-control sentences quickly and accurately. But there may be some small systematic differences in processing difficulty which could reveal what strategy, if any, the parser is using to assign a controller prior to encountering the final main verb. Consider the following examples from the list of the sentences tested in this experiment:

- (22) Tosio-ga kissaten-de Junko-ni [PRO Tookyoo-e
 -NOM cafe-at -DAT -LOC
 ryokoosuru] koto-o hakkirito yakusokusita.
 travel fact-ACC clearly promised
 'lit. At the cafe, Tosio clearly promised Junko the
 fact that PRO travels to Tokyo.'

(23) Jiroo-ga sensyuu Kazumi-ni [PRO Tookyoo-e
 -NOM last week -DAT -LOC
 iku] koto-o denpoo-de tanonda.
 go fact-ACC telegraph-by asked
 'lit. Last week, Jiroo asked Kazumi by telegraph the
 fact that PRO goes to Tokyo.'

Because of the proposals of FCR/CF, we are particularly interested in whether MRFS applies in Japanese. If it does, sentences like (22) should be more difficult to process than sentences like (23), because MRFS assigns the recent filler Junko to the gap, whereas the S-control verb in (22) yakusokusita requires the subject Tosio to be associated with the gap.

Other possible strategies that the parser might rely on are to always select the main clause subject as a filler, or always select the main clause object as a filler. The former was suggested by the results of the pilot study but was not confirmed there because of the crudity of the measurements, leading to unstable data. The latter prediction is in line with the tendency of the pre-test, where O-control verbs tended to be identified more easily than S-control verbs.

It is also possible that the parser does not rely on any consistent strategy, in which case no significant difference in processing time between the two sentence types should occur. Non-reliance on a strategy might be due to the fact that the parser can process both possible sentence analyses in parallel, or it might wait until control

information becomes available to determine the correct filler. Or possibly, the parser does guess in advance of control information from the verb but guesses at random. If the FCR/CF account of English is correct and if MRFS is indeed a natural tendency on the part of the human sentence processor which should be universal, then we would not expect these latter possibilities to be true for Japanese. Recall the discussion in Section 2.2.5. where it is explained why MRFS should be universal if it exists at all.

3.4.2 Method

Subjects:

Twenty three subjects participated in this experiment. All subjects were native speakers of Japanese at Kyoto University in Japan. They were paid 500 yen (= \$3.50) for half an hour. Subjects' responses and response times were measured. Data from subjects whose responses showed less than 80% agreement with the SC/OC classification of verbs were excluded from analysis. Data from five subjects were removed from the analysis by this standard.

Procedures:

As in the pilot study, subjects were instructed to listen to each sentence, and to respond by naming the person who was supposed to be in Tokyo. The sentences were tape recorded with a 1000 Hz tone which initiated timing of the

response; the timer was stopped by voice activation as the subject started uttering the response. Experimental sentences were presented in pseudo-random order, with filler sentences interspersed. The detailed design of this experiment was discussed in Section 3.3. See Appendix E for the actual sentences.

3.4.3 Results

The mean reaction time (RT) for each subject and the mean consistency score (CS) were computed. Missing data points were replaced by the subject's mean RT in the RT calculation. The data were submitted to analysis of variance to determine statistical significance. (For all of the differences reported in this chapter, we take $p < .05$ to indicate statistical significance; $.05 < p < .1$ to constitute marginal significance.) The results are shown in Table 3. See Appendix F for detailed report of the mean RT for each item.

Table 3: Results of Experiment 1 - Mean Reaction Times and 'Consistency Score' with 'p-value'

Sentence Type	RT (msec)	CS (%)
S-control	661	90.7
O-control	618	89.8
Difference	43	0.9
p-value	$p = .033$ $F(1, 17) = 5.374$	$p = .294$ $F(1, 17) = .294$

3.2.5 Discussion

The results demonstrated that S-control sentences had significantly longer response time than O-control sentences. The difference in the consistency score between S-control and O-control sentences was not significant. If it is proper to take increased response time as an indicator of a momentary garden path, as FCR/CF did, then findings of Experiment 1 indicate that an O-controller is preferred for the empty subject in these sentences before grammatical control information becomes available. Therefore, this result seems to be straightforwardly consistent with MRFS as claimed by FCR/CF, because for these sentences we do not have to worry about whether trace can be a controller or not. However, MRFS may not be the only possible source of these results. The object NP might be the preferred controller because it is the most recent filler or because it is an object. That is, one cannot determine whether the preference is a preference for recency or a preference for the grammatical function as object. In order to determine which of these two is the case, and to examine the claim that empty categories are not recognized as controllers, we need to consider the data of Experiments 2 and 3.

3.5 Experiment 2

3.5.1 Overview

To test MRFS in conjunction with the claim that the processor does not recognize empty categories as possible controllers, we need to front the object NP in constructions otherwise comparable to those tested in Experiment 1. However, fronting the object introduces a new ambiguity into these sentences, which makes them unsuitable for testing. For example, if we simply invert the two NPs as is shown in (24) below, this inversion will invite a reconstruction that is represented in (25) below. Because the trace and the empty subject are both invisible, it is very likely that a parser interprets the subject of the matrix sentence as the subject of the embedded sentence.

(24)a. Hanako_i-ni Taroo-ga t_i [PRO Tookyoo-e iku]
 -DAT -NOM -LOC go
 koto-o yakusokusita.
 fact-ACC promise
 'lit. To Hanako, Taroo promised the fact that PRO goes
 to Tokyo.'

b. Hanako_i-ni Taroo-ga t_i [PRO Tookyoo-e iku]
 -DAT -NOM -LOC go
 koto-o susumeta.
 fact-ACC recommended
 'lit. To Hanako, Taroo recommended the fact that PRO
 goes to Tokyo.'

(25)a. Hanako-ni [Taroo-ga Tookyoo-e iku] koto-o
 -DAT -NOM -LOC go fact-ACC
 yakusokusita.
 promised
 'lit. (Someone) promised Hanako the fact that Taroo
 goes to Tokyo.'

- b. Hanako-ni [Taroo-ga Tookyoo-e iku] koto-o
 -DAT -NOM -LOC go fact-ACC
 susumeta.
 recommended
 'lit. (Someone) recommended Hanako the fact that Taroo
 goes to Tokyo.'

Now there is no empty subject to be filled in (25), so we cannot find out anything about strategies for filling it.

Other ways of inverting subject and object are also unfortunately unsatisfactory for our purposes. For example, adding a causative or passive morpheme changes the relation between an agent and a patient. In other words, the control relation is reversed by these functional morphemes.

Consider the following examples:

- (26)a. Taroo_i-ga Hanako_j-ni [PRO_{i/*j/k} Tookyoo-e iku]
 -NOM -DAT -LOC go
 koto-o utiaketa.
 fact-ACC confessed
 'lit. Taroo confessed to Hanako the fact that PRO
 goes to Tokyo.'

- b. Hanako_i-ga Taroo_j-ni t_i [PRO_{*i/j/k} Tookyoo-e iku]
 -NOM -DAT -LOC go
 koto-o utiake-rare-ta.
 fact-ACC confess-Pass-Past
 'lit. Hanako was confessed to by Taroo the fact that
 PRO goes to Tokyo.'

(26b) is derived from (26a) by moving the object NP Hanako to the sentence initial position and adding the passive morpheme -rare- to the main verb. In (26a), the person who is expected to be in Tokyo is Taroo (or a third party), but not Hanako. That is, the verb utiakeru is a S-control verb.

In (26b), the person who is supposed to be in Tokyo is still Taroo (or a third party), denoted by an object marked with a dative marker (-ni). Thus, utiake-rare-ru has the status of an O-control verb, despite the fact that the verb utiakeru itself is a S-control verb. By the same token, susume-rareru has the status of an S-control verb despite the status of O-control of the verb susumeru as is shown below.

(27)a. Taroo_i-ga Hanako_j-ni [PRO_{*i/j/k} Tookyoo-e iku]
 -NOM -DAT -LOC go
 koto-o susumeta.
 fact-ACC recommended
 'lit. Taroo recommended to Hanako the fact that PRO goes to Tokyo.'

b. Hanako_i-ga Taroo_j-ni t_i [PRO_{i/*j/k} Tookyoo-e iku]
 -NOM -DAT -LOC go
 koto-o susume-rare-ta.
 fact-ACC recommend-Pass-Past
 'lit. Hanako was recommended to by Taroo the fact that PRO goes to Tokyo.'

It is known that in English the controller changes if the infinitival clause is passivized. Consider the following examples from Bouchard (1984):

- (28) (=Bouchard's (95) and (97))
 a. John promised Mary [_S PRO to shave himself].
 b. John promised Mary [_S PRO to be allowed to shave herself].
- (29) (=Bouchard's (96) and (98))
 a. John asked Mary [_S PRO to shave herself].
 b. John asked Mary [_S PRO to be allowed to shave himself].

Furthermore, Bouchard claims that "The same judgement hold when passivization of the matrix verb has taken place" (p.194). Consider the following examples:

- (30) (=Bouchard's (99))
- a. *Bill was promised \underline{t} [_s PRO to shave himself].
 - b. Bill was asked \underline{t} [_s PRO to shave himself].
 - c. Bill was promised \underline{t} [_s PRO to be allowed to shave himself].
 - d. *Bill was asked \underline{t} [_s PRO to be allowed to shave himself].

Notice that (30a) is ungrammatical in English, while the comparable Japanese example (i.e. (26b)) is grammatical.

In both (26b) and (27b), two NPs are converted and there is a trace so that we can examine whether the trace is selected as a possible filler by MRFS. Furthermore, these constructions do not invite a reconstruction mentioned above. Thus, it seems that these passivized examples in Japanese are suitable to test recent/distant filler differences. The problem in these transformed sentences, however, is that deep Cases and surface Cases are different. For example, in (27a) the object Hanako is marked with the dative marker -ni, while it is marked with the nominative marker -ga in the passivized sentence (27b). Similarly, the possible controller Taroo in (27a) is marked with the nominative -ga while it is marked with the dative -ni in (27b). What we need is a construction in which the subject

and object convert only their positions without any grammatical changes. Therefore, these passivized sentences cannot be used to find out whether the most recent filler is preferred, independently of other factors such as deep/surface Case discrepancy.

However, there is a way of changing the order of subject and object NPs which suffers from neither of these problems. For this purpose we can use nominals in place of the clause with nominalizer koto used in Experiment 1. In order to establish a well-controlled test of the effect of movement of the object, Experiment 1 must first be repeated with these nominal constructions, to see if they show a similar preference for O-controllers. Then, in Experiment 3, we will be able to test comparable object-fronted sentences.

One form of verb conjugation, which is called "renyookei" (continuous form) in Japanese, can be used as a nominal in Japanese. For example, the gerundive nominal "iki" (going) is formed by adding "i" to the verb stem "ik-" (to go).¹⁴ Thus, the sentence "Taroo-ga Tookyoo-e iku" has the corresponding nominal expression: "Taroo-no Tookyoo iki." That is, the subject of this nominal expression must be marked with a genitive -no, as in its English counterpart "John's going to Tokyo." Therefore, we can avoid the two problems discussed above. Even without changing the surface

cases of NPs, there is no structural ambiguity, because for the subject Taroo to be the clause mate of the subordinate clause, it is necessary for Taroo to be marked with a genitive -no not with a nominative -ga, as is shown below.

(31)a. Hanako_i-ni Taroo-ga t_i [PRO Tookyoo iki]-o
 -DAT -NOM going-ACC
 yakusokusita.
 promised
 'lit. To Hanako, Taroo promised PRO going to Tokyo.'

b. Hanako-ni [Taroo-no Tookyoo iki]-o
 -DAT -GEN going-ACC
 yakusokusita.
 promised
 'lit. To Hanako, (someone) promised Taroo's going to Tokyo.'

In Japanese, there are two different types of verb with respect to their morphological construction. One is a "simple" verb like iku (to go), warau (to laugh), which cannot be analyzed into smaller elements. The other is a "derived" verb like ryokoosuru (to travel), kenkyuusuru (to study), which can be decomposed into a noun (ryokoo, kenkyuu) and an affix -suru. Thus, there are two types of nominal related to these two types of verb in Japanese. One of them is the "gerundive" nominal mentioned above, the other is a "basic" nominal, from which verbs are derived. For example, the verb ryokoosuru (to travel) is derived from the noun ryokoo (travel). Thus, the sentence "Taroo-ga Tookyoo-e ryokoosuru" (Taroo travels to Tokyo) corresponds to the nominal expression "Taroo-no Tookyoo ryokoo" (Taroo's

travel to Tokyo). Both types of nominals were used in this experiment.

3.5.2 Method

Design and Materials:

The basic design for Experiment 2 was the same as that for Experiment 1. All details such as Name Sets, Scripts, Verbs, and Adverbs were exactly the same as Experiment 1. The only difference was the use of nominals rather than nominalized clauses in the experimental sentences. Some sample sentences are shown below.

(32) S-Control:

a. Tosio_i-ga ototoi Junko_j-ni
 -NOM the day before yesterday -DAT
 [PRO_{i/*j/k} Tookyoo iki]-o tegami-de hakuzyoosita.
 going-ACC letter-by confessed
 'lit. The day before yesterday, Tosio confessed by
 mail Junko PRO going to Tokyo.'

b. Kooiti_i-ga kaisya-de Tamae_j-ni [PRO_{i/*j/k} Tookyoo
 -NOM company-at -DAT
 ryokoo]-o wazato kakusiteita.
 travel-ACC purposely kept secret
 'lit. At the company, Kooiti purposely kept to Tamae
 secret PRO the travel to Tokyo.'

(33) O-Control:

a. Jiroo_i-ga sensyuu Kazumi_j-ni [PRO_{*i/j/k} Tookyoo
 -NOM last week -DAT
 iki]-o denpoo-de tanonda.
 going-ACC telegraph asked
 'lit. Last week, Jiroo asked by telegraph Kazumi PRO
 going to Tokyo.'

b. Tosio_i-ga kissaten-de Junko_j-ni [PRO*_{i/j/k}
 -NOM cafe-at -DAT
 Tookyoo ryokoo]-o hakkirito meireisita.
 travel-ACC clearly ordered
 'lit. Yesterday, Tosio clearly ordered Junko PRO the
 travel to Tokyo.'

Subjects:

This experiment employed the same technique as Experiment 1. Subjects were instructed to listen to each sentence, and to respond by naming the person who is to be in Tokyo. The time from the end of the sentence to the beginning of the response utterance was measured. Twenty five subjects participated in this experiment. All subjects were native speakers of Japanese at Kyoto University in Japan. They were paid 500 yen (= \$3.50) for half an hour.

3.5.3 Results

The data were analyzed as in Experiment 1. Data from two subject were removed from the analysis, since their responses showed less than 80% consistency with the classification of verbs as subject control or object control. In other cases, missing data points were replaced by the subject's mean reaction time. The reaction time for each subject and the mean consistency score for each subject were computed. Results for the overall data are shown in Table 4, and results for gerundive nominals and basic nominals are shown separately in Tables 5 and 6 below. See Appendix F for a more detailed report of RT for each item.

Table 4: Results of Experiment 2 - Mean Reaction Times and 'Consistency Score' with 'p-value'

Sentence Type	RT (msec)	CS (%)
S-control	696	88.7
O-control	631	90.5
Difference	65	-1.8
p-value	p=.029 F(1,22)=5.413	p=.489 F(1,22)=.494

Table 5: Results of Gerundive Nominals in Experiment 2 - Mean Reaction Times and 'Consistency Score' with 'p-value'

Sentence Type	RT (msec)	CS (%)
S-control	692	90.6
O-control	613	90.8
Difference	79	-0.2
p-value	p=.054 F(1,22)=4.117	p=.922 F(1,22)=.009

Table 6: Results of Basic Nominals in Experiment 2 - Mean Reaction Times and 'Consistency Score' with 'p-value'

Sentence Type	RT (msec)	CS (%)
S-control	699	86.9
O-control	647	90.2
Difference	52	-3.3
p-value	p=.051 F(1,22)=4.239	p=.353 F(1,22)=.009

3.5.4 Discussion

The results of Experiment 2 demonstrated that S-control sentences required longer processing time than O-control sentences, as in Experiment 1. The difference in consistency score between S-control and O-control sentences was not significant.

The separate results for gerundive and basic nominals exhibited the same pattern of O-control preference, with almost significant differences of RTs. Since the number of items in these analyses was half the overall number of experimental items (i.e. 24 vs. 48), the effect of the difference would be expected to be less robust in these analyses than in the overall analysis. The experimental findings revealed that sentences like (32) and (33) with deverbal nominals showed the same antecedent preference as the comparable examples in Experiment 1, which have nominalized sentences. This suggests that the parser treats nominals as having an empty subject (PRO), like nominalized sentences. We will assume in what follows that this is so. However, it is a matter of theoretical debate whether nominals have empty subjects or not, and this issue will be discussed in detail in Section 4.2.5.

Now, comparing the results of Experiments 1 and 2, it has been established that O-control preference is consistent for nominalized sentential constructions and nominal constructions. As before, this may suggest a parsing

strategy which favors either recent fillers or object fillers. Experiment 2 cannot by itself resolve this issue, but it does indicate that the effect of varying word order can now be tested with these nominal constructions.

3.6 Experiment 3

3.6.1 Overview

The purpose of this experiment was to examine what would happen when the surface positions of two fillers were inter-changed. The interchange of NPs should directly affect the application of MRFS (if, as FCR/CF assume, it is not sensitive to traces as possible fillers), because the most recent filler changes. If MRFS is indeed the strategy the parser applies when control information is delayed or unavailable, it will have to assign a different filler to the gap according to what is linearly most recent to the gap. In section 4.3, we will discuss at length the question of whether or not object fronting in Japanese leaves a trace. But it is important to note that this prediction from MRFS should hold regardless of whether the movement leaves a trace or not, given FCR/CF's assumption that the parser overlooks trace as a possible controller and selects the most recent lexical filler.

The combination of MRFS and LFO (Lexical Filler Only) hypothesis clearly predicts a preference for S-controllers

b. Tamae_j-ni kaisya-de Kooiti_i-ga \underline{t}_j [PRO_{i/*j/k}
 -DAT company-at -NOM
 Tookyoo ryokoo]-o wazato kakusiteita.
 travel-ACC purposely kept secret
 'lit. To Tamae, at the company, Kooiti purposely kept
 secret PRO the travel to Tokyo.'

(35) O-Control:

a. Kazumi_j-ni sensyuu Jiroo_i-ga \underline{t}_j [PRO_{*i/j/k}
 -DAT last week -NOM
 Tookyoo iki]-o denpoo-de tanonda.
 going-ACC telegraph asked
 'lit. To Kazumi, last week, Jiroo asked by telegraph
 PRO going to Tokyo.'

b. Junko_j-ni kissaten-de Tosio_i-ga \underline{t}_j [PRO_{*i/j/k}
 -DAT cafe-at -NOM
 Tookyoo ryokoo]-o hakkirito meireisita.
 travel-ACC clearly ordered
 'lit. To Junko, yesterday, Tosio clearly ordered PRO
 the travel to Tokyo.'

Subjects:

This experiment employed the same technique as used in Experiments 1 and 2. Twenty five subjects participated in this experiment. All subjects were native speakers of Japanese at Kyoto University in Japan. They were paid 500 yen (= \$3.50) for half an hour.

3.6.3 Results

The data were analyzed as in Experiments 1 and 2. Data from eight subjects were removed from the analysis, since their responses showed less than 80% consistency with the SC/OC classification of experimental sentences.¹⁵

In other cases, missing data points were replaced by the

subject's mean reaction time. Results for the overall data are shown in Table 7, and separate results for gerundive nominal and basic nominals are shown in Tables 8 and 9 below. See Appendix F for a more detailed report of RT for each item.

Table 7: Results of Experiment 3 - Mean Reaction Times and 'Consistency Score' with 'p-value'

Sentence Type	RT (msec)	CS (%)
S-control	751	84.4
O-control	652	90.9
Difference	99	-6.5
p-value	p=.02 F(1,16)=6.633	p=.101 F(1,16)=3.021

Table 8: Results of Gerundive Nominals in Experiment 3 - Mean Reaction Times and 'Consistency Score' with 'p-value'

Sentence Type	RT (msec)	CS (%)
S-control	760	85.2
O-control	630	91.6
Difference	130	-6.4
p-value	p=.04 F(1,16)=4.971	p=.147 F(1,16)=2.317

Table 9: Results of Basic Nominals in Experiment 3 - Mean Reaction Times and 'Consistency Score' with 'p-value'

Sentence Type	RT (msec)	CS (%)
S-control	739	83.7
O-control	672	90.1
Difference	67	-6.4
p-value	p=.091 F(1,16)=3.222	p=.125 F(1,16)=2.617

3.6.4 Discussion

The results of Experiment 3 demonstrated that O-control sentences were still faster to process than S-control sentences even though the object NP was not the most recent lexical filler but the distant filler. There was no significant difference in consistency of judgement between S-control and O-control sentences, although the tendency was for O-control sentences to be judged as O-control slightly often than for the S-control sentences to be judged as S-control.

The results for the gerundive nominals showed the same significant preference for O-control. The results for the basic nominals showed the same tendency of O-control preference, although the difference was only marginally significant. The less significant effect in these analyses of each nominal type may result from the fewer number of items than those in the overall analysis.

These findings eliminate MRFS for Japanese in conjunction with either (i) the claim that this movement of the object leaves no trace, or (ii) the claim that the movement leaves a trace but the parser is (temporarily) 'blind' to it. Hence, in order to maintain the validity of MRFS, it is necessary to admit the existence of trace in these constructions, and that the parser recognizes it as a possible filler. However, this conflicts with FCR/CF's assumption that trace is not counted as a possible filler in

English control constructions. It is implausible to claim that this kind of 'blindness' to empty categories is a characteristic peculiar to the parser for English.

Certainly, no explanation has been proposed for why this should be so. The only assumption under which it would be plausible would be that the parser for English overlooks an empty category in the FCR/CF constructions because it is still in the process of finding and filling it, i.e. it does not quite yet exist by the time the immediately following PRO is encountered. But then, as noted by Fodor (1988), this makes the error a mere performance error rather than a systematic failure of transparency, and undermines the whole argument for MRFS and LFO in English.

To summarize: All the three main experiments showed a clear preference for O-control. We have taken this as counter-evidence to the combination of MRFS and LFO. However, other possible explanations for these experimental findings should be considered. It might be suggested that what we have been calling S-control constructions do not really involve control of PRO at all, and that in Japanese just as in English, "subject-control" is in fact rare and exceptional. This is an important linguistic issue and will be addressed in Section 4.2. But the experimental evidence could not easily be accounted for on this assumption. Suppose that only the O-control is a real case of control to which MRFS and LFO apply. It is still predicted that the O-

control sentences in Experiment 3 should be more difficult to process than the O-control sentences in Experiment 2, because the subject controller picked up by MRFS and LFO is not the correct filler. The experimental findings do show that RTs for O-control sentences in Experiment 3 are longer than RTs for them in Experiment 2 (652 msec - 631 msec = 21 msec difference). However, there is the same trend of increase in RT between Experiment 2 and Experiment 3 for what we have been calling S-control sentences (751 msec - 696 msec = 55 msec difference). If this is not a control construction at all, it is not clear why this difference should exist. Even if it is a control construction, there is no obvious explanation other than the fact that the word order in Experiment 3 is somewhat less natural than the word order in Experiment 2. But note that this would then also explain the difference in RT between experiments for the O-control sentences.

Other possible explanations for the data which do not challenge MRFS and LFO would be that the S-control sentences are more difficult than the O-control sentences for irrelevant reasons, such as (i) that the S-control verbs are less familiar than the O-control verbs, or (ii) that the meanings of the S-control sentences are less plausible (or natural) than those of the O-control sentences, or (iii) that the controller is less definitely determined by the grammar for S-control than O-control. A series of follow-up

experiments was conducted to investigate these possibilities.

3.7 Follow-up Tests

All the follow-up tests were conducted in the form of a questionnaire written in Japanese characters.¹⁶ Thus, the subjects had more time to answer the questions compared with subjects in the main experiments.

3.7.1 Frequency Rating

Lexical access times are well known to depend on word frequency. In the main experiments, subjects responded to the whole sentence immediately after hearing the matrix verb. So, a response time difference between S-control and O-control sentences could perhaps be due to a difference in speed of access of the S-control and O-control verbs. We did not conduct a timed lexical access experiment, but we did conduct an experiment to check whether O-control verbs are more frequent in Japanese (in sentences of this level of complexity and style) than S-control verbs are. In fact what was established in this experiment was the degree of perceived familiarity of different verbs. Of course, the relation between lexical familiarity and frequency is not perfectly straightforward. However, Gernsbacher (1984) has

reported that experimentally determined familiarity reliably affects word recognition latencies in a way very comparable to the effect of frequency.

Method:

The questionnaire for this test was a list of 104 verbs, 24 of which were S-control verbs and other 24 were O-control verbs. These 48 verbs were the same verbs used in Experiments 1 to 3. Their order of the appearance was the same as in Experiments 1 to 3. The other 56 verbs were pseudo randomly selected from a Japanese dictionary by the experimenter as filler verbs to disguise the purpose of the test. At the right side of each verb, there was a 5-point scale. Subjects were instructed to mark one of five points. Fifty students at Kyoto University answered this questionnaire. They performed the questionnaire as part of the requirements for a course. The mean rating for each verb was computed. The instruction and the results are shown below (See Appendix G for data for each item):

Instructions (given in Japanese):

"Concerning the following words, please mark the five point scale according to how often you encounter and use them. Please mark point 1 if you have never encountered nor used the word. Please mark point 2 if you have heard someone use the word but you rarely use it. Please mark point 3 if you sometimes encounter and use the word. Please mark point 4 if you usually encounter and use the word. Please mark point 5 if you encounter and use the word very often."

Results:Table 10: Mean Rating Score for Frequency Test
(point 5 is the maximum)

Verbs	Rating
S-control	4.23
O-control	3.99
Difference	0.24
p-value	p=.075 F(1,23)=3.454

Discussion:

It should be noted that all but one of these verbs fell towards the "more frequent" end of the scale, though there were differences among them. The results showed that the difference of judged frequency between S-control verbs and O-control verbs was non-significant, though there is a marginally significant trend for S-control verbs to have a higher mean judged frequency than O-control verbs. If this factor had influenced ease of sentence processing in the main experiments, we could have expected that the S-control sentences would have been easier to process than the O-control sentences, contrary to the results of the main experiments. Therefore, it is not plausible that a difference of frequency was the cause of the faster responses to the O-control sentences in Experiments 1, 2, and 3.

3.7.2 Naturalness Rating

It is possible that the S-control sentences and the O-control sentences differ with respect to how natural they are. That is, the preference for O-control might be the result of greater naturalness of the O-control sentences. Thus, the purpose of this follow-up test is to examine how natural subjects perceive each sentence to be.

Three questionnaires were used in this follow-up test, corresponding respectively to Experiments 1, 2, and 3. Exactly the same sentences as in these three main experiments were written on paper in the same order as in the three experiments.

Subjects were students at Kobe University of Foreign Studies. Twenty seven subjects responded to Questionnaire 1, twenty five subjects responded to Questionnaire 2, and twenty four subjects responded to Questionnaire 3. They performed the questionnaire as part of the requirements for a course.

Next to each sentence was a five point rating scale. The task was to mark an appropriate point for each sentence from "extremely natural" (point 5) to "extremely unnatural" (point 1). The instructions (which include the instruction for Consistency of Antecedent Selection to be presented in the next section) and the mean rating score are presented below (See Appendix H for data of each sentence):

Instructions (given in Japanese):

"Concerning the following sentences, please mark the five point scale according to how natural you feel them to be. Please mark point 1 if you feel the sentence is very unnatural. Please mark point 2 if you have heard someone use the sentence but you rarely use it. Please mark point 3 if you sometimes encounter and use the sentence. Please mark point 4 if you usually encounter and use the sentence. Please mark point 5 if you encounter and use the sentence very often.

Furthermore, please mark the name of the person who is supposed to be in Tokyo."

Results (Q = Questionnaire):

Table 11: Results of Naturalness Rating - Mean Rating Score (RS) with 'p-value'

Sentence Type	RS(%): Q 1	RS(%): Q 2	RS(%): Q 3
S-Control	3.54	3.56	3.51
O-Control	3.49	3.59	3.57
Difference	0.05	-0.03	-0.06
p-value	p=.492 F(1,26)=.485	p=.437 F(1,24)=.622	p=.297 F(1,23)=1.138

Discussion:

Note that 131 out of 144 sentences tested fell at the "natural" end of the scale (i.e. had a score higher than 3.00: see Appendix H). The exceptions were evenly distributed across S-control and O-control sentences. No sentence had a mean naturalness rating less than 2.7. There was no significant difference between the rating of the S-control sentences and the rating of the O-control sentences

for any of the three questionnaires. The results of this follow-up test suggest that the findings in the main experiments did not reflect a difference of naturalness between the S-control and the O-control sentences.

3.7.3 Consistency of Antecedent Selection

It is conceivable that the antecedents for PRO in O-control sentences in Japanese are significantly easier to identify than those in S-control sentences. As we have seen in the pre-test, subjects seemed to be somewhat more consistent in identifying the antecedent in O-control sentences than in S-control sentences. However, the materials in the pre-test were not completely identical to those in the main experiments, so this point needs to be examined again with the sentences in the main experiments.

Thus, the purpose of this follow-up test is to check whether there is a significant difference of consistency between the S-control sentences and the O-control sentences in identifying the antecedents for the empty subject. If the O-control sentences have a significantly higher consistency score than the S-control sentences, this difference might have been the cause of the preference for O-control in the main experiments.

The questionnaires and subjects in this follow-up test were the same as those in the Naturalness Rating test. That is, subjects were asked two questions in one questionnaire;

(i) "How natural is this sentence?" (Naturalness), which is reported in the previous section, and (ii) "Who is supposed to be in Tokyo?" (Consistency Score). See the instructions in the previous section.

Note that the percentages in Table 11 denote the percentage of subjects whose judgments agreed with the SC/OC classification of sentences established by the experimenter. (See Appendix I for detailed data for each item.)

Results:

Table 12: Results of Antecedent Selection - Mean Consistency Score (CS) with 'p-value'

Sentence Type	CS(%): Q 1	CS(%): Q 2	CS(%): Q 3
S-Control	94.3	90.1	87.9
O-Control	92.3	88.6	88.4
Difference	2.0	1.5	-0.5
p-value	p=.299 F(1,23)=1.127	p=.578 F(1,23)=.317	p=.880 F(1,23)=.023

The difference in consistency between S-Control and O-Control sentences was not significant for any of the three sets of materials. In the first two questionnaires the S-Control sentences were judged more consistently. In the third questionnaire the O-Control sentences were judged more consistently. But in all cases the differences were very small and not significant.

Discussion:

The findings of this follow-up test suggest that it is not the case that the results of the main experiments reflected a greater clarity in the determination of the controller for PRO, in the O-control sentences than in the S-control sentences.

**3.7.4 Antecedent Selection and Confidence Rating
- Without Context**

As we have noted, there is a possibility of a "third party" interpretation for the empty subject in Japanese, in addition to a subject control or an object control interpretation. It is imaginable that the S-control sentences in the main experiments were more ambiguous than the O-control sentences, in the sense that the S-control sentences allowed the third party interpretation more easily than the O-control sentences did. Thus, the results of the main experiments may possibly have reflected a difference in degree of ambiguity of this kind between the S-control and the O-control sentences.

In the previous antecedent selection test, the task was to select the antecedent in an "either-or" fashion where the only choices offered were the subject and the object of the matrix clause. In the present test, subjects were given three choices of possible antecedent: subject NP, object NP, and a third individual not mentioned in the sentence. Also they were asked to score how confident they were concerning

the selection of the antecedent. Thus, this test examined how confidently subjects selected subject NP as an antecedent in S-control sentences and selected object NP in O-control sentences, and also how possible the third party interpretation was in these two types of sentences. If O-control sentences have significantly higher confidence ratings than S-control sentences, this may be why they were responded to more rapidly than the S-control sentences in the main experiments.

Furthermore, if the percentage of third party interpretations is significantly higher for the S-control sentences than for the O-control sentences, this also may have contributed to the greater processing difficulty of S-control sentences in the main experiments. (Note that the existence of any third party interpretations might be taken as evidence that the construction does not involve control of PRO. This is discussed in Chapter 4.)

Two tests (Test A and B) were conducted. Sentences in Test A had the "Subject-Object" order and those in Test B had the opposite "Object-Subject" order. Materials used in Test A were exactly the same as those in Experiment 2, and materials in Test B were exactly the same as those in Experiment 3. Each sentence was presented with three options for the possible antecedent of the empty subject: the subject of the matrix clause, the object of the matrix clause (both designated by a name), and some individual not

mentioned in the sentence which is written as "someone else" without specific name. No specific context was provided to introduce this third party individual or to favor the third party possibility or either of the other possibilities. At the right side of each of the three options, there was a 6-point scale. Subjects were instructed to mark the point from the most possible (point 5) to the least possible (point 1), and the totally impossible (point 0). The instructions, given in Japanese, are shown below:¹⁷

"In the following sentences (from 1 to 56), there appear three pairs of people: "Tosio" and "Junko", "Jiroo" and "Kazumi", and "Kooiti" and "Tamae". Please read the following sentences and mark one of the six points (point 5 to 0) according to "Who is most likely to be in Tokyo". For example, let us consider the following example:

Tosio-ga ototoi Junko-ni Tokyo iki-o
 -NOM the day before yesterday going-ACC
 hakkirito syoodakusita
 clearly consented
 'The day before yesterday, Tosio clearly consented to going to Tokyo to Junko.'

Tosio	5	4	3	2	1	0
Junko	5	4	3	2	1	0
Sonota (someone else)	5	4	3	2	1	0

In the above example, two people, i.e. Tosio and Junko appear. If you think only Tosio is in Tokyo and there is no possibility that Junko is in Tokyo, then, mark point 5 for Tosio and mark point 0 for Junko.

If you think it is possible that Junko is also in Tokyo, but the possibility is lower than the possibility that Tosio is in Tokyo, mark a point between 4 and 1 according to that possibility.

Furthermore, if you think it is possible that a third party (e.g. Taroo) is also in Tokyo, then, mark

point 5 to 1 according to its possibility.

In short, if you think one (or two) of the three people can never be in Tokyo, then, mark point 0 for that person. If you think one (or two) of the three people can be in Tokyo, then, mark a point between 5 and 1 according to the possibility of his or her being in Tokyo."

Subjects were native speakers of Japanese at Shoin University who participated in these tests to fulfill a course requirement. Eighteen subjects participated in Test A, and another eighteen subjects participated in Test B.

Results:

Within each group of sentences (S-control and O-control), three significance tests were conducted: subject NP vs. object NP; subject NP vs. third party; and object NP vs. third party. Missing data points were replaced by the mean of each subject. The results are shown below:

Test A: same materials as Experiment 2

Table 13: Mean of Rating Score for Subject-Object order

(I) Subject-NP vs. Object-NP comparison

Interpretation	Sentence Type	
	S-control	O-control
Subject-NP	3.6	2.6
Object-NP	2.8	3.7
Difference	0.8	-1.1
p-value	p=.003 F(1,17)=11.278	p=.003 F(1,17)=12.013

(II) Subject-NP vs. Third Party comparison

Interpretation	Sentence Type	
	S-control	O-control
Subject-NP	3.6	2.6
Third Party	3.0	3.0
Difference	0.6	-0.4
p-value	p=.118 F(1,17)=2.701	p=.206 F(1,17)=1.727

(III) Object-NP vs. Third party comparison

Interpretation	Sentence Type	
	S-control	O-control
Object-NP	2.8	3.7
Third Party	3.0	3.0
Difference	-0.2	0.7
p-value	p=.368 F(1,17)=.853	p=.069 F(1,17)=3.740

Test B: same materials as Experiment 3

Table 14: Mean of Rating Score for Object-Subject order

(I) Subject-NP vs. Object-NP comparison

Interpretation	Sentence Type	
	S-control	O-control
Subject-NP	3.8	2.8
Object-NP	3.2	4.1
Difference	0.6	-1.3
p-value	p=.0169 F(1,17)=7.012	p=.0002 F(1,17)=22.423

(II) Subject-NP vs. Third Party comparison

Interpretation	Sentence Type	
	S-control	O-control
Subject-NP	3.8	2.8
Third Party	2.9	2.8
Difference	0.9	0
p-value	p=.005 F(1,17)=10.358	p=.548 F(1,17)=.375

(III) Object-NP vs. Third Party comparison

Interpretation	Sentence Type	
	S-control	O-control
Object-NP	3.2	4.1
Third Part	2.9	2.8
Difference	0.3	1.3
p-value	p=.236 F(1,17)=1.505	p=.0002 F(1,17)=21.758

Discussion:

The results clearly show that a subject controller is preferred over an object controller in the sentences experimentally designated as S-control sentences, and an object controller is preferred over a subject controller in the sentences experimentally designated as O-control sentences. These differences are significant, as shown in Tables 13 (I) and 14 (I).

Let us now look at the results for the preferred antecedent interpretation compared with a third party interpretation. In Test A the difference was not significant for the S-control sentences (Table 13 (II): $p=.118$), and was marginally significant for the O-control sentences (Table 13 (III): $p=.069$). In Test B, the difference was significant for both the S-control sentences (Table 14 (II): $p=.005$) and the O-control sentences (Table 14 (III): $p=.0002$). Except one case, there was a significant difference between the preferred interpretation and the third party interpretation. And in the case where no significant effect was found, the preferred interpretation had a higher score than the third party interpretation (3.6 vs. 3.0). This seems to indicate that there is substantial preference for the preferred interpretations over the third party interpretation. The issue of third party interpretation will be discussed in Section 4.2.

For the purpose of explaining the preference for O-control in the main experiments, what is relevant is whether the S-control sentences are more ambiguous than the O-control sentences. If this is the case, the greater processing difficulty of the S-control sentences in the main experiments could be accounted for without giving up MRFS and LFO. However, note that MRFS and LFO predict an O-control preference for Subject-Object order, and an S-control preference for Object-Subject order. So, the third party ambiguity could account for the discrepancy between predicted and obtained results only if the ambiguity were particularly severe for S-control sentences in Object-Subject order (in the case of Test B). The third party explanation would be possible if the following two conditions are satisfied. (i) The third party interpretation is possible only for S-control sentences, i.e. O-control sentences do not have the third party interpretation, or at least S-control sentences have remarkably high score of the third party interpretation than O-control sentences. But this is not true: the scores of the third party interpretation were almost the same: 2.9 for S-control sentences and 2.8 for O-control sentences. And the difference was not significant ($F(1,17)=1.224, p=.283$). (ii) The difference between the subject interpretation and the third party interpretation is not significant (possibly ambiguous) but the one between the object interpretation and

the third party interpretation is significant (possibly unambiguous). This is not true either: both were significant. But the significance of the difference between the subject interpretation and the third party interpretation ($p=.005$) is less than the significance of the difference between the object interpretation and the third party interpretation ($p=.0002$). This could be the source of the difficulty of the subject interpretation in Object-Subject order; though not so strong evidence as mentioned above. Thus, the results do not show any greater preference in Object-Subject order for the third party interpretation in S-control sentences than in O-control sentences.

The same is true when we look at the results for the third party interpretation relative to the non-preferred interpretation. In Subject-Object order, the third party interpretation was rated slightly higher than the non-preferred interpretation, for both the S-control and the O-control sentences, but the difference did not reach significance (see Table 13 (II): O-control and (III): S-control). In Object-Subject order, the third party interpretation was rated slightly lower than the non-preferred interpretation for both the S-control and the O-control sentences, but again the difference did not reach significance (see Table 14 (II): O-control and (III): S-control). Thus, the comparison of non-preferred interpretation and third party interpretation did not show

any differences across the two sentence types or the two word orders. We may tentatively conclude that the degree of preference for a third party controller was not the source of the consistent preference for an object controller in the main experiments.

It is possible, however, that the third party interpretation would have been more strongly favored if it were not for the fact that no NP indicating the existence of a specific third party appeared in the sentence that was being judged. The sentences in these tests contained no NP other than the subject NP and object NP of the main clause. Furthermore, no context was provided to support a third party interpretation, although the possibility of a third party interpretation was briefly mentioned in the instructions for the test. In order to reveal the potential for third party interpretations more clearly, it will be useful to conduct a test with a context which encourages the third party interpretation.

3.7.5 Antecedent Selection and Confidence Rating - With Context

In the previous test, we could not find any consistently greater preference for a third party interpretation in S-control sentences. However, the potential for a third party interpretation may reveal itself more clearly if context invoking such an interpretation is provided. Conceivably, under these circumstances, an

asymmetry in the strength of the third party interpretation will be revealed, between the S-control and O-control sentences. Thus, the idea of this follow-up test is to examine the effect of context on the selection of an antecedent.

The materials for this test were the same as those for the previous test, but the instructions for this test explicitly indicated the existence of a specific third party (Taroo). Except for this context in the instructions emphasizing the third individual, and the specific name given to him, everything was the same as in the previous test.¹⁸ The instructions are shown below:

"In the following sentences (from 1 to 56), there appear three pairs of people: "Tosio" and "Junko", "Jiroo" and "Kazumi", and "Kooiti" and "Tamae". And in these sentences, the topic is Taroo. That is, these people are talking about Taroo. Then, please read the following sentences and mark one of the six points (point 5 to 0) according to "Who is most likely to be in Tokyo". For example, let us consider the following example:

Tosio-ga ototoi Junko-ni Tokyo iki-o
 -NOM the day before yesterday going-ACC
 hakkirito syoodakusita.
 clearly consented
 'The day before yesterday, Tosio clearly consented
 to going to Tokyo to Junko.'

Tosio	5	4	3	2	1	0
Junko	5	4	3	2	1	0
Taroo	5	4	3	2	1	0

In the above example, two people, i.e. Tosio and Junko

appear. If you think only Tosio is in Tokyo and there is no possibility that Junko is in Tokyo, then, mark point 5 for Tosio and mark point 0 for Junko.

If you think it is possible that Junko is also in Tokyo, but the possibility is lower than the possibility that Tosio is in Tokyo, mark a point from 4 to 1 according to that possibility.

Furthermore, if you think it is possible that Taroo is also in Tokyo, then, mark a point from 5 to 1 according to its possibility.

In short, if you think one (or two) of the three people can never be in Tokyo, then, mark point 0 for that person. If you think one (or two) of the three people can be in Tokyo, then, mark a point between 5 and 1 according to the possibility of his or her being in Tokyo."

Subjects were native speakers of Japanese at Shoin University who participated in these tests to fulfill a course requirement. Twenty one subjects participated in Test A, and twenty subjects participated in Test B.

Results:

The methods of analysis were the same as in the previous test.

Test A: same materials as Experiment 2

Table 15: Mean of Rating Score for Subject-Object order

(I) Subject-NP vs. Object-NP comparison

Interpretation	Sentence Type	
	S-control	O-control
Subject-NP	4.3	3.2
Object-NP	3.6	4.6
Difference	0.7	-1.4
p-value	p=.0039 F(1,20)=10.618	p=.0001 F(1,20)=52.951

(II) Subject-NP vs. Third Party comparison

Interpretation	Sentence Type	
	S-control	O-control
Subject-NP	4.3	3.2
Third Party	4.2	4.0
Difference	0.1	-0.8
p-value	p=.749 F(1,20)=.104	p=.006 F(1,20)=9.256

(III) Object-NP vs. Third Party comparison

Interpretation	Sentence Type	
	S-control	O-control
Object-NP	3.6	4.6
Third Party	4.2	4.0
Difference	-0.6	0.6
p-value	p=.008 F(1,20)=8.450	p=.034 F(1,20)=5.175

Teat B: same materials as Experiment 3

Table 16: Mean of Rating Score for Object-Subject order

(I) Subject-NP vs. Object-NP comparison

Interpretation	Sentence Type	
	S-control	O-control
Subject-NP	4.1	3.2
Object-NP	3.5	4.2
Difference	0.6	-1.0
p-value	p=.0149 F(1,19)=7.175	p=.0001 F(1,19)=62.151

(II) Subject-NP vs. Third Party comparison

Interpretation	Sentence Type	
	S-control	O-control
Subject-NP	4.1	3.2
Third Party	3.8	3.8
Difference	0.3	-0.6
p-value	p=.286 F(1,19)=1.200	p=.018 F(1,19)=6.685

(III) Object-NP vs. Third Party comparison

Interpretation	Sentence Type	
	S-control	O-control
Object-NP	3.5	4.2
Third Party	3.8	3.8
Difference	-0.3	0.4
p-value	p=.208 F(1,19)=1.697	p=.103 F(1,19)=2.928

Discussion:

Concerning the preferred interpretations for the experimentally designated S-control and O-control sentence, these tests showed the same results as the previous tests. That is, a subject controller is preferred in the S-control sentences, and an object controller is preferred in the O-control sentences, for both word orders (see Table 15 (I) and Table 16 (I)).

Let us now look at the results for the preferred antecedent interpretation and the third party interpretation. In Subject-Object order (Test A), the difference was not significant for the S-control sentences (Table 15 (II): $p=.749$), but was significant for the O-control sentences (Table 15 (III): $p=.034$). For Object-Subject order (Test B), the difference was not significant for both the S-control and O-control sentences (Table 16 (II): $p=.286$ and Table 16 (III): $p=.103$).

The important question, as noted in the previous section, is how the strength of the third party interpretation is distributed among sentence types and word orders. In fact, the comparison of preferred interpretation and third party interpretation indicates a greater degree of ambiguity for the S-control sentences in Subject-Object order, but no difference between the S-control and the O-control sentences in Object-Subject order. If we assume that ambiguity makes processing more difficult, the results

of Test A (Subject-Object order) could explain the S-control difficulty. This results can also be expected by MRFS: the subject filler is not preferred, because it is the distant filler. If the subject interpretation in Test B were significantly ambiguous than the object interpretation in relation to the third party interpretation, it could have explained S-control difficulty independently of MRFS. However, the results do not support the hypothesis that processing difficulty in the main experiments was determined by the degree of the third party ambiguity: the score of the third party interpretation was 3.8 for both types of sentences, and of course, they are not significantly different ($F(1.17)=.018$, $p=.89$); the difference between the preferred and the third party interpretation was not significant for both.

Now, let us consider the results for the non-preferred interpretation compared with the third party interpretation. For Subject-Object order (Test A) the third party interpretation was rated significantly higher than the non-preferred interpretations in both the S-control and the O-control sentences (see Table 15 (II): O-control and (III): S-control). For Object-Subject order (Test B), the third party interpretation was rated slightly higher than the non-preferred interpretation for the S-control sentences, but the difference did not reach significance (see Table 16 (III): S-control). For the O-control sentences the third

party interpretation was significantly preferred over the non-preferred interpretation (see Table 16 (II): O-control). This comparison of non-preferred interpretation and third party interpretation does not show any asymmetry of preference for a third party interpretation that could account for the results in the main experiments.

Providing context biased to the third party interpretation, we expected that this interpretation would exhibit higher scores in this test than in the previous test. This expectation was satisfied:

Table 17: Mean Rating Score for the Third Party Interpretation

(A) Subject-Object order

Context	Sentence Type	
	S-control	O-control
With context	4.2	4.0
Without context	3.0	3.0
difference	1.2	1.0

(B) Object-Subject order

Context	Sentence Type	
	S-control	O-control
With context	3.8	3.8
Without context	2.9	2.8
difference	0.9	1.0

It is clear from the above table that rating score for the third party interpretation is relatively higher when some context supporting that interpretation is provided than when context is not provided. However, note that all other scores became higher with context than without context.

Table 18: Mean Rating Score for the Subject and the Object-NP Interpretation

(A) Subject-Object order

(i) Subject-NP Interpretation

Context	Sentence Type	
	S-control	O-control
With context	4.3	3.2
Without context	3.6	2.6
Difference	0.7	0.6

(ii) Object-NP Interpretation

Context	Sentence Type	
	S-control	O-control
With context	3.6	4.6
Without context	2.8	3.7
Difference	0.8	0.9

(B) Object-Subject order

(i) Subject-NP Interpretation

Context	Sentence Type	
	S-control	O-control
With context	4.1	3.2
Without context	3.8	2.8
Difference	0.3	0.4

(ii) Object-NP Interpretation

Context	Sentence Type	
	S-control	O-control
With context	3.5	4.2
Without context	3.2	4.1
Difference	0.3	0.1

From the findings of these two Antecedent Selection follow-up tests, we could make the following two claims: (i) There is a significant difference of antecedent selection between S-control and O-control sentences, in accord with the classification of sentences established on the basis of the experimenter's native intuitions and the results of the pre-test. (ii) The third party interpretation varies in strength according to the context, but this does not affect the antecedent preference. Overall, the findings of these two tests (without and with context) showed that there was no significant difference in the strength of the third party interpretation relative to sentence type (S-control or O-

control) or word order (Subject-Object or Object-Subject). Thus, it is not tenable to assume that competition from the third party interpretation can account for the preference for the object-control in the main experiments.

3.7.6 Sentence Completion Test

To make a fair test of MRFS in Japanese, we want the parser to encounter the empty subject, and recognize it as PRO, before it encounters the verb that carries information about the controller. But Japanese sentences tend to be highly ambiguous, at least temporarily. It is conceivable, then, that the results of the main experiments are due in some fashion to a mistake by the parser about the nature of the construction in these sentences. Thus, the purpose of this follow-up test was to examine at what point the subjects in the main experiments realized that the sentence contained PRO. Did they realize this before they encountered the final verb which determined its antecedent? (Linguistic issues concerning the existence of the empty subject in nominals will be discussed in Section 4.1.6.). Three sentence completion tests were conducted to answer this question.

Sentence Completion Test 1

The sentence fragments examined in this test were selected from the experimental sentences in Experiment 2.

Three fragments containing "Tookyoo iki" (going to Tokyo) and another three fragments containing "Tookyoo ryokoo" (the travel to Tokyo) were tested. In this completion test, these six sentence fragments ended with the nominal "iki" (going) or "ryokoo" (travel). That is, the pattern was "NP₁ + Adverb + NP₂ + [Tookyoo iki/ryokoo] ...". Twelve filler fragments, taken from the filler sentences in Experiment 2, were also included. Six were from subject filler sentences, and six were from object filler sentences. The total number of sentence fragments was 18.

Twenty three subjects took this test as a part of their course credits at Shoin University. The instruction was as follows: "The following sentence fragments (01) - (18) are incomplete. Please add appropriate words to complete these 18 fragments as meaningful sentences."

It was found that subjects completed the fragments in basically two different ways. One was to complete a fragment with the genitive particle -no plus a noun. The other was to complete a fragment with the accusative particle -o plus a verb. Our experimental sentences correspond the latter case.

First let us consider some examples of sentence completion with the genitive particle obtained from the test. These examples sorted by S-control (36), O-control (37), or ambiguous (38):

- (36)a. Tosio-ga ofisu-de Junko-ni [_{NP}[PRO Tookyoo iki]
 -NOM at-office -DAT going
 -no keikaku]-o zimansita.
 -GEN plan-ACC boasted
 'lit. At office, Tosio boasted Junko the plan of going
 to Tokyo.'
- b. Jiroo-ga sensyuu Kazumi-ni [_{NP}[PRO Tookyoo ryokoo]
 -NOM last week -DAT travel
 -no omiyage]-o watasita.
 -GEN present-ACC handed
 'lit. Last week, Jiroo handed Kazumi the present from
 the travel to Tokyo.'
- (37)a. Kooiti-ga kinoo Tamae-ni [_{NP}[PRO Tookyoo iki]
 -NOM yesterday -DAT going
 -no kippu]-o watasita.
 -GEN ticket-ACC handed
 'lit. Yesterday, Kooiti handed Tamae the ticket for
 going to Tokyo.'
- b. Tosio-ga ofisu-de Junko-ni [_{NP}[PRO Tookyoo ryokoo]
 -NOM at-office -DAT travel
 -no kansoo]-o kiita.
 -GEN impression ask
 'lit. At office, Tosio asked Junko the impression of
 the travel to Tokyo.'
- (38)a. Jiroo-ga sensyuu Kazumi-ni [_{NP}[PRO Tookyoo iki]
 -NOM last week -DAT going
 -no sinkansen]-no zikokuhyyoo-o watasita.
 -GEN bullet train-GEN time table-ACC handed
 'lit. Last week, Jiroo handed the time table of the
 bullet train going to Tokyo.'
- b. Tosio-ga ofisu-de Junko-ni [_{NP}[PRO Tookyoo ryokoo]
 -NOM at-office -DAT travel
 -no panfuretto]-o miseta.
 -GEN pamphlet-ACC showed
 'lit. At office, Tosio showed Junko the pamphlet of
 the travel to Tokyo.'

This type of completion will be called the "genitive completion", since that the gerundive nominal "Tookyoo iki" (going to Tokyo) and the basic nominal "Tookyoo ryokoo" (the travel to Tokyo) are interpreted as modifiers of the noun

keikaku (plan), omiyage (present), kippu (ticket), etc. In (36), the agent of going/traveling seems to be the subject Tosio in (36a) and the subject Ji-roo in (36b). On the other hand, in (37) the empty subject seems to be identical with the object Tamae in (37a) and the object Junko in (37b). Furthermore, in (38) the agent of going/traveling seems to be unspecific. That is, this empty subject allows an "arbitrary" PRO interpretation, which will be discussed in Section 4.0. Considering especially this possibility of arbitrary interpretation, this "genitive completion" might be rather ambiguous concerning antecedent selection. However, we are not particularly interested in this type of completion, because it is different from our experimental sentences.

If the fragment was completed with supplying a human noun, it would be the case that there is no PRO. For example, 'Tosio-ga Junko-ni [[[e] Tookyoo iki]-no syoonen (boy)]-o syookaisita (introduced)' (Tosio introduced Junko the boy who's going to Tokyo). The empty subject in this case is bound by the following noun syoonen (boy) not the preceding noun (Tosio or Hanako). However, there was no example of such kind of completion.

The most frequently used nouns for the "Tookyoo iki" pattern were kippu (ticket): 13 out of 69 (18.8%), sinkansen (bullet train): 6 out of 69 (8.7%), and hanasi (talk): 5 out of 69 (7.2%). On the other hand, for the "Tookyoo ryokoo"

pattern, hanasi (talk): 15 out of 69 (21.7%), keikaku (plan): 6 out of 69 (8.7%) had relatively high preference. The total sum for both patterns; hanasi: 14.5%, kippu: 9.4%, keikaku: 5.1%, and sinkansen: 4.3%.

The other way to complete the fragments was to add the accusative particle -o plus a verb. The following examples are sorted by S-control (39) and O-control (40).

- (39)a. Jiroo-ga ototoi Kazumi-ni [PRO Tookyoo
 -NOM the day before yesterday -DAT
 iki]-o utiaketa.
 going-ACC disclosed
 'lit. The day before yesterday, Jiroo disclosed to
 Kazumi going to Tokyo.'
- b. Tosio-ga ofisu-de Junko-ni [PRO Tookyoo ryokoo]-o
 -NOM at-office -DAT travel-ACC
 kokuhakusita.
 confessed
 'lit. At office, Tosio confessed to Junko traveling to
 Tokyo.'
- (40)a. Kooiti-ga kinoo Tamae-ni [PRO Tookyoo iki]-o
 -NOM yesterday -DAT going-ACC
 susumeta.
 recommended
 'lit. Yesterday, Kooiti recommended to Tamae going to
 Tokyo'
- b. Jiroo-ga sensyuu Kazumi-ni [PRO Tookyoo ryokoo]-o
 -NOM last week -DAT travel-ACC
 tanonda.
 asked
 'lit. Last week, Jiroo asked of Kazumi traveling to
 Tokyo.'

This type of completion will be called the "accusative completion" in the sense that the gerundive nominal "Tookyoo iki" (going to Tokyo) and the basic nominal "Tookyoo ryokoo"

(the travel to Tokyo) are interpreted as accusative objects of the verb utiaketa (disclosed), susumeta (recommended), etc. In this interpretation, the empty subject seems to be bound by the main clause subject in (39) and the main clause object in (40).

Let us consider where subjects become aware of the existence of the missing subject. In (39a), for example, at the point of Tookyoo, it is not clear whether there is a clause boundary, since it is possible to say, 'Jiroo-ga Kazumi-ni Tookyoo-no hanasi-o sita' (Jiroo talked to Kazumi about Tokyo). At the point of iki (going), it is clear that there must be an empty subject, since iki is one place predicate that does not take an object. It is not clear, however, whether this empty subject is a trace of the following relative head (e.g. '[trace_i Tookyoo iki]-no hito_i' (a person going to Tokyo), or PRO. At the point of the accusative particle -o, it is clear that the empty subject is PRO, since an antecedent cannot follow. The particle would have to be -no for an antecedent to follow. Thus, if subjects select this interpretation, it would be expected that they are ready to commit themselves to deciding the antecedent of the empty subject at the point of the accusative particle -o.

The most frequently supplied verbs for the "Tookyoo iki" pattern were susumeta (recommended): 4 out of 69 (5.8%), and utiaketa (confessed): 3 out of 69 (4.3%). For

the "Tookyoo ryokoo" pattern, sasotta (induced): 10 out of 69 (14.5%) had relatively high preference. The total sum for both patterns, sasotta: 8%, susumeta: 3.6%, and utiaketa: 2.2%.

The verb utiaketa seems to be a clear S-control verb. If the subject confessed going to Tokyo, it is natural to interpret that the person who confessed went to Tokyo. Other clear cases of S-control verbs were kokuhakusita (confessed) and honomekasita (hinted). It seems to me that susumeta is a clear O-control verb. If the subject recommended that the object to go to Tokyo, it is natural to interpret that the recommender would stay there and the recommendee would go to Tokyo. Other clear cases of O-control verbs were tanonda (asked) and sizisita (instructed).

Although the S-control/O-control status of these verbs seems to me to be rather clear, this experiment provided neither confirming nor disconfirming evidence. Note that the task of this test was only to complete a sentence, and not to answer which NP is the controller.

Results:

Three sets of data are shown below; (i) mean percentage for types of sentence completion for "Tokyo iki" nominal, (ii) mean percentage for "Tokyo ryokoo" nominal, and (iii)

mean of (i) and (ii).¹⁹

Table 19: Results of Sentence Completion Test 1

(i) "Tokyo iki"

Completion Type	Rating (%)
Genitive Completion	61.6
Accusative Completion	38.4
p-value	P=.076 F(1,22)=3.455

(ii) "Tookyoo ryokoo"

Completion Type	Rating (%)
Genitive Completion	56.5
Accusative Completion	43.5
p-value	P=.377 F(1,22)=.811

(iii) Mean of (i) and (ii)

Completion Type	Rating (%)
Genitive Completion	59.1
Accusative Completion	40.9
p-value	P=.153 F(1,22)=2.183

Discussion:

The results of this completion test showed that there was no significant difference in likelihood between the

"genitive completion" and the "accusative completion" although the "genitive completion" has a slightly higher score than the "accusative completion". These findings will suggest that some subjects had interpreted the fragment "Tookyoo iki/ryokoo" as constituting a part of a genitive phrase and other subjects as constituting an accusative phrase at this point.

For the genitive construction, subjects know the existence of the empty subject. Subjects assumed an antecedent precedes the empty subject. No subjects assumed a head of relative which follows the empty subject. So, the gap-filling strategy would be applied here. It could be the case that this strategy may not be the same as for clausal complements. But ideally it would be, since it is very odd if MRFS applied to one but other. So probably, even these -no constructions are relevant to MRFS. But we will set aside.

For the accusative construction, subjects know the existence of the empty subject that must be PRO. At the point of -o it is clear that the antecedent of the empty subject must precede. The antecedent cannot follow, since a relative head does not follow the accusative -o in Japanese. In this response, same kinds of control verbs as in the experimental materials appeared (e.g. utiaketa (disclosed): S-control and susumeta (recommended): O-control).

Now let us now examine two other completion tests which

demand completion of a sentence fragment at different points.

Sentence Completion Test 2

In this second completion test, the sentence fragments ended with the accusative particle -o. That is, the pattern was "NP₁ + Adverb + NP₂ + [Tokyo iki/ryokoo]-o ...". There will be basically only one choice for this type of completion. That is, the "genitive completion" is impossible in this case, because this type of completion requires the genitive particle -no instead of the accusative particle -o. Thus, the only choice should be the "accusative completion", although there is a possibility of completing it not only with a verb but also with an adverb plus a verb.

The results of the second completion test showed that all subjects (21 native speakers of Japanese at Shoin University) completed these fragments with a verb. Two out of 126 cases were completed with an adverb plus a verb (as in our experimental sentences). This finding suggests that at the point of the accusative particle -o subjects strongly expected a verb to appear.

As is discussed in the previous section, the existence of the accusative particle -o clearly indicates that the sequence "Tookyoo iki/ryokoo" constitutes an accusative phrase containing the empty subject whose antecedent must

precede. Thus, the parser will be clearly aware of the existence of the empty subject and will be ready to fill this gap at this point. See some examples below:

- (41)a. Kooiti-ga kinoo Tamae-ni [PRO Tookyoo iki]-o.
 -NOM yesterday -DAT going-ACC
 utiaketa
 disclosed
 'lit. Yesterday, Kooiti disclosed Tamae going to
 Tokyo.'
- b. Jiroo-ga ototoi Kazumi-ni [PRO Tookyoo
 -NOM the day before yesterday -DAT
 iki]-o susumeta
 going-ACC recommended
 'lit. The day before yesterday, Jiroo recommended
 Kazumi going to Tokyo.'

The most frequently appeared verbs for the "Tookyoo iki" pattern were tugeta (announced): 13 out of 63 (20.6%), susumeta (recommended): 12 out of 63 (19%), and utiaketa (confessed): 7 out of 63 (11.1%). On the other hand, for the "Tookyoo ryokoo" pattern; susumeta (recommended): 11 out of 63 (17.5%), hanasita (told): 5 out of 63 (7.9%), and sasotta (invited): 5 out of 63 (7.9%) had relatively high preference. The total sum for both patterns, susumeta: 18.3%, tugeta: 13.5%, utiaketa: 7.2%, hanasita: 7.2%, and sasotta: 4.8%.

It seems to me that susumeta is a clear O-control verb, as is discussed in the previous section. Other clear cases of O-control verbs (although the percentage of them is less than 3 %) were meizita (ordered), tanonda (asked). It seems

to me that utiaketa is a clear S-control verb. Other clear cases of S-control verbs were kokuhakusita (confessed). The verbs tugeta and hanasita might be ambiguous between S-control and O-control interpretation. That is, the subject can announce/talk that the subject is going/traveling to Tokyo, or that the object must go/travel to Tokyo (because of some force which is out of control of the object). The verb sasotta could have both the subject and object as controller, although the subject seems to have dominant status. We assume tentatively that this verb is S-control verb with the proviso mentioned above. To summarize:

Table 20: Number and percentage of the most frequently supplied verbs in Sentence Completion Test 2

"Tookyoo iki": total number is 63

S-control	<u>utiaketa</u> (confessed)	7 (11.1%)
O-control	<u>susumeta</u> (recommended)	12 (19%)
Ambiguous	<u>tugeta</u> (announced)	13 (20.6%)

"Tookyoo ryokoo": total number is 63

S-control	<u>sasotta</u> (invited)	5 (7.9%)
O-control	<u>susumeta</u> (recommended)	11 (17.5%)
Ambiguous	<u>hanasita</u> (told)	5 (7.9%)

The above is a list of the top three of the most frequently supplied verbs. From this list, we may say that O-control verbs are more frequently expected to appear than S-control

verbs (23 vs. 12). We cannot tell, however, whether this high expectation of O-control verbs caused the O-control preference, or the O-control preference caused the high expectation of O-control verbs. We do not know which precedes (or follows) which. And also note that the task of this test was only to complete a sentence, and not to answer who is supposed to go/travel to Tokyo. Thus, the distinction between S-control and O-control (and ambiguous control) was not definite in this test, since the purpose of this test was to examine at which point subjects become aware of the existence of the empty subject.

Sentence Completion Test 3

In the third completion test, the sentence fragments ended with an adverb. That is, "NP1 + Adverb + NP2 + [Tookyoo iki/ryokoo]-o + Adverb ...". There is basically only one way of completing this fragment. That is, the only possible way to complete this fragment is to choose the "accusative completion" as in the previous completion task. Thus, we would expect that subjects complete this fragment with a verb, although another adverb can be added.

The third completion test showed the same results as the second test. That is, in the completion task for the fragment, subjects (23 native speakers of Japanese at Shoin University) completed these fragments with a verb without any exception. This finding suggests that subjects strongly

expected a verb to appear at this point. See some examples below:

- (42)a. Kooiti-ga kinoo Tamae-ni [PRO Tookyoo iki]-o
 -NOM yesterday -DAT going-ACC
 denwa-de utiaketa
 telephone-by disclosed
 'lit. Yesterday, Kooiti disclosed Tamae going to Tokyo
 by phone.'
- b. Jiroo-ga sensyuu Kazumi-ni [PRO Tookyoo iki]-o
 -NOM last week -DAT going-ACC
 denpoo-de tanonda
 telegraph-by asked
 'lit. Last week, Jiroo asked Kazumi going to Tokyo by
 telegraph.'

The most frequently appeared verbs for the "Tookyoo iki" pattern were siraseta (informed): 54 out of 75 (72%), tugeta (announced): 8 out of 75 (10.7%), and tutaeta (reported): 4 out of 75 (5.3%). The variation for this completion pattern was relatively low; only nine different verbs were used. On the other hand, the "Tookyoo ryokoo" pattern had much more variation; more than 25 different verbs appeared. Among them, kotowatta (refused): 13 out of 75 (17.3%), siraseta (informed): 9 out of 75 (12%), and tugeta (announced): 7 out of 75 (9.3%) had relatively high preference. The total sum for both patterns; siraseta: 42%, tugeta: 10%, kotowatta: 8.7%, and tutaeta: 6.7%.

The verbs siraseta tugeta and tutaeta could be ambiguous between S-control and O-control interpretation, as is discussed in the section on the previous sentence

completion tasks. The verb kotowatta seems to have clear S-control status. If the subject refused to go/travel to Tokyo, it is natural to interpret that the subject, not the object, was supposed to go/travel to Tokyo, although he would not go/travel to Tokyo as a result of the refusal. To avoid such a confusion, this kind of verb was not used in our main experiments. Other clear cases of S-control were hakuzyoosita (confessed), honomekasita (hinted), kokuhakusita (confessed), and utiaketa (disclosed). On the other hand, the clear cases of O-control were only two; tanonda (asked) and iiwatasita (sentenced). For this completion task, thus, S-control verbs seems to be preferred. Note that this is not definitely established by this test, since the task of this test was only to complete a sentence, and not to answer who is supposed to go/travel to Tokyo. To summarize:

Table 21: Number and percentage of the most frequently supplied verbs in Sentence Completion Test 3

"Tookyoo iki": total number is 75

S-control		
O-control		
Ambiguous	<u>siraseta</u> (informed) <u>tugeta</u> (announced) <u>tutaeta</u> (reported)	54 (72%) 8 (10.7%) 4 (5.3%)

"Tookyoo ryokoo": total number is 75

S-control	<u>kotowatta</u> (refused)	13 (17.3%)
O-control		
Ambiguous	<u>siraseta</u> (informed) <u>tugeta</u> (announced)	9 (12%) 7 (9.3%)

The above is a list of the top three of the most frequently supplied verbs. No O-control verbs appears on this list. Some O-control verbs did appear in this completion test, but the number was very small. O-control verbs seem not to be expected to appear more frequently than S-control verbs, unlike the results of the previous completion test.

From the above findings of three sentence completion tests, we could conclude that the parser expects to find a control verb at least by the point where the accusative particle -o appears, and that this expectation is further strengthened if an adverb subsequently appears. Among the responses to these completion tests, there was no other (no-

control) ending of these sentences that the experimenter had overlooked.²⁰ There was no tendency to mis-parse the sentence, for example, (i) supply a verb that does not fit the construction, e.g. '*Tosio-ga Junko-ni [Tookyoo iki]-o atta (met).' The two place predicate atta (met) does not satisfy the syntactic condition that the predicate must be a three place predicate. For this verb, 'Tosio-ga Junko-ni atta.' (Tosio met Junko.) would be fine. (ii) supply a verb that is syntactically suitable but semantically unacceptable, e.g. '*Tosio-ga Junko-ni [Tookyoo iki]-o karita (borrowed).' If '[Tookyoo iki]' is replaced by hon (book), this example becomes acceptable: 'Tosio-ga Junko-ni hon-o karita.' (Tosio borrowed a book from Junko.). No example indicated above appeared in these three completion tests.

Therefore, it would be plausible to assume that subjects in the three main experiments detected a gap at the subject position and were ready to fill it at the point they encountered the accusative particle -o.

We may also suppose that the parser definitively fills the gap on encountering the final verb. In the meantime, the parser might apply a strategy to guess the interpretation of the missing subject. Now we can ask how long the parser needs to rely on such a strategy. The mean syllable length of adverbs inserted between the accusative

particle -o and the final verb in the main experiments was 4.3. Is this too short for application of a strategy to occur? The parser might apply a strategy at the very point of the accusative particle -o, or not until some syllables later. FCR's definition of the MRFS (see (6) in page 14) says that this strategy applies "initially and quickly". Though of course it is difficult to know just how quickly is intended, it seems safe to assume that MRFS would have had an opportunity to apply during these sentences if it were psychologically real.

The purpose of these completion tests was to examine at what point the parser expects find out the empty subject (PRO), and how strong this expectation is among subjects. But, it is also possible to examine the data from the view point of how frequently S-control or O-control verbs appear (see Tables 20 and 21). We could have done some experiments using this paradigm: what kind of control verbs do subjects supply? However, this is a less sensitive experimental paradigm than that of our main experiments, because (i) it is not clear whether the high frequency of S-control or O-control verbs cause the S-control or O-control preference, or contrary to this, the S-control or O-control preference is the source of the high frequency of S-control or O-control verbs, and because (ii) there appear many ambiguous cases mentioned in Sentence Completion Test 3. In any case, nothing here undermine our experimental findings. There was

no consistent O-control verb preference throughout the tests. The increased number of ambiguous control cases in Sentence Completion Test 3 would be caused by the adverbs, which might give subjects time to think of more complicated sentences.

3.8 Conclusions: Comparison of Japanese and English

Pending clarification of linguistic issues in the next chapter, let us reconsider our experimental findings. The results of Experiments 1 and 2, in which experimental sentences have subject-object order, showed that O-control sentences were easier to process than S-control sentences. The objects in these two experiments were also the most recent fillers. Thus, the results of these experiments are compatible with the hypothesis that MRFS applies to Japanese control structures. However, the result of Experiment 3, in which experimental sentences have object-subject order, revealed that not the most recent lexical filler but the object was preferred as a controller, even when it was the distant lexical filler. This is not compatible with MRFS for Japanese except in conjunction with the claim that the parser recognizes empty categories as possible fillers.

The results of the follow-up tests indicated that there were no significant differences between S-control and O-control constructions with respect to perceived verb

frequency, sentence naturalness, and consistency or confidence of antecedent assignment. Therefore, it is appropriate to take the findings of the main experiments as a genuine indication that the processor favors object controllers regardless of their surface positions in the sentence. Thus, either (i) the parser knows that empty categories can be fillers, in which case MRFS could be correct and LFO is wrong; or (ii) the parser does not know that empty categories can be fillers, in which case MRFS is wrong and LFO could be correct. Therefore, MRFS can be correct for Japanese only if empty categories can be fillers. However, MRFS is supported for English, as part of the FCR/CF explanation for their data, only if empty categories cannot be fillers. Therefore, the experimental findings at least suggest that MRFS in its original form cannot account for the cases in English and the cases in Japanese in a unified fashion. At best, then, MRFS and LFO are special purpose strategies for English; at worst, they are not true at all.

Now, let us consider again the English and Japanese examples relevant to our discussion:

(43)a. That's the girl that the woman had decided [___ to sing for ___ last Christmas].

b. That's the girl that the woman had forced ___ [___ to sing last Christmas].

- (44)a. Taroo-ga Hanako-ni [___ Tookyoo iki]-o
 -NOM -DAT going-ACC
 yakusokusita/susumeta.
 promised recommended
 'lit. Taroo promised/recommended Hanako PRO going to
 Tokyo.'
- b. Hanako-ni Taroo-ga ___ [___ Tookyoo iki]-o
 -DAT -NOM going-ACC
 yakusokusita/susumeta.
 promised recommended
 'lit. To Hanako, Taroo promised/recommended PRO going
 to Tokyo.'

The English comparison of decide and force is that of one gap and two gaps. The Japanese comparison of S-O order and O-S order is also that of one gap and two gaps. In both languages, the constructions with two gaps are harder to process than that with one gap. This finding is compatible with the account of English processing suggested by Crain and Fodor: that object control sentences are difficult despite a preference for object control, because of the two adjacent gaps.

Now the only thing left to explain is why, for Japanese, both one gap (S-O order) and two gaps (O-S order) constructions prefer object control rather than subject control when both a subject and an object are present. Note that this is a different comparison than that of decide and force in English. It is like a comparison of promise and persuade in English. An experiment using this comparison is impossible in English, since promise is almost the only verb that shows subject control when both a subject and an object

are present, while English has a lot of object control verbs. That is, object control is overwhelmingly more common than subject control in English. Not only verb frequency but also language acquisition facts (see C.Chomsky (1969), Cohen Sherman (1983,1987)) suggest a preference for object control in English also.²¹ If we assume that the object preference found in the Japanese data is universal, the object controller preference in both S-O and O-S order can be explained. In both Japanese and English, object control is preferred. Therefore, it would be plausible to assume that the FCR/CF data for English picked up the processing load at the double gap position in object control structures, while the Japanese data picked up the object controller preference in O-control structures.

Another possible explanation for the object control preference in Japanese would be to explain the control phenomenon in terms of "thematic relations".²² Nishigauchi (1984) claims that Goal is chosen as the controller in the following examples:

- (45) (=Nishigauchi's (4a and b))
- a. Bill bought for Susan_i a large flashy car [PRO_i to drive].
 - b. John_i received from Susan a book [PRO_i to read].

Nishigauchi claims that the indirect object denotes the Goal in (45a), since the Theme (=the car) moves to the indirect object Susan. On the other hand, the subject is assumed to be Goal in (45b) because the movement of the Theme (a book) is directed toward the subject John. This difference of control behavior is explained by the difference of predicate (buy vs. receive) which governs the control relation.

However, there are cases in which no Goal is specified in a sentence. Consider the following examples:

- (46) (=Nishigauchi's (8a))
John_i owns a car [PRO_i to carry his own belongings in].
- (47) (=Nishigauchi's (10))
They deprived Mary_i of the money [PRO_i to pay her rent with].

Nishigauchi argues that the subject of verbs such as own, retain, etc. is associated with the thematic relation of Location, where this means what the Theme (e.g. a car in (46)) belongs to. On the other hand, the object of verbs like deprive, cure, etc. is assumed to bear the thematic relation of Source from which the Theme (e.g. the money in (47)) is transferred.

To summarize: If Goal is specified in a sentence, it is always chosen as controller. When only Location or Source is specified, then that thematic role serves as controller. Nishigauchi thus claims that there is a hierarchical relation among thematic roles concerning which thematic role

is chosen as controller, as is shown below.

- (48) (=Nishigauchi's (15))
 The Primary Location Hierarchy
 1. Goal > 2. Location, Source

However, Nishigauchi's interesting proposal of the general tendency for Goal antecedent has some limitation. In English, as Nishigauchi notices, the promise-type "obligatory control" does not fit the Goal preference. For instance, in 'John promised Mary [PRO to go to Tokyo].', the object Mary should be the antecedent of PRO, since it is the Goal of John's promising, but this is not the case. Furthermore, in a gerund construction like 'John admitted to Mary [PRO having eaten the cake].', the indirect object Mary is not the controller despite being Goal of John's admitting. In Japanese, all the subject control sentences are counter-examples to the general thematic preference for Goal. In these sentences, like a promise-type sentence in English, the subject is the controller despite the fact that the object is Goal. Thus, the Goal preference seems to be overridden by specific lexical control feature of subject control verbs. It is particularly interesting that Japanese has approximately as many subject control verbs that do not have a Goal controller.

Now, the object controller preference in Japanese do not have to be explained by the general Goal preference,

since Goal can be either a subject or an object. However, recall that in the Japanese examples used as experimental sentences, objects were marked with the dative particle -ni ('to' or 'toward'). This dative marker may facilitate the interpretation that the object denotes Goal. Thus, it could be assumed that the parser recognizes the object as Goal and prepares to parse the given sentence as an O-control sentence. In English cases, an object is not overtly marked with any marker, so that its thematic role as Goal is not so easily perceivable to the parser. However, if the object is in an apparent object position, it would be expected that the object is the preferred controller. For example, in the sentence "The woman begged the girl [PRO to sing ...]", in which the girl is the Goal of the woman's begging, it is not natural to assume that the parser prefers subject controller. When an object is present, a object control is such a strong tendency in English that it is really remarkable that FCR/CF should have observed a subject control preference in their experiments. This makes it more likely that their finding was due to some particular aspect of their experimental design, and does not reflect a real difference between English and Japanese.

Footnotes to Chapter 3

1. In what follows, the term "control" is used as indicating the linguistic phenomenon in which a noun phrase controls (is coindexed with) an empty subject (PRO). It should not be confused with the use of the term "control" often used in the psycholinguistic literature designating sentences used in an experiment to establish a baseline against which to compare experimental sentences.

2. The subjects for this pre-test were teachers at a Japanese school in the U.S., who were teaching Japanese students in the Japanese language. Thus, their linguistic intuitions of Japanese could be retained very well, although they are living in a bilingual situation.

3. Additional criteria for selecting these verbs were familiarity (some verbs are very rarely used loan words), and avoidance of homonyms (e.g. genmeisuru can be interpreted as declare clearly and order firmly, although these two are distinguished in a written form).

4. One may argue that the empty subject can also take a split antecedent as follows:

- (i) Taroo_i-ga Hanako_j-ni [e_{i&j} issyoni Tokyo-e iku] to
 -NOM -DAT together -LOC go COMP
 yakusokusita.
 promised
 'lit. Taroo promised Hanako that e go to Tokyo
 together.'

However, it is not clear that (i) does allow a genuine split antecedent interpretation. In the above example, the agent of going to Tokyo is still the subject NP, and the object NP is interpreted as being additional, an accompanier. Although this could be an interesting issue, it is an intricate one, and we will not go into it further here.

5. As we may notice, each group consists of verbs with some common meaning. Group-A has verbs meaning to tell/confess a thing, event, fact, etc. to a hearer. Group-B seems to involve verbs meaning to require a hearer to do something. It may be possible to characterize the two types of verbs by some semantic criteria, although it is yet unclear.

6. Here, the "conventional" way of counting means that the syllable counting is based on a Japanese writing system established on phonetic symbols (Hiragana or Katakana). That is, one phonetic symbol is considered to represent one syllable here. See Hattori (1951) and Shibatani (1990,

Chapter 8) for issues concerning the identification of syllables in Japanese.

Basically, a vowel can constitute one syllable by itself, but a consonant must be followed by a vowel to constitute one syllable. That is, Japanese has an open syllable structure. However, there are some exceptional syllable structures. For example, [n] is counted as one syllable at the word final position and when it is followed by a consonant (e.g. [hon] has two syllables, and [ganko] has three); consonant + semi-vowel (e.g. [kya], [kyu], [kyo], etc.) is counted as two syllables; and consonant cluster (e.g. [pp], [tt], [kk], etc.) is considered to be split into two syllables. For example, [atta] is counted as having three syllables.

7. It was unfortunately impossible to obtain frequency counts for these verbs, so the frequency of S-control and O-control verbs were not exactly matched. But see Section 3.7.1 where perceived frequency for the verbs used in the main experiments was presented.

8. The subjects were also teachers at a Japanese school. See Footnote 2.

9. Usually, the former name (Taroo) is used to indicate a male person, and the latter name (Hanako) is used to refer to a female person in Japanese.

10. Note that verbs like #11, 12, 19 in Appendix C showed a fairly low consistency score in this experiment, though not in the pre-test. However, the number of subjects (10 for both the pre-test and the pilot study) would not be enough to give any decisive conclusion.

11. RT ranges from 290 msec to 703 msec (=413 msec difference) for S-control verbs, and from 312 msec to 751 msec (=439 msec difference) for O-control verbs. STD ranges up to 504 for S-control verbs, and up to 619 for O-control verbs. It might be unnatural to get a low p-value ($p=.004$) when STDs are as high as this, but this is not impossible to occur.

12. Since we do not know the consistency score and RT in the pilot study for the newly added verbs from the pre-test, we took consideration of the consistency score of the pre-test. See Section 3.7.3 for the consistency score of all the verbs tested in the main experiments.

13. The term "filler" here is not to be confused with the term in "filler-gap relation".

14. We assume that this type of nominal is comparable to a gerundive nominal such as "going" in English in the sense that it is derived from a verb and can function as subject or object of a sentence. Consider the following examples:

- (i) Tookyoo iki ga enkisareta.
going NOM was postponed
'Going to Tokyo was postponed.'
- (ii) Taroo-wa Tookyoo iki o okuraseta.
-TOP going ACC delayed
'Taroo delayed going to Tokyo.'

15. One could say that the number of subjects (eight) who did not reach the standard in Experiment 3 is fairly high compared to the number in Experiment 1 (five) and in Experiment 2 (two). If this difference is significant, it may suggest that Object-Subject order is somewhat less natural than Subject-Object order in Japanese. Kuno (1973) says that, according to a large-scale statistical study of Japanese sentence structures by the National Language Research Institute, "the ratio of frequencies of occurrence between the SOV word order and the OSV word order in Japanese is 17 to 1" (p.4, Footnote 3).

16. This may result in some imprecision in the comparison between the follow-up tests and the main experiments in which presentation was auditory. The difference between auditory and visual presentation may be greater in Japanese than in English, because the Japanese writing system uses both Chinese characters (Kanji) and two types of phonetic symbols (Hiragana and Katakana). Thus, it may well be the case that a word is very common in a spoken form, but not so commonly used in a written form. Although I have limited the use of Kanji to some well used cases, there could be some influence of this somewhat complicated writing system on the answers of the subjects.

17. This instruction could be confusing what the sentence asserts with who might (on quite independent grounds) be in Tokyo. I deliberately used the expression 'to be in Tokyo' instead of 'going to Tokyo' to avoid a possible bias toward the sentences using 'going' over the sentences using 'travel'. However, even if the responses were biased, the bias should be spread among the tested sentences.

Furthermore, this instruction tends to encourage subjects to consider various mixed interpretations by saying 'if it is also possible that ...'.

Therefore, we devised a new instruction and did a pilot study. The instructions and the results are shown in Section 5.2. where some possible future experiments are discussed.

18. This way of providing context might not be enough to get a significant effect, since memory for the topic could become less robust toward the end of the test. In future experiments, it would be advisable to add a different short story preceding each sentence.

19. The measuring system was as follows: Suppose that there are 10 items to be calculated. If a subject answered with the genitive construction (i.e. with the marker -no), the score was marked as 2. If a subject answered with the accusative construction (i.e. with the marker -o), the score was 1. Because the statistic analysis program does not accept 0 as a legitimate element, I had to use 2 and 1 as a score number. Thus, if s/he answered 7 items with the genitive construction, and 3 items with the accusative construction, the score would be 7 by 2 = 14 and 3 by 1 = 3. After the statistic analysis, we can get the percentage of each type of response, if we divide the score by 2 and multiply by 100.

20. There could be some other way of completing the sequence in these tests, although these alternatives did not appear in the actual responses. For instance, it is possible to have a construction which has another verbal element such as a light verb suru (to do) preceding the final control verb.

(i) Tosio-ga Junko-ni [PRO Tookyoo ryokoo-o suru]
 -NOM -DAT travel-ACC do
 to utiaketa.
 COMP disclosed
 'Tosio disclosed to Junko that PRO will do travelling
 to Tokyo.'

Although the nature of this suru verb is not yet clear, the point here is that the sequence '*Tosio-ga Junko-ni Tookyoo ryokoo suru' is not grammatical, and it needs to be supplied with a control verb in the end as is illustrated above.

Another possible way would use a causative construction. Observe the following example:

(ii) Tosio-ga Junko-ni [PRO Tookyoo ryokoo]-o saseta.
 -NOM -DAT travel-ACC do-CAUS
 'Tosio made Junko travel to Tokyo.'

The causative seems to have some property similar to an O-control verb such as meireisita (ordered) which requires the hearer to do something. See Footnote 5 above.

21. But Hsu, Cairns and Fiengo (1985) claim that there are some discontinuous stages of acquiring of control:

- (1) subject-oriented
- (2) object-oriented
- (3) mixed subject-object (transitional)
- (4) approaching adult
- (5) adult

But see also Cohen Sherman (1983, 1987) arguing that there is no discontinuous stages of development.

22. See also Jackendoff (1972) and Růžička (1983) for discussions of control based on thematic relation.

CHAPTER 4

Linguistic Aspects of the Issue

In this chapter, we discuss two linguistic issues which were simply assumed and not yet fully discussed in the previous chapters. Section 4.1 reviews some discussions on empty categories. In Section 4.2, we discuss the issue of empty subjects in Japanese. Our experiments were designed to test control constructions in Japanese. The sentences used in these experiments share obvious properties with control constructions in English, but we wish now to take a more careful look at the similarities and differences, in order to decide how closely these experiments can be expected to correspond to those of FCR/CF on English. Section 4.3 treats the issue of trace in Japanese. We have noted that our experiments have a disjunctive conclusion: either the processor does not favor recent fillers in Japanese, or else, if it does, it construes the trace of object fronting (scrambling) as a possible filler. In either case, the FCR/CF account is not confirmed for Japanese. But it would be satisfactory to know which

alternative is correct. If it were established that scrambling does not leave a trace, the second alternative would be eliminated. If scrambling does leave a trace, we cannot tell whether the parser is taking the trace or the lexical NP as the filler in an object control construction. We can say only that a transparent parser would take the trace to be the filler because it is the trace that is in the argument position in association with the verb (the lexical NP is presumably adjoined to S, hence is in an A'-position); and there is reason to believe that a controller must always be an argument (in the case of obligatory control but not in the case of non-obligatory control: see discussions below).

These are complex topics, which could fill whole dissertation by themselves. Here, we must restrict our discussions to issues directly relevant to our experiments. But we begin with a brief general introduction to the study of empty categories in the GB (Government and Binding) theory framework.

4.1 empty categories

The notion of "gap", which is mainly used in the psycholinguistic literature, refers to various phonetically null elements such as PRO, pro, trace, etc. In this chapter, we will use the linguistic term "empty category"

(henceforth EC) to refer to these elements. In order to classify various ECs, it has been proposed to introduce two syntactic features: "+/-anaphoric" and "+/-pronominal". By using these features, we can discriminate the following four types of ECs (cf. Chomsky 1982, p.78, (104)):

(1) Four Types of ECs

	+anaphoric	-anaphoric
+pronominal	PRO	<u>pro</u>
-pronominal	anaphors	variables

These ECs are identified by a set of well-formedness conditions (such as Binding Theory stated in (3) below, the Projection Principle mentioned in Section 4.3 later, and the Theta-criterion) stated as follows (cf. Chomsky 1981, p.330; 1982, p.35):

- (2)a. An EC is a pronominal iff it is free or locally A-bound by an antecedent with an independent Theta-role.
- b. An EC is an anaphor iff it is locally A-bound by an antecedent that lacks an independent Theta-role.
- c. An EC is a variable iff it is locally A'-bound and is in A-position.

We will consider some characteristics of the empty pronominals (PRO and pro) and variables in this section, and WH-trace (one kind of variable) in Section 4.3. Anaphors

(=NP-trace) will not be discussed further here.

In the GB framework, the referential properties of overt NPs such as anaphors (each other), pronouns (he), and R-expressions (John) are characterized by the "Binding Principles", which can be represented as follows:

(3) (=Chomsky 1982, (17))
Principles of the Theory of Binding

- A. An anaphor is bound in its governing category.¹
- B. A pronominal is free in its governing category.
- C. An R-expression is free.

Since ECs are characterized by the same syntactic features as overt NPs, both overt and empty nominal elements are assumed to obey the same Binding Principles. Thus, PRO [+anaphor, +pronominal] is supposed to satisfy both principles A and B. However, it is a contradictory requirement to satisfy both principles A and B, because it means PRO must be simultaneously bound and free in its governing category. To avoid this contradiction, it is claimed that PRO cannot have a governing category. If PRO does not have a governing category, there is no governor. Then, PRO lacks a Case, because Case is assigned under government. Thus, a lexical counterpart of PRO does not exist, because a lexical NP is required to be case marked

because of the Case Filter. The above considerations regarding PRO are often referred to as the "PRO Theorem": PRO must be ungoverned.

Now, let us consider how PRO is construed. If an EC is PRO, its referential properties are assumed to be determined by the principles of "Control Theory", not by Binding Principles. In the OB (On Binding) framework, Chomsky (1980) distinguishes three types of control structures; subject control, complement control, and arbitrary control, as shown below (Chomsky's (90b), (91a), and (92a) respectively):

- (4) John promised (Bill) [PRO to win].
- (5) John persuaded Bill [PRO to leave].
- (6) It is unclear [what [PRO to do t].

Chomsky assumes that the basic principle of control is the "Minimal Distance Principle" of Rosenbaum (1967), which said that the NP closest to the deleted subject position would be the antecedent for "Equi-NP deletion". This is obviously a close relative of FCR/CF's MRFS, but unlike MRFS it is intended to be a principle of grammar, though it may have exceptions. Thus, the nearest NP is normally identified as the controller, as is the case in (5). However, Chomsky proposes that certain verbs such as promise in (4) are marked in the lexicon with the feature [+SC] indicating

"assign subject control". Thus NP is a controller for V if (i) NP is an indexed NP properly related to V; (ii) if V = [+SC] then NP is the subject of V. For a case like (6), Chomsky says that if COMP is not null and V has no controller, in the sense just given, then PRO is assigned arb. Rizzi (1986) characterizes arb as "a cover term for the feature specification identifying the set of properties generally referred to as "arbitrary interpretation": [+human, +generic, +/-plural], etc." (p.509).

Thus, the theory of control in the OB framework consists of two parts; one is the Minimal Distance Principle with lexically marked exceptions, and the other is an 'elsewhere' rule of arb assignment.

Chomsky (1981), however, points out that the phenomena of control are more complex than what were assumed in the OB framework. First, Chomsky notes that the normal control properties can sometimes be ambiguous and/or reversed.

Consider the following examples:

- (7) (=Chomsky's (8), p.76)
John asked the teacher to leave early.
- (8) (=Chomsky's (9), p.76)
John asked (begged, pleaded with, ...) the teacher to be allowed to leave early.
- (9) (=Chomsky's (2iv), p.75)
John pleaded with Bill [PRO to feed himself].

Here, (7) is ambiguous, because either John or the teacher

can be the controller. In (8), where the subordinate clause is passive, subject control is preferred, contrary to the object control preference in the comparable example (9) in which the subordinate clause is active.

Second, Chomsky points out that PRO_{arb} is not restricted to the case in which an overt complementizer appears. In purposive infinitivals, a referent of PRO may be arbitrary as is shown below:

- (10) (=Chomsky's (15), p.77)
The books were sold [PRO to help the refugees].

Chomsky also notes that c-command is not required for control, so that a non-c-commanding antecedent can control PRO as illustrated below:

- (11) (=Chomsky's (17i), p.77)
[PRO to clear myself of the charges] is important to me.

Furthermore, Chomsky says that there can be "long distance" control such as (12) below; the controller is not a subject or an object of the next clause up, but they, which is in two clauses up from PRO, is the antecedent of PRO.

- (12) (=Chomsky's (5), p.156)
They thought I said that [PRO to feed/feeding each other] would be difficult.

On the basis of the above observations, Chomsky says that control theory "involves a number of different factors: structural configurations, intrinsic properties of verbs, other semantic and pragmatic considerations" (pp.78-79). As Comrie (1984) claims, it appears that "in any comprehensive account of control phenomena, syntactic, semantic, and pragmatic factors must all be taken into account" (p.464).

In an attempt to distinguish these different factors relevant to control, Williams (1980) argues that there are basically two types of control. He proposes to account for control phenomena in terms of "predication". Williams distinguishes two types of control construction; "Obligatory Control" (OC) and "Nonobligatory Control" (NOC). He argues that OC has the same properties as predication does, and NOC does not. Consider the following example:

- (13) (=Williams' (31b))
 John_i promised Bill [PRO to leave]_i.

Here, it is claimed that the antecedent John is coindexed with the whole infinitival clause, not with a PRO alone. Thus, Williams argues that "the rule of Obligatory Control is really the rule of predication" (p.209), and OC has the following salient properties:

- (14) (=Williams' (26))
- OC1. Lexical NP cannot appear in the position of PRO.
 - OC2. The antecedent precedes the controlled PRO.
 - OC3. The antecedent c-commands the controlled PRO.
 - OC4. The antecedent is thematically or grammatically uniquely determined.
 - OC5. There must be an antecedent.

On the other hand, if the construction [PRO VP] is not in positions of predication, it is not necessary for it to be coindexed with an NP in the matrix clause. The properties of NOC are characterized as converses of those of OC as follows:

- (15) (=Williams' (42))
- a. No antecedent is necessary.
 - b. If there is an antecedent, it need not c-command.
 - c. The antecedent may follow S.
 - d. The antecedent is not uniquely determined.
 - e. Lexical NP can appear in the position of PRO.

The property (15a) is illustrated by the following (16a) and (16c). (15b) and (15c) are illustrated by (16b). (15d) is illustrated by (17) in which either the matrix subject or object can be construed as the controller. (15e) is illustrated by (18) below:

- (16) (=Williams' (43))
- a. what [PRO to do] is a mystery
 - b. what [PRO to do] is a mystery to John
 - c. there is nothing [PRO to do]
 - d. John has something [PRO to do]

- (17) (=Williams' (48))
- I am counting on Bill to get there on time.

- (18) (=Williams' (44))
 John has something for Bill to do.

Thus, the properties of NOC mentioned by Williams cover a fairly wide range of the phenomena: not only the 'generic' interpretation (PRO_{arb}) mentioned in Chomsky (1980) but also various types of control pointed out by Chomsky (1981).

Following Williams, it seems to be plausible to assume that there are basically two types of control; (i) Obligatory Control where the controller must be either the subject or the object in the next higher clause, (ii) Non Obligatory Control where a generic interpretation is possible (PRO_{arb}), or a non-c-commanding antecedent (long distance control), etc. can be the controller.² The sentences used in the FCR/CF experiments belong to the obligatory control case. The question, then, is how to determine the controller uniquely as the subject or the object in the main clause. One possibility is to assume a Minimal Distance Principle and specify the control property of exceptional verbs, as in Chomsky's (1980) OB framework. Another possibility is to depend on the thematic roles of the NPs in the main clause as in Nishigauchi (1984) (see Section 3.8).

The difference between our experimental sentences and those of FCR/CF is that the Japanese cases also allow a

'third party' to be the controller. 'Third party' here does not mean a non-specific referent like arb, but some specific referent in the preceding discourse. Some theoretical implications of this 'third party' interpretation will be considered in Section 4.2.

Now, let us consider the characteristics of pro. In the GB framework, pro [-anaphor, +pronominal] is considered to be a phonetically null counterpart of an overt pronoun such as he or she. Consider the following example:

- (19) (=Chomsky (1982)'s (105a))
e parla
 'he is speaking'

Here, Chomsky (1982) claims that "the EC e is as definite in reference as is he in the translation" (p.79). The referential content is supposed to be determined by the agreement (AGR) element to some extent. In (19), the empty subject in the tensed clause can have any referent that is a third person singular. Since the referent for pro must be definite, pro cannot have a generic interpretation, unlike PRO_{arb}^3 .

As is well known, some languages allow null subjects, but others do not. Now, let us consider what causes this difference. Chomsky claims that a "rich" agreement system

allows pro to occur in null-subject (pro-drop) languages. He says "the possibility of having a pure pronominal EC subject is related, though sometimes imprecisely, to a "rich enough" inflectional system, so that the inflection determines the grammatical features of the "missing subject"" (p.86). According to Chomsky, thus, Italian allows null subjects because it has a rich inflectional system, and English does not allow null subjects since it does not have such a rich inflectional system.

Rizzi (1982) does not employ the concept of the richness of inflectional system to account for the null-subject (pro-drop) parameter.⁴ His claim is motivated by the fact that there is an "important parallelism between subject NP and inflection on the one hand, and object NP and object clitic on the other hand" (p.130). Consider the following example:

(20) (=Rizzi's (44))
 [_{NP} e] ti conosco [_{NP} e].

'e you + know e'
 'I know you.'

In the above example, Rizzi claims that both the inflectional element "o" and the clitic "ti" can be interpreted as a definite pronoun. Thus, INFL in Italian,

like a clitic, is specified with the feature [+pronoun] so that grammatical features like person and number are specified by this feature. Rizzi argues that INFL in Italian functions as a proper governor so that the empty subject is governed. Rizzi's claim is that what is relevant to the null-subject phenomenon is not the richness of the inflectional system but the difference of the properties of the inflection itself; INFL in Italian can be [+pronoun], while INFL in English cannot.

Jaeggli and Safir (1989) argue that not the 'richness of AGR' but 'morphological uniformity' is responsible for the null-subject (pro-drop) phenomenon:

(21) (=Jaeggli and Safir's (42))

The Null Subject Parameter

Null subjects are permitted in all and only languages with morphologically uniform inflectional paradigms.

A paradigm is "morphologically uniform" if all forms are either inflected forms or bare forms. In other words, if a paradigm contains both inflected and bare forms, it is not uniform. Consider the following paradigms; Spanish, English, and French:

(22) (=Jaeggli and Safir's (37))

habl-o	<u>I speak</u>	1s
habl-as	<u>you (sg.) speak</u>	2s
habl-a	<u>he/she speaks</u>	3s
habl-amos	<u>we speak</u>	1pl
habl-áis	<u>you (pl.) speak</u>	2pl
habl-an	<u>they speak</u>	3pl

(23) (=Jaeggli and Safir's (44))

English:

to talk	infinitive
talk	present 1s, 2s, 1pl, 2pl, 3pl
talk-s	present 3s

French:

[parl-e]	infinitive ('to talk')
[parl]	present 1s, 2s, 3s, 3pl
[parl-ø]	present 1pl
[parl-e]	present 2pl

The Spanish paradigm in (22) contains only inflected forms, so that this is uniform. On the other hand, the English and French paradigms in (23) contain both inflected and bare forms, so that this is not uniform. In this sense, both Japanese and Chinese have a uniform paradigm, because the Japanese verbal paradigm involves only inflectional forms and Chinese shows no inflectional affixation. The theoretical implications of this proposal for Japanese will be discussed later (see Section 4.2.1).

Now, the claim that pro appears in a governed position seems to be a theoretical consequence in the GB framework. For the issue of why pro occurs, we have observed some proposals: (i) rich inflectional system, (ii) the properties of INFL, (iii) morphological uniformity. If the selection of the antecedent for pro is determined by the inflection, there should be no possible 'arbitrary' interpretation, because the inflection limits the possible antecedent (e.g. in (22), although the subject of the verb habl-a can be anyone who is 3sg, it is not unlimited: the subject cannot

be 1sg, 2sg, etc.) and thus contradicts the notion of arbitrariness, which entails a lack of any specific restriction (thus, can be anyone including 1sg, 2sg, 3sg, etc.). However, pro does allow a 'third party' interpretation, just as an overt counterpart (e.g. he, she, etc.) can refer to some third party in a context. The theoretical implication of the "third party" interpretation is addressed in the following sections.

4.2 Empty Subjects in Japanese

So far, we have implicitly assumed that the empty subject in a Japanese clause subordinate to verbs like yakusokusuru (to promise) and susumeru (to recommend) is PRO, which is subject to control theory. In the literature, however, there have been noted three possibilities concerning the status of the empty subject in a tensed subordinate clause: (i) PRO, (ii) pro, or variable, or (iii) PRO and pro are not differentiated in Japanese. In what follows, we will examine previous studies on Japanese empty subjects and consider some characteristics of empty subjects in Japanese.

First, let us briefly consider the distribution of empty subjects and objects in Japanese, following Hasegawa (1984-5), Whitman (1985), and Whitman (1987). There are basically three environments where empty subjects can

appear: (i) in a simplex sentence, (ii) in a tensed subordinate clause, in which we are especially interested, and (iii) in a tenseless subordinate clause. Japanese has two tense markers: '-ta' which indicates PAST, and '-u' which denotes nonPAST (present and future tense). Consider the following sentences:

- (24) a. (=Whitman (1985)'s (1a))
kesa [e] go-zi-ni oki-ta.
this morning 5-o'clock-LOC awake-PAST
'(I) awoke at 5 o'clock this morning.'
- b. (=Whitman (1985)'s (6a))
[e] siken-ni oti-ta no?
exam-LOC fall-PAST Q
'Did (you) fail the exam?'
- c. (=Hasegawa's (1a))
e Tokyo-e it-ta.
-LOC go-PAST
'I/We/He/They... went to Tokyo.'
- (25) a. (=Hasegawa's (2a))
John_i-ga [e_{i/j} Mary-o nagut-ta to] itta.
-NOM -ACC hit-PAST that said
'John_i said that he_{i/j} hit Mary.'
- b. (=Hasegawa's (48a))
John-ga Mary_i-ni [PRO_i Tokyo-e ik-u yooni]
-NOM -DAT -LOC go-nonPAST COMP
settoku sita.
persuaded
'John persuaded Mary to go to Tokyo.'
- (26) a. (=Whitman (1987)'s (15))
John_i-ga [PRO_i ik-oo to] si-ta.
-NOM go-SUBJ COMP do-PAST
'John tried to go.'
- b. (=Whitman (1987)'s (16))
John-ga Mary_i-ni [PRO_i ik]-ase-ta.
-NOM -DAT go-CAUS-PAST
'John made Mary go/come.'

- (27) a. (=Whitman (1987)'s (14))
 Honmono-o mi-te mo dame da.
 real thing-ACC see-GER even bad COP
 'It's no good even if (PRO=ARB) sees the real thing.'
- b. (=Hasegawa's (19a))
 [PRO_{arb} sensei-ni a-u no]-wa muzukasii.
 teacher-DAT meet-nonPAST fact-TOP difficult
 'For PRO_{arb} to meet the teacher is difficult.'

Whitman (1985) claims that the empty subject in (24a) is interpreted as a first person (speaker) and that the empty subject in (24b) is a second person (hearer) if these sentences are discourse initial. If some preceding discourse is provided, the empty subject can refer to any referent as is illustrated in (24c). (25a) illustrates that the empty subject in a tensed clause can be coreferent with an NP in the matrix clause or with a 'third party' in the discourse. Hasegawa claims that (25b), which is similar to our experimental sentences, "is not construed as arbitrary in reference nor does it refer to an empty topic". And this empty subject "seeks its antecedent within the clause that immediately dominates the sentence that contains PRO" (p.312). Whitman (1987) claims that (26a) and (26b), in which empty subjects appear in a tenseless subordinate clause, "exhibit obligatory control of subject position" (p.357). Whitman (1987) says that in (27a), where a Tense marker is not present, the empty subject "may have arbitrary reference" (p.356). Hasegawa argues that, even when a Tense marker (the nonPAST tense marker -u in the verb au) is

present in (27b), "the subject EC is construed as arbitrary in reference" (p.301).

Now, let us consider the construction used in our experiments. It is possible that the construction contains no EC at all. However, the construction "Taroo-ga Hanako-ni Tookyoo-e iku" cannot be a clause, because iku (to go) is a one place predicate that does not take an object. Therefore there must be an embedded clause which has an empty subject for the predicate iku: "Taroo-ga Hanako-ni [[e] Tookyoo-e iku] ...". See also Chomsky's (1982) "Extended Projection Principle" for the theoretical background for postulation a subject for a clause. In the construction "Taroo-ga Hanako-ni [[e] Tokyo-e iku] koto-o V", there are two possible interpretations for [e] at the point of the embedded verb iku. One is that [e] is a variable bound by a relative head. e.g. "Taroo-ga Hanako-ni [e_i Tokyo-e iku] hito_i-o syookaisita" (Taroo introduced to Hanako a person who is going to Tokyo). The other possibility is that [e] is PRO (or pro - see Section 4.2.1. below; this distinction will be set aside until the next section). At the point of the nominalizer koto, however, there is only one possible interpretation for [e], i.e. it is PRO. Because koto cannot be the subject for iku ("*Koto-ga Tokyo-e iku"), koto cannot be a relative head.

If the above discussion about the verbal iku (to go) is correct, then, it would be natural to assume that the

nominal construction "Taroo-ga Hanako-ni [[e] Tookyoo iki] ..." contains an empty subject, since iki (going) is the deverbial form which is related to the verbal form iku. The issue of empty subjects in nominals is addressed more extensively in Section 4.2.5.

In both of these constructions, it is possible to claim that there is no empty subject, as GPSG and LFG claim. Then a semantic rule is assumed to determine the interpretation of the "missing subject". Neither of these non-transformational theories accept the Extended Projection Principle (see Footnote 2 in Chapter 1).

Now, let us briefly consider the issue of empty objects, although this is not the our main concern. Consider the following examples:

- (28) (=Hasegawa's (1b))
 Mary-ga e hometa.
 -NOM praised
 'Mary praised me/you/him/her/them'
- (29) (=Hasegawa's (2b))
 John_i-ga [Mary-ga e_{7*i/j} nagutta to] itta.
 -NOM -NOM hit that said
 'John_i said that Mary hit him_{7*i/j}.'

Since there is little doubt that the EC in the object position is governed by a verb, these examples seem to show that Japanese admits pro, if a governed EC should be pro. However, Hasegawa claims that the empty object is a variable. This claim is based on Chomsky's (1982)

"functional determination" theory, which says that the status of an EC is determined by its function in the construction where it appears. Hasegawa assumes the following typology of ECs: (i) the empty object cannot be PRO because it is in a governed position, (ii) it cannot be an anaphor because it not locally A-bound by an antecedent that do not have independent Theta- role (see (2) in Section 4.1), (iii) it cannot be pro because Japanese does not have a 'rich enough' agreement system. Therefore, Hasegawa concludes, "the only option left for us is to consider these ECs "variable"" (p.293). If the empty object is a variable, it must have a c-commanding antecedent in a non-argument position. Hasegawa claims, following Huang (1984), that empty objects are bound by a topic phrase in an A'-position, and this topic can be null, i.e. may be freely deleted (or be empty) in languages like Japanese, Chinese, and Korean. Thus, the example (28) is represented as follows:

(30) (=Hasegawa's (10))
 [_{Topic} \emptyset_i] [Mary-ga e_i hometa].

This line of argument is extended to sentences in which the empty object appears in a subordinate clause. Thus, (29) is represented as follows:

(31) (=Hasegawa's (11b))
 [_{Topic} \emptyset_j] [John_i-ga [Mary-ga $e_{? *i/j}$ nagutta to] itta].

Since an empty object can be a variable in Japanese, it might be expected that an empty subject can also be a variable. Both Huang (1984) and Hasegawa says "yes" for this possibility. However, the difference between the empty object and the empty subject is that although the former can be only a variable, the latter can also be a pronominal. That is, the empty subject has a dual status. In what follows, we will examine the characteristics of the empty subject in Japanese, paying attention to this dual status. Although both Huang and Hasegawa claim that the empty subject can be a pronominal as well as a variable, they differ from each other on what kind pronominal it is: Huang says it is pro and Hasegawa says it is PRO.

4.2.1 Empty Subjects as pro, or variable

If TENSE in Japanese (obligatorily) governs subject position, an empty subject in a tensed clause will be pro (or a variable). But, Chomsky (1982) mentions that pro-drop (null-subject) phenomena are observed only in languages with a rich agreement system. This seems to imply that empty subjects in Japanese cannot be pro, because Japanese is clearly not a language with a rich agreement system; its verb inflections do not indicate gender, person, or number.

Recall that Jaeggli and Safir (1989) argue that not the 'richness of AGR' but 'morphological uniformity' is responsible for null subject (i.e. pro-drop) phenomena:

Null subjects are permitted in all and only languages with morphologically uniform inflectional paradigms. A paradigm is "morphologically uniform" if all forms are either inflected forms or bare forms. In this sense, Japanese has a uniform paradigm, because the Japanese verbal paradigm involves only inflectional forms. Jaeggli and Safir say that "Japanese verbal paradigms are inflected for tense/mood/aspect, and negation, but not for person and number" (p.29). Consider the following conjugation for the verb yom-u (read):⁵

(32) (=Jaeggli and Safir's (41))	
yom-u	<u>read-present</u>
yom-ta	<u>read-past</u>
yom-anai	<u>read-neg</u>
yom-eba	<u>read-conditional</u>
yom-oo	<u>let's read</u>
yom-itai	<u>want to read</u>
yom-are	<u>was read</u>
yom-ase	<u>make read</u>

Jaeggli and Safir, following Huang (1984, and 1989), argue that the identification of pro in a morphologically uniform language involves two processes: "one a null topic analysis, which involves WH-movement of a null operator leaving a WH-trace (variable) in subject position, and one involving a sort of control of pro" (p.36). Huang (1984) claims that both of these processes are involved in a Chinese (Japanese)-type language. In what follows, we will

consider Huang's argument concerning this dual status of empty subjects.

Huang (1984) argues that pro-drop can occur in a language with a poor agreement system such as Chinese, Japanese and Korean. First, he distinguishes three types of language: Italian (Spanish)-type, English-type, and Chinese (Japanese)-type. English-type languages are called "hot" languages, because "the communication process involves little or no audience participation", and Chinese-type languages are called "cool" languages, because "active audience participation is required" (p.531). This "hot-cool" distinction is claimed to be related to the question of to what extent the language allows empty pronouns. In English, an empty pronoun is allowed only in a subject position of a tenseless subordinate clause. In Italian, an empty pronoun is also allowed in a tensed clause as well, but not in object position. Thus, Italian-type is called "medium-hot". A Chinese (Japanese)-type language allows not only empty subjects in both a tenseless and a tensed clause, but also empty objects if appropriate contexts are provided. This type is "cool" in the sense that the speaker gives little information to interpret a sentence so that the hearer has to recover the necessary information from the discourse context. "Cool" languages are defined as "discourse-oriented" or "topic-prominent", and "non-cool" languages are "sentence-oriented" or "subject-prominent".

In order to account for these typological differences, Huang proposes a "Generalized Control Rule" (GCR):

- (33) GCR (=Huang's (61)):
Coindex an empty pronominal with the closest nominal element.

Here, the "nominal element" can be either an NP or AGR. In Italian, according to the GCR, the closest nominal element is AGR in INFL. Necessary information to recover the properties of the dropped pro is retained in AGR, so that pro-drop is allowed in an Italian-type language. In English, although the closest nominal is AGR, the agreement system is not rich enough to retain necessary information to recover the dropped pro. Thus, pro-drop is not observed in an English-type language. In Chinese (Japanese), there is no AGR, and thus the closest nominal must be an NP in a matrix sentence. Consider the following example:

- (34) (=Huang's (67))
Zhangsan_i shefa e_i bangmang wo.
Zhangsan try help I
'Zhangsan tried to help me.'

Here, the empty subject of the infinitival clause must refer to the subject of the matrix sentence. And there is no TENSE which can govern this subject position. Thus, this empty subject is claimed to be the same as the so-called PRO in "non-cool" languages. Huang claims that the empty

subject in a tenseless clause is PRO in a Chinese (Japanese)-type language.

Now, consider the status of an empty subject in a tensed clause:

- (35) (=Huang's (19c))
 Zhangsan shuo [e bu renshi Lisi].
 Zhangsan say not know Lisi
 'Zhangsan said that [he] did not know Lisi.'

Huang assumes that the empty subject cannot be PRO, since it is governed. He says that there are two possible interpretations for the empty subject in the tensed clause: one is "pronominal" in that it refers to the subject of the main clause, the other is "variable" in that it refers to a discourse topic distinct from the main clause subject. That is, the status of the empty subject in a tensed clause is ambiguous. Huang says that the empty subject "has a potential dual status: it may be a genuine zero pronoun, or it may be a variable that is bound to a zero topic" (p.555).

However, notice that Huang claims that when the empty subject is interpreted as pronominal, it "is identified by way of control by an NP (on a par with a controlled PRO in an infinitival clause)" (p.556). Thus, this pro is what Jaeggli and Safir (1989) call "controlled pro". Note that an empty subject in our Experiment 1 appears in a tensed clause so that it could be pro. If it is pro, according to Huang, its antecedent is determined in the same way as the

controller of PRO is determined. As the results of this experiment showed, the empty subject was interpreted as coreferential with either the subject or the object of the matrix clause. Furthermore, it is also found that there is a "third party" interpretation. Huang would say that the empty subject in this case is construed as a variable bound by a discourse topic.

Notice that Huang (1984) says that "The GCR is basically Chomsky's (1980) rule of control, extended here to cover both PRO and pro" (p.552). Chomsky's rule of control, which is basically identical with Rosenbaum (1967)'s Minimal Distance Principle, is a grammatical principle but permits lexical exceptions: promise type verbs are marked as [+SC] in the lexicon. Huang's GCR is also a grammatical principle, and it does not allow exceptions. So, there arises a problem concerning how to determine the proper antecedent for the promise type verbs. If GCR picks up the closest nominal element, there cannot exist subject control when both the subject and the object are present. Thus, in the sentence "John promised Mary to go", according to GCR, Mary is supposed to go, contrary to the correct interpretation that John is going. However, Huang says that "I will depart from Rosenbaum (1968) and Chomsky (1980; 1981) and assume that the notion of "minimal distance" does not distinguish between a c-commanding subject and a c-commanding object within the same clause. The choice

between subject and object as the controller of an empty pronominal seems largely determined by pragmatic factors" (p.553). Since a grammatical principle alone fails to determine the proper antecedent for empty subjects, Huang appealed to "pragmatic factors" for selection of the proper antecedent. Therefore, the distinction among PRO and pro is actually undermined, because "the distribution of a zero subject in a tensed sentence of "cool" languages is on a par with that of a zero subject in a tenseless clause of all languages" (p.557). Here, Huang admits that the interpretation of pro in a Chinese (Japanese)-type language is the same as that of PRO in any other type of language. Huang (1989) later extends the theory of control proposed in Huang (1984) and claims "that PRO and pro are not distinct in their features, namely that there is only one null pronominal, [+pronominal]" (p.205).

When the empty subject in a tensed subordinate clause is identified as a pronominal, the antecedent must be either the main clause subject or the main clause object. That is, the empty subject is controlled as PRO is. Now, if the empty subject is considered to be a variable, Huang (1984) says, "We may assume that there is a rule of coindexation, in the discourse grammar of a discourse-oriented language (in the LF' module of grammar following LF), which coindexes an empty topic node with an appropriate preceding topic" (p.550). Since there are always two possibilities

pronominal and variable) for the empty subject in a tensed clause, the interpretation of this empty subject would tend to be ambiguous. This dual status of the empty subject may explain the relatively high score of 'third party' interpretation in the follow-up test for antecedent selection (see Sections 3.7.4 and 3.7.5).

Huang argues that the empty subject in a tensed clause is pro as well as a variable. In the following subsection, we will examine Hasegawa's discussion that the empty subject in a tensed clause is PRO as well as a variable.

4.2.2 Empty Subjects as PRO, or variable

In English, PRO appears in the subject position of an infinitival (or gerundive) clause, in which INFL is empty, so that PRO is not governed by INFL. In Japanese, an empty subject of a subordinate clause can appear in a tensed clause. If tense is obligatorily a governor, then this empty subject will be governed by the tense in INFL. Therefore, if the empty subject in Japanese is PRO, it apparently does not satisfy an important condition for being PRO; PRO must be ungoverned.⁶ Instead, it would have to be pro or a variable. However, Hasegawa (1984-85) claims that the empty subject can nevertheless be PRO.

Hasegawa proposes two alternatives to explain how the requirement of non-government for PRO can be satisfied. The

first alternative is to employ the "rule R" proposed by Chomsky (1981). This rule would apply in the syntax, to optionally move a Tense element from INFL to a position under VP (a process similar to traditional "Affix Hopping"). Another alternative is to claim that "a Tense element in Japanese only optionally governs the subject" (p.300). Hasegawa's claim is that a lexical NP is governed by Tense, but an empty subject is not governed even if it appears in a tensed clause, either because the INFL is lowered to VP, or because INFL does not govern ECs. Thus, the empty subject, be it in a main clause or in a subordinate clause, can be PRO.

In order to illustrate this optionality of government in Japanese, Hasegawa presents the following example, in which either PRO or a lexical NP can appear in a tensed clause:

- (36) (=Hasegawa's (16a))
 John-ga Mary_i-ni [PRO_i/kanoz_{yo}_i-ga Tokyo-e iku
 -NOM -DAT she-NOM -LOC go
 yooni] settoku sita.
 COMP persuaded
 'lit. John persuaded Mary [PRO/she to go to Tokyo].'

When a Tense marker (u in the verb iku in the subordinate clause) is present, Hasegawa claims that "a lexical subject may show up in a complement, even in the equivalents of control constructions" (p.300). She argues that the above example exhibits control, because the characteristic of this

construction is that "PRO ... seeks its antecedent within the clause that immediately dominates the sentence that contains PRO" (p.312).

However, if the empty subject and the overt pronoun can appear in the same position, it seems that the empty subject is the empty counterpart of the overt pronoun. That is, if we assume that the empty subject is governed by the Tense element as the lexical subject is, this empty subject should be pro. However, Hasegawa excludes pro in Japanese, because Japanese lacks an AGR element which is indispensable to recover the content of pro. Thus, the empty subject must be PRO. Therefore, Hasegawa says that "the subject position in Japanese must be governed in order for a lexical item to appear there but must also be ungoverned in order for PRO to occur" (p.299).

Next, let us consider a case in which an empty subject is in a tenseless clause. The argument for PRO in a tenseless clause is that a lexical NP cannot appear in this construction, while PRO can. This is the case as is shown below.

- (37) (=Hasegawa's (17a))
 John-ga Mary-ni [PRO/*kanozyo-ga utaw]-asetu.
 -NOM -DAT she-NOM sing-caused
 'John made Mary sing.'

Here, the overt pronoun kanozyo is not allowed to occur, because the verb utaw is a stem which does not commit itself

to "tensedness". The tense element -ta is attached to the causative morpheme -(s)ase.⁷ The subject of the main clause John receives a nominative case from INFL (Tense) ta, whereas the subject of the embedded clause cannot receive a nominative case because there is no INFL to assign a case. If the empty subject is pro, it will not be allowed to appear in this position because the overt counterpart of pro (i.e. kanozyo in the above example) is not allowed in this position.

The argument given by Hasegawa for PRO in a tensed clause is that an arbitrary interpretation is possible in a subject position (though not in an object position as) is shown below:

- (38) (=Hasegawa's (18))
- a. [PRO_{arb} taima-o kau koto]-wa kinzirarete iru.
 marijuana buy fact-TOP forbidden
 'For PRO_{arb} to buy marijuana is forbidden.'
- b. *[Kodomo-ga PRO_{arb} kau koto]-wa kinzirarete iru.
 children-NOM
 'For children to buy PRO_{arb} is forbidden.'

Hasegawa argues that the empty subject is PRO, because "the availability of arbitrary reference has been taken to be one of the main properties of PRO" (p.301). Note also that the clause which contains the empty subject is a tensed clause which is generally considered not to permit a PRO subject.

that heads an A'-chain (Levin, 1984)" (p.305). Thus, the two possible interpretations in (39) are represented as follows (broken lines indicate syntactic movement of an EC and solid lines indicate construal process):

(40) (=Hasegawa's (38))

a. (= (39a) with the index i on the subject EC)

[_{Topic} ϕ_j] [John _{i} -ga

[e_j Mary-o nagutta [COMP t_j to]] itta][COMP OP _{j}]]

b. (= (39a) with the index i on the subject EC)

[John _{i} -ga [[PRO _{i} Mary-o nagutta][COMP to]] itta]

Concerning the above examples, Hasegawa states, "The subject EC can be a variable if it is analyzed as (40a). It can also be a pronominal (PRO) when the Tense of the complement does not govern it, which is shown in (40b)" (p.308). The problem in this system is that it must satisfy a contradictory requirement: the empty subject must be governed so that it can be a variable, and the empty subject must be ungoverned so that it can be PRO. This problem is resolved to claim that S-structure PRO (ungoverned) becomes a bound-variable (governed) in LF. This issue is discussed more extensively in Section 4.2.4.1.

Now let us reconsider the points made by Huang and

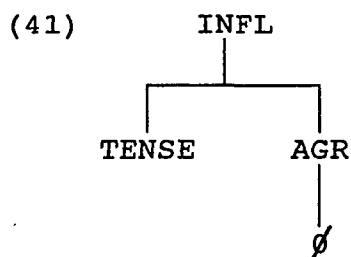
Hasegawa: (i) Not AGR but TENSE governs subject position, so that the empty subject is pro or a variable in a tensed clause, but PRO in a non-tensed clause. Nominative Case is assigned by TENSE under government. This is what Huang claims, which we examined in the previous subsection. (ii) TENSE optionally governs subject position. That is, TENSE governs subject position and assigns nominative Case if the subject is lexical, but does not govern subject position and does not assign any Case if the subject is empty. So, a tensed clause can contain PRO, and a non-tensed clause can also. An empty subject is governed in LF so that it can be a variable. This is what Hasegawa claims, which we have reviewed above. Both of them claim that an empty subject in a tenseless clause is PRO, and the empty subject can be a variable. The only difference is the empty subject in a tensed clause: pro or PRO. However, since Huang claims that pro is controlled as PRO is, and that there is no distinction between pro and PRO, both Huang and Hasegawa make the basically the same claim: the empty subject can be an empty pronominal that is controlled or can be a variable that is not controlled but discursively determined.

Then, there arises a question: When is an empty subject interpreted as an empty pronominal and when is it interpreted as a variable? The empty subject, of course, cannot be both pronominal and variable simultaneously, but it must be either the main clause subject or object

(controlled) or a discursively identifiable item (non-controlled). Both Huang and Hasegawa do not present any condition or principle to distinguish these two possible interpretations. Both of them seem to assume that the distinction largely depends on context in which the relevant sentence occur. If there is no principled way to discriminate the two possible interpretations, the empty subject is always ambiguous. For our experiments, if this potential ambiguity occurs only (or mostly) in S-control sentences, the object control preference could be explained by this ambiguity. However, there was no experimental evidence to support this (see Sections 3.7.4 and 3.7.5). And there have been no theoretical discussion that the potential ambiguity of empty subject occurs only (or mostly) in subject sentences.

In the following subsection, we will consider some discussions that the empty subject in Japanese is not controlled at all. Before going to the next subsection, however, let us briefly consider an alternative proposal of controlled empty subject. Since languages like Japanese (and Chinese, Korean) lack AGR, INFL contains only TENSE. When we consider the characteristics of the empty subject in relation to government and Case assignment, there is one more possibility other than to claim that the empty subject is governed as Huang does, and to claim that it is

optionally governed as Hasegawa does: to claim that it is never governed. Nakayama and Tawa (1988) suggest that "the head of INFL or a governor of the empty subject is AGR, not TENSE" (p.33). If this is the case, in all languages without AGR, subject position is never governed, so that the empty subject is PRO in both tensed and tenseless clauses. Thus, Nakayama and Tawa claim that "Since there is no AGR in Japanese, the subject position is assumed to be ungoverned. Therefore, the empty subject is PRO ([+anaphor, +pronominal])" (p.34). Since Japanese is a strict head-final language, they seem to assume the following structure of INFL:



Note that the claim that TENSE is not a governor in Japanese predicts that subjects must always be empty, because INFL (i.e. TENSE, since AGR in Japanese is always empty) does not assign Case to the subject. Thus, lexical subjects should not appear whether in a main or a subordinate clause. However, this prediction is totally wrong, because lexical subjects do appear in Japanese. Lexical subjects must have Case. Therefore, Nakayama and

Tawa claim that lexical NP in subject position has inherent nominative Case. Saito (1985) provides evidence that nominative Case is inherent in that it is not assigned by any element such as INFL. Consider the following example:

- (42) (=Saito's (62), p.198)
 Yahari, [_s natu-ga [_s biiru-ga umai]].
 after all summer-NOM beer-NOM tasty
 'After all, it's during the summer that beer tastes good.'

In the above example, there are two NPs with the nominative marker -ga and only one predicate umai. The first NP is not the argument of this predicate. Since Japanese allows this kind of "non-arguments with nominative Case", Saito claims that "it seems reasonable to suppose that the nominative Case marker ga is not in any sense a phonetic realization of abstract Case" (p.199). We will not discuss more about this proposal, since we need an extensive discussion on the system of Case assignment of Japanese that can occupy the hole dissertation. And this proposal has difficulty to explain the existence of the 'third party' interpretation for which Huang and Hasegawa, by claiming that this interpretation is due to a variable interpretation, can account.

4.2.3 Empty Subjects as neither PRO nor pro

The third possible way to characterize the empty

subject in Japanese is to say that it has some properties different from either PRO or pro. Here, we consider three discussions on this issue: Hoji (1987), Whitman (1985), and Fiengo and Haruna (1987). These people consider that the rule of control is irrelevant to the interpretation of the empty subject in Japanese.

Hoji (1987) claims that both empty subjects and empty objects in Japanese "are listed in the lexicon as pronominals, just like English overt pronominals are, although they do not have phonetic features" (p.196). Hoji assumes that "the putative asymmetry between the subject 'zero pronoun' and the object 'zero pronoun' noted in Kuroda(1965), which is cited in Huang (1984) and Hasegawa (1984), is not a grammatical contrast" (p.195). Consider the following examples:

(43) (=Huang's (25))

- a. dare-ga_i [e_i Bill-o nagutta]to itta ka?
 who-NOM Bill-ACC hit that said Q
 'Who_i said that [he_i] hit Bill?'
- b. *dare-ga_i [Bill-ga e_i nagutta]to itta ka?
 who-NOM Bill-NOM hit that said Q
 'Who_i said that Bill hit [him_i]?''

(44) (=Hasegawa's (2))

- a. John_i-ga [e_{i/j} Mary-o nagutta to] itta.
 -NOM -ACC hit that said
 'John_i said that he_{i/j} hit Mary.'
- b. John_i-ga [Mary-ga e_{?*i/j} nagutta to] itta.
 -NOM -NOM hit that said
 'John_i said that Mary hit him_{?*i/j}.'

In the above examples, empty subjects can be coreferential

with the main clause subject as in (a) sentences, while empty objects cannot be as in (b) sentences. Thus, both Huang and Hasegawa admit that there is a clear asymmetry of antecedent selection between an empty subject and an empty object, and claim that the empty object is a variable that is bound by a null topic operator. But Hoji (whose argument is presented below) does not admit this asymmetry as being real.

Huang argues that the empty subject in a tenseless clause is PRO and that the empty subject in a tensed clause is pro or a variable, because TENSE is a governor. Hasegawa considers that the empty subject in both a tenseless and a tensed clause is PRO, because TENSE optionally governs subject position, or TENSE is lowered to VP by the "rule R". This empty subject can also be a variable that is discursively identifiable.

Contrary to Huang/Hasegawa's argument, Hoji claims that there is no real asymmetry of antecedent selection between empty subjects and empty objects. Consider the following examples:

(45) (=Hoji's (i), p.196)

- a. John_i-ga [e_i Mary-o butta]to omotta.
 -NOM -ACC hit that thought
 'John_i thought that he_i hit Mary.'
- b. John_i-ga [Mary-ga e_i butta]to omotta.
 -NOM -NOM hit that thought
 'John_i thought that Mary hit him_i.'

Hasegawa admits that the e=i interpretation in (44b) becomes much easier when the matrix subject John receives stress (i.e. the empty object could be interpreted as being coreferent with the matrix subject), although without such stress she says there is a clear contrast between (44a) and (44b) with the i reading on the e: the empty subject can be coreferential with the matrix subject, but the empty object cannot be. The difference of intuition between Hasegawa and Hoji could be a difference of dialect (or idiolect). According to his own intuition, Hoji claims that there is no distinction in possible interpretation between empty subjects and empty objects, and argues that these ECs are empty counterparts of overt pronouns. Hoji mentions two points to support this view of empty pronominals. The first one is that "the functional determination of ECs is currently under scrutiny and far from established (cf. Safir 1984 and Saito 1985)" (p.196). The second one is that "even if essentials of Chomsky's (1982) functional determination approach are correct, it might be that Japanese 'zero pronouns' fall outside the typology of ECs that are to be partitioned" (p.196).

Following Hoji's claim that Japanese 'zero pronouns' are empty counterparts of overt pronouns, we would characterize these empty pronouns as pro. However, note that Hoji does not claim that 'zero pronouns' are functionally determined as pro [-anaphoric, +pronominal].

Hoji does not intend to develop a full argument about the 'zero pronouns', but he suggests the possibility that ECs in Japanese are not defined functionally by the features; [+/-anaphoric] and [+/-pronominal], then, it is natural to consider a different categorical definition for Japanese ECs from the one for English ECs. We turn to this in what follows. First, we will examine Whitman's proposal, and Fiengo and Haruna's proposal next.

Chomsky's (1982) functional determination of ECs presupposes a parallel between overt nominal elements and ECs by assuming the features [+/-anaphoric] and [+/-pronominal] for both. Whitman (1985) says that if NPs are classified "by the two relations that make up the definitions of the principle of the GB binding theory (and earlier theories of anaphora): "+/-bound" and "+/-domain", then, "we discover that there is a gap in this classification of NPs by their binding properties" (p.179). This gap is indicated by "?" by Whitman in the following representation.

(46) (=Whitman's (27))
Four Types of Nominals in Japanese

	Bound	Free
+Domain	anaphors	pronouns
-Domain	?	R-expressions

Here, "+/-Domain" refers to the presence or absence of a domain in which an NP must be free or bound, and the relevant domain is the governing category: NP or S. Whitman claims that "long distance reflexives" (e.g. zibun) and "zero pronouns" (pro and PRO) are included in the category [+Bound, -Domain], which is marked with "?" in (46). That is, this question mark is here used to cover both one type of lexical element and two types of empty pronominals. These elements must be bound but do not have any particular domain in which they are bound.

Whitman indicates that both the anaphoric reflexive zibun and zero pronouns in Japanese may be interpreted as coreferent with any c-commanding subject antecedent.

Consider the following examples:

- (47) (=Whitman's (22))
 John_i-wa [okaasan_i-ga [zibun_{i/?j}-ga naisyo-de
 -TOP Mom-NOM self-NOM secret-ly
 take-te i-ta] nikki-o yon-de simat-ta]
 keep-GER be-PAST diary-ACC read-GER PERF-PAST
 koto-ga wakat-ta.
 COMP-NOM find out-PAST
 'John_i found out that Mom_j had read the diary
 that self_{i/?j} had been keeping.'
- (48) (=Whitman's (23))
 John_i-wa [okaasan_i-ga [e_{i/?j} naisyo-de
 -TOP Mom-NOM secret-ly
 take-te i-ta] nikki-o yon-de simat-ta]
 keep-GER be-PAST diary-ACC read-GER PERF-PAST
 koto-ga wakat-ta.
 COMP-NOM find out-PAST
 'John_i found out that Mom_j had read the diary
 that he_i/she_j had been keeping.'

Whitman argues that (48) is a serious problem for Huang's claim that empty subjects can be either pro or a variable. If the empty subject in (48) is pro, the Generalized Control Rule should select the closest nominal element, i.e. okaasan, and would exclude the possible interpretation of [e]=John. This is not the case. If the empty subject is a variable, it cannot be bound by the overt NP John (which is not the case either), because it must be bound by a null topic operator. If it is bound by the overt topic phrase, it constitute the "strong crossover": it is a violation of principle C of the Binding theory, "which states that an R-expression (or variable) must not be bound by an element in an argument position" (p.177). Thus, Whitman seems to assume that the trace of the overt topic phrase is in an A-position and improperly binds the empty subject.

Therefore, Whitman claims that "the zero pronoun gap can be bound in general by any c-commanding NP, much as is assumed for zibun" (p.178). However, note that the construction above is a relative construction which differs from a construction that Huang discusses: the empty subject in a complement clause.

The second piece of evidence supporting the claim that the long distance reflexive zibun and zero pronouns are grouped together in the same category is that "both may be interpreted as subject to "backward" coreference with a non-subject experiencer antecedent" (p.178). Consider the

following examples:

(49) (=Whitman's (24))

a. [Koibito-ga [e_i]/zibun_i-o uragit-ta] koto-ga
 lover-NOM self-ACC betray-PAST COMP-NOM
 Hirosi_i-o hungai sase-ta.
 -ACC furious make-PAST

'That his lover had betrayed him_i, made Hirosi_i,
 furious.'

b. [[e_i]/zibun_i-ga koibito-ni uragi-rare-ta] koto-ga
 self-NOM lover-AG betray-PASS-PAST COMP-NOM
 Hirosi_i-o hungai sase-ta.
 -ACC furious make-PAST

'That he_i had been betrayed by his lover made Hirosi_i,
 furious.'

According to Huang's account, the empty object in (49a) is a variable bound by a null operator, and the empty subject in (49b) may be pro controlled by the backward antecedent Hirosi. Whitman declines to discriminate between empty objects and empty subjects in this way, because "this account completely fails to explain why the reflexive and the ec associated with the zero pronoun gap behave the same in these environments" (p.178-9).

The third piece of evidence to indicate that there are extensive similarities between the long distance reflexive zibun and the zero pronouns is that both may be bound as variables by WH-operators, but an overt pronoun may not. Consider the following example:

- (50) (=Whitman's (25))
 Dare_i-ga [[e_i]/zibun_i-ga/*kare_i-ga ik-u]
 who-NOM self-NOM he-NOM go-PRES
 to it-ta?
 COMP say-PAST
 'Who_i said that he_i would go?'

Finally, as evidence for the similarity between the anaphoric reflexive zibun and zero pronouns, Whitman claims that both may be associated with an arbitrary reference interpretation in subject position, as is shown below (PRES = Present form):

- (51) (=Whitman's (26))
 [[e]/zibun-ga hito-no mae-de kuti-ni su-ru]
 self-NOM people-GEN front-LOC mouth-LOC do-PRES
 to okasi-i.
 COMP strange-PRES
 'It's strange when one(self) says it in front of people.'

Huang's analysis would define the empty subject in (51) as a variable bound by a null topic operator. It cannot be pro, because there is no nominal element accessible to it. It cannot be PRO, because it appears in a tensed clause. However, the availability of arbitrary interpretation is characteristic of PRO, as Hasegawa (1984-5) emphasized.

Based on the above observations, Whitman argues that Huang's practice of dividing ECs up into variables and pronominals (PRO and pro) "fails to explain why the gap should pair with a reflexive as an overt category" (p.179). In order to explain the similarity between the long distance

reflexive zibun and zero pronouns, Whitman proposes a "partial specification of maximal projections". He assumes that there are a number of syntactic features associated with a maximal projection. Whitman distinguishes the following four nominal categories by using the three features (CASE, AGR, and INDEX) :

- (52) (=Whitman's (29))
- a. NP: Pure EC; underlying subject of passives.
 - b. NP CASE INDEX (value unspecified): Variables, long distance reflexives, zero pronouns.
 - c. NP CASE AGR INDEX (value optionally unspecified): Pronouns.
 - d. NP CASE AGR INDEX (value specified): Referring expressions.

Here, CASE is valued as nominative, accusative, etc., AGR as first person, second person, etc., INDEX as a number, a name, etc. The partial specification means underspecification of these features. (52b) characterizes a category which lacks the AGR feature and whose INDEX feature is unspecified. Whitman claims that this INDEX feature is specified by some "post-lexical" operation: (i) syntactic movement rule, (ii) interpretation in domain of an anaphor, (iii) control rule. Whitman claims that because of this operation, the elements in this category must be bound, while pronouns can be free, because INDEX values for pronouns are assigned in underlying representation.

Whitman says that "the classification of nominal

expressions by binding properties in (52) allows for no distinction between PRO and pro" (p.181), and that in fact "PRO and pro should not be distinguished in terms of their binding properties" (p.182). Then, he claims that "the distinguishing characteristics of PRO - the restriction that PRO appear only in the subject position of tenseless clauses and the availability of the 'arbitrary reference' interpretation - would then have to follow from principles outside of Binding Theory" (p.181-2).

Thus, Whitman proposes to define PRO and pro by the same features: [+Bound, -Domain]. If PRO has no domain, it will not be subject to obligatory control that is restricted to some domain. The data presented by Whitman showed that the long distance reflexive zibun pairs with the empty subject (and object), whether it is a variable, PRO, or pro according to Huang's analysis. So, Whitman claims that an empty subject or object can have all and only the same interpretations as zibun in that position. The problem in Whitman's proposal would be that it is difficult to explain a construction which we have been calling "object control". Consider the following example from Hasegawa (1984-5):

- (53) (=Hasegawa's (16a))
 John-ga Mary_i-ni [PRO_i/kanoz_iyo_i-ga Tokyo-e iku
 -NOM -DAT she-NOM -LOC go
 yooni] settoku sita.
 COMP persuaded
 'lit. John persuaded Mary [PRO/she to go to Tokyo].'

Here, the empty subject cannot be coreferent with the main clause subject John, contrary to Whitman's claim that "the zero pronoun gap can be bound in general by any c-commanding NP, much as is assumed for zibun" (p.178). Interestingly, in our experimental sentences, the empty subject and the reflexive zibun seem to pair with each other. However, the 'third party' interpretation is impossible for zibun. And the interpretation that zibun is coreferent with the main clause object is less natural than the interpretation that the empty subject is coreferent with the main clause object in "O-control" sentences. This may be related to the fact that zibun is usually (but not necessarily) coreferent with main clause subject. Observe the following examples:

- (54) Taroo_i-ga Hanako_j-ni [e_{i/*j/k}/zibun_{i/*j/*k}-ga
 -NOM -DAT self-NOM
 Tookyoo-e iku]koto-o yakusokusita.
 -LOC go fact-ACC promised
 'lit. Taroo promised Hanako that e_{i/*j/k}/self_{i/*j/*k} goes to Tokyo.'
- (55) Taroo_i-ga Hanako_j-ni [e_{*i/j/k}/zibun_{*i/?j/*k}-ga
 -NOM -DAT self-NOM
 Tookyoo-e iku]koto-o susumeta.
 -LOC go fact-ACC recommended
 'lit. Taroo recommended Hanako that e_{*i/j/k}/self_{*i/?j/*k} goes to Tokyo.'

If the empty subjects in our experimental sentences are not controlled and their interpretation is paired with the reflexive zibun which is usually associated with subject, we should expect subject preference instead of object

preference. This prediction was not satisfied. And, this prediction would not explain why there are so many object control cases compare to few subject control cases in English, although Whitman does not discuss control in English. Furthermore, experimental findings suggest that there is a possibility of the 'third party' interpretation, which should not exist if empty subjects are interpreted as zibun is interpreted.

In what follows, we will examine the discussion by Fiengo and Haruna (1987) that is also based on the interpretation of the reflexive zibun. In order to explain the characteristics of base generated ECs in Japanese, Fiengo and Haruna propose an "Initial Binding Theory" which is stated as follows:

- (56) (=Fiengo and Haruna's (38))
 (1) A [+Anaphor] is bound.
 (2) A [-Anaphor] is free.

This initial setting is assumed to be elaborated by a language learner given relevant data, so that a parametric difference among languages appears later. Fiengo and Haruna claim that Indo-European languages were elaborated to include the further opposition [+/-Pronominal], while Japanese was elaborated to add the condition "subject" to both principles in (56). As for the English binding theory,

Fiengo and Haruna say "Apart from the hierarchizing of features, the proposal is in large part a terminological adjustment of that made in Chomsky (1982)" (p.120). On the other hand, the Japanese binding theory is represented as follows:

- (57) (=Fiengo and Haruna's (21))
 Japanese Binding Theory
 (A) an anaphor is bound by subject
 (C) an R-expression is free of subject

Here, we must explain two issues: (i) what is the notion "subject"? (ii) why this binding theory lacks Principle B, i.e. why there is no reference to pronouns? Let us consider these issues in this order.

The term "subject" is used "to refer to whatever kind of NP it is which must be the antecedent of the reflexive anaphor zibun" (p.108). Thus "subject" is not necessarily a subject (marked with the nominative marker -ga) of a sentence, but an object (marked with the accusative marker -o) can be "subject". Consider the following examples:

- (58) (=Fiengo and Haruna's (15))
 a. [[zibun-ga, kaita] hon-ga] John-o,
 self-NOM wrote book-NOM -ACC
 sukkari kaeta.
 completely changed
 'The book which SELF wrote completely changed John.'

- b. *[[zibun-ga, kaita] hon-ga] tana-kara otite,
 self-NOM wrote book-NOM shelf-from falling
 John-ni, atatta.
 -LOC hit
 'The book which SELF wrote, falling off the shelf, hit
 John.'

Fiengo and Haruna claim that "in (58a) John may serve as antecedent of zibun; the object of kaeta behaves as it were a "subject", but the object of atatta does not; hence (58b) is not acceptable" (p.113). While the anaphoric reflexive zibun is bound by "subject", the R-expression John in the following examples must be free of "subject":

- (59) (=Fiengo and Haruna's (19))
 a. *[[John-ga, kaita] hon-ga] kare-o,
 -NOM wrote book-NOM he-ACC
 sukkari kaeta.
 completely changed
 'The book which John wrote completely changed him.'
 b. [[John-ga, kaita] hon-ga] tana-kara otite,
 -NOM wrote book-NOM shelf-from falling
 kare-ni, atatta.
 -LOC hit
 'The book which John wrote, falling off the shelf, hit
 him.'

Fiengo and Haruna argue that in (59a) the R-expression John is free of the "subject" kare, although in (59b) it may be coindexed with kare which is not "subject" but the object of atatta.

Note that there is no a priori notion of "subject" which binds the reflexive zibun. Thus it is impossible to define the notion "subject" independently of the behavior of

zibun. As Fiengo and Haruna themselves say, "the notion is not a purely configurational one; there is certainly no single syntactic position reserved for "subject" in Japanese. Although zibun must be c-commanded by the "subject" which binds it, it appears that semantic, perhaps thematic, criteria determine "subjectness" (p.113). The fundamental criterion is claimed to be "prominence" of a Theta-role, because, when a number of Theta-roles are contained in a clause, the most "prominent" Theta-role is chosen as the binder for zibun. Thus, Fiengo and Haruna claim that "The term "subject" would then be equivalent to the term "most prominent theta-role" (p.114).

Fiengo and Haruna argue that there are two pieces evidences that support the claim that "subjectness" is determined by the thematic notion "prominence". First, consider the following example:

- (60) (=Fiengo and Haruna's (20))
 A told B that C told D that ec₁ loves ec₂.

Fiengo and Haruna say that it was observed in Fiengo and Kim (1979) that the "twin" occurrence of the ECs in Korean required that their antecedents also be "twin", e.g. A and B, or C and D, or E and F (contextually determined). Thus, a combination like A and C in (60) is never allowed. Fiengo and Kim extended this constraint to twin occurrence of reflexives. Fiengo and Haruna claim that this restriction

on "twin" elements in Korean also applies to Japanese and generalize that "twin occurrences of X (X = ec or reflexive) must have twin antecedents" (p.114). Since "the description of antecedenthood for twin occurrences requires that the set of theta-roles in a clause be inspected", they argue that "the notion that the most prominent theta-role, the "subject", should have a privileged status becomes more natural" (p.114).

Second, Fiengo and Haruna argue that the "prominent" Theta-role is the "experiencer" Theta-role in Japanese. The reasons for this claim are (i) transitive constructions with inanimate subjects are ungrammatical in Japanese (ii) when there are two Theta-roles, the semantic experiencer is found in the nominative.⁸ That is, Fiengo and Haruna claim that the thematic notion "animate experiencer" has the privileged status in Japanese.

Why Fiengo and Haruna used the term "subject" to refer to the "prominent" Theta-role? They seem to assume, as Whitman does, that an EC in Japanese behaves like the reflexive zibun which is generally bound by a c-commanding subject. Remember that Fiengo and Haruna said that the term "subject" is used "to refer to whatever kind of NP it is which must be the antecedent of the reflexive anaphor zibun" (p.108). This basic assumption would suffer from the same problem as Whitman does: why there is an object antecedent

preference for an EC in Japanese (and in English also) contrary to the general tendency of subject preference for the reflexive zibun? Of course, zibun is not necessarily bound by the subject, but can be bound by the object, as Fiengo and Haruna point out. However, it is generally assumed so, as Whitman (1985) states: "the Japanese reflexive zibun may be interpreted as coreferent with any one of several c-commanding subject antecedents" (p.178) (see also Akatuka, 1976).

Now, let us consider why the Binding Theory for Japanese proposed by Fiengo and Haruna lacks Principle B. They point out that Japanese does not have lexical pronominals equivalent to those in Indo-European languages. First, they mention that so-called pronouns such as kare (he)/kanozyo (she) were originally deictic and acquired a pronominal use through Western influence.⁹ Second, they mention that possibilities of coreference are different between these "pronouns" and their alleged empty counterparts. Consider the following examples:

- (61) (=Fiengo and Haruna's (28))
 a. [kare-ga erabareta koto-ga][[John-no] titioya-o]
 he-NON was elected fact-NOM -GEN father-ACC
 odorokaseta.
 surprised
 'That he was elected surprised John's father.'

- b. [\emptyset erabareta koto-ga][[John-no] titioya-o]
 was elected fact-NOM -GEN father-ACC
 odorokaseta.
 surprised
 'That \emptyset was elected surprised John's father.'

Fiengo and Haruna claim that (61a) is unnatural if kare is coreferent with John-no titioya, but not unnatural if kare is coreferent with John. On the other hand, they say that the preferred coreferent of the EC in (61b) is John-no titioya, but not John. They argue that since the kare/kanozyo form is deictic, the possibility of coreference is not indicated by coindexing, but "a principle of avoidance" (to avoid unnecessary vagueness) determines the distribution of this form, as is shown below.

- (62) (=Fiengo and Haruna's (29))
- a. [keisatu-ga kare-o taiho-sita koto-ga]
 police-NOM he-ACC arrested fact-NOM
 John-o odorokaseta.
 -ACC surprised
 'That the police arrested him surprised John.'
- b. [keisatu-ga \emptyset taiho-sita koto-ga]
 police-NOM arrested fact-NOM
 John-o odorokaseta.
 -ACC surprised
 'That the police arrested \emptyset surprised John.'

Fiengo and Haruna claim that in (62a) the presence of kare is allowed as coreferent with John, since if it is replaced by an EC, the sentence becomes "vague" as in (62b): it is vague who was arrested. That is, they say that kare is deictically used to avoid this vagueness.

Suppose that the claim that Japanese lacks lexical pronouns is correct. Then let us consider whether Japanese also lacks empty pronominals. Fiengo and Haruna say that PRO in Indo-European is defined as a pronominal anaphor which must be ungoverned, and pro as a pronominal non-anaphor which is always governed. They claim that Japanese does not allow pro in subject position, since this position is not governed, whether it is in a main or a subordinate clause. That is, they claim that the nominative -ga marker is intrinsic and not assigned by government, but the assignment of the accusative -o is governed by a verb. If subject position is ungoverned and object position is governed in Japanese, PRO would be allowed to appear in subject position and pro in object position. However, Fiengo and Haruna deny this possibility. They argue that there is a criterion that "only PRO may have indeterminate reference while pro must have determinate reference" (p.117). They claim that the interpretation of empty subjects in Japanese is not "indeterminate" (i.e. arbitrary) but "ambiguous" as is shown below.

(63) (=Fiengo and Haruna's (30))
 koko-ni gomi-o suteru rasii.
 here-LOC trash-ACC throw away likely
 'It seems that _____ throws trash here.'

Here, if the person who throws trash is "ambiguous", it means that there are some specific number of people who have

possibility of throwing trash, but it is impossible to specify who s/he is. If the person who throws trash is "indeterminate", it means that the person can be anyone.

Furthermore, Fiengo and Haruna claim that this sort of "ambiguity" can be observed in a case of empty objects. In the following example, they say that "the empty dative object of nattoku-saseru 'persuade' is ambiguous in the same way" (p.118):

- (64) (=Fiengo and Haruna's (31))
 kare-no koodoo-ga [[kare-ga shooziki de-aruru koto-o]
 he-GEN action-NOM he-NOM honest is fact-ACC
 nattoku-saseru no-ni] zyuubun da.
 persuade enough is
 'His actions are enough to persuade ____ that he is honest.'

Since the person who is persuaded is "ambiguous", there must be some specific number of people who can be persuaded. It is assumed that we cannot specify who is actually persuaded in the above sentence.¹⁰

What they have argued is that in Japanese there is no contrast of "(in)determinacy" between the empty subject and the empty object, but they share the same property of "ambiguity". Thus, Fiengo and Haruna disagree with Hasegawa's (see also Whitman, 1987) claim that arbitrary interpretation is allowed only for empty subject but not for empty object. Observe the relevant example reproduced

below.

(65) (=Hasegawa's (18))

a. [PRO_{arb} taima-o kau koto]-wa kinzirarete iru.
 marijuana buy fact-TOP forbidden
 'For PRO_{arb} to buy marijuana is forbidden.'

b. *[Kodomo-ga PRO_{arb} kau koto]-wa kinzirarete iru.
 children-NOM
 'For children to buy PRO_{arb} is forbidden.'

Fiengo and Haruna's intuition could be different from Hasegawa's. Or, probably the interpretation of the concept of "ambiguous" and "arbitrary" could be different among them. Fiengo and Haruna claim that both empty subject and empty object have "ambiguous" interpretation but not "indeterminate" (arbitrary) interpretation, unlike Hasegawa. They account for this lack of (in)determinacy by claiming that there are actually no empty pronominals in Japanese. Since there is no pronominal element (be it lexical or empty) in Japanese, there is no contrast [+/-pronominal]. Thus, there is only the contrast [+/-anaphoric] in Japanese. Fiengo and Haruna claim that English binding theory requires that an anaphor be bound "in its governing category" in Principle A, and that Japanese binding theory requires that an anaphor be bound "by subject". That is why the long distance binding of the reflexive anaphor zibun is allowed in Japanese. They claim that this anaphor is not bound in its governing category, because there is no governing category in Japanese. Note that the claim that there is no

governing category in Japanese is basically the same as Whitman's claim that there is no domain in which long distance reflexives zibun, zero pronouns (pro and PRO) are bound.

Following this definition of Binding Theory, Fiengo and Haruna say "PRO will be defined as [+Anaphor, -Anaphor] in the reworking of Binding Theory which we propose, and this would entail in Japanese that PRO must both be free of and bound by subject" (p.118). This definition of PRO is clearly a contradiction. Therefore, Fiengo and Haruna conclude that there is no PRO in Japanese.

If there is no contrast between PRO and pro in Japanese, does it follow that all base generated ECs have the same interpretive properties? In other words, is it true that the possibilities of coreference are identical for all base generated ECs? The answer to this question seems to be "no", because there seem to be asymmetries between subject and object ECs in Japanese, as is mentioned by Kuroda (1965), Hasegawa (1984-5), and Huang (1984). Fiengo and Haruna did note that there is a subject-object asymmetry among the ECs, but they suggested that this is not a matter of syntax. They point out there are some "environments" which force indeterminate or determinate interpretation as follows:

- (66) (=Fiengo and Haruna's (36))
 oyogu koto-wa tanosii.
 swim fun
 'Swimming is fun.'
- (67) (=Fiengo and Haruna's (37))
 John-ga butta.
 hit
 'John hit ec.'

It seems that what is meant by the term "environment" in the above examples is a certain pragmatic notion such as context, situation, etc. Fiengo and Haruna seem to assume that the empty subject in (66) tends to be more indeterminate, and the empty object in (67) is more likely to be determinate. However, they claim that this is just a tendency and is not syntactically determine.

Hasegawa would say that the empty subject in (66) is PRO_{arb} and the empty object in (67) is a variable bound by a null topic operator. Huang would claim that both the empty subject and the empty object are variables bound by a null operator. Hoji would say that both of them are just empty counterparts of pronouns. Whitman might say that the empty subject is PRO_{arb} and the empty object is pro, although he would claim that there is no distinction between PRO and pro in the sense that both are bound in an unlimited domain.

In these three subsections, we have reviewed the attempts to discriminate PRO and pro according to whether they are governed or not, and according to what their

interpretation can be, e.g. +/-arb. And we found that this line of argument was not able to give us a decisive way of characterizing empty subjects in Japanese, because it is not clear what is a governor, how it governs, etc. in Japanese. Therefore, in what follows, we will try to seek a possible way to distinguish PRO and pro without relying on the "PRO Theorem".

4.2.4 Diagnostics for Empty Pronominals

Jaeggli & Safir (1989) propose three diagnostics for distinguishing PRO and pro; they are (i) the Resumption Test, (ii) Weak Crossover and PRO Gates, and (iii) the Emex Condition.

4.2.4.1 The Resumption Test

According to the Resumption Test proposed by Jaeggli and Safir (1989), PRO cannot be a resumptive pronoun even if there is no other bindee, while pro can. Consider the Spanish example below.

- (68) (=Jaeggli and Safir's (23b))
 *Juan_i, es imposible PRO_i llegar a tiempo.
 is impossible arrive on time
 'Juan_i, it is impossible PRO_i to get there on time.'

This example is ungrammatical, because PRO (which is ungoverned) is interpreted as a resumptive pronoun. On the other hand, example (69) below is grammatical, because pro

(which is governed by INFL) behaves as a resumptive pronoun.

- (69) (=Jaeggli and Safir's (24a))
 Juan_i, es imposible que pro_i llegue a tiempo.
 is impossible that arrive on time
 'Juan_i, it is impossible that (he_i) will get there on time.'

Hasegawa (1984-5) claims that PRO can function as a resumptive pronoun in Japanese. Consider the following example in which kodomo (child) is relativized (OP = operator, PERF = perfective):

- (70) (=Hasegawa's (34a))
 [[e_i e_j katteita] OP_j] inu_j-ga sinde-simatta]OP_i]
 kept dog-NOM die-PERF
 kodomo_i
 child
 'lit. the child who the dog which (he) kept died'

The empty subject e_i, which is assumed by Hasegawa to be PRO, is bound by the operator OP_j, which is in complementizer position in the relative clause. Hasegawa says that this empty subject (PRO) refers to the head of the relative, kodomo, through free coindexation at LF. She also claims that this coindexation procedure for the empty subject in (70) mirrors that for resumptive pronouns as is shown below for English:

- (71) (=Hasegawa's (35a))
the man_i who_i Mary will be shocked if I kiss him_i;

In the above example, Hasegawa claims that the resumptive pronoun him, the operator who and the relative head the man are coindexed just as in the Japanese example (70): the empty pronominal (PRO) e_i , the null operator OP_i and the relative head kodomo.

The Resumption Test proposed by Jaeggli and Safir says that PRO cannot be a resumptive pronoun even if there is no other bindee, while pro can. Thus, (70) can be grammatical only if the empty subject is pro. Hasegawa, who wishes to maintain that e_i in (70) is both PRO and resumptive, proposes a solution for this problem. She claims that PRO is governed at LF, though not at S-structure, either because INFL (Tense) always governs the subject at LF, or because the operation of the "rule R" (see Chomsky, 1981) is undone at LF. If the empty subject in a tensed subordinate clause is governed, it is a bound-variable pronominal that can behave as a resumptive pronoun.

Recall that Hasegawa argued that the empty subject at S-structure is ungoverned, either because INFL (Tense) only optionally governs the empty subject, or because the "rule R" moves a Tense element to a position under VP in syntax. Now, she claims that an empty subject is ungoverned at S-structure so that it can be PRO, and that it is governed at LF so that it can function as a resumptive pronoun. This possibility cannot be excluded, but if there is an alternative solution which does not have to say that the

status of government for the empty subject varies at different levels of representation, that would be more satisfactory, other things being equal.

In defense of Hasegawa's proposal, we may note that Chomsky (1982) assumes that "there is only one type of EC and that the status of a particular occurrence of an EC as PRO, NP-trace, or variable is functionally determined, that is, determined by the EC's role in derivations and representations" (p.34). This "functional determination" assures that an EC can change its status at different level of representation. Consider the following example:

(72) (=Chomsky's (48))
 PRO parla Giovanni.
 'Giovanni is speaking.'

Here, Giovanni is moved to and adjoined to VP leaving its own trace. However, this trace "lacks a c-commanding antecedent and is therefore PRO". Then, there must be "a rule substituting PRO for trace" (p.35). Thus, it may not be impossible to assume a rule that changes the status of government for the empty subject as Hasegawa did for Japanese.

4.2.4.2 Weak Crossover and PRO Gates

Jaeggli and Safir assume that "the WCO [Weak Crossover] effect arises whenever a single operator locally A'-binds

both a pronoun and a gap - a context of multiple variable binding" (p.17). Therefore, the following example exhibits WCO.

(73) (=Jaeggli and Safir's (28))
 *?Who_i did his_i washing his_i/the car'upset [e]_i.

Here, both the first his and the trace are locally A'-bound by the single operator who, thus WCO results (the second pronoun is irrelevant).

Jaeggli and Safir claim that when the overt pronoun is replaced by PRO, the WCO effect does not appear. This is illustrated as follows:

(74) (=Jaeggli and Safir's (27))
 Who_i did [_S [_{NP} PRO_i washing his_i car] upset e_i].

Here, the single operator who binds both his and the trace so that this sentence should be ruled out. However, PRO is assumed to act as a "gate" to permit coreference between his_i and the postverbal trace e_i. The single operator who also binds both PRO and the trace so that this sentence should be ruled out again. Jaeggli and Safir say "but for some reason this combination of multiple variable bindees [PRO and the trace] does not yield WCO effects" (p.18).

Jaeggli and Safir summarize as follows: "Thus whenever a multiple variable binding context evidences WCO effects

with an overt pronoun, a diagnostic for the presence of pro as opposed to PRO is available - pro will pattern with the overt pronoun" (p.18).

Now let us consider whether this WCO diagnostic applies to Japanese. First, observe the following examples:

(75) (=Hasegawa's (70a))
 [PRO_i urusaku sita kara] John-ga Mary_i-o sikkata.
 be-noisy because -NOM -ACC scold
 'John scolded Mary because (she) was noisy.'

(76) (=Hasegawa's (76a))
Mary_i-wa [[PRO_i urusaku sita kara]John-ga t_i
 sikkata]OP_i.
 'As for Mary, John scolded (her) because (she) was noisy.'

Here, (76) is formed from an underlying form like (75) by topicalizing Mary, which is coindexed with its trace across the empty subject. But this construction is not ungrammatical, as it would be if it exhibited the WCO effect. However, if we replace the moved NP Mary with a quantified expression, the WCO effect shows up; this is exemplified in the following examples (ADJ = adjunct):

(77) (=Hasegawa's (72a))
 * [PRO_i urusaku sita kara] John-ga daremo_i-o sikatta.
 be-noisy because -NOM everyone-ACC scolded
 'John scolded everyone because (they) were noisy.'

(78) (=Hasegawa's (74a))
 * [_S daremo_i-o [_S [_{ADJ} PRO_i urusaku sita kara] John-ga
t_i sikatta]].

A quantified NP is assumed to be subject to Quantifier Raising (QR) at LF (cf. May 1985); and (78) is the LF representation of (77). In (78), the quantified NP daremo is moved to the sentence initial position crossing over the empty subject: the typical WCO configuration. Therefore, in so far as (76) is grammatical, and Jaeggli and Safir's diagnostic is correct, the empty subject in the Japanese example (76) above should be PRO, as Hasegawa argues, because the empty subject does not invoke the WCO.

However, the empty subject in (78) should be pro contrary to Hasegawa's argument, because this construction is ruled out due to the WCO configuration. But, Hasegawa argues that the PRO in the Japanese example (78) is subject to the WCO effect, despite its status as PRO. Here, recall that Hasegawa claims that PRO is governed at LF, and a governed EC can function as a resumptive pronoun. The example (76) above is an S-structure representation, because topicalization is assumed to occur in the syntax (cf. Saito 1985). On the other hand, (78) is an LF representation of (77). Therefore, Hasegawa claims that the EC in (78) is actually a bound-variable pronominal which exhibits the WCO effect, even though it is a PRO which is comparable to a PRO in the English example (75).

4.2.4.3. The Emex Condition

The third diagnostic proposed by Jaeggli and Safir is

called the "EC Expletive" (Emex) Condition, which is stated as follows:

(79) (=Jaeggli and Safir's (35))

The Emex Condition

An expletive EC must be governed.

This condition is deduced from the observation that no language allows PRO to be expletive. We are not using this diagnostic for distinguishing pro and PRO for two reasons. First, since Japanese does not have an overt expletive, it is unclear whether Japanese has an empty expletive (cf. Nakayama and Tawa, 1988 for discussion on the existence of empty expletives).

The second and more important reason is that this condition distinguishes pro from PRO only if it presupposes that pro is governed and PRO is ungoverned. Jaeggli and Safir do presuppose this; they write: "If PRO is a pronominal anaphor, it follows that it cannot exist in a governed position, or else it will have a binding domain in which it must be both free and bound" (p.20). However, we are seeking a diagnostic which does not depend on the "PRO theorem".

4.2.5 Empty Subjects in nominals

Since the examples used in the crucial experiments 2 and 3 employed nominals rather than subordinate clauses, we

must consider the status of the understood subject of nominals in Japanese. The issue to be addressed in this subsection is not whether the empty subject is PRO or pro (or something else), but whether there is an empty subject in nominals at all.

It is controversial whether nominals involve empty subjects or not. Williams (1985) argues against postulating an empty subject in NP. The view that an NP has a 'controllable' PRO subject in the specifier position is called the 'NP PRO' theory. Consider the following example:

(80) (=Williams' (5))
 John took a PRO picture of Mary.

The 'NP PRO' theory can account for the fact that John is understood as corresponding to the 'maker' argument of picture, if the 'maker' role is assigned to PRO and John controls the PRO. However, Williams says that this account cannot be extended to the following example:

(81) (=Williams' (6))
 John took Mary's picture (t).

Since the specifier position is occupied by Mary, PRO cannot occur. But John is still understood as the maker of picture as in (80). Thus, Williams claims that "there must be some way to directly establish this link between John and the

to support the view that there is a PRO position in NPs.

Consider the following example:

- (83) (=Williams' (16))
 John took a PRO picture of him.

In the above example, John and him are disjoint, which could be attributed to the disjointness between PRO (which John controls) and him. However, Williams argues that "the implicit Maker argument of picture c-commands him and is in the same local domain as him, so disjointness between the two arguments of picture holds under principle B; since John is identified with the Maker argument (see (76)), John cannot be the same as him" (p.304). In order to hold this argument, according to Williams, Principle B must 'see' the implicit arguments. That is, implicit arguments must be syntactically recognizable by Principle B. Thus, Williams proposes the following treatment of implicit arguments:

- (84) (=Williams' (17))
 An implicit argument c-commands X if the verb (or noun) of which it is an implicit argument c-commands X.
 If an implicit argument is coindexed with X and c-commands X, then it binds X.

Williams says that "we are giving an implicit argument a syntactic status like other syntactic items, and we are identifying its syntactic position as the position of the verb or noun of which the implicit argument is an argument"

(p.303-304).

The disadvantage of Williams' proposal is that we need an extra proviso (84) for treating implicit arguments. Furthermore, if this stipulation assigns syntactic properties to implicit arguments, as Williams says, the reason to distinguish PRO as the syntactic realization of empty subject and an implicit argument that has syntactic properties will be lessened.

Furthermore, Williams argues that "cases of C (Principle C of the Binding Theory: see (3) in p.167) that apparently 'see' PRO in NP are actually 'seeing' implicit arguments that are not expressed" (p.305). Consider the following example:

(85) (=Williams' (24))

The PRO realization that John was unpopular upset him.

Williams mentions that Ross (1969) has argued for PRO in NP on the basis of the above example, because the 'realizer' role is assigned to PRO, and Principle C requires that John be disjoint from PRO. However, Williams claims that the implicit 'realizer' argument c-commands John, and Principle C assigns disjointness between John and the implicit argument. He argues that the 'PRO NP' view cannot explain the disjointness that holds between the 'realizer' role and John in the following example, since yesterday's precludes the appearance of PRO in the specifier position:

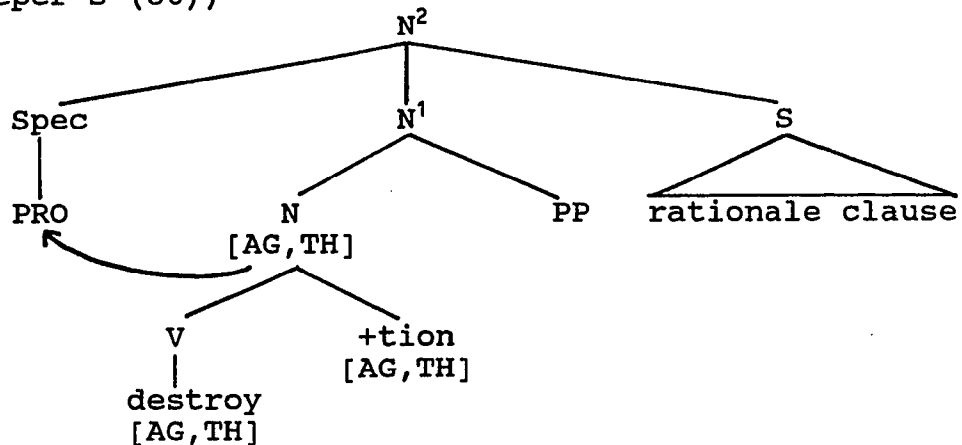
- (86) (=Williams' (25))
Yesterday's realization that John was a fool

However, it is controversial whether the temporal adjunct yesterday really occupies the position where PRO is assumed to appear. In what follows, we will consider discussions by Roeper (1987) and Abney (1987) that PRO is in fact present in this construction.

Roeper (1987) calls Williams' approach a 'lexical approach', which associates the arguments with properties of the verb itself. Roeper advocates both a 'morphological approach' and a 'syntactic approach'. The former associates implicit arguments with affixes (e.g. -ed, -able, -tion, etc.), and the latter associates implicit arguments with syntactic argument positions. As a case of latter, he argues that the Determiner of a nominalization contains a PRO which, like infinitives, carries the external argument of the verb. Consider the following example (87) which is represented as (88):

- (87) (=Roeper's (78a))
the destruction of the building to prove a point

(88) (=Roeper's (80))



Here, the implicit AGENT is initially present on the verbal thematic grid, and matched by a thematic grid on -tion. Then, the grid 'percolates' to the N node. This percolation is a kind of feature sharing which has the following three properties: (a) Information on one node can percolate to a categorically different node. (b) Percolation is triggered by a phonetically real affix. (c) The thematic grid of the affix must match the grid of the verb to which it attaches.

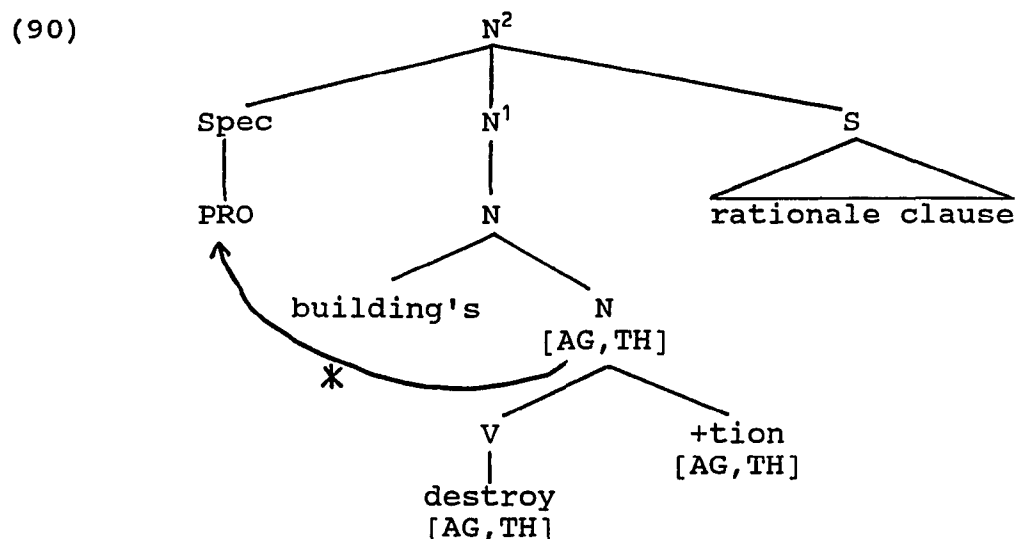
Furthermore, there is a thematic 'projection' from the N node to the external argument position, which is the PRO in the Spec of the nominalization. Now, the projected AGENT c-commands the rationale clause, so that the PRO in Spec can control the PRO in the rationale clause.

When the object the building is preposed, the control relation does not hold, as in the following example:

(89) (= Roeper's (78b))

*?the building's destruction to prove a point

Although Williams considered that the object occupies the position where PRO is supposed to occupy, Roeper argues that a new branching node is introduced to make it unable to project the implicit AGENT into the PRO in the Spec position. This would be represented as follows (cf. Roeper's (83a)):



Here, the claim that there is a PRO in a nominalization is maintained, and the grammatical difference between (87) and (89) is explained in a unified way. Williams pointed out that temporal adjuncts can fill the subject position as in (86). If the subject position is really occupied so that PRO is precluded, then, we have to admit that the licensing of a rationale clause is not evidence for the existence of PRO. Consider the following example:

(91) yesterday's destruction of the city to prove a point

This example should be excluded by the mechanism proposed above by Roeper, because yesterday's would prevent projecting the thematic agent from destruction to PRO in Spec. We will turn to this problem shortly when we consider Abney's approach to PRO in NP.

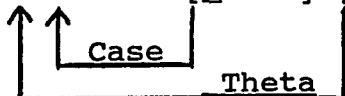
Abney (1987) proposes a "DP-analysis" which claim that NP is headed by a functional element, as S is headed by INFL. As the IP-analysis of S claims that S is headed by INFL, the DP-analysis of NP claims that NP is headed by an INFL-like element; "D" (determiner).

The first argument by Abney that there is a PRO subject of DP is based on Theta-theory. He argues that the Theta-Criterion predicts a recipient for the external Theta-role in action nominalizations like the destruction of the city. Abney claims that the Agent of destruction is understood and syntactically realized as follows:

(92) (=Abney's (70))
 [DP PRO the [NP destruction of the city]]
 ↑
 Theta

Abney assumes that the NP assigns the external Theta-role of destruction to PRO via predication (see Section 4.1). A possessive construction such as Caesar's destruction of the city is represented as follows:

(93) Caesar's [D AGR] [NP destruction of the city]

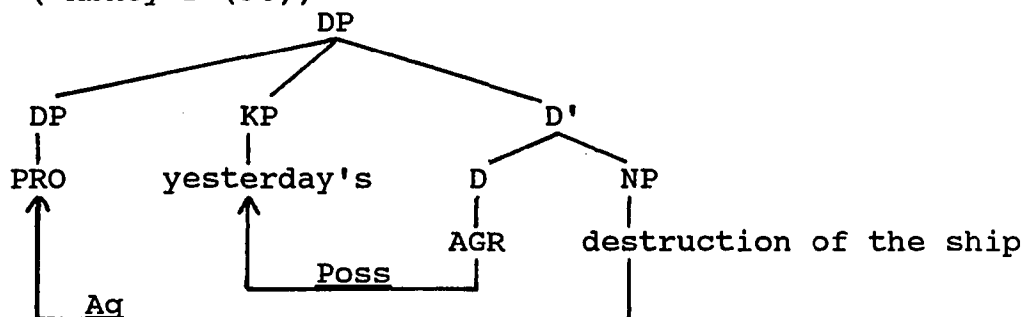


Here, Caesar is Theta-assigned by the NP as in (92), and Case-assigned by the empty D (=D_{AGR}). Abney claims that "If the possessor receives a Theta-role from N (either externally, as in [Caesar's destruction of Carthage], or via an internal trace, as in [the city's destruction t]), D_{AGR} does not assign the possessor Theta-role, and the subject receives only one Theta-role, as desired" (p.93). Here, consider again the problem pointed out by Williams; temporal adjuncts seem to occupy subject position to preclude PRO in NP:

(94) (=Abney's (89))
 yesterday's D_{AGR} destruction of the ship [to collect
 the insurance]

Contrary to Williams, Abney claims that PRO is in fact present in (94), which is represented as follows:

(95) (=Abney's (90))



Here, "KP" means a phrase marked with a postpositional Case marker (the possessive 's). That is, yesterday is Case-assigned by D_{AGR} , and it is also Theta-assigned by D_{AGR} , receiving the possessor Theta-role. On the other hand, PRO is Theta-assigned by NP, receiving the external Theta-role of destruction, and not Case-assigned by any element. The grammaticality of the above example is accounted for by the fact that D_{AGR} does not govern PRO. When PRO is displaced by a fronted object, rationale clauses cannot be controlled:

(96) (=Abney's (79))
 * [the boat]'s D [_{NP} destruction t [to collect the insurance]]
 ↑ _____ |

Thus, Abney says that "Roeper's original observation still holds: rationale clauses require a syntactically-realized controlling agent argument to be licenced" (p.96).

A second argument for a PRO in the subject position of a nominal is provided by control theory. Consider the following example:

(97) (=Abney's (80))
 Any attempt [PRO to leave]

Abney claims that since the attempter is necessarily the same as the leaver, a configuration of obligatory control is involved so there must be a PRO subject of the nominal

attempt.

A third argument for the existence of a PRO in a nominal is related to the Binding Principles A, B, and C. First, consider the following example:

(98) (=Abney's (81a))
 [pictures of themselves] bother the men

According to Principle A, the anaphor themselves must have a local antecedent. But this antecedent must be non-overt, because the above example lacks an overt antecedent. For this non-overt antecedent, Abney says that "A PRO subject of noun phrase is by far the most likely candidate" (p.98). Second, in the following example,

(99) (=Abney's (84))
 *PRO_i criticism of them_i

the criticizer(s) cannot be them. Abney claims that "This can be accounted for as a Principle B violation, if there is a PRO subject of criticism" (p.99). When we posit a syntactically realized empty subject PRO, we can straightforwardly account for the disjointness between the criticizer and them. We need no extra stipulation such as (84) which Williams proposes. Third, consider the following examples due to Ross (1967):

(100) (=Abney's (85))

- a. PRO_i the realization that he_i has broken the law
- b. PRO_{*i/j} the realization that John_j has broken the law

While the realizer can be he in (100a), it cannot be John in (100b), but must be someone else. Abney argues that "This is explicable as a Principle C violation, assuming there is a PRO present" (p.99). Recall that Williams argued against positing PRO in NP based on the example "Yesterday's realization that John was a fool". Williams claims that Principle C violation holds between John and the implicit realizer argument, not PRO. However, note that Principle C 'sees' (following Williams' term) this implicit argument as a syntactic element with the stipulation (84).

To summarize, Williams claims that the "subject" in nominals is not a syntactically realized argument, but simply "implied" element, although this element has syntactic properties. Contrary to this claim, Roeper argues that the "implicit argument" is syntactically realized as PRO. Furthermore, Abney proposes that NP should be analyzed as the complement of DP, which includes a PRO and a functional element D.

In what follows, I will consider the problem of the "subject" of the noun phrase in Japanese. First, consider the following example:

- (101) a. [_{ADJ} PRO ronten-o syoomei suru tame-ni]
 point-ACC prove in order to
 [_S PRO mati-o hakai-sita].
 city-ACC destroyed
 'PRO destroyed the city in order to prove a point.'
- b. [_{ADJ} PRO ronten-o syoomei suru tame-no]
 point-ACC prove in order to
 [_{NP} PRO mati-no hakai]
 city-GEN destruction
 'the city's destruction in order to prove a point'

(101b) is the nominal counterpart of (101a). Here, note that Japanese has only one form of possessive construction: "mati-no hakai" (city's destruction). The construction parallel to "destruction of the city" is "hakai no mati", but this is ungrammatical. This is due to the head-final characteristic of Japanese. Thus, it is impossible to prepose an object to test whether the preposed element occupies subject position to preclude PRO. That is, in Japanese we cannot compare the difference of grammaticality between "the destruction of the city to prove a point" and "*the city's destruction to prove a point", because Japanese does not have the form "destruction of the city" at all.

Next, consider whether Japanese nominals exhibit an obligatory control construction like "Any attempt [PRO to leave]":

- (102) Taroo-ga [PRO nigedasi]-tagatteiru.
 -NOM escape-want
 'Taroo wants [PRO to escape].'

(103) [PRO nigedasu tame-no] arayuru kokoromi/keikaku
 escape in order to every attempt/plan
 'every attempt/plan [PRO in order to escape]'

In (102), PRO is obligatorily controlled by the subject Taroo. That is, the person who "escapes" must be the same as the person who "wants". Likewise, in (103), the escaper is interpreted as being identical with the attempter/planner. No other interpretation is possible. Thus, following Abney, it would be claimed that an obligatory control relation holds in Japanese nominal constructions as well.

Third, let us consider how Binding Principles A, B, and C interact with Japanese nominal constructions. First, consider the following example:

(104) [zibun_i-no hon]-no PRO_i syuppan
 self-GEN book-GEN publication
 'PRO_i publication of self_i's book'

The reflexive anaphor zibun in Japanese must be bound by a subject, as is discussed in Fiengo and Haruna (1987). Since there is no overt subject in the above example, a PRO subject of the noun syuppan (publication) would be the only candidate as an antecedent, as Abney claims in the English example (98). Second, consider the following example:

- (105) karera_i-e-no PRO_{*i/j} hihan
 they-LOC-GEN criticism
 'lit. criticism to them'

Here, "e" is a locative marker, which is used in a construction such as "Taroo-ga Tookyoo-e iku" (Taroo goes to Tokyo). (105) is construed as "criticism (from someone) to them". If the construction in (105) is comparable to the English example (99): "*PRO_i criticism of them_i", it would suggest that a PRO subject is present in Japanese nominals, because Principle B insists that the pronoun karera be free in its governing category. Third, consider the following examples:

- (106)a. [zibun_i-ga hooritu-o okasita]to-yuu PRO_i ninsiki
 self_i-NOM law-ACC break that recognition
 'PRO_i recognition that he_i has broken the law'
- b. [Taroo_i-ga hooritu-o okasita]to-yuu PRO_{*i/j} ninsiki
 -NOM law-ACC break that recognition
 '(someone's) recognition that Taroo has broken the law'

While the recognizer must be zibun (self) in (106a), it cannot be Taroo in (106b), but must be someone else. It seems to be natural to assume that a PRO subject is present in (106a), because the anaphor zibun is usually bound by a subject in Japanese. The unavailability of a bound reading in (106b) will be accounted for as a Principle C violation, assuming there is a PRO subject present, as Ross and Abney argue.

From the above considerations, we could argue that the arguments for PRO in NP in English proposed by Abney are just as strong for PRO in NP in Japanese as well; obligatory control, Principles A, B, and C. However, Roeper's claim that rationale clauses are licensed only when there is a PRO subject in NP is not applicable to Japanese. Since Japanese is a strict head-final language, it has only one form of possessive construction; "NP-no N". Thus, it is impossible to test whether a preposed object prevents licensing of the rationale clauses. Note that this inapplicability of "rationale clause test" in Japanese also nullifies Williams' argument that there is no PRO subject in NP because rationale clauses can be licensed even if the subject position is occupied by a temporal adjunct; "yesterday's destruction of the city to prove a point". It is just impossible to use rationale clauses to examine the existence of a PRO subject in NP in Japanese.

Now, let us consider the issue of PRO in nominal from a different viewpoint. Hoji (1988) argues against postulating an empty subject in Japanese nominals. He proposes the "Bound Variable Interpretation" (BVI) test to examine the existence of an empty subject in NP in Japanese. This test says that a bound variable interpretation for pro is possible where a quantified NP (henceforth Q-NP) c-commands pro, and the BVI is impossible if the Q-NP does not c-command pro. (Remember that Hoji does not differentiate pro

from PRO. See Section 4.2.3). Consider the following examples:

- (107) (=Hoji's (6a))
 daremo_i-ga [_{NP}[_S pro_i hitome pro_j mita]hito_j]-o
 everyone-NOM he one glance him saw person-ACC
 sukini natta.
 fell in love
 'Everyone_i fell in love with the person that he_i took a
 glance at.'
- (108) (=Hoji's (7))
 * [_{NP}[_S pro_j hitome pro_i mita]hito_j]-ga [_{VP} daremo_i-o
 he one glance him saw person-NOM everyone-ACC
 sukini natta].
 fell in love
 'The person that took a glance at him_i fell in love
 with everyone_j.'

In (107), pro_i is interpreted as a variable being bound by the Q-NP daremo which c-commands pro_i. In (108), on the other hand, the Q-NP does not c-command pro_i. Thus, it is impossible to interpret that pro_i is bound by the Q-NP. Since a quantified NP is assumed to be subject to Quantifier Raising, the LF representation of (108) would be as follows:

- (109) * [_S daremo_i-o [_{NP}[_S pro_j hitome pro_i mita]hito_j]-ga
 [_{VP} t_i sukini natta].

Here, the Q-NP daremo is crossing over the empty subject pro_j, which is a case of "weak cross over" (WCO). Recall Jaeggli and Safir's argument that the empty subject is pro if it shows the WCO effect. However, also recall Hasegawa's claim that the empty subject is PRO even if it shows the WCO

effect, because the empty subject is governed at LF so that it can function as a resumptive pronoun.

Hoji claims that if the matrix object in (107) is preposed, as in (110) below, the BVI is still available.

- (110) (=Hoji's (9))
 [_s[_{NP}[_s pro_i hitome pro_i mita]hito_j]-o_k [_s daremo_i-ga
 he one glance him saw person-ACC everyone-NOM
 [_{VP} t_k sukini natta]]].
 fell in love
 '[The person that he_i took a glance at]_k, everyone,
 fell in love with t_k.'

Hoji says that "the availability of a bound variable reading in (110) can be assimilated to so-called "reconstruction" examples" (p.96).

What Hoji tries to show is that in a sentential construction, the BVI of an empty pronominal is impossible in the WCO construction and that it is possible in the case of "reconstruction". He assumes that if there are really empty pronominals in nominals, they should exhibit the same pattern of BVI as empty pronominals in sentential constructions.

Hoji applies this BVI test to the cases of empty elements in a nominal construction. First, Hoji mentions that the construction "NP-no N" is ambiguous as is shown below:¹¹

- (111) (=Hoji's (12))
 Chomsky-no hihan
 Chomsky-GEN criticism
 'someone's criticism of Chomsky' or
 'Chomsky's criticism of someone'

Thus, it seems that both an empty subject and an empty object can appear in nominals. Hoji says that "the alleged existence of the empty pronominal inside the NP is indicated in (112)" (p.97).

- (112) (=Hoji's (14))
 a. John_i-ga [_{NP} Mary-no pro_i(-no) hihan]-o mushi-shita.
 John-NOM Mary-GEN he(-GEN) criticism-ACC ignored
 ' John_i ignored Mary's criticism of him_i.'
 b. John_i-ga [_{NP} pro_i(-no) Mary-no hihan]-o kaita.
 John-NOM he(-GEN) Mary-GEN criticism-ACC wrote
 ' John_i wrote his_i criticism of Mary.'

Now, it is necessary to examine whether the "alleged" empty pronominals mentioned above really show the asymmetry between the WCO construction and "reconstruction" concerning the BVI test. Let us first consider the case of the WCO construction in nominals:

- (113) (cf. Hoji's (24))
 a. * [_{NP} [_S [_{NP} Mary-no (pro_i-no) hihan]-o hoodoosita]
 Mary-GEN criticism-ACC broadcast
 terebikyoku,]-ga [_{VP} daremo_i-o uttaeta].
 TV-station-NOM everyone-ACC sued
 '*The TV-station that broadcasted Mary's criticism of
 him_i, sued everyone_i.'

- b. ??[_{NP}[_S[_{NP} (pro_i-no) Mary-no hihan]-o hoodoosita]
 Mary-GEN criticism-ACC broadcast
 terebikyoku_j]-ga [_{VP} daremo_i-o uttaeta].
 TV-station-NOM everyone-ACC sued
 '??The TV-station that broadcasted his_i criticism of
Mary sued everyone_i.'

Hoji claims that when the empty pronoun is assumed to appear in the object position of hihan (criticism) (i.e. Mary-no pro-no hihan) as in (113a), we get the typical weak crossover effect, but if the empty pronoun is assumed to be in the subject position (i.e. pro-no Mary-no hihan) as in (113b), the BVI for the "criticizer" becomes marginal.

Now, let us consider whether the case of "reconstruction" changes the possibilities of BVI for the empty subject and the empty object in a nominal construction.

(114) (cf. Hoji's (27))

- a.
 [_S[_{NP}[_S pro_j[_{NP} Mary-no (pro_i-no) hihan]-o hoodoosita]
 it Mary-GEN criticism-ACC broadcasted
 terebikyoku_j]-o_k [_S daremo_i-ga [_{VP} t_k uttaeta]]].
 TV-station-ACC everyone-NOM sued
 '[The TV station that broadcasted Mary's criticism of
him_i]_k, everyone_i sued t_k.'

- b.
 ??[_S[_{NP}[_S pro_j[_{NP} (pro_i-no) Mary-no hihan]-o hoodoosita]
 it Mary-GEN criticism-ACC broadcasted
 terebikyoku_j]-o_k [_S daremo_i-ga [_{VP} t_k uttaeta]]].
 TV-station-ACC everyone-NOM sued
 '??[The TV station that broadcasted his_i criticism of
Mary]_k, everyone_i sued t_k.'

Here, the trace (i.e., t_k) of the reconstructed element is c-

commanded by the Q-NP daremo. Hoji claims that although the interpretation of having an empty object (i.e. Mary-no pro-no hihan) is clearly possible in (114a), the interpretation of having an empty subject (i.e. pro-no Mary-no hihan) is unclear in (114b).

From the above two observations, Hoji argues that the BVI for the empty object changes its status between the "weak crossover" configuration (BVI is impossible) and the "reconstruction" configuration (BVI is possible), but the BVI for the empty subject is equally unnatural in both configurations. Thus, he claims that "The variable binding test thus suggests that there is no syntactic position for the so-called subject of NP in Japanese. What appears to be the subject of NP in the above examples can and perhaps should be analyzed as an adjunct" (p.101).

Hoji's claim that "Mary-no hihan" (Mary's criticism) contains the object empty pronominal seems to be correct; it is natural for this construction to be analyzed as "Mary-no pro-no hihan" (Mary's criticism of someone). And "pro-no Mary-no hihan" (someone's criticism of Mary) is an unnatural interpretation of "Mary-no hihan", as is indicated by the double question mark in (113b) and (114b). However, there are independent reasons why this is so. First, in an intransitive construction such as "Mary-ga bisyoosita" (Mary smiled), the nominalization must mark the subject with -no; "Mary-no bisyoo" (Mary's smile). On the analogy of this

construction, "Mary-no hihan" is likely to be interpreted as "Mary's criticism" but not "criticism of Mary". Second, in a possessive construction "NP-no N", the NP is interpreted as Agent. For example, "Mary-no hon" (Mary's book) is interpreted as "the book that Mary possessed/wrote/bought". On the analogy of this, "Mary-no hihan" tends to be interpreted as "the criticism that Mary made". It is true that "Mary-no hihan" is syntactically ambiguous, but it is simply not natural to interpret it as having an empty subject. Hoji's BVI correctly reflect the unnaturalness of this interpretation.

Hoji argues that the empty subject does not exist in NP, because the bound variable interpretation is unnatural if we posit an empty subject. Contrary to this, we would claim that the BVI results in unnatural interpretation, because the interpretation as containing the empty subject is unnatural. The unnaturalness of the BVI does not prove the non-existence of the empty subject, it only reflects the unnaturalness of interpreting "Mary-no hihan" as having an empty subject; "pro-no Mary-no hihan". What we must examine is whether the BVI is really unnatural in the case where an NP is clearly an object in an "NP-no N" construction. Consider the following examples:

(115)

- a. *_{[NP]_s pro_j [_{NP} pro_i-no toti-no baibai]-o hoodoosita]}
 it land-GEN trade-ACC broadcasted
 terebikyoku_i]-ga [_{VP} daremo_i-o uttaeta].
 TV-station-NOM everyone-ACC sued
 'The TV-station that broadcasted his_i trade of
 land sued everyone_i.'
- b. [_s [_{NP} [_s pro_j [_{NP} pro_i-no toti-no baibai]-o hoodoosita]
 it land-GEN trade-ACC broadcasted
 terebikyoku_i]-o_k [_s daremo_i-ga [_{VP} t_k uttaeta]]].
 TV-station-ACC everyone-NOM sued
 '[The TV station that broadcasted his_i trade of
 land]_k, everyone_i sued t_k.'

Here, "toti-no baibai" (trade of land) cannot be interpreted as "The land trades" or "the trade that the land made", since the land is inanimate. If the empty subject is not a syntactically realized element, but an adjunct as Hoji claims, the BVI for the WCO construction (115a) and that for the "reconstruction" (115b) should equally be unnatural. However, there is a clear difference of availability of the BVI between (115a) and (115b). Thus, if Hoji's BVI test proves that there is an empty object in "NP-no pro-no N" construction, it does prove that there is an empty subject in "pro-no NP-no N" construction, because in both constructions the BVI is not available in the weak crossover configuration and available in the reconstruction configuration.

Now, let us consider the implication of the above arguments for the sentences used in our experiments. The English constructions used in the FCR/CF experiments contain PRO in a clausal complement. To be sure our comparison

between English processing and Japanese processing is valid, we should test comparable Japanese constructions. It is not unarguably admitted that the nominals we tested in Experiments 2 and 3 contain a PRO subject, even though their interpretation is quite similar to that of the English infinitival clauses with PRO, and though they showed the same parsing preference as the Japanese embedded clauses in Experiment 1. Further experiments should ideally be performed with a clearer case of PRO subject in Japanese. Recall, however, that we selected nominals for our experiments in order to avoid unwanted ambiguity that arises when a subject NP and an object NP are exchanged preceding a clausal complement. This was discussed in Section 3.5.1. But embedded imperative constructions discussed in Section 5.2 below may be satisfactory from this point of view.

4.2.6 Summary and Discussion

We have discussed three possibilities concerning the status of the empty subject in a tensed clause in Japanese (i.e. PRO, pro or variable, or indeterminate), and have found that all these possibilities have their own plausibility and implausibility. The correct conclusion crucially depends on what we take the criteria for PRO and pro to be. We have examined three diagnostics proposed by Jaeggli and Safir for distinguishing between PRO and pro. But Hasegawa shows that these diagnostics can be

circumvented if certain other assumptions are made.

The important criterion for our purpose is how the EC is interpreted: is it subject to control theory or not? According to Hasegawa, Japanese has PRO both in a tensed and tenseless subordinate clause which is subject to control theory. Thus, the empty subjects in our experimental sentences in Experiment 1 would be controlled PRO. Huang says that an empty subject in a tenseless subordinate clause is PRO, while that in a tensed clause is pro or a variable, although PRO and pro obey the same control rule: the Generalized Control Rule. Then, the empty subjects in Experiment 1 would be pro which is subject to the same control rule as for PRO, or they could be variables which have a pragmatically determined null operator. This implies that there are three possible antecedents for an empty subject: either the main clause subject or the main clause object if it is pro, or some third party in the discourse if it is a variable.

Since Hoji, Whitman, and Fiengo and Haruna do not make a distinction between PRO and pro, or deny the existence of them as empty pronominals, naturally they are not committed to control theory, which is proposed to define the interpretation only for PRO, while the interpretation of pro is assumed to obey the same principles as overt pronouns. Thus, the interpretation of empty subjects would depend largely on a non-syntactic discourse condition such as

mentioned by Fiengo and Haruna. However, note that Huang admits that the choice of controller of an empty pronominal is largely determined by some "pragmatic factors", even if the empty pronominal is syntactically defined as PRO or pro according to its governing properties.

Let us consider the import of this for our experiments. Assuming that the empty subject in our experimental sentences falls under control theory, and assuming that this controlled interpretation is favored by the parser over a 'third party' interpretation mediated by an empty topic, then our results clearly bear on the question: what interpretation strategies does the parser use on-line in lieu of control information that is not yet available? This is the same question as FCR/CF were addressing for English.

But suppose now that the alternative linguistic position were correct, and the empty subject in our experimental sentences was an empty pronoun whose interpretation is to be determined pragmatically just as for an overt pronoun. Then, our results would not concern on-line strategies for pronoun interpretation. They would then show a preference for an object antecedent, or else a most recent antecedent including ECs as potential antecedents. This would not directly engage the issues raised by FCR/CF, but would constitute to the rather extensive research on pronoun interpretation. It is not possible to review the literature in full here, but some basic connections can be

drawn.

An overt pronoun in English is marked with gender, number, etc. so that the possible antecedent for a pronoun is restricted to some extent. However, there are ambiguous cases in which a pronoun has two or more possible antecedents. Consider the following examples:

(116)a. John hit Bill and he ran away.

b. John hit Bill and Mary kicked him.

Note that this is a case of full, not temporary, ambiguity, so it allows us to study the parser's preferences when the grammar does not determine a unique analysis. Two basic strategies have been proposed concerning which antecedent is preferred in case of ambiguity such as this: (i) a "subject assignment strategy" (henceforth SAS) and (ii) a "parallel function strategy" (henceforth PFS). SAS claims that a pronoun is assigned to a preceding subject NP (cf. Broadbent (1973), Clancy (1980), Hobbs (1976)). PFS maintains that a pronoun is assigned to a previous NP in the same grammatical position as the pronoun (cf. Sheldon (1974), Grober et al. (1978), Cowan (1980)). In (116a), both SAS and PFS predict that the subject NP John is preferred as the antecedent, since it is the subject and has the same grammatical function as the pronoun he. On the other hand, in (116b), SAS predicts the subject NP John as the antecedent for the

pronoun him, while PFS predicts the object Bill as the antecedent since the pronoun is an object.

What would SAS and PFS predict for our experimental sentences, if they have a construction like 'Subject - Object - [pro ...]?' As in (116a), both SAS and PFS would predict that the subject is preferred as the antecedent, since it is the subject and has the same grammatical function as pro. Thus, if the empty subject in our experimental sentences were a non-controlled pro (unlike Huang's control pro), the object preference observed in our experiments would not be explained.

4.3 Linguistic Analysis of trace in Japanese

In this chapter, we will consider issues concerning empty categories created by movement. Trace theory claims that any moved constituent leaves behind in the position out of which it moves an empty category of the same type. One of the empirical motivations for this claim is the "wanna-contraction" facts. That is, wanna-contraction is possible in (117), but the intervening trace somehow blocks the contraction in (118).

(117) Might John want to win?
wanna

(118) Who_i might John want t_i to win?
*wanna

Although the trace in (118) is phonetically null, it can have the phonetic consequence of preventing "want to" from being contracted to "wanna". Not all traces are in a position that is susceptible to this kind of phonetic demonstration. As we will see below, there are some other criteria available to help to decide when a trace is present.¹²

4.3.1 Configurationality in Japanese

Japanese clauses are strictly verb-final, and NPs are case-marked by enclitics (e.g. -ga, -o, -ni, etc.). Because of this case-marking, the grammatical function of each NP (e.g. Subject, Object, etc.) is rather clearly detectable.¹³ Thus, an NP can be moved without losing necessary information to interpret a sentence. And indeed, word order is fairly free in Japanese. However, a natural or 'unmarked' word order seems to exist, in the sense that a native speaker feels the following word orders as normal, though other orders are also possible.

(119) Taroo-ga hasitta.
 -NOM ran
 'Taroo ran.'

(120) Taroo-ga Hanako-ni atta.
 -NOM -DAT met
 'Taroo met Hanako.'

- (121) Taroo-ga Hanako-o mita.
 -NOM -ACC saw
 'Taroo saw Hanako.'
- (122) Taroo-ga Hanako-ni hon-o okutta.
 -NOM -DAT book-ACC sent
 'Taroo sent a book to Hanako.'
- (123) Jiroo-wa Taroo-ga Hanako-ni hon-o okutta
 -TOP -NOM -DAT book-ACC sent
 koto-o sitteiru.
 fact-ACC knows
 'Jiroo knows the fact that Taroo sent a book to
 Hanako.'

The preferred word orders illustrated above can be summarized as follows:¹⁴

(124) TOP(wa) - NOM(ga) - DAT(ni) - ACC(o) - VERB

The naturalness of an alternative word order varies according to context, situation, personal preference, etc. However, the point is that the positions of NPs within the clause in Japanese are fairly exchangeable. For example, all six possible variants of sentence (122) are grammatical as is shown below.

- (125)a. Taroo-ga Hanako-ni hon-o okutta. (NOM-DAT-ACC)
 b. Taroo-ga hon-o Hanako-ni okutta. (NOM-ACC-DAT)
 c. Hanako-ni Taroo-ga hon-o okutta. (ACC-NOM-DAT)
 d. Hanako-ni hon-o Taroo-ga okutta. (ACC-DAT-NOM)

- e. Hon-o Taroo-ga Hanako-ni okutta. (DAT-NOM-ACC)
 f. Hon-o Hanako-ni Taroo-ga okutta. (DAT-ACC-NOM)

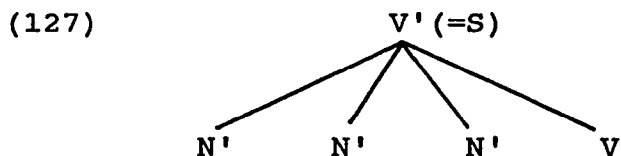
In a series of studies by Hale (1980, 1982, 1983) and others such as Whitman (1979) and Farmer (1980), the issue of free word order has been considered under the heading of "non-configurationality". Saito (1985) reviews three hypotheses proposed for this free word order phenomenon in Japanese: "strong non-configurational", "weak non-configurational", and "configurational" hypotheses. I will briefly examine the first and second hypotheses, and then consider the third one in more detail.

4.3.2 Strong non-configurational hypothesis

The strong non-configurational (or flat structure) hypothesis proposes the following phrase structure rule to generate all variants of a sentence (Hale 1980, p.185):

$$(126) (=Hale's (1)) \\ X' \text{ ---> } X'^* X$$

Here, X stands for the head of the maximal projection of any category, and X'* means any number of syntactic category X' (e.g. N'). Thus, (126) gives the following tree representation for (125a-f) (case markings are omitted):



Since this hypothesis assumes that Japanese lacks the category "VP", the resulting structure is "flat" under the S node. Thus, each constituent c-commands the others. Only differences in Case for each NP indicate differences in grammatical function (Subject, Object, etc.). Since all the possible variants are base generated by the phrase structure rule, no movement rule is required. Therefore, there is no trace to be left by movement.

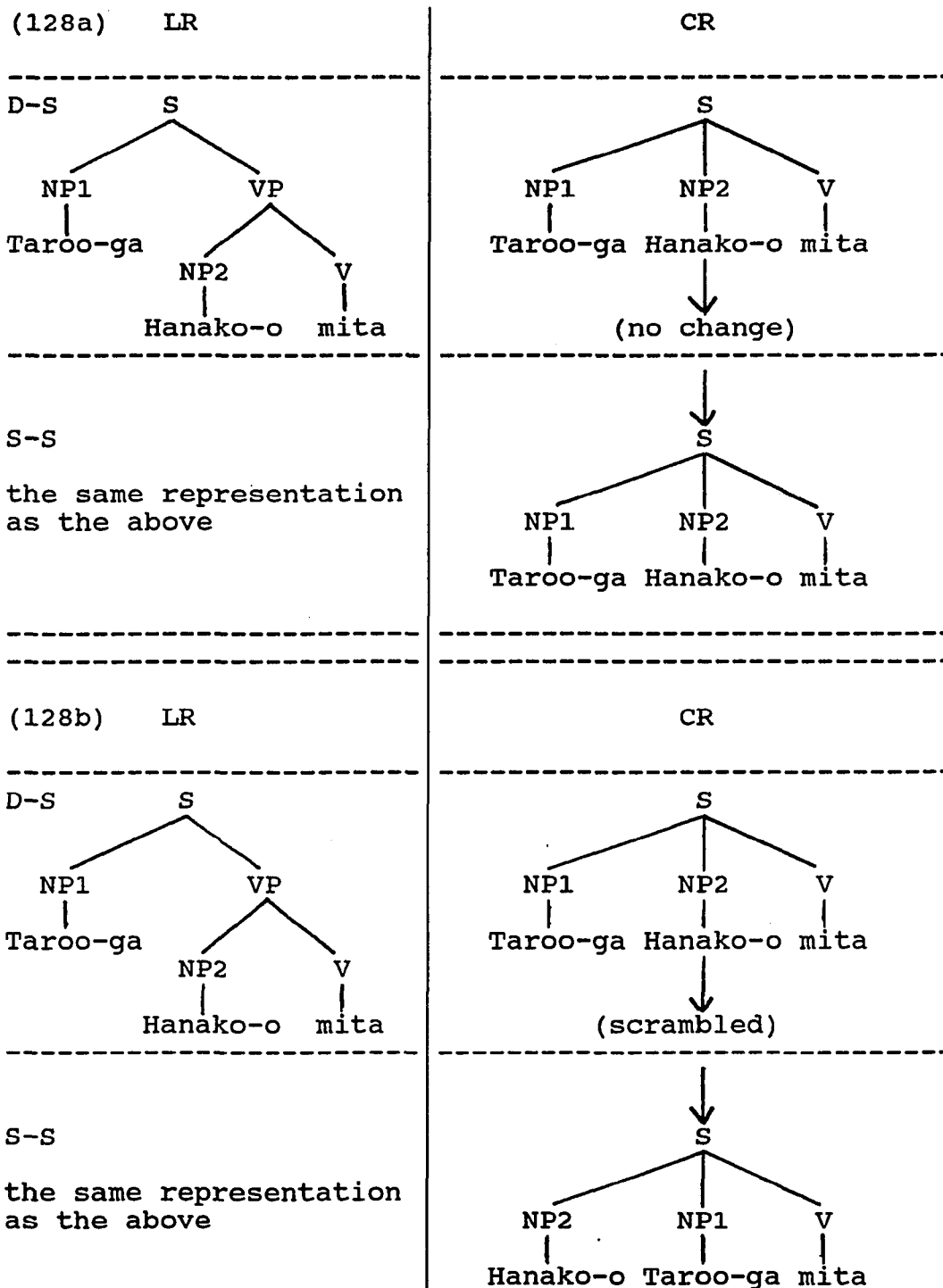
4.3.3 Weak Non-configurational Hypothesis

The second (i.e. weak non-configurational) hypothesis postulates a dual syntactic representation at both D-structure and S-structure. One of the dual syntactic representations is called the "lexical representation", which assigns a hierarchical structure to each constituent. This structure is configurational and obeys the Projection Principle, which states that the Theta-Criterion must be satisfied at each level of representation; the Theta-Criterion requires that each NP (or A-chain) must receive one Theta role, and every Theta role must be assigned. The other syntactic representation is termed a "constituent representation", and represents only the linear order of

constituents, with no configurational relationships. Because these two representations are postulated for a sentence at both D-structure and S-structure, there are four representations for one sentence. The weak non-configurational hypothesis assumes that the lexical representation does not change between D-structure and S-structure, but the constituent representation can be changed between these two structures, although it does not have to be changed. Let us take the example (121) and consider the word order variants:

- (128)a. Taroo-ga Hanako-o mita. (SOV)
 -NOM -ACC saw
 'Taroo saw Hanako.'
- b. Hanako-o Taroo-ga mita. (OSV)
 -ACC -NOM saw
 'Hanako, Taroo saw.'

According to this hypothesis, (128a) and (128b) will be represented as follows (LR = Lexical Representation, CR = Constituent Representation, D-S = D-Structure, S-S = S-Structure):



The motivation for this dual representation is the external/internal asymmetry of Theta-assignment. The Theta-

role of a subject NP depends on the choice of an object NP, because the whole predicate (verb + its object) assigns a Theta-role to its subject. On the other hand, the Theta-role of an object NP is determined by the verb itself.

Consider the following examples:

- (129)a. John-ga eda-o otta.
 -NOM twig-ACC broke
 'John broke the twig.'
- b. John-ga ude-o otta.
 -NOM arm-ACC broke
 'John broke his arm.'

In both (129a) and (129b), the verb otta (broke) assigns the same Theta-role (Patient) to their object NPs eda (twig) and ude (arm). However, the predicate "eda-o otta" (broke the twig) assigns the Theta-role "Agent" in (129a), which is different from the Theta-role "Experiencer" assigned by the predicate "ude-o otta" (broke his arm) in (129b).

Therefore, sentences must have the category "VP" at the level of representation where Theta-role assignment takes place.

On this weak non-configurational hypothesis, as well as strong non-configurational hypothesis, a movement rule is assumed not to play a role. Chomsky (1981, p.129) proposes the following rule for Japanese as an analogue of the rule Move-Alpha:

(130) (=Chomsky's (6))
 Assume a GF

Here, GF (Grammatical Function) is the basis for Theta-assignment. That is, a Theta-role determined by GF is assigned in the lexical representation, and this Theta-role is carried over into the constituent representation. Thus, the assignment of a Theta-role takes place only in the lexical representation in D-structure, and the Theta-roles are simply assumed as such in the constituent representation. Therefore, there is no movement rule or trace.

The weak non-configurational hypothesis assumes that only the lexical structure of a sentence is constrained by the Projection Principle, and hence must have the category VP. By contrast, the constituent structure is not constrained by the Projection Principle, and hence does not need to have VP.

4.3.4 Configurational Hypothesis

The third hypothesis claims that Japanese is a configurational language like English. Saito (1985) claims that the Projection Principle is a universal principle and thus holds in Japanese as well. Note that the Projection Principle requires that the Theta-marking properties of each lexical item be represented categorically at each syntactic level: at D-structure, S-structure, and LF.

Since the configurational hypothesis assumes that the Projection Principle is observed at each level of representation, in the example "Hanako-o Taroo-ga mita" (Hanako, Taroo saw), the Theta-marking property of the verb mita (it assigns THEME to the object Hanako) must be represented at S-structure. Thus, there must be VP and a movement rule which leaves a trace that can receive the THEME role: [_S Hanako-o Taroo-ga [_{VP} t mita]]. This movement rule is called "scrambling" by Saito, and is an S-structure adjunction operation. Here, note the following three points. First, the term "scrambling" is used differently from the traditional way. In Ross (1967), "scrambling" is defined as an optional rule which "scrambles" (freely exchanges) major constituents within a clause. Saito's scrambling rule moves a constituent to a specific position outside a clause and creates another clause. Secondly, the landing site of the moved NP is not base generated but created by "adjunction". That is, an argument NP is moved to a non-argument position, as in the case of WH-movement in English, although the moved element is not a WH-element. Finally, this rule leaves a trace unlike the traditional scrambling rule. This trace plays an important role in Saito's argument for the configurationality of Japanese.

In what follows, we will consider the following three kinds of evidence given to support Saito's claim of configurationality for Japanese; "pronominal coreference",

"crossover phenomena", and "quantifier floating".

4.3.4.1 Pronominal Coreference

First, Saito assumes that the following condition concerning pronominal coreference holds both in English and in Japanese (and perhaps in any language universally):

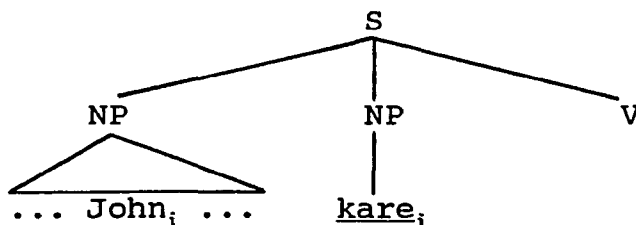
- (131) (=Saito's (17))
A pronoun cannot c-command its antecedent.

Now, let us consider the following example:

- (132) (=Saito's (18c))
[_{NP} John_i-kara okane-o moratta hito]-ga kare_i-o
-from money-ACC received person-NOM he-ACC
suisensita (koto)
recommended fact
'The person who received money from John recommended him.'

If we do not admit the category "VP" in Japanese, we should represent (132) as follows:

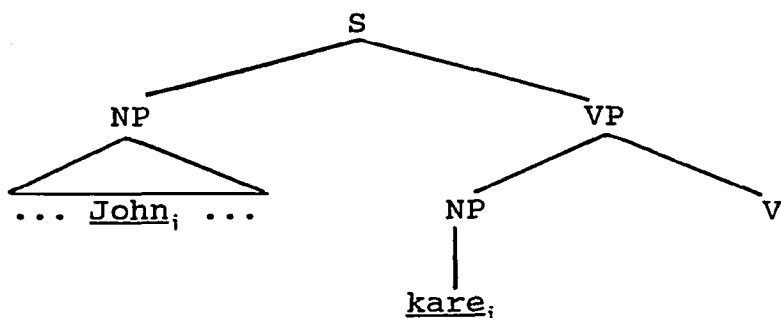
- (133) (=Saito's (19a))



In this representation, the pronoun kare c-commands its

antecedent John. Thus, (132) must be ruled out if (131) is correct, although (132) is perfectly acceptable. Therefore, Saito claims that we must postulate the VP node to represent (132) as follows:

(134) (=Saito's (19b))



That is, assuming (131) is correct, we can account for the grammaticality of (132) only by admitting the category VP.

Furthermore, Saito claims that the condition (131) leads to an analysis of the free word-order phenomenon in terms of a movement rule. Consider the following examples:

(135) (=Saito's (20))

- a. *Kare_i-ga [_{NP} Mary-ga John_i-ni okutta tegami]-o
 he-NOM -NOM -to sent letter-ACC
 mada yonde inai.
 yet read have-not

'*He has not read the letter Mary sent to John.'

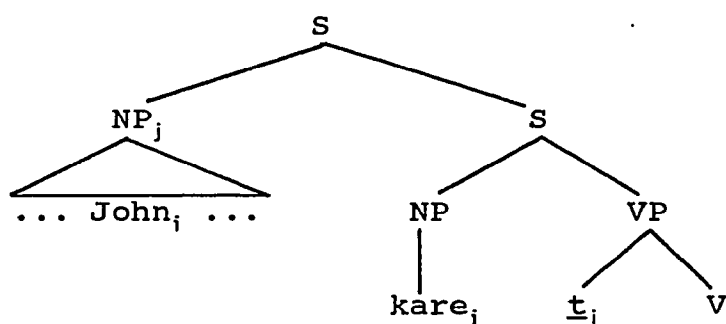
- b. [_{NP} Mary-ga John_i-ni okutta tegami]-o kare_i-ga
 mada yonde inai.

'The letter that Mary sent to John, he has not read.'

Saito claims that the difference of grammaticality between

(135a) and (135b) is explicable, if we assume that (135b) is derived from (135a) by a movement rule, which is a scrambling rule that adjoins a moved NP to an S node. Along this line of explanation, we should represent (135b) as follows:

(136) (=Saito's (23))



In this representation, the pronoun kare does not c-command its antecedent John. Although the pronoun c-commands the trace of the moved NP which includes the antecedent, the condition (131) applies only at S-structure. Thus, it is clear that (135b) does not violate the condition (131). Note that if the subject and object NPs in (135b) were analyzed as sisters under S, as in (133), then it would incorrectly be predicted that (135b) is ungrammatical.

Although Saito's discussion about pronominal coreference in Japanese seems to be plausible, there are some problems to be noticed. One problem, which he himself points out, concerns the legitimacy of the formulation in (131). Saito admits it is still controversial whether

syntactic constraints on anaphoric relations are to be stated solely in terms of c-command in the sense of Reinhart (1976, 1981) or not. The possible objection to the formulation of coreference relations in (131) is that not only the c-command relation but also a linear precedence relation is necessary for a correct formulation of the constraint. However, Saito claims that "even if precedence-relations do affect the possibility of pronominal coreference, our argument can be maintained as long as (137) holds" (p.44).

(137) (=Saito's (27))

A pronoun cannot c-command its antecedent even if the latter precedes the former.

Saito cites Kuno's (1983) examples of English sentences containing mutually c-commanding coreferential noun phrases and says "it is not clear that such data are directly relevant to our argument" (p.45). The examples are shown below:

(138) (=Saito's (28))

- a. John showed Mary_i herself_i in the mirror.
- b. *John showed herself_i Mary_i in the mirror.

The above examples suggest that when an anaphor and its antecedent are in the mutual c-command relation, the anaphor cannot precede the antecedent. That is, the precedence

relation affects the grammaticality of these two sentences. However, as Saito mentions, it is not clear how this case of anaphoric coreference is related to pronominal coreference which is what is in question here.

Saito presents two observations which seem to support (137): a pronoun cannot c-command its antecedent whether the antecedent precedes or follows the pronoun. The first point is illustrated in the following example:

(139) (=Saito's (29))

- a. [_{NP} Kare_i-no okaasan-ga genki-datta koro]-no John_i
 -GEN mother-NOM well-was time-GEN
 'Lit. John of the time when his mother was well = John
 as he was when his mother was well'
- b. ?[_{NP} kare_i-no okaasan-ga genki-datta koro]-no kare_i
- c. *[_{NP} John_i-no okaasan-ga genki-datta koro]-no kare_i

Saito claims that (139a) is grammatical in spite of the fact that the pronoun kare precedes the antecedent John, whereas (139c) is ungrammatical even though the antecedent precedes the pronoun. The difference of grammaticality comes from the fact that the pronoun does not c-command its antecedent in (139a) but does in (139c). Thus, the data seem to support the claim that the coreferentiality relation is constrained solely by the c-command relation.

However, one may argue that Saito's grammaticality judgement completely contradicts that of some other native speakers of Japanese. That is, for some speakers, (139a) is

ungrammatical and (139c) is grammatical. Pronominal coreference in Japanese seems to be tricky in some cases. A sentence with a pronoun in the initial position sounds strange, especially if the sentence is the first sentence in a discourse. Thus, the natural way of saying (139a) would be "[okaasan-ga genki-datta koro]-no John". That is, with deletion of the pronoun (or, using no pronoun at all), it sounds natural as Japanese.¹⁵ One must, however, accept Saito's argument here if (139c) is indeed ungrammatical for speakers who use pronouns more freely and accept (139a).

Saito's second observation that is claimed to support (137) is taken from a VOS language (Malagasy). Saito argues that if a pronoun could c-command its antecedent as long as it follows its antecedent, then the Malagasy counterpart of He_i loves John_i's mother (=loves John_i's mother he_i) should be grammatical. The Malagasy example, which is shown below, is ungrammatical like its English counterpart.

(140) (=Saito's (30))

- a. Nahita ny reniny Rasoa.
 past-see the mother-her/his
 'Raso_a saw her mother.'
- b. *Nahita ny renin-d Raso_a izy.
 she/he
 '*She saw Raso_a's mother.'

4.3.4.2 Crossover

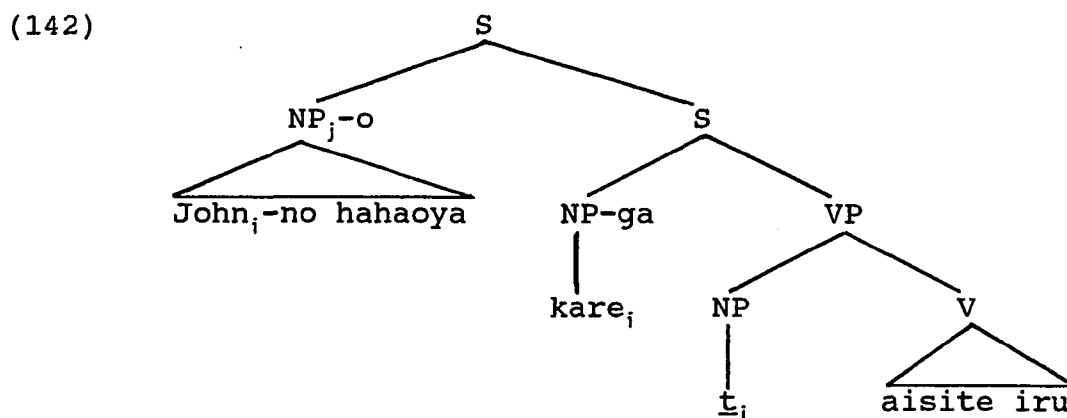
Saito's second argument for configurationality concerns crossover phenomena. Let us consider the following examples, paying attention to the case marking.

(141) (=Saito's (32))

a. John_i-no hahaoya-ga kare_i-o aisite iru.
 -GEN mother-NOM he-ACC love
 'John_i's mother loves him_i.'

b. ?*John_i-no hahaoya-o kare_i-ga aisite iru.
 -GEN mother-ACC he-NOM love
 '??/* John_i's mother, he_i loves.'

According to the configurationality analysis of Japanese, (141b) should be derived from "Kare_i-ga [John_i-no hahaoya]-o aisiteiru" by a scrambling rule. This rule is a movement rule which adjoins the target node to the S node. Thus, (141b) is represented as follows:



As is clear from the above representation, the pronoun kare does not c-command its antecedent John. Therefore, this

sentence should be grammatical if the constraint stated in (137) is the only constraint on coreferentiality of pronouns.

In order to explain the ungrammaticality of this sentence, Saito invokes the cross over constraint. First, he proposes that a subject pronoun (kare) cannot take a name (John) contained in the object as its antecedent regardless of the linear order. However, there is an apparent counter-example to this statement. The counter-example is (135b) which is repeated below:

- (143) [Mary-ga John_i-ni okutta tegami]-o kare_i-ga
 mada yonde inai.
 'The letter that Mary sent to John, he has not read.'

In this sentence, the subject pronoun kare can take as its antecedent the name John contained in the object NP.

Therefore Saito proposes the following generalization:

- (144) (=Saito's (34))
 When the object precedes the subject, a pronoun in the subject position can take a name contained in the object as its antecedent only if the name is embedded "deeply enough" within the object.

This can now be recognized as a crossover effect, if it is assumed that when the object appears sentence-initially, it is moved to that position. Saito's argument can be summarized as follows: (i) the "deeply enough" facts are

well-known in connection with crossover phenomena; (ii) crossover phenomena occur only for movement to A'-position; (iii) therefore, object fronting in Japanese is movement to A'-position.

4.3.4.3 Quantifier Floating

The third argument that Saito gives for a movement analysis of the free word order phenomenon concerns "quantifier floating". A quantifier in Japanese can float out of NP as is shown below:

(145) (=Saito's (37))

a. [_{NP} Sannin-no gakusei]-ga sake-o nonde iru.
 3person-GEN student-NOM sake-ACC drinking
 'Three students are drinking sake. = There are three students drinking sake.'

b. Gakusei-ga sannin sake-o nonde iru.

(146) (=Saito's (38))

a. John-ga [_{NP} sanbon-no sake]-o motte kita.
 -NOM 3bottle-GEN sake-ACC came-with
 'John came with three bottles of sake.'

b. John-ga sake-o sanbon motte kita.

The (a) sentences and (b) sentences have roughly the same meaning. Even if a quantifier has floated out of NP, it still can modify the target NP from outside of that NP. However, there is a restriction on the operation of floating; a quantifier cannot cross another NP argument. That is, a quantifier cannot modify its target NP if another NP intervenes between them. Thus, (145b) cannot be changed

as follows:

- (147) (=Saito's (39a))
 *Gakusei-ga sake-o sannin nonde iru.
 student-nom sake-acc 3person drinking

However, (146b) can be altered as follows:

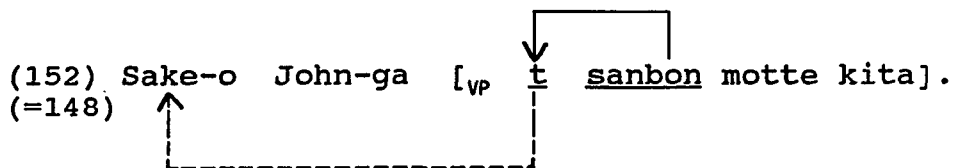
- (148) (=Saito's (40a))
 Sake-o John-ga sanbon motte kita..
 sake-ACC -NOM 3bottle came-with
 'John came with three bottles of sake.'

In order to explain this asymmetry, Saito invokes the category VP and the scrambling (movement) rule. Thus, the examples (145b, 146b, 147, and 148) will be represented as follows (solid line = modifying relation, dotted line = movement of NP):

- (149) Gakusei-ga sannin [_{VP} sake-o nonde iru].
 (=145b)
-

- (150) *Gakusei-ga sake-o sannin [_{VP} t nonde iru].
 (=147)
-

- (151) John-ga [_{VP} sake-o sanbon motte kita].
 (=146b)
-



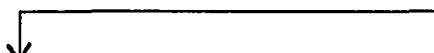
In (150), the quantifier sannin, which is outside of VP, is separated from its target NP gakusei by another NP sake. That is why this sentence is ungrammatical. On the other hand, in (152) the quantifier sanbon, which is inside of VP, modifies the trace of its target NP sake. In other words, the quantifier and the target NP are connected by the trace and thus indirectly stand in the modifying relation. Therefore, Saito claims that by postulating a VP node and a scrambling rule, we can account for the asymmetry between (150) and (152).

Before we can accept the above argument, we must consider some potential problems. First, the quantifiers in the above examples are not the same as the so-called "quantifiers" such as takusan (much, many), sukosi (little, few), zenbu (all) etc. The quantifiers used in Saito's discussion are all "numeral classifiers" in the sense that they are semantically correlated with a certain type of objects. For example, nin is usually associated with human beings, and bon with long, slender objects such as pencils, tubes, etc. Thus, the literal translation of sannin-no gakusei would be "three entities of human being of

student".¹⁶ This classifier can be used as an independent noun, as follows:

- (153) Sannin-ga koro-sare-ta.
 3person-NOM kill-CAUS-PAST
 'Three persons were killed.'

If we consider sannin in (153) as a noun, and add an instrumental particle -de (with), the sentence becomes grammatical as follows (the arrow indicates modifying relation):

- (154)  Gakusei-ga sake_i-o sannin-de [_{VP} t_i nonde iru].
 student-NOM sake-ACC 3person-with drinking
 'Students are drinking sake with being three. = There are three students drinking sake.'

Note the structural similarity between the ungrammatical example (150) and the grammatical example (155). If the quantifier sannin-de somehow floated from the NP sannin-no gakusei, it is difficult to maintain Saito's claim that a quantifier cannot float across another NP. However, it is not clear whether -de attachment takes place after the floating of the quantifier, or sannin-de is generated differently from the floated quantifier sannin. If sannin-de is an adverbial phrase such as ofisu-de (at the office), resutoran-de (in the restaurant), etc., it will be natural

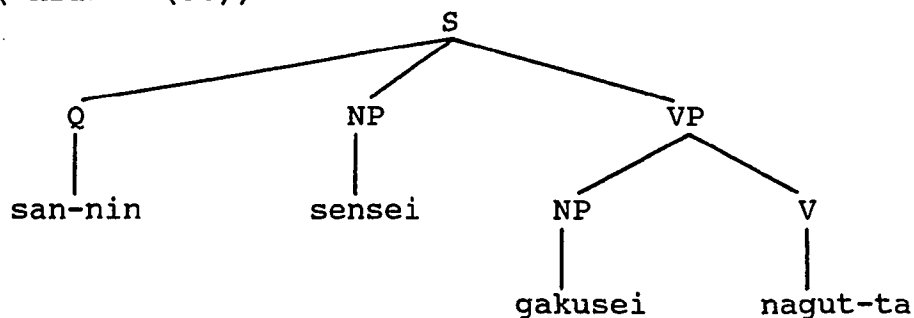
to assume that the behavior of the floated quantifier and an adverbial phrase is different.

Arai (1984) also uses "quantifier floating" for arguing for the configurationality of Japanese. However, her data do not coincide with Saito's. She claims that sannin in the following example can modify either sensei (teacher) or gakusei (student):

- (155) (=Arai's (5c))
 San-nin sensei-ga gakusei-o nagut-ta.
 3persons teacher-NOM student-ACC hit-PAST
 'The teacher hit three students.'
 'Three teachers hit a student.'

Arai claims that a quantifier must c-command an NP when it modifies that NP. Then, she proposes the following representation for (156):

- (156) (=Arai's (8c))



If the quantifier sannin floated from the NP sannin-no gakusei, this floating also violates Saito's constraint on quantifier floating, because this quantifier modifies its

target NP gakusei across another NP sensei.

However, the above example is a case of leftward floating, which may require a different generalization of the constraint. That is, it may be possible that rightward floating cannot cross another NP, but that leftward floating can cross another NP. For instance, consider the following examples:

- (157) a. Sono otoko-ga [sanbiki-no inu]-o korosita.
 that man-NOM three dog-ACC killed
 'That man killed three dogs.'
- b. Sono otoko-ga inu-o sanbiki korosita.
- c. Sanbiki sono otoko-ga inu-o korosita.

The quantifier sanbiki consists of the numeral san (three) and the classifier biki which is used only for animals but not for human beings. Thus, this quantifier cannot modify otoko (man), because the classifying specification is not satisfied. Thus, the constraints on quantifier floating apparently do not apply when there is no potential ambiguity. Therefore, it is natural, in (158c), to interpret the quantifier sanbiki as modifying the target NP inu (dog) and crossing over another NP otoko (man).

Further research into the complex phenomenon of quantifier floating seems to be necessary before we can be confident of the validity of Saito's third argument for configurationality.

4.3.5 Discussion

We have reviewed three hypotheses concerning the free word order phenomenon of Japanese. We are inclined to accept the third hypothesis that Japanese is configurational, but we acknowledge that this conclusion is not definitive at present. We will not go into further detail here. Our particular interest in the arguments about configurationality is the implication concerning the existence of trace. As long as this issue remains unresolved, it is impossible to know exactly what conclusions follow from our experimental findings concerning the validity of MRFS and LFO.

The experimental findings showed that the order of subject and object NPs did not affect which NP was taken to be the controller: the object NP was always preferred as controller. If Japanese is not configurational, the experimental findings disconfirm MRFS for these conclusions, because then MRFS predicts a preference for the linearly most recent lexical filler, and in Experiment 3 this was the subject NP, not the object NP. On the other hand, if Saito is right that Japanese is a configurational language, then the preferred controller in Experiment 3 was either the object trace, in contradiction of LFO, or the lexical object NP, in contradiction of MRFS.

Notice that our general conclusions follow regardless of which of these alternatives is true. In either case, the

FCR/CF explanation for their English results was not supported by the Japanese constructions tested. And this reduces the plausibility of the FCR/CF explanation of the English results relative to an explanation which presupposes universal parsing strategies (see Section 2.2.5). Most importantly, it is clear that whether Japanese has trace or not, there is no need, on current evidence, to adopt the non-transparency hypothesis which claims that the parser does not recognize trace as a possible filler. In the absence of evidence against it, it is appropriate to accept the transparency hypothesis since it represents the strongest claim about the relation between parser and grammar.

Footnotes to Chapter 4

1. The definition of "Governing Category" is as follows (Chomsky 1981, p.211, (70 II)):

- (i) Beta is a governing category for Alpha if and only if Beta is the minimal category containing Alpha, a governor of Alpha, and a SUBJECT accessible to Alpha.

Here, SUBJECT includes [NP,S], [NP,NP], and [+AGR].

2. Manzini (1983) also distinguishes two types of control structure. One of them contains PRO in an object clause as in (i) below. The constraint that PRO is bound in the matrix S applies to this type of control structure. In the other type of control structure, PRO is included in a subject clause. Manzini claims that PRO in this case (co)refers freely as can be seen in (ii).

(i) (=Manzini's (18))

*Mary_i said that John asked Bill [_s PRO_i to behave herself]].

(ii) (=Manzini's (28))

Mary knows that [PRO to behave herself in public] would help Bill.

3. Rizzi (1986) notes that "there is one case in which pro in subject position of a tensed clause does not function as a (referential or expletive) definite pronoun: in impersonal si sentences it is interpreted as arbitrary" (p.520).

(i) (=Rizzi's (42))

pro_{arb} si_{arb} dorme troppo.
'People sleep too much.'

However, Rizzi also notes that "arb interpretation is the exceptional case for pro in subject position" (p.520).

4. Rizzi uses the term "Null Subject" parameter instead of "Pro-drop" parameter, because there is nothing to be 'dropped'.

5. What Jaeggli and Safir cite here is a so-called "consonant stem verb". Japanese has another type of verb which is called a "vowel stem verb", because the stem ends with a vowel "e" (or "i") as is shown below:

tabe-r-u	eat-present
tabe-ta	eat-past
tabe-nai	eat-neg
tabe-r-eba	eat-conditional

tabe-y-oo	let's eat
tabe-tai	want to eat
tabe-r-are	was eat
tabe-s-ase	make eat

Note that some morphemes are attached to the stem directly, and others are preceded by another element such as "-r-", "-y-", "-s-". In either case, the above paradigm is uniform in the sense that all forms are inflected.

6. How government works in Japanese is a subject of debate. Here we tentatively assume, following Hasegawa (1984-5, p.328), that Nominative Case is assigned by INFL (Tense) under government.

7. Although the embedded sentence in this example is tenseless, this may not be an infinitival construction in the same sense of that in English. See Fiengo and Haruna (1987) for discussion of this issue.

8. So, Fiengo and Haruna should predict that there are no verbs in Japanese like English annoy or amuse. But this prediction seems to be wrong. Observe the following example:

- (i) Akanboo-ga yonaka-ni naite hahaoya-o komaraseta.
 baby-NOM midnight cry mother-ACC annoyed
 'lit. The baby annoyed her mother by crying at midnight.'

Here, the experiencer of 'annoying' is not the baby marked with the nominative but the mother marked with the accusative. However, it might be the case that the verb komaraseru has the same characteristic as causative. Then, (i) will be represented as follows:

- (ii) Akanboo-ga yonaka-ni naite [hahaoya-ga komaru]aseta.
 baby-NOM midnight cry mother-NOM annoy CAUS

If this analysis is correct, the claim that the semantic experiencer is found in the nominative will hold.

9. Historically speaking, the third person male pronoun kare (< ka (that) + re (thing)) has been used to indicate any unclear thing, object, place, time, or person that is not included in the domain of the speaker. The third person female pronoun kanozyo was coined about one hundred years ago to translate the third person female pronoun in European languages (e.g. she, elle, sie, etc.). This pronoun can be analyzed as ka (that) + no (particle) + zyo (woman). Very often, these pronouns are used as nouns meaning "boy friend" and "girl friend" respectively. They are used for ordinary

coreference rather rarely. See Sakamoto (1988) for more detailed discussion on "pronouns" in Japanese.

10. Note that the construction (64) is a causative which can be analyzed as follows (see also Footnote 8):

- (¹) kare-no koodoo-ga [_e [kare-ga shooziki de-aruru koto-o]
 he-GEN action-NOM he-NOM honest is fact-ACC
 nattokusuru]-aseru no-ni zyuubun da.
 understand -CAUS enough is
 'His actions are enough for _____ to understand that he
 is honest.'

If the causative is analyzed as represented above, there is no need to assume empty object. It could be enough to mention a simpler example such as below.

- (i) (=Fiengo and Haruna's (37))
 John-ga butta.
 hit
 'John hit ec.'

Here, the direct object of hit is assumed to be "ambiguous". See the discussions in what follows.

11. As mentioned before, there is no form "N of NP" in Japanese, but only "NP's N". Thus, there is a double -no construction as follows:

- (i)a. Taroo-ga Hanako-o hihan-sita.
 -NOM -ACC criticized
 'Taroo criticized Hanako.'
 b. Taroo-no Hanako-no hihan
 -GEN -GEN criticism
 'Taroo's criticism of Hanako'

The literal translation of (ib) would be "Taroo's Hanako's criticism".

12. See Fiengo (1977) for more detailed discussion of the theoretical foundations of this issue. A unitary account of the distribution of trace is now provided by the ECP (Empty Category Principle). Chomsky (1986, p.17) states that "A nonpronominal empty category must be properly governed", and "proper government" is defined as follows:

- (i) (=Chomsky's (30))
Beta is properly governed by Alpha if it is governed by Alpha and a certain kind of connection holds between Alpha and Beta.

See Kayne (1981), Chomsky (1986) for more detailed discussion of ECP.

13. However, there are some cases where "NP-ga" does not represent the grammatical subject. Consider the following cases:

- (i) When the genitive "-no" is changed to "-ga":
 Nihon ga dansei ga tanmei desu. (= Kuno's (17b), p.67)
 Japan male short-life-span are
 'It is Japan that men have a short life-span in.'

Kuno (1973) argues that the subject "Nihon-ga" is derived from the genitive form "Nihon-no" (Japan's) by applying the rule of Subjectivization: "Change the sentence-initial NP-no to NP-ga, and make it the new subject of the sentence" (p.71).

- (ii) When an object is marked with "-ga":
 Dare ga kore ga dekiru ka? (= Kuno's (23a), p.88)
 who this can
 'Who can do this?'

Here, the object kore is marked with ga. There are some verbals that take ga for object marking, such as dekiru (to be able to), wakaru (to understand), hosii (to want), kirai (to dislike), etc. See Kuno (p.90-91) for a more or less exhaustive list of this kind of verbals.

14. Shibatani (1990) gives one of the examples of basic word order as follows:

- (i) (=Shibatani's (1a), p.257)
 Taroo ga Hanako ni hon o yatta
 NOM DAT book ACC gave
 'Taroo gave a book to Hanako.'

15. A pronoun tends to be avoided in some contexts. In the sentence "John would prefer [his going to the movie]", Chomsky (1981) claims that there is a strong preference for taking the pronoun his to be someone other than John, although his is not in a disjoint reference position. Chomsky therefore proposes the "Avoid Pronoun" principle. This "might be regarded as a subcase of a conversational principle of not saying more than is required, or might be related to a principle of deletion-up-to-recoverability, but there is some reason to believe that it functions as a principle of grammar" (p.65).

16. See Sakamoto (1990) for the characteristics of classifiers in Japanese.

CHAPTER 5

Conclusions and Directions for Future Research

5.1 Conclusions

The fundamental concern in this dissertation has been how we can defend the "transparency" hypothesis from the attack of the "non-transparency" hypothesis. The idea of the "Most Recent Filler" strategy (MRFS) is deeply related to our concern, since it presupposes two untested hypotheses which assume a non-transparent parser: (i) Control information is delayed in application (ii) A trace is not considered as a possible filler (i.e. the Lexical Filler Only hypothesis, or LFO). These hypotheses have to be examined separately. The merit of experiments using a head-final language such as Japanese is that we can separate (i) from (ii), since control information is necessarily delayed in a verb-final language.

Now, let us reconsider our experimental findings. The results of Experiments 1 and 2, in which experimental sentences have Subject-Object order, showed that O-control sentences were easier to process than S-control sentences.

The object NPs in these two experiments were also the most recent fillers. Thus, the results of these experiments are compatible with the hypothesis that MRFS applies to Japanese control structures. However, the result of Experiment 3 with Object-Subject order revealed that not the most recent lexical filler but the object NP was preferred as a controller, even when it was the distant lexical filler. This is not compatible with MRFS for Japanese except in conjunction with the claim that the parser recognizes empty categories as possible fillers.

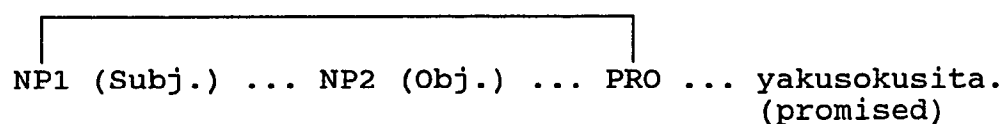
Thus, either (i) the parser knows that empty categories can be fillers, in which case MRFS could be correct, and LFO is wrong; or (ii) the parser does not know that empty categories can be fillers, in which case MRFS is wrong, and LFO could be correct. Therefore, MRFS can be correct for Japanese only if empty categories can be fillers. However, MRFS is supported for English, as part of the FCR/CF explanation for their data, only if empty categories cannot be fillers. Therefore, the experimental findings at least suggest that MRFS in its original form cannot account for the cases in English and the cases in Japanese in a unified fashion. At best, then, MRFS and LFO are special purpose strategies for English; at worst, they are not true at all.

Now, let us compare the findings for Japanese and for English in more detail, to see if we can explain the difference in preference between them. Our experimental

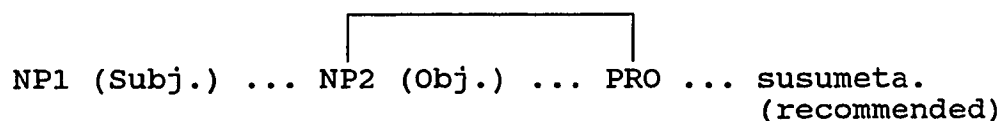
findings revealed that the parser prefers an object controller in Japanese regardless of its surface position. For convenience, the structure of the experimental materials is shown in (1) and (2) below (solid line = Control Relation, dotted line = Movement).

(1) **Subject - Object word order**

a. Subject control

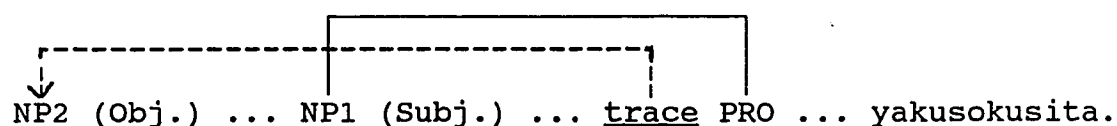


b. Object control

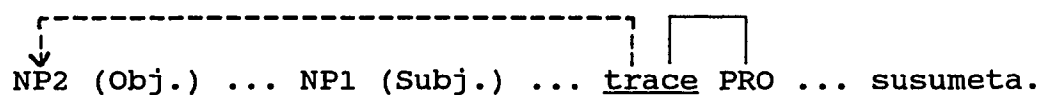


(2) **Subject - Object word order**

a. Subject control



b. Object control



The results can be summarized as follows (Here, "<" means "easier than".):

Table 1: Comparison of S-control and O-control

S-O order (1)	S-cont. (a) < O-cont. (b)
O-S order (2)	S-cont. (a) < O-cont. (b)

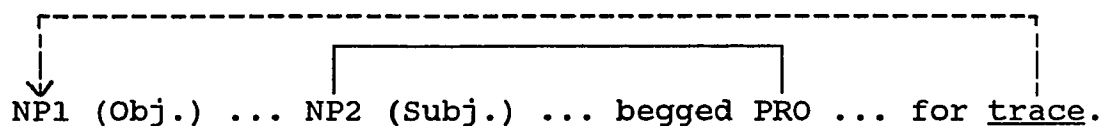
Table 2: Comparison of S-O order and O-S order

S-cont. (a)	S-O order (1) < O-S order (2)
O-cont. (b)	S-O order (1) < O-S order (2)

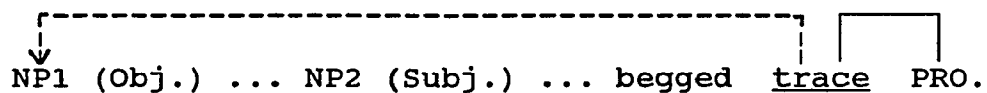
On the other hand, in English, according to FCR/CF, the preference is for subject control (when the object is an empty category, otherwise for object control). The structure of the English examples is as follows:

(3) **Ambiguous main clause verb**

a. Subject control

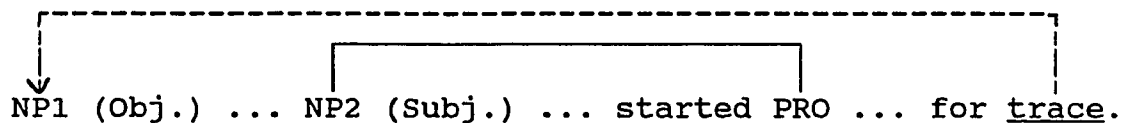


b. Object control



(4) **Unambiguous main clause verb**

a. Subject control



b. Object control

NP1 (Obj.) ... NP2 (Subj.) ... forced trace PRO.

The FCR/CF results for English can be summarized as follows (Here, "<" means "easier than", and "=" means "equal".):

Table 3: Comparison of RF and DF sentences

Ambiguous (3)	RF (a) < DF (b)
Unambiguous (4)	RF (a) < DF (b)

Table 4: Comparison of Ambiguous and Unambiguous verbs

RF (a)	Ambiguous (3) = Unambiguous (4)
DF (b)	Ambiguous (3) = Unambiguous (4)

In order to understand these findings, we may note that much of the variation in difficulty can be attributed merely to the extra complexity of a construction with two adjacent gaps over a construction in which there is only one gap at the critical position. This is the factor emphasized by Crain and Fodor. The comparison of one gap versus two gaps in Japanese is the comparison of S-O order versus O-S order, and the comparison of one gap versus two gaps in English is the comparison of RF versus DF sentences. In both languages, the two gap construction is more difficult than the one gap construction.

Now, what remains to be explained is the difference between (2b) and (4b). In both, there is a sequence of trace immediately followed by PRO. But, (2b) is easy relative to (2a), while (4b) is difficult relative to (4a). It appears, then, that in Japanese an empty object controller (trace) is preferred over an overt subject controller, while in English an empty object controller (trace) is less preferred than an overt subject controller. Now, why should this be so? Some possible answers are as follows:

(I) It could be the case that for English, unlike Japanese, control information is available on-line, i.e. it is false that control information is significantly delayed after the verb has been encountered. That is, it can be assumed that the cause of the different processing results is just the difference between the unavailability of control information in Japanese and the availability of it in English, at the point where PRO is recognized as present. In that case, the FCR/CF experiments were not picking up a controller-preference strategy at all. The differences in difficulty that they observed could be attributed instead to processing load at the double gap position, as claimed by Crain and Fodor. It would still be the case that MRFS applies in ambiguous control constructions. It would apply in (3) above, and in all examples in Japanese. The general

assumption here is that strategies apply only when the grammar does not disambiguate the input.

However, this still leaves to be explained an apparent difference between Japanese where MRFS does recognize empty categories, and English where it does not, i.e. LFO applies in English but not in Japanese. This assumption would seem to be necessary to explain the subject preference in ambiguous English examples, versus the object preference in ambiguous Japanese examples. In fact, however, it is not necessary to make this assumption. It can be assumed that LFO is universally false, i.e. that MRFS does recognize empty category fillers in both languages. The preference in English can be seen as a preference for the simpler subcategorization of the ambiguous verb. As shown in (3) above, the subject control sentence has only a subject in addition to the complement clause, while the object control sentence has both a subject and an object in addition to the complement clause. In other words, this is not a preference concerning control, but merely a preference concerning argument structure.

(II) Another possible way of reconciling the Japanese and English facts would be to assume that there is a universal preference for object control. What differs between the two languages would be the difficulty of filling a trace-gap. Suppose this is difficult in English but easy

in Japanese. In that case the English object control sentences would be difficult despite a preference for object control, because of the trace that precedes the PRO. But Japanese object control sentences would be easy, because object control is preferred for PRO and there is no great difficulty in processing the preceding trace. That is, even assuming that scrambling in Japanese leaves a trace, it might be easier to fill this scrambling-trace than to fill the WH-trace tested in FCR/CF English experiments. Now, why might it be so?

There are two possibilities. It might be that the case marking on the fronted object in Japanese allows the processor to assign a thematic role to the NP without needing to find its gap, while in English a thematic role can be assigned only on the basis of the gap position. Or possibly, the Japanese processor treats the scrambling as a simple permutation of two adjacent constituents, providing two alternative word orders (even if the grammar treats it as Move-Alpha leaving trace). For either of these reasons, scrambling in Japanese could be significantly less trouble to the parser than WH-movement in English. (Of course, a more extreme version of this proposal is that Saito is wrong and there is no trace created by Scrambling in Japanese. See Section 4.3 for discussion of this possibility.)

(III) Let us continue to assume a universal preference for object control. As in explanation II, the difference between English and Japanese would concern the cost of the double gap construction. Unlike II, the present suggestion is that the difficulty (as proposed by Crain and Fodor) occurs when the second gap needs as its filler the first gap, which is itself still being processed. Note that in Japanese, as indicated by sentence completion experiments reported in Section 3.7.6, the processor cannot be sure that PRO is present until it has processed the case-marker following the verb that itself follows the PRO. Thus, although the PRO appears structurally adjacent to the trace, in terms of the temporal parameters of processing, it is recognized by the parser at some distance after the trace is recognized. Hence the time pressure of filling two gaps at once in English does not occur in Japanese.

(IV) Another possibility for reconciling the results might be to adopt the explanation of control in terms of thematic relations. As noted in Section 3.8, Nishigauchi claims that Goal is preferred as the controller. Suppose this is a universal preference. However, the languages differ with respect to how clearly marked the Goal NP is. In Japanese, the Goal is clearly marked with the dative case-marker -ni. In English, it may be marked with preposition to (as in 'John gave the book to Mary') or not

at all (as in 'John gave Mary the book')

In the experimental sentences for English, there was no explicit dative marker. Explicit marking may facilitate the interpretation with the Goal as controller. To complete this explanation it must be assumed, as above, that the double gap processing carries some cost. In Japanese this would be offset by the Goal controller preference, but in English it would not, and subject controller would be preferred.

In conclusion: the data presented in this dissertation cannot allow us at present to choose among these (and perhaps other) various alternative explanations. However, they all appear to have some considerable plausibility. And, with one small exception, they are all compatible with transparency between the parser and the mental grammar. The only exception is the possibility that where the grammar dictates Move-Alpha leaving trace, the parser opts for a simpler process of permutation. Otherwise, however, these accounts all differ from that of FCR/CF in being consistent with transparency.

5.2. Future Research

Here, let us consider some possible moves for future research.

(I) As a technical matter, it will be necessary to use a technique such as the cross modal priming technique (Swinney et al., 1979) to test "on-line" processing (see Section 2.2.4). We need to develop both hardware and software to adopt this technique for Japanese sentences (Japanese computers are not compatible with IBM computers mostly used in U.S.A.). Our experimental sentences should probably be changed to contain common nouns instead of proper names as the subject and the object, since the priming results obtained for English have been with common nouns. And also three kinds of probe words are necessary. Consider the following example ($Adv_1 - Adv_4 =$ Adverbs, [1] - [5] are probe points):

- (5) Shichyoo-no ie-de Adv_1 bengoshi-ni Adv_2 isya-ga Adv_3
 mayor-GEN house-at lawyer-DAT doctor-NOM
 [1] Yooroppa-no chiisana kuni-e iku [2] koto-o
 Europe-GEN small country-LOC go fact-ACC
 [3] Adv_4 [4] VERB [5]

'At the mayor's house, to the lawyer VERB the doctor that [e] goes to a small country in Europe.'

Here, VERB stands for one of subject and object control verbs. The probe word for bengoshi (the lawyer) could be saiban (trial), that for isyaa (the doctor) could be byooin

(hospital), and the control word could be any word (e.g. shinbun (newspaper)) matched in length and frequency to these probe words. Note that there is also an explicit third party other than the subject and the object: shichyoo (mayor). Our prediction is that the probe word for bengoshi (lawyer) would be responded faster than the probe word for isya (doctor) or the control word at the point [3], since the results of the sentence completion experiments (see Section 3.7.6) suggest that subjects are aware of the existence of the empty subject by this point, and bengoshi (lawyer) would be an object controller. Or, the object preference effect may appear only later at point [4]. The interesting point is [5]. If the verb is an object control verb, the object controller reactivation will continue. If the main clause verb is a subject control verb, we may expect that the subject controller may be reactivated, though probably this effect will be slow and the object controller reactivation may continue for some time. Of course, the above expectation may not be satisfied, since Nicol's study for English showed that the reactivation of PRO is slow and inaccurate (see Section 2.2.4).

(II) As for experimental sentences, it may be necessary to examine a clearer case of control in Japanese. Fiengo and Kim (1981) suggested that an imperative construction in Korean shows clear object control. Consider the following

examples:

- (6) (=Fiengo and Kim's (33))
 [John-ka_i Mary-eke_j [e_{i/j} Fred-l_il salanghantako]
 -NOM -DAT -ACC love-IND
 malhaassta].
 told
 'John told Mary that love (Indicative) Fred.'
- (7) (=Fiengo and Kim's (34))
 [John-ka_i Mary-eke_j [e_{*i/j} Fred-l_il salanghalako]
 -NOM -DAT -ACC love-IMP
 malhaassta].
 told
 'John told Mary that love (Imperative) Fred.'

Fiengo and Kim claim that the interpretation of the empty subject is ambiguous¹ (whether the subject John or the object Mary) when the subordinate verb is indicative (as in (6)) and is uniquely determined as coreferential with the object Mary when the subordinate verb is imperative (as in (7)). From this observation, they assume that "Control Theory applies to e and the subject of imperatives" (p.16). Here, Fiengo and Kim do not mention the possibility of the third party interpretation. So, it is not clear whether (6) is three way ambiguous or not. However, the point is not whether this sentence is two way ambiguous or three way ambiguous, but that it is ambiguous.

The above discussion seems to be applicable to Japanese. Consider the following examples:

- (8)a. Ano otoko-no isya_i-ga kono zyosei_j-ni [PRO_{?i/j/k}
 that male doctor-NOM this woman-DAT
 ninsin si-teiru] to itta.
 pregnant be-IND COMP said
 'lit. That male doctor said to this woman that (she) is
 pregnant.'
- b. Kono zyosei_i-ga kanozyo-no otto_j-ni [PRO_{i/?j/k}
 this woman-NOM she-GEN husband-DAT
 ninsin si-teiru] to itta.
 pregnant be-IND COMP said
 'lit. This woman said to her husband that (she) is
 pregnant.'
- (9)a. Ano otoko-no isya_i-ga kono zyosei_j-ni [PRO_{?i/j/?k}
 that male doctor-NOM this woman-DAT
 ninsin si-nasai] to itta.
 pregnant be-IMP COMP said
 'lit. That doctor said to this woman that (she) must be
 pregnant.'
- b. Kono zyosei_i-ga kanozyo-no otto_j-ni [PRO_{*i/?j/?k}
 this woman-NOM she-GEN husband-DAT
 ninsin si-nasai] to itta.
 pregnant be-IMP COMP said
 'lit. This woman said to her husband that (he) must be
 pregnant.'

When the embedded verb is non-imperative as in (8), either the main clause subject or the main clause object (or possibly a third party that is discursively identifiable) can be the antecedent of the empty subject (although one or other will be usually preferred according to their relative plausibility in that environment, cf. Fiengo and Haruna (1987)). On the other hand, if the embedded verb is imperative, the main clause object can be the antecedent of the empty subject as in (9a), but the main clause subject cannot be the antecedent as in (9b). Since it is biologically impossible for otto (husband) to be pregnant,

the obligatory PRO=j interpretation of (9b) is semantically odd. The third party interpretation in imperative sentences seems to be less plausible than that in indicative sentences, probably because an imperative focuses on the addressee so that the third party possibility becomes less natural.

A pilot study to examine how consistent the interpretation of the empty subject is in an imperative sentence has been done. The results seem to support the suggestion above. Therefore, it will be advantageous to use imperative embedded verbs for future research.

Unfortunately it is not so clear that there is any fully unambiguous example of subject control (when an object is present). However, if we use a technique like cross modal priming, we can examine on-line processing. Thus, it would not be necessary to investigate so-called subject control cases. If we can detect a significant reactivation of an object controller at a crucial point (between the clause boundary and the main verb) in both Subject-Object order and Object-Subject order, it would suggest that there is no recency strategy such as MRFS.

(III) If we continue to use subject control and object control sentences as in our experiments reported above, we would refine the follow-up test for antecedent selection (Sections 3.7.4 and 3.7.5), and could choose verbs that

exhibit clear subject or object antecedent selection. The instructions given in the previous tests could be confusing. They do not clearly express the difference between who the embedded clause is about, and whether he or she actually performs the action (going to Tokyo). For example, even if John promises to go to Tokyo, he might not actually go. Also the instructions do not clearly distinguish between what the sentence says, and who might (on quite independent grounds) be in Tokyo. Furthermore, this instruction tends to encourage subjects to consider various mixed interpretations by saying 'if it is also possible that ...'. Therefore, we devised a new instruction and did a pilot study (The number of subjects so far is only five.). The instructions and the results are shown below (see also Footnote 17 in Chapter 3).

Questionnaire: Please read the question twice and fully understand its meaning, and then start answering.

question

In the following sentences (from 1 to 56), there appear three pairs of people: "Tosio" and "Junko", "Jiroo" and "Kazumi", and "Kooiti" and "Tamae". And, these sentences are about 'someone's going to Tokyo'.

Then, please read the following sentences and mark one of the six points (point 5 to 0) according to how natural the sentence can be understood as being about "who's going to Tokyo". For example, let us consider the following example:

(Example) Junko-ni Tosio-ga ototoi
 -DAT -NOM the day before yesterday
 Tookyoo iki-o odayakani syoodakusita
 going-ACC quietly consented
 'To Junko, the day before yesterday, Tosio quietly
 consented going to Tokyo.'

Junko	5	4	3	2	1	0
Tosio	5	4	3	2	1	0
Sonota (someone else)	5	4	3	2	1	0

You may think that this sentence is about Junko going to Tokyo. Or, you may think it is about Tosio going to Tokyo, or about someone else going. Keep in mind that the person might not actually get to Tokyo (for example, s/he might miss the train, or change her/his plans). Also, of course somebody else might feel like accompanying the person that goes. But please ignore this possibility.

What we are interested in is: The sentence talks about someone going to Tokyo. Who is someone?

- (i) If someone is definitely Junko, mark 5 on the scale next to Junko's name.
- (ii) If someone is definitely not Junko, mark 0 on the scale next to Junko's name.
- (iii) Use points between 5 and 0 if it is not completely clear.
- (iv) Do this for every person listed under the sentence.

Results

The same materials as Script 2 in Experiment 3
(24 experimental sentences)

Mean of Rating Score for Object-Subject order

(I) Subject-NP vs. Object-NP comparison

Interpretation	Sentence Type	
	S-control	O-control
Subject-NP	4.5	0.7
Object-NP	1.5	4.7
Difference	3.0	-4.0

(II) Subject-NP vs. Third Party comparison

Interpretation	Sentence Type	
	S-control	O-control
Subject-NP	4.5	0.7
Third Party	0.8	0.5
Difference	3.7	0.2

(III) Object-NP vs. Third Party comparison

Interpretation	Sentence Type	
	S-control	O-control
Object-NP	1.5	4.7
Third Party	0.8	0.5
Difference	0.7	4.2

Since the number of subjects is small (five), we cannot get a decisive conclusion. But the portion of 'third party' and nonpreferred interpretation seems to be much reduced with this new version of instruction. Thus, this preliminary study suggests that there is much less ambiguity in these sentences than the previous questionnaire had suggested. This is relevant to both experimental and theoretical aspects of the issue. So it will be advisable to consider using the new instructions in future experiments.

(IV) If it is still not clear whether the interpretation (subject control or object control) is due to

a true control relation, or just to semantic/pragmatic factors, we can examine the interpretation of overt pronouns. If both the empty subject and the overt pronoun exhibit the same interpretation, then, it seems reasonable to conclude that not control but semantic/pragmatic factors are relevant to antecedent selection. This might also support the arguments for pro over PRO.

In English, examples such as 'John promised/persuaded Bill that he would/should go to Tokyo' can be examined, although no previous study of pronouns with control-type verbs has been done (as far as I know). The problem, however, is that the choice of the modal verb would need to be controlled since it appears to affect the interpretation of the pronoun.

In Japanese, it is controversial whether so-called pronouns such as kare (he) and kanozzyo (she) are really pronominal as in English (see Fiengo and Haruna in Section 4.2.3). However, it might still be possible to employ them as pronouns at least with some speakers, especially younger generation, who seem to use them as pronouns regardless of their historical origin (perhaps they were deictic, and still used as deictic as well as pronominal; see also Saito in Section 4.3). If the interpretation for the overt pronouns is the same as that for empty subjects, then, Hoji's claim that Japanese 'zero pronouns' are empty counterparts of overt pronouns would be supported. We could

also examine the interpretation for the reflexive anaphor zibun. If the interpretation for zibun is the same as that for empty subjects, then, the claim that Japanese empty subject is parallel with the reflexive anaphor could be confirmed (This is what Whitman and Fiengo and Haruna claim).

(V) Another way to examine control relations is to test the grammaticality of the relevant sentence. In English, a sentence like '*John persuaded Mary to wash himself' is ungrammatical, showing clearly that Mary cannot be the controller of PRO. Since Japanese does not distinguish gender, number, person, etc., it is impossible to use the same kind of sentence as the English one mentioned above. However, it would be possible to see whether semantic factors reveal the interpretation of empty subject. One possible construction is mentioned in (II) above: to use 'male - female' distinction. Observe the following example:

- (10) Otto_i-ga tsumaj-ni [PRO_{??i/*j/k} ninsin suru]
 husband-DAT wife-DAT pregnant be
 koto-o yakusokusita.
 fact-ACC promised
 'lit. ??The husband promised the fact that PRO would
 be pregnant.'

If the above sentence is semantically odd, it will show that there is a control relation between the subject otto (husband) and the empty subject, and this relation conflicts

with the semantic notion of pregnancy: a husband is (usually) a male, and a male person cannot be pregnant. Another possible construction to test control relation from a semantic viewpoint is to use a 'collective - noncollective' distinction. Consider the following example:

- (11) Hitorino keikan_i-ga gunsyuu_j-ni [e_{*i/j} kaisansuru]
 one police-NOM crowd-DAT disperse
 koto-o yookyuusita.
 fact-ACC required
 'One police officer required the crowd to disperse.'
- (12) Hitorino keikan_i-ga gunsyuu_j-ni [e_{??i/*j} kaisansuru]
 one police-NOM crowd-DAT disperse
 koto-o yakusokusita.
 fact-ACC promised
 '??One police officer promised the crowd to disperse.'

It is semantically natural that the crowd (collective noun) disperse, while it is odd to suggest that one police officer (noncollective noun) could disperse. Since (11) is natural and (12) is odd, this supports the intuition that there is object control in (11) and subject control in (12).

Appendix A: Consistency Score for verbs in the pre-test**Group A - Potential S-control verbs tested in the pre-test**
(*=verbs used in the subsequent pilot study)

Verbs	Consistency Score (%)
1. aimainisiteita (make vague)	100
2. *ayamatta (apologize, beg)	100
3. *benkaisita (explain, excuse)	100
4. damatteita (keep silent)	90
5. *dangensita (declare, assert)	100
6. enryosita (be reserved)	80
7. *hakuzyoosita (confess)	100
8. *hanasita (tell)	100
9. happyoosita (announce)	90
10. himitunisiteita (keep secret)	80
11. hiteisita (deny)	80
12. *honomekasita (hint, suggest)	100
13. *hookokusita (report)	100
14. hosyoosita (guarantee)	60
15. *ibatta (be arrogant)	100
16. iihatta (insist, persist)	80
17. *iisibutta (hesitate to say)	100
18. *kakusiteita (keep secret)	100
19. *kokuhakusita (confess)	100
20. *koogensita (declare, profess)	100
21. koohyoosita (announce officially)	90
22. kotowatta (refuse)	70
23. kyozetusita (refuse, reject)	60
24. *meigensita (declare)	100
25. *moosideta (offer, propose)	100
26. naratta (learn)	70
27. *sengensita (declare)	100
28. *siraseta (inform)	100
29. *soodansita (consult)	100
30. *syabetta (talk)	100
31. syoodakusita (consent, agree)	60
32. *tikatta (swear)	100
33. *tutaeta (report)	100
34. ukeatta (guarantee)	70
35. ukeotta (contract)	70
36. *utiaketa (disclose)	100
37. utikesita (deny)	80
38. wabita (apologize)	100
39. *yakusokusita (promise)	100
40. *zimansita (boast, be proud)	100

MEAN	90.8

Group B - Potential O-control verbs tested in the pre-test
 (*=verbs used in the subsequent pilot study)

Verbs	Consistency Score(%)
1. aigansita (implore, entreat)	90
2. *hantaisita (oppose)	100
3. iituketa (tell, order)	90
4. *ininsita (leave, entrust)	100
5. *iraisita (request)	100
6. *itakusita (entrust)	100
7. kankokusita (advise)	80
8. *kinsisita (prohibit, forbid)	100
9. kinzita (prohibit, forbid)	100
10. *kitaisita (expect)	100
11. *kyokasita (permit)	100
12. *kyooseisita (compel, force)	100
13. kyoyoosita (demand)	90
14. makaseta (leave, entrust)	100
15. *meireisita (order)	100
16. meizita (order)	100
17. mitometa (admit)	100
18. motometa (want, ask)	100
19. negatta (wish, ask, request)	100
20. *nozonda (wish)	100
21. osiekonda (inculcate)	80
22. *osituketa (force, thrust)	100
23. *saisokusita (urge)	100
24. *sasizusita (direct, instruct, order)	100
25. *seikyuusita (demand, request)	100
26. sekasita (expedite, hurry, rush)	100
27. *sizisita (indicate, instruct)	100
28. *sosonokasita (seduce, instigate)	100
29. *susumeta (recommend)	100
30. *syooninsita (admit, approve)	100
31. *syooreisita (encourage)	100
32. *syootisita (agree)	100
33. takusita (entrust)	100
34. *tanonda (ask)	100
35. tasinameta (reprove, warn)	80
36. tyuukokusita (advice)	100
37. unagasita (urge)	100
38. yooboosita (demand)	90
39. *yookyuusita (demand)	100
40. *yurusita (forgive)	100

MEAN	97.5

Appendix B: List of sentences for the pilot study
 (The number of each sentence represents the order of presentation.)

Sentences with S-control verbs

1. Taroo-ga kinoo-no yuugata Hanako-ni Tokyo-e iku koto-o zimansita.
3. Hanako-ga kinoo-no yuugata Taroo-ni Tokyo-e iku koto-o ibatta.
6. Taroo-ga kinoo-no yuugata Hanako-ni Tokyo-e iku koto-o soodansita.
7. Taroo-ga kinoo-no yuugata Hanako-ni Tokyo-e iku koto-o tutaeta.
9. Hanako-ga kinoo-no yuugata Taroo-ni Tokyo-e iku koto-o utiaketa.
12. Hanako-ga kinoo-no yuugata Taroo-ni Tokyo-e iku koto-o iisibutta.
16. Hanako-ga kinoo-no yuugata Taroo-ni Tokyo-e iku koto-o kakusiteita.
17. Hanako-ga kinoo-no yuugata Taroo-ni Tokyo-e iku koto-o ayamatta.
18. Taroo-ga kinoo-no yuugata Hanako-ni Tokyo-e iku koto-o hakuzyoosita.
21. Hanako-ga kinoo-no yuugata Taroo-ni Tokyo-e iku koto-o moosideta.
22. Taroo-ga kinoo-no yuugata Hanako-ni Tokyo-e iku koto-o sengensita.
24. Hanako-ga kinoo-no yuugata Taroo-ni Tokyo-e iku koto-o syabetta.
25. Taroo-ga kinoo-no yuugata Hanako-ni Tokyo-e iku koto-o siraseta.
26. Taroo-ga kinoo-no yuugata Hanako-ni Tokyo-e iku koto-o yakusokusita.
28. Hanako-ga kinoo-no yuugata Taroo-ni Tokyo-e iku koto-o kokuhakusita.

30. Taroo-ga kinoo-no yuugata Hanako-ni Tokyo-e iku koto-o koogensita.
33. Hanako-ga kinoo-no yuugata Taroo-ni Tokyo-e iku koto-o meigensita.
37. Hanako-ga kinoo-no yuugata Taroo-ni Tokyo-e iku koto-o tikatta.
40. Hanako-ga kinoo-no yuugata Taroo-ni Tokyo-e iku koto-o honomekasita.
41. Taroo-ga kinoo-no yuugata Hanako-ni Tokyo-e iku koto-o hookokusita.
43. Taroo-ga kinoo-no yuugata Hanako-ni Tokyo-e iku koto-o benkaisita.
44. Taroo-ga kinoo-no yuugata Hanako-ni Tokyo-e iku koto-o dangensita.
46. Hanako-ga kinoo-no yuugata Taroo-ni Tokyo-e iku koto-o hanasita.

Sentences with O-control verbs

2. Taroo-ga kinoo-no yuugata Hanako-ni Tokyo-e iku koto-o sasizusita.
4. Taroo-ga kinoo-no yuugata Hanako-ni Tokyo-e iku koto-o osituketa.
5. Taroo-ga kinoo-no yuugata Hanako-ni Tokyo-e iku koto-o seikyuusita.
8. Hanako-ga kinoo-no yuugata Taroo-ni Tokyo-e iku koto-o kitaisita.
10. Taroo-ga kinoo-no yuugata Hanako-ni Tokyo-e iku koto-o sosenokasita.
11. Hanako-ga kinoo-no yuugata Taroo-ni Tokyo-e iku koto-o syootisita.
13. Hanako-ga kinoo-no yuugata Taroo-ni Tokyo-e iku koto-o iraisita.
14. Taroo-ga kinoo-no yuugata Hanako-ni Tokyo-e iku koto-o kyokasita.

15. Taroo-ga kinoo-no yuugata Hanako-ni Tokyo-e iku koto-o sizisita.
19. Hanako-ga kinoo-no yuugata Taroo-ni Tokyo-e iku koto-o saisokusita.
20. Hanako-ga kinoo-no yuugata Taroo-ni Tokyo-e iku koto-o nozonda.
23. Hanako-ga kinoo-no yuugata Taroo-ni Tokyo-e iku koto-o susumeta.
27. Taroo-ga kinoo-no yuugata Hanako-ni Tokyo-e iku koto-o kinsisita.
29. Hanako-ga kinoo-no yuugata Taroo-ni Tokyo-e iku koto-o yurusita.
31. Taroo-ga kinoo-no yuugata Hanako-ni Tokyo-e iku koto-o yookyuusita.
32. Hanako-ga kinoo-no yuugata Taroo-ni Tokyo-e iku koto-o tanonda.
34. Taroo-ga kinoo-no yuugata Hanako-ni Tokyo-e iku koto-o hantaisita.
35. Taroo-ga kinoo-no yuugata Hanako-ni Tokyo-e iku koto-o syooreisita.
36. Hanako-ga kinoo-no yuugata Taroo-ni Tokyo-e iku koto-o syooninsita.
38. Taroo-ga kinoo-no yuugata Hanako-ni Tokyo-e iku koto-o kyooseisita.
39. Hanako-ga kinoo-no yuugata Taroo-ni Tokyo-e iku koto-o meireisita.
42. Hanako-ga kinoo-no yuugata Taroo-ni Tokyo-e iku koto-o ininsita.
45. Taroo-ga kinoo-no yuugata Hanako-ni Tokyo-e iku koto-o itakusita.

Appendix C: Results of Pilot Study

(The numbering indicates the order of presentation.)

S-control

Verbs	RT(msec)	CS(%)	STD
01. zimansita (boast)	290	100	87
03. ibatta (be arrogant)	588	90	504
06. soodansita (consult)	316	100	110
07. tutaeta (report)	671	100	247
09. utiaketa (disclose)	335	90	213
12. iisibutta (hesitate to say)	464	50	396
16. kakusiteita (keep secret)	422	100	126
17. ayamatta (apologize)	561	100	335
18. hakuzyoosita (confess)	410	100	207
21. moosideta (offer)	653	90	306
22. sengensita (declare)	330	100	259
24. syabetta (talk)	391	100	98
25. siraseta (inform)	258	80	122
26. yakusokusita (promise)	422	90	225
28. kokuhakusita (confess)	345	90	123
30. koogensita (declare)	401	90	170
33. meigensita (declare)	552	100	268
37. tikatta (swear)	465	90	242
40. honomekasita (hint)	352	100	402
41. hookokusita (report)	440	100	238
43. benkaisita (excuse)	391	100	228
44. dangensita (declare)	294	100	132
46. hanasita (tell)	703	100	176

MEAN	439	94	227

O-control

Verbs	RT(msec)	CS (%)	STD
02. sasizusita (instruct)	401	100	282
04. osituketa (force)	451	100	201
05. seikyuusita (demand)	398	100	187
08. kitaisita (expect)	751	80	431
10. sasonokasita (seduce)	640	70	305
11. syootisita (agree)	489	50	77
13. iraisita (request)	600	90	424
14. kyokasita (permit)	611	80	434
15. sizisita (instruct)	477	70	185
19. kinsisita (prohibit)	626	60	618
20. nozonda (wish)	481	80	300
23. susumeta (recommend)	549	100	278
27. saisokusita (urge)	639	100	486
29. yurusita (forgive)	365	90	237
31. yookyuusita (demand)	312	100	72
32. tanonda (ask)	414	100	134
34. hantaisita (oppose)	684	70	185
35. syooreisita (encourage)	539	100	467
36. syooninsita (approve)	382	80	166
38. kyooseisita (compel)	490	100	224
39. meireisita (order)	585	90	497
42. ininsita (entrust)	413	90	281
45. itakusita (entrust)	433	100	216

MEAN	509	87	291

Appendix D: The total number of appearances of each verb and adverb in one script of 24 sentences

- (A) SC verb: 6 different verbs (in matrix sentence)
 (B) OC verb: 6 different verbs (in matrix sentence)
 (C) Other Verbs:
- (i) iku, ryokoosuru:
 three times in SC (in embedded clause)
 three times in OC (in embedded clause)
 - (ii) ryokoosuru, syuppatusuru, dekakeru:
 twice in SF1 (one gerundive and one past form,
 both are main verbs)
 - (iii) iku, syuppatusuru, dekakeru:
 once in SF2 (past form, in matrix sentence)
 once in OF2 (causative form, in matrix sentence)
 - (iv) yorokobasu, komaraseru, okoraseru
 once in SF2
 - (v) okurikonda, hakensita, tukainidasita:
 once in OF1 (in purpose clause)
- (D) Time Adverbials:
- kinoo, ototoi, sensyuu: 4 times each
 once in SC (between NP1 and NP2)
 once in OC (between NP1 and NP2)
 once in SF2 (after purpose clause)
 once in OF2 (between NP1 and NP2)
- (E) Instrumental Adverbials:
- (i) basu-de, kisya-de, hikooki-de: 4 times each
 twice in SF1 (after NP1, and after NP2)
 once in OF1 (after NP2)
 once in OF2 (after NP2)
 - (ii) denwa-de, denpoo-de, tegami-de: twice each
 once in SC (before SC verb)
 once in OC (before OC verb)
- (F) Locative Adverbials:
- (i) kissaten-de, ofisu-de, kaisya-de: twice each
 once in SC (between NP1 and NP2)
 once in OC (between NP1 and NP2)
 - (ii) Kyoto, Oosaka, Nagoya: twice each
 once in SF1 (with "-e", before the last verb)
 once in OF1 (with "-kara", between NP1 and NP2)
- (G) Manner Adverbials:
- (i) hakkirito, seisikini, wazato: twice each
 once in SC (before SC verb)
 once in OC (before OC verb)
 - (ii) kokorokara, nantokasite, muriyari:
 once each in SF2 (between NP1 and NP2)

Appendix E: Sentences for Experiment 1Practice:

- (1) OC Jiroo-ga ototoi Kazumi-ni Tookyoo-e
iku koto-o denwa-de aigansita.
- (2) SF Kooiti-ga hikooki-de Tookyoo-e syuppatusi,
Tamae-wa basu-de Oosaka-e syuppatusita.
- (3) SC Tosio-ga kissaten-de Junko-ni Tookyoo-e
ryokoosuru koto-o wazato himitunisiteita.
- (4) OF Jiroo-ga Kyooto-kara Kazumi-o
kisyade Tookyoo-e hakensita.

Warm-up:

- (1) SC Kooiti-ga sensyuu Tamae-ni Tookyoo-e
iku koto-o tegami-de tutaeta.
- (2) OF Tosio-ga kinoo Junko-o
kisyade Tookyoo-e syuppatusaseta.
- (3) OC Jiroo-ga ofisu-de Kazumi-ni Tookyoo-e
ryokoosuru koto-o seisikini meizita.
- (4) SF Kooiti-ga muriyari Tamae-o okoraseru
tameni ototoi Tookyoo-e dekaketa.

Scripts 1 and 2:

- 01 SC Tosio-ga kissaten-de Junko-ni Tookyoo-e
ryokoosuru koto-o hakkirito yakusokusita.
- 02 OF Jiroo-ga Oosaka-kara Kazumi-o
hikooki-de Tookyoo-e okurikonda.
- 03 OC Kooiti-ga kinoo Tamae-ni Tookyoo-e
iku koto-o denwa-de yurusita.
- 04 SF Jiroo-ga kisyade Tookyoo-e dekake
Kazumi-wa hikooki-de Kyooto-e dekaketa.
- 05 OF Kooiti-ga sensyuu Tamae-o
basu-de Tookyoo-e syuppatusaseta.
- 06 OC Tosio-ga ofisu-de Junko-ni Tookyoo-e
ryokoosuru koto-o seisikini itakusita.

- 07 SC Jiroo-ga ototoi Kazumi-ni Tookyoo-e
iku koto-o tegami-de honomekasita.
- 08 SF Tosio-ga kokorokara Junko-o yorokobasu tameni
sensyuu Tookyoo-e syuppatusita.
- 09 SC Kooiti-ga kaisya-de Tamae-ni Tookyoo-e
ryokoosuru koto-o wazato kakusiteita.
- 10 OF Tosio-ga Nagoya-kara Junko-o
basu-de Tookyoo-e tukainidasita.
- 11 OC Jiroo-ga sensyuu Kazumi-ni Tookyoo-e
iku koto-o denpoo-de tanonda.
- 12 SF Kooiti-ga hikooki-de Tookyoo-e ryokoosi
Tamae-wa basu-de Oosaka-e ryokoosita.
- 13 OF Jiroo-ga kinoo Kazumi-o
kisya-de Tookyoo-e dekakesaseta.
- 14 OC Kooiti-ga kaisya-de Tamae-ni Tookyoo-e
ryokoosuru koto-o hakkirito yooboosita.
- 15 SF Jiroo-ga nantokasite Kazumi-o komaraseru
tameni ototoi Tookyoo-e dekaketa.
- 16 SC Tosio-ga kinoo Junko-ni Tookyoo-e
iku koto-o denwa-de syabetta.
- 17 OF Kooiti-ga Kyooto-kara Tamae-o
kisya-de Tookyoo-e hakensita.
- 18 OC Tosio-ga ototoi Junko-ni Tookyoo-e
iku koto-o tegami-de unagasita.
- 19 SC Jiroo-ga ofisu-de Kazumi-ni Tookyoo-e
ryokoosuru koto-o seisikini koohyoosita.
- 20 SF Tosio-ga basu-de Tookyoo-e syuppatusi
Junko-wa kisya-de Nagoya-e syuppatusita.
- 21 SF Kooiti-ga muriyari Tamae-o okoraseru tameni
kinoo Tookyoo-e itta.
- 22 OC Jiroo-ga kissaten-de Kazumi-ni Tookyoo-e
ryokoosuru koto-o wazato susumeta.
- 23 OF Tosio-ga ototoi Junko-o
hikooki-de Tookyoo-e dekakesaseta.

- 24 SC Kooiti-ga sensyuu Tamae-ni Tookyoo-e
iku koto-o denpoo-de moosideta.
- 25 OC Tosio-ga kinoo Junko-ni Tookyoo-e
ryokoosuru koto-o tegami-de yookyuusita.
- 26 SF Jiroo-ga hikooki-de Tookyoo-e syuppatusi
Kazumi-wa basu-de Oosaka-e syuppatusita.
- 27 SC Kooiti-ga ofisu-de Tamae-ni Tookyoo-e
iku koto-o wazato zimansita.
- 28 OF Jiroo-ga Nagoya-kara Kazumi-o
basu-de Tookyoo-e hakensita.
- 29 SF Kooiti-ga nantokasite Tamae-o komaraseru
tameni kinoo Tookyoo-e itta.
- 30 SC Tosio-ga sensyuu Junko-ni Tookyoo-e
ryokoosuru koto-o tegami-de tikatta.
- 31 OC Jiroo-ga kaisya-de Kazumi-ni Tookyoo-e
iku koto-o seisikini motometa.
- 32 OF Tosio-ga ototoi Junko-o
basu-de Tookyoo-e ryokoosasetta.
- 33 OC Kooiti-ga sensyuu Tamae-ni Tookyoo-e
iku koto-o denwa-de saisokusita.
- 34 SF Tosio-ga basu-de Tookyoo-e ryokoosi
Junko-wa kisyade Nagoya-e ryokoosita.
- 35 SC Jiroo-ga kissaten-de Kazumi-ni Tookyoo-e
iku koto-o seisikini sengensita.
- 36 OF Kooiti-ga Kyoto-kara Tamae-o
hikooki-de Tookyoo-e okurikonda.
- 37 SF Jiroo-ga muriyari Kazumi-o okoraseru tameni
ototoi Tookyoo-e syuppatusita.
- 38 SC Kooiti-ga kinoo Tamae-ni Tookyoo-e
iku koto-o denwa-de ibatta.
- 39 OF Jiroo-ga sensyuu Kazumi-o
kisyade Tookyoo-e syuppatusasetta.
- 40 OC Tosio-ga kissaten-de Junko-ni Tookyoo-e
ryokoosuru koto-o hakkirito meireisita.

- 41 SF Kooiti-ga kisyade Tookyoo-e dekake
Tamae-wa hikooki-de Kyooto-e dekaketa.
- 42 OF Tosio-ga Oosaka-kara Junko-o
kisyade Tookyoo-e tukainidasita.
- 43 OC Jiroo-ga ototoi Kazumi-ni Tookyoo-e
iku koto-o denpoo-de sasizusita.
- 44 SC Tosio-ga kaisyade Junko-ni Tookyoo-e
ryokoosuru koto-o hakkirito koogensita.
- 45 OF Kooiti-ga kinoo Tamae-o
hikooki-de Tookyoo-e dekakesaseta.
- 46 SC Jiroo-ga ototoi Kazumi-ni Tookyoo-e
ryokoosuru koto-o denpoo-de wabita.
- 47 SF Tosio-ga kokorokara Junko-o yorokobasu tameni
sensyuu Tookyoo-e dekaketa.
- 48 OC Kooiti-ga ofisu-de Tamae-ni Tookyoo-e
ryokoosuru koto-o wazato syooreisita.

Scripts 3 and 4:

- 01 OC Tosio-ga kissaten-de Junko-ni Tookyoo-e
ryokoosuru koto-o hakkirito nozonda.
- 02 OF Jiroo-ga Oosaka-kara Kazumi-o
hikooki-de Tookyoo-e okurikonda.
- 03 SC Kooiti-ga kinoo Tamae-ni Tookyoo-e
iku koto-o denwa-de ayamatta.
- 04 SF Jiroo-ga kisyade Tookyoo-e dekake,
Kazumi-wa hikooki-de Kyooto-e dekaketa.
- 05 OF Kooiti-ga sensyuu Tamae-o
basu-de Tookyoo-e syuppatusaseta.
- 06 SC Tosio-ga ofisu-de Junko-ni Tookyoo-e
ryokoosuru koto-o seisikini happyoosita.
- 07 OC Jiroo-ga ototoi Kazumi-ni Tookyoo-e
iku koto-o tegami-de ininsita.
- 08 SF Tosio-ga kokorokara Junko-o yorokobasu tameni
sensyuu Tookyoo-e syuppatusita.

- 09 OC Kooiti-ga kaisya-de Tamae-ni Tookyoo-e ryokoosuru koto-o wazato sasonokasita.
- 10 OF Tosio-ga Nagoya-kara Junko-o basu-de Tookyoo-e tukainidasita.
- 11 SC Jiroo-ga sensyuu Kazumi-ni Tookyoo-e iku koto-o denpoo-de soodansita.
- 12 SF Kooiti-ga hikooki-de Tookyoo-e ryokoosi, Tamae-wa basu-de Oosaka-e ryokoosita.
- 13 OF Jiroo-ga kinoo Kazumi-o kisyade Tookyoo-e ikaseta.
- 14 SC Kooiti-ga kaisya-de Tamae-ni Tookyoo-e ryokoosuru koto-o hakkirito kokuhakusita.
- 15 SF Jiroo-ga nantokasite Kazumi-o komaraseru tameni ototoi Tookyoo-e dekaketa.
- 16 OC Tosio-ga kinoo Junko-ni Tookyoo-e iku koto-o denwa-de mitometa.
- 17 OF Kooiti-ga Kyooto-kara Tamae-o kisyade Tookyoo-e hakensita.
- 18 SC Tosio-ga ototoi Junko-ni Tookyoo-e iku koto-o tegami-de hakuzyoosita.
- 19 OC Jiroo-ga ofisu-de Kazumi-ni Tookyoo-e ryokoosuru koto-o seisikini kyokasita.
- 20 SF Tosio-ga basu-de Tookyoo-e syuppatusi, Junko-wa kisyade Nagoya-e syuppatusita.
- 21 SF Kooiti-ga muriyari Tamae-o okoraseru tameni kinoo Tookyoo-e itta.
- 22 SC Jiroo-ga kissaten-de Kazumi-ni Tookyoo-e ryokoosuru koto-o wazato damatteita.
- 23 OF Tosio-ga ototoi Junko-o hikooki-de Tookyoo-e dekakesaseta.
- 24 OC Kooiti-ga sensyuu Tamae-ni Tookyoo-e iku koto-o denpoo-de iraisita.
- 25 SC Tosio-ga kinoo Junko-ni Tookyoo-e ryokoosuru koto-o tegami-de utiaketa.

- 26 SF Jiroo-ga hikooki-de Tookyoo-e syuppatusi
Kazumi-wa basu-de Oosaka-e syuppatusita.
- 27 OC Kooiti-ga ofisu-de Tamae-ni Tookyoo-e
iku koto-o wazato osituketa.
- 28 OF Jiroo-ga Nagoya-kara Kazumi-o
basu-de Tookyoo-e hakensita.
- 29 SF Kooiti-ga nantokasite Tamae-o komaraseru
tameni kinoo Tookyoo-e itta.
- 30 OC Tosio-ga sensyuu Junko-ni Tookyoo-e
ryokoosuru koto-o tegami-de kyooseisita.
- 31 SC Jiroo-ga kaisya-de Kazumi-ni Tookyoo-e
iku koto-o seisikini dangensita.
- 32 OF Tosio-ga ototoi Junko-o
basu-de Tookyoo-e ryokoosasetta.
- 33 SC Kooiti-ga sensyuu Tamae-ni Tookyoo-e
iku koto-o denwa-de hookokusita.
- 34 SF Tosio-ga basu-de Tookyoo-e ryokoosi
Junko-wa kiswa-de Nagoya-e ryokoosita.
- 35 OC Jiroo-ga kissaten-de Kazumi-ni Tookyoo-e
iku koto-o seisikini makaseta.
- 36 OF Kooiti-ga Kyooto-kara Tamae-o
hikooki-de Tookyoo-e okurikonda.
- 37 SF Jiroo-ga muriyari Kazumi-o okoraseru tameni
ototoi Tookyoo-e syuppatusita.
- 38 OC Kooiti-ga kinoo Tamae-ni Tookyoo-e
iku koto-o denwa-de syooninsita.
- 39 OF Jiroo-ga sensyuu Kazumi-o
kiswa-de Tookyoo-e syuppatusasetta.
- 40 SC Tosio-ga kissaten-de Junko-ni Tookyoo-e
ryokoosuru koto-o hakkirito meigensita.
- 41 SF Kooiti-ga kiswa-de Tookyoo-e dekake
Tamae-wa hikooki-de Kyooto-e dekaketa.
- 42 OF Tosio-ga Oosaka-kara Junko-o
kiswa-de Tookyoo-e tukainidasita.

- 43 SC Jiroo-ga ototoi Kazumi-ni Tookyoo-e
iku koto-o denpoo-de benkaisita.
- 44 OC Tosio-ga kaisya-de Junko-ni Tookyoo-e
ryokoosuru koto-o hakkirito seikyuusita.
- 45 OF Kooiti-ga kinoo Tamae-o
hikooki-de Tookyoo-e dekakesaseta.
- 46 OC Jiroo-ga ototoi Kazumi-ni Tookyoo-e
ryokoosuru koto-o denpoo-de sizisita.
- 47 SF Tosio-ga kokorokara Junko-o yorokobasu tameni
sensyuu Tookyoo-e dekaketa.
- 48 SC Kooiti-ga ofisu-de Tamae-ni Tookyoo-e
ryokoosuru koto-o wazato aimainisiteita.

Appendix F: Response times by sentences for Experiments 1,2 and 3 ("No." represents the position of the sentence in the experimental presentation. E1, E2, and E3 represent Experiments 1, 2, and 3 respectively. SC = S-control, and OC = O-control.)

First Session

No.	Verbs	RT (msec)		
		E1	E2	E3
01	SC yakusokusita (promise)	679	648	893
07	SC honomekasita (hint)	689	658	718
09	SC kakusiteita (keep secret)	444	546	643
16	SC syabetta (talk)	584	625	809
19	SC koohyoosita (announce officially)	875	875	858
24	SC moosideta (offer)	778	849	966
27	SC zimansita (boast)	543	632	702
30	SC tikatta (swear)	698	864	818
35	SC sengensita (declare)	634	669	647
88	SC ibatta (be arrogant)	682	854	835
44	SC koogensita (declare)	717	679	608
46	SC wabita (apologize)	924	878	1.126
03	OC yurusita (forgive)	793	561	774
06	OC itakusita (entrust)	714	639	838
11	OC tanonda (ask)	709	580	653
14	OC yooboosita (demand)	752	601	717
18	OC unagasita (urge)	797	737	761
22	OC susumeta (recommend)	655	775	677
25	OC yookyuusita (demand)	636	635	594
31	OC motometa (ask)	609	622	826
33	OC saisokusita (urge)	490	587	697
40	OC meireisita (order)	506	550	559
43	OC sasizusita (direct)	560	570	580
48	OC syooreisita (encourage)	627	692	973

Second Session

No.	Verbs	RT (msec)		
		E1	E2	E3
03	SC ayamatta (apologize)	600	660	815
06	SC happyoosita (announce)	713	631	720
11	SC soodansita (consult)	781	825	757
14	SC kokuhakusita (confess)	637	596	617
18	SC hakuzyoosita (confess)	649	588	690
22	SC damatteita (keep silent)	586	645	537
25	SC utiaketa (disclose)	511	570	617
31	SC dangensita (declare)	752	653	713
33	SC hookokusita (report)	505	544	498
40	SC meigensita (declare)	720	843	807
43	SC benkaisita (excuse)	792	735	982
48	SC aimainisiteita (make vague)	362	641	647
01	OC nozonda (wish)	665	664	750
07	OC ininsita (entrust)	732	674	621
09	OC sosonokasita (seduce)	534	616	669
16	OC mitometa (admit)	678	750	662
19	OC kyokasita (permit)	414	497	426
24	OC iraisita (request)	526	545	546
27	OC osituketa (force)	522	513	540
30	OC kyooseisita (compel)	542	609	514
35	OC makaseta (entrust)	433	583	465
38	OC syooninsita (admit)	644	655	455
44	OC seikyuusita (demand)	727	854	684
46	OC sisisita (instruct)	576	635	658

Appendix G: Results of Frequency Test

<u>S-control Verbs</u>	Rating

yakusokusita (promise)	4.90
honomekasita (hint)	3.52
kakusiteita (keep secret)	4.62
syabetta (talk)	4.98
koohyoosita (announce officially)	3.78
moosideta (offer)	3.94
zimansita (boast)	4.84
tikatta (swear)	4.18
sengensita (declare)	3.98
ibatta (be arrogant)	4.56
koogensita (declare)	3.30
wabita (apologize)	3.76
ayamatta (apologize)	4.82
happyoosita (announce)	4.60
soodansita (consult)	4.64
kokuhakusita (confess)	4.24
hakuzyoosita (confess)	4.16
damatteita (keep silent)	4.68
utiaketa (disclose)	4.32
dangensita (declare)	3.88
hookokusita (report)	4.40
meigensita (declare)	3.14
benkaisita (excuse)	4.04
aimainisiteita (make vague)	4.22

MEAN	4.23
RANGE 3.14 - 4.90	

<u>O-control Verbs</u>	Rating
yurusita (forgive)	4.60
itakusita (entrust)	2.74
tanonda (ask)	4.94
yooosita (demand)	3.24
unagasita (urge)	3.50
susumeta (recommend)	4.60
yookyuusita (demand)	4.28
motometa (ask)	4.24
saisokusita (urge)	4.00
meireisita (order)	4.40
sasizusita (direct)	3.66
syoooreisita (encourage)	3.24
nozonda (wish)	4.38
ininsita (entrust)	3.48
sosonokasita (seduce)	3.76
mitometa (admit)	4.56
kyokasita (permit)	4.22
iraisita (request)	3.14
osituketa (force)	4.40
kyooseisita (compel)	3.98
makaseta (entrust)	4.48
syooninsita (admit)	3.72
seikyuusita (demand)	4.10
sizisita (instruct)	4.14
MEAN	3.99
RANGE 2.74 - 4.94	

Appendix H: Results of Naturalness Rating

<u>Questionnaire 1</u>		<u>Questionnaire 2</u>		<u>Questionnaire 3</u>		
SC	OC	SC	OC	SC	OC	
3.56	3.59	3.69	4.17	3.21	3.79	
3.67	3.56	4.09	3.97	3.79	3.75	
3.00	3.48	3.53	3.89	2.92	3.79	
4.19	3.07	4.09	3.49	3.92	3.54	
2.96	3.74	3.17	3.97	3.54	3.83	
3.33	3.41	3.75	3.45	3.50	3.42	
3.89	3.04	3.89	3.69	4.00	3.42	
3.59	3.35	3.29	3.69	3.38	3.17	
3.67	3.44	3.77	3.85	3.67	3.42	
3.74	3.78	3.97	4.05	3.79	4.12	
3.19	3.93	3.41	3.73	3.54	4.08	
3.00	3.37	3.17	2.89	3.58	3.54	
3.48	3.04	2.96	2.72	3.20	2.82	
3.22	3.63	2.96	3.76	3.28	3.90	
3.41	2.74	3.54	2.80	3.61	3.49	
3.89	3.26	3.88	3.04	3.70	2.95	
3.59	3.96	3.68	4.24	3.57	3.78	
3.59	3.70	3.52	4.00	3.11	3.90	
3.93	3.89	4.01	3.64	4.11	3.57	
3.41	3.74	2.92	3.52	3.32	3.65	
3.81	3.78	4.16	3.44	3.70	3.57	
3.85	3.15	3.28	3.48	3.53	3.11	
3.44	3.00	3.44	2.72	3.36	3.28	
3.52	4.11	3.28	4.12	2.95	3.78	
MEAN	3.54	3.49	3.56	3.59	3.51	3.57

Appendix I: Results of Antecedent Selection

	<u>Questionnaire 1</u>		<u>Questionnaire 2</u>		<u>Questionnaire 3</u>	
	SC(%)	OC(%)	SC(%)	OC(%)	SC(%)	OC(%)
	96.0	85.2	75.0	88.0	81.0	95.8
	84.6	88.9	78.3	96.0	87.0	100.0
	96.2	92.0	95.8	87.5	95.7	95.8
	92.6	88.5	96.0	73.9	95.8	68.2
	92.0	85.2	76.2	91.3	72.7	83.3
	92.3	96.2	86.4	100.0	87.5	100.0
	100.0	91.7	100.0	78.3	100.0	78.3
	100.0	95.8	76.5	78.3	77.3	77.3
	92.6	88.5	100.0	91.3	95.7	82.6
	100.0	92.3	100.0	95.8	95.8	100.0
	96.2	100.0	95.8	100.0	87.0	87.5
	100.0	96.2	91.3	91.3	87.0	100.0
	92.6	92.6	87.0	75.0	78.3	58.3
	80.8	92.6	70.0	95.7	69.6	95.7
	88.9	74.1	90.9	77.3	83.3	91.7
	100.0	74.1	91.3	71.4	91.7	65.2
	96.3	100.0	95.7	95.7	91.3	100.0
	100.0	92.3	95.7	91.7	95.8	100.0
	100.0	100.0	95.7	95.7	91.7	95.8
	77.8	100.0	78.3	95.7	83.3	91.7
	96.3	100.0	100.0	95.7	87.5	91.7
	92.6	100.0	95.7	95.7	87.0	87.5
	100.0	92.6	95.5	72.7	97.5	79.2
	96.3	96.3	95.7	91.3	91.3	95.8
MEAN	94.3	92.3	90.1	88.6	87.9	88.4

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