THE ACQUISITION OF JAPANESE PRONOUNS

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INTRODUCTION

In this paper I will study the acquisition of pronoun interpretation by Japanese children. My study deals mainly with two issues. The first relates to the issue of when some of the principles involved in the interpretation of pronouns appear in child language. The other examines Barbara Lust's (1981, 1983) claim that abstract structural relations unique to the language faculty determine the interpretation of pronouns.

The first section describes some basic properties of Japanese and its pronoun system. Next, I discuss my experiments on Japanese reflexive pronouns and report on experiments dealing with other patterns of pronominalization. Lastly, I deal with the general implications of the experimental findings. An appendix contains the complete set of sentences employed in the experiments.

BASIC PROPERTIES OF JAPANESE

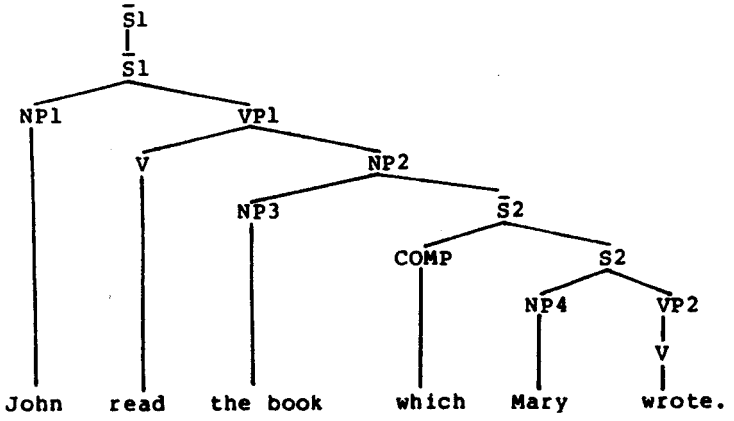
The basic word order in Japanese is S(ubject) O(bject) V(erb), although OSV patterns are also natural. A case particle assigned to each NP indicates its grammatical function. The most common particles are ga (Nominative) for subject, o (Accusative) for direct object, and ni (Dative) for indirect object. The particle wa (Topic) is employed to indicate topicality. As Li and Thompson (1976:45) state, the topic represents the discourse theme while the subject is a more sentence-oriented notion. The following sentences illustrate the SOV and OSV word orders and some of the case particles.

(1) SOV
Mary ga John o home-ta.
N A praise-Pst
(Mary praised John)

(2) OSV
John o Mary ga home-ta
A N praise-Pst
(Mary praised John)

Branching direction is another structural property of Japanese that is different from English. Languages are called right branching if they place recursive categories (such as relative clauses) to the right of the head noun, and left branching if they place them to the left. English is a predominantly right branching language as the syntactic tree in (3) illustrates.

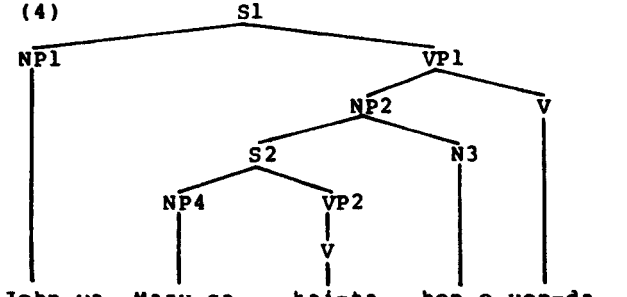
(3)



As (3) shows, the relative clause (S2) follows the head noun the book (NP3).

In contrast, Japanese is a predominantly left branching language since, as tree (4) shows, a recursive term (S2) is attached to the left of the head noun (NP3).

(4)



(John read the book that Mary wrote.)

Reflexive Pronouns

There are three types of pronominal elements in Japanese: the reflexive pronoun zibun "self", the lexical pronouns kare

"he", kanozyo "she", etc. and the null pronoun marked as ∅. Observe sentence (5).

(5) Bob wa {zibun no/kare no/∅} zyoosi o kirat-tei-ru.
T self G he G PRO boss A dislike-Pres
(Bob dislikes self's/his/∅ boss.)

In (5) the pronominal element (zibun, kare, ∅) can be dependent for its interpretation on the name Bob. This interpretive relation between a pronominal element such as zibun, kare, ∅ and its referent is called anaphora.

One property that distinquishes the reflexive pronoun zibun "self" from other pronouns is the Subject-Antecedent Condition stated in (6).

(6) The Subject-Antecedent Condition
The antecedent of a reflexive pronoun must be the subject of a sentence (Kuroda 1979, Kuno and Kaburaki 1977).

The Subject-Antecedent Condition predicts that zibun will be coreferential with either the matrix subject Harry or the subordinate subject Jane in (7).

(7) [Harry wa [Jane ga zibun o hihan-si-ta to] it-ta].
S T S N self A criticize-P COM say-P
(Harry said that Jane criticized self.)

The Japanese reflexive, unlike English reflexives, zibun can be used regardless of the person, gender and number of the antecedent.

Another important property of the Japanese reflexive is the Humanness Condition stated in (8) and illustrated in (9).

(8) The Humanness Condition
The antecedent for zibun has an animate referent (Inoue 1976, Kuno and Kaburaki 1976).

(9) a. Tanaka wa kono mondai o zibun no ronbun de siteki si-ta.
T this problem A self G paper in point out do-P
(Tanaka pointed out this problem in self's paper.)

*b. Kono mondai wa Tanaka ni zibun no ronbun de siteki sare-ta.
this problem T D self G paper in point out pass-P
(*This problem was pointed out by Tanaka in self's paper.)

Although the inanimate NP kono mondai is subject in (9b), it cannot be the antecedent of zibun. However, as the following example shows, zibun can have as its antecedent an NP denoting a higher animal, especially pets (Inoue 1976:119).

(10) Inu wa zibun no ie o sit-tei-ru.
dog T self G house A know-Pres
(A dog knows self's house.)

Null-Pronouns

A pronoun in Japanese can either follow its antecedent as illustrated in (11a) or precede it as shown in (11b).

(11) a. Forward Anaphora: antecedent precedes the pronoun.

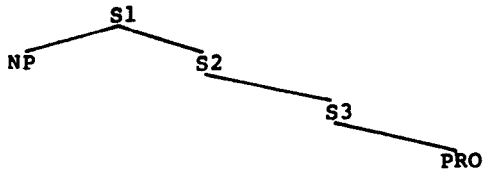
Jane wa isoga-nakat-ta node ∅ basu ni nori-hagu-ta.
T hurry-NEG-P because PRO bus on get-miss-P
(Because Jane did not hurry, she missed a bus.)

b. Backward Anaphora: pronoun precedes its antecedent.

∅ biiru o nom-i-sugi-ta node Ken wa hutukayoi ni
PRO beer A drink-over-P because T hangover from
kakat-ta.
suffer-P
(Because he drank too much beer, Ken suffered from
a hangover.)

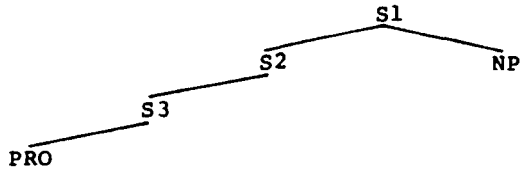
Although both patterns of anaphora are acceptable in the adult grammar, Lust (1981, 1983) claims that children understand anaphora best when the direction of anaphora accords with the branching direction of the language they acquire. Thus children who speak English (a predominantly right branching language) will favor the forward direction of anaphora since it generally contains a pronoun to the right of its antecedent as illustrated in (12a).

(12) a.



In contrast, children who speak Japanese (a predominantly left branching language) will prefer the backward pattern of anaphora since a pronoun is located to the left of its antecedent as shown in (12b).

(12) b.



The "directionality" issue will be discussed in detail below.

The purpose of the experiments reported below was to determine (a) at what age the Subject-Antecedent Condition comes to play a role in interpreting reflexive pronouns, and (b) which of the properties of reflexives is more salient for children, humanness or subjecthood. The purpose of the imitation experiment derives from a controversial claim made by Lust (1981, 1983) to the effect that children understand anaphora best when the direction of anaphora accords with the branching direction of the language they are acquiring.

EXPERIMENTS ON JAPANESE PRONOUNS

My study consisted of three experimental tasks: an act-out task, a question-answer task and an imitation task. The act-out task and the question-answer task are discussed in this section. These tasks were designed to test the acquisition of the Subject-Antecedent Condition and the Humanness Condition respectively.

The subjects were 60 children ranging in age from 4;1 to 11;11. They were divided into five age groups in the manner illustrated in Table 1.

Table 1. Subjects.

Group	Age	Number M / F	Total	Ave.Age M / F	Ave.Age
K2	4	6 / 6	12	4;5/4;7	4;6
K3	5	6 / 6	12	5;5/5;4	5;4
G2	7	6 / 6	12	7;7/7;5	7;6
G4	9	6 / 6	12	9;8/9;6	9;7
G6	11	6 / 6	12	11;8/11;7	11;8
Total		30/30	60		
Adult	24;9-30;8	5 / 5	10	26;4/27;0	26;8

All the children in K2 and K3 came from a large private day care center in Iwahune, Tochigi prefecture, Japan. The children in

G2, G4 and G6 were from one of the public elementary schools in Iwahune. All subjects were native speakers of Japanese with normal development in aural, visual and linguistic skills. The socio-economic status of the children varied considerably, but the majority can be described as lower to middle class or working class.

At the beginning of the experimental session, each child was introduced to five dolls, two males and three females, of approximately the same size. The dolls' names, which corresponded to the human NPs in the stimulus sentences, were selected on the basis of familiarity. Every child distinguished the dolls from each other immediately and there was no confusion.

The author tested the children individually in an audio-visual room in the elementary school and in the guest room in the kindergarten. The children from G2 to G6 completed the four tasks in one experimental session, while the K2 to K3 children underwent each experiment separately--an arrangement which allowed them to take a break and to play in the next room. All children completed their experimental tasks on the same day.

Four experimental tasks (two question-answer tasks, an act-out task and an imitation task) were given to the children in random order. A pretest was given prior to each task to ensure that the children understood what was required of them. Half the children took Question-Answer task 1 before Question-Answer task 2 while the others were given the tests in the reverse order.

Ten adults, five males and five females, also participated in the experiments to determine the adult speakers' judgements (see Table 1). Nine of them had completed their university education and the other senior high school.

The Subject-Antecedent Condition

The act-out experiment was designed to examine the effect of grammatical relations on interpretation. Twenty sentences were organized in random order and presented to the children. The children were tested individually and told that they were to play a game which involved making the dolls do what the experimenter said. Two simple warm-up sentences were given followed by the 20 sentences in random order. A practice sentence is shown below.

Okaa-san ga zibun no kata o tati-ta.
mother N self G shoulder A pat-P
(Mother patted self's shoulder.)

All the children who participated in experiments understood the practice sentences well and acted them out correctly with the dolls.

Three tokens each of sentence type involving four pairs of grammatical relations (Subject/D.O., Subject/I.O., Subject/Possessive, Matrix Subject/Subordinate Subject) were devised. Each type included two or three human NPs to the left of a reflexive pronoun. The only sentence type which is ambiguous in the adult grammar is type IV, with either subject serving as antecedent.

The sentences were designed to determine whether children choose the subject as antecedent regardless of the other grammatical relations present in the sentence. Tokens which manifest each pair of grammatical relations are illustrated below.

I. Subject/D.O.
Ken-tyan ga Hana-tyan o zibun no tebukuro de sawat-ta.
N A self G glove with touch-P
(Ken touched Hana with self's gloves.)

II. Subject/I.O.
Ken-tyan ga Midori-tyan ni zibun no omotya o mise-ta.
N D self G toy A show-P
(Ken showed Midori self's toy.)

III. Subject/Possessive
Hana-tyan no Okaa-san ga zibun no yoohuku o arat-ta.
G mother N self G clothes A wash-P
(Hana's mother washed self's clothes.)

IV. Matrix Subject/Subordinate Subject
Hana-tyan wa [Ken-tyan ga zibun o tunet-ta to] it-ta.
T N self A pinch-P COM say-P
(Hana said that Ken pinched self.)

There were five major response types: correct intrasentential response (that is, a subject antecedent), correct extrasentential response (a first person singular antecedent), a pseudo-subject response (when the child chose an incorrect NP to be the subject but then interpreted it as antecedent), other incorrect responses and no response.

The results of the act-out test are given in Table 2.

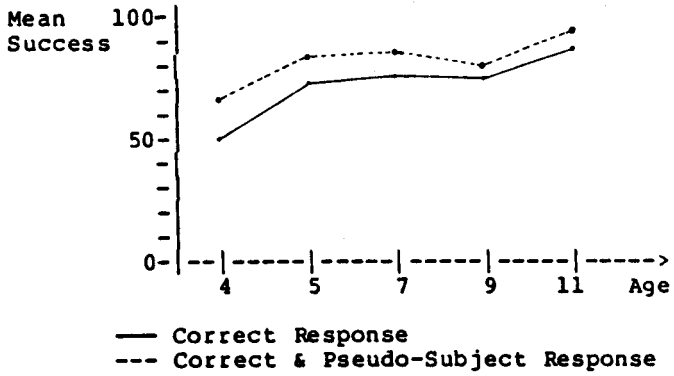
Table 2. Results of the Subject Antecedent Task.

S	Response	Age 4	5	7	9	11	Mean
I	Correct	75.5	83.3	80.5	91.6	100.0	86.2
	Pseudo-S	16.7	8.4	13.9	5.6	0.0	8.9
	Addressee	0.0	0.0	0.0	0.0	0.0	0.0
	Error	8.4	8.4	2.8	2.8	0.0	4.5
	No Resp.	0.0	0.0	2.8	0.0	0.0	0.6
II	Correct	61.1	86.1	86.1	97.2	97.2	85.6
	Pseudo-S	19.5	5.6	5.6	0.0	2.8	6.7
	Addressee	0.0	0.0	0.0	0.0	0.0	0.0
	Error	16.7	8.4	8.4	2.8	0.0	7.3
	No Resp.	2.8	0.0	0.0	0.0	0.0	0.6
III	Correct	41.7	83.3	80.5	75.0	91.6	74.4
	Pseudo-S	8.4	0.0	2.8	5.6	2.8	3.9
	Addressee	0.0	0.0	0.0	0.0	0.0	0.0
	Error	50.0	16.7	16.7	19.5	5.6	21.7
	No Resp.	0.0	0.0	0.0	0.0	0.0	0.0
IV	Correct	22.3	33.3	47.3	27.8	55.6	37.2
	Pseudo-S	19.5	25.0	13.9	8.4	16.7	16.7
	Addressee	0.0	0.0	2.8	0.0	0.0	0.6
	Error	58.4	38.9	36.1	63.9	27.8	45.0
	No Resp.	0.0	0.0	2.8	0.0	0.0	0.6
Mean	Correct	50.0	71.6	73.6	72.9	86.1	70.9
	Pseudo-S	16.0	9.7	9.0	4.9	5.6	9.0
	Addressee	0.0	0.0	0.7	0.0	0.0	0.5
	Error	33.4	18.1	16.0	22.2	8.4	19.6
	No Resp.	0.7	0.7	0.7	0.0	0.0	0.5

Note: Sentence Types according to component Grammatical Relations
I Subject--Direct Object
II Subject--Indirect Object
III Subject--Possessive
IV Matrix Subject--Subordinate Subject

A three-way ANOVA shows that children's age ($F(4,200)=13.768$, $p<.0001$) and sentence type ($F(3,200)=54.499$, $p<.0001$) are significant as main effects.

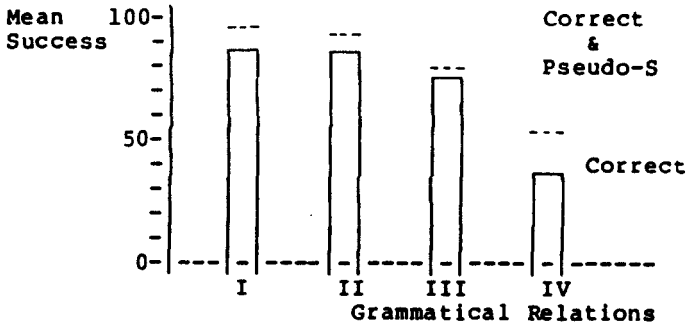
Figure 1. Results of the Subject Antecedent Task.



In Figure 1 the dotted line represents all responses in which children linked the reflexive to the NP which they chose as subject, regardless of whether this choice was correct. A one-way ANOVA shows that the factor of age is significant between 4 and 5, 4 and 7, 4 and 9, 4 and 11, and 5 and 11 years old ($p < .01$). There is a slight decline in the rate of correct responses between 7 and 9 years old, but it was not statistically significant.

Figure 2 shows the effect of different pairs of grammatical relations on children's interpretation of reflexives.

Figure 2. Effect of Grammatical Relations on Subject Antecedent Task.



Note: I Subject-Direct Object
II Subject-Indirect Object
III Subject-Possessive
IV Matrix-Sub.Subject

A one-way ANOVA reveals that the difference between type IV and types I, II and III was significant (p,.01). Children responded almost equally well in both type I (86.2%) and type II (85.6%) sentences and did slightly less well on the bi-clausal type IV sentences (37.2%). In this type there was even one case where a child (a 7-year-old female) regarded herself as the referent of the reflexive. Moreoever, children performed least well (31.6%) when they acted out sentences involving three human NPs (two subjects and one object).

Addition of the pseudo-subject responses to the correct ones yields even higher scores (indicated by the dotted line). A one-way ANOVA shows that types III and IV are each significantly different from types I and II (p,.01). Children observed the Subject-Antecedent Condition more than 90% of the time on type I and II, and in almost 80% of the cases on type III. However, children achieved only a chance level on type IV.

The first major cut-off point is between ages 4 and 5. Apparently the 5-year-olds become more aware of differences among case particles and are therefore better able to distinguish grammatical relations than the 4-year-olds. Another major cut-off point is between age 11 and the rest of the younger groups.

Children applied the Subject-Antecedent Condition with the greatest success when the sentences involved a subject and a direct or indirect object. There was, however, some confusion in cases where the sentence contained both a subject and a possessive (type III). It is possible that children have more

difficulty identifying the grammatical role of the possessive than that of the direct and indirect object since a possessive NP, unlike a direct or indirect object NP, appears in the sentence initial position in this structure so that children often took it to be subject. Thus children acted out a sentence such as (13) as either (14) or (15).

(13) Hana-tyan no Okaa-san ga zibun no yoohuku o arat-ta.
G mother N self G clothes A wash-P
(Hana's mother washed self's clothes.)

(14) Hana-tyan ga Okaa-san no yoohuku o arat-ta.
N mother G clothes A wash-P
(Hana washed mother's clothes.)

(15) Okaa-san ga Hana-tyan no yoohuku o arat-ta.
mother N G clothes A wash-P
(Mother washed Hana's clothes.)

The error type exemplified in (14) accounts for 15.4% of the total mistakes made on type III while the error type in (15) accounts for 61.5%.

The high incidence of errors such as (15) could conceivably have been the result of the pragmatic variable of "empathy" which, Kuno (1975:321) asserts, refers to the "speaker's attitude with respect to who, among speech event participants (the speaker and the hearer) and the participants of an event or state that he describes, the speaker takes sides with". For example, according to Kuno, the speaker is taking sides with John in (16a) and Mary in (16b) since they are mentioned by name.

(16) a. John hit his wife
b. Mary's husband hit her.

In my sentence (13), then, the speaker should be empathizing with Hana-tyan. Since Kuno (ibid:324) further states that "syntactic prominence" is given "to a person who you are describing who you are empathizing with", it is plausible that children chose Hana-tyan as antecedent of the reflexive in (13) because of its high empathy factor.

Another error pattern, which accounts for 17.9% of the mistakes, involved interpreting a sentence such as (17) as (18).

(17) Midori-tyan ga Ken-tyan no atama ni zibun no hon o nose-ta.
N G head on self G book A put-P
(Midori put Ken's book on his head.)

(18) Midori-tyan ga Ken-tyan no atama ni Ken-tyan no hon o
N G head on G book A
nose-ta.
put-P
(Midori put Ken's book on Ken's head.)

In this error pattern children seem to interpret the reflexive self as a non-reflexive ∅ since a null pronoun does not require the Subject-Antecedent Condition.

As for the contrast between the matrix and subordinate subjects, there was great confusion. Most of the errors involved ignoring the reflexive and taking the matrix subject as agent and the subordinate subject as the patient. This pattern occurred in 60.5% of the 81 errors.

In cases where the sentence contained three human NPs there were various other errors, most of which involved ignoring one or more NPs and/or the matrix verb. It is probable that three proper names in a row created processing difficulties which made children eliminate one of the nominals.

One reason for the difficulty which children encountered on the type IV sentences may have been their center-embedded structure. Thus a sentence such as (19) involves three consecutive NPs in the sentence initial position. The center-embedded clause is placed in brackets.

(19) Hana-tyan wa [Ken-tyan ga zibun o tunet-ta to] it-ta.
T N self A pinch-P COM say-P
(Hana said that Ken pinched self.)

Children have to wait until the end of the sentence to find the verb associated with the matrix subject. A sentence such as (20) would place even greater strain on the language processing mechanisms since it contains four NPs in a row before a single verb is encountered.

(20) Midori-tyan wa Ken-tyan ni [Hana-tyan ga zibun o kai-ta
T D N self A scratch-P
to] it-ta.
COM say-P
(Midori said to Ken that Hana scratched self.)

In fact children did worse on token (20) than (19) (31.6% versus 40.0%).

The Humanness Condition

There was only one sentence type which imposed a choice on the children between the Subjecthood and the Humanness Conditions. Three tokens of this sentence type were prepared, all of them involving a non-human subject and a human direct object as illustrated in (21).

(21) Hebi ga Hana-tyan o zibun no niwa de kan-da.
snake N A self G yard L bite-P
(A snake bit Hana in self's yard.)

Zibun no niwa te dare no niwa?
self G yard who G yard
(Whose yard is self's yard?)

In the published literature on Japanese reflexives, the sentences used to support the Subject-Antecedent Condition always contain a ¼+human subject. It is therefore not clear which of these features -- syntactic subjecthood or semantic humanness -- is more salient in the development of interpretation of anaphora. In this experiment the children could (i) choose the non-human subject, (ii) select the direct object, which was the only human NP in the sentence, (iii) shift the reference to the first person singular.

Three experimental sentences were given to the children. The stimulus sentences were repeated as often as needed and the entire procedure was tape-recorded.

Four types of responses were scored: subject, object or the speaker as antecedent and no response.

A two-way ANOVA shows that there is no significant effect of main factors (age and sex) at the p,.01 level. The subjects through all age groups consistently chose a human object NP as antecedent of a reflexive pronoun as outlined in Table 3.[1]

Table 3. Results of Humanness Condition Task.

	Age						
Ant.	4	5	7	9	11	Mean	Adults
Non-H.S.	13.9	2.8	22.2	27.8	27.8	18.9	60.0
Human O.	75.0	55.6	75.0	72.2	72.2	70.0	16.7
Speaker	0.0	0.0	0.0	0.0	0.0	0.0	23.3
No Resp.	11.1	41.7	2.8	0.0	0.0	11.1	0.0

Children chose the human object in 70.0% of the cases, while they chose the non-human subject only 18.9% of the time. A chi-square analysis shows this difference to be significant (x^2 (1)=52.9, p,.001).

Children's responses are in contrast with those of adults, who chose the non-human subject 60.0% of the time and the human object in only 16.7% of the cases. Adults also took the reflexive to be coreferential with the "speaker" 23.3% of the time.

The results suggest that humanness is the critical criterion for coreference used by children in interpreting reflexive pronouns since it overwhelmingly outweighs the Subjecthood Condition in all age groups. This is an interesting result since it

contrasts with what is found in adults who take subjecthood to be the vital property of reflexive pronouns. It is conceivable that adults metaphorically humanize non-human subjects in order to ensure that their interpretation of zibun complies with the Subject-Antecedent Condition and the Humanness Condition.

DIRECTIONALITY

In both Japanese and English, a pronoun can either precede or follow its antecedent. It has been found that at some point of development children show a preference for forward over backward anaphora (Chomsky 1969, Ingram and Shaw 1981). In other words, they prefer that the pronoun follow rather than precede its antecedent. It is conceivable that this preference is the result of the processing strategy described (but not adopted) by Lust (1983:144).

(22) Processing Theory
Children begin acquisition universally with a forward direction of anaphora, simply in keeping with basic cognitive constraints involved in real time, on-line processing of sentences. Since real time processing may be represented as left to right, it is consistent with forward anaphora.

This version of processing theory predicts that children from any language background will favor the forward pattern of anaphora.

Another possibility is that the forward preference is the result of branching direction, which reflects both linear order and dominance relations. The notion (PBD) of the Principal Branching Direction (PBD) is stated in (23).

(23) Principal Branching Direction (PBD)
PBD refers to the branching direction which holds consistently in unmarked form over major recursive structures of a language, where "major recursive structures" are defined to include relative clause formation of complex NP, adverbial subordinate clause, and sentential complementation.

Lust (ibid:141) claimed that PBD constrains children's directionality preference in the way indicated in (24).

(24) Constraint on Anaphora
In early child language, the direction of grammatical anaphora accords with the Principal Branching Direction (PBD) of the specific language being acquired. Anaphora is constrained forward in a principally right-branching language. It is constrained

backward in a principally left-branching language.

In an attempt to confirm this hypothesis, Lust and Wakayama (1981) tested 81 monolingual Japanese children between the ages of 2;5 and 5;10 on coordinate structures. Since Japanese is a left-branching language, Lust predicted that children would initially prefer backward anaphora. Lust and Wakayama employed two types of coordinate structures (two tokens for each type) to determine if the direction of anaphora involved in coordinate structures makes any difference in children's performance of an imitation task. Forward and backward coordinations are shown in (25a) and (25b) respectively.

(25) a. Forward Coordination
Inu wa hoeru si ∅ kamituku.
dog T bark and PRO bite
(dogs bark and ∅ bite.)

b. Backward Coordination
Usagi ∅ kame ga hasiru.
rabbit PRO and turtle N run
(Rabbits ∅ and turtles run.)

As the ∅ symbols indicate, Lust and Wakayama assumed that coordinate structures involve zero anaphors corresponding to the understood NP inu "dog" in (6a) and to the understood verb hasiru "run" in (6b).

The results of the elicited imitation task revealed that Japanese children correctly imitated backward coordination more often than forward coordination, as predicted by the 'constraint on anaphora'. The success rate for the backward coordination was 1.65 out of 2 tokens (82.5%), while that of forward coordination was 1.21 (60.5%). It was not reported whether this difference was statistically significant.

Lust (1983) provides further evidence that children are aware of abstract and complex dominance relations in both right- and left-branching languages. Based on data from natural speech and experimental studies in right-branching languages (English, Arabic) and in left-branching languages (Japanese, Chinese, Sinhalese), she concluded that English and Arabic speakers imitated forward coordination more successfully than backward coordination and that there was a delay in productive use of backward coordination in natural speech. In contrast with the results obtained from speakers of right-branching languages, it was found that Japanese, Chinese and Sinhalese speakers had more difficulty imitating forward coordinate structures and that they develop later than backward structures in natural speech.

In yet another experiment, Lust (1981) tested 69 English-speaking children aged 3;6 to 5;7 on sentences containing a subordinate clause. The task involved imitation of the

structures exemplified in (26). Subordinate clauses are placed in brackets. The subscript s indicates occurrence in a subordinate clause.

(26) a. Redundant (NP-NPs)
Jane was sad [because Jane dropped the ice cream cone].

b. Redundant (NPs-NP)
[Because Sam was thirsty], Sam drank some soda.

c. Forward Pronominalization (NP-PROs)
Tommy ran fast [because he heard a lion .

d. Backward Pronominalization (PROs-NP)
[Because she was tired], Mommy was sleeping.

e. Forward Pronominalization (NPs-PRO)
[Because Jenna saw a mouse], she ran away.

Lust used two tokens for each type, one with the connective because and the other with while. She found that the pronominalized structures (c,d,e) were correctly imitated significantly more often than the redundant constructions (a,b). The predominant error type in the redundant structures involved conversion to a forward structure (c,e), which occurred in 47% of the cases. Among the pronominalization structures, the forward pattern of anaphora was correct more often than the backward ones (89% versus 59%). A common error in backward anaphora involved conversion into the forward structure. This occurred 28% of the time, compared to 4% for the reverse change. Lust found that neither the connective type nor clause order had a significant effect on the children's performance.

A similar study was carried out on left-branching languages by Lust and Mangione (1983), who reported on experimental results involving both coordinate and subordinate structures from English, Chinese and Japanese. Lust and Mangione used four tokens for the coordinate structures (see (25)) and two tokens for subordinate clause structures in each language. Examples of the subordinate clause structures in Japanese are given in (27).

(27) a. Forward subordinate structure
Papa ga gohan o taberu-to, ∅ otya o ire-ta.
N meal A eat-when PRO tea A pour-P
(When Papa ate the meal, he poured tea.)

b. Backward subordinate structure
∅ mado o akeru-to, Onee-san ga kusyami o si-ta.
PRO window A open-when sister N sneeze A do-P
(When she opened the window, the elder sister sneezed.)

In Chinese and Japanese the anaphor consisted of a zero pronoun rather than an overt pronoun since this is the more natural pattern (Huang 1984:553-554).

The results revealed that English speakers imitated forward anaphora significantly better than backward anaphora. On the other hand, Chinese and Japanese subjects imitated backward sentences better than forward ones in coordinate structures, which supports Lust's hypothesis concerning PBD.

However, close examination of the data showed that Chinese speakers did better on the forward pattern (71%) than the backward one (63%) in the subordinate clause structures. Moreover, Japanese speakers did only slightly better on the backward cases (approximately 46%) than the forward ones (approximately 37%) on the subordinate clause structures. (Approximate percentages had to be computed from the graph provided by Lust and Mangione (ibid:156), as they did not present exact figures.) Lust and Mangione claim that the latter difference indicates "a significant preference for backward forms" (ibid:153), even though the difference was small.

In addition, half of the experimental sentences exhibited a serious problem. Consider in this regard (28).

(28) Mama-ga kasa-o otosi-ta-no, ∅ doa-o akeru-to.
mother-N umbrella-A drop-P PRO door-A open-when
(Mama dropped the umbrella when she opened the door.)

Sentence (28) sounds unnatural if the zero pronoun refers to **Mama**. Since a zero pronoun in a subordinate clause can not refer back to a nominative-marked NP in Japanese, it is more natural to interpret the pronoun as referring to the speaker or a third person. However, if the matrix NP is marked as topic (with the suffix -wa as in (29)), it sounds natural and qualifies as antecedent of the zero pronoun in the subordinate clause.

Sentence (28) is unnatural for a second reason since the matrix verb is located in the middle of the sentence. The sentence becomes natural if the matrix verb is located sentence finally as in (29).

(29) Mama wa [∅ doa o akeru to] kasa o otosi-ta-no.
T PRO door A open when umbrella A drop-P
(Mama, when she opened the door, dropped the umbrella.)

Lust and Mangione's results could obviously have been affected by the unnaturalness of their test sentences.[2]

Although Lust's own data were flawed in certain aspects, the PBD principle has been very influential and has been accepted as a fact in some quarters. For instance, in Newmeyer's (1983:17) important book on grammatical theory, it is reported that "(children) are sensitive to the highly abstract, specifically grammatical concept of 'principal branching direction'". I now attempt to test the validity of Lust's claim for Japanese.

The Imitation Experiment

The subjects were 72 children ranging in age from 3;5 to 11;11. They were divided into six age groups in the manner illustrated in Table 4.

Table 4. Subjects.

Group	Age	Number M / F	Total	Ave.Age M / F	Ave.Age
K1	3	6 / 6	12	3;9/3;8	3;8
K2	4	6 / 6	12	4;5/4;7	4;6
K3	5	6 / 6	12	5;5/5;4	5;4
G2	7	6 / 6	12	7;7/7;5	7;6
G4	9	6 / 6	12	9;8/9;6	9;7
G6	11	6 / 6	12	11;8/11;7	11;8
Total		36/36	72		

Although the children in K1 did not participate in the other three tasks, they took part in the imitation task. Children in K1 as well as K2 and K3 came from the same day care centre in Iwahune. The subjects described in section 2.0 were also employed in this experiment.

In an attempt to test Lust's (1983) predictions concerning directionality preferences for pronominalization, I designed an imitation task consisting of three sentence types with three tokens of each type. A total of nine sentences were given to the children. Six of the nine sentences were based on the tokens used in Lust's (1981:78) experiment and translated into Japanese while three tokens using the connective "after" were added for this experiment. Lust originally designed five sentence types which are exemplified again below. (The subscript $_{\underline{s}}$ indicates occurrence in a subordinate clause.)

I NP-NPs Jane was sad, because Jane dropped the ice cream cone.

II NPs-NP Because Sam was thirsty, Sam drank some soda.

III NP-PROs Tommy ran fast because he heard a lion.

IV PROs-NP Because she was tired, Mommy was sleeping.

V NPs-PRO Because Jenna saw a mouse, she ran away.

The Japanese counterparts of these sentences are listed below. (Brackets show the location of a subordinate clause.)

I NP-NPs Jane wa [Jane ga aisu-kuriimu o otosi-ta kara]
T N ice-cream A drop-P because
kanasikat-ta.
sad-P

II NPs-NP [Sam wa nodo ga kawai-ta kara] Sam wa sooda o
T throat N thirst-P because T soda A
non-da.
drink-P

III NP-PROs Tommy wa [ø raion ga hoeru no o kii-ta kara]
T PRO lion N roar COM A hear-P because
hayaku hasit-ta.
fast run-P

IV PROs-NP [ø kutabiretei-ta kara] Okaa-san wa netei-ta.
PRO tired-P because mother T sleeping-P

V NPs-PRO [Jenna wa nezumi o mi-ta kara] ø nige-ta.
T mouse A see-P becausePRO run away-P

In the Japanese counterparts of Lust's type I and III two identical NPs appear in sentence initial position and their grammatical roles must be differentiated on the basis of the case markers -wa (theme) and -ga (nominative). This case marking system distinguishes the matrix subject (marked by -wa) from the subordinate subject (marked by -ga) in the adult grammar.

Unfortunately, however, topic and nominative case markings are acquired at a fairly late stage in language acquisition (Harada 1983). This suggests that children may not be able to use case markers effectively to interpret the sentences we are considering. For this reason, type I and III sentences were not used in the experiment which I will discuss here. I supplied three tokens for each of the remaining three structures.

The children were told to repeat a sentence immediately after the experimenter said it to them. Sentences were addressed to the child as many times as was necessary to elicit a response.

The children were given two one-clause practice sentences to ensure that they understood the task. A sample practice sentence is given below.

Midori-tyan ga onigokko o si-ta.
N hide & seek A do-P
(Midori played hide-and-seek.)

All the children passed the practice session easily. In the experiment, three tokens of each of the type IV and V sentences were presented to the children in random order followed by three of the redundant type II sentences. The pronominalized sentences were ordered before the sentences containing redundant NPs because a pilot study suggested that children were apt to assume two lexical NPs were obligatory in every sentence when they are exposed first to the redundant sentences.

Responses were scored for correct imitation of nouns and pronouns. There were five response types besides correct imita-

tion; conversion to forward anaphora, conversion to backward anaphora, double pronominalization, creation of a redundant NP and deletion of one clause.

A three-way ANOVA revealed that age ($F(5,180)=29.281$, $p<.0001$) and sentence types ($F(2,180)=126.131$, $p<.0001$) were significant as main effects. The percentages for each response type are tabulated in Table 5 and represented graphically in Figures 3 to 5.

Table 5. Results of Directionality Study.

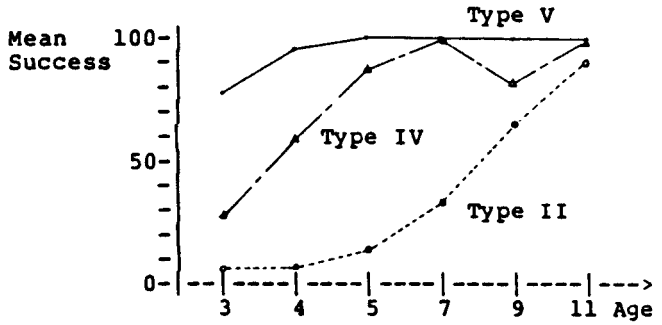
		Age						
	Resp.	3	4	5	7	9	11	Mean
II	✓	5.6	5.6	11.1	30.6	63.9	88.9	34.3
	F	63.9	86.1	88.9	69.4	36.1	11.1	59.3
	B	2.8	0.0	0.0	0.0	0.0	0.0	0.5
	∅-∅	2.8	0.0	0.0	0.0	0.0	0.0	0.5
	*	13.9	8.3	0.0	0.0	0.0	0.0	3.7
	?	11.1	0.0	0.0	0.0	0.0	0.0	1.9
IV	F	38.9	27.8	13.9	0.0	13.9	0.0	15.8
	B ✓	27.8	58.3	86.1	100.0	80.6	100.0	75.5
	PRO-∅	16.7	8.3	0.0	0.0	5.6	0.0	5.1
	NP-NP	2.8	2.8	0.0	0.0	0.0	0.0	0.9
	*	5.6	2.8	0.0	0.0	0.0	0.0	1.4
	?	8.3	0.0	0.0	0.0	0.0	0.0	1.4
V	F ✓	77.8	94.4	100.0	100.0	100.0	100.0	95.4
	B	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	∅-PRO	2.8	2.8	0.0	0.0	0.0	0.0	2.8
	NP-NP	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	*	13.9	2.8	0.0	0.0	0.0	0.0	2.8
	?	5.6	0.0	0.0	0.0	0.0	0.0	0.9

Note:

Sentence Structures	Response Type
II NP-NP	✓ Correct
IV PRO-NP	F Forward Response
V NP-PRO	B Backward Response
	NP-NP An NP Insertion
	PRO-NP An NP Deletion
	* Error
	? No Response

As Figure 3 illustrates, the percentage of correct imitation increases constantly with age.

Figure 3. Results of Directionality Study.

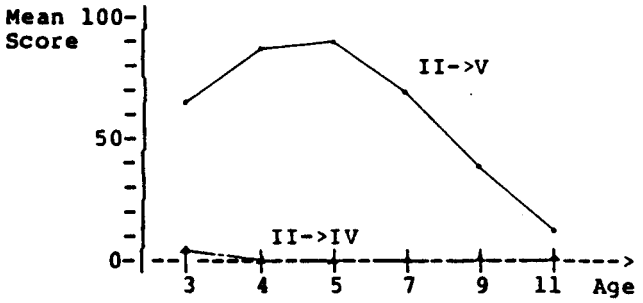


Note: Type II (NP-NP)
Type IV (Pro-NP)
Type V (NP-PRO)

The easiest sentence structure involves forward pronominalization (type V [NP-PRO]); even the youngest group (age 3) correctly imitated it in 77.8% of the cases. Five-year-olds and the older children achieved 100% correct imitation on this structure. In contrast, the redundant structure (type II [NP-NP]) was the hardest. Five-year-olds achieved a mean score of only 11% although they performed without error on type V.

Figure 4 illustrates the major error patterns for the redundant structure.

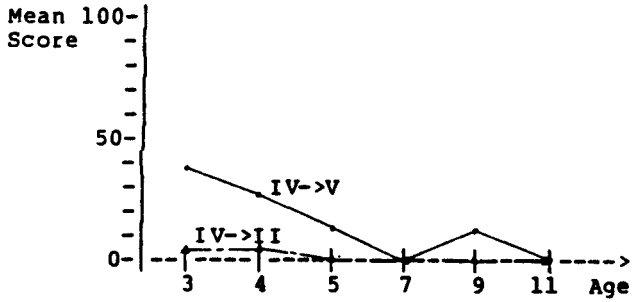
Figure 4. Conversion of Type II (Redundant) Structure.



Redundant sentences were overwhelmingly converted into forward patterns (type V) by replacing the second NP with a zero pronoun. A chi-square analysis showed this structural conversion to be a statistically significant trend (x^2 (1)=6561.0, p,.001). Notice that there was virtually no conversion to the backward pattern (type IV).

The major error on backward anaphora (type IV) involved conversion to the forward pattern (type V) by switching the positions of a zero pronoun and an NP. This is indicated in Figure 5.

Figure 5. Conversion of Type IV (Backward Anaphora) Structures.



Conversion to a forward pattern of anaphora was most common among the youngest group (38.9%). The only other error in this group was made by a 3-year-old who converted backward pronominalization to a redundant structure by replacing the zero pronoun with an NP. Forward anaphora, however, did not involve these major structural changes.

From these results it is clear that pronominalized structures are easier than redundant structures and that forward pronominalization is far easier than backward. These results are compared with results obtained from English-speaking children by Lust (1981) in Table 6.

Table 6. Comparison of Scores Between English and Japanese Children.

S	Resp	Eng/Jap	Age 3	Age 4	Age 5	Mean
II	√	English	30.4	45.2	63.9	46.5
		Japanese	4.2	8.3	12.5	8.3
	F	English	52.0	45.5	34.0	43.8
		Japanese	70.8	87.5	87.5	81.9
	B	English	0.0	0.0	0.0	0.0
		Japanese	4.2	0.0	0.0	1.4
IV	F	English	32.0	27.3	25.0	28.1
		Japanese	37.5	20.8	12.5	23.6
	B √	English	55.4	60.2	66.7	60.8
		Japanese	25.0	62.5	87.5	58.3
V	F √	English	71.5	84.3	91.7	82.5
		Japanese	75.0	91.7	100.0	88.9
	B	English	--	--	--	--
		Japanese	0.0	0.0	0.0	0.0

Note: Sentence Structure
II NP-NP(Redundant)
IV PRO-NP(Backward)
V NP-PRO(Forward)

Response Type
√ Correct
F Forward Response
B Backward Response

As this comparison shows, Japanese children converted redundant structures into the forward pattern of anaphora almost twice as much as English children did (81.9% versus 82.5%). Furthermore, Japanese children converted backward anaphora to the forward pattern only slightly less than English children (23.6% versus 28.1%).

It is clear from the results cited above that there is a strong preference for forward anaphora among Japanese children. These results contradict Lust's prediction that in left-branching languages children will prefer backward anaphora and suggests that children universally prefer the forward pattern of anaphora regardless of the PBD in the language they are learning. In contrast, the version of processing theory which favors forward patterns of anaphora seems to account for the data.

CONCLUSION

In my experiments the Japanese children observed the Subject Antecedent Condition regardless of the grammatical relations present in the sentences. It was also found that children took humanness rather than subjecthood to be the vital factor in the interpretation of the Japanese reflexive zibun.

With respect to Principal Branching Direction, my study disconfirms Lust's (1981, 1983) claim about the Constraint on

Anaphora. Like English speaking children, the Japanese children overwhelmingly preferred the forward pattern of anaphora. These findings seem to support the Processing Theory stated in (22) above which predicts that children will favour the forward pattern of anaphora regardless of the PBD of the language and that it is universally less marked than the backward pattern of anaphora.

FOOTNOTES

[1]Five-year-olds did not respond 41.7% of the time, which is the highest incidence of refusal for any age group. It is conceivable that children at this stage believe that subject NPs should have human referents. Thus they might have been puzzled over the non-human subject in the stimulus sentence. Somehow, this period of confusion does not extend to the following stage (7-year-olds) in this experiment.

[2]See Terazu (1983) for a critique of Lust's studies and O,Grady, Suzuki-Wei and Cho (1985) for an alternative account of Lust's results.

APPENDIX

The Act Out Experiment

Pretest Sentences

1. Okaa-san ga zibun no kata o tatai-ta.
   mother N self G shoulder A pat-P
   (Mother patted self's shoulder.)

2. Midori-tyan ga zibun o tunet-ta.
   N self A pinch-P
   (Midori pinched self.)

Experimental Sentences

1. (Ken touched Hana with self's glove.)

(1) Ken-tyan ga Hana-tyan o zibun no tebukuro de sawat-ta.
N A self G glove with touch-P

(2) Ken-tyan ga zibun no tebukuro de Hana-tyan o sawat-ta.
N self G glove with A touch-P

(3) Zibun no tebukuro de Ken-tyan ga Hana-tyan o sawat-ta.
self G glove with N A touch-P

(4) Hana-tyan o Ken-tyan ga zibun no tebukuro de sawat-ta.
A N self G glove with touch-P

(5) Hana-tyan o zibun no tebukuro de Ken-tyan ga sawat-ta.
A self G glove with N touch-P

(6) Zibun no tebukuro de Hana-tyan o Ken-tyan ga sawat-ta.
self G glove with A N touch-P

2. Midori-tyan ga Ken-tyan o zibun no musimegane
   N A self G magnifying glass
   de mi-ta.
   with see-P
   (Midori saw Ken with self's magnifying glass.)

3. Midori-tyan ga Hana-tyan o zibun no hankati de
   N A self G handkerchief with
   mekakusi-si-ta.
   blindfold-P
   (Midori blindfolded Hana with self's handkerchief.)

4. Ken-tyan ga Midori-tyan ni zibun no omotya o mise-ta.
N D self G toy A show-P
(Ken showed Midori self's toy.)

5. Midori-tyan ga Hana-tyan ni zibun no booru o nage-ta.
N D self G ball A throw-P
(Midori threw self's ball to Hana.)

6. Hana-tyan ga Ken-tyan ni zibun no boosi o kabuse-ta.
N D self G hat A put-P
(Hana put self's hat on Ken.)

7. Hana-tyan no Okaa-san ga zibun no yoohuku o arat-ta.
G mother N self G clothes A wash-P
(Hana's mother washed self's clothes.)

8. Ken-tyan no Otoo-san ga zibun no kutu o migai-ta.
G father N self G shose A polish-P
(Ken's father polished self's shoes.)

9. Midori-tyan ga Ken-tyan no atama ni zibun no hon o
N G head on self G book A
nose-ta.
put-P
(Midori put self's book on Ken's head.)

10. Zibun ga Ken-tyan no Otoo-san o tatai-ta.
self N G father A hit-P
(Self hit Ken's father.)

11. Zibun ga Hana-tyan no Okaa-san ni batti o tuke-ta.
self N G mother D badge A put-P
(Self put a badge on Hana's mother.)

12. Zibun ga Ken-tyan no Otoo-san o tunet-ta.
self N G father A pinch-P
(Self pinched Ken's father.)

13. Hana-tyan wa Ken-tyan ga zibun o tunet-ta to it-ta.
T N self A pinch-P COM say-P
(Hana said that Ken pinched self.)

14. Midori-tyan wa Ken-tyan ni Hana-tyan ga zibun o
T D N self A
kai-ta to it-ta.
scratch-P COM say-P
(Midori said to Ken that Hana scratched self.)

15. Ken-tyan wa Hana-tyan ga zibun ni batti o tuke-ta to
T N self D badge A put-P COM
it-ta.
say-P
(Ken said that Hana put a badge on self.)

Question-Answer Task 1

Pretest Sentences

1. Midori-tyan ga zibun o tunet-ta.
N self A pinch-P
(Midori pinched self.)

2. Ken-tyan ga zibun o kai-ta.
N self A scratch-P
(Ken scratched self.)

Experimental Sentences

1. Hebi ga Hana-tyan o zibun no niwa de kan-da.
snake N A self G yard in bite-P
(A snake bit Hana in self's yard.)

2. Raion ga Otoo-san ni zibun no kodomo no tikaku de
lion N father D self G child G near L
hoe-ta.
roar-P
(A lion roared at father near self's child.)

3. Sika ga Midori-tyan no senaka o zibun no hiroba de
deer N G back A self G open place L
tutui-ta.
poke-P
(A deer poked at Midori's back in self's open place.)

The Imitation Experiment

Pretest Sentences

1. Midori-tyan ga onigokko o si-ta.
N hide&seek A do-P
(Midori played hide-and-seek.)

2. Okaa-san ga keeki o yai-ta.
mother N cake A bake-P
(Mother baked a cake.)

Experimental Sentences

1. Ken-tyan wa nodo ga kawai-ta kara Ken-tyan wa zyuusu o
T throat N thirsty because T juice A
non-da.
drink-P
(Because Ken was thirsty, Ken drank juice.)

2. Otoo-san ga kuruma o untensi-tei-ru aidani Otoo-san wa
father N car A drive-ing while father T
torakku ni butukat-ta.
truck D bump-P
(While Father was driving a car, Father bumped a
truck.)

3. Midori-tyan wa ason-da atode Midori-tyan wa Okaa-san o
T play-P after T mother A
tetudat-ta.
help-P
(After Midori played, Midori helped Mother.)

4. Ø kutabire-tei-ta kara Okaa-san wa ne-tei-ta.
PRO tired-P because mother T sleep-ing-P
(Because she was tired, Mother was sleeping.)

5. Ø soto ni i-ta aidani Ken-tyan wa syooboosya o mi-ta.
PRO outside be-P while T fire truck A see-P
(While he was outside, Ken saw a fire truck.)

6. Ø kingyo ni esa o age-ta atode Hana-tayn wa puuru
PRO gold fish D bait A give-P after T pool
e it-ta.
to go-P
(After she fed gold fish, Hana went to pool.)

7. Hana-tyan wa nezumi o mi-ta kara Ø nige-ta.
T mouse A see-P because PRO run away-P
(Because Hana saw a mouse, she ran away.)

8. Ken-tyan wa uma ni not-tei-ru aida Ø mawari o
T horse on ride-ing while PRO around A
mi-ta.
look-P
(While Ken was riding a horse, he looked around.)

9. Otoo-san wa outi ni kaet-te-ki-ta atode ø sinbun
father T home to come-P after PRO newspaper
o yon-da.
A read-P
(After Father came home, he read a newspaper.)

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