LANGUAGE AND COGNITIVE PROCESSES, 1999, *14* (5/6), 663–686

A U-shaped Relative Clause Attachment Preference in Japanese

Edson T. Miyamoto
University of Tokyo

Edward Gibson
Massachusetts Institute of Technology

Neal J. Pearlmutter
Northeastern University

Takako Aikawa
Microsoft

Shigeru Miyagawa
Massachusetts Institute of Technology

This paper presents results from a self-paced reading experiment in Japanese investigating attachment preferences for relative clauses to three ensuing potential nominal heads. Similar to previous results from the processing of English, Spanish and German, we observed the following non-monotonic preference ordering among the three attachment sites: most local, least local, intermediate. We discuss the result in light of two types of parsing models: models that only consider attaching a modifier to candidate sites whose lexical heads have already been encountered, and models in which predicted categories are also considered as possible modification sites. We contend that the preference to attach to the least local site over the intermediate site

Requests for reprints should be addressed to Edson Miyamoto, Tsujii Lab., Department of Information Science, Faculty of Science, University of Tokyo, 7-3-1 Hongo Bunkyo-ku Tokyo, 113-0033 Japan. Email: etm@is.s.u-tokyo.ac.jp

We would like to thank the participants in the sentence processing laboratory at MIT and the audience at the 11th CUNY Conference on Human Sentence Processing for helpful discussions on earlier presentations of this work. All remaining errors are our own. Partial funding for the project was provided by the JST/MIT joint international research project "Mind/Articulation". The first author was supported by a fellowship from CNPq (Brasília, Brazil).

argues against the first type of model, and supports the second type of model with a factor such as predicate proximity or anaphor resolution driving the preference to attach the RC to the least local candidate site.

INTRODUCTION

In the sentence processing literature, principles such as *right association*, *late closure*, and *locality* have often been assumed to apply universally across languages, favouring the interpretation in which a modifying phrase is attached to the closest possible site in linear terms (Frazier, & Fodor, 1978; Gibson, 1991, 1998; Kimball, 1973; Phillips, 1995). Recent proposals by Gibson, Pearlmutter, Canseco-Gonzalez, and Hickok (1996) and Hemforth, Konieczny, Scheepers, and Strube (1998) have refined this view by suggesting factors that modulate locality, so as to account for cross-linguistic results in the attachment of relative clauses (RCs) (see Mitchell & Brysbaert, 1998, for a recent overview). The purpose of the present paper is to investigate the attachment preferences of head-final RCs in Japanese.

In an experiment measuring reading time and grammaticality judgement accuracy Gibson et al. (1996) showed that, in sentence fragments such as (1a) and (1b) with three potential host nouns, native speakers preferred to attach the RC to the low noun (i.e., N_3, the lowest candidate noun in the tree structure) both in Spanish and English. Furthermore, attachment to the high noun (N_1) was preferred over the middle noun (N_2). Note that RC attachment in (1) was disambiguated by manipulating number on the head nouns so that only one of them is compatible with the verbs in the RC (namely, fue dañada in (1a) and was in (1b)).

Example (1) *head-initial RCs*

	N_1		N_2		N_3	RC
a.	la(s) *lámpara(s)*	cerca de	la(s) *pintura(s)*	de	la(s) *casa(s)*	[que fue dañada en la inundación]
b.	the *lamp(s)*	near the	*painting(s)*	of the	*house(s)*	[that was damaged in the flood]

Cuetos, Mitchell, and Corley (1996) raised some potential methodological problems with the grammaticality judgement task used by Gibson et al. (1996). However, the original pattern of results was replicated using reading time measures in Spanish (Gibson, Pearlmutter, & Torrens, in press) and German (Walter, & Hemforth, 1998).

The overall preference for low attachment found by Gibson et al. (1996) is compatible with locality. However, the advantage of the high over the middle noun is not. In order to explain this U-shaped preference curve (i.e., with the middle noun as the least preferred site), Gibson et al. (1996)

proposed a second factor, *predicate proximity*, which prefers the attachment of the modifying phrase to the high site (N_1) and therefore competes with locality. The attachment preference then results from the interaction of these two factors. According to predicate proximity, modifiers are preferentially attached to the phrase closest in structural terms to the predicate of the sentence. In the construction in (1), predicate proximity is not strong enough to override locality, resulting in the preference for N_3. But it is strong enough to yield the preference for N_1 over N_2.

Hemforth and colleagues (Hemforth et al., 1998; Walter, & Hemforth, 1998) suggested an alternative proposal in which the factor favouring the attachment of a RC to the higher site is related to the process of finding the antecedent for the relative pronoun in the RC (e.g., who in English) as this process may be biased towards discourse salient entities such as the head of a complex NP (e.g., N_1 in (1)).

The purpose of this paper is to explore some aspects of RC attachment when three potential host nouns are available. In particular, we will consider the case in which the RC precedes the head nouns and is not initiated by a complementiser or a relative pronoun, as in (2).

Example (2) *head-final RCs*
RC N_3 postposition N_2 postposition N_1

In (2), we have the head-final RC construction in languages such as Japanese, Korean and Tamil, which have postpositions rather than prepositions and therefore present the nouns in the opposite order to that of head-initial languages (cf. (1)). In linear terms (i.e., in terms of the number of intervening words), N_3 is still the closest site to the RC and consequently should be favoured by locality more than the other two sites. Moreover, structurally, N_3 is the lowest noun available for attachment, and the farthest one (N_1) is the highest.

Assuming an incremental parser, which processes each incoming word immediately and tries to integrate it without delay to the phrase marker built so far (e.g., Marslen-Wilson, & Tyler, 1980, 1981), the positioning of the head nouns after the RC in the head-final RC construction makes it particularly interesting to compare to its head-initial counterpart. In head-initial RC constructions, the attachment decision is made after the three nouns have been encountered. In head-final RCs, however, the RC is processed first and only then are the nouns detected. Hence, under an incremental model, the parser should attempt to attach the RC to each incoming noun in turn until a successful attachment is made.[1] Because the

[1] Here, *attachment* refers to the process of determining the head noun that the RC modifies independent of whether the actual constituent being processed and incorporated into the mental representation at that point is the RC (as in head-initial constructions) or the head noun (as in head-final constructions).

first noun (N_3) is the only available candidate initially, it is natural to expect it to be the most preferred site for attachment. If attachment to the first noun is not successful, incrementality predicts that the middle noun is favoured over the high noun as the parser attempts to resolve the attachment as soon as possible.

However, this overlooks an important factor in the processing of head-final constructions in that the parser's decisions may be influenced by a category that is predicted to be upcoming in the input string. Evidence that predicted categories influence the parser's behaviour is provided by Yamashita (1994) who showed that native Japanese speakers do not wait for the detection of a verb in order to start interpreting a sequence of NPs. Instead these NPs are interpreted as the arguments of a predicted verb whose properties (e.g., ditransitivity) are only partially determinable from the case markers on those NPs.

Thus, when discussing the processing of head-final RC constructions with multiple potential heads, it is necessary to consider whether there is partial information predicting a category, and, if so, how such information could affect the attachment of the RC. First, partial information may be available in this construction in the form of a particle (e.g., a postposition) marking a noun being processed, which indicates that a higher noun is to come. For example, when processing N_3 in (2) above, the parser may be already predicting another noun because of the postposition that immediately follows N_3, assuming that the postposition can be seen parafoveally while the noun is read (see Rayner, Sereno, Morris, Schmauder, & Clifton, 1989, for evidence in English). Second, if a particle does predict a higher noun, then there are two alternative ways for the parser to treat such partial information with respect to attachment decisions. It is conceivable that whenever a lexicalised candidate (i.e., a category whose head has already been read in the input) is available, the parser ignores any predicted category as a potential site for attachment. In other words, the parser may only use predicted categories as a last resort when no lexicalised options are available. We will refer to this strategy as parsing with lexically-realised candidates, or *lexicalised-parsing* (cf. the *head attachment principle*; Konieczny, Hemforth, Scheepers, & Strube, 1997). Alternatively, the parser may consider associating the RC to a predicted site whose head is still to be processed, even if a lexically-realised candidate is also available. We will refer to this type of model as a *predictive-parsing* model.

The following are the predictions that lexicalised- and predictive-parsing make in the head-final RC construction with three candidate sites. In lexicalised-parsing, whenever there is one lexicalised candidate noun available, the parser will not consider a predicted category as a possible candidate, preferring instead to use a lexicalised noun as the head of the

RC. This is exactly the situation when the low noun is read together with the following postposition in the sense that there is a lexicalised noun (the low noun) and a predicted noun (the middle noun), thus the low noun should be preferred over the middle noun. Similarly when the middle noun and the ensuing postposition are read, the high noun is being predicted but it is not yet lexicalised. Consequently, if the low noun was not previously interpreted as the head of the RC, then the middle noun should now be preferred over the high noun. Thus, according to lexicalised-parsing, the parser favours attachment to the nouns in the order that they become available—low, middle, high—a monotonic decreasing preference ordering of the sites. In more general terms, lexicalised-parsing is incompatible with any preference for a higher site (N_H) in detriment of a lower one (N_L) because, at some point during parsing, N_L will be lexicalised and available for attachment whereas N_H will not have been lexicalised yet and therefore is not available as a head for the RC. Note that the strength with which factors such as predicate proximity (Gibson et al., 1996) and anaphor resolution (Hemforth et al., 1998) favour higher sites is irrelevant in lexicalised-parsing because the lower sites are lexicalised sooner, hence preempting any preference to attach to a higher (upcoming) site.

In contrast, under predictive-parsing, it is possible that an upcoming noun may be preferred as the attachment site for the RC over a noun already available. In fact, most preference patterns in the Japanese RC construction would be compatible with predictive-parsing. The predictions in this case will crucially depend on the weights of the factors favouring the low site (locality) and the high site (predicate proximity or anaphor resolution) at each point during the processing of the RC heads. With the exception of the middle site being preferred overall, varying such an assignment of weights within predictive-parsing could account for most outcomes in the present experiment, but if the weights of the factors in the Japanese construction should mirror the ones proposed for Spanish and English (Gibson et al., 1996), then a U-shaped preference ordering of the sites would be the expected result.

Kamide and colleagues provide some suggestive evidence for predictive-parsing in two self-paced reading experiments testing the attachment of head-final RCs with two potential hosts in Japanese. In the first experiment, Kamide and Mitchell (1997) reported an initial advantage for low attachment, supporting locality. In a follow-up experiment (Kamide, Mitchell, Fodor, & Inoue, 1998), the segmentation for their self-paced presentation was modified so that, contrary to the presentation in the original experiment, the first head noun and the following particle (the genitive market no) were presented in the same region. Although the low condition was still faster than the high condition, this difference was no longer significant. This suggests that locality was weakened by the visibility

of the genitive marker, which signalled that another site was upcoming. However, based on the lack of statistical significance in this second study alone, it is not possible to determine the extent to which the predicted category is in fact exerting an influence in the process. More convincing evidence in support of predictive-parsing would be a statistically significant preference to associate an RC to a predicted candidate over a lexicalised one.

In summary, there are two distinct predictions being made in relation to attachment preferences in head-final RC constructions with three head nouns. First, there is the prediction for a monotonic curve with the middle (N_2) being preferred over the high (N_1). And second, there is the prediction for a U-shaped curve, in which the middle site (N_2) is the least preferred. In both cases, the most local site (N_3) is predicted to be the most preferred. We investigated these predictions in the head-final RC construction with three potential attachment sites in Japanese.

METHOD

Participants

Thirty-nine native speakers of Japanese participated for $20 each. They had all come to the U.S. as adults and were residents of the Boston area. One participant was eliminated for answering the comprehensive questions at chance level, and two were eliminated because of extremely long or short baseline reading times (see the Analysis section for details).

TABLE 1
Regions for Self-paced Reading Presentation

	Region					
Condition	1	2	3	4	5	6
Low	RC_A	N_A $postp_1$	N_B $postp_2$	N_C topic	$pred_1$	$pred_2$
Mid	RC_B	N_A $postp_1$	N_B $postp_2$	N_C topic	$pred_1$	$pred_2$
High	RC_C	N_A $postp_1$	N_B $postp_2$	N_C topic	$pred_1$	$pred_2$
Mid	RC_A	N_C $postp_1$	N_A $postp_2$	N_B topic	$pred_1$	$pred_2$
High	RC_B	N_C $postp_1$	N_A $postp_2$	N_B topic	$pred_1$	$pred_2$
Low	RC_C	N_C $postp_1$	N_A $postp_2$	N_B topic	$pred_1$	$pred_2$
High	RC_A	N_B $postp_1$	N_C $postp_2$	N_A topic	$pred_1$	$pred_2$
Low	RC_B	N_B $postp_1$	N_C $postp_2$	N_A topic	$pred_1$	$pred_2$
Mid	RC_C	N_B $postp_1$	N_C $postp_2$	N_A topic	$pred_1$	$pred_2$

Note: letter subscripts indicate attachment, so that RC_A plausibility attaches only to N_A, for example. Postp = postposition; topic = topic marker; pred = predicate.

Materials

Sentences like those in (3) were presented using Japanese characters, with the attachment of the RC disambiguated by plausibility. The potential attachment sites are in italics in (3); the slashes indicate the divisions between regions for the self-paced reading presentation. In (3a), the RC is biased towards the low site (N_3); in (3b), towards the middle site (N_2); and in (3c), towards the high site (N_1). Appendix B contains a complete list of the stimuli.

Example (3) *head-final RCs*

a.

	RC	/ N_3	$postp_1$	/ N_2	$postp_2$	/
[$_{RC}$	Eda-ga	oreteiru]/	*shigemi*-no	yoko-no/	*hito*-no	ushiro-no/
	branch-$_{Nom}$	broken /	bush	beside /	person	behind /

N_1-topic	/ $pred_1$	/ $pred_2$
jitensha-wa/	kireide/	ooki-katta
bicycle-$_{Top}$ /	pretty /	big-was

b.

[$_{RC}$ Paati-de atta]/ . . .
party-$_{Loc}$ met

c.

[$_{RC}$ Gakkou-made notta]/ . . .
school-to rode

'The bicycle behind the person beside the bush that *has a broken branch*
I met at the party
I rode to school
was pretty and big.'

In order to control for potential lexical and plausibility differences, the three head nouns were rotated through the three attachment sites for each of the three plausibility-biased RCs, yielding a total of nine subconditions, as schematically represented in Table 1.

Because of the plausibility biases, each RC in Table 1 has to attach to the same noun (as the subscripts A, B, C indicate), but the position of the noun itself varies from condition to condition. For example, in (3b), the RC that I met at the party always attaches to person, but the position of this head noun (high, middle or low) depends on the subcondition.

In order to make all of the head noun rotations plausible within an item, only locative postpositions were used in the items. Eight different complex

postpositions were used (beside, near, on the left (side) of, on the right (side) of, in front of, next to, behind, on the other side of) in the sense that they all included a noun as part of their complex (e.g., the noun front in in front of or the noun left in on the left of in English). As in English, this head noun is not a grammatical candidate attachment site for any modifier, so there are exactly three potential attachment sites for the RC in all of the target items.

In the segmentation of the sentences for the self-paced reading presentation, regions 2 and 3 included a head noun and a postposition together. Words are not usually separated by spaces in written Japanese, hence there is no a priori natural way to segment the regions. However, two factors led us to display each PP (i.e., a postpositional phrase comprised of a postposition with its preceding noun) as a single region. First, particles such as no (which initiated the locatives used as postpositions) mark the previous noun and are not used on their own. Second, the comparison between lexicalised-parsing and predictive-parsing is only possible if the partial information (i.e., the postposition predicting a higher noun) is available at the earliest possible point. For lexicalised-parsing any such delay would not have any impact (as the parser is not taking partial information into account), but for predictive-parsing a slight delay may disrupt the use of information and could create a confound.

Nine lists were created by distributing the 36 stimuli in a Latin Square design. Each participant saw exactly one of the lists intermixed with 65 unrelated items in pseudo-random order. After each sentence, participants answered a yes/no comprehension question presented on a new screen.

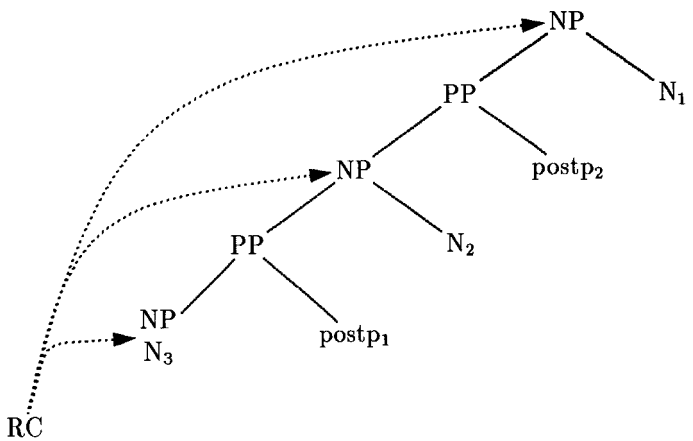

FIG. 1. N_3 modifying N_2—RC can attach to any of the 3 nouns.

Stimulus norming

A crucial assumption in this experiment is that attachment to each of the three sites is grammatical. In particular, in the present case, it is necessary to guarantee that attachment of the RC to N_2 is grammatical by making sure that the first PP (N_3 $postp_1$) modifies N_2 (see Figure 1) and not N_1 (see Figure 2). In the latter structure, it would not be possible to attach the RC to N_2, assuming that attachments leading to crossed branches are ungrammatical.

To ensure that the PP containing N_3 modified N_2 and not N_1 in our stimuli, we presented a separate group of 46 native Japanese speakers with fragments like (4a) and questions about which of N_1 or N_2 was modified by N_3, as in (4b).

Example (4)

	N_3	$postp_1$	N_2	$postp_2$	N_1
a.	shigemi-no	yoko-no	hito-no	ushiro-no	jitensha
	bush	beside	person	behind	bicycle

"the bicycle behind the person beside the bush"

b.	shigemi-no	yoko-ni-wa	hito-ga	imasuka	soretomo
	bush	beside$_{-Loc\ -Top}$	person$_{-Nom}$	is	or
	jitensha-ga	arimasuka?			
	bicycle$_{-Nom}$	is			

"Is the person or the bicycle beside the bush?"

As in Table 1, each triple of head nouns was rotated through three different orderings, yielding a total of nine different orderings for each item in the main experiment. Each participant saw exactly one of the nine orderings of each of the 36 items mixed pseudo-randomly with 44 filler items. Some of the fillers were biased for low or high attachment and were

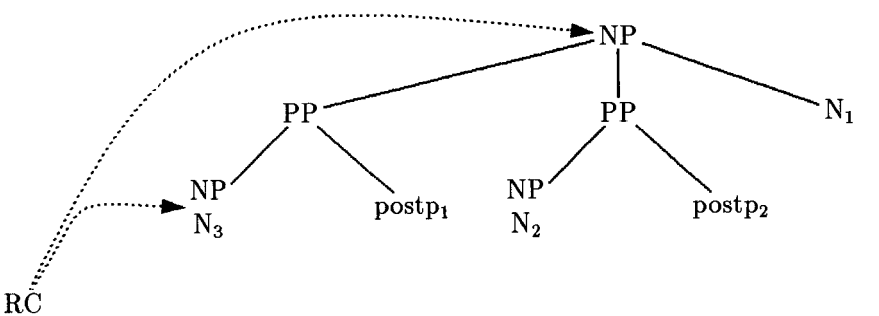

FIG. 2. N_3 modifying N_1—RC cannot attach to N_2.

used to ensure that participants were not using any particular strategy in the survey. Nine participants' data were eliminated for not answering these foil items appropriately.

As expected, participants had a strong preference for the low attachment, choosing to attach N_3 to the lower noun (N_2) more than 85% of the time. In each of the 36 triples, low attachment was preferred at least 75% of the time.

Procedure

The experiment was conducted on a Power Macintosh 7500/100 running PsyScope (Cohen, MacWhinney, Flatt, & Provost, 1993) with a button-box. Participants were timed in a phrase-by-phrase self-paced non-cumulative moving-window reading task (Just, Carpenter, & Woolley, 1982). The characters initially appeared as dots, and participants pressed the leftmost button of the button-box to reveal each subsequent region of the sentence and cause all other regions to revert to dots. At the end of each sentence, the yes/no question appeared on a new screen, which participants answered by pressing one of two buttons. No feedback was given.

The experimental trials were preceded by one screen of instructions and eight practice trials. All sentences were presented on a single line. The experiment took participants approximately 20 minutes.

Analysis

We analysed comprehension question response accuracy and reading times. For the purposes of analysis and presentation of the data, the nine subconditions in Table 1 were collapsed into the three conditions of interest (low, mid, high attachment).

Analyses were conducted on residual reading times per region (Ferreira & Clifton, 1986), derived by subtracting from raw reading times each participant's predicted time to read regions of the same length (measured in number of characters), which in turn was calculated from a linear regression equation across all of a participant's sentences in the experiment. The residual reading times were trimmed so that data points beyond four standard deviations from the relevant condition × region cell mean were discarded, corresponding to less than 1% of the total data. The means and analyses presented below are based on the trimmed residual reading times.

Two participants were eliminated for having unusual intercepts in their regression equations (1949 msec and −1505 msec). The other 36 participants had intercepts between 155 and 1008 msec ($M = 524$ msec; $SD = 232$ msec). Inclusion of the two participants eliminated did not alter the patterns in the data.

RESULTS

Comprehension question response accuracy

Performance in the low attachment condition (91% correct) was better than in the middle (85%) ($F_1(1,35) = 8.51$, $P < .01$; $F_2(1,35) = 12.3$, $P < .01$) or the high (86%) conditions ($F_1(1,35) = 9.33$, $P < .01$; $F_2(1,35) = 8.23$, $P < .01$), but the high and middle conditions did not differ (Fs < 1).

Reading times

Figure 3 shows the residual reading times by region. No differences were present (Fs < 1) in the first region (the RC). In region 2 (the first PP), the low attachment condition was significantly faster than the middle condition ($F_1(1,35) = 5.37$, $P < .05$; $F_2(1,35) = 5.67$, $P < .05$) and the high condition ($F_1(1,35) = 10.5$, $P < .01$; $F_2(1,35) = 7.87$, $P < .01$). The high and middle conditions did not differ (Fs < 1).

In region 3 (the second PP), the high condition was faster than the low condition ($F_1(1,35) = 13.2$, $P < .01$; $F_2(1,35) = 11.9$, $P < .01$) and the middle condition ($F_1(1,35) = 8.76$, $P < .01$; $F_2(1,35) = 10.2$, $P < .01$); but the low and middle conditions did not differ ($F_1(1,35) = 1.17$, $P = .287$; $F_2(1,35) = 1.21$, $P = .278$).

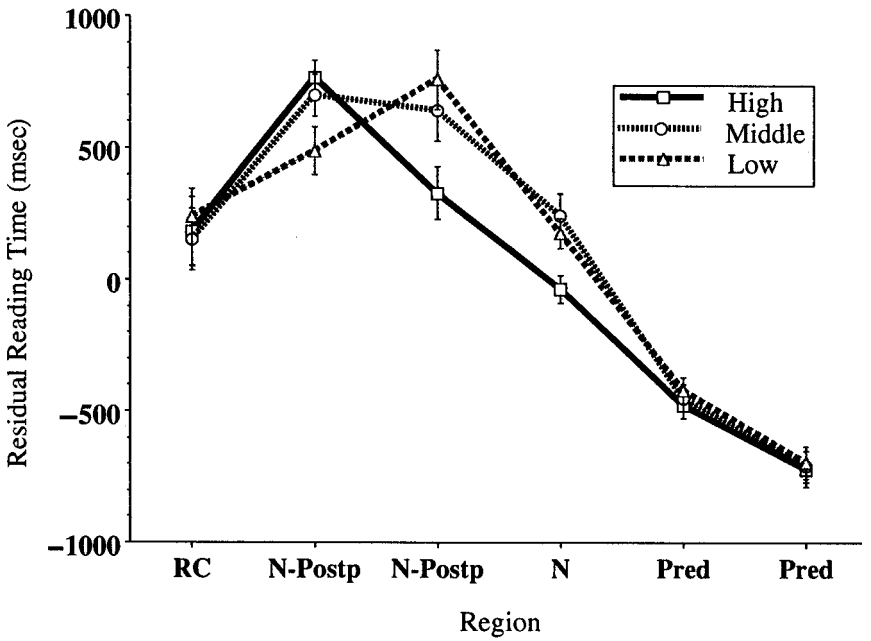

FIG. 3. Residual reading times for each region.

Region 4 (the third noun and the topic marker) presented the same pattern as region 3: the high condition was faster than the low condition ($F_1(1,35) = 9.76$, $P < .01$; $F_2(1,35) = 10.4$, $P < .01$) and the middle condition ($F_1(1,35) = 15.4$, $P < .01$; $F_2(1,35) = 19.2$, $P < .01$); and the low and middle conditions did not differ (Fs < 1).

In region 5 (the initial segment of the main predicate), the high condition was still faster than the low condition ($F_1(1,35) = 4.18$, $P < .05$; $F_2(1,35) = 4.34$, $P < .05$); but the middle condition did not differ from either the high condition ($F_1(1,35) < 1$; $F_2(1,35) = 1.06$) or the low condition ($F_1(1,35) = 1.55$, $P = .222$; $F_2(1,35) < 1$).

There were no differences in region 6 (the second part of the main predicate; Fs < 1).

The statistical analyses with the raw reading times yielded a pattern identical to that for residual reading times, except that the high and low conditions did not differ reliably in region 5 for the raw reading times. See Appendix A for presentation of the raw reading times in each condition.

Because the results of the norming study did not yield a 100% preference to attach the first PP low, it is possible that difficulty attaching the RC to the middle site could arise from the ungrammatical instances in which the first PP attached high. To ensure that our results were not due to these instances, separate analyses were conducted on the 12 items that, according to the off-line norming study, were most biased toward locally attaching the first PP. In those 12 items, the first PP attached low as desired an average of 92% of the time, with a minimum of 89% for any individual item. The numerical pattern of results for these items was identical to the pattern for the full set of stimuli. However, probably because of the small number of items in these analyses, the differences among the conditions in each region did not reach significance, except in region 4 (containing the high noun) where the high attachment condition was significantly faster than the middle condition ($F_1(1,35) = 8.83$, $P < .01$; $F_2(1,11) = 7.81$, $P < .05$) and the low condition ($F_1(1,35) = 4.41$, $P < .05$; $F_2(1,11) = 6.38$, $P < .05$), but the middle and low conditions did not differ (Fs < 1). Because the pattern was the same for the most strongly biased items as for the full set, the pattern of effects is unlikely to have resulted from the possibility that the N_2 RC attachment might be ungrammatical.

DISCUSSION

The results of the experiment indicate a preference to attach according to locality. First, the percentage of correct responses to the comprehension questions supports the preference to attach the RC to the closest noun. Second, a preference for the closest site was detected in region 2 of the

self-paced reading presentation (i.e., the first PP). This result indicates that even when a head noun and its ensuing postposition are presented in the same region in a self-paced reading experiment, there is a preference for the low attachment condition, thus suggesting that the lack of statistical significance in the advantage for the low attachment condition in Kamide et al. (1998) was probably accidental. (Analysing our data using raw reading time per character, which is the method used by Kamide and colleagues, yielded the same overall pattern of results as in the reported analyses.)

The results also support a U-shaped preference ordering over a monotonic preference ordering of the candidate sites, which argues against lexicalised-parsing models in general. The evidence for the U-shared preference curve comes from region 3, where the reading time of the high condition was faster than in the middle condition.

The reading times of the high condition in regions 2 (containing the low noun) and 3 (containing the middle noun) are particularly informative because in both cases the RC in this condition is incompatible with the head noun being read, but it is only in region 2 that the high condition is slow. This suggests that the relatively slow reading time in region 2 in the high condition is not caused by the incompatibility between the head noun and the RC alone, otherwise a similar slow reading time should have occurred in region 3 as well. It is conceivable then that participants are attempting to attach the RC to each of the three incoming heads, and that they are only slow when the attachment fails with a favoured site (N_3) but not when the attachment fails at a less preferred site (N_2), as long as another potential site is to come.

The U-shaped preference curve supports a predictive-parsing model in which the preference to attach to the high site over the middle site is explained by an independent factor. The anaphor resolution process could be such a factor as it is not bound to either lexicalised- or predictive-parsing. Another possibility for the factor preferring the high site is predicate proximity, as it favours the site structurally closest to a predicate and remains neutral to the use of partial information during parsing. Consider how a high site factor may interact with locality within a predictive-parsing model to generate the U-shaped preference pattern observed in our experiment. When processing the low site, the parser considers attaching the RC to the current noun (N_3 in (2), repeated below as (5)) as well as to the noun predicted by the first postposition. However, because of the strength of locality at this point, the closest site (N_3) is preferred; hence, the low attachment is fast. In the middle and high attachment conditions, however, plausibility disfavours the low site in region 2, contradicting locality and leading to the slow-down in these two conditions.

Example (5) *head-final RCs*
RC N_3 postposition N_2 postposition N_1

In cases when the low attachment fails, the parser proceeds to region 3 and considers the middle noun (N_2) and the newly predicted noun as possible candidates for attachment. At this point, the high site factor is stronger than locality, making the parser prefer to attach the RC to the upcoming noun (N_1), therefore making the high attachment unproblematic. However, in the middle condition, the middle noun (N_2) is favoured by plausibility, which in this case contradicts the parser's preference to attach to the high noun, thus leading to the slowdown observed in region 3.

The following discusses three other types of factors that may be involved in the results obtained in the experiment. The first is related to priming, the second to discourse complexity and the third to RC length.

An anonymous reviewer suggested that the faster reading times for the low attachment condition in region 2 may be caused by semantic priming, as the RC in region 1 (and possibly some words contained therein) may have primed the low candidate noun in the low condition, leading to faster lexical access in region 2 when compared to the other two conditions. However, priming effects in English sentences are on the order of 30–40 msec (Foss, 1982), whereas the effect in region 2 is around 200 msec. Furthermore, semantic priming differences are unlikely to account for the comprehension performance advantage for the low attachment condition. An independent preference for locality is required to explain this preference, which can then be used to account for the observed reading time difference.

Another factor that may apply in the RC structures under consideration is related to discourse complexity. Such a factor may explain the relatively slow reading times of the low condition in regions 3 and 4, which were not predicted by any of the models that were considered previously. Note that because the RC attachment was successful in region 2 in the low attachment condition, the processing of the two ensuing regions should have been straightforward. We speculate that such slow reading times could stem from the types of interpretations involved when the RC is attached to the low noun N_3 as compared to the high noun N_1. Consider an English example in which the RC that Mary likes is attached to the high noun bicycle.

Example (6) The *bicycle* beside the *boy* [$_{RC}$ that Mary likes] ...

Because bicycle is already being restricted by the PP beside the boy, it is less likely that the RC further restricts bicycle because, in order to do so, we would have to image several bicycles some of which are beside the boy and, among these bicycles beside the boy, it is the case that Mary

likes one of them (as in Altmann & Steedman, 1988; Crain & Steedman, 1985). Thus, restricting an already restricted entity in the discourse may lead to a level of complexity that the parser may not be willing to entertain in a null context (see Thornton, Gil, & MacDonald, 1998, for evidence relevant to attachment decisions modulated by the specificity of the candidate nouns). According to this reasoning, then, when attached high, the RC is more likely to be interpreted as providing some extra (non-restrictive) information about the noun. However, if the RC modifies the low noun boy, then a restrictive interpretation of the RC may obtain. Suppose that this is what is happening in the Japanese head-final RC construction: the RC is sometimes interpreted as restrictive in the low attachment, but always as non-restrictive in the other attachments. In this case, if discourse is more complex for restrictive than non-restrictive information, the low attachment of the RC might have been particularly taxing in regions 3 and 4 as the complexity of the restrictive RC was compounded with the complexity of modifying N_2 with N_3 and then N_1 with N_2 according to the intervening postpositions. Therefore, in the low condition, the initial advantage from locality in region 2 would be replaced by difficulty with discourse complexity in the following two regions. It is unlikely that discourse complexity is the factor favouring the high site overall because, according to the previous reasoning, the middle attachment would also lead to a non-restrictive interpretation of the RC and therefore this hypothesis could not explain the advantage of the high over the middle condition in regions 3 and 4.

Alternatively, reanalysis triggered by long RCs may be another possible explanation for the relatively slow reading times after the attachment is made in the low attachment condition (Fodor, 1998). Kamide and colleagues proposed that the longer the RC, the more likely it will be re-attached to the high noun. Supporting evidence comes from a positive correlation between the length of the RC and the difference between the reading times of the low and the high conditions in their self-paced reading experiment (Kamide et al., 1998). In our experiment, it could be claimed that the relatively slow reading times in regions 3 and 4 in the low condition are due to a late preference that the parser may have to re-attach longer RCs to the high site. If this were the case, longer RCs in the present experiment should lead to greater slow-downs. However, no correlation was found in our data between the number of characters in the RC and the reading times of the low condition in region 2 ($r = -.06$; $P = .53$), region 3 ($r = -.12$; $P = .22$) or region 4 ($r = -.01$; $P = .91$). Similarly, no correlation was found between RC length and the difference in reading times of the low and high conditions in region 2 ($r = -.04$; $P = .67$), region 3 ($r = -.01$; $P = .87$) or region 4 ($r = -.04$; $P = .68$). Each of the two correlation analyses above was conducted with a total of 107 pairs of points (i.e., three

subconditions times 36 times, except for one item that had no data available for one subcondition), with the length of the relative clauses varying between 4 and 17 characters (M = 9.6; SD = 2.9). Thus, it is unlikely that the correlations were not significant because too few data points were considered. Moreover, comprehension performance was best in the low condition, which does not support a reanalysis explanation, because more confusion (and hence more comprehension errors) might be expected if such reanalysis had been attempted.

CONCLUSION

There seem to be two factors at work in the Japanese head-final RC construction with multiple candidate hosts. One is locality favouring the closest site, the other (possibly predicate proximity or anaphor resolution) favours the high site, giving rise to a U-shaped preference curve. In addition to these two factors, we tentatively suggest that discourse complexity may also play a role as the type of interpretation for the RC varies.

The U-shaped preference ordering of the candidate sites in the present head-final construction is particularly informative because it supports a parsing framework in which predicted categories are considered as candidates for attachment along with lexically-realised alternatives. We have argued that such use of partial information is crucial to explain the preference to attach to the high site over the middle site, and that any model of modifier attachment must be able to accommodate such a feature in order to account for the preference ordering observed here.

REFERENCES

Altmann, G., & Steedman, M. (1988). Interaction with context during human sentence processing. *Cognition*, *30*, 191–238.

Cohen, J.D., MacWhinney, B., Flatt, M., & Provost, J. (1993). PsyScope: An interactive graphic system for designing and controlling experiments in the psychology laboratory using Macintosh computers. *Behavior Research Methods, Instruments and Computers*, *25*, 257–271.

Crain, S., & Steedman, M. (1985). On not being led up the garden path: The use of context by the psychological syntax processor. In D.R. Dowty, L. Karttunen, & A.M. Zwicky (Eds), *Natural language parsing*, pp.320–358. Cambridge, UK: Cambridge University Press.

Cuetos, F., Mitchell, D.C., & Corley, M.M.B. (1996). Parsing in different languages. In M. Carreiras, J.E. García-Albea, & Sebastián-Gallés (Eds), *Language processing in Spanish*, pp.145–187. Mahwah, NJ: Lawrence Erlbaum Associates Inc.

Ferreira, F., & Clifton, C., Jr. (1986). The independence of syntactic processing. *Journal of Memory and Language*, *25*, 348–368.

Fodor, J.D. (1998). Learning to parse? *Journal of Psycholinguistic Research*, *27*, 285–319.

Foss, D.J. (1982). A discourse on semantic priming. *Cognitive Psychology*, *14*, 590–607.

Frazier, L., & Fodor, J.D. (1978). The sausage machine: A new two-stage parsing model. *Cognition*, *6*, 291–325.

Gibson, E. (1991). *A computational theory of human linguistic processing: Memory limitations and processing breakdown.* Unpublished doctorial dissertation, Carnegie Mellon University, Pittsburgh, PA.

Gibson, E. (1998). Linguistic complexity: Locality of syntactic dependencies. *Cognition*, *68*, 1–76.

Gibson, E., Pearlmutter, N.J., Canseco-Gonzalez, E., & Hickok, G. (1996). Recency preference in the human sentence processing mechanism. *Cognition*, *59*, 23–59.

Gibson, E., Pearlmutter, N.J., & Torrens, V. (in press). Recency and lexical preferences in Spanish. *Memory and Cognition.*

Hemforth, B., Konieczny, L., Scheepers, C., & Strube, G. (1998). Syntactic ambiguity resolution in German. In D. Hillert (Ed.), *Sentence processing: A crosslinguistic perspective*, pp.293–312. *Syntax and Semantics*, *31*, San Diego, CA: Academic Press.

Just, M.A., Carpenter, P.A., & Woolley, J.D. (1982). Paradigms and processes in reading comprehension. *Journal of Experimental Psychology: General*, *3*, 228–238.

Kamide, Y., & Mitchell, D.C. (1997). Relative clause attachment: Non-determinism in Japanese parsing. *Journal of Psycholinguistic Research*, *26*, 247–254.

Kamide, Y., Mitchell, D.C., Fodor, J.D., & Inoue, A. (1998). Relative clause attachment ambiguity: Further evidence from Japanese. Poster presented at the eleventh annual CUNY Conference on Human Sentence Processing, Rutgers University, New Brunswick, NJ, March, 1998.

Kimball, J. (1973). Seven principles of surface structure parsing in natural language. *Cognition*, *2*, 15–47.

Konieczny, L., Hemforth, B., Scheepers, C., & Strube, G. (1997). The role of lexical heads in parsing: Evidence from German. *Language and Cognitive Processes*, *12*, 307–348.

Kuno, S. (1973). *The structure of the Japanese language.* Cambridge, MA: MIT Press.

Marslen-Wilson, W., & Tyler, L.K. (1980). The temporal structure of spoken language understanding. *Cognition*, *8*, 1–71.

Marslen-Wilson, W., & Tyler, L.K. (1981). Central processes in speech understanding. *Philosophical Transactions of the Royal Society*, *Series B*, *295*, 317–332.

Mitchell, D.C., & Brysbaert, M. (1998). Challenges to recent theories of crosslinguistic variation in parsing: Evidence from Dutch. In D. Hillert (Ed.), *Sentence processing: A crosslinguistic perspective*, pp.313–335. *Syntax and Semantics*, *31*, San Diego, CA: Academic Press.

Phillips. C. (1995). Right association in parsing and grammar. In C.T. Schütze, J.B. Ganger, & K. Broihier (Eds), *Papers on language processing and acquisition*, pp.37–93. *MIT Working Papers in Linguistics*, *26*, Cambridge, MA: MIT (MITWPL).

Rayner, K., Sereno, S.C., Morris, R.K., Schmauder, A.R., & Clifton, C. (1989). Eye movements and on-line language comprehension processes. *Language and Cognitive Processes*, *4*, 21–49.

Thornton, R., Gil, M., & MacDonald, M.C. (1998). Accounting for crosslinguistic variation: A constraint-based perspective. In D. Hillert (Ed.), *Sentence Processing: A Crosslinguistic Perspective*, pp.211–225. *Syntax and Semantics*, *31*, San Diego, CA: Academic Press.

Tsujimura, N. (1996). *An introduction to Japanese linguistics*. Oxford, UK: Blackwell.

Walter, M., & Hemforth, B. (1998). Attachment preferences of extraposed and adjacent relative clauses following three-site NPs in German. Poster presented at the eleventh annual CUNY Conference on Human Sentence Processing. New Brunswick, NJ, March, 1998.

Yamashita, H. (1994). *Processing of Japanese and Korean.* Unpublished doctoral dissertation, Ohio State University, Columbus, OH.

APPENDIX A

The raw reading times (i.e., without normalising according to length), trimmed at 4.0 standard deviations (calculated for each condition), are shown in Figure 4.

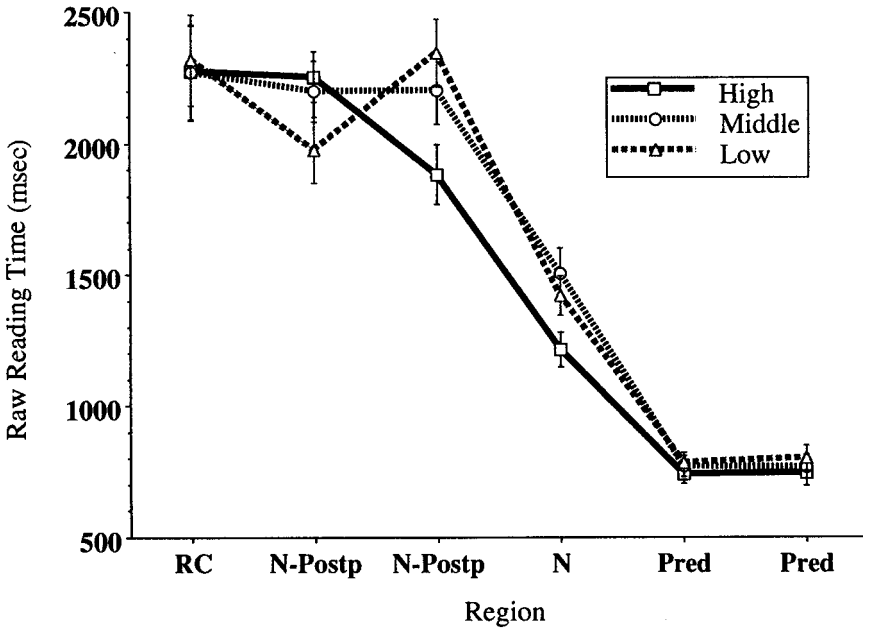

FIG. 4. Raw reading times for each region.

APPENDIX B

The following are the experimental items used in the experiment. All nine subconditions are presented for item 1. For all the other items, only three subconditions are presented as the other six subconditions can be deduced from the pattern presented in Table 1.

The 12 items analysed separately because they showed the strongest local attachment biases of the first PP in the off-line norming study were 10, 11, 13, 14, 16, 21, 22, 24, 32, 33, 34 and 35.

1a. タベほえていた / 机の横の / ドアの近くの / 犬は、 / 毛むくじゃらで / 濡れている。
1b. ノブがこわれている / 机の横の / ドアの近くの / 犬は、 / 毛むくじゃらで / 濡れている。
1c. 上の引き出しが壊れている / 机の横の / ドアの近くの / 犬は、 / 毛むくじゃらで / 濡れている。
1d. タベほえていた / ドアの横の / 犬の近くの / 机は、 / 英国製の / アンティークだ。
1e. ノブがこわれている / ドアの横の / 犬の近くの / 机は、 / 英国製の / アンティークだ。
1f. 上の引き出しが壊れている / ドアの横の / 犬の近くの / 机は、 / 英国製の / アンティークだ。
1g. タベほえていた / 犬の横の / 机の近くの / ドアは、 / いい鍵がついていて / 盗難を防ぐ。
1h. ノブがこわれている / 犬の横の / 机の近くの / ドアは、 / いい鍵がついていて / 盗難を防ぐ。
1i. 上の引き出しが壊れている / 犬の横の / 机の近くの / ドアは、 / いい鍵がついていて / 盗難を防ぐ。

2a. その中にほうきがしまってあった / 皿洗機の右側の / こんろの反対側の / 戸棚は、 / 引き出しが三段ついていて / かなり幅がある。
2e. 野菜を調理していた / こんろの右側の / 戸棚の反対側の / 皿洗機は、 / 昨日デパートで / 買った。
2i. 今、皿を洗っている / 戸棚の右側の / 皿洗機の反対側の / こんろは、 / 昨日デパートで / 買った。

3a. 私が夕べ読んだ / 鉛筆の近くの / ディスケットの右側の / 本は、 / 長くて / 退屈だった。
3e. 私が夕べ消した / ディスケットの近くの / 本の右側の / 鉛筆は、 / 教室に / あった。
3i. 私がしんを折ってしまった / 本の近くの / 鉛筆の右側の / ディスケットは、 / 便利で / 仕事が捗った。

4a. きのうの消印が押された / 缶の左側の / ホッチキスの前の / 絵葉書は、 / 小さくて / 奇麗だった。
4e. 針が入っていなかった / ホッチキスの左側の / 絵葉書の前の / 缶は、 / ひょろ長くて / 滑り易い。
4i. コカコーラが一杯入っていた / 絵葉書の左側の / 缶の前の / ホッチキスは、 / 重くて / 黒い。

5a. 山田さんが群集に砲火した / 鍵の隣の / ズボンの後ろの / 銃は、 / 本物の弾が / 入っていた。
5e. 椅子でひっかけてやぶってしまった / ズボンの隣の / 銃の後ろの / 鍵は、 / 鋭くて / ギザギザだった。
5i. 山田さんがきのう金物屋で買った / 銃の隣の / 鍵の後ろの / ズボンは、 / 茶色で / 短すぎた。

6a. きのう巣を作っていた / 水たまりの横の / 小枝の隣の / クモは、 / 小さいが / 恐い。
6e. 木から折れて落ちてしまった / 小枝の横の / クモの隣の / 水たまりは、 / 深くて / 大きかった。
6i. 子供がピチャピチャ水を飛び散らした / クモの横の / 水たまりの隣の / 小枝は、 / 曲がっていて / 脆かった。

7a. とてもうるさく鳴っていた / ペンの近くの / コップの左の / 電話は、 / 軽くて / 使い易い。
7e. 水がこぼれ落ちそうに入っている / コップの近くの / 電話の左の / ペンは、 / 古いが / とてもよく書ける。
7i. インクがきれている / 電話の近くの / ペンの左の / コップは、 / 蝉が入っていて / 壊れている。

8a. 羽毛が一杯つまった / ベルトの右側の / ナイフの反対側の / 枕は、 / ふかふかしていて / 心地よい。
8e. 鋭く尖れた / ナイフの右側の / 枕の反対側の / ベルトは、 / 擦り切れていて / 小さい。
8i. いつも川野さんがズボンにしている / 枕の右側の / ベルトの反対側の / ナイフは、 / 切れ味が / 悪い。

9a. すごいスピードで走っていた / 道路の横の / 標識の前の / バスは、 / 明るい黄色で / とても長かった。
9e. 読みにくかった / 標識の横の / バスの前の / 道路は、 / 狭くて / カーブが多い。
9i. 車が止めてあった / バスの横の / 道路の前の / 標識は、 / 古くて / 雨や風で傷んでいる。

10a. ページが破れている / ラジオの近くの / コンピューターの隣の / 雑誌は、 / 三十年前のものだが / まだそのまま保存されている。
10e. 画面が緑の / コンピューターの近くの / 雑誌の隣の / ラジオは、 / 楽しませて / リラックスさせてくれる。
10i. 五つの放送局が聞ける / 雑誌の近くの / ラジオの隣の / コンピューターは、 / 便利で / 面白い。

11a. その部屋を照らしていた / ステレオの右側の / ソファの後ろの / ランプは、 / 煌々として / 高

い。

11e. 座り心地よいクッションの / ソファの右側の / ランプの後ろの / ステレオは、 / 音が大きくて / 耳障りだ。

11i. うるさい音でなっていた / ランプの右側の / ステレオの後ろの / ソファは、 / 柔らかいが / 丈夫だ。

12a. 夕べ一晩中鳴いていた / 蝶の近くの / 花の前の / カエルは、 / とても機敏で / すばしっこい。

12e. 五月に満開に咲いていた / 花の近くの / カエルの前の / 蝶は、 / そよ風の中を / ひらひらと飛んでいる。

12i. さなぎから出たばかりの / カエルの近くの / 蝶の前の / 花は、 / 鮮やかで / 色彩に富んでいる。

13a. 素晴らしい曲を弾いた / 子猫の横の / 椅子の左の / ギターは、 / 木製で / 美しい音色を出す。

13e. 脚にキャスターが付いている / 椅子の横の / ギターの左の / 子猫は、 / 毛がフサフサしていて / 愛らしい。

13i. 毛糸玉とじゃれている / ギターの横の / 子猫の左の / 椅子は、 / 柔らかくて / 座り心地がよい。

14a. ハスの葉が浮いていた / 道の前の / 家の右側の / 池は、 / 風で / 波立っている。

14e. 古れんがでできた煙突がある / 家の前の / 池の右側の / 道は、 / くねくねと曲がっていて / 狭い。

14i. 平野さんが歩き慣れた / 池の前の / 道の右側の / 家は、 / 朽ちて / 倒れかけていた。

15a. 中村さんが木曜日にしていた / ほうきの左の / ティーポットの後ろの / エプロンは、 / 汚れていて / シミが付いている。

15e. ストーブの上で沸き立っていた / ティーポットの左の / エプロンの後ろの / ほうきは、 / ブラシは硬いが / 使い易い。

15i. 中村さんが床を掃いた / エプロンの左の / ほうきの後ろの / ティーポットは、 / 日本製で / 美味しいお茶がいれられる。

16a. 自分の鳴き声で犬を追い立てた / 帽子の近くの / 靴の反対側の / 猫は、 / 年寄りで / 愛想が悪い。

16e. 私が右足にはいていた / 靴の近くの / 猫の反対側の / 帽子は、 / 上に大きな羽が / 付いている。

16i. 私が頭にかぶっていた / 猫の近くの / 帽子の反対側の / 靴は、 / キメの細かい革で / できている。

17a. 自分の父親に微笑みかけた / ベッドの隣の / ボールの前の / 男の子は、 / 優しくて / 朗らかだ。
17e. その子供が池に投げすてようとした / ボールの隣の / 男の子の前の / ベッドは、 / 寝心地がよくて / 小さい。
17i. 犬が寝ていた / 男の子の隣の / ベッドの前の / ボールは、 / ゴム製で / よく弾む。

18a. マリーがパイのために切った / 手紙の近くの / スプンの後ろの / りんごは、 / つるつる光っていて / 赤い。
18e. マリーがヨーグルトをすくった / スプンの近くの / りんごの後ろの / 手紙は、 / 長くて / 詳しく書かれている。
18i. マリーがけさ叔父宛に書いた / りんごの近くの / 手紙の後ろの / スプンは、 / 柄が入っていて / 欠けている。

19a. 観光客に噛みついた / プールの隣の / 檻の左側の / ライオンは、 / 大きくて / 美しい。
19e. 鎖で出来ている / 檻の隣の / ライオンの左側の / プールは、 / 大きくて / 美しい。
19i. 観光客が泳いだ / ライオンの隣の / プールの左側の / 檻は、 / 大きくて / 美しい。

20a. 学校まで乗った / 茂みの横の / 人の後ろの / 自転車は、 / きれいで / 大きかった。
20e. パーティーで会った / 人の横の / 自転車の後ろの / 茂みは、 / きれいで / 大きかった。
20i. 枝がおれている / 自転車の横の / 茂みの後ろの / 人は、 / きれいで / 大きかった。

21a. 妹が描いた / テーブルの隣の / テレビの右側の / 絵は、 / 高くて / 小さかった。
21e. うるさい音がしている / テレビの隣の / 絵の右側の / テーブルは、 / 高くて / 小さかった。
21i. 私が夕べ食事をした / 絵の隣の / テーブルの右側の / テレビは、 / 高くて / 小さかった。

22a. お茶がいっぱい入っている / 写真の横の / 新聞の反対側の / 茶碗は、 / 古くて / 黄ばんでいた。
22e. うその話が書いてある / 新聞の横の / 茶碗の反対側の / 写真は、 / 古くて / 黄ばんでいた。
22i. 昨日焼き増しした / 茶碗の横の / 写真の反対側の / 新聞は、 / 古くて / 黄ばんでいた。

23a. ワインを急冷凍した / 缶切りの隣の / 流しの左側の / 冷蔵庫は、 / 古くて / 使いにくかった。
23e. 我々が食器洗いをした / 流しの隣の / 冷蔵庫の左側の / 缶切りは、 / 古くて / 使いにくかった。
23i. 研ぐ必要のある / 冷蔵庫の隣の / 缶切りの左側の / 流しは、 / 古くて / 使いにくかった。

24a. 木に登った / 街灯の隣の / 郵便受けの反対側の / りすは、 / 小さくて / 可愛かった。
24e. 郵便やさんがあけた / 郵便受けの隣の / りすの反対側の / 街灯は、 / 小さくて / 可愛かった。

24i. 道を明るく照らしている / りすの隣の / 街灯の反対側の / 郵便受けは、 / 小さくて / 可愛かった。

25a. 女の子にささやいた / コピー機の近くの / 壁の横の / 図書館員は、 / 大きくて / 醜かった。
25e. コンクリートで出来ている / 壁の近くの / 図書館員の横の / コピー機は、 / 大きくて / 醜かった。
25i. 私が以前論文を複写した / 図書館員の近くの / コピー機の横の / 壁は、 / 大きくて / 醜かった。

26a. 清掃婦がほうきではいた / アライグマの後ろの / バケツの反対側の / 砂は、 / 茶色で / きれいだった。
26e. 水がいっぱい入っている / バケツの後ろの / 砂の反対側の / アライグマは、 / 茶色で / きれいだった。
26i. 追いかけた / 砂の後ろの / アライグマの反対側の / バケツは、 / 茶色で / きれいだった。

27a. 警笛を吹いた / 車の横の / 木の右側の / 警察官は、 / 美しくて / 有名だった。
27e. 葉っぱが落ちてしまった / 木の横の / 警察官の右側の / 車は、 / 美しくて / 有名だった。
27i. バックミラーがとれている / 警察官の横の / 車の右側の / 木は、 / 美しくて / 有名だった。

28a. 弦が切れた / スツールの左側の / トランペットの前の / ハープは、 / 古くて / 小さかった。
28e. 吹き口がなくなった / トランペットの左側の / ハープの前の / スツールは、 / 古くて / 小さかった。
28i. 花子がすわった / ハープの左側の / スツールの前の / トランペットは、 / 古くて / 小さかった。

29a. 田中さんに書いた / 鏡の横の / 練り歯磨きの反対側の / メモは、 / 新しくて / 白かった。
29e. 虫歯を防ぐ / 練り歯磨きの横の / メモの反対側の / 鏡は、 / 新しくて / 白かった。
29i. 光っている / メモの横の / 鏡の反対側の / 練り歯磨きは、 / 新しくて / 白かった。

30a. まだ飲んでいない / スプーンの後ろの / ステーキの近くの / お茶は、 / 高くて / 有名だ。
30e. こんがりと焼いてある / ステーキの後ろの / お茶の近くの / スプーンは、 / 高くて / 有名だ。
30i. 銀で出来ている / お茶の後ろの / スプーンの近くの / ステーキは、 / 高くて / 有名だ。

31a. ヒールが高い / 上着の隣の / 傘の右側の / ブーツは、 / 古くて / 破れていた。
31e. 柄が奇麗な / 傘の隣の / ブーツの右側の / 上着は、 / 古くて / 破れていた。
31i. いい生地で出来ている / ブーツの隣の / 上着の右側の / 傘は、 / 古くて / 破れていた。

32a. 消えてしまった / バラの前の / 彫像の左側の / ローソクは、 / 大きくて / きれいだった。
32e. 腕が一本おれている / 彫像の前の / ローソクの左側の / バラは、 / 大きくて / きれいだった。
32i. きれいに咲いている / ローソクの前の / バラの左側の / 彫像は、 / 大きくて / きれいだった。

33a. はさみが一つしかない / タオルの近くの / ピンの前の / カニは、 / 小さくて / 赤かった。
33e. コーラが入っている / ピンの近くの / カニの前の / タオルは、 / 小さくて / 赤かった。
33i. 洗濯した / カニの近くの / タオルの前の / ピンは、 / 小さくて / 赤かった。

34a. くぎを打った / 鋸の横の / ドライバーの後ろの / カナヅチは、 / 新しくて / 使いやすかった。
34e. ネジをしめた / ドライバーの横の / カナヅチの後ろの / 鋸は、 / 新しくて / 使いやすかった。
34i. 板を切った / カナヅチの横の / 鋸の後ろの / ドライバーは、 / 新しくて / 使いやすかった。

35a. ガットのはりかえが必要な / ロッカーの前の / トレーナーの右側の / ラケットは、 / 新しくて / 高かった。
35e. 袖が長い / トレーナーの前の / ラケットの右側の / ロッカーは、 / 新しくて / 高かった。
35i. 鍵がかかっている / ラケットの前の / ロッカーの右側の / トレーナーは、 / 新しくて / 高かった。

36a. 10分おくれている / マグカップの隣の / カタログの反対側の / 時計は、 / 高くて / 重かった。
36e. ２００ページもある / カタログの隣の / 時計の反対側の / マグカップは、 / 高くて / 重かった。
36i. コーヒーが入っている / 時計の隣の / マグカップの反対側の / カタログは、 / 高くて / 重かった。