

Japanese EFL Learners' Native-like Parsing of PP Attachment Ambiguity

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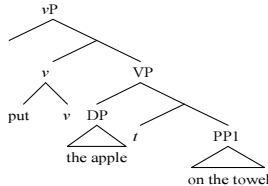
1. Introduction

Our goal is to investigate whether L2 parsing is similar to L1 parsing with respect to the adoption of parsing principles or strategies. We examined Japanese EFL learners' parsing of PP attachment ambiguity, illustrated as in (1)

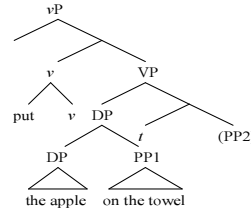
(1) Put the apple on the towel into the bag.

Assuming the incremental (i.e., word-by-word) parsing, (1) is temporarily ambiguous and two structures as in (2a-b) are possible for the first PP (PP1) attachment.

(2) a. VP-attachment



b. DP-attachment



VP-attachment in (2a) is based on Minimal Attachment (MA) (fewer syntactic nodes preferred (Frazier 1979)), whereas DP-attachment in (2b) is motivated by Late Closure (more recent attachment preferred (Frazier 1979)). At the second PP (PP2), (1) is disambiguated, supporting DP-attachment.

It has been demonstrated that native speakers of English show a garden-path effect in (1) (see, e.g., Ferreira & Clifton 1986; Frazier 1987; Tanenhaus *et al.* 1995). Their preferred, initial analysis adopting MA-based VP-attachment as in (2a) turns out to be incorrect at PP2 because no attachment site is available for that PP, and thus reanalysis into DP-attachment as in (2b) is required. Hirose *et al.* (2008) found in the higher-proficiency Japanese EFL learners a native-like preference for initial MA-based VP-attachment. The question remains whether the lower-proficiency learners without such a preference had preferred LC-based DP-attachment instead.

2. The Present Study

The purposes of the present study are (i) to confirm the outcome of Hirose *et al.* (2008) by the self-paced reading technique and (ii) more importantly to detect a LC-based DP-attachment preference, if any, as well as a MA-based VP-attachment preference.

Sixty-eight Japanese EFL learners participated in a self-paced reading experiment composed of twenty-four target sentences as in (3a-d) (R stands for a region of segmentation), counterbalanced into four lists, with forty-eight filler sentences.

- (3) a. Susan / put / the candy / in the box / into the paper bag / before the party.
 b. Susan / put / the candy / for her son / into the paper bag / before the party.
 c. Susan / put / the candy / in the box / right away / before the party.
 d. Susan / put / the candy / into the box / right away / before the party.

In (3a) and (3c), the PP in R4 is temporarily ambiguous as to attachment but, in the underlined, critical R5, is disambiguated into DP- and VP-attachment, respectively. The sentences in (3b) (the PP in R4 forced to DP-attachment) and (3d) (the PP in R4 forced to VP-attachment) are unambiguous controls for (3a) and (3c). The mean residual reading times (RRT's) were analyzed by 2 (DP/VP for Attachment) x 2 (un/ambiguous for Ambiguity) ANOVAs. The rationale was that longer RRT's in R5 in ambiguous (3a) and (3c) compared to unambiguous counterparts, (3b) and (3d), would indicate a garden-path effect due to MA-/LC-based VP-/DP-attachment preferences, respectively.

No reliable RRT differences were observed in R1-R4 and R6 (no interactions between Attachment and Ambiguity). The RRT's in R5 are summarized as in Table 1 ((3a-d) represent four conditions).

Table 1: The Mean RRT's in R5 by Condition

	(3a) DP:amb	(3b) DP:unamb	(3c) VP:amb	(3d) VP:unamb
The Mean RRT's (ms)	490	50	8	-112

There were main effects of Attachment ($F(1,67) = 17.41, P < .001$; $F(1,23) = 13.14, P < .01$) and of Ambiguity ($P_s < .001$), and their interaction was also significant ($F(1,67) = 12.86, P < .001$; $F(1,23) = 12.65, P < .01$). The subsequent pair-wise comparisons indicated a reliable RRT difference in DP-attachment conditions ($P_s < .001$) and a statistically marginal RRT difference in VP-attachment conditions ($F(1,67) = 5.24, P < .05$; $F(1,23) = 3.84, P = .062$).

Although we cannot deny a possibility that the main effect of ambiguity observed in R5 might have been due to the use of different lexical items in R4, we discuss as follows on the basis of the pair-wise comparisons, given that the interaction was statistically significant. The significant RRT difference in R5 between (3a) and (3b) means a garden-path effect in (3a) and implies a native-like parsing preference for adopting MA-based VP-attachment for PP1 in (3a). The statistically marginal RRT

difference in R5 between (3c) and (3d) may suggest that the Japanese EFL learners were bimodal in that they might have had both preferences of MA-based VP-attachment and LC-based DP-attachment. The former preference seems, however, superior because, given the significant interaction, the size of ambiguity effect (or, inferably, garden-path effect) was bigger in DP-attachment conditions, indicating the MA preference. Another reason is that it was only 23 out of 68 participants (33.82%) who showed a bigger RRT difference in VP-attachment conditions, suggesting the LC preference, as in Table 2.

Table 2: The Mean RRT's in R5 by Condition for the 23 Participants

	(3a) DP:amb	(3b) DP:unamb	(3c) VP:amb	(3d) VP:unamb
The Mean RRT's (ms)	266	236	205	-167

As Hirose *et al.* (2008) pointed out, the adoption of MA or LC is probably related to whether or not the learner can use the ditransitive verb's argument structure and take the incoming PP as an argument as soon as he/she encounters it.

3. A Follow-up Sentence Completion Study

A new group of twenty Japanese EFL learners were recruited to examine their knowledge of the ditransitive verb's argument structure. The task was a sentence completion questionnaire, as in (4), consisting of twelve ditransitive verbs used in the main experiment.

(4) The woman put _____

The participant was instructed to use as many words as he/she liked to complete a sentence.

The results showed that the participants' L2 knowledge of ditransitive verbs varied both by participant and by item. Estimating that the proficiency levels of the participants in this study and in the main experiment were not considerably different, we compared the results of the sentence completion and the RRT pattern in R5. In fact, out of the twelve ditransitive verbs, *jam*, *set*, and *drip* were used by a majority as monotransitive (only an object DP written), and as in Table 3 the RRT difference for *jam* and *set* was bigger in VP-attachment conditions than in DP-attachment conditions.

Table 3: The Mean RRT's in R5 by Condition for *jam* and *set*

	(3a) DP:amb	(3b) DP:unamb	(3c) VP:amb	(3d) VP:unamb
The Mean RRT's (ms)	31	18	-88	-165

On the other hand, *put*, *stuff*, *pour*, and *place* were used as ditransitive by a majority, and the RRT difference for all of them was bigger in DP-attachment conditions as in Table 4¹.

Table 4: The Mean RRT's in R5 by Condition for *put*, *stuff*, *pour*, and *place*

	(3a) DP:amb	(3b) DP:unamb	(3c) VP:amb	(3d) VP:unamb
The Mean RRT's (ms)	660	6	-186	-177

For those verbs that were predominantly used as monotransitive, it is probable that the subsequent PP was analyzed as an adjunct, triggering LC. Thus, the RRT pattern in Table 3 would mean a garden-path effect in (3c) due to the LC preference. Contrastively, the RRT pattern in Table 4 indicating the MA preference was observed for those verbs that were used mainly as ditransitive. There may be some correlation between the learner's parsing preference and ditransitive knowledge.

4. General Discussion

Our self-paced reading experiment, as a whole, supported the Japanese EFL learners' native-like preference for adopting MA in parsing of the temporary PP attachment ambiguity. This fact is interesting in that, whether L1 or L2 parsing, MA is initially adopted, although the pattern did not seem to hold for all items. Together with the results of the follow-up sentence completion study, our finding leaves us a possibility that the Japanese EFL learners were bimodal, suggesting both MA and LC preferences depending on the ditransitive verbs. Recruiting the same population, the correlation between their RRT patterns and ditransitive knowledge should be further examined. Since some of the verbs used in the present study could have been treated both as ditransitive and as monotransitive, the same norming study by native speakers should be conducted for the verb in question to be unambiguously ditransitive.

References

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¹ For the other verbs put aside here, *lean* and *splash* were used by a majority as intransitive, and *insert*, *lay*, and *spray* were used as ditransitive by nine out of 20 participants.