Second Language Learners’ Greater Difficulty with Structural Processing Routines over Case Morphology in Processing Japanese Relative Clause Sentences

Masahiro Hara

I. Introduction

Several studies (Hara, 2016; Hopp, 2010; Jackson & Bobb, 2009; Jackson & Dussias, 2009) find that second language (L2) learners can use case morphology while processing simplex clauses but fail to do so across clause boundaries when their first language (L1) lacks a case system. Importantly, two factors in those studies may have influenced their findings: 1) the absence of a robust case system in learners’ L1 and 2) an L1–L2 difference in configurational properties (head–final vs. head–initial). In those studies’ L1–L2 parings, both factors correlate with each other. When learners’ L1 (English) lacks a robust case system, it differs in configurational properties from their L2s (Japanese and German); correspondingly, when learners’ L1s have a robust case system (Korean, Dutch, Russian), they are similar in configurational properties to their L2s (Japanese and German). Therefore, it is difficult to discern which factor is responsible for L2 learners’ observed processing difficulties. The present study aims to resolve this problem by introducing a new L1–L2 paring in which learners’ L1 (Chinese) lacks a case system yet is similar in configurational properties to their L2 (Japanese), i.e., pre–nominal relative clause. By comparing Chinese learners’ processing patterns with those of English learners, whose L1 is dissimilar in either factor to Japanese, it is possible to disentangle influences of those factors on L2 processing.

Existent studies on L2 morphosyntactic processing fail to distinguish between learners’ difficulty with the processing of case–marking information and their difficulty in engaging in structural processing routines that are different from those of their L1. Jackson and Bobb (2009), using a self–paced reading paradigm, have found evidence of English learners’ use of case–marking information in processing German wh–extractions. In reading Wer hast du gedacht, vermisste den Lehrer in den Ferien? (WhoNOM have you thought, missed theACC teacher during the vacation?) and Wen hast du gedacht, vermisste der Lehrer in den Ferien? (WhoACC have you thought, missed theNOM teacher

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highly proficient English learners of German have taken longer to read the initial wh-element on the object-extraction compared to the subject-extraction. Learners’ preference for subject-first processing is indicative of their real-time use of case-marking information on the initial wh-phrase (see Schlesewsky, Fanselow, Kliegl, & Krems, 2000 for similar findings in L1 German processing). Importantly, their sensitivity to case-marking information has failed to carry over to the complement clause across the clause-boundary, resulting in no reading time difference between both types of extraction (see Jackson & Dussias, 2009, for similar findings). Note that in processing the complement clause, English learners need to engage in structural processing routines different from those of their L1 due to differences between English and German in complement clause configuration. Therefore, it is unclear which factor has led to learners’ failure to show a reading time asymmetry in processing wh-extractions in complement clauses: difficulty with using case-marking information or that with adopting L1-specific structural processing routines.

Hopp (2010) aims at disentangling L1 influences on learners’ real-time ability to use German inflectional morphology, case and subject-verb agreement, by including learners whose L1s differ in case-marking system and word order. In the self-paced reading experiment, learners (Russian, Dutch, and English L1s) have read Er denkt, dass der/den Hotelier im August den/der Gastwirt angezeign hat (He thinks the hotel owner in August the landlord sued has). In reading the critical region, der/den Hotelier im August (the hotel owner in August), all near-native groups have read the nominative-marked version faster than the accusative-marked one, suggesting their sensitivity to case-marking information (subject-first preference). No advanced learner groups have showed such reading asymmetry. Therefore, the self-paced reading experiment has been unable to disentangle L1 influences according to cross-linguistic differences in case-marking system and word order.

In order to determine whether L2 learners can use case morphology at real-time processing, the present study aims at separating two cross-linguistic factors that have confound earlier studies’ findings, case system and structural processing routines. It examines L2 processing of relative clause sentences in Japanese (+pre-nominal relative clause, +case system) by learners whose L1s are Korean (+pre-nominal relative clause, +case system), English (-pre-nominal relative clause, -case system), and Chinese (+pre-nominal relative clause, -case system). Because the comparison of three learner groups’ reading patterns allows for separating out influences of structural processing routines, it is possible to determine if learners can make real-time use of case morphology even when their L1 lacks it.

2. The structure and the processing of Japanese, Korean, English, and Chinese relative clauses

Japanese, Korean, and Chinese are similar in their relative clause structures whereas English differs from them. In Japanese, Korean, and Chinese, a relative
clause precedes its head noun; in English, a relative clause follows its head noun. On the other hand, Japanese and Korean use a robust case system to mark the grammatical functions of noun phrases while English and Chinese lack one. These differences are illustrated in (1) to (4):

(1) Japanese relative clause:

\[
\begin{array}{llll}
\text{detective-ACC} & \text{trust} & \text{reporter-NOM} & \text{party-ACC}
\end{array}
\]

(2) Korean relative clause:

\[
\begin{array}{llll}
\text{detective-ACC} & \text{trust-ADN} & \text{reporter-NOM} & \text{party-ACC}
\end{array}
\]

(3) English relative clause:

The reporter, [who ___i trusted the detective] left the party.

(4) Chinese relative clause:

\[
\begin{array}{llll}
\text{Trust} & \text{detective GEN reporter left} & \text{party}
\end{array}
\]


The present study uses four experimental conditions in (5a) to (5d) as modeled on Miyamoto and Nakamura (2003):

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1 Both Korean and Japanese employ a pre-nominal relative clause without an overt complementizer. A Japanese relative clause has no morphological marking while a Korean relative clause bears the adnominal marker \(-\text{nu/n}\) on its predicate (Kwon, Polinsky, & Kluender, 2006, p. 3).

2 In Chinese, the lexical item \textit{de} serves as a relative clause marker as well as a genitive marker (Hsiao & Gibson, 2003, p. 6).

(5) a. Subject relative clause with nominative head noun
   Kinoo\_ obaasan-o\_ eki made\_ mukae ni itta\_ gakusee-ga\_
   Yesterday elderly lady-ACC station to went to meet student-NOM
   syukudai-o\_ wasureta.
   homework-ACC forgot
   ‘The student who picked up the elderly lady at the station yesterday
   forgot the homework.’

b. Subject relative clause with accusative head noun
   Kinoo\_ obaasan-o\_ eki made\_ mukae ni itta\_ gakusee-o\_
   Yesterday elderly lady-ACC station to went to meet student-ACC
   sensee-ga\_ yonda.
   professor-NOM summoned
   ‘The professor summoned the student who picked up the elderly
   lady at the station yesterday.’

c. Object relative clause with accusative head noun
   Kinoo\_ obaasan-ga\_ eki made\_ mukae ni itta\_ gakusee-o\_
   Yesterday elderly lady-NOM station to went to meet student-ACC
   sensee-ga\_ yonda.
   professor-NOM summoned
   ‘The professor summoned the student who the elderly lady picked
   up at the station yesterday.’

d. Object relative clause with nominative head noun
   Kinoo\_ obaasan-ga\_ eki made\_ mukae ni itta\_ gakusee-ga\_
   Yesterday elderly lady-NOM station to went to meet student-NOM
   syukudai-o\_ wasureta.
   homework-ACC forgot
   ‘The student who the elderly lady picked up at the station yesterday
   forgot the homework.’

All relative clauses in (5a) to (5d) have identical lexical items; their relative
clause–internal noun phrase (obaasan ‘lady’) is marked as either accusative or
nominative depending on relativization type. Their head noun (gakusee
‘student’) is marked as either nominative or accusative within each type of
relativization. The remainder of the main clause following the head noun differs
depending on the head noun’s case marking but is counterbalanced between
both types of relativization. Therefore, the experimental conditions are crossed
in terms of relativization (subject vs. object) as well as case marking on the head
noun (nominative vs. accusative).

Japanese native speakers and Korean learners would read the head noun or
subsequent regions faster in subject relative clause than object relative clause
sentences. Because English lacks a robust case system and, moreover, uses a
post–nominal relative clause, English learners would show sensitivity to case
morphology in their processing of relative clause–internal regions (simplex
clause) but may not do so while processing the main-clause regions (complex clause) (cf. Jackson and Bobb (2009)). Chinese learners would show reading patterns similar to those of English learners if the real-time processing of case morphology in complex clauses is difficult for learners whose L1 lacks a case system. In contrast, if the processing of case morphology is possible when L1 and L2 have the same structural configuration, i.e., the pre-nominal relative clause, then Chinese learners would evince reading patterns similar to those of Japanese native speakers and Korean learners.

3. The present study

The present study aims at determining whether highly advanced L2 learners can use case-marking information in processing relative clause sentences in Japanese by separating out influences of the presence of a robust case system and structural processing routines.

3.1. Participants

There were four groups of participants in the study: 20 Korean, 18 English, and 18 Chinese learners of Japanese along with 20 native speakers of Japanese. Table 1 presents background information on the learner participants’ Japanese language-learning experiences. The learner groups’ average scores on the Japanese language proficiency test (JLPT) were significantly different (F2, 53) = 6.483, p = .003), with the Chinese group being different from both Korean and English groups and the latter groups not being different from each other. At the time of their participation in the study, all Korean and Chinese learners had lived in Japan for at least three and a half months and many were taking undergraduate or graduate courses at Waseda University in Tokyo as degree-seeking students. Most English learners were students at the Inter-University Center for Japanese Language Studies in Yokohama, and had resided in Japan for at least eight and a half months at the time of participation. All English learners were advanced learners of Japanese and post-baccalaureates: some were graduate students studying a Japan-related field while others were preparing for a profession using Japanese (e.g., translation). All Japanese participants were university students in Tokyo. All participants were compensated for their participation in the study.
Table 1: Learners’ background information and JLPT scores

<table>
<thead>
<tr>
<th>L1</th>
<th>Age (yrs)</th>
<th>JLPT (%)</th>
<th>Length of Study (yrs)</th>
<th>Visiting (mo)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Korean</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>23.5</td>
<td>96.6</td>
<td>4.10</td>
<td>10.9</td>
</tr>
<tr>
<td>Range</td>
<td>19 – 33</td>
<td>89.3 – 100</td>
<td>2.0 – 7.0</td>
<td>3.5 – 29.0</td>
</tr>
<tr>
<td>SD</td>
<td>3.47</td>
<td>1.05</td>
<td>1.56</td>
<td>9.07</td>
</tr>
<tr>
<td>English</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>24.3</td>
<td>94.4</td>
<td>4.68</td>
<td>24.7</td>
</tr>
<tr>
<td>Range</td>
<td>19 – 29</td>
<td>85.7 – 100</td>
<td>3.0 – 9.0</td>
<td>4.0 – 104.0</td>
</tr>
<tr>
<td>SD</td>
<td>2.89</td>
<td>1.50</td>
<td>1.50</td>
<td>25.60</td>
</tr>
<tr>
<td>Chinese</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>25.7</td>
<td>90.2</td>
<td>4.65</td>
<td>18.9</td>
</tr>
<tr>
<td>Range</td>
<td>20 – 34</td>
<td>75 – 100</td>
<td>2.0 – 8.0</td>
<td>3.5 – 93</td>
</tr>
<tr>
<td>SD</td>
<td>3.58</td>
<td>2.02</td>
<td>2.86</td>
<td>23.76</td>
</tr>
</tbody>
</table>

3.2. Materials

The present study used 24 quadruplets of sentences in four experimental conditions as given in (5a) to (5d). Four lists were generated in a Latin Square design: each list was assigned six sentences of each of the four conditions, with no more than one condition from each of the 24 sets appearing in each list. Each list also contained 48 fillers. Half of the fillers were included for a separate experiment while the other half varied in structure and length. Thus there were a total of 72 sentences in each list. Each of the four lists was pseudo-randomized so that at least one filler sentence intervened between two experimental sentences. For each experimental and filler sentence, a comprehension question was created that targeted a various part of the sentence. Half of the experimental and filler sentences were assigned a comprehension question that was true with respect to the content of the sentence while the other half of the sentences received a comprehension question that was false.

3.3. Procedure

Prior to their arrival at an experimental session, learner participants completed a questionnaire on their Japanese language learning experience and biographical background. They also individually took the grammar section of the Japanese Language Proficiency Test (extracted from Levels 2 and 3) and were instructed to study a list of vocabulary items and kanji (Chinese characters adopted in Japanese) that appeared in the experimental material.

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4 A norming study, based on a seven-point scale rating of sentence naturalness, was conducted to ensure that there was no plausibility difference between two human-denoting nouns (obaasan ‘elderly lady’ and gakusee ‘student’) as either agent or patient of the verb (mukae ni iku ‘go to meet’) in the 24 sets used in the experiment.
At the experimental session, the participant performed a self-paced reading experiment. The self-paced reading experiment employed a segment-by-segment, self-paced reading paradigm (see Just, Carpenter, & Woolley, 1982). Each sentence was presented region-by-region in the center of a display screen on a laptop computer as illustrated by the back slashes in (5a) to (5d). After having read the final region of each sentence, the participant responded to a comprehension question on the sentence. Graphic feedback (a sad face) was provided when the response was incorrect as explained to the participant in the instructions for the experiment. Upon completing the first half of the experiment, there was a brief relaxation break. The participant then continued the experiment until finishing it. The self-paced reading experiment took learner participants 40 to 50 minutes and native speaker participants approximately 30 minutes to complete. The reading time for each region of every sentence was recorded using E-Prime software (Schneider, Eschman, & Zuccolotto, 2002), as was the response to each comprehension question. The experimental session took place in the author’s office.

3.4. Results
3.4.1. Comprehension question accuracy

Table 2 presents the four participant groups’ accuracy rates on the comprehension questions on subject and object relative clause sentences ((5a-5b) vs. (5c-5d)). There was no significant difference between four participant groups in response accuracy on subject relative clause sentences ($F_1(3, 72) = .711, p = .549; F_2(3, 92) = .296, p = .828$) and on object relative clause sentences ($F_1(3, 72) = 1.32, p = .276; F_2(3, 92) = .382, p = .766$). The Japanese native speaker and the English learner groups responded similarly to comprehension questions on subject and object relative clause sentences: for the Japanese group, $F_1(1, 19) = .856, p = .367; F_2(1, 23) = .062, p = .805$, and for the English group, $F_1(1, 17) = .225, p = .641; F_2(1, 23) = .114, p = .738$. The Korean and Chinese learner groups were significantly more accurate on subject than on object relative clause sentences: for the Korean group, $F_1(1, 19) = 8.435, p = .009; F_2(1, 23) = 5.435, p = .029$; for the Chinese group, $F_1(1, 17) = 2.138, p = .047; F_2(1, 23) = 1.690, p = .207$. 
Table 2: Comprehension question accuracy rates (%)

<table>
<thead>
<tr>
<th>Group</th>
<th>Condition</th>
<th>Subject relatives</th>
<th>Object relatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japanese NSs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$M$</td>
<td>87.92</td>
<td>85.83</td>
<td></td>
</tr>
<tr>
<td>$SD$</td>
<td>7.39</td>
<td>5.48</td>
<td></td>
</tr>
<tr>
<td>Korean learners</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$M$</td>
<td>89.58</td>
<td>82.50</td>
<td></td>
</tr>
<tr>
<td>$SD$</td>
<td>8.92</td>
<td>7.10</td>
<td></td>
</tr>
<tr>
<td>English learners</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$M$</td>
<td>85.19</td>
<td>83.33</td>
<td></td>
</tr>
<tr>
<td>$SD$</td>
<td>10.91</td>
<td>11.43</td>
<td></td>
</tr>
<tr>
<td>Chinese learners</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$M$</td>
<td>87.50</td>
<td>80.56</td>
<td></td>
</tr>
<tr>
<td>$SD$</td>
<td>10.00</td>
<td>8.57</td>
<td></td>
</tr>
</tbody>
</table>

3.4.2. The processing of subject and object relative clause sentences

Figures 1 to 4 present the four participant groups’ residual reading times per mora on the initial adverbial to the main verb regions in subject and object relative clause sentences ((5a and 5b) vs. (5c and 5d)) (see Ferreira & Clifton, 1986; Trueswell, Tanenhaus, & Garnsey, 1994, for discussion of residual reading times). A repeated-measures ANOVA was conducted for each participant group: for the participants analysis, relative clause type (subject vs. object) was entered as a within-participants factor and for the items analysis, region (initial adverbial phrase to main verb) as a within-items factor.

![Japanese NSs](image)

Figure 1: Japanese native speakers’ residual reading times

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5 In Figures, the RC and the HN stand for relative clause and head noun, respectively.
Figure 2: Korean learners’ residual reading times

Figure 3: English learners’ residual reading times

Figure 4: Chinese learners’ residual reading times
The Japanese native speakers read the main verb in subject relative clause sentences significantly faster than in object relative clause sentences: $F_1(1, 19) = 6.703, p = .018; F_2(1, 23) = 4.226, p = .051$; for all other regions, $F_1 s \leq 1.028; F_2 s \leq 1.537$. Similarly, the Korean learners read the main-clause noun phrase, the region immediately following the head noun, in subject relative clause sentences significantly faster than in object relative clause sentences: $F_1(1, 19) = 9.337, p = .007; F_2(1, 23) = 5.263, p = .031$; for all other regions, $F_1 s \leq 2.961; F_2 s \leq 4.106$.

The English learners read the relative clause–internal verb in object relative clause sentences faster than in subject relative clause sentences, which falls just short of statistical significance in the subject analysis but which is significant in the item analysis: $F_1(1, 17) = 4.029, p = .061; F_2(1, 23) = 5.379, p = .030$; for all other regions, $F_1 s \leq 1.164; F_2 s \leq .702$. The Chinese learners read the adverbial phrase immediately following the relative clause–internal noun phrase in object relative clause sentences significantly faster than in subject relative clause sentences ($F_1(1, 17) = 7.191, p = .016; F_2(1, 23) = 9.670, p = .005$). That difference nearly disappeared when they read the relative clause–internal verb: $F_1(1, 17) = 3.415, p = .082; F_2(1, 23) = 6.213, p = .020$. Critically, they read the head noun in subject relative clause sentences significantly faster than in object relative clause sentences: $F_1(1, 17) = 4.407, p = .051; F_2(1, 23) = 4.773, p = .039$. For all other regions, there were no differences between subject and object relative clause sentences: $F_1 s \leq 2.803; F_2 s \leq 2.535$.

4. Discussion

The self-paced reading study reported above has found evidence of L2 learners’ real-time use of case morphology in processing relative clause sentences in Japanese. Korean learners read subject relative clause sentences faster than object relative clause ones on the head noun and post-head noun regions; Japanese native speakers exhibited a similar processing asymmetry at the main–verb region. By contrast, English learners read object relative clause sentences faster than subject relative clause sentences on the relative clause–verb region. Chinese learners exhibited the processing asymmetries similar to those of both English and Korean learners, that is, difficulty with subject relative clause sentences in reading relative clause–internal regions and that with object relative clause sentences in reading main–clause regions.

Because subject and object relative clause sentences are identical in terms of lexical items and linear order but differ only in case marking on the relative

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6 The Chinese learners continued to read the main–clause noun and the main–clause verb faster in the subject relative than in the object relative clause sentences: for the main–clause noun, ($F_1(1, 17) = 3.403, p = .083; F_2(1, 23) = 4.497, p = .045$; for the main–clause verb ($F_1(1, 17) = 6.195, p = .023; F_2(1, 23) = 1.547, p = .226$. respectively. Both differences were not statistically robust and likely resulted from the spillover effects from their reading of the head noun region.
clause–internal noun and the head noun, the learners’ reading asymmetries suggest their ability to use case–marking information while reading Japanese relative clause sentences incrementally.

Two factors may have affected learners’ ability to use case–marking information at real time: case morphology and processing routines for pre–nominal relative clauses. Because Korean has both, Korean learners are likely to have shown a processing asymmetry similar to that of Japanese native speakers. Although English has neither, English learners evinced their ability to use case–marking information in reading simple clauses, i.e., the relative clause–internal regions; on the other hand, there was no evidence that their use of case–marking information carried over across clause boundaries (comapre Jackson & Bobb, 2009). Chinese lacks a robust case system and uses pre–nominal relative clauses. Similar to English learners, Chinese learners showed a processing asymmetry suggestive of their use of case morphology in reading the relative clause–internal regions. Moreover, their use of case morphology seems to have continued across clause boundaries because they, as Korean learners did, evinced a greater reading slowdown at the head noun in the object than in the subject relative clause sentences. Therefore, learners’ ability to use L2–specific structural processing routines is likely to be the factor affecting L2 processing of relative clause sentences in Japanese because all three learner groups were able to use case morphology at real time regardless of the presence of a robust case system in their L1s.

5. Conclusion

The present self–paced reading study has found evidence that L2 learners are able to make real–time use of case morphology in processing relative clause sentences in Japanese. Korean learners, whose L1 is similar to Japanese in the use of a robust case system and pre–nominal relative clauses, showed a similar processing asymmetry to that of Japanese native speakers. English learners, whose L1 lacks a robust case system and uses post–nominal relative clauses, exhibited sensitivity to case morphology only in processing simplex clauses (viz. relative clause–internal regions). Importantly, Chinese learners, whose L1 lacks a robust case system and uses pre–nominal relative clauses, evinced sensitivity to case morphology in processing both relative clause–internal and main clause regions. Taken together, advanced L2 learners’ ability with case morphology is modulated by L1–L2 similarities in structural processing routines, not by the presence of case system in their L1.

References


