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L2 Processing of English Direct Object and Oblique Relative Clauses*

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ABSTRACT

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This study examines how second language learners of English process English direct object (DO) and oblique (OBL) RCs. In L1 and L2 processing research, subject and DO RCs are frequently used to test the comprehension and production of complex structures. However, comparing the processing of these two types of RCs is potentially problematic because they differ in terms of typical head noun animacy and canonical word order. In order to eliminate potential effects from these factors, this study instead utilizes DO RCs and OBL RCs to accurately test for an effect of the length between the filler and the gap in sentences involving filler-gap dependencies. The participants were 39 intermediate- and advanced-level L2 English learners. The study's analysis of their comprehension accuracy and reading times resulted in two main findings: (1) the learners comprehended DO RCs more accurately than OBL RCs and (2) they spent much more time reading OBL RCs than DO RCs. These results indicate that, for L2 English learners, DO RCs are less complex and easier to process than OBL RCs. The results support a filler-gap-dependency distance effect; that is, greater length between the filler and the gap increases L2 processing difficulty.

I. INTRODUCTION

In a variety of studies, relative clauses (RCs) are discussed in light of experimental data (e.g., production tasks, comprehension tests, sentence processing) because they employ syntactic resources that involve long distance dependencies. Interestingly, research using a variety of tasks to test both production and comprehension has indicated that subject relatives are easier to process and produce than direct object relatives in head-initial languages such as English (Gibson, 1998, 2002; Grodner & Gibson, 2005; O'Grady, 1997; Warren & Gibson, 2002). More specifically, adult native speakers of English have more difficulty processing DO RCs, as in (1b), than subject RCs, as in (1a) (Flynn & Lust, 1980; Friedmann, Belletti, & Rizzi, 2009; Gennari & MacDonald, 2008; Gibson, 1998, 2000; King & Just, 1991; Traxler, Morris, & Seely, 2002; Wanner & Maratsos, 1978).

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(1a) Subject relative clause:
The student [that _ attacked the reporter]

(1b) Direct object relative clause:
The student [that the reporter attacked _]

Furthermore, children acquire and use the direct object relatives later than the subject relatives (C. E. Kim & O'Grady, 2016), as do L2 learners (K. S. Jeon & H. Y. Kim, 2007; C. E. Kim, 2013, 2017, 2018). Experimental studies supporting this asymmetry have employed picture-selection tasks, elicited-production tasks (C. E. Kim & O'Grady, 2016; McKee, McDaniel, & Snedeker, 1998; Zukowski, 2009), and eye-tracking methods (Mak, Vonk, & Schriefers, 2002; Traxler et al., 2002). Experimental works on RC processing have also demonstrated gap effects in Korean, which, unlike English, is a head-final language (N. Kwon, Gordon, Y. H. Lee, Kluender, & Polinsky, 2010). There is a hierarchical order of relative clause constructions, supporting Noun Phrase Accessibility Hierarchy (NPAH) by Keenan and Comrie (1977), presented in (2). In (2), noun phrase types that are less marked typologically appear to the left of noun phrase types that appear to the right. The NPAH has been supported by extensive literature reviews covering many different languages including English, other European languages, Korean, Chinese, and Japanese (Hsiao & Gibson, 2003; C. E. Kim, 2013; N. Kwon et al., 2010; Miyamoto & Nakamura, 2003).

(2) Noun Phrase Accessibility Hierarchy:
S > DO > IO > OBL > GEN

While previous works examined the processing of English RCs, few studies controlled factors (animacy, canonicity) which can influence readers to process English RCs. The goal of this study is (1) to examine the length effect between the filler and the gap by testing DO RCs and OBL RCs to eliminate the unsolved issues such as animacy and canonicity; (2) to suggest whether the L2 proficiency have an effect on L2 processing; and (3) to contrast L2 processing with L1 processing.

II. LITERATURE REVIEW

Many studies that have shown that DO RCs are more difficult to process than subject RCs have examined the effects of gap position in RCs with English native speakers (King & Just, 1991). First of all, according to Gibson's (1998, 2000) Dependency Locality Theory, DO RCs create a greater memory burden and processing cost than subject RCs. According to O'Grady (2015), processing difficulty is directly related to the distance between the filler and gap, which is greater in DO RCs than in subject RCs, as exemplified in (3).

(3a) Subject RC:
the boy [that _ likes the girl]
|___0___|

(3b) Direct object RC:
the boy [that the girl likes _]
|_____1___2__|

Taking another approach, MacWhinney (2005) suggested that the relative difficulty of processing different RC types is related to the need to shift perspective during comprehension and production (C. E. Kim, 2015a; MacWhinney, 1997, 2005). In this view, the shift of the semantic role of the head noun increases the processing demands of DO RCs, as in (4b). Processor assumed that *the actor* as an agent of the sentences at first, however, it should be shifted from agent to theme when processor encounter another NP *the writer*. Therefore, in DO RCs, the head noun becomes the subject of the main clause but the DO of the subordinate clause. In subject RCs, however, the head noun is the subject in both the main and the subordinate clauses. Thus, readers tend to take *the actor* as an agent to the end of the embedded clause as in (4a).

(4a) Subject RC:
The actor [that _ attacked the writer]
[agent] [theme]

(4b) Direct object RC :
The actor [that the writer attacked _]
[agent]
[agent] [agent]
[theme] [agent]

Following MacWhinney, C. E. Kim (2015a) concluded that one of the main reasons that Korean children have difficulty producing DO RCs may be the required perspective shift.

The traditional comparison between subject and DO RCs has two unresolved issues affecting sentence comprehension and production. First, as Kidd, Brandt, Lieven, & Tomasello (2007) pointed out, DO RCs almost always have inanimate head nouns, as in (5a), and only rarely have animate head nouns as in (5b).

(5a) the music [that the director made _]
[inanimate]

(5b) the musician [that the director liked _]
[animate]

Because most DO RCs take inanimate head nouns, as in (5a), experiments using DO RCs with animate head nouns are problematic when the test material are inauthentic. Nevertheless, it is still problematic to use DO RCs with inanimate head nouns to compare subject and DO RCs. DO RCs with inanimate head nouns do not require the parser to use syntactic knowledge; for example, the

director can make the music, but the music cannot make the director. Once a reader notices that the music cannot make the director, the reader does not need to use full knowledge to figure out what the subject and DO are in the RC. Second, subject and DO RCs have different word orders. As Slobin and Bever (1982) observed, subject RCs follow the canonical English SVO word order, as shown in (6a), whereas DO RCs have a noncanonical word order, as in (6b). Some L1 acquisition research suggests that this difference may add to the difficulty of processing DO RCs. Experimental studies such as those of C. E. Kim (2015a) and C. E. Kim and O'Grady (2016) indicate that, in a DO condition, English-speaking children tend to produce double direct objects (i.e., resumptive NP), as in (6c). This error presumably results from the children's intention to follow an English canonical word order as the relative clause unfolds.

(6a) the reporter [that _ made the music]
S V O

(6b) the music [that the director made _]
O S V

(6c) the music [that the director made * the music]

To address the animacy issue (Reali & Christiansen, 2007), some recent studies have tested different types of RCs (indirect object, OBL) to investigate potential filler-gap length effects on sentence processing. C. E. Kim and O'Grady (2016) conducted elicitation tasks to find a genuine length effect between the filler and the gap in RCs. C. E. Kim (2016, 2017), in particular, conducted a series of sentence processing studies with native speakers and second language learners of English, focusing on subject and indirect object RCs. She found that both groups performed better on subject RCs than on indirect object RCs and comprehended the former more quickly than the latter. The findings from two experimental works can be explained by the length effect, which is proposed by O'Grady (2005), as exemplified as in (7). Subject RCs have no intervening materials between the filler and the gap, however, indirect object RCs have three materials (boy, threw, bag).

(7a) Subject RC:
the girl [that _ threw the bag to the boy]
S V DO IO
|__0___|

(7b) Indirect object RC:
the girl [that the boy threw the bag to_]
IO S V DO
|_____1____2_____3____|

However, this comparison is still problematic, because subject RCs are much more frequent than indirect object RCs in spoken and written English (C. E. Kim, 2013). Furthermore, subject RCs follow English canonical word order, whereas indirect object RCs do not. C. E. Kim (2016) therefore compared DO and OBL RCs, as in (8), again to investigate how the length of the filler-gap dependency affects the comprehension of RCs (Frazier & dnArcais, 1989).

(8a) Direct object RC:
the hat [that the boy tossed _ onto the pillow]
DO S V OBL
[inanimate]

(8b) Oblique RC:
the pillow [that the boy tossed the hat onto _]
OBL S V DO
[inanimate]

Because these two types of RCs tend to have inanimate head nouns and do not follow English canonical word order (SVO), the study avoided confounding effects of word order and head noun animacy. C. E. Kim (2016) used a self-paced reading task with 52 native speakers of English in her study. She found that the L1 speakers read sentences with DO RCs faster than sentences with OBL RCs; they also comprehended the former more accurately than the latter. C. E. Kim concluded that the longer dependencies in OBL RCs create greater syntactic complexity, leading to greater processing difficulty. In sum, comparing DO and OBL RCs has two advantages. First, because they both have inanimate head nouns, the NPs are reversible; that is, both *putting the book on the carton and putting the carton on the book* are semantically plausible. Readers therefore must use syntactic knowledge to comprehend both types of RCs. When both interpretations are possible, readers must use actual syntactic knowledge to figure out what the theme or patient is and what the locative is. Second, both RCs follow a non-canonical word order, and require the reader to hold the head noun in mind to resolve the filler and gap connection while reading the sentence. These factors enable research to clearly identify a distance effect in sentence processing. The aim of the present study is to investigate whether L2 learners process DO and OBL RCs differently, and whether their processing is affected by their English proficiency. Because the two types of RCs have different lengths of filler-gap dependency, comparing them will clearly show any distance effect in second language sentence processing. To measure processing difficulty during the reading of sentences, the study calculates reading comprehension accuracy and total reading times (C. E. Kim, 2015a, 2015b, 2016). The research questions of the present study are as follows:

1) Does RC gap position affect L2 learners' reading comprehension accuracy when both the animacy factor of the heads and canonicity are controlled? Will RC gap position effects differ according to L2 proficiency?
2) Does RC gap position affect L2 learners' total read-

ing times? Will RC gap position effects differ according to L2 proficiency?

3) Are L1 and L2 speaker's processing patterns for direct object and oblique RCs (dis)similar?

III. METHOD

1. Participants

Thirty-nine L1-Korean learners of English (8 male; 31 female) enrolled at universities in Seoul and Gwangju participated in this study. All participants were the natives of Korea, and started learning English as a foreign language in middle school in an EFL context. The age of the participants ranged between 19 and 27 years with a mean being 22.38. Their English proficiency was measured by their official TOEIC scores. Their scores ranged from 620-990, with a mean of 862.4. The participants were divided into two groups: the intermediate-proficiency group (18 participants; scores below 930, M = 738) and the high-proficiency group (21 participants; scores above 930, M = 968). All of them were paid $10 for their participation in the task.

2. Materials and Procedures

The study's self-paced reading test comprised 16 sets of experimental sentences and 32 fillers. Participants read sentences word-by-word in a self-paced reading task. By investigating the 'reading times,' this task gives an indication of processing difficulty while participants read sentences (Caplan & Waters, 2001; Carpenter, Miyake, & Just, 1994; Just, Carpenter, & Woolley, 1982; MacWhinney & Pleh, 1988). Each experimental set consisted of two sentences, one with a DO RC (the DO RC condition) and one with an OBL RC (the OBL RC condition). One sample set is shown in Table 1. To read a whole sentence comprising 11 words, readers press the button on a keyboard. One word was shown and disappeared at a time when readers press the button. Each word was considered a region, indicated by R.

TABLE 1
Sample Test Items

Region	Direct object RC	Oblique RC
R1	the	the
R2	book	box
R3	that	that
R4	I	I
R5	lifted	lifted
R6	onto	the
R7	the	book
R8	box	onto
R9	was	was
R10	too	too
R11	heavy	heavy

The materials were presented to the participants on a computer using E-Prime software. The presentation order of sentences in the two conditions and fillers was automatically randomized. All sentences were followed by yes-no or wh-comprehension questions, which the participants answered using the keyboard. The participants were familiarized with the experiment after complete of sample items. The two types of sentences, DO RC and OBL RC, had the same words in regions; however, the sequence of the words differs. The 48 items including 16 critical items and 32 fillers were randomly assigned to one of two lists by using a Latin-square design so that each reader saw only one version of each sentence. This study measures two dependent variables: (1) reading comprehension accuracy; (2) total reading times (RTs). First, to determine the mean scores, all answers to comprehension questions of the 16 critical items (8 items for each condition) were saved in E-Prime software automatically. The data was converted into an Excel file to determine reading comprehension accuracy. For each condition, participants' comprehension scores were 100% when they had 8 correct answers. Second, to measure total reading times, three different analyses on total RTs were performed. Three sets of regions were targeted to compare the difficulty of reading the two types of RCs: (1) R1-R8, the head noun and relative clause; (2) R1-R9, the head noun, relative clause, and main verb; and (3) R1-R11, the whole sentence. Sample test items appear in Appendix. It took approximately 30 minutes to finish the entire task. All participants met the experimenter in a quiet lab individually. After finishing a reading task, the participants were asked to finalize a questionnaire that surveys background information such as age and TOEIC score.

IV. RESULTS

1. Reading Comprehension Accuracy

The first research question asked the mean scores on the comprehension questions by the participants. The overall scores on all comprehension questions were 60.8% for the intermediate-proficiency group and 52.16% for the high-proficiency group. Comprehension accuracy for the intermediate-proficiency group on DO RC and OBL RC conditions was 73.6% and 43.75%, respectively. For the high-proficiency group, it was 78.57% and 58.30%, respectively. The gap position (DO vs. OBL) and the proficiency of the L2 learners were used as the two independent factors, with comprehension score as a dependent factor. This result is extended to the analysis of a two-way ANOVA, which uses proficiency as the between-subject factor and gap as the within-subject factor. As a result, it showed a significant effect of gap position (DO vs. OBL; $F(1, 38) = 45.52$, $p = .000$) and main effect of group (high > intermediate; $F(1, 38) = 6.92$, $p = .009$). However, no interaction effect was founded between RC condition and proficiency level. Overall, these results indicate that the L2 learners in both proficiency groups comprehended DO

RCs better than OBL RCs.

2. Total Reading Times

The total RTs include the reading time data from only the test items with correct answers to the comprehension questions. As the first analysis, the RTs for R1-R8 were investigated, as in (9a-b).

(9a) Direct object RC:
the book [that I lifted _ onto the box]

(9b) Oblique RC:
the box [that I lifted the book onto _]

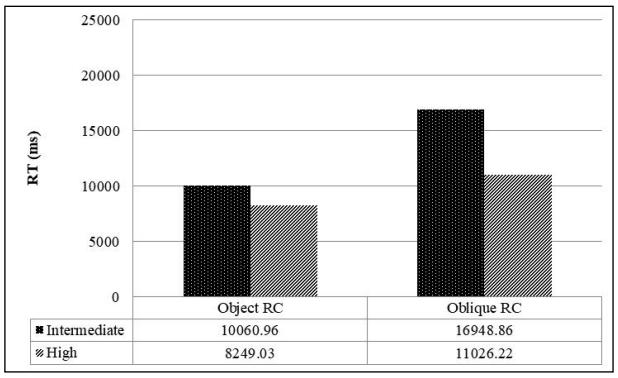

FIGURE 1 Total RTs in Milliseconds From R1-R8

The results are shown in Figure 1.The gap position (DO vs. OBL) was used as an independent factor, and total RT from R1 to R8 was used as the dependent factor. The participants spent shorter reading time for the DO RC condition than for the OBL RC condition (intermediate group: 10060.96 ms vs. 16978.86 ms; high group: 8249.03 ms vs. 11026.22 ms). The results of the statistical analysis show a significant effect of gap position (DO vs. OBL; $F(1, 38) = 12.12$, $p = .001$) and a main effect of group (high > intermediate; $F(1, 38) = 64.31$, $p = .000$) on total RTs from R1-R8. This first set of eight words, the relative clause with the head noun, is critical to the research questions. Because the L2 learners spent much more time on the OBL RCs than the DO RCs, it can be concluded that a gap effect arises in this region. As the second analysis, total RTs in R1-R9 were investigated; region 9 was the main verb of the full sentence, as in (10a) and (10b).

(10a) Direct object RC:
the book [that I lifted _ onto the box] was

(10b) Oblique RC:
the box [that I lifted the book onto _] was

The total RT results for this region set are shown in Figure 2. The analysis at the main verb region showed a position effect; there was a main effect of gap position.

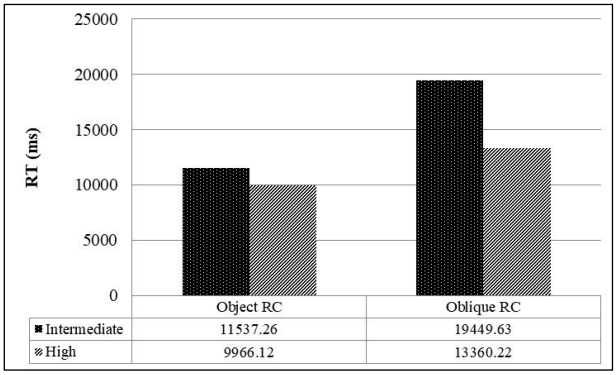

FIGURE 2 Total RTs in Milliseconds From R1-R9

The participants spent shorter reading time for the DO RC condition than for the OBL RC condition (intermediate group: 11537.26 ms vs. 19449.63 ms; high group: 9966.12 ms vs. 13360.22 ms). The statistics show a significant effect of gap position (DO vs. OBL; $F(1, 38) = 26.61$, $p = .000$) and a main effect of group (high > intermediate; $F(1, 38) = 45.57$, $p = .000$) on total RTs from R1-R9. The second set added the main verb to the RC and head noun of the first set. At the main verb region, the verb (i.e., matrix verb) was read much faster in the DO RC condition. Compared to the first set, the difference between conditions is larger in the second set, indicating that the participants spent a much longer time in reading the matrix verb region.

In the last analysis, for the region set from R1 to R11, as shown in (11a) and (11b), there was a significant effect for gap type (DO vs. OBL; $F(1, 38) = 26.09$, $p = .000$) and a main effect of group (high > intermediate; $F(1, 38) = 45.16$, $p = .000$) on total RTs from R1-R11. As shown in Figure 3, the participants spent shorter reading time for the DO RC condition than for the OBL RC condition (intermediate group: 13887.95 ms vs. 23422.41 ms; high group: 12112.61 ms vs. 16223.95 ms).

(11a) Direct object RC:
the book [that I lifted _ onto the box]
was too heavy

(11b) Oblique RC:
the box [that I lifted the book onto _]
was too heavy

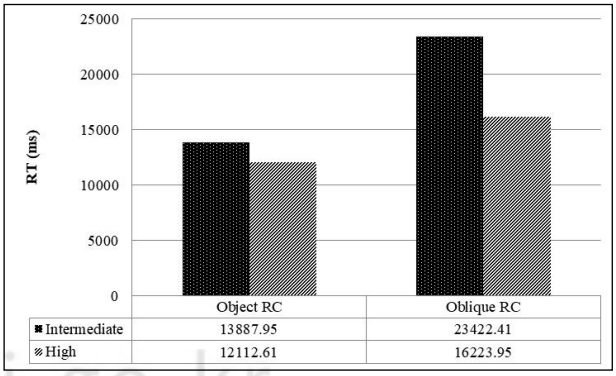

FIGURE 3 Total RTs in Milliseconds From R1-R11

All in all, all of the L2 learners showed significantly faster total RTs on OBL RCs than on DO RCs. But, as seen in Table 2, these differences of RTs for the two conditions were much larger in the intermediate-proficiency group than in the high-proficiency group. For the first set, the differences between the two conditions were 6887.90 ms for the intermediate-proficiency group and 2777.19 ms for the high-proficiency group. The disparity between the two RC conditions was larger for the intermediate-proficiency group (7912.37 ms) than the high-proficiency group (3394.10 ms) in the second set. Also, the difference increased strikingly, for R1-R11 (intermediate: 9534.46 ms; high: 4111.34 ms).

TABLE 2
RT Difference for Each Condition by Group (milliseconds)

Region	Intermediate	High
R1-8	6887.90	2777.19
R1-9	7912.37	3394.10
R1-11	9534.46	4111.34

3. Comparison with L1 Processing

The last research question asked whether L1 and L2 speakers' processing of DO and OBL RCs might differ. Comparing the results from this L2 processing study to the results of C. E. Kim's (2016) L1 processing study, which used the same test with English-speaking adults, we see that L1 and L2 speakers show very similar patterns. C. E. Kim (2016) reported that English-speaking adults (n = 52) manifested more difficulty in reading OBL RCs compared to DO RCs. As shown in Table 3, their accuracy on comprehension questions showed a significant difference between the two types of RCs: 83% for DO RCs and 56% for OBL RCs (p = .000).

TABLE 3
Reading Comprehension Accuracy (%)

Group	Direct object RCs	Oblique RCs
Intermediate	73.60	43.75
High	78.57	58.30
L1 (C.E. Kim, 2016)	83.00	56.00

In addition, the L1 speakers also read the DO RCs significantly faster than the OBL RCs (R1-R8: 4566 ms vs. 5218 ms; R1-R9: 5199 ms vs. 6130 ms; R1-R11: 6605 ms vs. 7727 ms). In sum, based on both reading comprehension accuracy and total reading time measurements, the OBL RCs were more difficult than the DO RCs for the L2 learners to process, just as they were for the native speakers of English in C. E. Kim's (2016) study.

V. DISCUSSION

Both comprehension accuracy and total RTs show a difference across types of relative clause. This study's research questions inquire into whether the two types of RCs have distance effects on sentence processing by L2 learners. The analysis of the participants' comprehension scores indicates that English OBL RCs are significantly more difficult than DO RC RCs for ESL learners to comprehend. The analyses of the total reading times also suggest the greater difficulty of processing OBL RCs than DO RC RCs for the study's participants: They read the DO RCs significantly faster than the OBL RCs. This difference was caused by longer RTs in the OBL RC condition in all three region sets analyzed: (1) Region1-Region 8, (2) Region 1-Region 9, and (3) Region 1-Region 11. Because the numbers of words were the same in both conditions, the slowdown (longer RTs) in each analysis for the OBL RCs suggests that it is the length between the filler and the gap that affects syntactic processing.

While various explanations have been proposed to explain differences in the processing difficulty of different RC constructions, the current study suggests that it is the distance effect—the greater distance of the filler-gap dependency—that leads to more processing difficulty in the OBL RC condition than in the DO RC condition. Both conditions take an inanimate head noun (e.g., *the book or the box*) as the subject of the full sentence. Because inanimate nouns occur infrequently in the subject position, the readers know from the very beginning of reading that they need to hold open various possibilities for the role of the inanimate head noun. When the readers encounter the word *that* (R3), the role of the inanimate head noun becomes clearer in the unfolding relative clause. Mak et al. (2002) pointed out that readers are highly likely to see the inanimate head noun as signaling a DO RC. The possibility that the subject of the matrix clause can become the DO or take any other role may impose a greater processing load on the parser, compared to when it becomes the subject of the relative clause. At the same time, while more of the sentence is displayed, the filler is held in the reader's mind until it can be properly placed. For this reason, both conditions give the readers more difficulty than would subject RC sentences. At region 4, they encounter the pronoun *I* and realize the noun they are holding in mind is not the subject of the unfolding clause, leading to a reanalysis. In the DO RC condition, the parser can put the held noun in the gap position after region 5, whereas in the OBL RC condition, the parser must continue to keep it in memory until after region 8. In the latter case, the parser has a harder time connecting the filler and the gap because it encounters three different lexical items (*I lifted the book*) before reaching the gap, as seen in (12b), compared to only two (*I lifted*) in the DO RC condition (12a).

(12a) The book [that I lifted _ onto the box]
1 2

(12b) The box that [I lifted the book onto _]
1 2 3

The need to hold discourse referents in mind increases

working memory loads while the filler-gap relation is resolved. Therefore, having one more referent in the OBL RC adds to the parser's difficulty in comprehending the sentence through the resolving process. The resolution first appears possible after region 5; and it is possible in the DO condition. But, in the OBL RC condition, the parser next encounters the definite article *the* in region 6, which makes it clear that the previous resolution at region 5 is impossible. The reader must hold the filler, the subject of the RC, and the third noun in their memory until region 8 in the OBL RC condition, and must go through a process of reanalysis as well. The different levels of difficulty of the processes of comprehending the two types of relative clauses are reflected in total RT results from region 1 to region 8. Moreover, the intermediate group showed a larger difference between the two conditions.

In the second RT analysis, which includes the main verb region (R9), the differences were larger for the OBL condition than for the DO condition. Both conditions have the same be-verb, was. Both proficiency groups spent quite a long time reading that single word, was. This is presumably because additional retrieval is processed at this region for the OBL condition. In other words, because the gap position is located after region 8 in the OBL RC condition, the filler and gap resolution happens at region 9.

For the last RT analysis, for the set from region 1 to region 11, the processing patterns are similar. The differences between the second set (R1-R9) and this third set (R1-R11) were again larger for the OBL RC condition than for the DO RC condition. In short, the participants in both proficiency groups spent much more time reading the last two words of sentences in the OBL RC condition.

VI. CONCLUSION

This study is conducted to contribute to the literature on L2 sentence processing by comparing direct object relative clauses with oblique relative clauses. Both RC types typically have inanimate head nouns and noncanonical word order, which makes it possible to avoid the animacy and word-order effects that limit the usefulness of subject and DO RC comparisons.

As the first research question, it was tested whether L2 learners of English differ in their ability to comprehend the two RC types. An analysis of their comprehension accuracy showed a significant difference between the two conditions. Both proficiency groups showed better accuracy scores on DO RCs than on OBL RCs. As the second research question, the total RTs supported the claim that L2 learners process DO RCs more easily than OBL RCs. The L2 learners from both proficiency groups took longer to read the OBL RCs than to read the DO RCs. The results indicate that sentences including OBL RCs were more challenging to comprehend than sentences including DO RCs, and that their difficulty increased at the region of the relative clause and continued to increase in the following regions. As the last research question, the outcomes of this study along with those of C. E. Kim's (2016) L1 study show that DO RCs are easier to comprehend than OBL RCs for both L1 and L2 English speakers. This finding supports similar patterns between L1 processing and L2 processing suggested by some researchers (Dekydspotter, Schwartz, & Sprouse, 2006; Dussias, 2003; C. E. Kim, 2017). In particular, Dussias's work showed L2 speakers use the same parsing strategies as native speakers. Alongside previous works, data from the study revealed L2-English speakers and L1-English speakers favored relative clauses with shorter distance between the filler and the gap when reading in their L1 and L2.

The findings strongly become clear evidence of the effect of the distance of the filler-gap dependency because the distances between the filler and the gap are more expanded in OBL RCs than in DO RCs. The results from the present study thus support the idea of the distance effect in relative clause processing. Gibson (1998, 2000), O'Grady (2015), and Hawkins (1999, 2004) claimed that holding intervening lexical items in mind while processing filler-gap dependencies generates processing difficulty. By this logic, the additional intervening lexical item in OBL RCs causes the parser more difficulty in processing this type of RC. The comprehension scores indicated that L2 learners of English comprehend DO RCs much better than OBL RCs. Also, the total RT analyses showed that they read DO RCs much more quickly than OBL RCs. Therefore, this study demonstrates that the distance effect occurs in second language processing just like it does in native language processing. Both conditions have identical words in each sentence but show different comprehension scores and reading times, indicating that it is the different syntactic structures that cause different patterns in comprehending sentences. In other words, distinct syntactic structures create more or less burden while L2 learners are reading relative clauses.

Two pedagogical implications were found in this study: First, with the results, teachers could have understood various factors of RCs processing. They are required to find out function of English RC structure with regard to different types of RCs. Second, teachers should learn to utilize relative clauses with proper activities by considering various factors, such as animacy and pronominal RC subject at their classes.

This study has two important limitations. First, OBL RCs are infrequently used in actual speech. According to C. E. Kim (2017), even in L1 corpora, English OBL RCs are very rare. Alongside structural complexity, their low frequency may cause the greater difficulty of comprehending and processing OBL RCs over DO RCs. To resolve this problem, future research should compare learners' processing of other types of OBL RC. Second, the relatively small number of participants (n = 39) was another limitation of this study. More research is needed to determine the proficiency effect by adding L2 groups.

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APPENDIX

Test Items

1. The book that I lifted onto the box was too heavy.
   The box that I lifted the book onto was too heavy.
2. The soda that I mixed the beer into was quite delicious.
   The beer that I mixed into the soda was quite delicious.
3. The scarf that I twisted around the rope was so cheap.
   The rope that I twisted the scarf around was so cheap.
4. The table that I moved toward the couch was really messy.
   The couch that I moved the table toward was really messy.
5. The letter that I hid under the photo was very surprising.
   The photo that I hid the letter under was very surprising.
6. The paper that I placed on the binder was too large.
   The binder that I placed the paper on was too large.
7. The paper that I positioned over the handkerchief was so colorful.
   The handkerchief that I positioned the paper over was so colorful.
8. The saucer that I set on the dish was really dirty.
   The dish that I set the saucer on was really dirty.
9. The purse that I laid on the blanket was very antique.
   The blanket that I laid the purse on was very antique.
10. The towel that I left on the laptop was quite pretty.
    The laptop that I left the towel was quite pretty.
11. The bag that I threw onto the cushion was too big.
    The cushion that I threw the bag onto was too big.
12. The hat that I tossed onto the pillow was so light.
    The pillow that I tossed the hat onto was so light.
13. The purse that I stashed in the bag was very expensive.
    The bag that I stashed the purse in was very expensive.
14. The water that I poured into the wine was really cold.
    The wine that I poured the water into was really cold.
15. The book that I put on the carton was very small.
    The carton that I put the book on was very small.
16. The ball that I dropped on the container was quite old.
    The container that I dropped the ball on was quite old.