Complex-NP Islands in Korean: An Experimental Approach

Yong-hun Lee
Chungnam National University
99 Daehak-ro, Yuseong-gu
Daejeon 305-764, Korea
yleeuiuc@hanmail.net

Yeonkyung Park
Hannam University
70 Hannamro, Daedeok-gu
Daejeon 306-791, Korea
withbyk@hanmail.net

Abstract

This paper took an experimental approach and examined island constraints in Korean. Among many island constraints, this study took a Complex NP island constraint, and the experiment was designed with 3 related factors: presence vs. absence of island, matrix clause vs. embedded clause, and scrambling. The analysis results illustrated that the presence/absence of complex NP island did not play a role by itself in Korean but that it made distinctions through the interactions with other factor such as matrix vs. embedded clause.

1 Introduction

Since Ross's identifications of island constraints in English (Ross, 1967), there have been a lot of debates on the existence of island constraints in other languages. For example, Nishigauchi (1990) and Watanabe (1992) claimed that there were island constraints in Japanese, but Ishihara (2002) and Sprouse et al. (2011) mentioned that this language had no island constraint. Likewise, there have been controversies on the existence of island constraints in Korean. Some have argued for the presence of island effects (Lee 1982, Han 1992, Hong 2004), while others have argued against it (Sohn 1980, Kang 1986, Suh 1987, Hwang 2007).

This paper investigated the island constraints in Korean. Our questions were (i) if Korean also has the Complex NP island constraints and (ii) if there are, why there have been so many controversies on the existence of island constraints.

In order to answer these questions, this paper took an experimental approach and examined the island properties in Korean. The target sentences were constructed with three factors, and native speakers' intuition was measured with Magnitude Estimation (ME). After the experiment, all the data for the target sentences were extracted and they were statistically analyzed with R.

Through the analysis, it was found that that the presence/absence of Complex NP island did not play a role by itself in Korean but that it made distinctions through the interactions with other factor such as matrix vs. embedded clause. These examples provided an account for why there have been so many controversies on the existence of island constraints in Korean.

This paper is organized as follows. In Section 2, previous studies were reviewed especially focused on the experimental approaches. Section 3 includes the accounts for experimental design (research materials and research methods), and Section 4 enumerates the analysis results. Section 5 contains discussions, and Section 6 summarizes this paper.

2 Previous Studies

2.1 Island Effects in Korean

Since Ross (1967) identified the island constraints in English, there have been lots of studies on the existence of island constraints in other languages. Those studies primarily focused on examining if the island constraints exist in their languages and why the language escaped the island constraints when the language did not demonstrate the island phenomena.

Korean is no exception. There have been lots of studies on the island constraints in Korean. Earlier studies were primarily focused on the basic island properties in Korean. Choi (1989)

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tried to explain the island phenomena with LF-movements. Song (1995) investigated the relationship between the island constraints and *wh*-in-situ property. On the other hand, Lee (1999) studied negative islands in Korean.

There are two opposite positions in the previous approaches. Some claimed that Korean has island constraints (Lee 1982; Han 1992; Hong 2004; Park, 2001, 2009). Hong (2004) proposed 2 diagnostics for syntactic movements: island and intervention effects. The study mentioned that Korean has an island effects and that no intervention effects were observed in the *wh*-movements. Park (2001) and Park (2009) examined sluicing constructions in Korean. Through the investigation, it was found that matrix sluicing in Korean was island-sensitive. The study argued that the island sensitivity arose because the *wh*-phrase did not move to CP in overt syntax. Park (2009) also proposed accounts for the contrast between matrix sluicing and fragment answers in Korean with respect to island sensitivity.

On the other hand, other scholars claimed that there is no island effect in Korean (Sohn, 1980; Kang, 1986; Suh, 1987; Hwang, 2007; Chung, 2005; Yoon, 2011, 2012; Kim, 2013). Chung (2005) mentioned that Korean *ettehkey* (how) did not show island effects. Given the revised nominal analysis, the scope of *ettehkey* (how) in Korean had to be licensed via binding, since there was no island effect. Yoon (2011, 2012) identified two novel environments where *wh*-phrases showed no island effects: the declarative intervention context and the embedded context. Then, the question was why the in-situ *wh*-phrases were not identical to the standard *wh*-phrases in English. The study also mentioned that the standard *wh*-island effects corresponded to the misinterpretation judgment and argued for it by showing that there was a strong correlation between the *wh*-islands and the possibility that *wh*-in-situ questions would be misinterpreted as Yes/No-questions. Kim (2013) investigated *wh*-islands in the relative clauses. The study claimed that the fact that Korean escaped the island constraint can be explained by a semantico-pragmatic constraint, which is based on the notion of coherence and the construction-specific factors that cause processing difficulty.

2.2 Experimental Approaches to Islands

Recently, as computer technology and statistics develop, many researchers have had an interest in measuring native speakers' intuition on syntactic data objectively and scientifically (Bard, Robertson, and Sorace, 1996; Schütze, 1996; Cowart, 1997; Keller, 2000). This research method was also applied into the study of islands, and lots of fruitful facts have been discovered through experimental approaches.

Sprouse et al. (2012) adopted an experimental approach and examined native speakers' intuition. They employed 2×2 factor combinations in (1) and investigated four types of island constraints using the following sentences (Sprouse et al., 2012:87-8).

(1) Factor Combinations
a. NON-ISLAND | MATRIX
b. NON-ISLAND | EMBEDDED
c. ISLAND | MATRIX
d. ISLAND | EMBEDDED

(2) Whether islands
a. Who __ thinks that John bought a car?
b. What do you think that John bought __ ?
c. Who __ wonders whether John bought a car?
d. What do you wonder whether John bought __ ?

(3) Complex NP islands
a. Who __ claimed that John bought a car?
b. What did you claim that John bought __?
c. Who __ made the claim that John bought a car?
d. What did you make the claim that John bought __?

(4) Subject islands
a. Who __ thinks the speech interrupted the TV show?
b. What do you think __ interrupted the TV show?
c. Who __ thinks the speech about global warming interrupted the TV show?
d. What do you think the speech about __ interrupted the TV show?

(5) Adjunct islands
a. Who __ thinks that John left his briefcase at the office?
b. What do you think that John left __ at the office?
c. Who __ laughs if John leaves his briefcase at the office?
d. What do you laugh if John leaves __ at the office?

Along with these target sentences, they examined the intuition of 173 native speakers. Through the experiments, they obtained the following results (Sprouse et al. 2012:100).

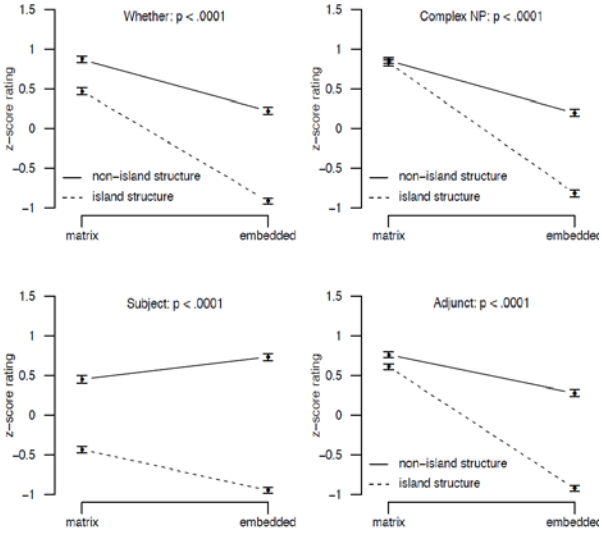

Figure 1. Analysis Results in Sprouse et al. (2012)

These analysis results illustrated (i) that native speakers showed more acceptability for non-island structures than island structures both in matrix and embedded causes and (ii) that the differences of acceptability became greater in embedded clauses rather than matrix clauses. These observations demonstrated that there were clearly island effects in English.

Kim and Goodall (2014) employed a similar method in their experiments and examined the island constraints in Korean. They designed four experiment sets to test the existence of *wh*-island (*whether* island) and adjunct island effects in Korean. Since Korean is a *wh*-in-situ language, another factor (canonical order vs. scrambled) was taken into consideration and their experiments had a 2×2×2 design: Location of *wh*-word (in matrix vs. embedded clause), Embedded clause type (non-island vs. island) and Answer type (appropriate for direct *wh*-question vs. yes/no question).

They made use of question-answer pairs along with appropriate contexts in order to examine native speakers' intuition. They made the questions in the stimuli ambiguous so that *wh*-words might be interpreted either as *wh*-words or as existential, as in Hong (2004).

A total of 48 native speakers participated in the experiments and the intuition was measured with a 7-point Likert scale. The following figures showed us the analysis results.

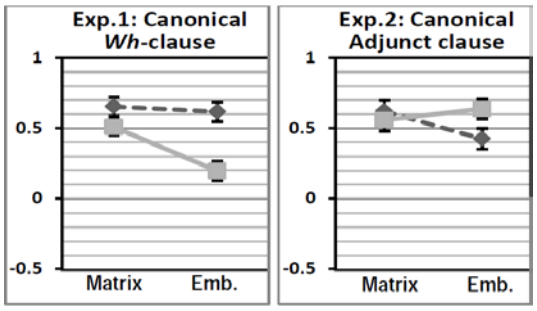

Figure 2. Canonical Order in Korean

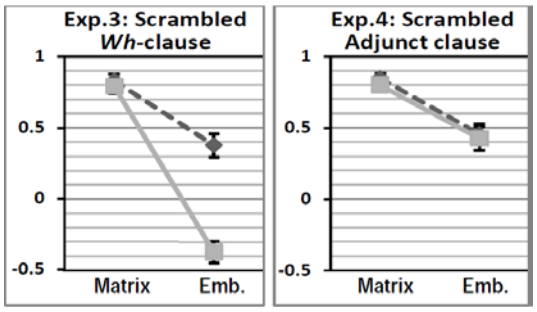

Figure 3. Scrambled Order in Korean

They found that there were a significant interaction between Location (matrix or embedded clause) and Embedded clause type (non-island or island) in Exp. 1 and Exp. 3, but that there was no such interaction in Exp. 2 and Exp. 4. This implies that there is an island effect with *wh*-clauses (Exp. 1 and Exp. 3) but that no island effect exists with adjunct clauses (Exp. 2 and Exp. 4).

Along with these results, they obtained another interesting observation. For the ambiguous questions contained in the question-answer pairs, they observed that one reading or the other was encouraged. Furthermore, they found that the presence or absence of an appropriate context made the *wh*-reading pragmatically plausible or implausible, even in the cases where an island constraint was violated.

3 Research Method

3.1 Research Question and Hypothesis

Among the island constraints proposed in Ross (1967), this paper tried to investigate the Complex NP island constraint in Korean.

Our research questions are as follows.

(6) Research Questions
   a. Is there a Complex NP island effect in Korean?
   b. If there is an island effect, why are there so many controversies on the existence of island effects?

For these questions, we made the following hypotheses.

(7) Hypothesis
a. If there is no Complex NP island effect in Korean, the acceptability scores of all the types in the target sentences will not be distinguishable from one another.
b. If there is a Complex NP island effect in Korean, the acceptability scores of all the types in the target sentences may be distinguishable from one another or the patterns that the Korean data illustrated may be different from English Complex NP islands.

To examine these hypotheses, an experiment was designed as follows.

3.2 Materials

In order to closely examine the island constraints in Korean, the first thing to be done was to make target sentences. This paper basically followed the factor combinations in (1) à la Sprouse et al. (2012), but another factor Scrambling was also taken into consideration as in Kim and Goodall (2014). That is, the following three factors were employed in the experiment: Island constraint (Absence vs. Presence), Location of *wh*-word (Matrix clause vs. Embedded clause), and Scrambling (Canonical vs. Scrambled). Since three factors were adopted and each factor had two values, the experiment had a 2×2×2 design.

First of all, basic target sentences were made with the sentences in (3) and the sentences in Pearl and Sprouse (2014). The following sentences are basic target sentences for Complex NP constraints in Korean.[1]

(7) a. *Nwu-ka Younghee-ka mok.keli-lul*
Who.NOM Younghee.NOM necklace.ACC
ilhepeli-ess-ta-ko cwucangha-ni?
lose.PAST.DECL.COMP claim.Q
'Who claimed that Younghee lost the necklace?'
b. *Chelsoo-nun Younghee-ka mues-lul*
Chelsoo.TOP Younghee.NOM what.ACC
ilhepeli-ess-ta-ko/nun cwucangha-ni?
lose.PAST.DECL.COMP claim.Q
'What did Chelsoo claim that Younghee lost?'
c. *Nwu-ka Younghee-ka mok.keli-lul*
Who.NOM Younghee.NOM necklace.ACC
ilhepeli-ess-ta-ko cwucang-ul
lose.PAST.DECL.COMP claim..ACC
ha-yss-ni?
do.PAST.Q
'Who made a claim that Younghee lost the necklace?'
d. *Chelsoo-nun Younghee-ka mues-lul*
Chelsoo.TOP Younghee.NOM
what.ACC
ilhepeli-ess-ta-ko cwucang-ul
lose.PAST.DECL.COMP claim..ACC
ha-yss-ni?
do.PAST.Q
'What did Chelsoo made a claim that Younghee lost?'

These four sentences match with the corresponding sentences in (3), and they contained the factor combinations in (1). Four sentences in (7) have a canonical order, and the sentences with scrambled orders were constructed by interchanging the subject and object of these basic target sentences. [2]

Along with these target sentences, the double number of filler sentences were made. The half of the filler sentences (8 sentences) were constructed based on the structure of the target items. However, they was not related with the Complex NP island constraints. The others of the filler sentences (8 sentences) were composed of the sentences that had no relation with the purpose of the experiment. Among them, 4 sentences were grammatical one and the others were ungrammatical one.

After all the target and filler sentences were constructed, a random numbers were generated with the R function (from 1 to 24; 8 target sentences and 16 fillers), and each sentence was given the generated random numbers. Then, the sentences were given to the participants after the sentences were sorted based on the random number.

[1] In fact, the basic target sentences in the experiment were constructed primarily based on Pearl and Sprouse (2014) and Sprouse et al. (2014), rather than based on the sentences in Sprouse et al. (2012), since the Korean translations of the sentences in these studies were more natural.

[2] A reviewer pointed out that the sentences in (7c) and (7d) must contain *ilhepeli-ess-ta-nun*, not *ilhepeli-ess-ta-ko*. In fact, this verb form was also included in the data sets, since it is desirable to avoid the lexicalization effects. However, the differences between the sentences with *ilhepeli-ess-ta-nun* and those with *ilhepeli-ess-ta-ko* were not statistically significant. In addition, these two types of sentences demonstrated the same pattern in Figure 4.

3.3 Procedure

The data for a total of 50 native speakers were collected from the experiment. All the participants (ages ranging between 19 and 27) resided in and around Daejeon area, South Korea. They were either current university students or graduates of universities in Korea.

All the participants were first asked to fill out a simple one-page survey that contains biographical information such as age, gender, and dialect(s), together with the consent form for participating in the experiment. Then they were asked to proceed to take the main task.

The main task used in the experiment was an acceptability judgment task using Magnitude Estimation (ME; Lodge, 1981; Johnson, 2008), not the Likert scale as in Kim and Goodall (2014).

There are several reasons why this paper took an ME in the acceptability judgment task, rather than the Likert scale.[3] First, the Likert scale has limited resolution. For example, if native speakers may feel that a sentence is somewhere between 4 and 5 (something like 4.5), gradient ratings are not available in the latter method. However, the former permits as much resolution as the raters wish to employ. Second, the latter method uses an ordinal scale, and there is no guarantee that the interval between * and ** represent the same difference of impressions as that between ? and ??. The former method, on the other hand, provides judgments on an interval scale for which averages (mean value, *m*) and standard deviations (*sd*) can be more legitimately used. Third, the latter limits our ability to compare results across the experiments. The range of acceptability for a set of sentences has to be fitted to the scale, and what counts as ?? for one set of sentences may be quite different from what counts as ?? for another set of sentences.

There are two types of ME methods: numerical estimates and line drawing. However, as Bard et al. (1996) pointed out, the participants sometimes think of numeric estimates as something like academic test scores, and so they limit their responses to a somewhat categorical scale (e.g. 70, 80, 90, 100), rather than using a ratio scale as intended in the magnitude estimation.

Accordingly, the current study adopted a line drawing method in which the participants were asked to draw different lengths of lines to indicate the naturalness (acceptability) of a given sentence (after reading the sentence). An acceptability judgment task (also known as native speakers' intuition test) was used in the study since this method is known to be a psychological experiment which can be used to get the subconscious knowledge of native speakers in a given language (Carnie, 2012). In the main task, participants were required to draw a line for each sentence, according to the degree of acceptability/naturalness of the given sentence.

4 Statistical Analysis

4.1 Normality Tests and Regression

After all the data were collected from acceptability judgment tasks, the values were extracted for target sentences by measuring the length of lines. Then, the normality tests (Baayen, 2008; Gries, 2013) were performed to check whether parametric tests were available or not. If the distributions of the data follow the normal distribution, the parametric tests are available, such as *t*-tests, ANOVAs, or (ordinary) linear regression tests. However, if the distributions do not follow the normal distribution, the non-parametric tests must be applied such as Wilcoxon tests, Friedman tests, or generalized linear regression tests.

When the normality tests were performed, it was found that all the data sets did not follow the normal distribution. Some were positively skewed, and others showed a slightly bimodal distribution. Accordingly, non-parametric tests had to be applied in the analysis of our data.

After the normality tests, the collected data were descriptively analyzed. Then, in order to closely examine how each factor affects the acceptability of the target sentences, a (generalized) regression test was performed. According to Agresti (2007), a generalized regression test is available when the distribution does not follow the normal distribution. Thus, the test was adopted to examine how each factor affects the acceptability of the sentences.

After we performed a regression analysis, it is necessary to choose the most appropriate model among the several possible models. According to

[3] Lee (2013) contained a detailed discussion on the differences between ME and Likert scales in the acceptability judgment task (intuition tests). Lodge (1981) mentioned that this ME had several advantages over the category scaling (the Likert scale). Although there are some claims that the Likert scales are available in the acceptability judgment task, this paper follows previous studies (Lodge, 1981; Johnson, 2008) and adopted ME in the experiment.

Gries (2013), there are two types of model selection parameters. One is based on the direction of the analysis and the other is the criterion determining whether or not a predictor gets to be in the model. On the direction of the analysis, most analyses have adopted a backward selection, and this paper also took this method. There are two types of approaches to the selection of relevant models: significance-based approaches and criterion-based approaches. This paper took a significance-based approach. That is, the analysis would start from the maximally saturated model, and continued to remove predictors (backward) until the analysis reached the significant differences in the *p*-value (significant-based).

4.2 Descriptive Statistics

Before a regression test was conducted, a basic descriptive analysis was performed to the data. Although all the data sets did not follow the normal distribution, since the *p*-values of the tests were *marginal*, the mean values and their 95% confidence intervals (CIs) were adopted in the descriptive analysis. The following figures show us the overall tendency of the data.

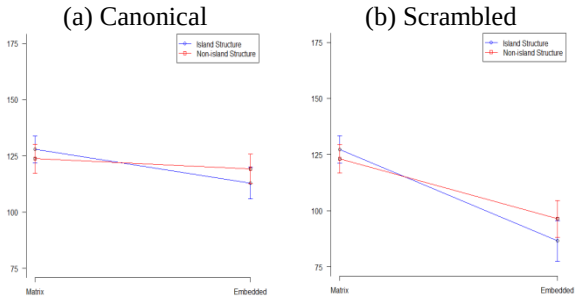

Figure 4. Descriptive Analysis of the Data

As you can observe in these plots, two lines in the plots are crossed. This tendency is similar to that of Exp. 2 (Figure) in Kim and Goodall (2014), but it is different from the Complex NP constraints in English (Figure 1).

Note that the 95% CIs of all of the four pairs overlap. This demonstrates that two data sets are not statistically distinguished, which implies that there is no (Complex NP) island effect in Korean. Also note that the scores for matrix clause in the Scrambled sentences are higher than the values for the embedded sentences. This implies that the matrix vs. embedded distinctions play an important role also in Korean.

4.3 Inferential Statistics

Since it is difficult to visually examine how the three factors play a role in the Complex NP islands in Korean data, a (generalized) linear regression test was performed. [4] This method was taken, since the data set did not follow the normal distribution. The following table illustrates the analysis results. Here, the following abbreviations were used: I for Island constraint (Absence vs. Presence), C (Clause Type) for the location of *wh*-word (Matrix clause vs. Embedded clause), and S for Scrambling (Canonical vs. Scrambled).

	Estimate	*sd*	*t*	*p*
(Intercept)	114.638	1.236	92.751	<<<.001
I	0.988	1.236	0.799	.425
C	-10.858	1.236	-8.785	<<<.001
S	6.288	1.236	5.087	<<<.001
I:C	3.043	1.236	2.462	.014
I:S	-0.413	1.236	-0.334	.739
C:S	6.003	1.236	4.856	<<<.001
I:C:S	-0.428	1.236	-0.346	.730

Table 1. Regression Analysis Results of the Data

As observed in this table, both factors C and S were *highly* significant ($p<.001$), but the factor I was not significant ($p=.425$).

There were interactions between the factors. The factor C has a strong interaction with the factor S ($p<.001$), but a weak but significant interaction with the factor I ($p=.014$). All the other interactions (I:S and I:C:S) were statistically insignificant ($p>.05$).

These results implied that the factor I (the absence vs. presence of Complex NP island constraint in Korean) did not play a role by itself, but played a marginal role through the interaction with the factor C. The factor I did not play a role in the other interactions (I:S and I:C:S).

4.4 Analysis with Effect Plots

Since a (generalized) linear regression test was performed, let's examine how three factors and their interactions influenced the acceptability of the sentences. Figure 5 illustrates the effect plots for each factor.

[4] Someone might ask why a (generalized) mixed effect model was not used here, as in Sprouse et al. (2012). It may be possible to use the model. However, in our experiment, the only random factor was speaker variations. Though speaker variation is also an important factor, a generalized (fixed) linear regression model was applied here to make the statistical process simple.

As observed in these figures, the 95% CIs overlaps in the factor Island, while two groups are clearly distinguished in the other factors Clause Type and Scrambling. This implies that the factor Island by itself is insignificant in the Korean data (p=.425), while the other factors Clause Type and Scrambling are statistically significant in Korean (p<.001 in both factors).

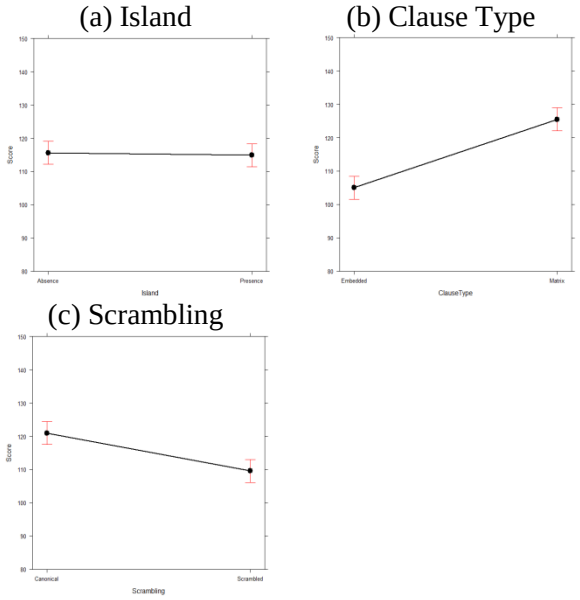

Figure 5. Effect Plots for 3 Factors

Now, let's move to the interactions among the factors. The following plot shows the interactions between the factor Island and the factor Clause Type.

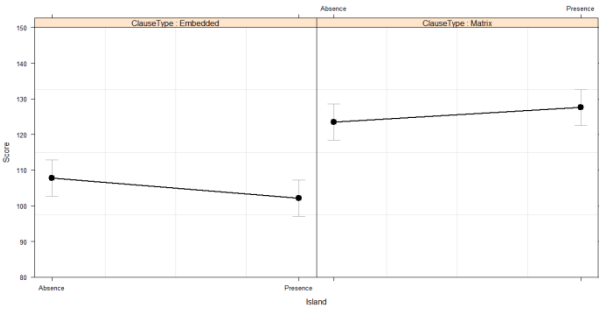

Figure 6. Effect Plot for Island:Clause Type

If there is no interaction between two factors, the lines are parallel. If there is an interaction between two factors, however, the lines are not parallel. As observed in these plots, two lines are not parallel. This implies that there is an interaction between two factors (p=.014).

The following plot shows us the interactions between two factors Island and Scrambling.

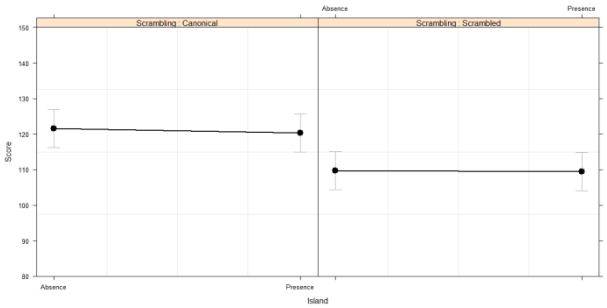

Figure 7. Effect Plot for Island:Scrambling

As observed in these plots, two lines are nearly parallel. This implies that there is no interaction between two factors (p=.739).

The following plot shows us the interactions between the factor Clause Type and the factor Scrambling.

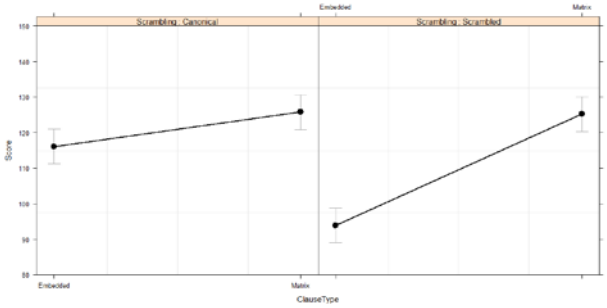

Figure 8. Effect Plot for Clause Type:Scrambling

As observed in these plots, two lines are not parallel. Furthermore, the slopes of two lines are clearly different. This implies that there is a strong interaction between two factors (p<.001).

The last plot shows us the interactions among the three factors: Island, Clause Type, and Scrambling.

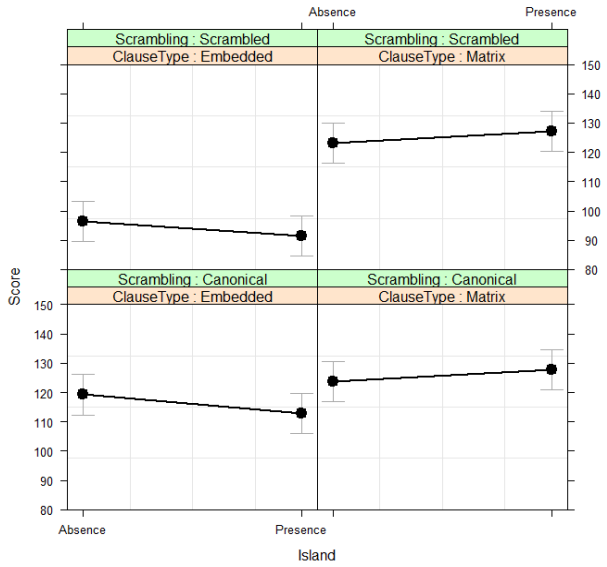

Figure 9. Effect Plot for Interactions

As observed in these plots, all the lines are not parallel. However, the slopes of the lines are not clearly different. This implies that there is little interaction between two factors (p=.730).

5 Discussion

Now, let's see what answers can be provided to the research questions in (6) and Hypothesis in (7) along with the analysis results.

For the first question, the analysis results in Table 1 demonstrated that Korean clearly had a Complex NP island constraint, like English. These results experimentally supported the claims that Korean also HAD island constraints as in English (Lee 1982; Han 1992; Hong 2004; Park, 2001, 2009), though the island types of this paper was different from those of the previous studies.

The second research question is related with two hypotheses in (7). Since it was observed Korean had a Complex NP island constraint in Table 1, the hypothesis in (7a) cannot be maintained anymore. The comparison of the second graph in Figure 2 (Complex NP) and two graphs in Figure 4 clearly demonstrated that the general tendency in Korean was different from that of English, which supports the second hypothesis in (7b). As two graphs in Figure 4 demonstrated, two lines in the graphs for Korean Complex NP island were crossed. It is hard to say that the tendency was made by chance, because two lines were crossed in both cases (both in Canonical order and in Scrambled order). An interesting fact was that the sentences with island structures had higher acceptability than those with non-island structures in the matrix clauses. It is difficult to say that the tendency was made by chance, because this tendency appeared in both cases environments. A similar pattern was also observed in the Exp. 2 (Figure 2) of Kim and Goodall (2014). Therefore, the exact properties for this tendency have to be investigated through the further research.

From theses analysis results, it is possible to guess why there have been so many controversies on the existence of island constraints in Korean. As mentioned in Section 2.1, some claimed that Korean has island constraints (Lee 1982; Han 1992; Hong 2004; Park, 2001, 2009), and others claimed that there is no island effect in Korean (Sohn, 1980; Kang, 1986; Suh, 1987; Hwang, 2007; Chung, 2005; Yoon, 2011, 2012; Kim, 2013). Our analysis results provide a partial answer why there have been so many controversies on the existence of island constraints in Korean. As Table 1 demonstrates, the statistical analysis results in Table 1 contain the supporting evidences of both claims. The p-value of the factor Island (p=0.425) and the effect plot in Figure 8 illustrated that this factor is statistically insignificant. This implies that Korean may have no Complex NP island effects. However, the p-value of the interaction between two factors Island and Clause Type (p=0.014) and the effect plot in Figure 6 illustrated that the interaction between these two factors was statistically significant. This implies that Korean may have Complex NP island effects through the interaction with other factors. That is, though the factor Island itself does not have statistically significant influence on the acceptability of the Korean sentences, if this factor interacts with other factor(s), it may have a statistically significant influence. If no such interaction exists, the factor Island does not have a statistically significant influence. Whether the factor has an interaction with other factors or not depends on the environment of corresponding island constructions. These dual facets of island properties of Korean have made so many controversies on the existence of island constraints in Korean.

6 Conclusion

In this paper, the Complex NP island constraint was closely examined in Korean. Three elements (Island, Clause Type, and Scrambling) were taken as factors which may influence the acceptability of sentences in Korean, and the experiment had a 2×2×2 design.

Based on this design, an experiment (an acceptability judgment task) was performed, where the data for 50 Korean native participants were collected. In the experiment, ME was adopted to measure the acceptability of the native speakers. After the experiments, all the values were extracted for target sentences and they were analyzed with R.

Through the experiments, the following facts were found. First, the factor Island (the absence vs. presence of Complex NP island constraint in Korean) did not play a role by itself, but played a marginal role through the interaction with the factor Clause Type (Matrix vs. Embedded). Second, the factors Clause Type and Scrambling played statistically significant roles in Korean and that there is a strong interaction between two factors.

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