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The Effect of Noun Animacy on L2 Processing of the English Plural Morpheme *-s* by Korean and Chinese Learners^{*}

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[Abstract]

This study investigates the effect of noun animacy on second language processing of the English nominal plural morpheme *-s* by Korean- and Chinese-speaking learners of English. Unlike English, the plural markers in Korean and Chinese are largely optional, and are subject to distributional constraints contingent on the animacy of the host nouns, such that in Korean, pluralization is more readily available for the nouns that denote humans than those that denote objects, while in Chinese, only human nouns can take the plural marker. Based on these observations, the present study tested whether and how the animacy of nouns affects second language acquisition and processing of the English plural morpheme. To that end, the sensitivity of

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Korean and Chinese learners of English to the ungrammaticality of the singular human vs. object nouns occurring in obligatory plural contexts was measured in a self-paced sentence reading task. The results showed that both groups of learners were sensitive to number violation on human nouns but not on inanimate nouns, suggesting an important role of noun animacy in the L2 processing of the English plural morpheme. The implications are discussed in terms of theory development and pedagogical application in second language acquisition.

Key Words: English as a second language, second language acquisition, second language processing, plural morpheme, noun animacy

1. Introduction

One of the most debated issues concerning second language (L2) acquisition is the question of whether adult L2 learners can acquire the native-like knowledge of the L2 grammatical categories that are not instantiated in their first language (L1) (e.g., Hawkins and Chan 1997; Hopp 2010; Jiang et al. 2011; Schwartz and Sprouse 1996; Song 2015). Persistent difficulties adult learners experience with such L2 grammatical features (e.g., Lardiere 1998) have been attributed to deficits either in the L2 grammatical representations constructed by adult learners (e.g., Hawkins and Chan 1997; Jiang et al. 2011) or in the performance systems that are not optimal for the spontaneous access to the successfully acquired L2 grammatical representations (e.g., Hopp 2010; McDonald 2006; Song 2015).

The representational deficit views posit that L2 learners who passed the critical period of language learning cannot integrate novel grammatical features into their L2

system in the same way as they had done for their L1 (Hawkins and Chan 1997). The performance deficit views, on the other hand, assume that new grammatical features can be acquired by adult learners with high enough proficiency in the L2, but the apparent difficulty they have with those features is due to the less efficient processing systems that prevent grammatical knowledge from being readily applied during real-time language comprehension and production (Hopp 2010).

Among the grammatical categories that have received much interest in L2 acquisition research is the nominal plural morpheme *-s* in English. Whereas it is grammaticalized and thus required on countable nouns denoting multiple entities, plural markers in other languages such as Korean (*-tul*) and Chinese (*-men*) are largely optional and thus construed as not fully grammaticalized (Song 1975; Ueda and Haraguchi 2008). The different grammatical status of plural markers across languages has served as a testing ground for the debate between the representational and performance deficit views (e.g., Jiang et al. 2011; Song 2015).

The existing empirical evidence, however, is yet equivocal, with some studies supporting the representational views (Jiang 2007; Jiang et al. 2011) and others being more consistent with the performance views (Song 2015; Wen et al. 2010). The present study aims to contribute to resolving this conflict by testing the effect of a potentially relevant factor that has not yet received due attention. While the plural markers are optional in both Korean and Chinese, their distribution is constrained by the animacy of the host nouns. Putting aside the details, the plural markers in the two languages are most common with nouns denoting humans as compared with those denoting animals or objects. This fact leads to the possibility that Korean and Chinese learners will show better performance in processing the English plural morpheme when it appears with human nouns than with inanimate nouns.

To address the possibility described above, the present study administered a

self-paced sentence reading experiment in which Korean- and Chinese-speaking learners of L2 English were exposed to grammatical plural vs. ungrammatical singular nouns occurring in the context where a plural noun is required. Half of the nouns denoted humans while the other half denoted inanimate objects. To preview the results, both groups of participants showed evidence that they successfully detected the ungrammaticality of singular nouns in plural contexts only when the nouns denoted humans. How the result fits with the previous findings is discussed in the Discussion section together with its theoretical and practical implications.

2. Literature Review

In this section, previous work on the L2 acquisition and processing of the English plural morpheme is first summarized, and then follows a brief presentation of the role of animacy in the distribution of the plural markers in Korean and Chinese.

2.1. Previous work on L2 acquisition of the English plural morpheme *-s*

Earlier studies on L1 and L2 acquisition began to illuminate the path of grammatical development by documenting the order of acquisition of different grammatical morphemes (e.g., Brown 1973; Dulay and Burt 1974). Subsequent studies have extended our understanding of L2 grammar acquisition through in-depth investigations into the acquisition of individual morphemes such as the past tense *-d* (e.g., Hawkins and Liszka 2003; Lardiere 1998) and the plural morpheme *-s* (e.g., Jiang 2007; Jiang et al. 2011; Song 2015; Wen et al. 2010). A series of studies focusing on the

acquisition of the English plural morpheme is reviewed below as the immediate background for the present study.

Jiang (2007) and his colleagues (Jiang et al. 2011) investigated the L2 learnability of the English plural morpheme by adult learners whose L1 either has a similar grammatical plural morpheme as English (i.e. Russian) or does not have one (i.e. Chinese and Japanese), using the sentences exemplified in (1).

- (1) a. The child was watching some of the rabbits in the room.
- b. *The child was watching some of the rabbit in the room.

The object of the sentences in (1) takes the form of the partitive structure, in which the quantifier *some* requires the following noun *rabbits* to be in the plural form. Jiang and his colleagues used the word-by-word self-paced reading paradigm to detect L2 learners' immediate (in)sensitivity to number violation on nouns like *rabbit* in (1b) (Just, Carpenter and Woolley 1982). Their rationale for the methodology was that if L2 learners could acquire the native-like L2 grammatical knowledge about the English plural morpheme as implicit and automatic as the L1 knowledge, they should show evidence of quickly detecting number violation after reading *rabbit* in (1b) in the form of increased reading time as compared with *rabbits* in (1a).

The results of Jiang and colleagues' experiments suggest that even quite advanced Chinese- (Jiang 2007) and Japanese-speaking learners of English (Jiang et al. 2011) do not detect number violation on nouns while reading sentences for meaning, whereas native speakers and Russian-speaking learners of English both show online sensitivity to number violation on the two words following the ungrammatical singular noun (e.g., *in the* in (1b)). Based on these findings, the authors specify their representational deficit view into the Morphological Congruency Hypothesis, according to which an L2 morpheme is much easier to acquire when there is an

equivalent morpheme in the learner's L1.

The Morphological Congruency Hypothesis, however, was soon to confront counterevidence from subsequent studies that did show the online sensitivity to the missing plural morpheme by L2 English learners whose L1 was Korean (Song 2015), Chinese (Wen et al. 2010), or Japanese (Mansbridge and Tamaoka 2018). Most relevant for the present study is Song's (2015) study because it included a close replication of Jiang's work (Jiang 2007; Jiang et al. 2010). Although he tested Korean learners of English unlike Jiang, who tested Chinese learners, the results are still valid for testing the Morphological Congruency Hypothesis because in both Korean and Chinese, the plural morpheme is largely optional in contrast with that of English.

Song (2015) interpreted his finding in line with the performance deficit views as suggesting that L2 grammatical morphemes can in principle be acquired by adult learners regardless of whether their L1 instantiates functionally equivalent morphemes (also see Wen et al. 2010). He further suggests that the conflicting results of his and Jiang's studies might be attributed to greater processing load incurred by Jiang's materials due to the fact that some of them had three words in between the quantifier and the critical noun (e.g., *several* of the board *members*), whereas Song's materials all had two words in between (e.g., *three* of the *engineers*). His processing-based account is further supported by the additional finding of his study that the sensitivity to number violation was evidenced right on the critical nouns for both native speakers and Korean learners in syntactically simpler determiner phrases as in (2) below (also see Wen et al. 2010), whereas it was delayed for more complex partitive structures like (1) by one and two words for the native speakers and Korean learners, respectively.

- (2) a. Haley ordered four brown leather chairs for her new condo.
- b. *Haley ordered four brown leather chair for her new condo.

Note that in Jiang et al.'s (2011) study, the number violation effect also appeared not on the critical nouns but on the words following them, consistent with Song's finding. These findings overall fit well with the performance deficit views, under the assumption that more complex structures and longer distance between elements to be associated cause greater processing burden (e.g., Gibson 1998, Hawkins 1997).

Although the accounts based on the notion of less efficient L2 processing are plausible, an important semantic factor inherent in the materials of the previous studies seems to be worthy of further investigation. The factor of current interest is the animacy of the nouns with which learners' sensitivity to number violation was tested in previous work. Specifically, the proportion of human and animate nouns was greater in Song's (2015) study (9 out of 16, or 56%) than in Jiang et al.'s (2011) study (11 out of 29, or 38%). With only human nouns counted, their proportion in Song's materials (50%) is more than twice as high as in Jiang et al.'s (21%). If L2 learners are more sensitive to the presence or absence of the plural morpheme on the human nouns than on the inanimate nouns, arguably due to the distribution of plural makers in their respective L1s, the conflicting results from the earlier studies could be ascribed at least partly to the asymmetry in the proportion of human nouns in their experimental materials.

2.2. Distribution of plural markers in Korean and Chinese

As presented earlier, the grammatical status of the plural markers in Korean and Chinese is contrasted with that of the plural morpheme in English in that the formers

are optional. In addition to optionality, there is another aspect of plural markers that varies across languages. As is well known in terms of the animacy hierarchy in grammatical marking evident in natural languages (e.g., Croft 2002), plural marking is more widely attested with human and animate nouns than with inanimate nouns across languages (Corbett 2000), including but not limited to Korean and Chinese (Nemoto 2005; Song 1975).

The examples in (3) and (4) represent the distributional pattern of the plural marker contingent on the animacy of host nouns in Korean and Chinese (Chung 2011; Kang 2007; Nemoto 2005). The “>” symbol in (3) indicates a higher frequency of occurrence in natural language corpora (Kang 2007).

(3) haksayng-tul > kay-tul > chayl-tul

‘students’, ‘dogs’, ‘books’

(4) xuesheng-men, *gou-men, *shu-men

As shown in (3) and (4), the Korean plural marker occurs in a wider context than that of Chinese. Despite this distributional difference, however, the speakers of both of the two languages would be most likely to encounter the plural marker with human nouns than with the other types of nouns. If we assume that L2 learners’ L1 grammar knowledge plays an important role in L2 grammar acquisition (e.g., Luk and Shirai 2009) and use (e.g., Grüter and Hopp 2021), it would be plausible to hypothesize that Korean- and Chinese-speaking learners of English are more likely to be sensitive to the grammatical presence and/or ungrammatical absence of the English plural morpheme on human nouns than on inanimate nouns. Consistent with this hypothesis, Chung’s (2011) analysis of the texts taken from the English-Korean parallel sub-corpus of the 21st Century Sejong Project shows that when English plural nouns are translated into Korean, human nouns are more likely to be marked as

plural than inanimate nouns, with animal nouns falling in between. The present study aimed to test whether similar effects of noun animacy also manifest in the online comprehension of plural nouns in English by Korean and Chinese learners.

3. The Experiment

3.1. Participants

Forty-five Korean-speaking (29 females) and 26 Chinese-speaking (18 females) learners of English participated in the experiment. They were undergraduate or graduate students in universities located in Seoul. The mean age of the Korean learners was 23.8 years (SD=1.85) and that of the Chinese learners was 26.8 years (SD=5.47). Thirty-nine Korean learners reported in the background questionnaire their recent TOEIC scores (M=875, Range: 650-990), 3 Chinese learners TOEIC scores (M=567, Range: 550-600), 2 Chinese learners IBT TOEFL scores (100, 91), and 8 Chinese learners IELTS scores (M=6.9, Range: 6.5-7.5). Although not complete, the reported set of standardized proficiency test scores indicates that the participants approximately represent the upper-intermediate to advanced levels of proficiency.

3.2. Materials

The main task for the present experiment was a self-paced reading task involving sentences manipulated in terms of plural marking and animacy of the nouns embedded in obligatory plural contexts. A series of offline tasks including a cloze

test, a grammaticality judgment task, and a vocabulary check test were also administered for controlling reasons as will be detailed below.

Self-paced reading task

Four types of sentences were used for the self-paced reading task as exemplified in (5) and (6).

(5) a. *Human noun, grammatical condition*

They met several of the board members during their visit.

b. *Human noun, ungrammatical condition*

They met several of the board member during their visit.

(6) a. *Inanimate noun, grammatical condition*

They saw several of the action movies during their visit.

b. *Inanimate noun, ungrammatical condition*

They saw several of the action movie during their visit.

The structure of the experimental materials closely followed Jiang et al.'s (2011) study except that the animacy of the critical nouns was systematically manipulated. Twenty pairs of sentences as in (5) and 20 pairs of sentences as in (6) were constructed. Nine different quantifiers and numerals were used to make the partitives in the sentences (*two, three, four, some, several, many, most, both, and all*). For the critical nouns in the partitives, 20 human and 20 inanimate nouns were used. The length of the human vs. inanimate nouns was matched on the number of characters (Human nouns: $M=6.35$, $SD=0.93$; Inanimate nouns: $M=6.2$, $SD=1.54$; $t(38)=0.372$, $p>.1$). Corpus frequency of the two types of nouns was also matched based on the WebCelex written lemma log frequency (available at <http://celex.mpi.nl/>) (Human nouns: $M=1.72$, $SD=.53$; Inanimate nouns: $M=1.69$, $SD=.39$; $t(38)=.173$, $p>.1$).

The 20 pairs of the experimental sentences with human nouns were distributed in

two lists so that one member of the pair appears in one list, resulting in 10 grammatical sentences and 10 ungrammatical sentences in each list. The 20 pairs of the sentences with inanimate nouns were also assigned to two lists in the same way. These lists of sentences were combined into two larger lists, each of which now contained 10 sentences in each of the four conditions described in (5) and (6). Participants were randomly assigned to one of the two lists so that they read either the grammatical or ungrammatical version of the sentences with the same critical noun. The 40 experimental sentences in each list were combined with 56 filler sentences, resulting in a total of 96 sentences in each list. Comprehension check questions were prepared for 20 of the experimental sentences (e.g., *Did they meet someone during their visit?*) and 44 of the fillers to ensure that the participants read the sentences for meaning. The correct answer for the half of the comprehension questions was *yes*, while that for the other half was *no*.

If Korean and Chinese learners of English have acquired the implicit and automatic grammatical knowledge of the English plural morpheme, they will read the ungrammatical singular nouns more slowly than the grammatical plural nouns at or right after the critical nouns in self-paced reading. More pertinent to the current purposes, if they transfer their knowledge about the distribution of their L1 plural marker to the processing of the English plural morpheme, the number violation effect should be greater with human nouns than with inanimate nouns.

Also note that three words were placed between the quantifier and critical noun in the partitive structure as in a subset of sentences in Jiang et al.'s (2011) study (e.g., *several of the board members*) unlike Song's (2015) study where there were consistently two words in between (e.g., *three of the engineers*). This was to test Song's (2015) suggestion that the failure of Jiang et al.'s study to find evidence for L2 learners' online sensitivity to number violation could be due to the increased

processing load incurred by the greater number of words in between.

Cloze test

A cloze test was administered to obtain information about the relative proficiency levels of the participants. The test consists of a passage with 40 words deleted. Three alternative choices were provided for each blank from which the participant chose the best matching word to the context. Each correct answer was assigned 1 point with the maximum score of 40. The mean cloze test score was 31.58 (SD=3.48) for the Korean learners and 29 (SD=7.05) for the Chinese learners. The difference was significant ($t(69)=2.063$, $p<0.5$), indicating that the Korean learners were slightly more advanced in overall proficiency. To control for this difference in proficiency between groups, the cloze test scores were entered as a covariate in statistical analysis.

Grammaticality judgment task

To make sure the participants know, at least explicitly, that the nouns in the partitive structure must be pluralized, an offline grammaticality judgment task was conducted after the self-paced reading task. The materials represented the same four conditions as in the self-paced reading task, with each condition containing three sentences like (5a), (5b), (6a), and (6b), respectively. Eighteen filler sentences (half grammatical and half ungrammatical for various reasons) were added to the test stimuli, and their order was randomized to construct a grammaticality judgment test. Another version of the test was made by reversing the order of sentences to control for presentation order effect. In the grammaticality judgment task, the participants were asked to indicate on the test sheet whether the given sentences were “acceptable” or “unacceptable” and how to correct them when judged to be unacceptable.

Vocabulary check test

For the effect of noun animacy, if any, to appear in the self-paced reading task, the participants must know the meaning of the critical nouns. To ensure they know the nouns, a vocabulary check test was administered at the end of the experiment. In the test, the participants saw the same sentences that they had read in the self-paced reading task, and marked the words that they were not familiar with. The sentences with the critical nouns unknown to the participants were excluded from analysis (7 items from 3 participants).

3.3. Procedure

Participants were tested individually and completed the background questionnaire, self-paced reading task, cloze test, grammaticality judgment task, and vocabulary check test in that order. The self-paced reading task was implemented using *Linger*, an open-access software for psycholinguistic experiments (available at <https://web.archive.org/web/20191220181934/http://tedlab.mit.edu/~dr/Linger/>). The task began with written instructions followed by 7 practice items. At the beginning of each experimental trial, the sentence was first presented with each letter in the words masked with a dash. Spaces between words were retained and the end of the sentence was marked with a period. On each press of the space bar on the keyboard by the participant, one word appears on the screen from left to right with the preceding word returning to a string of dashes. When the participant pressed the space bar on the last word, either a comprehension check question or the next trial followed. The time measured in millisecond (ms) between each press of the space bar was taken to be the reading time for the word displayed on the screen. The other tests were administered in a paper-and-pencil format. The entire procedure took around an hour.

3.4. Results

The results are reported in the order of the grammaticality judgment and self-paced reading task. The results of the other tests will be presented where relevant.

Grammaticality judgment task

Table 1 presents the mean percent accuracy of grammatical judgments on human vs. inanimate nouns for each participant group.

〈Table 1: Mean percent accuracy of grammaticality judgment by noun animacy and participant group. Standard deviations in parentheses.〉

	Human nouns	Inanimate nouns	Total
Korean learners (N=45)	86.7 (15.7)	83.0 (19.0)	84.8 (14.9)
Chinese learners (N=26)	83.3 (20.5)	80.1 (20.6)	81.7 (18.9)
Total	85.4 (17.6)	81.9 (19.5)	83.7 (16.4)

Table 1 shows that the mean accuracy is numerically higher for the Korean learners than for the Chinese learners, and for the human nouns than for the inanimate nouns. To test the reliability of this pattern, an analysis of variance was conducted on the participants' accuracy rates with the animacy of nouns (human vs. inanimate) as a within-participant factor, the L1 of the participants (Korean vs. Chinese) as a between-participant factor, and the cloze test scores as a covariate. The cloze test scores were centered so that the statistical results on the noun animacy and L1 factors can be interpreted with the proficiency set at the overall mean.

The results show that there was a significant main effect of the cloze test ($F(1, 68)=17.639, p<.001$), with the other main effects and interactions being

non-significant (all $F_s < 2.511$, all $p_s > .1$). This suggests that with increase in proficiency, the participants were more accurate in judging the grammaticality of the plural vs. singular nouns in a partitive structure, which is hardly surprising. More relevant for the current purposes, the participants' explicit grammatical knowledge about the plural morpheme required in the partitive structure seemed to be quite robust and did not differ either between human and inanimate nouns or between Korean and Chinese learners.

Self-paced reading task

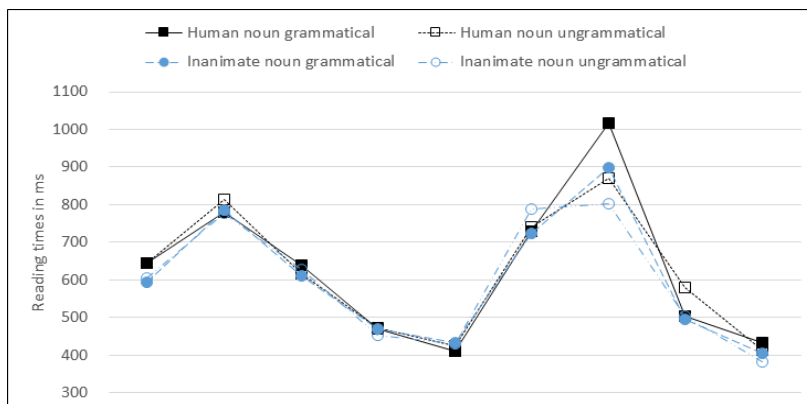
Knowledge about the obligatory nature of the plural morpheme on countable nouns in the partitive structure is a prerequisite for the online sensitivity to number violation to appear during reading. For that reason, the participants whose accuracy rate for the grammaticality judgment task was lower than 70% were excluded from the analysis of reading times. Six Korean and 8 Chinese learners were excluded on this criterion, leaving 39 Korean and 18 Chinese learners for reading time analysis.

There were two regions of interest. The first was the critical noun whose animacy and plurality were manipulated (e.g., *member(s)* and *movie(s)* in (5) and (6)). The second was the following word which served as the spill-over region to detect any delayed effect from the preceding number violation (e.g., *during* in (5) and (6)). For each region, the raw reading times were trimmed as follows. First, reading times over 5000ms or under 200ms were discarded. Second, for each participant, outliers exceeding the mean reading time for each condition by more than 3 SDs were removed. This trimming procedure resulted in a loss of 1.7% of the data points.

Figures 1 and 2 present the mean reading times on each word by condition for the Korean and Chinese learners, respectively. The overall pattern of reading times suggest that the different conditions exerted differential influences mainly on the two

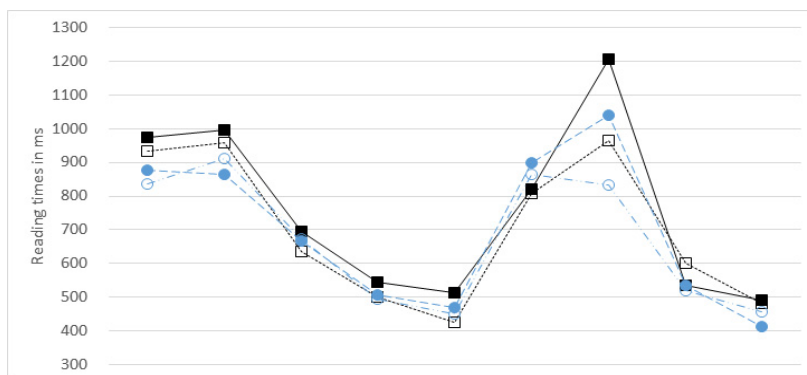
regions of interest, especially for the Korean learners.

<Figure 1. Mean reading times by condition for the Korean learners>



- They met several of the board members during their ...
- They met several of the board member during their ...
- They saw several of the action movies during their ...
- They saw several of the action movie during their ...

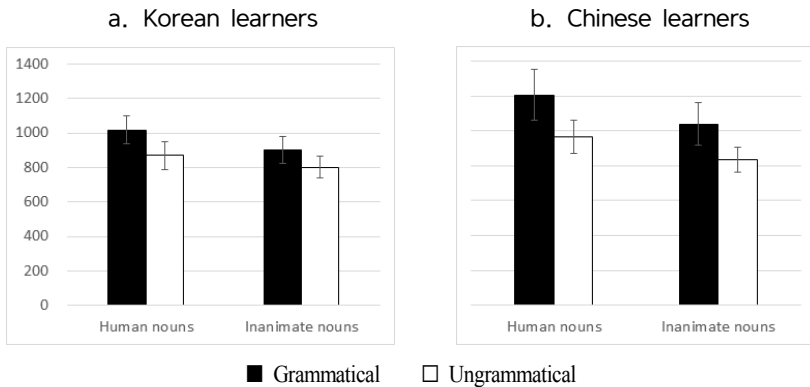
<Figure 2. Mean reading times by condition for the Chinese learners>



To better illustrate the pattern of learners' reading behaviors in the regions of interest, the bar-graph representation of the reading times are presented in Figures 3 and 4. The figures show that the overall reading time patterns are quite similar between the two learner groups both on the critical noun and the following spill-over region, with slightly longer reading times for the Chinese learners.

At the critical noun region, as shown in Figure 3, both groups of learners took longer to read the grammatical plural nouns than the ungrammatical singular nouns regardless of animacy.

<Figure 3. Mean reading times by condition at the critical noun region. Error bars indicating ± 1 standard error.>



To verify the apparent pattern, an analysis of variance was conducted with noun animacy and grammaticality as within-participant factors, learners' L1 as a between-participant factor, and the centered cloze test scores as a covariate. There was a significant main effect of noun animacy ($F(1,54)=19.158, p<.001$), indicating that the human nouns overall took longer to read. The main effect of grammaticality was also significant ($F(1,54)=35.372, p<.001$), indicating that the participants took longer to read grammatical plural nouns than ungrammatical singular nouns, which

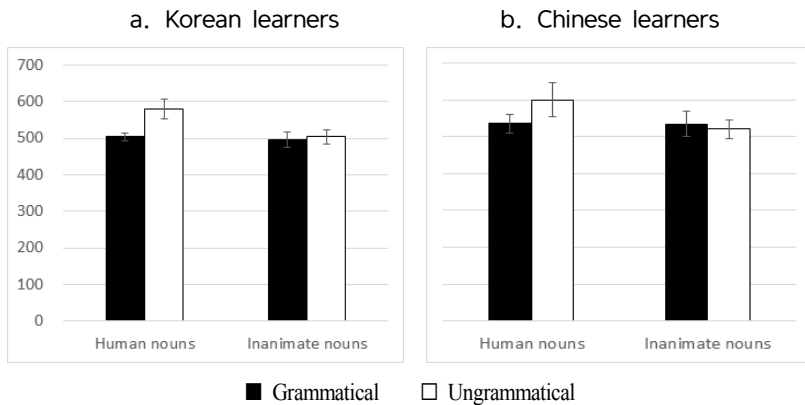
was in the opposite direction to the expected grammaticality effect. The main effect of grammaticality was modulated by proficiency as indicated by the significant interaction of the two factors ($F(1,514)=4.082, p<.05$). The interaction indicates that as proficiency increased, the difference in reading time between the grammatical and ungrammatical nouns became smaller. The other effects and interactions were not significant (all $ps>.1$).

To further explore the moderation of grammaticality effects by proficiency, the participants were broken down into the high- and low-proficiency groups on the basis of the median cloze test score of 32. For the high-proficiency learners ($N=26$), the difference in reading time between the grammatical and ungrammatical noun conditions was 70ms for the human nouns and 73ms for the inanimate nouns. Analysis of simple effects of grammaticality in each animacy condition using paired samples t-tests revealed that these differences were not significant (both $ts<1.097$, both $ps>.1$). For the low-proficiency learners ($N=31$), on the other hand, the difference in reading time between the grammatical and ungrammatical nouns was 268ms for the human nouns and 181ms for the inanimate nouns, which were both significant (both $ts>3.378$, both $ps<.01$). Assuming that more advanced learners should be more sensitive to grammaticality and more capable of processing complex material, the decrease in reading time difference between singular and plural nouns with increase in proficiency suggests that the lower-proficiency learners' reading time pattern may not be due to grammaticality, but rather should be attributed to difficulty involved in processing plural nouns. Potential reasons for this finding will be further discussed in the Discussion section.

At the spill-over region, as Figure 4 shows, both learner groups seemed to take longer to read the ungrammatical singular nouns than the grammatical plural nouns only when they denoted humans. This finding is consistent with the hypothesized

effect of noun animacy on the learners' sensitivity to number violation.

<Figure 4. Mean reading times by condition at the spill-over region.
Error bars indicating ± 1 standard error.>



An analysis of variance was conducted to verify the observed pattern in the same way as the critical noun region. The results showed that the main effects of animacy ($F(1, 54)=9.549, p<.01$) and grammaticality ($F(1,54)=5.283, p<.05$) were significant, together with their interaction ($F(1,54)=6.454, p<.05$). The other main effects (i.e., L1 and cloze test score) and interactions were not significant (all $F_s<1$, all $p_s>.1$). Further tests of simple effects of grammaticality in each animacy condition for each participant group revealed that for the human nouns, the grammaticality effect was significant for the Korean learners ($t(38)=3.292, p<.01$) and marginally significant for the Chinese learners ($t(17)=1.989, p<.1$). For the inanimate nouns, in contrast, the effect of grammaticality was not significant either for the Korean or Chinese learners (both $t_s<1$, both $p_s>.1$). This finding is largely consistent with the expected pattern, in which the Korean and Chinese learners of English are more sensitive to the absence of the required plural morpheme on the human nouns than on the inanimate

nouns, arguably due to the distributional pattern of the plural markers in their L1.

4. Discussion

The present study aimed to test the effect of noun animacy on L2-English learners' ability to detect the ungrammatical absence of the plural morpheme on countable nouns during sentence comprehension. To that end, a self-paced reading experiment was conducted with Korean- and Chinese-speaking learners of English using the sentences in which the animacy and plurality of nouns were manipulated. Overall, the behavior of the two learner groups was quite comparable, except for a slight difference in their proficiency as measured with a cloze test. The results showed that both groups of learners had acquired knowledge about the English plural morpheme as reflected in grammaticality judgments. In the self-paced reading, both groups of learners showed online sensitivity to the missing plural morpheme on the nouns that must be in the plural form. The effect did not emerge not on the critical nouns, but on the following word after the nouns, as was also the case in previous studies. A novel finding of the present study was that the L2 learners' sensitivity to the ungrammatical singular nouns were only evident for the nouns denoting humans (e.g., **several of the board member*) with little grammaticality effect shown with inanimate nouns (e.g., **several of the action movie*). In addition, an unexpected pattern of reading time was found on the critical nouns, such that it took longer to read grammatical plural nouns than the ungrammatical singular nouns, suggesting that some feature of plural nouns increased processing burden.

The present findings are consistent with the previous studies that showed that L2-English learners with L1s without equivalent plural morphemes are capable of

acquiring the English plural morpheme and using it in online sentence processing (Mansbridge and Tamaoka 2018; Song 2015; Wen et al. 2010). The present study also extends the previous findings by showing that Korean and Chinese learners of English have greater difficulty recognizing the grammatical number of inanimate nouns as compared with human nouns. This finding suggests that the conflicting finding between Jiang et al. (2011) and Song (2015) is likely to be due to the different proportions of animate nouns in their materials rather than due to the difference in linear distance between quantifier and noun as was proposed by Song, since the linear distance was kept relatively far in the present study as in Jiang et al.'s. The greater likelihood with which the missing English plural morpheme was detected on human vs. inanimate nouns as shown in the present study also complements the more frequent use of the plural marker with human vs. inanimate nouns in English-to-Korean translation as reported in Chung (2011).

The finding that the participants were sensitive to number violation with human nouns but not with inanimate nouns presents an important piece of evidence regarding the theorization of L2 learnability of the English plural morpheme. The Morphological Congruency Hypothesis (Jiang et al. 2011), for example, could address it by extending the range of acquirable L2 morphemes to those that do not have as close equivalents in the learner's L1 as was originally hypothesized. As the present finding suggests, L2 grammatical morphemes seem to be learnable even when the corresponding L1 morphemes are not as strictly grammatical, especially when supported by the salient semantic properties such as animacy. The processing-based views of the L2 acquisition of the English plural morpheme (e.g., Song 2015; Wen et al. 2010) would also benefit by adding noun animacy to the array of linguistic factors causing processing difficulty, which was hypothesized to include factors such as structural complexity and linear distance between elements to be integrated.

The source of the noun animacy effect found in this study is also of interest regarding the issue of whether and how L1 knowledge influences L2 acquisition. Although the present study has focused on learners' L1 as a potential source of the animacy effect, it may also be due to a universal tendency that guides the learning of a novel grammatical morpheme. As briefly mentioned in the Introduction section, the animacy hierarchy is a language-universal tendency that makes human nouns more readily available for a wide variety of grammatical marking as compared with non-human nouns. This universal tendency might also affect the learning of the English plural morpheme by learners whose L1 does have an equivalent grammatical morpheme such as Russian (e.g., Jiang et al. 2010). Further research is called for in regards with this possibility.

The unexpected pattern of reading times on the critical nouns also needs an explanation. To recapitulate, the present results showed that grammatical plural nouns took longer to read than ungrammatical singular nouns. Given the direction of the effect, it is unlikely to be due to grammaticality. Then we could attribute this apparent 'anti-grammaticality' effect on the critical nouns to the inherent properties of plural nouns. A readily available observation is that plural nouns are longer than singular nouns as it would be natural for longer words to take longer to read. But it is not highly likely that one or two more letters (-s or -es) caused the processing difficulty of the magnitude evidenced in the present study. More plausible explanations could be based on the morphological analysis required for processing pluralized nouns and/or increased processing load involved in representing plural entities in mind as compared with a single entity.

The findings of the present study also offer some pedagogical implications in L2 acquisition. First, since Korean and Chinese learners seem to be able to learn the use of the English plural morpheme with human nouns relatively more naturally, it would

be beneficial to guide their attention explicitly toward the pluralization of inanimate nouns for the faster learning and more accurate production of the morpheme. Second, pedagogical activities that encourage morphological and semantic processing of plural nouns may help L2 learners cope with increased processing difficulty involved with plural nouns as evidenced in the present study.

5. Limitations and Future Research

The present study suggests that Korean and Chinese learners of English are better capable of processing the English plural morpheme on human nouns than on inanimate nouns. This finding yields implications for theory development and language teaching in L2 acquisition as discussed in the previous section.

There are, however, some limitations to this study that need to be addressed in future research. For one thing, unbalanced participant group sizes may have made it difficult to find meaningful differences between the Korean and Chinese learners. In addition, the narrow range of proficiency levels represented by the participants may have obscured an important role of proficiency in L2 morphological learning.

Future research addressing these limitations will be better able to test the possibility that the differences in the distribution of the plural markers in Korean and Chinese may cause subtle differences in the learning of the English plural morpheme by L1-speakers of the two languages, which the current study failed to find. The possibility that the human noun advantage in plural morpheme acquisition shown in this study may be a universal tendency in L2 learning is also an interesting issue worthy of further study.

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국문초록

한국인과 중국인 영어 학습자의 영어 복수 형태소 처리와 명사 유생성의 관계

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이 논문은 명사 유생성이 한국인과 중국인 영어 학습자의 영어 복수 형태소 -s 처리에 미치는 영향을 살펴보았다. 영어의 복수 형태소와 달리 한국어와 중국어의 복수 표지는 수의적이고 명사의 유생성에 따른 분포상의 제약을 받는다. 한국어의 복수 표지는 무생 명사보다 유생 명사와 함께 쓰이는 경우가 많은 반면, 중국어의 복수 표지는 사람을 나타내는 명사에만 허용된다. 이러한 모국어의 특징이 영어 복수 형태소 습득과 처리에 어떤 영향을 미치는지 알아보기 위해 자기속도조절 문장읽기 실험을 통해 한국인과 중국인 영어학습자가 복수 형태소가 필수적인 문법 맥락에서 그것이 누락된 단수형 명사의 비문법성을 인지하는지, 그리고 인지 여부가 명사의 유생성에 영향을 받는지 측정하였다. 실험결과에 따르면, 한국인과 중국인 영어학습자는 사람을 나타내는 명사에서 복수 형태소가 누락된 경우에는 즉각적으로 그 비문법성을 인지했지만, 사물을 나타내는 명사에 대해서는 그렇지 않았다. 이러한 결과는 제2언어 습득 이론의 발달과 제2언어 교수의 개선에 유익한 함의를 제시할 수 있다.

주제어: 제2언어로서의 영어, 제2언어 습득, 제2언어 처리, 복수 형태소, 명사 유생성

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