Chinese Learners’ Processing of Nominal Suffixes in Korean*

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This study investigates how L2 learners process morphologically complex words to see whether L2 processing of inflectional morphology is similar to L1 processing. Chinese learners of Korean, all of whom had studied Korean for more than one year and were regarded as advanced learners, participated in a lexical decision task of Korean words with primes of nominal suffixes. The results showed that no priming occurred for the plural marker as well as the morpho-syntactic case markers, which clearly demonstrated clear differences between L1 and L2 processing. The results suggest that adult L2 learners are less sensitive to morphological structure than native speakers and rely more on lexical storage than on morphological parsing during processing.

[morphological processing/nominal suffixes, 형태 처리/명사 접사]

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I. Introduction

Many researchers of psycholinguistics have explored the question of whether the speaker or hearer employs morphologically structured representations when they process inflected or derived words. Specifically, there have been many debates on the status of morphologically complex nominals, which centered on two main models: the Decomposition Model (Pinker & Ullman, 2002) and the Full-listing Model (McClelland & Patterson, 2002). The Decomposition Model states that in morphological processing, the recognition of an inflected word such as ‘books’ involves decomposing the word into its stem and its affix, that is, ‘book + s’. On the other hand, the Full-listing Model claims that every inflected word is recognized as an unanalyzed whole word. For example, ‘books’ would not be recognized as the word ‘book’ plus a plural suffix, ‘-s’, but as a single indecomposable word, just like ‘book’.

Recently, researchers have begun to investigate L2 learners’ processing of morphologically complex words and compared it with that of L1 speakers and hearers. Some researchers have claimed that L1 and L2 processing share the same processing system and that L2 processing is less automatic and slower than L1 processing and influenced by the learners’ native language (Chen, Shu, Liu, Zhao, & Li, 2007; Hernandez, Li, & MacWhinney, 2005; McDonald, 2006; Weber & Cutler, 2003). However, most of the studies have maintained that L2 processing differs in more fundamental ways from L1 processing (Clahsen & Felser, 2006a, 2006b; Felser & Roberts, 2007; Marinis, et al., 2005; Ullman, 2001, 2004, 2005). According to Ullman (2005), L2 processing is largely dependent upon the lexical memory system while reliance on the procedural system occurs to a much lesser extent than in L1 processing, which means that, when processing morphologically complex words, L2 learners mainly rely on full-form storage, while L1 learners rely on grammatical computation and decompose morphologically complex words.

The present study addresses the issue between the Decomposition Model and the Full-listing Model in L2 processing through the visual word recognition experiments, targeting morphologically related nominals in Korean, two of which are plural markers and morpho-syntactic case markers. A standard visual priming procedure will be conducted to show that neither orthographic/phonological nor semantic similarity underlies morphological effects. Thus, experimental results
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from examining the Chinese learners’ L2 processing of morphologically complex words in Korean should shed fresh light on the contrasting predictions of the two models on the morphological processing of Korean nouns and suffixes. The specific research questions addressed in the present study are as follows:

1. Are morphological suffixes on Korean nouns decomposed or processed as a whole in Chinese learners’ L2 processing?
2. Is the Chinese learners’ L2 processing of (morpho-syntactic) case markers on Korean nouns different from that of the (pure morphological) plural marker?

In order to answer these research questions, a priming experiment examining the morphological processing of two different types of nominal suffixes was conducted. The first type of nominal suffix is the case marker type, or the morpho-syntactic type: the nominative case marker ‘-ka’ and the accusative case marker ‘-tul’. The second type of nominal suffix was the plural marker ‘-tul’. The first prediction was L2 processing of Korean inflectional morphology by Chinese learners of Korean would be different from L1 processing of the same morphology by Korean native speakers. The second prediction was that the two types of nominal suffixes would show different patterns in morphological processing. The reason behind this prediction is that although the plural marker ‘-tul’ is a purely morphological marker, case markers in Korean, whether nominative or accusative, presuppose the presence of other syntactic elements, whether the matrix verb, or the subject/object of a sentence, hence the term ‘morpho-syntactic’.

II. Research Background

2.1 Single- vs. Dual-Mechanisms: Declarative/Procedural Memory in L2 Processing

With regard to L1 processing of morphologically complex words, there has been a controversy over single-mechanism models versus dual-mechanism models. Single-mechanism models (McClelland & Patterson, 2002; Seidenberg & Gonnerman, 2000) claim that all word forms are stored in an associative lexicon
and that the morphological structure of inflected and derived words plays no direct role in the way they are processed. According to the single-mechanism model, for example, the English past tense is represented and processed as a whole unit (e.g., *walked*) rather than as decomposed with a stem and an inflectional affix (e.g., *walk + ed*). Dual-mechanism models (Clahsen, 1999; Pinker, 1999; Pinker & Ullman, 2002), on the other hand, posit two distinct representational systems and processing mechanisms for morphologically complex words. According to the models, regular past-tense forms in English, for example, are claimed to have morphologically structured representations making them suitable for employing morphologically-based parsing during processing. Irregular past-tense forms in English, on the other hand, are said to have whole-word representations stored in memory and to be directly retrieved from the lexicon during processing.

Ullman (2004), in line with dual-mechanism models, proposed the declarative/procedural model, which claims that processing one’s native language involves two different brain memory systems, a lexical store of memorized words which depends upon declarative memory and is rooted in a network of specific brain structures including medial temporal and prefrontal cortical regions, and a mental grammar which includes combinatorial rules and is rooted in a network including frontal/basal-ganglia circuits. In an attempt to apply the model to L2 acquisition and processing, Ullman (2005) argued that L2 processing is largely dependent upon the lexical memory system while reliance on the procedural system occurs to a much lesser extent than in L1 processing. Maturational changes that occur in childhood/adolescence cause the overreliance on the declarative system in L2 processing and lead to the attenuation of the procedural and enhancement of the declarative system. This claim also leads to the prediction that morphological decomposition is underused or even absent in L2 processing and that L2 learners mainly rely on full-form lexical storage of morphologically complex words.

Silva and Clahsen (2008) also showed contrast between L1 and L2 processing. In their masked priming experiments, the L1 group showed efficient priming for both inflected and derived word forms. However, the L2 learners demonstrated repetition-priming effects but no priming for inflected and reduced priming for derived word forms. Silva and Clahsen (2008) interpreted these results, particularly no priming effects for inflected words as supporting the view that adult L2
learners rely more on lexical storage and less on combinatorial processing of morphologically complex words than native speakers. Thus, our study is more concerned with L2 morphological processing of "inflectional" suffixes such as case markers and plural markers in Korean.

2.2 L1 Processing of Nominal Suffixes in Korean

In order to compare the L2 processing of morphologically complex words in Korean with Korean native speakers’ L1 processing, the present study adopted the experimental design of Ahn et al.’s (2011) study and took the similar procedure with the same morphologically related nominals in Korean. Therefore, it is necessary to briefly review Ahn et al. (2011) and present its results in this section.

Ahn et al. (2011) conducted an experiment which examined the morphological processing of two types of nominal suffixes in Korean: the plural suffix ‘-tul’ and nominative/accusative case markers ‘-ka’/’-lul’. The Stimulus Onset Asynchrony (SOA), the time duration for which the prime word is displayed on the screen, was 160 ms, and the experimental design included six different conditions according to prime types: identical, morpho-syntactic, semantic, phonological, plural, and unrelated. The following table shows the mean reaction times (RTs) and standard deviations (SDs) for the six different conditions in the experiment.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Mean RT</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identical</td>
<td>385.63</td>
<td>26.37</td>
</tr>
<tr>
<td>Morpho-syntactic</td>
<td>468.00</td>
<td>47.89</td>
</tr>
<tr>
<td>Semantic</td>
<td>492.79</td>
<td>44.51</td>
</tr>
<tr>
<td>Phonological</td>
<td>517.36</td>
<td>54.19</td>
</tr>
<tr>
<td>Plural</td>
<td>439.66</td>
<td>43.59</td>
</tr>
<tr>
<td>Unrelated</td>
<td>438.42</td>
<td>56.82</td>
</tr>
</tbody>
</table>

The statistical results of one-way ANOVAs (Analyses of Variance) and post-hoc pairwise comparisons revealed that the mean RT for the plural condition was significantly shorter than the RT for the unrelated condition and the RTs for the morpho-syntactic condition were not significantly different from the RT for the unrelated condition. These results showed that priming occurred for the plural
marker\(^1\), but no priming occurred for the morpho-syntactic case markers, suggesting that the morphological processing for the two types of suffixes differ. Ahn et al. (2011) argued that Korean nouns with the plural suffix are decomposed into the stem and affix, supporting the Decomposition Model. Regarding the difference between the plural marker and the morpho-syntactic case markers, they also suggested that while plural markers are truly morphological affixes, case markers in Korean are morpho-syntactic, and thus presuppose the existence of other syntactic elements, such as the matrix verb, hence the lack of priming effects.

**III. The Present Study**

The purpose of the four experiments reported below was to investigate whether native speakers and adult L2 learners of Korean make use of morphological structure in processing inflected word forms.

3.1 Participants

The participants for the present study were 119 Chinese learners who were studying Korean at a language institute of a Korean University located in Seoul, Korea. They were taking Korean Level 5 and 6 classes, which are regarded as advanced levels.\(^2\) The mean age of the participants was 23.8 and their average length of stay in Korea was 29 months. Of 119 participants, there were 87 males and 32 females.

3.2 Experimental Design

A between-subject design was used for this study, with six different conditions depending on the type of prime. The independent variable was the type of noun prime that was used (i.e., condition type) and the dependent variable was the RT.
for the lexical decision task. The yes/no answer scores to the lexical decision task were collected in order to examine whether the participants were responding to the items (i.e., target words) correctly. A total of 119 participants were assigned randomly to each of the six conditions (i.e., 20 participants per each condition).

The six experimental conditions according to prime type were as follows: identical, morpho-syntactic, unrelated, semantic, phonological, and plural. The test conditions of most interest in this experiment were the morpho-syntactic condition and the plural condition. The morpho-syntactic condition presented a noun plus nominative/accusative case marker as a prime, and the plural condition used a singular noun plus the plural suffix ‘-tul’ as the prime. An example of a prime-target pair in each of the six conditions is presented in Table 2. One might argue that morphological relations could be reduced to a convergence of orthographic/phonological and semantic overlapping since morphologically related words not only share a common root or stem but also orthographic/phonological and semantic features. Thus, the present study was designed to investigate whether morphologically related words reveal distinct characteristics from orthographically/phonologically and/or semantically related words.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Prime</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identical</td>
<td>kicha</td>
<td>kicha</td>
</tr>
<tr>
<td>Morpho-syntactic</td>
<td>kichaka</td>
<td>kicha</td>
</tr>
<tr>
<td>Semantic</td>
<td>yehang</td>
<td>kicha</td>
</tr>
<tr>
<td>Phonological</td>
<td>kichayey</td>
<td>kicha</td>
</tr>
<tr>
<td>Plural</td>
<td>kichatul</td>
<td>kicha</td>
</tr>
<tr>
<td>Unrelated</td>
<td>sakwa</td>
<td>kicha</td>
</tr>
</tbody>
</table>

3.3 Materials

A total of 180 experimental word prime-target pairs were used: thirty for each of the six conditions. A total of 45 filler prime-target pairs were added to the thirty experiment pairs, thereby producing a total of 75 prime-target pairs in each condition. As the answer to the lexical decision task for all the experimental items was ‘yes’, the filler items were designed so that only eight were real words, and the remaining 37 were non-words, in order to make the number of ‘yes’ and ‘no’
answers equal. The order in which the test items and fillers were presented was randomized for each subject.

3.4 Procedure

The main task for our study was a lexical decision priming task (Forster & Davis, 1984). Participants were seated in front of a computer and were given instructions for the experiment. They were told to focus on the ‘+’ sign in the center of the computer screen. After the focus point disappeared, they were told that a word would appear in its place. If they thought the word was a correct word in Korean, they were told to press a button on the keyboard for ‘yes’. If they thought the word was not an existing word in Korean, they were told to press another button on the keyboard for ‘no’.

After 500 ms, the focus point disappeared and the prime word appeared on the screen for 160 ms. After 160 ms, the target word appeared on the screen. It was the target word that they were asked to make a lexical decision on. To prevent the chance of purely orthographic priming, the target word and prime word were presented in different fonts.

The participants were guided through 12 practice items and were given an opportunity to ask questions if they were unsure about the instructions before the actual experiment started. Both the answers to the lexical decision task and the time it took for them to respond were recorded by E-prime software. The entire experiment took about fifteen minutes.

3.5 Analysis

The RTs to the lexical decision task for each test item by each participant were examined for outliers (i.e., RT scores deviated markedly from other RT scores). RTs deviated from more than 2.5 standard deviation from the mean RT of each condition were excluded from the analysis. A one-way ANOVA (Analysis of Variance) was performed for RT scores (i.e., dependent variable) as a function of condition (i.e., independent variable).
IV. Results

Table 3 presents mean RTs and SDs in the six experimental conditions and the results of RTs are graphically displayed in Figure 1. Table 3, along with Figure 1, shows considerable differences between the six conditions. The RT under the identical condition was fastest and the RT under the unrelated condition was slowest. Of the six conditions, the phonological condition showed RT as fast as the identical condition and the morphological condition was as slow as the unrelated condition.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identical</td>
<td>646.68</td>
<td>109.89</td>
<td>20</td>
</tr>
<tr>
<td>Morpho-syntactic</td>
<td>729.47</td>
<td>96.80</td>
<td>20</td>
</tr>
<tr>
<td>Semantic</td>
<td>713.61</td>
<td>64.67</td>
<td>20</td>
</tr>
<tr>
<td>Phonological</td>
<td>662.79</td>
<td>79.37</td>
<td>20</td>
</tr>
<tr>
<td>Plural</td>
<td>716.40</td>
<td>119.96</td>
<td>20</td>
</tr>
<tr>
<td>Unrelated</td>
<td>740.19</td>
<td>116.66</td>
<td>19</td>
</tr>
</tbody>
</table>

One-way ANOVA was performed and the results showed that there was a significant difference in the RTs for the six conditions ($F(5, 113) = 2.84, p<.05$). Post-hoc pairwise comparisons (Tukey HSD) revealed that there existed, though it is very marginal, a significant difference between the identical condition and the unrelated condition ($p=.047$) and no other significant differences were found regardless of the seemingly big differences in RTs between conditions (e.g., 662.79 ms in phonological condition and 740.19 ms in Unrelated condition).

FIGURE 1
Comparison of Mean RTs by Condition
V. Discussion and Conclusion

The present study was designed to investigate morphologically complex words in L2 processing by examining Chinese learners’ L2 processing of Korean nominal affixes and to see whether L2 processing differs from that of Korean native speakers. The previous study in L1 processing of Korean nominal suffixes showed priming effects for the plural marker but no priming for the morpho-syntactic case markers, which provided evidence in support of the Decomposition Model for plural markers (Ahn et al., 2011).

The first research question of the present study asked whether morphological suffixes on Korean nouns are decomposed or processed as a whole in Chinese learners’ L2 processing. The priming effects were found only for the identical condition while priming effects did not occur for all the other conditions. In other words, the RTs for the morphological, semantic, phonological and plural conditions were not significantly shorter than the RT for the unrelated condition. These results suggest that the Chinese L2 learners of Korean might have stored and processed Korean nominal suffixes as unanalyzed units, not in decomposed forms.

Note, on the other hand, that the mean RTs for the morphological, semantic, phonological and plural conditions were not significantly longer than that of the mean RT for the identical condition. In other words, the RTs for the four conditions are neither longer than the RT for the identical condition nor shorter than the RT for the unrelated condition. This type of priming might be defined as ‘weak priming’, since their priming effects are not significantly different from both the baseline conditions (i.e., the unrelated condition and the identical condition).3)

In Korean speakers’ L1 processing, as shown in Table 1, priming effects were found for the plural condition while no priming effects occurred for the other orthographically/phonologically related condition and semantically related condition. However, the priming effects for the plural condition were not the ‘full’ priming.

3) Verissimo and Claesen (2009) referred to a pattern in which there are no differences between test and identity and in which both conditions have shorter RTs than in the unrelated condition as ‘full’ priming. They also referred to a pattern in which test primes are shorter than in the unrelated condition but longer than in the identity condition as ‘partial’ or ‘reduced’ priming. ‘Weak priming’ coined in our research has no special status in their work, and hence is equivalent to ‘no priming’ in theirs and other’s priming study.
The RT for the plural condition was significantly shorter than the RT for the unrelated condition, but it was also longer than the RT for the identical condition, which means that 'reduced' or 'partial' priming, not the 'full' priming was found for the plural condition. Though the priming effects for the plural condition in L1 processing was regarded as 'partial', the results are different from the L2 processing results of the present study. The so-called 'weak' priming for the plural condition in Chinese learners' L2 processing might be interpreted to show no priming effects, since the plural condition RTs were not significantly shorter than the unrelated condition. Thus, it might be suggested that Chinese learners do not decompose Korean nominal suffixes during processing.

The second research question is concerned with the difference between morpho-syntactic case markers and plural markers in Chinese learners' L2 processing of Korean nominal suffixes. In Korean native speakers' L1 processing of Ahn et al.'s (2011) study, the morphological processing of plural markers was different from that of morpho-syntactic case markers, for which no priming effects were found. That is, the priming effects (even if the effects were regarded as being partial or reduced) were found for the plural condition. H.-D. Ahn et al. (2011) maintained that nouns with morpho-syntactic case markers in Korean are processed in a qualitatively different manner than nouns with purely morphological markers. However, the present study showed very weak priming effects for both plural markers and morpho-syntactic case markers. In other words, unlike L1 processing, Chinese L2 learners of Korean did not show any distinction in their recognition of plural markers, which are truly morphological, and morpho-syntactic case markers.

With regard to the difference between L1 and L2 processing of morphologically complex words, Silva and Clahsen (2008) showed the full priming effects for inflected and derived word forms in native speakers of English, but different patterns for inflection and derivation in German, Chinese, and Japanese L2 learners of English, that is, no priming for the former and partial priming for the latter. The results of the present study appear to confirm the no priming effects for inflection in L2 processing. Korean nominal suffixes, both plural markers and morpho-syntactic case markers, are regarded as inflectional morphology, since they only add grammatical function to the target items without changing their syntactic categories. Therefore, in order to verify the differences between inflected
and derived word forms in L2 processing, more future studies are needed to focus on L2 morphological processing of derived word forms by Chinese learners of Korean.

The present study revealed a clear distinction between L1 and L2 processing of inflectional morphology in Korean and, thus, it can be concluded that adult L2 learners rely more on lexical storage of inflected words and are less affected by the complex morphological structure of inflected words than native speakers. As mentioned before, however, even though it is not as strong as the partial or reduced priming, the so-called ‘weak’ priming was found for the plural markers as well as morpho-syntactic case markers. In other words, the mean RTs for the plural condition and the morpho-syntactic condition were not significantly longer than that the mean RT for the identical condition. This ‘weak’ priming effects can be identified with no priming, but it also might be interpreted as there being some probable priming effects with different SOAs. If the prime were presented for shorter or longer period than 160 ms, the results might show different priming effects for the plural marker and the morpho-syntactic case markers. Therefore, many future studies will be necessary to investigate the possibility that the plural marker and the morpho-syntactic case markers in Korean may be processed differently at shorter or longer SOAs than the SOA of 160 ms.

Finally, the present study was conducted with only the advanced level learners of Korean. In a recent study of Korean L2 learners’ processing of English inflectional morphology, Lee (2011) proposed a pedagogical implication that L2 learners should have a large amount of exposure experience to L2 for efficient processing and retrieval of inflectional morphology4. In order to provide pedagogical insight for Korean L2 learners or teachers, future studies which examine the morphological processing by L2 learners of Korean with different proficiency levels, including beginning and intermediate level learners, are necessary.

4) There have been several research studies on Korean L2 learners’ processing of English syntax or morphology (Kweon & Lee, 2001; Lee & Kwon, 2008). However, few research studies have been done in the area of L2 learners’ processing of Korean morphology or syntax.
References


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poor grammaticality judgment performance by late second language learners. *Journal of Memory and Languages, 55*, 381-401.


예시언어(Examples in): English

적용가능 언어(Applicable Languages): English

적용가능 수준(Applicable Levels): College Level

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