Chinese Learners’ L2 Morphological Processing of Final and Prefinal Endings in Korean Verbs*

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This study investigates how Chinese learners of Korean process morphologically complex words to see whether verbal suffixes are decomposed or processed as a whole. 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 final and prefinal verbal endings. The results of a visual priming experiment with the SOA of 160 ms showed that strong or full priming occurred for the past tense suffix, but no priming for the honorifics, which is different from L1 processing of Korean prefinal endings. This study revealed reduced priming effects for the final ending, which is also different from Korean L1 processing of the same endings. The results of the present study, however, showed priming effects for verbal suffixes similar to Chinese L2 learners’ processing of Korean nominal suffixes.

[morphological processing/verbal suffixes, 형태 처리/동사 접사]

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I. Introduction

In morphological processing studies, research questions arise as to whether the speaker or hearer employs morphologically structured representations when they process inflected or derived words. Specifically, many debates on the status of morphologically complex words have centered on two main models: the Decomposition Model (Clahsen, 1999; Pinker, 1999; Pinker & Ullman, 2002) and the Full–listing Model (McClelland & Patterson, 2002; Seidenberg & Gonnerman, 2000). The Decomposition Model states that in morphological processing, the recognition of an inflected word such as ‘cleaned’ involves decomposing the word into its stem and its affix, that is, ‘clean + ed’. On the other hand, the Full–listing Model claims that every inflected word is recognized as an unanalyzed whole word. For example, ‘cleaned’ would not be recognized as the word ‘clean’ plus a verbal suffix, ‘–ed’, but as a single indecomposable word, just like ‘clean’.

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; Marinins, Roberts, Felser, & Clahsen, 2005; Silva & Clahsen, 2008; Ullman, 2001, 2004, 2005). According to Ullman (2005), L2 processing is largely dependent upon the lexical memory system, declarative memory, while reliance on the procedural system occurs to a much lesser extent than in L1 processing. It 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 verbal suffixes in Korean, two of which are final endings and prefinal endings. A standard visual priming procedure will be conducted to show that neither orthographic/phonological nor semantic
similarity underlies morphological effects. Thus, experimental results 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 verbs and suffixes. The specific research questions addressed in the present study are as follows:

1. Are final endings of Korean verbs decomposed or processed as a whole in Chinese learners’ L2 processing?
2. Are prefinal endings of Korean verbs decomposed or processed as a whole in Chinese learners’ L2 processing?
3. Is the Chinese learners’ L2 processing of Korean verbal suffixes different from that of Korean speakers’ L1 processing?
4. Is the Chinese learners’ L2 processing of Korean verbal suffixes different from that of Korean nominal suffixes?

In order to answer these research questions, a priming experiment examining the morphological processing of two different types of verbal suffixes was conducted. The first type of verbal suffix is one of the verbal final endings ‘-ko’, and the second type of verbal suffix is two different prefinal endings, the past tense ending ‘-ass/ess/ss’ and the honorific ending ‘-si’. We report findings from the morphological priming experiments that 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. Our study further shows that L2 processing of verbal suffixes by Chinese learners of Korean would be different from L2 processing of nominal suffixes by the same group of Chinese learners of Korean.

II. Previous Studies

1. L1 Processing of Verbal 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, An, Choi, Hwang, Jeon, and Kim’s (2011a) study and
took the similar procedure with the same morphologically related verbs in Korean. Therefore, it is necessary to briefly review Ahn et al. (2011a) and present its results in this section.

Ahn et al. (2011a) conducted an experiment which examined the morphological processing of two types of verbal suffixes in Korean: the verbal ending ‘-ko’ and the preverbal ending ‘-si’. 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, morphological (=verbal ending), semantic, phonological, honorific (=preverbal ending), and unrelated. The following table shows the mean reaction times (RTs) and standard deviations (SDs) of the lexical decision tasks (LDTs) 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>519</td>
<td>75.1</td>
</tr>
<tr>
<td>Morphological</td>
<td>575</td>
<td>46.6</td>
</tr>
<tr>
<td>Semantic</td>
<td>609</td>
<td>57.1</td>
</tr>
<tr>
<td>Phonological</td>
<td>640</td>
<td>62.0</td>
</tr>
<tr>
<td>Honorific</td>
<td>560</td>
<td>51.7</td>
</tr>
<tr>
<td>Unrelated</td>
<td>643</td>
<td>95.2</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 morphological condition (=verbal ending) was significantly shorter than the RT for the unrelated condition (p<.05). The RTs for the honorific condition (=preverbal ending) was also significantly different from the RT for the unrelated condition (p<.05). The RTs for the semantic and phonological conditions, by contrast, were not significantly different from the RT for the unrelated condition. These results showed that priming occurred for the verbal suffixes (both final and prefinal endings). Ahn et al. (2011a) argued that Korean verbs with the (pre)final suffixes are decomposed into the stem and affix, supporting the Decomposition Model.
2. L2 Processing of Nominal Suffixes in Korean by Chinese Speakers

Ahn et al. (2011b) explored the issue between the Decomposition Model and the Full-listing Model in L2 processing through the visual word recognition experiments which targeted morphologically related nominals in Korean. One hundred and nineteen Chinese learners who were taking advanced Korean classes participated in a lexical decision priming task comprising six different conditions: identical, morpho-syntactic, unrelated, semantic, phonological, and plural. Table 2 shows an example of a prime–target pair in each of the six conditions for lexical decision tasks (LDTs).

### TABLE 2
Priming Conditions for LDTs

<table>
<thead>
<tr>
<th>Condition</th>
<th>Prime</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identical</td>
<td>kicha ‘train’</td>
<td>kicha ‘train’</td>
</tr>
<tr>
<td>Morpho-syntactic</td>
<td>kichaka ‘train-NOM’</td>
<td>kicha ‘train’</td>
</tr>
<tr>
<td>Semantic</td>
<td>yeayang ‘travel’</td>
<td>kicha ‘train’</td>
</tr>
<tr>
<td>Phonological</td>
<td>kichalyey nonword</td>
<td>kicha ‘train’</td>
</tr>
<tr>
<td>Plural</td>
<td>kichatul ‘train-PL’</td>
<td>kicha ‘train’</td>
</tr>
<tr>
<td>Unrelated</td>
<td>sakawa ‘apple’</td>
<td>kicha ‘train’</td>
</tr>
</tbody>
</table>

The SOA was 160 ms, so the prime word appeared on the computer screen for 160 ms before the target word appeared on the screen. The participants were asked to make a lexical decision on the target word and their RT were automatically recorded by E-prime software.

The results of the experiment showed 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. A significant difference was found 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. In other words, the priming effects were found only for the identical condition while priming effects did not occur for all the other conditions. Based on these results, Ahn et al. (2011b) maintained that the Chinese L2 learners of Korean
might have stored and processed Korean nominal suffixes as unanalyzed units, not in decomposed forms, and 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.

III. Method

1. Participants

The participants for the present study were 135 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 levels1). The mean age of the participants was 24.3 years old and their average length of stay in Korea was 32 months. Of 135 participants, there were 53 males and 82 females. Upon completion of the experiments, the Chinese participants received a payment of ₩10,000 cash.

2. Experimental Design

A between-subject design was used for this study, with seven different conditions depending on the type of prime. The independent variable was the type of verb prime that was used (i.e., condition type) and the dependent variable was the RT for the lexical decision tasks. The yes/no answer scores to the lexical decision tasks were collected in order to examine whether the participants were responding to the items (i.e., target words) correctly. A total of 135 participants were assigned randomly to each of the seven conditions (i.e., 19 or 20 participants per each condition).

The seven experimental conditions according to prime type were as follows: identical, morphological, semantic, phonological, past, honorific, and unrelated. The test conditions of most interest in this experiment were the morphological condition concerned with final endings, and the past and honorific conditions with prefinal endings. An example of a prime–target pair in each of the seven conditions is

1) All the participants had passed Level Four of the TOPIK (Test of Proficiency in Korean).
presented in Table 3. 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 3**
Primming Conditions and Prime–Target Pairs

<table>
<thead>
<tr>
<th>Condition</th>
<th>Prime</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identical</td>
<td>sata ‘buy’</td>
<td>sata ‘buy’</td>
</tr>
<tr>
<td>Morphological</td>
<td>sako ‘buy–CONJ’</td>
<td>sata ‘buy’</td>
</tr>
<tr>
<td>Semantic</td>
<td>siccang ‘mart’</td>
<td>sata ‘buy’</td>
</tr>
<tr>
<td>Phonological</td>
<td>sata ‘buy’</td>
<td>sata ‘buy’</td>
</tr>
<tr>
<td>Past</td>
<td>sassta ‘buy–PAST’</td>
<td>sata ‘buy’</td>
</tr>
<tr>
<td>Honorific</td>
<td>sasita ‘buy–HON’</td>
<td>sata ‘buy’</td>
</tr>
<tr>
<td>Unrelated</td>
<td>hanul ‘sky’</td>
<td>sata ‘buy’</td>
</tr>
</tbody>
</table>

3. Materials

A total of 280 experimental word prime–target pairs were used: forty for each of the seven conditions. For the morphological condition, one of the final endings in Korean, ‘-ko’, was used, and two prefinal endings, ‘-ass/ess/ss’ and ‘-(u)si’, were used for the past condition and the honorific condition, respectively. The prime and target words in all the conditions were two syllable ones except the past and honorific conditions. The prime and target words for the past condition were two or three syllables and those for the honorific condition were three or four syllable words.

A total of 60 filler prime–target pairs were repeatedly used for each condition, thereby producing a total of 100 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 ten were real words, and the remaining fifty 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.
4. Procedure

The main task for our study was a lexical decision priming task (Marslen-Wilson et al., 1994). 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 the prime word were presented in different fonts. In sum, the priming technique involves three visual events presented on a computer screen as summarized below:

- Fixation: + (500 ms)
- Prime: 사다 (160 ms)
- Target: 사다

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 twenty minutes.

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 was performed for RT scores (i.e., dependent variable) as a function of condition (i.e., independent variable).
IV. Results

Table 4 presents mean RTs and standard deviations of lexical decision tasks in the seven experimental conditions and the results of RTs are graphically displayed in Figure 1. Table 4, along with Figure 1, shows considerable differences between the seven conditions. The RT under the identical condition was fastest (617.61 ms), and the RT under the past condition was as fast as that under the identical condition (626.90 ms). Slow RTs were found under the conditions of phonological (764.68 ms) and unrelated (758.03 ms) and semantic (757.24 ms). The most striking result is the large gap of RTs between the past condition (626.90 ms) and the honorific condition (731.35 ms), considering that they both belong to the same category of the verbal suffix, prefinal endings of verbs.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identical</td>
<td>617.61</td>
<td>98.85</td>
</tr>
<tr>
<td>Morphological</td>
<td>668.79</td>
<td>71.08</td>
</tr>
<tr>
<td>Semantic</td>
<td>757.24</td>
<td>131.71</td>
</tr>
<tr>
<td>Phonological</td>
<td>764.68</td>
<td>101.23</td>
</tr>
<tr>
<td>Past</td>
<td>626.90</td>
<td>75.92</td>
</tr>
<tr>
<td>Honorific</td>
<td>731.35</td>
<td>89.78</td>
</tr>
<tr>
<td>Unrelated</td>
<td>758.03</td>
<td>76.71</td>
</tr>
</tbody>
</table>

**TABLE 4**

Mean RTs and SDs by LDTs on Conditions

**FIGURE 1**

Comparison of Mean RTs by LDTs on Conditions
One-way ANOVA was performed and the results showed that there was a significant difference in the RTs for the seven conditions ($F(5, 129) = 8.97, p<.05$). In order to identify any significant differences between each condition, post-hoc pairwise comparisons (Tukey HSD) were performed and the results revealed that there existed a significant difference between the identical condition and the unrelated condition ($p=.000$), between the identical condition and the semantic condition ($p=.000$), between the identical condition and the phonological condition ($p=.000$), and between the identical condition and the honorific condition ($p=.005$). No significant difference was found between the identical condition and the morphological condition ($p=.629$), and between the identical condition and the past condition ($p=1.000$). A significant difference was also found between the past condition and the unrelated ($p=.001$), semantic ($p=.001$), and phonological ($p=.000$) conditions. The comparisons between the morphological condition and the three conditions (i.e., the unrelated, semantic, and phonological conditions) showed interesting results. First of all, a significant difference was found between the morphological condition and the phonological condition ($p=.036$). However, the comparisons between the morphological condition and the unrelated condition, and between the morphological condition and the semantic condition show a marginal level of significance around .05 (i.e., .065 and .058, respectively).

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 verbal suffixes and to see whether L2 processing differs from that of Korean native speakers and how L2 processing of verbal suffixes differs from that of nominal suffixes. The previous study in Ahn et al.’s (2011a) study showed that priming occurred for the morphological and honorific conditions in L1 processing of Korean verbal suffixes, which can be interpreted to support the Decomposition Model. In another study of the L2 processing of nominal suffixes, on the other hand, Ahn et al. (2011b) showed no priming effects for inflection in L2 processing and maintained that Chinese L2 learners of Korean store and process Korean nominal suffixes as unanalyzed units, not in decomposed forms.

First of all, the present study showed strong or full priming effects for the past
condition. The RT for the past condition was significantly shorter than the RT for the unrelated condition, but it was not significantly longer than the RT for the identical condition, which means that the ‘full’ priming was found for the past condition. These results might indicate that Chinese L2 learners of Korean decompose Korean past markers during processing. However, the present study clearly showed no priming effects for another prefinal ending, honorifics in Korean. A significant difference was found between the identical condition and the honorific condition, but no significant difference was found between the unrelated condition and the honorific condition. In other words, the RT for the honorific condition was significantly longer than the RT for the identical condition, but it was not significantly shorter than the RT for the unrelated condition. As mentioned before, Ahn et al. (2011a) showed full priming effects for the honorific condition in L1 processing of Korean verbal suffixes, supporting the Decomposition Model. Thus, the results of the current study revealed the stark contrast between L1 and L2 processing of Korean honorifics.

This study also revealed reduced priming effects for the morphological condition, namely, verbal endings. The RT for the morphological condition was neither longer than the RT for the identical condition nor shorter than the RT for the unrelated condition. Considering the full priming effects for the morphological condition in L1 processing of Korean verbal suffixes (Ahn et al., 2011a), it can be concluded that L2 learners of Korean process final verbal endings in Korean differently from Korean native speakers, storing and processing them as unanalyzed units, not in decomposed forms. However, one thing to be noted here is that the $p$-value of the pairwise comparison between the morphological condition and the unrelated condition was marginal (i.e., $p=.065$), and that there was no significant difference between the identical condition and the morphological condition ($p=.629$). In other words, even if no statistically significant difference was found between the morphological condition and the unrelated condition, the RT difference between the two conditions was so large that the priming for the morphological condition could be said to be as strong as the priming for the identical condition or the past condition.

Chinese learners’ L2 processing of Korean verbal suffixes in the present study showed priming effects similar to their processing of Korean nominal suffixes. As mentioned before, reduced priming effects for both plural markers and
morpho–syntactic case markers were found in Chinese L2 learners’ processing of Korean nominal suffixes, and Ahn et al. (2011b) maintained that the Chinese L2 learners of Korean might have stored and processed Korean nominal suffixes as unanalyzed units, not in decomposed forms. In the present study, too, Chinese L2 learners showed reduced priming effects for the morphological verbal final endings.

With regard to the processing of inflectional morphology, Silva and Clahsen (2008) found the full priming effects for inflected and derived word forms in L1 processing of English, no priming for inflectional morphology and partial priming for derivational morphology in L2 processing2). Unlike the results of Ahn et al. (2011b), which appeared to confirm the no priming effects for inflectional morphology (i.e., both plural markers and morpho–syntactic case markers) in L2 processing, the present study presents conflicting evidence on L2 processing of inflectional morphology. In other words, no priming effects were found for honorific preverbal endings, whereas full priming and reduced priming effects occurred for past tense prefinal endings and conjunctive final endings which are also inflectional. Based on the results of the present study, therefore, it seems hasty to conclude that full priming occurs in L2 processing of inflectional morphology or that L2 processing of inflectional morphology is different from that of L1 processing. In order to verify the differences between L1 and L2 processing of inflected word forms and priming effects of different types of inflectional morphology, more future studies are needed to focus on L2 morphological processing of various types of inflected word forms by L2 learners with different native language backgrounds.

Several limitations of the study finally need to be mentioned. First of all, the participants of the present study were advanced level learners of Korean. Lee (2011), in a recent study of Korean L2 learners’ processing of English inflectional morphology, presented a pedagogical implication that L2 learners should be exposed to a large amount of L2 input for efficient processing and retrieval of inflectional morphology3). In order to provide pedagogical insight for Korean L2

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2) According to Silva and Clahsen (2008), “full priming” occurs when the RTs for the Identity and Test conditions are similar and both shorter than the Unrelated condition, hence “full priming” would indicate morphological decomposition. “Partial priming” occurs when the RTs for Test condition are longer than the Identity condition and shorter than the Unrelated condition.

3) There have been several research studies on Korean L2 learners’ processing of English...
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.

Second, the present study adopted a visual priming, in which the SOA was 160 ms. Even though the present study included the semantic condition and the phonological condition, the visual priming experiment with the SOA longer than 80 ms could not completely control the semantic or phonological effects of the priming words. Therefore, further studies, which adopts the masked priming paradigm (Forster & Davis, 1984), should be designed and performed to thoroughly investigate and control both orthographic and phonological activations during L2 processing.

References


Syntax or morphology (Kwon & Lee, 2001; Lee & Kwon, 2008). However, few research studies have been done in the area of L2 learners’ processing of Korean morphology or syntax.


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