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Lexical Processing of English Derived Words by Korean EFL Learners and NSE

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Debate has continued about how L1 speakers process morphologically complex words. Consensus has been divided between single- and dual-route processing models. We conducted lexical decision experiments with a wide variety of English derived words to investigate how Korean EFL learners and L1 English speakers access complex words. First, we show that English prefixed or suffixed words are processed with greater cost than simplex words for both English L1 speakers and EFL learners. Second, suffixed words are processed with faster response times and higher accuracy than prefixed words. Third, complex words are accessed differently in terms of affixal salience according to the individual affixes that belong to the same morphological classes. Finally, the homophony of affixes with dual membership induces Korean EFL learners, not English L1 speakers to process complex words with more difficulty than those with single-membership affixes. These results suggest that derived words are processed via morphological decomposition into stems and affixes whereas simplex words are directly accessed as whole word units, supporting the dual-route processing models. Additionally, this study implies that prefixes are more likely to be parsed from the bases than suffixes. Furthermore, it is suggested that the processing efficiency of derivational words varies according to each affix type, which complements the formal structural theory of lexical morphology. Finally, it is indicated that the confusability of affixes with dual membership hinders the processing of the derivational words.

Keywords: EFL, NSE, Morphological processing, single-route model, dual-route model, affixal salience, EFL learners' lexicon, processing-based constraint on affix ordering

Introduction

Research interest in the psycholinguistics field has focused over several decades on how morphological complex words are stored, retrieved or accessed when they are presented visually or aurally (Andrews, Miller, & Rayner, 2004; Juhasz, Starr, Inhoff, & Placke, 2003; Pollastsek & Hyönä, 2005; Taft & Forster, 1976). Cognitive processing mode might differ from the grammatical, and structural description regarding how complex words are formed within various phonological, semantic or morphological constraints as modelled by lexical morphology (Kiparsky, 1982, 1985). Are the morphologically complex words accessed as whole-units, or via morphological decomposition (parsing the whole words into constituents such as root or affix)?

Numerous studies have sought to answer this question and seem to have reached a consensus that lexical processing involves both access to whole word and morphological decomposition. Morphological decomposition can be drawn commonly from the results of lexical decision tasks (LDTs) under the reasoning that if lexical access is via morphological decomposition, whole words are parsed into their constituent morphemes, which incurs longer response times (RTs) than if they are processed as whole-units. In addition to the mode of morphological processing, this issue is also associated with what the lexical representations are, i.e., whether words are represented as single units or individual morphemes as argued under connectionist models.

Most previous studies on the processing of derived words have, however, focused on L1 speakers' lexical access and their cognitive patterns (Baayen & Schreuder, 2000; Lehtonen, Cunillera, Rodreguesz-Fornells, Annika, Tuomainen, & Laine, 2007; Plag & Baayen, 2009). Thus, to advance accumulated knowledge of lexical processing by L1 speakers, the present study is primarily concerned with whether/how FL speakers process morphologically complex words, particularly derived words. With psycholinguistic data elicited from Korean EFL learners, we pursue three goals in this study. First, we investigate whether there is any processing cost or benefit associated with decomposing English derived words into their constituents in comparison with monomorphemic words for Korean EFL learners (e.g., *intact* vs. *bullet*). As there have been discrepant results with respect to the cost and benefits of processing derived words for L1 speakers, the current study is expected to accrue evidence for either effect for EFL speakers. Second, we examine whether there is a difference between prefixed and suffixed derived words in terms of processing efficiency characterized by RTs and accuracy in LDTs for EFL learners (e.g., *uncertain* vs. *desirable*). Third, we aim to investigate if there is any difference in processing benefits between class I and class II affixed words (e.g., *incredible* vs. *uncomfortable*) and whether processing efficiency varies within each class of affixed words according to individual affixes (e.g., *inaccurate* vs. *prejudice*). By addressing these issues, the present study is expected to shed light on the more comprehensive processing patterns of EFL speakers' lexical access to a wide variety of morphologically complex derived words.

Whereas a great bulk of previous research focuses on ESL learners' (meta)cognitive strategies on English vocabulary or the effects of L2 morphological awareness on L2 reading (Choi, 2015; Wang, 2009; Yamada, 2018), the current paper is concerned with revealing ESL learners' morphological processing strategies and the structures of their mental lexicon.

Theoretical Background

Costs or Benefits of Processing of Complex Words

Two viable positions about the processing of morphologically derivational or inflected words have been proposed. One posits that complex words enjoy processing benefits rather than suffer from costs (Bertram, Schreuder, & Baayen, 2000; Burani & Thornton, 2003; Butterworth, 1983; Sereno & Jongman, 1997). Specifically, many studies have shown that RTs were shorter for complex words such as *betrayal* and *walked* than for monomorphemic words such as *tiger*. Under this processing, complex words are directly accessed to the full forms of their representations in a holistic manner without computation of their constituents (Butterworth, 1983). The underlying assumption of these supralexical models is that morphological constituency plays no role in the structure of mental lexicon, supporting full-listing stance (Lukatela, Carello, & Turvey, 1987). Alternatively, the whole words can be directly accessed to the root that is associated with the words containing the same root as argued in the connectionist model (Joanisse & Seidenberg, 1999; Elman, Bates, Johnson, Karmiloff-Smith, Parisi, & Plunkett, 1996; Rumelhart & McClelland, 1986). In the same vein, Fiorentino and Poeppel (2007) and Taft (2004) advocated single-route models. They argue for an obligatory decomposition of derived words, which is a principal characteristic of the sublexical models of morphological processing. These models posit that complex words are initially accessed to their bases and affixes and subsequently to full forms via re-association of the morphemes. These models are couched in a single-route theory which claims that morphological processing is performed via direct access to the whole words.

Alternatively, dual-route theory postulates that morphologically derived complex words are accessed both via the decomposition to their constituents and directly as full-forms in a holistic fashion, depending on frequency (low- vs. high-frequency base), affixal salience, word formation type (inflection vs. derived), affixal type (class I vs. class II), and regularity of verbal inflection (irregular vs. regular past tense form) (Andrews, Miller, & Rayner, 2004; Baayen & Schreuder, 2000; Hyönä & Pollatsek, 1998; Marslen-Wilson, Tyler, Waksler, & Older, 1994; Pollatsek & Hyönä, 2005; Ullman, 1999; Ullman, Corkin, Coppola, Hickok, Growdon, Koroshetz, & Pinker, 1997). Computation of root and affixes during lexical access is evidenced by the study results showing that RTs are significantly slower than monomorphemic words. Specifically, affix stripping can take place when complex words are accessed. A traditional example of dual-route models comes from Ullman et al. (1997). They argue that regularly inflected forms such as *talked* are formed, stored and retrieved in the mental lexicon via morphological decomposition (e.g., *talk+ed*) regardless of their frequency while irregular words such as *caught* are stored and accessed as whole word units. This model is also supported by neurological finding that regular forms are processed in a different brain region than irregular ones (Jaeger, Lockwood, Kemmerer, Van Valin Jr., Murphy, & Khalak, 1996; Marslen-Wilson & Tyler, 1997).

Further evidence for affix stripping comes from LDTs, eye-movement recording, etc. These studies found that processing cost differs depending on the relative frequency of derived words and that processing of derived words is sensitive to both the frequency of the derived words and the base frequency. For instance, the word (e.g., *agreeable*, *government*) whose base frequency is higher than that of its embedding derived word elicited shorter RTs than the word (e.g., *serenity*, *discernment*) that included a relatively low-frequency base (Hay, 2001; Hay & Baayen, 2002; Schreuder, Burani, & Baayen, 2003; Vannest, Polk, & Lewis, 2005: 68). This suggests that the affix should be stripped off the embedding derived words when computing and accessing them and that suffixed word frequency and base frequency should be computed jointly.

Against this theoretical background, a purpose of the current study is to explore whether Korean EFL speakers enjoy the benefit of derived complex words or suffer from the cost of processing them via morphological decomposition. To pursue this goal, we will examine whether Korean EFL speakers' mental lexicon adopts full-form storage representations or morphological computing mechanism.

Affixal Salience and Morphological Decomposition

Laudanna and Burani (1995) postulated that affixes play a role in regulating the degree of morphological decomposition in the processing of derived morphologically complex words. They proposed the concept of affixal salience to refer to the likelihood of the affix acting as a processing unit. To be specific, the greater the perceptual affixal salience, the more likely the morphological decomposition into base and affix is to operate in the processing of derived words. A variety of factors affecting affixal salience have been studied including orthographic length of affix, type and token frequency of affix, productivity of affix, confusability or homonymy of affix (Andrews & Davis, 1999; Baayen, 1994; Hay & Baayen, 2003; Järvikivi, Bertram, & Niemi, 2006). For instance, Järvikivi, Bertram and Niemi (2006) showed that affixes with fewer allomorphs increase affixal salience and thus enhance morphological decomposition in processing Finnish derived words. Laudanna and Burani (1995) found that more frequent and longer affixes tend to serve as processing units more often than less frequent and shorter ones. They also found that more productive affixes are likely to induce morphological parsing than less productive ones. Additionally, affixes in homonymy such as the English suffix *–er* (agentive or comparative marker) inhibit morphological parsing and rather facilitate holistic processing for suffixed words in Dutch and English (Burani, Marcolini, & Stella, 2000). Evidence for the productivity of affixes was also presented in many studies, showing that more productive affixes such as *–ness* lead to a greater number of coinages of new words and an increased likelihood of morphological parsing compared to less productive affixes such as *–ity* in English and Dutch (Anshen & Aronoff, 1988; Baayen, 1994; Laudanna & Burani, 1995).

The concept of affixal salience and the factors affecting it are important in the processing of derived words because the relative perceptual degree of affixal salience might potentially lead us to expect the relative degree of morphological parsing.

In the present study, we will examine whether the processing efficiency of derived words is influenced by affixal homophony, one of the factors affecting affixal salience for Korean EFL learners. This examination is significant in the sense that it might reveal EFL learners' sensitivity to the confusability of homophony of dual affixes. If the derived words attached with dual affixes elicit slower RTs than single affixed words, it indicates that even dual affixes are recognized and stripped via decomposition. However, if dual affixed words lead to shorter RTs than single affixed words, it implies that the speakers do not suffer confusion about the salient status of dual affixes and process the words as whole units. We experimented with three English suffixes, namely *–able, -ize, -ist* that serve dual morphological functions and are classified as level I and level II according to lexical morphology. Hence, our study will contribute to revealing the role of these suffixes in the degree of morphological parsing for EFL learners.

Lexical Processing and Affix Ordering

To account for the relationship between lexical processing and affix ordering, two types of models have emerged. One is a formal linguistic model, known as lexical morphology model (Kiparsky, 1982, 1985). For instance, under this model, English affixes are commonly classified into two classes or levels, class I and class II, by various criteria such as the origin of affix, phonological change accompanied by affixation, semantic transparency of affixed words, and morphological criterion. With respect to affix ordering, class I affixes whose origin is Latinate or Greek are positioned closer to roots than class II affixes which are purely Germanic. This grammatical distinction has been supported by neuropsychological studies. It was shown that class I suffixed words (e.g., *-ity, -ation*) are processed in a different region of brain from class II suffixed words (e.g., *-ness, -less, -able*) (Vannest, Polk, & Lewis, 2005). Additionally, it was claimed that the former are accessed as whole-word units, whereas the latter are retrieved via morphological parsing. These findings can be interpreted to provide additional evidence for dual-route processing models.

The other proposal was put forward in the cognitive model to reveal the role of lexical processing in affix ordering. One common hypothesis is called 'complexity-based ordering' (Hay, 2003; Hay & Plag, 2004; Plag & Baayen, 2009). Under this model, the probability of the affixes to undergo stripping from the bases determines or regulates the relative positioning from the roots. To be specific, it is postulated that derivational affixes that are more likely to be parsed from their bases tend to be positioned further from the root than those that are less likely. On the basis of the parsability of affixes, Plag and Baayen (2009) proposed a hierarchy of English suffixes in terms of relative distance from the roots as this: *-ian* > *-ive* > *-ish* > *-ment* > $\textit{-ful}_N$ > *-ery* > *-ous* > $\textit{-ary}_N$ > *-less* > $\textit{-ful}_{Adj}$ > $\textit{-ly}_{Adj}$. It is also posited that this processing-based constraint on affix ordering can account for the combinability. That is, given the ordering hierarchy such as A > B > C, more natural affix ordering is A-B or B-C whereas C-A or B-A ordering is systematically precluded (Sims & Parker, 2015: 48). This model is important in revealing that aside the formal dichotomy of class I and class II, morphological decomposability during lexical access provides more sophisticated criterion for affix ordering and in complementing a linguistic model.

With this background, the present study explores whether there is any difference in processing efficiency within derived words with class I prefixes (in+, con+, pre+) and within those with class II prefixes (un#, non#, semi#). Our study testifies to the affix-ordering hypothesis, i.e., whether affix ordering in lexical morphology model can be regulated by lexical processing load even with EFL learners.

Research Questions of the Present Study

As briefly mentioned previously in the introduction, we aim to answer the following four research questions. The principal goal of the current paper is to reveal the processing patterns for derived morphologically complex words with Korean EFL learners. First, we examine whether English derived words enjoy a benefit or suffer from the cost during lexical access in comparison with the processing of monomorphemic words. This question also might hint at the issue of single-route versus double-route processing manners for complex words. Second, this study explores whether there is any difference in processing efficiency or processing manner regarding single-route or double-route models between prefixed and suffixed derived words. The third question is associated with a factor affecting affixal salience. To be specific, we investigate whether confusability or homophony of English affixes such as–*able*, -*ize*, -*ist* affects (or precludes) morphological decomposition and boosts holistic processing, as has been shown in previous studies (Bertram, Schreuder, & Baayen, 2000). The last question involves the issue of whether processing efficiency varies according to individual prefix or suffix, supporting processing-based constraint on affix ordering.

Processing Experiments

Participants

Thirty native English speakers (henceforth, ES) participated in the lexical decision experiment. They were recruited from Cornell University in the US. They were undergraduate or graduate students (11 males and 19 females) and were paid compensation for their participation. Their age was on average 23, ranging from 18 to 30. Their dialects varied from East Coast, West Coast, Mid Western to Southern.

Thirty-six Korean learners of English (henceforth, KS) also participated in the identical LDT. They were all recruited from Daegu University campus in Korea (10 males and 26 females). Their major or minor was English. Their average age was 22 (ranging from 20 to 27 yrs). They received formal English education from grade school to college for an average of 11 years (ranging from 8 to 17 yrs). They had on average 2 hours of English study per day. Their self-evaluation of English proficiency ranged from 2 to 7, averaging 5 out of a 10 point-scale (from 1 to 10). Their TOEIC scores were on average 650 (and ranged from 450 to 895). This information indicates that they were intermediate level L2 English learners.

Materials

Three groups of stimuli were used for three block-processing experiments: (i) prefixed word stimuli, (ii) suffixed word stimuli, and (iii) dual-membership affixed word stimuli.

First, to obtain the processing of prefixed stimuli, we randomly used 30 class I prefixed words (*in+*, *con+*, *pre+*), 30 class II prefixed words (un#, non#, semi#), 30 monomorphemic words, and 30 nonce word fillers as is summarized in Table 1 below (See the Appendix for the full list of words). In total, 120 token stimuli were selected. All the words had two to five syllables and were low-frequency words with frequency below 50 according to the BNC corpus (Leech, Rayson, & Wilson, 2001). The average number of syllables in class I, class II, and monomorphemic words was 2.6, 3.2, and 2.2 respectively.

TABLE 1
English Prefixed Word Stimuli

	Class I pref. words	Class II pref. words	Mono-morp words	Noncewd
	in+, con+, pre+	un#, non#, semi#		
Ex.	*inadequate*	*uncertain*	*genuine*	*unziba*
No.	30	30	30	30

Second, to examine the processing of suffixed complex word stimuli and to determine whether the finding replicates that obtained in a previous study, we adopted the identical word stimuli used in Yun (2015). In total, 90 real English words and 10 nonce filler words were randomly selected; 30 words embedded class I suffixes (-*ity*, -*tion*), 30 words were class II suffixed ones (-*able*, -*ness*, -*less*), and 30 words were monomorphic. All stimuli consisted of one to five syllables.

TABLE 2
English Suffixed Word Stimuli

	Class I suff. words	Class II suff. words	Mono-morph	Noncewd
	-ity, -tion	-able, -ness, -less		
Ex.	*curiosity*	*fitness*	*perfect*	*szoots*
No.	30	30	30	10

Third, to examine if dual-membership suffixed words affect lexical processing, we randomly selected derived words embedding three dual-membership suffixes such as *-able, -ize, -ist*. Thirty class I derived words, 30 class II derived words, and 30 monomorphemic words were drawn. Additionally, 30 filler nonce words were created. In total, 120 tokens were elicited as seen in Table 3 below. All the tokens were matched in the number of syllables, i.e., two to four syllables.

TABLE 3
English Dual-Membership Affixed Word Stimuli

	Class I	Class II	Mono-morph	Noncewd
	-able, -ize, -ist	-able, -ize, -ist		
Ex.	*capable*	*debatable*	*harvest*	*subkuz*
No.	30	30	30	30

Table 4 presents statistical information of these three dual-membership affixes such as number of suffix types, number of tokens, tokens per million, and category-conditioned productivity of each suffix (Sims & Parker, 2015, pp. 178-179).

TABLE 4
Statistical-Distributional Properties of the English Dual-Membership Affixes

Suffix	No. of types	No. of tokens	Tokens per million	Category-conditioned productivity
-able	245	18,744	1047	0.0012
-ize	166	12,121	677	0.0004
-ist	294	13,287	742	0.0032

In sum, 340 stimuli tokens were used in three block LDTs and presented to the 36 KS, and the 30 ES in the visual LDTs. Thus, a total of 7,920 responses were obtained, from which 6,480 responses were analyzed for statistics (120 tokens × 66 subjects).

Procedures

LDTs were conducted in three blocks. Each participant was presented with prefixed word stimuli in block 1, then with suffixed complex word stimuli in block 2 and finally with dual-membership stimuli in block 3.

Both groups of study participants participated in the lexical processing task. The 36 KS were instructed to sit at a computer in a quiet phonetics room at Daegu University in Korea. As each stimulus appeared on the computer screen one by one, the subjects were told to judge whether the stimulus was a real English word or not. They were asked to press 1 if it is an English word and press 2 if it is not. They had to make responses as quickly and accurately as possible once they saw it and made the judgment. All the procedures, including the running and randomizing stimuli were performed through E-Prime Professional 2.0. RTs and accuracy were automatically obtained from the outset of the visual stimuli to the time when participants pressed the response key on the keyboard. An interval signal of a 2,000 ms pause was presented after they pressed the key. To familiarize the subjects with the procedure, 5 practice trials were

Vol. 16, No. 4, Winter 2019, 1182-1200

presented to each subject before the main task was initiated. The lexical decision experiment lasted approximately 20 minutes. The procedure for the ES was the same as for the KS. The experiments were carried out in a sound-attenuated booth in a phonetics room at Cornell University in the US.

RTs (ms) and accuracy (%) of responses were garnered through the E-Prime software and were analyzed within each group. Since identical stimuli were presented to each participant, all data were subject to a repeated-measures ANOVA with subject and word as random effects. We calculated the fixed effects with respect to four independent variables: (1) morphological complexity (Derived words vs. Monomorphemic words), (2) Affixation Type (Prefixed words vs. Suffixed words), (3) Affix class type (Class I affixed word vs. Class II affixed words), and (4) Individual Affixes. All the statistical analyses were performed through IBM SPSS 23. As all the analyses conducted in this study are a repeated-measures ANOVA, sphericity test was also performed to obtain the equal variance of the compared groups. Thus it is assumed that homoscedasticity evident from sphericity tests is observed to give validity to ANOVA in the analyses in the following sections.

Results

Processing of English Prefixed Words

All the ES showed accuracy above 81% and 34 out of the 36 KS exhibited an accuracy above 70% in LDTs for English prefixed words. To obtain the RT data, only correct responses were included, and responses ranging above 1000 ms were excluded as outliers.

Table 5 shows the mean accuracy (averaged across all responses) and RTs (computed over correct responses) for both speaker groups with the identical prefixed and simplex visual stimuli. For the KS, a one-way repeated-measures ANOVA analysis for the RTs showed that the 28 ms difference between prefixed and simplex word conditions proved significant ($F(1, 35) = 28.86$, $p < .05$), whereas the accuracy did not exhibit a significant difference between the two conditions ($F(1, 35) = .85$, $p > .05$). For the ES, simplex words elicited 42-ms-faster RTs than prefixed words ($F(1, 29) = 97.07$, $p < .05$) and their accuracy rates were 4% lower than those of prefixed words ($F(1, 29) = 70.22$, $p < .05$).

Overall, the results displayed consistent processing patterns with more rapid RTs for the simplex words compared to prefixed ones for both English L1 and Korean L2 speakers. These results indicate that prefixed words do not enjoy the processing benefits observed in some previous studies (Beyersmann, Ziegler, & Grainer, 2015; Stanners, Neiser, & Painton, 1979) and imply that prefixed words are accessed via prefix stripping and morphological computation rather than via holistic manner, supporting the dual-route models (Schreuder & Baayen, 1995; Taft & Forster, 1976).

TABLE 5
Mean Accuracy (%) and RTs (ms.) and Standard Deviations (SD) of the Korean and English Speakers for Prefixed and Simplex Words

		RT (SD)	Acc (SD)
KS	Prefixed words	623 (95)	82.2 (8.8)
	Simplex words	595 (93)	81.3 (6.6)
ES	Prefixed words	568 (96)	89.8 (3.1)
	Simplex words	527 (87)	85.3 (2.9)

Furthermore, as illustrated in Table 5, the ES responded to prefixed words significantly faster and more accurately than the KS (for the RTs, $F(1, 29) = 5.34$, $p < .05$; for the accuracy rates, $F(1, 29) = 17.78$, $p < .05$). The same trend was observed for simplex words (for the RTs, $F(1, 29) = 7.82$, $p < .05$; for the accuracy rates, $F(1, 29) = 6.56$, $p < .05$). These results suggest that overall processing capacity characterized by speed and accuracy was lower for the KS than for the ES.

Table 6 illustrates the mean RTs and accuracy rates by morphological class and speaker group. First, the mean response latencies for class I prefixed words were significantly faster than those for class II counterparts for the ES. High accuracy rates for both conditions corroborate the validity of the processing data. Additionally, class I prefixed words led to faster RTs and lower error rates than class II counterparts for the KS as well.

This finding suggests that class II prefixed words are more likely to be decomposed into the base and class II affixes than class I prefixed words or simplex words when it comes to visual word processing in English. This accrues additional supportive evidence for dual-route models for class I and class II affixed words (Laudanna & Burani, 1995). Furthermore, the present study implies that even Korean L2 English speakers' processing strategy for L2 complex words matures along the developmental path of their target language speakers.

TABLE 6
Mean RTs (ms.) and Accuracy Rates by Morphological Class and Speaker Group (Brackets Show Standard Deviations)

Spkrs	M class	Class I	Class II	F & p-values
ES	RT	543 (97)	587 (93)	$F(1, 29) = 59.12$, $p < .05$
	Acc	89 (1.5)	90 (5.6)	$F(1, 29) = .61$, $p > .05$
KS	RT	599 (97)	647 (96)	$F(1, 35) = 47.34$, $p < .05$
	Acc	84 (6.9)	81 (1.25)	$F(1, 35) = 4.15$, $p < .05$

To examine whether the processing of derived words is affected by a prefix within the identical affixal class and to testify to the affixal salience hypothesis, the RTs and accuracy rates were analyzed. Table 7 shows the mean RTs and accuracy rates by each affix and speaker groups. First, interestingly, the effect of affixal salience emerged in the processing of class I prefixes for ES ($F(2, 58) = 16.73$, $p <.05$). As shown in Table 7, the RTs were fastest for the prefix 'con-', followed by 'pre-' and 'in-'. Post-hoc LSD test revealed that the differences among all three conditions were significant ('con-' vs. 'pre-', $p < .05$; 'pre-' vs. 'in-', $p < .05$; 'in-' vs. 'con-', $p < .05$). Similar effects of the affix type were observed for the processing of class II prefixed words ($F(2, 58) = 49.71$, $p < .05$). The RTs were faster in the order of *un >> non >> semi*. The differences among the three conditions were all significant ('un-' vs. 'non-', $p < .05$; 'non-' vs. 'semi-', $p < .05$; 'semi-' vs. 'un-', $p < .05$). With regard to the accuracy rates for prefixed words, significant differences were obtained ($F(2, 58) = 757.86$, $p < .05$). Class II prefixed words were also processed with significantly different accuracy rates ($F(2, 58) = 9.60$, $p < .05$). These intriguing results seem to confirm Plag and Baayen's (2009) hierarchy of English affixes in terms of affix salience, which might be manifested in the form of affix ordering.

TABLE 7
Mean RTs (ms.) and Accuracy Rates by Individual Prefix and Suffix and Speaker Group (Brackets Show Standard Deviations)

Spkr		class I			class II		
		in-	con-	pre-	un-	non-	semi-
ES	RT	573 (104)	522 (103)	535 (97)	531 (99)	588 (100)	656 (88)
	Acc	99 (2.5)	70 (2.6)	99 (4.0)	90 (0)	94 (7.2)	86 (11.8)
KS	RT	636 (99.3)	555 (99.5)	595 (106.6)	581 (84.4)	672 (103)	679 (119)
	Acc	88 (12.7)	69 (3.6)	94 (9.3)	88 (7.8)	84 (16.2)	69 (23.2)

What is interesting here is that 'in-' prefixed words were processed with slower lexical latencies than 'un-' prefixed one unlike the expectation and previous finding. The interpretation of this case needs further investigation with a larger amount of data and leads to suggestion that the salience of individual affixes might involve complex factors such as grammatical classification, individual speakers, etc.

Turning to the KS, the RTs exhibited significant differences in the processing of class I prefixed words in accordance with each affix ($F(2, 68) = 29.65$, $p < .05$). The RTs were fastest for the words with the prefix 'con-', followed by the words with the prefix 'pre-' and the prefix 'in-'. The affix within class I also affected the accuracy rates ($F(2, 70) = 107.54$, $p < .05$). Furthermore, derived words with the class II prefix 'un-' enjoyed a relative processing advantage over those with class I prefixes 'non-, semi-' ($F(2, 64) = 33.35$, $p < .05$). Their accuracy rates also differed according to each class II prefix ($F(2, 70) = 18.68$, $p < .05$). Like the differences observed in the ES, the KS showed different processing efficiency in both class I and class II prefixed words. These results indicate that KS possess different processing capacity for derived words depending on the individual affix type.

Overall, the RTs of the KS were relatively shorter and their accuracy rates were lower than those in ES. There were statistically significant differences in the RTs for all the prefix conditions between KS and ES except for the 'con-' and 'semi-' prefixed words. This finding suggests that KS speakers' processing efficiency is lower than that of ES.

Combining the ES and KS results suggest that prefixed words did not benefit from processing efficiency over simplex words. However, class I prefixed words exhibited processing advantages over their class II counterparts, suggesting that the former are more likely to be accessed holistically than the latter.

Processing of English Suffixed Words

For the data of the ES, all the incorrect responses were removed for the RT analysis and the responses that elicited less than 1,000 ms were excluded, along with nonce word stimuli. Hence a total of 10.8 % were excluded for the RT analyses. Since all the subjects showed an accuracy of 94 %, the data for all the ES subjects were included. Additionally, data cleaning was also conducted for the RT analyses of Korean data. Incorrect responses, responses for nonce word stimuli, and outlier responses less than 1,000 ms of RTs were removed from the RT analyses, and 16.2% of the data were excluded for further RT analyses. All the KS yielded an accuracy above 82 % and corroborated the validity of the RT data.

Table 8 shows the mean RTs and accuracy rates for the LDTs for English suffixed and simplex words by KS and ES. Analyses revealed that suffixed words (derivational and inflected words) were responded to significantly more slowly than simplex words for KS ($F(1, 29) = 5.23$, $p < .05$). This processing efficiency was valid as evident from the high accuracy above 95% ($F(1, 29) = .89$, $p > .05$). This result suggests that suffixed words do not benefit from processing advantage over simplex words and that suffixed words are accessed via morphological decomposition with suffix stripping as prefixed words.

Such efficient processing patterns for simplex words over suffixed ones were also found for the RT data for ES ($F(1, 29) = 13.5$, $p < .05$). The accuracy rates of 99% exhibited the ceiling effect for ES as expected ($F(1, 29) = 1.66$, $p > .05$). This finding indicates that like prefixed words, suffixed words are likely to be accessed via morphological computation rather than holistically, compared to simplex words.

TABLE 8
Mean Accuracy (%) and RTs (ms.) and Standard Deviations (SD) of the Korean and English Speakers for Suffixed and Simplex Words

		RT (SD)	Acc (SD)
KS	Suffixed words	556 (141)	96 (6.2)
	Simplex words	541 (129)	95 (5.8)
ES	Suffixed words	500 (117)	99 (0.9)
	Simplex words	485 (106)	99 (1.7)

Furthermore, the effect of subject group also emerged, showing that suffixed words were processed with faster RTs and higher accuracy for ES than for KS (RT, $F(1, 29) = 3.84$, $p = .06$; Acc., $F(1, 29) = 7.95$, p

< .05). Simplex words were responded to more rapidly and accurately for the former than for the latter (RT, $F(1, 29) = 4.97$, $p < .05$; Acc., $F(1, 29) = 17.8$, $p < .05$). Overall, this finding can be interpreted to suggest that ES's processing capacity is higher for suffixed words than for KS just like their processing advantages for prefixed words.

To examine whether the processing efficiency for suffixed words is affected by morphological or affix classes, further analyses were carried out. Mean RTs and accuracy rates in ES and KS are summarized in Table 9. The results showed that affix class did not yield significant differences in the RTs and accuracy rates for the processing of suffixed words in ES (RT, $F(2, 58) = 1.98$, $p > .05$; Acc., $F(2, 58) = 2.43$, $p > .05$). Similar patterns were obtained for KS, indicating that the effect of affix class was not significant (RT, $F(2, 58) = 1.53$, $p > .05$; Acc., $F(2, 58) = 3.30$, $p >.05$). These findings are intriguing in that the dichotomy in the processing efficiency does not hold for processing suffixed words unlike the prefixed words found in the present study. To be specific, there were no differences between class I and class II suffixes and between derivational and inflectional suffixed words (RT, $F(1, 29) = 2.7$, $p > .05$; Acc. $F(1, 29) = 0.0$, $p > .05$). This implies that dual-route processing models are incapable of offering a suitable mechanism for the similar processing costs.

TABLE 9
Mean RTs (ms.) and Accuracy Rates by Morphological Class and Speaker Group (Brackets Show Standard Deviations)

Spkrs	M class	Class I	Class II	inflection
ES	RT	505 (122)	503 (123)	493 (110)
	Acc	99 (0.7)	99 (2.3)	99 (1.5)
KS	RT	556 (142)	561 (148)	549 (136)
	Acc	97 (5.3)	95 (8.2)	96 (5.7)

To determine if the effect of affix salience emerges by individual suffixes, further analyses were performed. The mean RTs and accuracy rates by speaker group and individual affix type are summarized in Table 10. A one-way repeated-measures ANOVA of the RT data in ES revealed statistically significant differences among affixal types within class 1 suffixed word condition ($F(1, 29) = 8.14$, $p = .008$) and within inflectional word condition ($F(1, 29) = 5.92$, $p < .05$). No significant difference, however, was found for class II derivational suffixed words ($F(2, 58) = 1.54$, $p > .05$). These RT data were validated by comparatively high accuracy rates above 98% for all the affixal type conditions in ES. No significant differences were observed for accuracy rates (all three affixal types, $p > .05$).

TABLE 10
Mean RTs (ms.) and Accuracy Rates by Individual Suffix and Speaker Group (Brackets Show Standard Deviations)

		class I derv.		class II derv.			Infl	
		ity	tion	able	ness	less	ed	ing
ES	RT	494(121)	517(129)	493(137)	509(128)	505(116)	485(111)	501(111)
	Acc	100	99 (1.7)	99 (1.8)	99 (1.8)	98 (5.5)	99 (2.1)	99 (1.7)
KS	RT	550 (141)	562 (146)	568 (146)	548 149)	564 (165)	550 (141)	548 (134)
	Acc	96 (7.5)	98 (4.6)	95 (8.9)	96 (8.5)	93 (12.4)	95 (7.5)	96 (5.4)

As illustrated in Table 10 above, analyses of the RT data in KS did not reveal any significant differences among individual suffix types within class I derivational condition ($F(1, 29) = 2.04$, $p > .05$), within class II derivational condition ($F(2, 58) = 2.04$, $p > .05$) or within inflectional condition ($F(1, 29) = 0.04$, $p > .05$). Overall, these results seem to suggest that the frequency of suffixed words mediates complex word processing for both NSE and KS. Additionally, inflectional suffixed words might benefit from processing advantages over derivational suffixed ones for both speaker groups, supporting the dual-route processing models via frequency.

In summary, like prefixed words, suffixed words suffered more processing burden than simplex words for both ES and KS. Moreover, dichotomy in processing efficiency was not observed between class I and II suffixed words or between derivational suffixed words and inflectional words unlike the results found for prefixed words. Furthermore, processing efficiency differed among individual suffixed word type within class I or inflectional words unlike the case of prefixed words. Lastly, the frequency of suffixed words mediated the word processing, which is consistent with the findings obtained in previous studies (Burani & Thornton, 2003; Kuperman, Bertram, & Baayen, 2010).

Processing of English Derived Words with Dual-Membership Affixes

We examined whether the processing of derivational words is affected by dual membership of the embedded affixes. Table 11 exhibits mean RTs and accuracy rates by single or dual membership affixed words. The results showed that for ES, words with affixes of dual membership elicited faster RTs than prefixed words but slower RTs than suffixed words. These differences were marginally significant ($F(2, 58) = 3.06$, $p = .05$), but post-hoc LSD test revealed a significant difference only between prefixed and suffixed words ($p < .05$). Words with dual membership affixes did not lead to significantly faster RTs than those with single membership affixes ($F(1, 29) = .97$, $p > .05$). This finding indicates that the former do not suffer from a heavier cost of processing than the latter because of the duality of the affixes contained in the derived words for ES.

Interestingly, the analyses of the RTs in KS revealed that words with dual-membership affixed words led to slower response latencies than those complex words with single-membership affixes as illustrated in Table 13 below ($F(2, 58) = 6.47$, $p < .05$). Post-hoc LSD test also confirmed this result ($p < .05$). Accuracy rates were also affected by the single- or dual-membership of affixes in KS. This finding suggests that KS suffered from processing of words with dual-membership affixes more than those with single-membership affixes. It is also implied that morphological decomposition or computation is involved in the processing of derived words with dual-membership affixes.

TABLE 11
Mean RTs (ms.) and Accuracy (%) and Standard Deviations (SD) in ES and KS for Dual-Affixed, Prefixed and Suffixed Words

		RT (SD)	Acc (SD)
ES	Dual-affixed words	557 (112)	91 (2.4)
	Prefixed words	568 (97)	90 (3.1)
	Suffixed words	504 (122)	99 (1.4)
KS	Dual-affixed words	662 (96)	83 (7.6)
	Prefixed words	615 (95)	83 (8.5)
	Suffixed words	556 (141)	96 (6.4)

Analyses were conducted to explore whether the processing of derived words is affected by various factors such as affix type and morphological class type. Table 12 shows mean RTs and accuracy rates by each affix type and morphological class in ES. First, words with dual-membership affixes were processed with longer RTs than morphologically simplex words ($F(1, 29) = 55.33$, $p < .05$, 557 ms vs. 516 ms). This suggests that the former are processed via affix stripping or morphological decomposition, which supports dual-route models. Second, derived words with prefixes 're-, sub-, de-' resulted in 12-ms-faster RTs than those with suffixes '-able, -ize, -ist' ($F(1, 29) = 4.48$, $p < .05$, 551 ms vs. 563 ms). This finding implies that prefixed words benefit from processing efficiency whereas suffixed counterparts suffer from the heavy burden of processing. Third, what is more intriguing is that words with class I affixes (e.g., *capable*) were responded to more rapidly than those with class II affixes (e.g., *debatable*) due to their relative processing advantages ($F(1, 29) = 7.89$, $p < .05$, 550 ms vs. 564 ms). This is evident from analysis results revealing a main effect of affix type ($F(5, 145) = 3.14$, $p < .05$), a main effect of morphological class ($F(1, 29) = 7.39$, $p < .05$) and a marginally significant interaction between these two ($F(5, 145) = 2.25$, $p < .05$). It also provides additional supportive evidence for dual-route processing models.

A closer examination into the effect of class type within each affix, as seen in Table 12 below, the mean RTs were faster for class I affixed words (e.g., *denounce*) than for class II affixed counterparts (e.g., *decamp*) except for words with '-ize'. Such differences, however, were statistically not significant except for 'de-' prefixed words ($F(1, 29) = 5.78$, $p <.05$) and '-ist' suffixed words ($F(1, 29) = 6.04$, $p <.05$). This result indicates that native English speakers tend to process class I affixed words as whole units whereas class II affixed words are accessed via morphological computation, supporting dual-route models.

TABLE 12
Mean Accuracy (%) and RTs (ms.) by Affix Type in ES

Affix	MClass	Acc (%)	N	Mean RT	SD	SE
re-	1	78	113	531	148	13
	2	98	141	539	156	11
sub-	1	97	140	532	142	11
	2	98	142	549	148	11
de-	1	97	140	542	151	12
	2	93	132	571	155	12
-able	1	98	143	556	154	11
	2	99	144	575	142	11
-ize	1	63	91	562	146	14
	2	80	117	540	147	13
-ist	1	98	139	544	129	12
	2	97	138	566	141	12

Finally, we investigated whether the processing efficiency for derivational words with dual membership affixes is influenced by affix type and morphological class type in KS. The results are summarized in Table 13. Firstly, derivational words with dual-membership affixes produced slower RTs than simplex words (665 ms vs. 634 ms, $F(1, 35) = 25.99$, $p = .000$). This indicates that words with dual membership affixes, like those with single membership affixes, suffer from the processing cost more heavily than simplex words. Secondly, like ES, prefixed words were responded to more rapidly than suffixed ones ($F(1, 35) = 9.0$, $p < .05$, 653 ms vs. 674 ms). Thirdly, derivational words with class I affixes were processed with 37-ms-faster RTs than those with class II counterparts like ES ($F(1, 35) = 24.24$, $p < .05$, 646 ms vs. 683 ms). As for the ES, this result suggests that even the KS make a distinction between class I and II status for the words with the same dual-membership affixes. Closer examination revealed that the RTs were faster in the order of prefixed words with *re- >> sub- >> de-* ('re-' vs. 'sub-', $p < .05$; 'sub-' vs. 'de-', $p < .05$; 'de' vs. 're-', $p < .05$) and suffixed words with *-ize >> -able >> -ist* ('-ize' vs. '-able', $p < .05$; 'able-' vs. '-ist', $p < .05$; '-ist' vs. '-ize', $p < .05$). As illustrated in Table 13, the mean RTs were faster for words with class I affixes (e.g., *capable*) than for those with class II affixes (e.g., *dependable*) for each of the six affixes. However, the differences were significant only for the words attached to "-able" ($F(1, 33) = 29.40$, $p < .05$) and "re-" ($F(1, 34) = 5.67$, $p < .05$). Additionally, the differences were marginally significant for "-ist" suffixed words ($F(1, 31) = 0.39$, $p = .09$) and "de-" prefixed words ($F(1, 31) = 3.81$, $p = .06$). The differences were not significant for the "-ize" suffixed words and "sub-" prefixed words.

Vol. 16, No. 4, Winter 2019, 1182-1200

TABLE 13
Mean Accuracy (%) and RTs (ms.) by Affix Type in KS

Affix	MClass	Acc (%)	N	Mean RT	SD	SE
re-	1	78	125	601	105	19
	2	94	146	636	94	17
sub-	1	89	139	627	104	20
	2	84	113	637	111	20
de-	1	91	134	636	119	22
	2	82	107	677	110	20
-able	1	92	141	604	103	18
	2	94	132	673	118	21
-ize	1	62	90	630	104	19
	2	78	112	644	92	17
-ist	1	84	122	671	105	23
	2	88	115	692	123	22

In sum, the ES did not suffer from a higher cost of processing of derivational words with dual membership affixes compared to simplex words, whereas KS did. This lack of a processing cost for the simplex words for ES may stem from more robust lexical status in the representation of mental lexicon. In contrast, KS seemed to be contingent upon morphological decomposition via affix stripping during the processing of these words. More importantly both ES and KS made a significant distinction in the processing efficiency by processing class I affixed words more efficiently than class II affixed counterparts.

General Discussion

The present study addressed the following four questions regarding morphological processing by L2 and L1 speakers: whether L2 English speakers gain a processing benefit for polymorphemic derived words over morphologically simplex, i.e., monomorphemic words or suffer from processing cost due to morphological decomposition into stems and affixes; whether lexical decision making operates differently between prefixed and suffixed derivational words; whether the processing efficiency shows variation among words with individual affixes belonging to the identical morphological classes; whether the confusability due to dual membership of certain affixes hampers or facilitates the processing of affixed words.

The present study results indicate that both English L1 and Korean EFL speakers suffer from the processing of prefixed or suffixed derivational words, compared to that of morphologically simplex words. These results are not consistent with the findings in favor of a holistic processing of complex words (Bertram et al., 2000; Burani & Thornton, 2003; Sereno & Jongman, 1997). Rather, they accrue additional supportive evidence for morphological decomposition models (Joanisse & Seidenberg, 1999; Elman et al., 1996). At the present, however, it is not clear whether such affix stripping operates obligatorily as claimed by Taft (2004) and Fiorentino and Poeppel (2007). In either case, faster RTs for simplex words than for derived words seem to support dual-route processing models between these types of word. A potential account of this division is that the former are stored, represented and accessed as full forms whereas the latter undergo morphological decomposition into stems and affixes, and thus suffer the cost of processing. This might offer further evidence for the division between storage and computation in morphological processing.

Although the RTs were substantially faster for the ES than for the KS, their similar processing patterns suggest that L2 learners might be in a developmental stage toward the organization of L2 lexicon in regard to the dichotomy of simplex and complex words. Given the previous finding that inflectional

Vol. 16, No. 4, Winter 2019, 1182-1200

suffixed words also suffer from heavier processing costs, it might be common that speakers take the decompositional processing route for morphologically complex words (Allegre & Gordon, 1999; Niemi, Laine, & Tuominen, 1994; Ullman, Corkin, Coppola, Hickok, Growdon, Koroshetz, & Pinker, 1997).

We observed that both a prefix and a suffix might serve as a potential unit for morphological processing (Laudanna, Burani, & Cermele, 1994; Laudanna & Burani, 1995). As reported previously, the results reveal a difference in processing cost between prefixed and suffixed words. We found that processing times were faster for English suffixed words than for prefixed words in both ES and KS, given that the lengths of prefix and suffixed are matched. Also differences in RT for ES between class I and class II affixed words were not significant. This suggests that the asymmetry in RT comes from more salient status of prefixes over suffixes. This finding is also in line with previous findings (Taft, 1979). Specifically, derived words with class I prefixes such as *in-*, *con-*, and *pre-* gave rise to slower RTs than those with class I suffixes such as *-ity* and *-tion*, especially for the ES (See Table 10). The difference was 68 ms for ES and 57 ms for KS. This processing difference might suggest that English prefixes have greater affixal salience than suffixes and that affixal stripping is more likely to operate in the processing of prefixed words than in that of suffixed words. Stanners, Neiser and Painton (1979) suggested that class II prefixed words access both the representation of the whole word (e.g., *untrue*) and the representation of the stem (e.g., *true*), whereas class I prefixed words activate the whole word representation (e.g., *progress*) and the words that share the same stem (e.g., *regress, ingress*). Kim, Wang and Taft's (2015) study showed that Korean suffixed words might undergo morphological decomposition prelexically whereas Korean prefixed words are supralexcially processed via morphological decomposition only when whole words are accessed for Korean L1 speakers. However, while Kim et al.'s (2015) study conducted the masked priming LDT with real and nonce words, the current study used only the lexical decision method solely with real words. For this reason, it does not suffice to interpret the present study results to mean that English prefixed words are accessed supralexically whereas suffixed words are processed prelexically. Rather, a potential explanation might be that the former are accessed via morphological decomposition whereas the latter are recognized as whole units prelexically, supporting dual-route models.

The finding reported herein is consistent with one previous study that showed that lighter constraints are imposed on English prefixes through selectional restrictions than suffixes (Zirkel, 2010). The present study contributes to the processing field by revealing that L2 learners are also equipped with a similar processing capacity involving this imbalance between prefixed and suffixed words.

As reported previously, class I prefixed derived words were processed faster than class II prefixed ones for both ES and KS. However, there were no significant differences in lexical decision times between class I suffixed and class II suffixed words for both ES and KS. This seems to contradict Vannest and Boland's (1999) claim that words with class II suffixes such as *–less* are processed via morphological decomposition whereas those with class I suffixes such as *–ity* or *–tion* are accessed as full forms. This also opposes the 'complexity-based ordering' hypothesis that proposes that class II affixes are more likely to be parsed from their bases than class I affixes (Hay, 2003; Hay & Plag, 2004; Plag & Baayen, 2009). More precisely, the present study results suggest that this hypothesis seems to hold true only for prefixed derivational words.

Our study testified to the 'Complexity-Based Ordering' hypothesis with words with different affixes that belong to the same morphological class. Interestingly, we found that processing of derived words varies according to the individual affixes they include. This finding is in line with recent processing studies, supporting their suggestion that processing load is a potential factor determining the (im)possible combinations of affix ordering (Hay & Plag, 2004; Plag & Baayen, 2009; Zirkel, 2010). To be specific, the results of the present study showed that lexical decision times were faster in the order of *con-* > *pre-* > *in-* for class I prefixed words and in the order of *un-* > *non-* > *semi-* for class II counterparts for both ES and KS. Under the hypothesis above, these findings can be interpreted to suggest that affixes such as *in-* or *semi-* have stronger affixal salience than *con-* or *un-* and that the former are more likely to be parsed or stripped from the base than the latter. Another interesting prediction is that words with the combination of ‘in-con-Base’ are more likely to be admissible than those of ‘con-in-Base’ because the latter are more difficult to process than the former according to Hay (2002, 2003).

For suffixed words as well, affixal salience turned out to be different in class I suffixed words (*-tion* > *-ity*) and inflectional words (*-ing* > *-ed*) in ES. However, no differences were found for class II suffixed words (*-able~-ness~-less*). Compared to previous findings that class II affixed words suffer the processing of affix stripping unlike class I counterparts (Prasada & Pinker, 1993; Vannest, Polk, & Lewis, 2005), this result is novel. However, it is currently not clear what factors contribute to the asymmetry in the presence of variation of processing efficiency according to lexical strata. It might be the case that the frequency or productivity of each affix is involved in the inter-affix variation, but this issue is left for future investigation. Additionally, no differences in affixal salience were found among suffixed words for KS. Plag and Baayen (2009) discuss the issue of the ordering of *-less* and *-ness* in more detail. In a search of the webpage corpus, they found that many derivational words with *-ness-less* are attested (e.g., *happinessless, consciousnessless, businessless, sadnessless,* etc.). Nevertheless, it remains problematic that in spite of the relatively weaker parsability (or salience) of the suffix *-less* over *-ness*, derivational words with *-less-ness* are more common. However, the present study results may explain this by showing similar processing times between *-less* and *-ness* derived words.

Overall, the present study results seem to indicate that affixal salience tends to emerge and take effect in the processing of prefixed words rather than of suffixed words. This finding is also novel in that Zirkel (2010) focuses on the hierarchy of prefixes and Plag and Baayen (2009) reveal the affixal salience of suffixes.

Finally, the present study investigated one of the factors affecting affixal salience: homophony or confusability of affixes. The presence of such affixes in complex words is expected to inhibit LDT and give rise to slower response latencies. However, for ES, words with dual membership affixes such as *re-*, *sub-*, *de-*, *-able*, *-ize*, and *-ist* were processed more rapidly than prefixed words but more slowly than suffixed words with single membership affixes, which indicates the action of the inhibition effect, compared to suffixed words. In contrast, the KS suffered from the processing of words with dual membership affixes. One account is that they might have been confused with the membership of the relevant affixes and this accrued additional processing burden. Alternative explanation is that they might not be possessed with implicit knowledge of the dual-membership affixes, inhibiting the whole-word processing of class I suffixed words. Overall, these findings suggest that confusability of affixes of dual membership tend to hamper or delay the processing of the derived words that include them. Our study results offer additional supporting evidence for the effect of homophony of affixes (Andrews & Davis, 1999; Hay & Baayen, 2003; Järvikivi et al, 2006).

Conclusion

The present study has attempted to gain a more comprehensive understanding of the processing mechanism by which Korean EFL learners and English L1 speakers access morphologically complex derivational words in comparison to simplex words. The study results support the following four conclusions: English derivational words, unlike simplex words, are retrieved via affix stripping or morphological decomposition into stems and affixes; prefixes are more likely to be parsed from the bases than suffixes, and thus exhibit greater affix salience; derivational words tend to vary in their processing efficiency according to the affixes they include, except for class II affixes with the ES and for suffixes with the KS even though the affixes belong to identical morphological classes in view of the traditional distinction proposed in lexical morphology for both Korean EFL learners and English L1 speakers; and the homophony of affixes with dual membership is a barrier for processing the derivational words that include them, especially for Korean L2 speakers.

The current study has explored major issues regarding morphological processing and makes a significant contribution to our knowledge of L2 processing. Despite the robustness of the data, the range of derivatives in English, the number of prefixes and suffixes, and the levels of L2 proficiency still need to be investigated further. In particular, it might be interesting to investigate whether these study results for EFL learners also hold for possible or impossible combinations of affixes with calculation of the affix salience.

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Vol. 16, No. 4, Winter 2019, 1182-1200

Appendix

Class I Prefixed Words

inadequate, incomplete, incredible, intact, inaccurate, inadvertent, irrelevant, illegal, informal, inept, confer, conscious, contempt, confess, constraint, convey, conform, confront, confine, conduct, prejudice, preliminary, prescribe, presume, pretend, prevail, predict, prefer, preserve, precede

Class II Prefixed Words

unaware, uncertain, unconscious, unfair, unhappy, unlike, unnecessary, unpleasant, unusual, unknown, nonsense, nonstop, nonchalant, nonprofit, nonlocal, nonmember, nonviolence, nonfiction, nonhuman, nonnative, semicircle, semicolon, semitruck, semifinal, semiliterate, semirigid, semisolid, semipro, semitone, semiannual

Class I Suffixed Words

divinity, curiosity, complexity, ability, formality, validity, minority, stability, brutality, nobility, morality, fatality, vitality, humidity, mobility, adaptation, temptation, observation, admiration, combination, computation, orientation, revelation, relaxation, inspiration, consultation, explanation, provocation, expectation, imagination

Class II Suffixed Words

regrettable, profitable, comfortable, advisable, desirable, predictable, enjoyable, accountable, fashionable, remarkable, fitness, emptiness, weakness, baldness, bitterness, calmness, freshness, gentleness, greenness, sickness, meaningless, dreamless, merciless, heedless, stainless, noiseless, priceless, countless, speechless, breathless

Inflectional Words

buttoned, branched, perplexed, slipped, advanced, worried, dilated, bottled, painted, withered, scorched, handled, touched, frosted, collected, grinding, twinkling, kissing, glimmering, stamping, settling, catching, blooming, flashing, doubling, sparkling, scattering, steering, switching, yielding

Dual-Membership Affixed Words

capable, probable, mutable, tolerable, affable, debatable, dependable, noticeable, perishable, manageable, minimize, recognize, hypothesize, mesmerize, exorcize, generalize, modernize, centralize, naturalize, publicize, feminist, optimist, pessimist, populist, antagonist, anarchist, modernist, generalist, naturalist, monarchist, rebel, refute, refrain, relieve, recede, recycle, repaint, rewrite, rebuild, renew, submit, subside, substitute, subdue, subscribe, subtitle, subclass, subfield, subplot, subset, denounce, descend, despair, deride, deprive, decrown, defocus, deforest, devalue, decamp