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Effects of the Stress Cues on English Word Recognition by Korean Learners of English

강세 단서가 한국인 영어 학습자의 영어 단어 인지에 미치는 영향

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조 미 리

Effects of the Stress Cues on English Word Recognition by Korean Learners of English

by

Miri Jo

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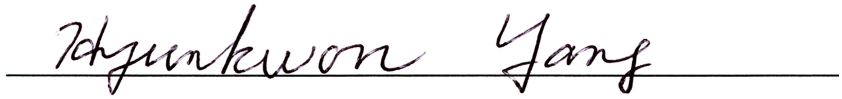

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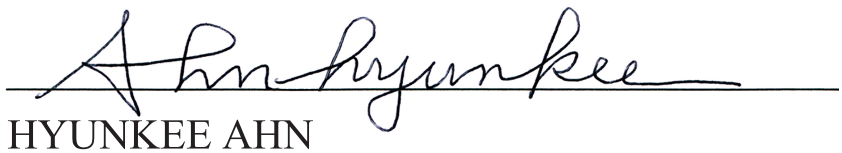

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ABSTRACT

This study investigates the effects of the stress pattern (trochaic vs. iambic) on English word recognition by Korean learners of English. Speech segmentation, more specifically word recognition, has been known to be affected by the language-specific cues. In the present study, stress is of main concern as a word recognition cue because English and Korean have different prosodic characteristics in terms of stress. While stress has a contrastive function and seems to constrain lexical access in English, Korean is known to have no stress system on the word level and little has been studied about its role in Korean word recognition. As a result, three research questions were proposed as follows: (a) can Korean learners of English use an initial-stressed syllable of a word as a cue in word recognition of an English connected speech?; (b) are there any differences in the performance by Korean learners of English at different proficiency levels?; (c) is there any interaction between the stress pattern and the other factors including the syllable count and the word class?

In order to answer these questions, the word spotting task was conducted with a total of 42 university students, who were born and raised in Seoul or Gyeonggi-do province. They were divided into two groups, the advanced and the intermediate-low group. The participants were asked to detect a real English word from a stream of nonsense syllables. To examine the effects of the stress pattern and its interaction with the other factors including syllable count and word class, the materials used in the task were carefully selected, including disyllabic and

trisyllabic nouns or verbs. The task was followed by a word knowledge test containing the list of the target words in order to confirm that they target words were highly familiar to the participants.

The findings of the study suggest that the Korean learners did not seem to use the trochaic pattern to set a word boundary. They responded faster and more accurately to the target words with the iambic stress pattern. Furthermore, there was no difference between the groups, suggesting that the L2 prosodic cues like stress are hard to be acquired. The other factors of concern in the present study such as syllable count and word class did not show any interaction with the stress pattern. In conclusion, Korean learners of English do not seem to use the frequent distributional stress cue in English when recognizing a word from a sequence of nonsense syllables. These findings not only provide some understanding on the speech segmentation by Korean L2 listeners, but also shed light on the significance and necessity of the instruction on stress in teaching English listening.

Key Words: English word recognition, Speech segmentation, Segmentation Cues, Prosody, Stress pattern in English

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1.
INTRODUCTION

The present study aims to investigate the effects of an initially stressed word as a cue in word recognition from an English connected speech by Korean learners of English. This chapter introduces the purpose and necessity of the study. Section 1.1 explains the purpose of the study, and Section 1.2 states the research questions. Finally, Section 1.3 outlines the organization of the thesis.

1.1. Purpose of the Study

Reception is a prerequisite for production. If one cannot understand what other people say, they cannot speak. In order to make language learners communicate in the target language, they should be instructed listening first. Therefore, the role of listening and its importance should not be ignored along with speaking skills in language learning. However, when it comes to listening, it seems to be quite disregarded in the English classrooms in Korea. Furthermore, the instructional forms of English classes are rather weighted toward listening comprehension checks or listening strategies. The typical English listening class usually consists of solving the listening comprehension questions which are similar to the national College Scholastic Ability Test (CSAT), paying little attention to how listeners actually perceive the speech.

Field (2010) proposed that listening includes two processes: decoding of the speech signals and meaning building. Decoding is defined as the segmentation of continuous sound signals into syllables, words, clauses or meaningful units, while meaning building means restoration and expansion of what has been said with the coming speech signals. He claimed that although these two processes are closely related, they should be treated differently in the course of teaching and learning a language because of their distinct characteristics. For the native listeners, decoding happens automatically so that they can make use most of their efforts to understand the speech in the meaning building phase, but language learners depend more on the lexical knowledge because of their lack of decoding ability or skills of the target language. Therefore, he suggested that it might be more efficient to train the language learners about how to decode the speech in order to improve their listening ability.

The continuous nature of spoken speech adds importance on the decoding process. In order to understand spoken speech, listeners should segment the series of sounds into individual words because spoken speech is a chunk of continuous sounds without distinct word boundaries. Native listeners develop various segmentation strategies based on the experiences and understandings of their own language, and the language-specific strategies develop and are solidified at a very early age. This indicates that language learners might have difficulty in learning the target language when their mother tongue is substantially different from its counterpart.

Given the importance of the process of decoding a speech, a question

arises about which cues are efficient for speech segmentation. There have been a plethora of researches on what specific segmental information listeners use to segment a speech, but little has been discovered about the role of suprasegmental factors in speech segmentation. Some studies have suggested that suprasegmental features function as a powerful cue than segmental features in word recognition (Anderson-Hsieh, Johnson and Marslen-Wilson, 1987; Field, 2003, 2005; McQueen, 2005). Considering that Korean has a different prosodic system from that of English, Korean learners of English may apply their own distinctive prosodic strategy to L2 speech segmentation when listening to English speech, which may result in difficulty in segmentation. (Cutler & Butterfield, 1992; Cutler & Carter 1987; Cutler & Clifton, 1984; Cutler & Norris, 1988; Grosjean & Gee, 1987; McQueen, Norris & Cutler, 1994; Norris, McQueen & Cutler, 1995).

Specifically, native English speakers have tendency to use the Metrical Segmentation Strategy (MSS), under which they perceive an initially stressed syllable as a beginning of a word, while the Korean language is known to have no distinctive stress system. Therefore, it can be expected that Korean learners of English may not use or use the segmentation less efficiently than native English speakers (Jun 1993, 1998, 2005; Kim 2004; Kim & Cho 2009; Kim & Nam, 2011, 2013). In consequence, the present study intends to investigate the role of stress in word recognition from an English speech and how Korean learners of English use this cue when they segment a continuous speech into meaningful units.

1.2. Research Questions

The present study aims to examine the effects of an initially stressed word as a word recognition cue in English speech by Korean learners of English. In addition, it also investigates whether there are any interactional effects between stress pattern and proficiency level or stress pattern and other factors including syllable count and word class. In order to investigate those issues, this study addresses the following research questions:

(1) Can Korean learners of English perceive an initially stressed syllable of a word as a cue in word recognition in connected speech in English?

(2) Are there any differences in performance across proficiency levels among Korean learners of English?

(3) Is there any interaction between stress pattern and other factors including syllable count and word class?

1.3. Organization of the Thesis

The present thesis consists of five chapters. Chapter 1 introduces the purpose of the research and proposes the research questions. Chapter 2 explicates the theoretical and experimental studies of the word recognition in speech perception. Chapter 3 describes methodology adopted in this study and data collection procedure. Chapter 4 reports the results of the experiments and discusses the findings. Finally, Chapter 5 recapitulates the major findings and suggests some limitations and implications for further studies.

CHAPTER 2.
LITERATURE REVIEW

This chapter provides an overview of the previous researches on word recognition, or speech segmentation, and the role of prosody as a segmentation cue regarding the research questions introduced in the previous chapter. Section 2.1 explains the importance of word recognition in speech perception process. Section 2.2 introduces various cues for the speech segmentation. In Section 2.3, lexical stress is mainly discussed as one of the useful prosodic segmentation cues in English. Lastly, Section 2.4 provides cross-linguistic differences in stress perception and its use in word recognition, especially focusing on Korean.

2.1. Word Recognition in Speech Perception

A spoken speech is a continuous stream of sound. It does not contain any salient markings of word boundaries, which can be found in written language such as spaces or commas. In order to understand utterance, one should be able to extract a possible word from the running speech, matching the auditory information to the already stored lexical knowledge. This spoken word recognition process seems to be effortless and rather unconscious, or even trivial. However, it involves complicated decoding issues such as co-articulation or invariant speech sounds because of the continuity of spoken speech (McQueen,

2005).

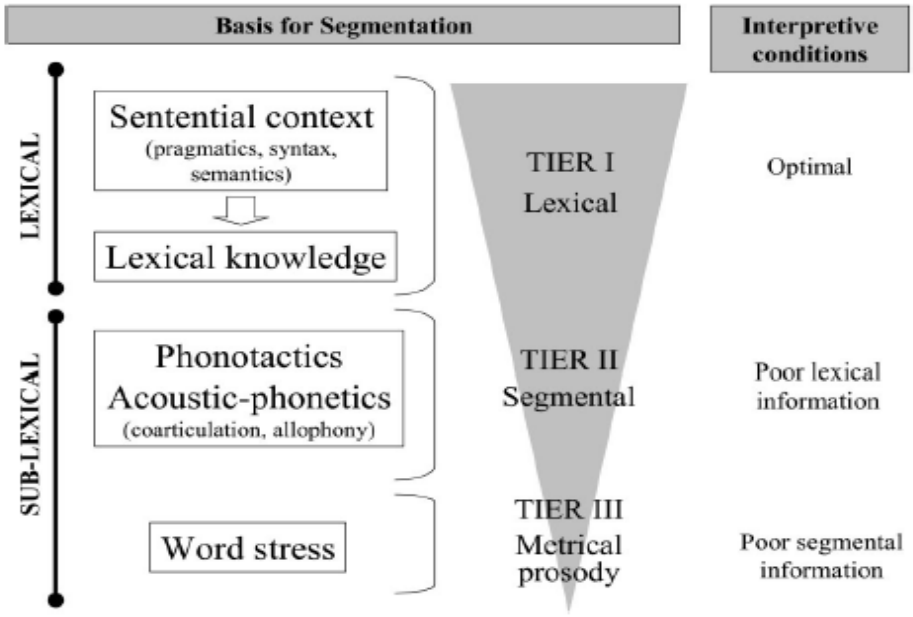
Listeners seem to solve these decoding problems by exploiting the available cues signaling a likely word boundary. A large body of researches on spoken word recognition or speech segmentation have tried to discover what specific kind of information serves as a reliable cue for listeners (Cutler & Norris, 1988; Cutler & Otake, 1994; Davis, Marslen-Wilson, & Gaskell, 2002; Gow & Gordon, 1995; Mattys, White and Melhonr, 2005; McQueen 1998, 2005; Norris, McQueen, & Cutler, 1995; Sebastian-Galles, Dupoux, Segui, & Mehler, 2001). The traditional view on speech segmentation divides the cues into two categories: pre-lexical and lexical representations (Gow & Gorden, 1995). From the pre-lexical perspective, speech segmentation is facilitated with the help of pre-lexical cues including phonetic features, possible word constraint, or metrical stress. On the other hand, lexical-driven segmentation posits that a lexical item is the only solution accounting for the lexical fragments, which aids listeners to parse a string of sounds into a discrete word. It regards the pre-lexical cues as a by-product of lexical segmentation.

However, a lexical-driven segmentation model has some limitations to fully explain the process of speech segmentation. First, word knowledge sometimes cannot solve the ambiguity among the possible interpretations of spoken speech. For example, the phonetically different expressions produced in the same segmental sequence (e.g., *ice cream* and *I scream*) can activate multiple competitors which cannot be distinguished only by lexical knowledge. Also, listeners can locate a possible word boundary in a sequence of syllables even though the target word is not stored in their lexicon. Infants have been reported

to be able to detect the onset of a word more accurately when it corresponds to the phonotactic rule or prosodic unit of their mother tongue in the absence of word knowledge (Jusczyk et al., 1993; Jusczyk, Houston & Newsome, 1999; Mattys, Jusczyk, Luce, and Morgan, 1999).

Therefore, along with lexical knowledge, listeners should be able to make use of the pre-lexical cues for the successful speech segmentation. As a compromise, Mattys, White and Melhorn (2005) proposed the speech perception process with the hierarchal approach as presented in Figure 2.1.

Figure. 2.1.
Sketch of the Hierarchical Approach to Speech Segmentation



(Mattys, White and Melhorn, 2005, p. 488)

They suggested that the speech segmentation requires multiple information from various levels including syntax, semantics, pragmatics, phonetics and lexical knowledge, but the degree to which listeners pay their attention may vary according to the listening conditions. They claimed that even though lexical knowledge has a great contribution to speech perception, the fine-grained information including segmental and suprasegmental elements also plays a significant role and, therefore, requires a more thorough investigation.

Sources of pre-lexical information for speech segmentation are known to be language- specific (Cutler & Norris, 1988; Cutler et al., 1986; Cutler & Otake, 1994; Guion, 2005; McQueen, 1998; Otake et al, 1993, 1996; Pallier, Bosch, & Sebastián-Gallés, 1997; Sebastián-Gallés & Soto-Faraco, 1999; Tremblay, 2008; Tyler and Cutler, 2009; Vroomen et al., 1998). For example, the phoneme sequence of /kv/ is not allowed in English, while it is legitimate in German. It means that this phonotactic constraint may be used as a cue for locating a word by German listeners, while it is rather an irrelevant cue for English listeners (McQueen, 1998). Prosodic features such as stress or pitch movement also seem to be a powerful segmentation cue for listeners. Vroomen et al. (1998) suggested that English and Dutch listeners had a tendency to exploit their preference for word-initial stress in speech segmentation. Furthermore, listeners were found to use their own language-specific segmentation strategy even in the experiments using an artificial language. Tyler and Cutler (2009) conducted an experiment with English, French and Dutch listeners to investigate whether they used a pitch-movement cue when they heard a continuous speech of an artificial language. The results revealed that the cue was used differently across languages.

Dutch and English listeners drew greater attention to the prominence at the left-edge while French listeners benefited more from the pitch-movement cue on the right-edge. Considering that Dutch and English have a trochaic stress pattern while French has an iambic one, these findings indicate that speech input can be parsed differently based on listeners' linguistic backgrounds.

Native listeners seem to segment the speech with much ease and automatically while language learners appear to have difficulty in decoding a continuous speech of the target language. Several researches have demonstrated that L2 listeners' ability to use the strategies which are critical to L2 speech segmentation is dependent on their own native languages (Mattys, White & Melhorn, 2005; Weber & Cutler, 2006). Mattys, White and Melhorn (2005) found that language learners had a propensity to make use of the cues which they have attained from their mother tongue when listening to L2 speech. Weber and Cutler (2006) also suggested that even advanced German learners of English tended to apply their German phonotactic constraints to the segmentation of English speech.

Furthermore, the rhythmic structure of language has different contributions to the speech segmentation by L2 learners (Cutler et al., 1986, Otake et al., 1993, 1996, Cutler and Otake, 1994; McQueen, Otake & Cutler, 2001). For example, Japanese listeners, whose native language has a mora-based rhythmic structure, also applied their own specific prosodic feature to speech segmentation in English (Cutler and Otake, 1994).

As discussed above, word recognition is the very first and basic step for listening process and requires multiple levels of information. This process is

automatic for the native listeners while it can be very complex and difficult for language learners. This is because some of the cues are language-specific, which develop and are fixated at very early age. Therefore, it might be helpful for language learners to acquire the segmentation cues used in the target language to facilitate the speech perception process. In the next section, the reliable pre-lexical cues studied in the field of speech segmentation will be discussed more thoroughly.

2.2. Segmental and Suprasegmental Factors in Word Recognition

To parse a continuous stream of spoken words successfully, listeners appear to make use of various acoustic phonetic cues, which can be categorized into two major parts: segmental features and suprasegmental features. Segmental features have been of major concern of researchers in speech segmentation studies, regarded as a critical factor to decode spoken speech.

Phonemic awareness, or phoneme perception, is one of the important and useful segmental cues for both native and L2 listeners. In order to comprehend spoken speech, one should be able to recognize the fact that the words consist of phonemes and discern the different phonemes within the word. Therefore, it is important for language learners to develop the acoustic ability to differentiate foreign phonemes of the target language. However, once the native phoneme system develops and is fixated, language learners have tendency to concatenate

the phonemes of their mother tongue with those of the target language, which may prevent them from properly distinguishing the phonemes from the foreign spoken speech (Pallier, Bosch, & Sebastián-Gallés, 1997; Sebastián-Gallés & Soto-Faraco, 1999). An extended body of empirical researches on phoneme perception by second language learners have demonstrated that it is impossible for thelearners to achieve the native-like ability to perceive phonemes of the target language (Dehaene et al., 1997; Pallier, Colomé & Sebastián-Gallés, 2001).

Phonotactics is also known to be beneficial in segmenting a string of boundless sounds into discernable words. The regularity of possible arrangements of sounds enables listeners to predict what comes next to the given phonemes or even accelerates the lexical competition among the possible following phonemes. Also, some strings of phonemes that are never likely to appear within the same syllable serve as cues for possible word boundaries. (Brent, 1997; Brent & Cartwright, 1996; Cairns, Shillcock, Chater, & Levy, 1997; Mattys, Jusczyk, Luce, & Morgan, 1999; McQueen, 1998). From his experiment with native German listeners, McQueen (1998) showed that they performed better at locating a real word with faster response time and more accuracy when the target word was embedded in a sequence matching with their phonotactic boundary. Vitevitch and Luce (1999) also suggested the facilitative role of phonotactic rules in speech segmentation. In their study, the native English listeners recognized the experiment words with frequent phoneme arrangement faster than those with less frequent phonotactics, which proved its role in demarcating the word boundaries.

The ability to recognize the phonotactic rule specific to one’s native

language seems to be acquired and develop at very young age. Jusczyk, Friederici, Wessels and Syenkerud (1993) had an experiment with 9-month-old infants whose native languages were English and German. They were presented with non-words with the phoneme arrangements which are allowed in each language exclusively. The results showed that infants whose native language was English paid more attention to the sound sequences conforming to English phonotactics and German infants did so on those to the German phonotactics.

While a large body of studies have been focusing on figuring out which segmental features are more facilitative as a speech segmentation cue, little has been known about the role of suprasegmental factors such as intonation, duration and word stress, which are often collectively called prosody. Recently converging evidence has shown that prosody plays a significant role in speech perception (Anderson-Hsieh, Johnson and Marslen-Wilson, 1987; Cutler & Norris, 1988; Field, 2003, 2005; Marslen-Wilson, 1987; McQueen, 1998, 2005). Anderson-Hsieh, Johnson and Marslen-Wilson (1987) suggested that the segmental features which were pronounced in a wrong way had little influence on listeners' word recognition while suprasegmental played a great role. They found that native English listeners had more trouble in recognizing a word with wrongly assigned stress rather than a word with wrong phonemes such as *shigarette*. In addition, some researches have suggested that suprasegmental features seem to emerge sooner than segmental features in the course of language acquisition and override the phonotactic cues in speech segmentation (Friederici & Wessels, 1993; Jusczyk et al., 1993; Jusczyk, Houston & Newsome, 1999; Mattys, Jusczyk, Luce, and Morgan, 1999; Nazzi, Bertoncini & Mehler, 1998;

Weber, Hahne, Friedrich & Friederici, 2004). All this evidence signifies the importance of prosodic cues for speech perception.

Vowel lengthening in the word final position is one of the prosodic cues that have been extensively studied as a powerful cue for demarcating the word boundaries (Hay & Diehl, 2007; Saffran, Newport & Aslin, 1996; Tyler & Cutler, 2009; Vaissiere, 1983). Tyler and Cutler (2009) proved the benefits and universality of the vowel lengthening cue in their word spotting task with an artificial language. After a short period of exposure to an artificial language, the English, Dutch and French listeners heard a continuous sequence of CV syllables of that artificial language, and then were requested to press the corresponding keys whether they thought they heard a word or not. All the groups responded more correctly when vowel lengthening occurred in the final position. It indicates that final lengthening is a universal cue for signaling a word boundary across different languages.

While vowel lengthening in the final position seems to be a universal prosodic feature, some suprasegmental factors are also known to be language-specific. Languages are known to be categorized into three types of rhythmic structures: stressed-timed, syllable-timed and mora-timed (Katamba, 1992). This rhythmic structures have been found to highly constrain the segmentation of speech by native listeners (Cutler et al., 1986; Cutler & Otake, 1994; Otake et al., 1993, 1994). For example, Japanese learners of English, whose native language encourages mora-based segmentation, appeared to apply their native prosodic strategy to English speech segmentation (Cutler & Otake, 1994), while French listeners showed preference for the syllable-based segmentation procedure since

their mother tongue is a syllable-timed language (Cutler et al., 1986).

Cross-linguistic difference in use of suprasegmental cues means that language learners who are not familiar with the prosodic features of the target language can have some trouble perceiving words in a continuous stream of sounds. In the next section, stress will be of main concern as one of the suprasegmental cues in word recognition in English.

2.3. Stress as a Crucial Cue for English Word Recognition

Researchers have been trying to find out how prosodic factors contribute to speech perception and listeners' relative reliance on each cue. Mattys (2005) proposed that the use of cues in perceiving speech depends on speech conditions. In natural speech environment, where various cues for segmentation converge together, it is not clear which specific elements are functional to help listeners find word boundaries among available cues. Therefore, listening models should be able to specify the efficient strategies and sources for speech segmentation. He suggested that word stress in English can be a powerful cue when listeners extract words from a stream of sounds due to the specific rhythm created by stress.

The definitions on stress are slightly different among scholars, but in general, a stressed syllable is produced relatively stronger than other syllables in terms of phonetic properties including intensity, loudness and a change of pitch

(Katamba, 1992). English is categorized as a stress language in that every lexical word has at least one stressed syllable. Also, stress sometimes distinguishes the two different words with the same phoneme sequence. Therefore, on the word level, when the stress is placed on the wrong position, it may harm the intelligibility of speech. Cutler and Clifton (1984) investigated whether listeners would show different performance when they changed the location of stress in disyllabic words (e.g. *canTEEN* to *CANteen*, and *TURbine to turBINE*). They found that listeners responded more slowly to the word with alternated stress, which indicated that stress can have impact on the intelligibility of speech by listeners. Field (2005) also examined how wrongly assigned stress would influence intelligibility of speech by native English listeners. It was found that the misallocated stresses had a negative impact on intelligibility of the speech, along with stress direction and vowel length. Stress also plays a powerful role in selection of a word among multiple candidates. Grosjean and Gee (1987) suggested that a phonological word, a combination of one strong syllable and the following several weak syllables, may facilitate the lexical access.

Not only on the word level, but also on the continuous speech level, stress has been reported to play a significant role. Vroom (1998) proposed word stress as one of the crucial cues in speech segmentation because stressed syllables are more recognizable due to their relative prominence. Every word in English has at least one primary stress and the vowels of the unstressed syllables in the same word are reduced or weakened in its property. Therefore, in the segmentation process of a continuous speech, stress seems to be a reliable index for locating word boundaries.

The distributional frequency of the trochaic stress pattern in English words has been found to facilitate the speech segmentation (Bond, 1999; Cutler and Butterfield, 1992; Cutler & Carter, 1987; Cutler & Norris, 1988). Most of the English words appear to start with a stressed syllable, so native English speakers have tendency to use it as a beginning of word, which is called Metrical Segmentational Strategy (MSS). Cutler and Carter (1987) insisted that this segmentation strategy by English speakers be based on the prosodic characteristics of English words. They analyzed more than 33,000 English words from a dictionary, and found that 73 percent of English words have primary stress or secondary stress fall on the first syllable. These statistics show that a stressed syllable is an efficient cue for the native English listeners to process a spoken speech.

Cutler and Norris (1988) supported this idea through their word spotting task. They asked the native English listeners to detect a monosyllabic real English word from a stream of nonsense syllables. They found that the participants extracted the target words more easily when the stress fell on the first syllable of the word (e.g., *míntef*) than on the second syllable (e.g., *mintáyve*). They claimed that since English listeners seemed to regard a stressed syllable as a word boundary, [t] in a strong syllable following a stressed syllable like in *míntáyve* may be processed as an onset of another word, preventing the appropriate word boundary setting. Slips of ear is another evidence that stress is recognized as a critical cue to word boundaries (Bond, 1999; Cutler and Butterfield, 1992). Cutler and Butterfield (1992) analyzed the common listening errors committed by English listeners. It was found that they had a tendency to

insert word boundaries before the strong syllables and make a mistake to ignore the boundaries before weak syllables. This result indicated that the native English listeners make a frequent misinterpretation due to the overuse of metrical segmentation strategy.

Furthermore, lexical stress was found to be more correlated to the intelligibility of speakers' pronunciation than segmental features (Anderson-Hsieh, Johnson and Koehler, 1992; Hahn, 2004; Derwing, Munro, Wiebe 1998). Anderson-Hsieh, Johnson and Koehler (1992) conducted an experiment with English learners with 11 different languages, and found that prosodic features had a greater impact on listeners' intelligibility of speech than segmental features. Hahn (2004) also suggested the importance of suprasegmentals through his study with specific focus on the effect of primary stress on the intelligibility of speech. He found that the speech with correctly placed primary stress was evaluated much favorable by the native English listeners than those with incorrect or missing primary stress. The empirical evidence on the importance of lexical stress in speech production also supports the necessity of its role in speech perception.

English infants are known to be sensitive to the trochaic stress pattern of their mother tongue (Echols, Crowhurst and Childres, 1997; Jusczyk et al., 1993a). Jusczyk et al. (1993a) conducted a modal-priming experiment with 9 month-year-old infants whose mother tongue was English, and had them hear the two syllable words with the trochaic or iambic stress pattern. The results showed that the infants paid their attention to target words with strong-weak stress pattern longer. Echols, Crowhurst and Childres (1997) also investigated the

sensitivity to the stress of 9 month-year-old infants. They made a short running speech with the non-words with weak-strong-weak pattern, and inserted 250ms-long pauses between the words. The infants were found to respond the longest to the case where the pause was placed before the strong syllable, which indicated that the English infants had a strong preference for the strong syllable.

All these researches suggest that the ability of perceiving prosodic features of one's mother tongue develops at very early age, even before the infants build up the concrete lexicon. Furthermore, the language-specific prosodic system seems to be fixated at early age as well. This may imply that language learners who are studying a language with prosodic system different from that of their own can have some trouble acquiring a new prosody and exploiting it as a cue for speech perception. Therefore, in the next section, it will be discussed more in depth about the use of the stress cue in L2 word recognition, especially focusing on Korean learners, associated with their own prosodic system.

2.4. Stress Cue in L2 Word Recognition

A growing body of empirical studies on the word recognition by L2 learners have demonstrated that it is largely dependent on their first language prosodic system (Cutler & Norris, 1988; Guion, 2005; Lin et al., 2014; Tremblay, 2008; Tyler & Cutler, 2009; Vroom et al., 1998). Therefore, the metrical segmentation strategy by English native speakers can be difficult for L2 learners whose mother tongue has no stress system or does not put much importance on

stress cue to acquire. For example, the native French speakers, whose language has no contrastive stress, have been known to be "stress deaf" in lexical segmentation (Charette, 1991; Goad & Buckley, 2006; Dupoux, Sebastian-Galles, Navarrete & Peperkamp, 2008; Peperkamp and Dupoux, 2002; Tremblay, 2008). Peperkamp and Dupoux (2002) found that French learners of English had some difficulty in perceiving English stress contrasts due to their fixed-stress system. However, Tremblay (2008) suggested the difference in processing stress across proficiency levels and its learnability by L2 learners like French. In her study with Canadian French learners of English, she conducted a series of cross-modal word identification experiments to see whether the lexical stress in English constrains the word recognition of French learners' of English. She found from the individual analysis that some of the learners did show a "near-native like" performance on the recognition task, which implies the learnability of stress processing of the target language.

Unlike French listeners, Dutch L2 learners of English seem to benefit from the stress, even more than English listeners do, in speech segmentation (Booij, 1995; Cooper et al. 2002; Cutler and Donselaar, 2001; Donselaar et al., 2005). Dutch has a similar prosodic system to English in that stress is placed rather randomly across words, but unlike English, vowels in unstressed syllables are not reduced. These characteristics may explain the more reliance on the stress cue in word recognition than the native English listeners. Therefore, Dutch listeners have been regarded to perform better than English listeners in exploiting stress in word recognition. The results from the experimental study by Cooper et al. (2002) supported this idea. In their cross-modal priming task, Dutch learners

of English were asked to listen to a sentence ending with the first one or two of the syllable of a word, followed by a prosodically matching or mismatching word written on the screen, and then decide whether it was a real English word or not. The L2 learners responded significantly faster and more accurately to the prosodically matching words, which indicated that stress played as an efficient cue for the Dutch learners to recognize English words.

Korean, like French, is considered to have no distinctive stress system. There have been some controversies over the existence of lexical stress in Korean, but it is doubted that Korean has a fixed stress system on a word level (Koo, 1986; Jung, 1965; Lee, 1997; Jun, 1998, 2000, 2005; Sohn, 1999). Jun (1993, 1998) suggested that even though Korean words have a "strengthening and weakening," stress does not play any role in distinguishing minimal pairs in Korean.

For the prosodic model of Korean, Jun (1998, 2000, 2005) suggested that it has tone patterns which are associated with the Accentual Phrase (AP). Based on the intonational framework by Pierre-humbert and Beckman (1986, 1988), she assumed that speech is hierarchically broken down into smaller units by suprasegmental features including pitch or intonation rather than by syntactic constituents. Korean has two phrasal level prosodic units, which are Accentual Phrase (AP) and Intonational Phrase (IP) while English has Intermediate Phrase (ip) and Intonation Phrase (IP). An IP in both languages has similar characteristics in a sense that its domain is within the intonation level, highly related to the semantics and usually associated with phrase-final lengthening. However, the Korean AP and the English ip are different in terms of pitch or

intonational demarcation. While the English ip is marked by High or Low phrase accent, Korean is known to have a final High boundary tone.

According to Jun (1998, 2000, 2005), the Korean AP boundary is marked by initial and final rising intonation, often interacting with segmental information such as aspirated consonants although the tonal patterns of the Korean AP are various, depending on the dialects. The beginning of the AP can have either a rising tone (LH) or a high plateau (HH) on the first two syllables of the phrase, but the LH tone occurs more frequently in Korean speech. Kim (2004) analyzed the tonal patterns of AP in Korean reading speech and radio dramas, and found that about 88 % of the phrase initials were marked with a rising tone while the other patterns (#LL, #HL, or #HH, where # refers to the boundary of AP) appeared less frequently. For the phrase-final syllables, about 85 % of APs had an H tone. Therefore, it can be said that the Korean AP has a default intonational pattern with a rising tone on its initial and final (Kim & Cho, 2009).

These specific intonational patterns of the Korean AP have been found to contribute to speech segmentation in a connected speech (Kim 2004, Kim and Cho 2009). Kim and Cho (2009) conducted a word spotting task to examine how beneficial these intonational cues of the Korean AP are for the native Korean listeners in detecting a word boundary in the speech. The results showed that the participants were more susceptible to the combination of the phrase-final H tone and the phrase-initial L tone. Even though this intonational pattern was not an exclusive cue, it indicates that Korean listeners do use them as a cue for speech segmentation, and the more frequent pattern facilitates the segmentation process.

Little evidence has been suggested on whether stress is used by Korean

learners of English to constrain the lexical competition in English word recognition. Kim and Nam (2011, 2013) conducted a word spotting task with the participants at an intermediate-high level to examine their sensitivity to an initial-stress syllable. They asked the participants to detect a real English word embedded in a string of nonsense syllables (e.g., /*lau/often*, /*lau/agree*). The results showed that they responded faster and more accurately when the target words had the iambic stress pattern. They explained that not only Korean learners did not seem to be able to use the trochaic stress pattern to distinguish a word from a stream of speech, but also they might have applied their frequent tonal pattern of Korean AP boundary (H#L) in locating the word boundary. In other words, Korean learners may have misinterpreted the initially stressed syllable of the target word as the end of the word. The results of Chung (2013)'s study support the possibility of the transfer of Korean prosodic feature to English speech segmentation. Korean learners of English showed heavy reliance on pitch more than on the other elements like duration and intensity when identifying English stress.

To recapitulate, Korean prosodic system is different from that of English in two respects. First, Korean does not have a stress on the word level and seem to be used for word recognition or speech segmentation. Instead, it has tonal patterns associated with the Accentual Phrase, while English has the Intermediate Phrase as its counterpart, which is marked with pitch accents. Considering that the native listeners of a language start to develop their strategies of using the stress cue for speech segmentation at very early age, which are solidified quickly, Korean learners of English can be expected to have some difficulty parsing a

connected speech in English due to the stark contrast in prosodic systems of both languages. Considering the evidence suggested hitherto, the present study intends to investigate speech segmentation by Korean learners of English, specifically focusing on the stress cue. Since there has been little research on the phrase-level segmentation by language learners, this study can fill the gap in the field of research on L2 learners' speech segmentation, and may discover the developmental path of acquisition of prosody by examining the effects of stress across proficiency levels.

CHAPTER 3.
METHODOLOGY

This chapter describes the methodology used in the present study. Section 3.1 explains the word spotting task adopted for the study. Section 3.2 presents the experimental settings including participants, materials and procedure of the experiment. Finally, Section 3.3 demonstrates how data were collected and analyzed.

3.1. Word Spotting Task

The present study employed the word spotting task, which has been extensively adopted for the experiments to investigate how listeners segment speech or recognize a word from speech (Cutler & Norris, 1988; Cutler & Shanley, 2010; Kim & Nam, 2011, 2013; Kim & Cho 2009; McQueen 1998; Lin et al., 2014; Tyler & Cutler, 2009; Van der Lugt, 2001; Vroomen et al., 1998; Weber & Cutler, 2006). McQeen (1996) summarized the general procedure employed in the word spotting task as follows:

1) Participants listen to a string of nonsense syllables embedding a real target word. The target words should not be shown in advance.

2) Participants are asked to press a corresponding button whether they detect a real word or not. To ensure that the intended words are detected, they are requested to speak the target word they hear aloud after the button press.

The dependent variables of the word spotting task are response time and error rate. Response time is usually measured from the offset of the target word and the key response by the participants.

McQueen (1996) claimed an "ecological validity" of the word spotting task in examining the speech segmentation process because the task itself is to recognize a word from a continuous speech. Also, since it requires participants to respond as quickly as possible, it helps researchers to see the online operation of lexical activation and competition while listening to speech. The task also reflects the natural listening process in real life in a way that it does not provide any prior signals about what kind of input comes next. Supporting the ecological validity of the word spotting task, Cutler and Shanley (2010) even suggested the benefit of using this task as a practice tool to train L2 learners about L2 speech segmentation

There exist limitations of the word spotting task. First, the experimental materials are not exactly identical to natural "real" continuous speech since the former is usually the combination of one or two nonsense words. Also, the participants may feel some burden because they have to respond as quickly as possible, which may impede their efficient processing of speech (McQueen, 1996). However, the task is still a beneficial and practical tool to decide whether

the listeners could detect a word from a stream of speech with ease.

Therefore, the present study adopted the word spotting task, replicating the experiments conducted by Kim and Nam (2011, 2013) with stimuli modified and adjusted according to the purpose of the study.

3.2. Method

3.2.1. Participants

A total of 42 native Korean learners of English participated in the present study. All of them were students from universities located in Seoul, who were born and raised in Seoul or Gyeonggi-do province. The reason for setting the intentional limit on participants' residence is to prevent the possible prosodic effect from different dialectal variances (Jun, 1993, 1998, 2005; Kim, 2004; Kim & Nam, 2011, 2013; Sohn, 2001). The participants were categorized into two groups based on their English proficiency levels (advanced and intermediate-low), especially considering listening comprehension scores of the official English language proficiency tests such as TOEIC or TEPS after the experiment. All the participants filled out language and biological background questionnaires including gender, age at present, age of first exposure to English, Length of Residence (LOR) in English speaking countries, and TOEIC or TEPS scores. The detailed background information of the participants is illustrated in Table 3.1.

The advanced group was composed of 8 female and 12 male students while the intermediate-low group was made up of 14 female and 8 male students. The average age of both groups was 23. The first year of exposure to English was 8.25 for the advanced group and 9.8 for the intermediate-low group. The length of residence was controlled in a way that all the participants have stayed or lived in the English speaking countries less than a year. The mean LOR for the advanced group was 5.55 months, while it was 0.25 months for the intermediate-low group. There was no significant group difference in terms of LOR (p=.601).

Table 3.1
Background Information on the Participants

	Advanced group (n=20)	**Intermediate-low group (n=22)**
Gender (F/M)	8/12	14/8
Mean age (year-old)	23	23
Mean age of first exposure to English (year-old)	8.25	9.8
Mean length of Residence (months)	5.55	0.25
Proficiency level **Mean test score (Listening score)*	TEPS 884.46 (354.27) TOEIC 954 (487)	TEPS 551.1 (193.7) TOEIC 637 (305.5)

The standard for setting the proficiency level was based on the grade system provided by each test and the conversion table provided by TEPS

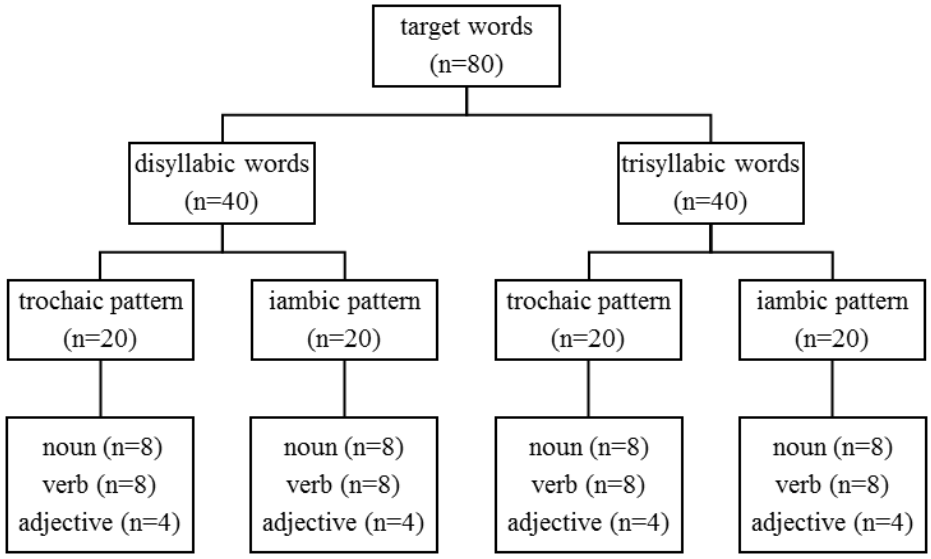
organization (www.teps.or.kr). According to the TEPS grading system, total scores above 800 (for TOEIC, above 920) are considered an advanced level, while the total scores from 400 to 600 (for TOEIC, 480 ~ 755) are said to be intermediate-low level. To confirm that the two groups are different in terms of proficiency, Analyses of Variance (ANOVA) was carried out to compare the TEPS and TOEIC scores including both total scores and listening scores. The result of a one-way ANOVA showed that there was significant difference between the advanced group and the intermediate-low group ($p<.001$).

3.2.2. Materials

40 disyllabic and 40 trisyllabic English words were selected as target words. Each word has either trochaic stress pattern or iambic stress pattern. For trisyllabic words with iambic pattern, there were 14 words with the stressed syllable in the middle, and 6 words with the final stressed syllable. In addition, the word class including noun, verb and adjective was also considered, and they were proportionately distributed in the target word list. All the target words were chosen from the basic word list specified in the English education section of the 2009 Revised National Curriculum (2011). The purpose of selecting the target words from the basic vocabulary list in the national curriculum was to ensure their high familiarity to the participants in order to avoid the lexical effect from unknown words. The previous studies have usually checked the frequency of the words with the CELEX database (Cooper et al., 2002; Guion, 2005; Tremblay,

2008; Kim & Nam, 2011, 2013). However, since the CELEX database only shows the lexical frequency in English speaking environment, it seems to be inappropriate to adopt the CELEX database for the present study which targeted the Korean learners of English. Figure 3.1 specifies the composition of the target words used in the experiment and the detailed lists are included in Appendix A.

Figure 3.1.
The Composition of Target Words



Unlike Kim and Nam (2011, 2013)'s study, the present study included the target words with various number of syllables. The reason for this was to avoid any potential bias from the fixed number of syllables in the target words. Kim (2004) suggested that the word recognition can be influenced by syllable count in the target word. Therefore, the different number of syllables can provide a

chance to see if there is any syllable count effect in speech segmentation. The interaction between the syllable count and stress pattern was also considered to give some insight in word recognition by Korean learners because the distribution of stress pattern is different in di- and tri-syllabic words.

In addition, the word class of the target words was manipulated to investigate the interaction between word class and stress pattern. The English noun and verb of disyllabic words tend to have a different stress pattern. Stress is more likely to fall on the initial syllable of a noun while a verb is more likely to have final stress (Kelly & Bock, 1988; Sereno, 1986; Guion, 2005). Guion (2005) found that Korean early and late bilinguals of English did not perform as well as the native English speakers in utilizing the distributional stress pattern of noun and verb both in word production and perception tasks. For this reason, it might be meaningful to examine the sensitivity to stress pattern according to the L2 learners' word class.

In order to create nonsense target stimuli, a nonsense syllable was attached to each target word. The nonsense syllables were restricted to an open syllable (CV) because the coda consonant of a CVC syllable can make a juncture when combined with the following onset consonant, affecting the accurate recognition of the target words. The nonsense CV syllable was a possible phoneme sequence in English, but had no meaning itself. They were carefully administered in order not to create any real English word from the consecutive syllables in a carrier string when attached to the target word. In addition, the vowel in the attached syllable was limited to diphthongs because a single vowel can sound like a diphthong when merged with the target word beginning with a single vowel

(Kim & Nam, 2011, 2013). The examples of the target stimuli are illustrated in Table 3.2. For the practice session, eight target stimuli were additionally generated. The list of target stimuli are presented in Appendix A.

Table 3.2
Examples of Target Stimuli

	Trochaic pattern	**Iambic pattern**
Disyllabic word	/gau/finish, /pou/cancel	/gau/advice, /pou/create
Trisyllabic word	/gau/educate, /pou/decorate	/gau/remember, /pou/specific

80 nonce words for the filler were created by using the ARC non-word database program (Rastle & Coltheart, 2002) and modified to a slight extent according to the purpose of the present study. Filler words were all possible syllable sequences in English, but not a real word. Filler stimuli were also fabricated in the same manner as the way the experimental stimuli were created with slight modifications. Since the types of meaningless CV syllables attached to the target word were limited, the repetition of those syllables was inevitable. This could cause the participants to predict the pattern of the target stimuli, which might have an influence in collecting an accurate response for the segmentation. Therefore, the meaningless CV syllables were joined either in the initial or in the final position of the filler words. Besides, there were 20 more real English words with more than 5 syllables were chosen as filler stimuli. They

were included to disperse the target stimuli in the experimental list so that the participants would not notice the repeated pattern of the target stimuli. Additional eight filler stimuli were created for the practice session. The list of the filler words and the filler stimuli are provided in Appendix B.

To avoid the effect of the same order of the stimulus, three pseudo-randomized experimental lists were arranged. Each participant heard every word just once in one of the two stress patterns. Each list contained a total of 180 experimental stimuli, including 80 target-bearing strings, 80 filler-bearing strings, and 20 real-English word fillers.

All experimental items were recorded by a male native English speaker from the northeastern part of the U.S.A. with no specific regional accent, who has little knowledge in any languages other than English. He was asked to read the target and filler stimuli three times as naturally as possible with a consistent and moderate speaking rate. Recording was conducted in a quiet room with a digital recording application “Recordium” in the IPAD at the sampling rate of 44kHz. Among the three tokens for each stimulus, the best one was selected as the experimental items.

After the word spotting task, the participants took a word knowledge test (refer to Appendix C), including the list of target words used in the task. The lexical knowledge itself has a significant influence on the speech perception. If a listener does not know or is unfamiliar with the target words, poor performance on the word recognition task can be attributable to the lexical knowledge. Therefore, in order to ensure the independence from the lexical effect, the present study had to make certain whether the participants are familiar with the

target words in the experiment. They were asked to circle the words on the list which they do not know. If they knew the word, they were requested to rank their familiarity with the scale of 1 to 5, where 5 refers to “the most familiar”. The result of the word knowledge test is presented in Table 3.3.

Table 3.3
Mean Score of Familiarity with Words of the Word Knowledge Test

	Advanced group (n=20)	**Intermediate group** (n=22)
Mean score	5	4.9

Overall, the mean score of the familiarity of the target words were significantly high for both groups. All of the participants in the advanced group answered that they know the words on the list well, while a few words were found to be unknown to some of the participants in the intermediate-low group. The words that the participants responded unfamiliar were excluded from the analysis of both error rate and response time.

3.2.3. Procedures

The tasks were conducted in a quiet room with each participant. Stimuli presentation and data collection were performed by the E-prime software. At the beginning of the experiment, the participants were provided with a short

explanation of the experiment and instructed how to do the task. Before taking a real task, they had a practice session with 16 experimental items to familiarize themselves with the key response. The participants heard the stimuli from a laptop through a pair of headphones at a comfortable volume. They were told that they would hear a list of nonsense strings or real word, and they should spot a real English word in each string. While the sound comes out, there was a small symbol of cross for the fixation on the screen. Each sound file lasted about 1000ms, and as soon as the sound ended, the question "Did you hear a real English word?" was presented. They were asked to press the key "1" for "YES" with their preferred hand as quickly and accurately as possible. If they thought they heard a real English word, they have to say the word aloud. If they thought there was no real English word in the string, they were asked to press the key "2" as "NO". The researcher was always in the room with a participant during the experimental session and monitored their missing or incorrect responses. The responses for filler-bearing strings were not analyzed. The task procedure took around 10 to 13 minutes.

After the word spotting task, the participants were asked to take a word knowledge test to ensure that the participants were highly familiar with the target words used in the experiment. They were then offered small remuneration for their participation.

3.3. Data Collection and Analysis

For the analysis, Reaction Time (RT) and error rate were collected. When more than 2/3 of the participants missed a specific target word, it was excluded from the data analysis. According to the data, only one target word "nervous" was rejected. Also, the data from the two participants in the intermediate-low group were excluded because their error rate was over 50%.

RT was measured as duration between the offset of the target stimulus and the key press. Missing items, incorrect responses, and RT over 2065ms were treated as errors[1], and were not included for the analysis of RT. In addition, if a participant failed to speak out the real English word or spoke the wrong word after pressing the key "1", it was treated as an error and excluded from the data analysis as well.

The analysis of the data was conducted with the Statistical Packet for Social Science (SPSS 21 for Windows). The data of the groups and the other variables were compared using Repeated-Measured ANOVA (RM ANOVA). The dependent variables including RT and error rate was analyzed, respectively. The summary of the independent and dependent variables are described in Table 3.4.

[1] RT values that did not fall within two standard deviations of the mean RT for each participant were treated as errors (Kim, 2004).

Table 3.4
Independent and Dependent Variables used for Statistics

Independent Variables	**Between-groups variables**	▪ **Proficiency Level (2)** ▫ Advanced group (N=20) ▫ Intermediate-low group (N=20)
	Within- groups variables	▪ **Stress Pattern (2)** ▫ trochaic pattern (n=39) ▫ iambic pattern (n=40) ▪ **Syllable count (2)** ▫ disyllabic words (n=39) ▫ trisyllabic words (n=40) ▪ **Word class (2) in disyllabic words** ▫ noun (n=16) ▫ verb (n=16)
Dependent Variables		▪ **Error Rate (RT)** ▪ **Response Time (ER)**

CHAPTER 4.
RESULTS AND DISCUSSION

This chapter presents the results of the study and discusses them based on the research questions proposed in Chapter 2. Section 4.1 explains the effect of the stress pattern on word recognition associated with the proficiency level. Section 4.2 discusses how the stress pattern influences word recognition considering its interaction with the other factors including the syllable count and the word class.

4.1. Effects of Stress Pattern and Proficiency Level

The present study aimed to explore whether Korean learners of English perceive a word-initially stressed syllable as a cue to distinguish a word from spoken speech. Since English words have been reported to have the high distributional consistency of bearing stress on the initial syllable, the native English listeners have a tendency to regard a stressed syllable as the beginning of a word and use this cue to set a word boundary in the continuous speech (Cutler & Butterfield, 1992; Cutler & Carter 1987; Cutler & Clifton, 1984; Cutler & Norris, 1988; Grosjean & Gee, 1987; McQueen, Norris & Cutler, 1994; Norris, McQueen & Cutler, 1995). However, Korean is known to be lack of the stress system on the word level. Some studies have found that Korean learners of

English did not seem to benefit from the trochaic stress pattern in word identification tasks both on the word-level and the phrase-level (Guion 2005; Kim & Nam 2011, 2013; Lin et al., 2014). Therefore, the present study hypothesized that Korean learners of English might show a reduced ability to use the English stress cue, which does not play a significant role in their native language, in processing English words efficiently and rapidly as English native speakers do. It was also expected that the proficiency level of Korean learners might have an influence on their sensitivity to the stress cue in word recognition.

The mean error rate and the reaction time (RT) from the word spotting task by the Korean participants including both the advanced and the intermediate-low groups are shown in Figure 4.1 and Figure 4.2.

Figure 4.1.
Mean Error Rate in the Word Spotting Task

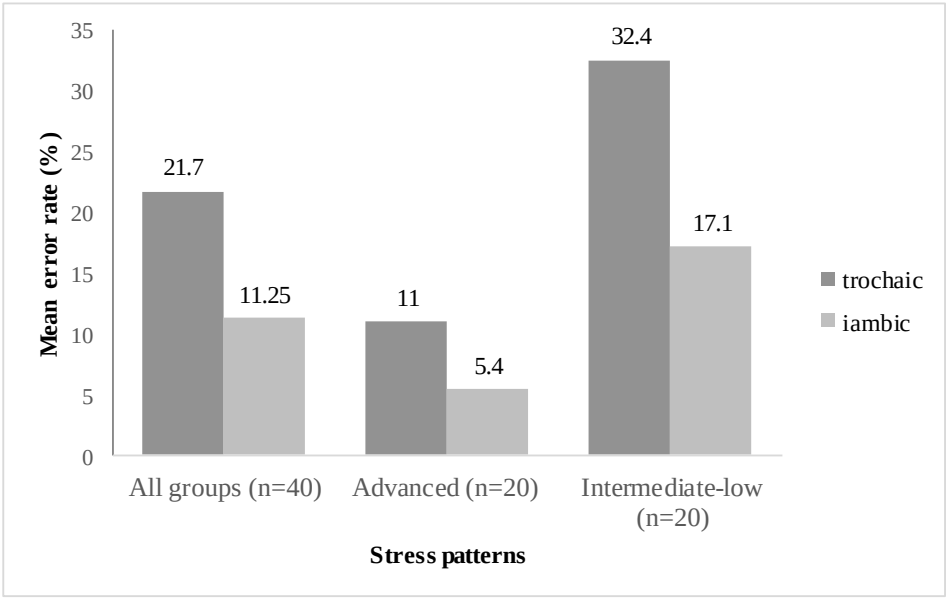
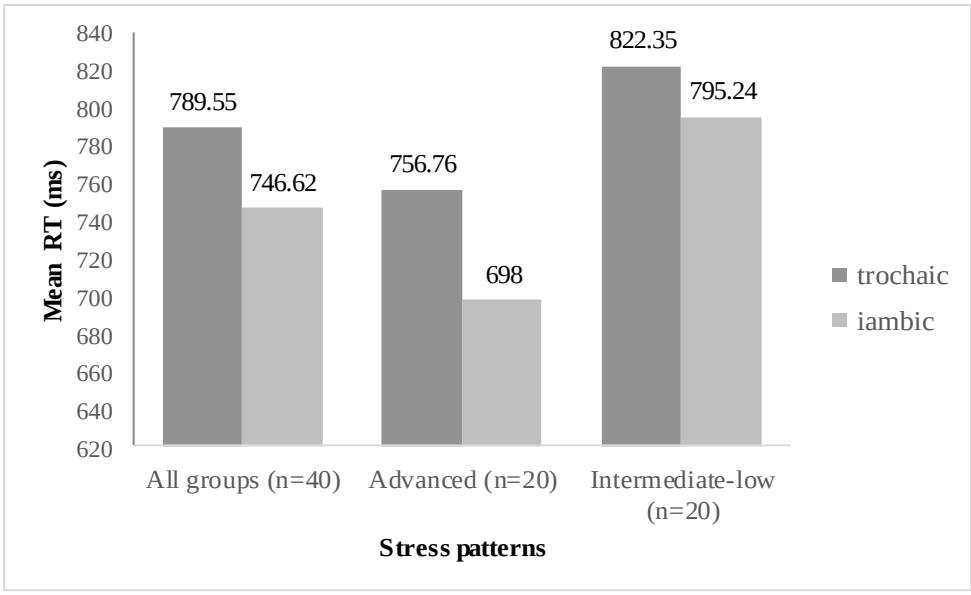


Figure 4.2.
Mean Reaction Time (RT) in the Word Spotting Task



Overall, the advanced group was found to show better performance in recognizing a word from a continuous sound string. However, the participants in both groups responded faster and more accurately to the target words with an iambic pattern than those with a trochaic pattern. This may indicate that the strong syllable on the first syllable of the target word did not play an efficient role in processing the word by the Korean participants.

In order to examine the effects of the stress pattern and its interaction with the proficiency level, a series of repeated measures ANOVAs were carried out as shown in Table 4.1. The proficiency level effect was expected that the Korean learners with higher proficiency might be able to perceive an initial-stressed syllable as an onset of the target word, while the intermediate-low learners are not sensitive to this cue. However, the inferential statistics on the mean error rate

and the mean RT showed that even though the participants in the advanced group were more accurate and faster in recognizing words in general, they also performed significantly better in favor of the words with the iambic stress pattern (F=36.585, p<.001 for error rate, F=15.854, p=.001 for RT) than those with the trochaic pattern as did the intermediate-low group (F=26.463, p<.001 for error rate, F=1.135, p=.300 for RT).

Table 4.1.
Repeated Measure ANOVAs on Stress Pattern and Proficiency Level

		SS	df	MS	F	*p*-value
All groups (n = 40)	**Error Rate** (%)	.526	1	.526	50.346	.000***
	RT (ms)	73734	1	73734	8.524	.006**
Advanced group (n = 20)	**Error Rate** (%)	.116	1	.116	36.585	.000***
	RT (ms)	69054	1	69054	15.854	.001***
Intermediate -low group (n = 20)	**Error Rate** (%)	.469	1	.469	26.463	.000***
	RT (ms)	14697	1	14697	1.135	.300
Group difference	**Error Rate** (%)	.059	1	.059	5.658	.023*
	RT (ms)	10018	1	10018	1.158	.289

*p<.05, **p<.01, ***p<.001

There was no significant interaction between the group and the stress pattern in RT ($F=1.158$, $p=.289$). This indicates that the faster response to the iambic words did not differ by group. However, the significant interaction in the analysis of error rates was found ($F=5.658$, $p=.023$), which means that the advanced group did respond more accurately when segmenting the iambic words.

The results of the present study was somewhat different from those of the study by Kim & Nam (2013). They conducted the similar word spotting task with participants at an intermediate-high level, and divided them into high and low performance groups based on their error rate. On the additional group analysis, the high performance group showed some sensitivity to the trochaic pattern in recognizing a word from a string of syllables. Therefore, in order to ascertain whether some of the participants in the present study were able to use the trochaic stress pattern as a cue in word recognition, an additional analysis was performed with the different group organization. As the Kim & Nam's (2013) study, the participants were re-divided into two groups by the standard of performance accuracy on the word spotting task. The mean error rate of the high performers was 8% while that of the low performer was 25.5%. The result from an one-way ANOVA on the error rate conducted to ensure the difference between the groups showed that the two groups were significantly different ($F=58.969$, $p<.001$).

As illustrated in Table 4.2, Korean learners of English in both high and low performance groups recognized the words bearing an initially stressed syllable more slowly and less accurately than those with the iambic stress pattern. Also, there was no significant difference between the groups in RT

(F=1.189, p=.282). However, the high performance group was found to respond much more accurately to the iambic words than did the low performance group (F=13.335, p=.001). These results were consistent with those from the original group composition.

Table 4.2.
Repeated Measure ANOVAs on Stress Pattern and Proficiency Level based on Re-grouping

		Mean number		F	*p*-value
		Trochaic	**Iambic**		
High performance group (n = 20)	**Error Rate** (%)	11	5	15.229	.001***
	RT (ms)	735.38	676.42	15.854	.001***
Low performance group (n = 20)	**Error Rate** (%)	34	17	43.979	.000***
	RT (ms)	843.73	816.82	1.135	.300
Group difference	**Error Rate** (%)			13.335	.001***
	RT (ms)			1.189	.282

**p<.01, ***p<.001

These findings are not in accord with the earlier expectation that the advanced group might have developed a native-like ability to use the trochaic stress pattern as a cue in identifying a word from spoken speech in English, which could indicate the learnability or developmental path of the stress pattern

cue in online processing of word recognition. However, they are not completely surprising because a large body of researches have suggested that prosodic features of the target language which are different from one's mother tongue are difficult for language learners to acquire (Cutler, Dahan, & van Donselaar, 1997; Cutler & van Donselaar, 2001; Dupoux, Pallier, Sebastián-Gallés & Mehler, 1997; Dupoux, Sebastián-Gallés, Navarrete & Peperkamp, 2008; Soto-Faraco et al., 2001). Korean is substantially different from English in terms of stress. It is known to have no word-level stress. In addition, their phrase-level prosodic structure is found to be associated with tonal pattern, while English speech is more related to stress accent (Jun, 1993, 1995, 2000, 2005; Kim, 2004; Kim & Cho, 2009; Sohn, 2001). It is possible that the Korean learners' exposure to the English prosodic cues might not be sufficient enough for them to learn and attain the native-like stress processing skill.

The Stress Parameter Model (SPM) also supports the idea that the stress typology of one's language has an influence on the encoding and representation of stress (Peperkamp, 2004; Peperkamp & Dupoux, 2002). It suggests that language learners without contrastive stress in their L1 might have difficulty in processing and using it in L2 speech segmentation. For example, French listeners with non-contrastive stress in their native language have been said to be "stress deaf" showing their reduced ability to discriminate a word from L2 speech by using the stress cue, even including the highly proficient French learners and simultaneous bilinguals (Dupoux, Pallier, Sebastian-Galles & Mehler, 1997, 2010; Dupoux et al., 2001; Peperkamp & Dupoux 2002, Dupoux, Sebastian-Galles, Navarrete & Peperkamp, 2008; Tremblay, 2009). Since stress does not

perform the contractive function in Korean as well, it can be expected that Korean learners of English might also have some disadvantage in processing and utilizing the stress cue. Lin et al. (2014) investigated how language learners with different linguistic backgrounds would process English stress in determining words of minimal pairs with contrastive stress. In their experiment, the materials in the lexical decision task were manipulated with such conditions as word frequency, stress location and vowel quality. The results showed that Korean learners at a high proficiency level only benefited from word frequency, suggesting that stress does not seem to facilitate their lexical access.

The findings in the present study are also in line with the studies suggesting the early acquisition of L1 prosodic features and its inflexibility. Several studies have proposed that the sensitivity to the stress cue seems to develop in infancy and hard to be reset (Jusczyk, Cutler & Redanz, 1993; Jusczyk, Houston & Newsom, 1999; Jusczyk et al., 1993; Mehler, Jusczyk, Lambertz, Halsted, Bertoncini & Amiel-Tison, 1988, Dupoux et al. 2008). In her study with the early and late Korean-English bilinguals, Guion (2005) conducted stress perception and production tasks to examine the effects of age in acquisition of L2 prosody. The results revealed that both of the groups failed to show native-like sensitivity to word-level of stress. She concluded that the early exposure to the Korean prosody has influenced their ability to abstract the English stress pattern on the lexical level. Considering that Korean students have little chance to listen to real English speech, the participants' less sensitivity to the stress cue in the present study may be a consequence of their lack of stress system and sufficient exposure to the English prosodic cue.

Another possible explanation for the tendency of not using the trochaic stress pattern to set a word boundary by Korean participants can be attributed to the transfer of L1 prosodic cue. In fact, they performed significantly better in identifying the target words with the iambic stress pattern in both error rates ($F=50.346$, $p<.001$) and RT ($F=8.524$, $p=.006$). The previous researches have pointed out the possibility that the difficulty of L2 speech segmentation by language learners might arise from the application of their native prosodic segmentation strategy to L2 speech segmentation (Cutler et al, 1986; Cutler & Otake, 1994; Otake, 1993; Otake et al., 1996; Tyler & Cutler, 2009; Weber & Cutler. 2006). In addition, in their word spotting task using artificial language, Tyler and Cutler (2009) found that, even with the unfamiliar artificial language, each group from different language backgrounds including Dutch, French and English paid more attention to their own language-specific prosodic cues, and parsed the same materials differently. These results may corroborate the idea that language learners might transfer the L1 prosodic cue to L2 speech segmentation.

For Korean, it is known that native Korean listeners tend to segment the speech based on Accentual Phrase (AP), which has a default final rising intonation pattern. Kim and Cho (2009) examined Korean phrase-level segmentation by the native Korean listeners from Seoul and Gyeonggi-do province. They found that they had a tendency to use the most frequent final rising intonation pattern (H#L, where # refers to the AP boundary) when locating a possible real word from a stream of nonsense syllables, and had some difficulty to detect the target word with the less frequent pattern (L#H). Kim and Nam (2011, 2013) proposed this distributional prosodic feature of Korean language

might negatively affect the ability of the Korean learners of English to use the trochaic stress pattern cue in English word recognition because they can possibly regard high pitch of the initial-stressed syllable as the end of the phrases or words. Therefore, the application of their own Korean prosodic feature to segmentation of English speech might prevent them from perceiving the stressed syllable as a cue for word onset. Chung's (2013) study provides some evidence to this idea. She found that the native Korean listeners showed heavy dependence on pitch in identifying English stress rather than other phonetic attributes of stress such as duration and intensity. The participants in her study performed well in perceiving an English stressed syllable with more prominence in pitch than that of an unstressed syllable, whereas they had difficulties with less prominent pitch.

In brief, the results of the present study revealed that Korean learners of English did not show any preference for the trochaic stress pattern, and they even recognized the English words significantly better when the word had the iambic pattern. Also, there was no performance difference between the groups across proficiency levels in that both the advanced and the intermediate-low groups responded faster and more accurately to the iambic words. This indicates that Korean learners do not seem to perceive a stressed syllable as the onset of a word and use it as a cue for setting the word boundaries. Furthermore, they might apply their native prosodic strategy in favor of the H#L tonal pattern to mark the word boundary in English word recognition, which could interfere with their identifying words with the trochaic pattern.

4.2. Effects of Stress Pattern and Other Factors

This section explains the interaction between the stress pattern and the other factors including the number of syllables and the word class of the target words.

4.2.1. Interaction between Syllable Count and Stress Pattern

The materials in this experiment were manipulated in terms of not only the stress pattern but also the number of syllables in the target word. The target words contained the stimuli including both disyllabic and trisyllabic words. The primary reason for this was to avoid the possible bias from the fixed number of syllables of the target words. It may also provide a chance to see whether the number of syllables has any influence on the listeners' word segmentation. Kim and Cho (2009) found that Korean trisyllabic words were recognized faster and more easily than disyllabic words by native Korean listeners. Since the materials in their study were Korean, it might be meaningful to examine the effects of the syllable count on the English word recognition by Korean learners of English.

Table 4.3 illustrates the statistical analysis of the mean error rate and the mean RT based on the syllable count conducted by the repeated measures ANOVA measure. The results showed that all the groups responded significantly faster and more accurately when it comes to recognition of the trisyllabic words

(F=85.529, p<.001 for error rate, F=19.064, p<.001 for RT). There was no significant group difference for error rate (F=.377, p=.543) and RT (F=.085, p=.772), which means that the group effect was not observed.

Table 4.3.
Repeated Measure ANOVAs on the Syllable Count

		Mean number		F	*p*-value
		Disyllabic	**Trisyllabic**		
All groups (n = 40)	**Error Rate** (%)	22.4	11.6	85.529	.000***
	RT (ms)	809.42	726.76	19.064	.000***
Advanced group (n = 20)	**Error Rate** (%)	14.3	4.2	37.173	.000***
	RT (ms)	764.92	689.85	9.723	.006**
Intermediate -low group (n = 20)	**Error Rate** (%)	30.5	18.9	48.765	.006**
	RT (ms)	853.92	763.67	9.537	.006**
Group difference	**Error Rate** (%)			.377	.543
	RT (ms)			.085	.772

**p<.01, ***p<.001

The results indicate that the participants found it easier to recognize trisyllabic words than disyllabic words. The frequency of the target words used in the present experiment had no significant difference between the di- and tri-

syllabic words. In addition, from the word knowledge test conducted after the word spotting task, all the participants were reported to know and be familiar with all the target words used in the experiment. Kim (2004) accounted for the easier recognition of Korean trisyllabic words by the neighborhood density. Luce (1986) explained the concept of neighborhood density as the number of words phonologically similar to a given word. More specifically, the phonological neighborhoods can be defined as "the categorical inclusion and exclusion of words in the neighborhood of the stimulus word based on one phoneme substitutions, additions, and deletions" (Luce, 1986, p. 24). For example, the neighbors of the word /kat/ would be /pat/, /kit/ or /kan/ by substitution, and /skat/ by addition. (Luce, 1986). Luce and Pisoni (1998) argued that the sparser the neighborhood density of a word is, the faster the listeners are likely to respond to the target word.

In order to investigate whether the neighborhood density can account for the results in the present study, a post-hoc analysis on the neighborhood density of each target word was conducted by calculating the number of phonological neighbors of 80 target words (40 disyllabic and 40 trisyllabic) using the neighborhood online database created by Washington University in St. Louis Speech & Hearing Lab (http://neighborhoodsearch.wustl.edu/Neighborhood). The results showed that the disyllabic target words had 2.15 phonological neighbors on average while the trisyllabic target words had an average 0.23 phonological neighbors. The difference between them were significant ($F=8.524$, $p=.006$). In addition, there was correlation between the error rate, RT and the number of neighbors ($r=.493$, $p=.001$ for error rate, $r=.698$, $p=.002$ for RT),

respectively. Therefore, according to the results from the present study, the easier recognition of trisyllabic words than that of disyllabic words in English seems to stem from the neighborhood density.

The interaction between the stress pattern and the syllable count was also analyzed. The underlying presumption for this analysis was from the distributional difference of the stress pattern in di- and tri- syllabic words. According to Cutler and Carter (1987), more than 60 percent of the English lexical words in the dictionaries were found to bear stress on the initial syllable, and nearly 90 percent of words from the spoken corpus had strong initial syllable. However, trisyllabic words have a high likelihood of having primary stress on the second syllable according to the English stress rule, which may affect the segmentation strategy of using the trochaic stress pattern as a cue. In other words, the participants might react differently to trisyllabic words in using the stress pattern cue in word recognition.

Figure 4.3 and 4.4 show the mean error rate and the RT from the word spotting task, especially focusing on the interaction between stress pattern and syllable count. Since the advanced and the intermediate-low groups were found to respond in the similar pattern to the stress pattern, the analysis of the interaction with other factors were not conducted separately for each group. Overall, the participants showed better performance with the iambic words in both syllable count conditions. However, there was no significant interaction between the stress pattern and the syllable count ($F=1.841$, $p=.183$ for error rate, $F=.085$, $p=.772$ for RT), which indicates that the number of syllables in a word did not affect the way of the listeners' using the stress patterns.

Figure 4.3.
Mean Error Rate Based on Syllable Count

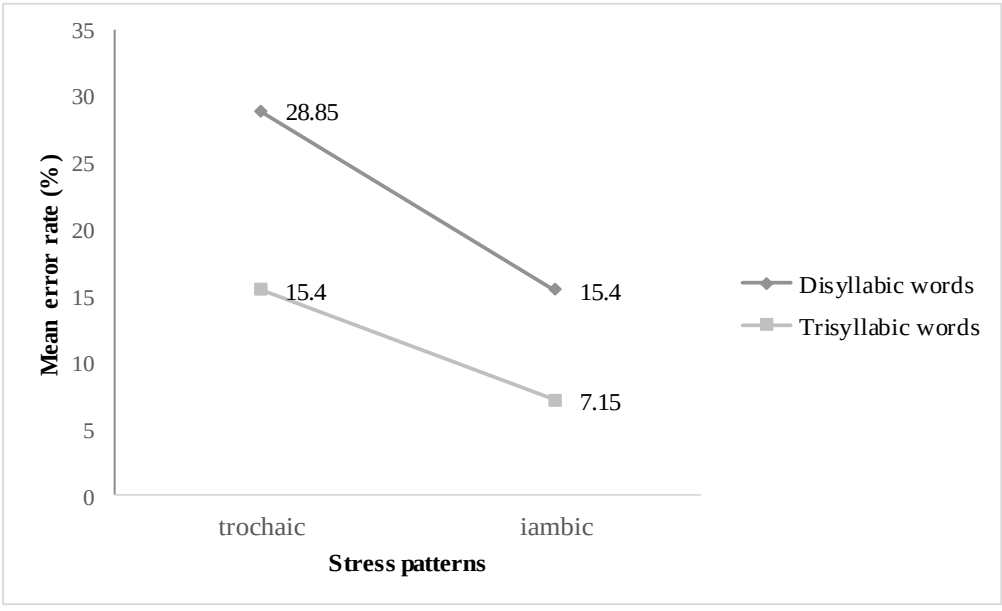
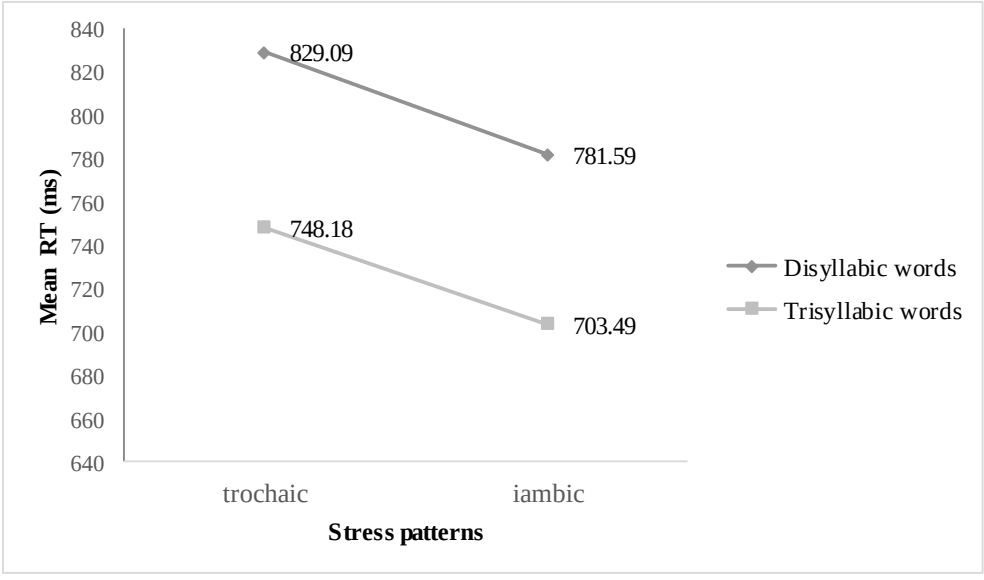


Figure 4.4.
Mean Reaction Time (RT) Based on the Syllable Count



The mean error rate and the mean RT from the experiment consistently show that Korean learners of English have a tendency to benefit from the iambic stress pattern in word recognition, regardless of the word count. Even though the syllable count itself affected the word recognition, that the different number of syllables in a word and the stress pattern interact together in word recognition could not be found. This may be a due to much higher tendency to prefer the iambic pattern by the learners at both levels.

4.2.2. Interaction between Word Class and Stress Pattern

English disyllabic words have been known to have the different stress patterns for noun and verbs. Nouns tend to have a stress on its initial syllable while verbs on the final syllable. This is represented directly to the minimal pairs of noun and verb with the same phoneme sequence such as *CONduct* (noun) - *conDUCT* (verb). Since there is a close connection between word class and stress pattern, the error rate and RT of the disyllabic words were particularly analyzed. Therefore, a total of 32 disyllabic words of nouns and verbs were analyzed. Since the experimental design used in the present study does not provide any context for the word class, only information on the word class was the word itself. Therefore, in order to avoid the confusion, the target word list used for this analysis did not include any noun or verb that can have minimal pairs by stress (e.g., water). The results of repeated measures ANOVA are presented in Figure 4.5 and 4.6.

Figure 4.5.
Mean Error Rate Based on the Word Class

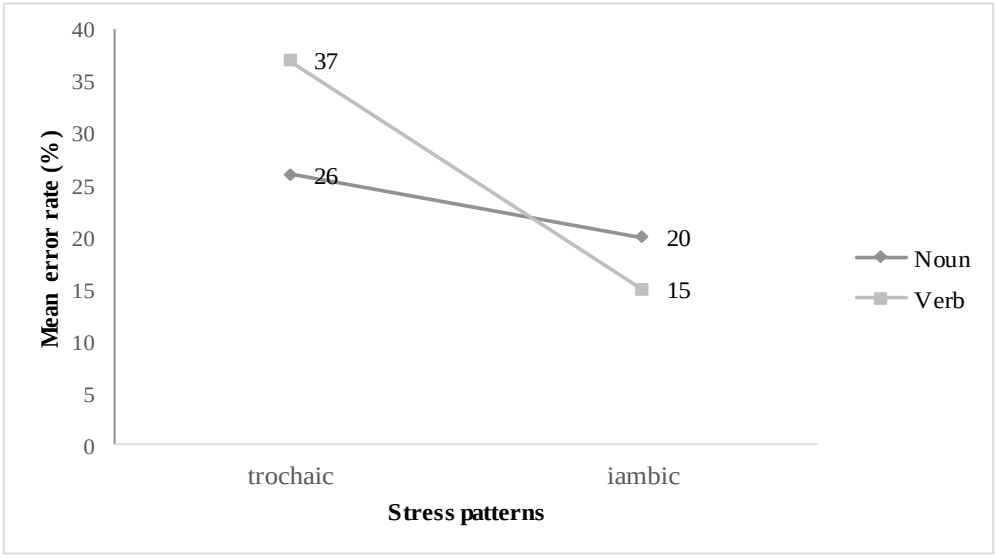
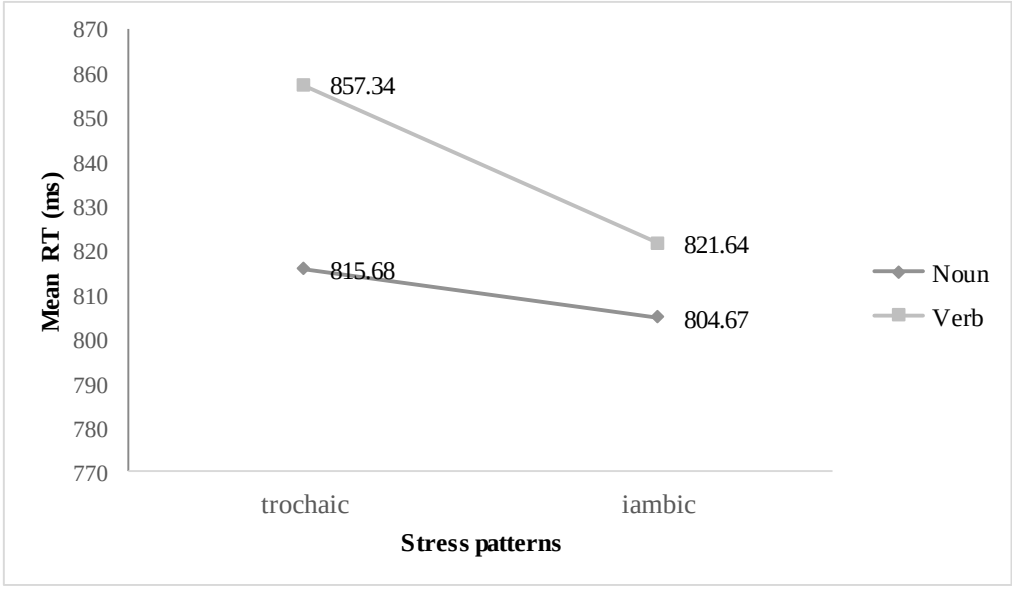


Figure 4.6.
Mean Reaction Times (RT) Based on the Word Class



As revealed in the results, the target words with the iambic stress pattern were more preferred for both nouns and verbs. There was a significant interaction stress pattern and word class in terms of error rate ($F=14.074$, $p<.001$), but no significant interaction as for RT ($F=.231$, $p=.633$). This result is consistent with Guion's (2005) study, where even early Korean bilinguals of English performed less efficiently in using stress pattern in English word perception task. Some studies suggested different results from the current study. Davis and Kelly (1997) conducted an experiment using disyllabic nonce words in English with English learners from various L1 backgrounds to examine the distributional knowledge of stress on noun and verb. They found that the L2 listeners placed the stress on the final syllable more than on the initial syllable of the non-words.

It might be possible that the participants could not perform their real segmentation ability because of the burden from the time limit. The current experiment was online word spotting task, which requires the immediate and quick response. However, the consistent better performance with the words with the non-initial stress syllable implies that Korean learners of English are not using trochaic stress pattern in recognizing the onset of a word, regardless of word class or syllable count, or even distracted by that when extracting English word from a continuous speech.

CHAPTER 5.
CONCLUSION

This chapter draws a conclusion based on the results and discussion proposed in the previous chapter. Section 5.1 presents a summary of the key findings of the present research, followed by some pedagogical implications. Section 5.2 discusses the limitations of the present study and provides some suggestions for future research.

5.1. Major Findings and Pedagogical Implications

The primary objective of the present study was to investigate whether Korean learners of English use a stressed syllable as a segmentation cue in English word recognition. This study also aimed to examine how Korean learners at an advanced and an intermediate-low level reacted to the distributional stress pattern of English. Lastly, the interaction between the stress pattern and the other factors including the syllable count and the word class was an additional concern for this study. In order to answer these research questions, the word spotting task was carried out with Korean learners of English at different proficiency levels. The key findings of the present study can be summarized as follows.

First, Korean learners do not seem to perceive an initially stressed word as

an onset of a word. This finding supports the results of the previous studies suggesting that Korean learners have less solid representation of stress in processing English speech (Guion, 2005; Kim & Nam, 2011, 2013; Lin et al., 2014). Their lack of ability to use the trochaic stress pattern as a cue in word recognition can be probably attributed to their own L1 prosodic feature. Since Korean listeners have a tendency to use the most frequent H#L intonational pattern to distinguish the AP boundaries in Korean, the participants in the present study might perceive the high pitch in English stress as the signal of a final syllable of a word (Kim, 2004; Kim & Cho, 2009; Kim & Nam, 2011, 2013).

Furthermore, there was no performance difference in terms of using the stress pattern cue between the advanced and the intermediate-low learners. Even though the overall performances by the advanced group were better than those by the intermediate-low group, the advanced learners also did not show any sensitivity to the trochaic stress pattern. This result may provide further evidence confirming that L2 prosodic cues like stress are hard for language learners to acquire, even for those with high proficiency. The high scores of the word knowledge test by both groups add some credibility to this analysis in a sense that the explicit knowledge on words does not guarantee the effective processing of speech.

Finally, it was found that the syllable count and the word class did not have any interaction with the stress pattern in word recognition. These results may be due to the participants' overall insensitivity to the stress pattern cue. However, the number of syllables, regardless of the interaction with stress pattern, was revealed to have an influence on the word recognition in the way

that trisyllabic words were easier for them to recognize than disyllabic words.

These findings can suggest some pedagogical implications to the current English education on listening. Most of English classes in Korea have focused primarily more on reading and grammar than other skills including listening. Even though teachers have been encouraged to teach speaking and listening as essential skills for language learners, the absolute amount of students' exposure to English speech seems to be very restricted. Furthermore, the typical listening instructions are centered on listening comprehension and listening strategy use, and little focus on the decoding of the speech by using stress or other prosodic cues.

Therefore, I would like to suggest that instructions on the stress and other suprasegmental features including intonation should be also implemented. Teachers should guide learners to notice and be aware of the prosodic differences between English and Korean, and provide them with systematically designed materials to help them acquire and use those cues in speech perception. Teachers themselves as well should be aware of the importance of prosodic cues in listening and take practical steps to create diverse activities concerning the stress cue. It is also recommended that the textbook and the National Curriculum should adopt these features in listening instructions.

5.2. Limitations and Suggestions for Further Research

This study presented some clear findings on the use of the stress pattern cue by Korean learners of English, but there exist several limitations. Most of all, the sample size was rather small to generalize about the role of the stress in English word recognition by Korean leaners. Further research is required to verify the Korean learners' ability to use the stress pattern cue with a larger number of participants.

Regarding the participants, their Length of Residence (LOR) in English speaking countries could have been another critical variable to be addressed in the study. Because of the practical limitation on recruiting the participants, the participants in the current study was composed of only people who have little experience in English speaking countries. Guion (2005) suggested that early bilinguals and late bilinguals showed some differences in their perception and production of the stress pattern of nouns and verbs. With the larger sample in each group at various proficiency levels and LOR, some interesting differences might emerge. Furthermore, a comparison of the performances by Korean learners to those by native English speakers would confirm the different use of prosodic cues between the two language.

Another limitation lies in the materials itself. The nonsense streams of syllables fabricated according to the purpose of the study were rather short and artificial, which implies that it may not be natural enough like a real spoken speech. It can be suggested for future studies to conduct a word spotting or

speech segmentation task with the materials taken or created from the longer, spontaneous, real speech. It would enhance deeper understanding on how language learners segment the speech of the target language.

Lastly, it would be beneficial to investigate the effect of stress instruction for speech perception. Listening instructions in English classrooms in Korea are heavily dependent on the listening comprehension checks. However, the bottom-up approach to improve students' listening skill is also necessary. Therefore, the future empirical research on the benefits of training stress perception would provide just cause for adopting it in English classrooms.

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APPENDICES

APPENDIX A.

List of Target Stimuli

	Disyllabic words		Trisyllabic words	
	Trochaic	Iambic	Trochaic	Iambic
v	/lau/borrow	/lau/collect	/lau/criticize	/lau/develop
	/gau/finish	/gau/describe	/gau/educate	/gau/remember
	/mau/realize	/mau/divide	/mau/emphasize	/mau/examine
	/tau/bother	/tau/ignore	/tau/calculate	/tau/develop
	/zou/punish	/zou/prepare	/zou/celebrate	/zou/understand
	/vou/listen	/vou/respond	/vou/estimate	/vou/guarantee
	/pou/manage	/pou/improve	/pou/decorate	/pou/disappear
	/zai/publish	/zai/select	/zai/satisfy	/zai/recommend
n	/kai/bottom	/kai/degree	/kai/capital	/kai/condition
	/moi/market	/moi/machine	/moi/factory	/moi/department
	/loi/concept	/loi/belief	/loi/furniture	/loi/kangaroo
	/noi/garden	/noi/survive	/noi/accident	/noi/musician
	/lau/uncle	/lau/event	/lau/holiday	/lau/position
	/gau/effort	/gau/advice	/gau/history	/gau/religion
	/mau/captain	/mau/disease	/mau/library	/mau/tradition
	/tau/pocket	/tau/giraffe	/tau/medicine	/tau/afternoon
a	/zou/angry	/zou/afraid	/zou/confident	/zou/realistic

	/vou/nervous	/vou/correct	/vou/negative	/vou/delicious
	/pou/famous	/zou/sincere	/pou/opposite	/pou/specific
	/zai/clever	/zai/polite	/zai/popular	/zai/romantic
Practice items				
	/lau/heavy /pou/station	/pou/create /noi/campaign	/tau/physical /pou/hospital	/zai/imagine /mau/tomorrow

* v = verb, n = noun, a = adjective

APPENDIX B.

List of Filler Stimuli

Disyllabic words		Trisyllabic words	
Trochaic	Iambic	Trochaic	Iambic
/lau/juntic	/lau/yielap	/lau/blicimal	/lau/weverfoon
/zou/fribur	/zou/sparteed	/zou/tarrison	/zou/ponomying
/zai/rumpet	/zai/tredeel	/zai/tipcyple	/zai/sulditious
/poi/greaber	/poi/pratoon	/poi/apdipate	/poi/tanpisty
/gau/gunplab	/gau/nuftect	/gau/naperate	/gau/talloping
mickple/mau/	loceed/mau/	mingernail/mau/	polomow/mau/
shimmal/zai/	abhart/zai/	nazipent/zai/	pilenow/zai/
gipsaw/tau/	abbass/tau/	fistipuff/tau/	flagrintly/tau/
lanket/pou/	sotilt/pou/	grozident/pou/	mollicle/pou/
clation/poi/	curveed/poi/	pimilar/poi/	moraging/poi/
/ti/hooset	/do/smolloon	/vou/peeperous	/vou/avolit
/ka/finko	/ka/shrudict	/kai/tratitude	/kai/figaster
/mo/grumpty	/mo/pursict	/moi/eglaphant	/moi/enucting
/da/cloptail	/da/fellect	/mau/frendelope	/mau/linzetful
/bo/grounkle	/bo/clonit	/pou/bellicove	/pou/esulsion
dibrous/pim/	malgree/pim/	dappering/peed/	fictotious/peed/
prampot/lut/	jalpeat/lut/	grimpetive/lut/	focuming/lut/

sweengel/pog/	frimcess/pog/	mauchery/pog/	fosigral/pog/
cruspow/gait/	culvere/gait/	heafenter/gait/	pimitial/gait/
wumple/mit/	novave/mit/	pingering/mit/	canbarrow/mit/
Real word fillers			
academic	sophisticated	transformation	laboratory
certificate	mediterraneon	testimony	apologetic
competition	pediatrician	demontrative	congratulation
fundamental	generosity	demarcation	elementary
eliminate	sporadically	Bureaucratic	disorganization
Practice items			
/lau/tanclet	/zou/dutchest	/kai/conipent	/zai/tolition
gwelling/pou/	dorgape/moi/	plabbergast/lau/	belottling/moi/

APPENDIX C.

Word Knowledge Test

◈ 다음 단어들 중 아는 단어에 O, 모르는 단어에 X를 하세요. 그리고 아는 단어라고 표시한 경우 단어의 친밀도를 1-5 로 표시하세요. (5로 갈수록 아주 친숙함)

(ex) student : O, 5 / perplexed : O, 1 / ostentatious : X

borrow	collect	criticize
finish	describe	educate
realize	divide	emphasize
bother	ignore	calculate
punish	prepare	celebrate
listen	respond	estimate
manage	improve	decorate
publish	select	satisfy
bottom	degree	capital
market	machine	factory
concept	belief	furniture
garden	survive	accident
uncle	event	holiday
effort	advice	history
captain	disease	library

pocket	giraffe	medicine
angry	afraid	confident
nervous	correct	negative
famous	sincere	opposite
clever	polite	popular
develop	understand	condition
remember	guarantee	department
examine	disappear	kangaroo
develop	recommend	musician
position	realistic	specific
religion	delicious	romantic
tradition	afternoon	

국 문 초 록

본 연구는 강세 패턴이 한국인 영어 학습자의 영어 단어 인지에 미치는 영향을 알아보고자 하였다. 말소리 분절, 더 구체적으로 단어 인지는 모국어의 특징적인 단서에 영향을 받는 것으로 알려져 있다. 본 연구에서는 단어 인지 단서로서 강세를 주요 관심사로 두었다. 이는 영어와 한국어가 강세의 측면에서 매우 다른 운율적 특성을 가지고 있기 때문이다. 영어에서 강세는 단어의 뜻을 구분하는 기능을 하고 단어 인지에 영향을 미치지만 한국어는 단어 수준에서 강세가 없다고 알려져 있으며, 강세가 한국어 단어 인지에 어떤 역할을 하는지에 대해서는 아직 연구된 바가 적다. 따라서 본 연구는 크게 (1) 한국인 영어 학습자들은 영어의 연속 음성에서 단어를 인지할 때 강세음절을 단어의 시작이라고 인지하는지, (2) 학습자의 수준 차에 따라 단어 인지에 차이가 있는지, (3) 강세 패턴과 단어의 음절 개수 및 단어의 품사와 같은 요소들 사이에 상호작용이 있는지에 대한 연구문제를 상정하였다.

본 실험에서는 앞서 제기된 연구문제를 해결하기 위해 단어 탐지 과제(word spotting task)를 실시하였다. 참가자들은 42명의 서울 및 경기 지역에서 태어나고 자란 대학생들로 영어 수준에 따라 상 및 중하의 두 집단으로 각각 나누어졌다. 두 집단은 일련의 무의미한 연속 음절을 듣고 그 안에서 실제 영어 단어를 인지하도록 지시 받았다. 강세 패턴과 단어의 음절 개수 및 단어의 품사와 같은 다른 요소들과의 상호작용을 분석하기 위해 본 실험에서 사용된 자료는 2음절 및 3음절의 명사와 동사를 포함하였다. 실험 단어들이 참가자들에게 친숙한 단어임을 확실히 하기 위해 단어 탐지 과제를 실행한 후 어휘력 시험을 보게 했다.

실험 결과, 다음과 같은 유의미한 결과를 발견할 수 있었다. 첫째, 한국인 영어 학습자는 영어에서 단어 인지의 주요 단서가 되는 강음절을 단어의 경계로 인식하지 않는 것으로 드러났다. 참가자들은 약음절로 시작하는 강세 패턴을 가진 단어에 더 빠르고 정확하게 반응하였다. 둘째, 상위 집단 학습자들과 중하위 수준의 학습자들 사이에 집단 간 강세 단서 활용 양상에는 유의미한 차이가 없었다. 이는 강세와 같은 외국어 운율 단서들이 습득하기 어려운 것임을 알려준다. 마지막으로, 강세 패턴은 단어 인지에 있어 단어의 음절 개수나 단어의 품사와는 별다른 상호작용을 하지 않는 것으로 나타났다. 결론적으로, 한국인 영어 학습자들은 영어 단어를 인지할 때 영어의 강세를 단서로 활용하지 않는다는 것을 확인할 수 있었다. 이러한 연구 결과는 제 2언어 학습자의 말소리 인지에 대한 이해를 제공할 뿐만 아니라, 영어 듣기 수업에서 강세와 같은 운율 요소에 대한 수업의 중요성 및 필요성을 제시한다.

주요어: 단어 인지, 말소리 분절, 분절 단서, 운율, 강세 패턴

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