Effects of Prefix Availability and Vocabulary Size on Japanese EFL Lexical Inferencing

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Abstract

The present study examined the effects of (a) a prefix clue in an unknown word and (b) the relationship between the use of prefixes and L2 vocabulary size on EFL learners’ lexical inferencing in reading. Previous studies have shown that L2 learners make use of morphological clues in unknown words to infer word meaning. In addition, some studies have demonstrated that the use of morphological clues contributes to L2 learners’ vocabulary knowledge through lexical inferencing ability. However, few studies have examined the relationship between the use of morphological clues and its contribution to lexical inferencing. In an experiment, a total of 35 Japanese EFL undergraduate and graduate students inferred the meanings of 11 target words whose prefixes were available for participants and 11 words whose prefixes were unavailable. All target words were presented in sentences that were not sufficiently informative to be able to infer the word meaning. The prefix availability and sentences containing target words were examined and created through two pilot studies. The results showed that prefix availability contributed to lexical inferencing, but it was also found that the effect of prefix availability on lexical inferencing might not differ in respect of learners’ vocabulary size. Finally, the possible ways of applying the findings of the present study to teaching English in the context of EFL are discussed.

1. Background

1.1 Text Comprehension and Lexical Inferencing

Vocabulary learning is necessary for learners of a second language (L2), not least because vocabulary knowledge is one of the essential elements of L2 reading. Previous studies have suggested that in order to comprehend the content of a text, L2 learners need to have gained a vast amount of vocabulary knowledge (e.g., Schmitt, 2008). For example, Nation (2006) argues that learners need to know 98% of words in the text written in English for unassisted comprehension, which is achievable with knowledge of approximately 9,000 word families. In short, L2 learners need to know a considerable amount of vocabulary for successful reading. This is, however, difficult for L2 learners, and particularly for those who are learning English as a foreign language (EFL) in the classroom (Grabe, 2009). Thus, EFL learners often encounter words with which they
are unfamiliar when reading a text. To successfully understand the content of the text under such circumstances, learners need to guess the meaning of unknown words in sentences and continue reading the text. The inferring of meaning of an unknown word is called *lexical inferencing*. With particular respect to L2 lexical inferencing, Haastrup (1991) proposes that L2 learners use world knowledge, contextual information surrounding the unknown words, and linguistic cues that the unknown words themselves contain for lexical inferencing. De Bot, Paribakht, and Wesche (1997) argue that lexical inferencing involves filling empty slots in a *mental lexicon* with the missing information, based on Levelet’s (1993) model of lexical processing performed by first-language (L1) speakers. According to Levelet (1993), a mental lexicon is located in the center of the model and is assumed to play the part of storing lexical knowledge. The mental lexicon is said to consist of two parts: *lemmas* and *lexemes*. The lemmas contain word meanings and grammatical information, and lexemes store morphological and phonological information. When L2 learners encounter an unknown word (or a target word), they begin by comparing the form of the target word with information stored in the lexemes. At the same moment, the learners make use of the meaningful morphological information of the target word, information from the sentence that surrounds the target word, and world knowledge. Finally, they connect the target word with concepts that they already know. Taking both Haasturp’s and de Bot et al.’s propositions into account, it can be said that L2 learners use the morphological clues in unknown words and information from the surrounding sentence(s) for lexical inferencing.

### 1.2 Effect of Morphological Clues on Lexical Inferencing

A large part of English words can be divided into the smallest meaningful units (i.e., morphemes). For instance, *blackboard* and *unhappy* can be decomposed into *black* and *board*, and *un-* and *happy*, respectively. A morpheme that can stand as a word by itself (e.g., *black, board, happy*) is called a *free morpheme*, whereas one that cannot exist as a word alone (e.g., *un-*) is called a *bound morpheme*, and a bound morpheme that makes a derivational word by attaching to a word is called a *derivational affix*. It has been found that decomposing a word into its morphemes and integrating each morpheme’s meaning enables us to understand the whole word’s meaning in studies of both L1 speakers (McCutchen & Logan, 2011) and L2 learners (Zhang & Koda, 2012). Such ability to reflect and manipulate morphological clues is called *morphological awareness* and is assumed to play a part in lexical inferencing (Zhang & Koda, 2012). However, several studies have suggested that the use of morphological clues might not always contribute to success in lexical inferencing. For example, Nassaji (2003) examined the knowledge source that learners of English as a second language (ESL) used for lexical inferencing using a think-aloud method. The results of the study showed that the use of morphological knowledge accounted for approximately a quarter (26.9%) of the whole knowledge source applied during lexical inferencing, which was the second most used type of knowledge after world knowledge (46.2%). However, judging from a statistical comparison of the kind of knowledge source with the rate of
success in lexical inferencing, Nassaji drew the conclusion that the use of morphological knowledge might not contribute toward successful lexical inferencing.

Previous studies examining the contribution of morphological and contextual clues toward successful lexical inferencing can be divided into the following positions: (a) The morphological clues contribute to success in lexical inferencing and (b) the morphological clues are not useful to infer the meaning of unknown words.

Hamada (2014) investigated the use by learners of English as a second language (ESL) of both morphological and contextual clues for when they could and could not rely on the morphemes in the target compound words to infer the meanings of the target words. The result of Hamada’s study revealed that (a) there was no significant difference among learners’ scores on the lexical inferencing tasks on the basis of their English proficiency when the free morphemes in the target words were available to infer word meaning and (b) learners with lower and intermediate proficiency were prone to depend on morphological clues even when these were not available in the target words, resulting in them failing to infer the meanings of the target words. These results suggest that L2 learners can use morphological clues to infer word meanings when free morphemes in unknown words are available. Hamada mentioned the following points for future research: First, the informativeness of context in both conditions was not controlled, which might have confounded the interpretation of the simple effects of morphemes on lexical inferencing; next, because the study used compound words consisting of a free morpheme and a pseudo morpheme, it is necessary to investigate words with derivational affixes, which are assumed to be more complex than compound words.

A study by Nakagawa (2006) compared morphological and contextual clues in EFL learners’ lexical inferencing. Three types of lexical inferencing tasks were used with two participant groups: The first with only the morphological clue, containing the spelling of a target unknown word alone, was presented to one participant group; the second with a contextual clue, where sentences were presented in which the target word was replaced by parentheses, was given to the other participant group; and the third containing both morphological and contextual clues was provided for both groups. The results showed that the morphological clues were effective in inferring not the meanings but the part of speech of the target words, whereas the contextual clues were relatively useful to infer the meanings of the target words. This seems to correspond to Nassaji’s (2003) view above. However, there are several points that should be noted. First, the morphemes of the target words were not fully controlled. For instance, *recourse*, one of the target words used in Nakagawa’s study, means something that you do to achieve something or deal with a situation. However, the combination of its morphemes (i.e., *re, course*) is not equal to its whole meaning. Nakagawa’s (2006) experiment thus includes words whose morphological clues are not informative in a way that allows participants to infer their meanings. This might have led to the aforementioned result. Second, participants’ responses to the target words suggest that they used the morphological clues to infer the meaning of the target words. Nakagawa reports participants’
responses to the target words (e.g., “windless” for *unwind*, “make a barrier in front” for *prevaricated*) that reveal their unsuccessful attempts to infer the target word meanings using the affixes in the words.

To sum up, previous studies have found that L2 learners seem to be able to use morphological clues in unknown words to infer their meanings. However, there are few studies examining L2 lexical inferencing with available morphology in detail. L2 learners may be able to use the information of a free morpheme in an unknown compound word to succeed in lexical inferencing while reading. However, whether they can use the clues of derivational affixes, which are assumed to be more complex than free morphemes, for successful lexical inferencing remains to be revealed. Thus, there is room for investigation of lexical inferencing in reading using derivational affixes.

1.3 The Relationship Between Use of Morphological Clues and Learners’ Vocabulary Size

The previous section presented an overview of the literature on the use of morphological clues in unknown words and its effect on learners’ success in lexical inferencing. This section will consider previous research on the relationship between the use of morphological information and learners’ vocabulary size in lexical inferencing.

Previous studies have shown that there are significant connections between the use of morphological clues and learners’ vocabulary size. For instance, Mochizuki and Aizawa (2000) revealed that EFL learners’ vocabulary size and affix knowledge have a positive correlation. In their study, Mochizuki and Aizawa implemented the vocabulary-size test (VST) and an affix test created by the authors to measure participants’ vocabulary size and affix knowledge and examined their relationship. The affix test they used comprised multiple-choice questions with four choices, of which the participants were instructed to choose the correct one corresponding to the meaning of a target affix (prefix or suffix), which was accompanied by three pseudo words. The results of the study showed that there were correlations (a) between learners’ vocabulary size and prefix knowledge ($r = 0.58$) and (b) between their vocabulary size and suffix knowledge ($r = 0.54$). In other words, it was revealed that learners with large vocabulary size knew more English affixes than ones with a small amount of vocabulary. This result may not be surprising because it has been reported that morphological clues in new words are used in learning by both L1 speakers (Brusnighan & Folk, 2012) and L2 learners (Paribakht & Wesche, 1999). It should be noted that the type of participants’ affix knowledge that Mochizuki and Aizawa measured was receptive knowledge. It is thus unclear if participants can ascertain the meanings of affixes when they are presented solely. Moreover, this study did not address the relation between lexical inferencing with morphological clues and learners’ vocabulary size.

Zhang and Koda (2012) investigated such relation within a framework of structural equation modeling, focusing on “the ability to analyze multimorphemic English words appropriately into their morphological units and correctly identify the root on which the meaning of each target word
was based” (p. 1201), or their morphological awareness. They examined whether Chinese EFL learners’ morphological awareness contributed to their L2 vocabulary knowledge (the size and depth of vocabulary) and reading proficiency directly and indirectly through the mediation of lexical inferencing ability. The results of the study demonstrated the following points: (a) Chinese EFL learners’ morphological awareness directly contributed to vocabulary knowledge and (b) Chinese EFL learners’ morphological awareness contributed to vocabulary knowledge indirectly through the mediation of lexical inferencing ability. In their discussion, Zhang and Koda argued that analyzing words into morphemes (e.g., affix, base) helps L2 learners’ lexical inferencing, which is the reason for the indirect contribution of morphological awareness toward vocabulary knowledge through lexical inferencing ability.

Putting these studies together allows us to make the following suppositions. Because it was found that (a) there is a positive relation between learners’ vocabulary size and affix knowledge and (b) learners’ ability to analyze words into morphemes contributes to vocabulary knowledge through lexical inferencing ability, it is probable that learners gain skills to break down words into morphological units and integrate their meanings as they increase their vocabulary knowledge, resulting in incidental gain in affix knowledge. Thus, it is possible that learners with a larger vocabulary size succeed in lexical inferencing with morphological clues.

1.4 The Present Study

Previous studies have shown that L2 learners made use of morphological clues contained in unknown words for lexical inferencing while reading a text. Several studies, however, suggest that L2 learners’ use of morphological clues might not contribute to successful lexical inferencing. Therefore, it is necessary to clarify whether L2 learners succeed in inferring the meaning of an unknown word when a prefix of the word is available for them to infer word meaning in detail. In particular, the availability of affix clues has not been fully examined (Hamada, 2014). Thus, the current study will focus on affix availability. In addition, some previous studies have found there to be a close relationship between L2 lexical inferencing led by learners’ use of morphological clues and vocabulary size. Consequently, it is worthwhile to investigate the effect of vocabulary size on success in lexical inferencing resulting from use of morphological clues, especially derivational affixes, in unknown words.

Thus, the present study aims to investigate Japanese EFL learners’ lexical inferencing in reading from the perspective of affix availability and learner vocabulary size. Of the derivational affixes, the present study focused on prefixes. This is because most prefixes add additional meaning to the base of a word, whereas suffixes mainly function as morphemes that change the words’ part of speech. The present study concerns itself with inferring word meanings, so it is reasonable to focus on learners’ use of prefixes in lexical inferencing. The research questions (RQs) posed to address the aims of the present study are formulated below:
RQ1: Does the availability of a prefix clue in an unknown word contribute to lexical inferencing by Japanese EFL learners?

RQ2: Does the effect of the availability of a prefix clue in an unknown word on lexical inferencing by Japanese EFL learners differ in respect of their vocabulary size?

2. Method

The present study contains two pilot studies (Pilot Study 1 and 2) and one main experiment. The two studies were administered to select target words and create sentences serving as material for the main experiment, which was conducted to meet the aims of the present study and to answer the RQs above.

2.1 Pilot Study 1

The purpose of the first pilot study was to select target words for the material of the main experiment. Prefixes in the target words were divided into two types in terms of their availability: ones that participants can use, as they know their meanings (hereafter “available condition”) and ones that participants cannot use, as they do not know their meanings (hereafter “unavailable condition”), based on the results of Pilot Study 1.

Participants. Ten Japanese undergraduate and graduate students participated in Pilot Study 1. They majored in humanities, engineering, and social studies.

Material. To judge what kind of prefixes participants were able to use and not use, a prefix test was invented by the author and administered to them. This test included 29 prefixes. They were extracted from Nation’s (2013) sequenced list of derivational affixes for learners of English. Based on the format used in Mochizuki and Aizawa’s (2000) affix test, three words that consisted of a prefix and a pseudo base were presented to participants per prefix (see Appendix A). The prefixes in the three pseudo words were underlined and participants were asked to write down their meanings in their L1 (i.e., Japanese). In doing so, the participants’ reproductive knowledge of the prefixes was measured, ensuring their recall of the prefix meanings without any support.

Scoring and results. With reference to Ushiro et al.’s (2013) criteria, participant responses to the prefix test were rated on the basis of a three-point scale (0: unsuccessful, 1: partially successful, 2: successful). Successful meant that responses completely accorded with the meaning of a prefix, partially successful that they were not totally equal to but related to the meaning of a prefix, and unsuccessful that they had nothing to do with the meaning of a prefix (see Table 1). The scoring began with the rating of 30% of all responses by a graduate student majoring in English education and the author.
Table 1

<table>
<thead>
<tr>
<th>Point</th>
<th>Scale</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Successful</td>
<td>外に (“out”)</td>
</tr>
<tr>
<td>1</td>
<td>Partially successful</td>
<td>例外 (“exception”)</td>
</tr>
<tr>
<td>0</td>
<td>Unsuccessful</td>
<td>大量の (“vast”), 横に広がる (“widen”)</td>
</tr>
</tbody>
</table>

The inter-rater agreement was 87.36%, κ = .778, p < .001, and discrepancies were resolved through discussion between the raters. Finally, the rest of the responses were rated by the same raters. Based on the result, 11 prefixes with higher marks were chosen as the prefixes in the available condition and 11 prefixes with lower marks were selected as the prefixes in the unavailable condition. Table 2 summarizes the descriptive statistics of the prefixes of both the available and unavailable conditions.

Table 2

<table>
<thead>
<tr>
<th>Condition</th>
<th>M</th>
<th>95% CI</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Available (n = 11)</td>
<td>1.66</td>
<td>[1.48, 1.83]</td>
<td>0.27</td>
</tr>
<tr>
<td>Unavailable (n = 11)</td>
<td>0.49</td>
<td>[0.24, 0.74]</td>
<td>0.37</td>
</tr>
<tr>
<td>Total (N = 22)</td>
<td>1.07</td>
<td>[0.77, 1.37]</td>
<td>0.67</td>
</tr>
</tbody>
</table>

Note. The maximum possible score was 2.00.

Selection of target words. Target words for the material of the main experiment were selected on the following basis: A target word consists of a prefix selected through the pilot study and a noun that is below Level 5 of the JACET 8000 vocabulary list (Japan Association of College English Teachers [JACET], 2003) or assumed to be known to the group of participants (i.e., Japanese undergraduate and graduate students). The target words and the prefixes selected through this pilot study are summarized in Appendix B.

2.2 Pilot Study 2

Pilot Study 2 was conducted (a) to create a sentence for each target word and (b) to ensure that the sentences created were not informative enough to infer the meaning of a target word.

Participants. Ten Japanese undergraduate and graduate students, who had not participated in Pilot Study 1, participated in this pilot study. They majored in humanities, engineering, and international studies.
Material. Two sentences were created for each target word, and the total number of the sentences numbered 44. Words in Level 5 or higher in the JACET 8000 vocabulary list (JACET, 2003) were replaced with high-frequency words other than the target words. All target words were replaced by parentheses. This is because the purpose of this preliminary study was to create sentences whose contextual information would not help participants infer the meaning of the target words. Participants were asked to infer the meaning of the target word, which was missing from the parentheses in the sentence, and to write the inferred meaning on the sheet in their L1.

Scoring and results. The way of scoring participants’ responses was the same as that of Pilot Study 1. The inter-rater agreement was 84.85%, κ = .659, p < .001, and discrepancies were solved through discussion between the raters. Finally, 22 sentences whose scores were lower than the others were chosen for the material of the main experiment based on the results.

2.3 Main Experiment

Participants. The participants were a total of 35 Japanese undergraduate and graduate students (13 males and 22 females; average age = 20.49; range = 18–24), who had participated in neither Pilot Study 1 nor 2. They majored in varied subjects, such as humanities, engineering, art and design, etc. Some participants reported their qualifications or scores on large scale English tests (i.e., EIKEN, TOEIC, or TOEFL) on the questionnaire that was distributed before the experiment began. Taking their responses as roughly indicative of the group as a whole, we can assume that the English proficiency of the participants in the present study ranged approximately from pre-intermediate to intermediate. Participants were divided into two vocabulary-size groups: the upper (M = 5606.84, SD = 248.75, 95% CI [5483.13, 5730.54], Min/Max = 5385/6346) and the lower (M = 4683.26, SD = 501.21, 95% CI [4425.56, 4940.95], Min/Max = 3269/5269) and the total was M = 5158.24, SD = 607.04, 95% CI [4949.72, 5366.77], Min/Max = 3269/6346. A t-test result of the scores on the VST showed a significant difference between the two groups, t(23.13) = 6.84, p < .001, d = 2.36.

Materials.

Lexical inferencing task. The lexical inferencing task created by the author included a total of 22 questions comprising sentences selected after Pilot Study 2, each of which contained a target word. All the target words were underlined. Participants were told to make their utmost effort to infer the meaning of a target word (Hamada, 2014) and write the inferred meaning in the blank on the sheet in their L1 (see Appendix C). Participants were also asked to judge whether they already knew the target word in the sentence prior to undertaking the experiment and to correspondingly check either the “yes” or “no” box.

Vocabulary-size test. To measure each participant’s vocabulary size, the Mochizuki Vocabulary Size Test in Aizawa and Mochizuki (2010) was adopted for this experiment. This is because this VST was developed for Japanese EFL learners and can measure a test taker’s vocabulary size to a maximum of 7,000 words. The participants choose one English word
corresponding to a Japanese definition out of six options for each question. In this experiment, six sections of the VST (vst 22–72) were used.

**Prefix test.** A prefix test, which was the same as the one used in Pilot Study 1, was used in the main experiment, with the following exception: It included 22 target prefixes matching those of the target words. This test was conducted in the main experiment to confirm that the division of the prefixes into the available and unavailable conditions that was undertaken in Pilot Study 1 was applicable to the main experiment.

**Procedure.** The experiment was conducted with participants either individually or in groups. Before it began, both oral and written explanations of the purpose and procedure of the main experiment were given to participants by the author. Then, the author received the participants’ informed consent and started the procedure. First, participants were instructed to work on the VST. They were given three minutes to answer questions in each section of the VST. After finishing the VST, the participants were told to engage in the lexical inferencing task. Finally, the prefix test was administered. Both the lexical inferencing task and the prefix test were conducted under no time limit. Almost all participants went through the whole procedure in approximately 60 minutes.

**Scoring and data analyses.**

**Prefix Test.** The way of scoring participants’ responses was the same as that of Pilot Study 1. The inter-rater agreement was 88.64%, $\kappa = .795$, $p < .001$, and discrepancies were solved through discussion between the raters. To achieve the purpose mentioned above, a 2 (Experiment [between]: Pilot Study 1 vs. main) × 2 (Prefix [within]: available vs. unavailable) analysis of variance (ANOVA) was conducted for the scores of the prefix tests administered in Pilot Study 1 and the main experiment.

**Lexical Inferencing Task.** The way of scoring the lexical inferencing task was the same as that of the prefix test in Pilot Study 1. Table 3 shows an example of scoring for the lexical inferencing task. The inter-rater agreement was 80.91%, $\kappa = .699$, $p < .001$, and discrepancies were solved through discussion between the raters. Words that participants judged as known words and for which they wrote the correct meanings were excluded from analysis.

Table 3

<table>
<thead>
<tr>
<th>Point</th>
<th>Scale</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Successful</td>
<td>不安 (&quot;unrest&quot;)</td>
</tr>
<tr>
<td>1</td>
<td>Partially successful</td>
<td>争い (&quot;struggle&quot;)</td>
</tr>
<tr>
<td>0</td>
<td>Unsuccessful</td>
<td>停電 (&quot;power failure&quot;)</td>
</tr>
</tbody>
</table>
To statistically compare the effect of the prefix availability with that of the groups’ difference in participants’ vocabulary size, a 2 (Vocabulary [between]: upper vs. lower) × 2 (Prefix [within]: available vs. unavailable) ANOVA was conducted for the scores of the lexical inferencing task.

3. Results

3.1 Prefix Test

The descriptive statistics of the prefix test conducted in the main experiment is summarized in Table 4. The results from the two-way ANOVA for the prefix-test scores showed a main effect of availability of the prefix, \( F(1, 20) = 56.83, p < .001, \eta^2 = .70 \). In addition, the result indicated that there was statistically no difference between the two experiments, \( F(1, 20) = 0.02, p = .896, \eta^2 = .00 \). Moreover, the ANOVA did not yield a significant interaction between the availability of the prefixes and the difference between the two experiments, \( F(1, 20) = 0.01, p = .913, \eta^2 = .00 \). The descriptive statistics of the prefix tests above and the significant difference in prefix availability showed that the prefixes in the available condition scored significantly higher than those in the unavailable conditions. In addition, because the main effect of the experiments and the interaction was not found, it can be said that the dichotomy between the conditions of the prefixes in the main experiment matches that of Pilot Study 1. Thus, it became clear that the division of the prefix availability into the two conditions (i.e., the available and unavailable conditions) in the pilot study was applicable to the main experiment.

Table 4
Descriptive Statistics of the Prefix Test in the Main Experiment

<table>
<thead>
<tr>
<th>Condition</th>
<th>( M )</th>
<th>95% CI</th>
<th>( SD )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Available (( n = 11 ))</td>
<td>1.62</td>
<td>[1.34, 1.92]</td>
<td>0.35</td>
</tr>
<tr>
<td>Unavailable (( n = 11 ))</td>
<td>0.50</td>
<td>[0.24, 0.74]</td>
<td>0.47</td>
</tr>
<tr>
<td>Total (( N = 22 ))</td>
<td>1.06</td>
<td>[0.74, 1.39]</td>
<td>0.73</td>
</tr>
</tbody>
</table>

*Note.* The maximum possible score was 2.00.

3.2 Lexical Inferencing Task

Table 5 summarizes the descriptive statistics of the scores of the lexical inferencing task. The results of a two-way ANOVA conducted for the scores on the lexical inferencing task revealed the following points. Regarding prefix availability, there was a statistically significant difference between the available and unavailable conditions, \( F(1, 33) = 118.68, p < .001, \eta^2 = .57 \). Also, the ANOVA yielded a main effect of vocabulary size, \( F(1, 33) = 8.52, p = .006, \eta^2 = .20 \). This indicates that there was a significant difference between the upper and lower groups of
participants’ vocabulary size. However, the results did not show an interaction between prefix availability and vocabulary-size group, $F(1, 33) = 0.02, p = 894, \eta^2 = .00$.

Table 5

<table>
<thead>
<tr>
<th>Group</th>
<th>Available condition</th>
<th>Unavailable condition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>95% CI</td>
</tr>
<tr>
<td>Upper ($n = 18$)</td>
<td>1.24</td>
<td>[1.14, 1.34]</td>
</tr>
<tr>
<td>Lower ($n = 17$)</td>
<td>1.07</td>
<td>[0.95, 1.19]</td>
</tr>
<tr>
<td>Total ($N = 35$)</td>
<td>1.16</td>
<td>[1.08, 1.23]</td>
</tr>
</tbody>
</table>

Note. The maximum possible score was 2.00.

4. Discussion

4.1 The Effect of a Prefix Clue on L2 Lexical Inferencing (RQ1)

The ANOVA for the scores on the lexical inferencing task yielded a main effect of prefix availability. Taken together, this result and the mean scores in Table 5 indicate that the score on the lexical inferencing task in the available condition is significantly higher than in the unavailable condition. This result and the fact that the effect was large ($\eta^2 = .57$) together indicate that the availability of prefixes in target words strongly contributed to the successful inference of word meanings. This suggests that EFL learners probably used morphological clues in unknown words to successfully infer word meanings. This supports the findings of prior studies (de Bot et al., 1997; Haastrup, 1991). De Bot et al. (1997) proposed that learners might use information such as morphological clues, contextual information, and world knowledge. Drawing on both de Bot et al.’s (1997) explanation of L2 lexical inferencing and our results, we can assume that a prefix clue would help EFL learners connect the unknown word with their conceptual knowledge, leading them to successfully infer word meaning. In addition, the results suggest that learners used the clues extracted from the prefix in the target words. Because a previous study (Hamada, 2014) suggested that it was necessary to focus on L2 learners’ use of derivational affixes, which were assumed to be more complex than compound nouns, for lexical inferencing, it appears that the finding that they are able to use prefix clues for lexical inferencing might have led us one step further. From this finding, it can be assumed that L2 learners may be sensitive not only to word-level morphemes (free morphemes) but also to affix-level ones (bound morphemes).

4.2 The Effect of Vocabulary Size on L2 Lexical Inferencing Using a Prefix Clue (RQ2)

The result of the ANOVA and the scores in Table 5 showed that the scores of the participants in the upper group for vocabulary size were significantly higher than those of the
participants in the lower group. However, the effect of vocabulary size cannot be said to be large according to the effect size of the main effect of vocabulary size ($\eta^2 = .06$). In addition, the ANOVA did not yield an interaction between prefix availability and participant vocabulary size. These results suggest that the effect of a prefix clue on L2 lexical inferencing might not be the result of L2 vocabulary knowledge. This can be explained from the perspectives of (a) L2 morphological awareness and (b) world knowledge, as below.

First, the morphological awareness of all the participants in the present study might be equally sufficient to make use of the prefix clues in the target words for successful lexical inferencing. L2 morphological awareness contributes to L2 vocabulary knowledge through lexical inferencing (Zhang & Koda, 2012), so the size of vocabulary is assumed to be dependent on morphological awareness. In addition, as discussed in Section 4.1, the participants in the present study strongly benefited from the prefix clues in lexical inferencing, which suggests that they have the ability to analyze words into morphemes. Taken together, these presumptions allow us to state that the participants in the present study equally benefited from the prefix clues because of the same or similar level of morphological awareness, resulting in the absence of an interaction between prefix availability and L2 vocabulary size.

Second, the participants in the present study might use world knowledge over morphological and contextual clues. When L2 learners infer word meaning, they are supposed to use linguistic knowledge (e.g., morphological clues), information from the context containing an unknown word, and world knowledge (de Bot et al., 1997; Haastrup, 1991). This was proven by Nassaji’s (2003) empirical study reporting that nearly half (46.2%) of the knowledge source that ESL learners used to infer the meanings of unknown words was world knowledge. However, the present study unfortunately neither investigated to what extent the participants used their world knowledge nor controlled for the availability of world knowledge that the participants could use. Thus, this point needs to be examined in future research.

5. Conclusion

In the present study, (a) the effects of a prefix clue in an unknown word and (b) the relationship between the use of prefixes and L2 vocabulary size on Japanese EFL learners’ lexical inferencing in reading were examined. The results of the lexical inferencing task revealed that the availability of prefixes in unknown words contributed to EFL learners’ success in inferring word meanings (RQ1). This suggests that EFL learners can make use of prefix clues, which are assumed to be more complex than free morphemes, for successful lexical inferencing when these are available to them. Also, the results of the present study did not show the existence of an interaction between prefix availability and L2 vocabulary size, suggesting that the effects of a prefix clue in an unknown word on EFL lexical inferencing was not related to L2 vocabulary size (RQ2). There are two possible reasons for this absence of an interaction: First, all participants were proficient
Although this study has derived at insightful findings and taken the discoveries of past studies on EFL learners’ lexical inferencing one step further, there are also limitations that should be considered. First and foremost, a wide range of participants are needed to reveal the nature of L2 lexical inferencing in more detail. Previous studies have claimed that L2 learners’ vocabulary size affects the use of morphological clues for lexical inferencing (e.g., Zhang & Koda, 2012); however, the present study did not support this. Also, as discussed above, the participants in this study might have morphological awareness that is good enough to use prefix clues in unknown words to succeed at inferring word meaning. This suggests that it is possible for a group of L2 learners who are of the same quality as the participants in the present study to make use of prefix clues for successful lexical inferencing. Thus, the same or similar research should be conducted with L2 learners with different levels of vocabulary size, and in particular, with those who are less proficient (e.g., high school students) than the participants in the present study (i.e., university students). This will enable us to observe the effect of prefix availability on lexical inferencing in terms of the development of L2 vocabulary size.

Second, observing learners’ on-line processing may be necessary to describe what kind of clues they actually used during lexical inferencing. As one of the possible reasons for the absence of an interaction between prefix availability and vocabulary size, it was suggested that the participants in the present study might use world knowledge more than morphological or contextual clues. This is supported by Nassaji’s (2003) study, which revealed that ESL learners use world knowledge the most and morphological knowledge the second most using a think-aloud method requiring participants to verbalize and report on what they were thinking while engaging in the task (Nassaji, 2003). Thus, it would be worthwhile to examine L2 learners’ use of prefix clues during lexical inferencing with the same materials used in the present study through the methodological use of think-aloud protocols. To sum up, resolving the limitations mentioned above is necessary for the further clarification of the mechanism underlying L2 lexical inferencing.

The findings of the present study have some pedagogical implications for teachers in EFL classrooms. It is advisable for teachers to note the fact that learners need to know that (a) words can be broken down into the smallest meaningful units, and (b) integrating such morpheme meanings may lead learners to succeed at lexical inferencing. For instance, it would be preferable for teachers to let learners guess the meaning of the word *interchange*, once they have learnt that some English words can be broken down through the English-teaching curriculum. In doing so,
learners may improve their morphological awareness, which is assumed to indirectly contribute not only to the learning of new words but also to reading comprehension (Zhang & Koda, 2012).

However, there are two points that teachers should bear in mind. First, the findings of the present study become applicable in a situation in which learners know the meanings of both the prefix and the base in the target word. Thus, prefixes and words (or bases) in unknown words should be learnt before inferencing (i.e., prefixes and bases need to be available to learners). Second, because it is assumed that learners connect an unknown word to the corresponding concept in lexemes (de Bot et al., 1997), the teacher should ensure that learners know that the concept that the target derivational word to be inferred by the learners represents must already be known to them. For example, even if a learner could analyze the word biplane into bi “two” and plane, it would be no use inferring the word unless the learner knew what a biplane is. Taking the above points into consideration, teachers can lead learners to successful lexical inferencing.

Acknowledgment

I would like to thank Professor Yuji USHIRO and his seminar members for their helpful advice and support in ameliorating the present study. I also thank three anonymous reviewers for their helpful suggestions.

References


Appendices

Translation of Japanese sentences are in parentheses.

Appendix A: Example of the Prefix Test in Pilot Study 1

1. antiphon nth antiwomped antisicked

<table>
<thead>
<tr>
<th>Prefixes</th>
<th>Target words</th>
<th>Prefixes</th>
<th>Target words</th>
</tr>
</thead>
<tbody>
<tr>
<td>anti-</td>
<td>antihero</td>
<td>arch-</td>
<td>archenemy</td>
</tr>
<tr>
<td>re-</td>
<td>redescription</td>
<td>ab-</td>
<td>abnormality</td>
</tr>
<tr>
<td>non-</td>
<td>nonmember</td>
<td>per-</td>
<td>peruse</td>
</tr>
<tr>
<td>un-</td>
<td>unrest</td>
<td>ante-</td>
<td>anteroom</td>
</tr>
<tr>
<td>sub-</td>
<td>subeditor</td>
<td>bi-</td>
<td>biplane</td>
</tr>
<tr>
<td>mid-</td>
<td>midship</td>
<td>de-</td>
<td>depopulation</td>
</tr>
<tr>
<td>mis-</td>
<td>misdirection</td>
<td>circum-</td>
<td>circumnavigation</td>
</tr>
<tr>
<td>pre-</td>
<td>prehistory</td>
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<td>oblong</td>
</tr>
<tr>
<td>neo-</td>
<td>neogeography</td>
<td>pro-</td>
<td>protractor</td>
</tr>
<tr>
<td>dis-</td>
<td>discomfort</td>
<td>ex-</td>
<td>exposition</td>
</tr>
<tr>
<td>ad-</td>
<td>adjudgement</td>
<td>com-</td>
<td>compassion</td>
</tr>
</tbody>
</table>

Appendix B: Target Words with Prefixes Selected Through Pilot Study 1

Available condition

Unavailable condition

Appendix C: Example of the Lexical Inferencing Task

I heard a news story about a crime which happened this morning. The reporter said unrest was spreading all over the town.

<table>
<thead>
<tr>
<th>この英文中の下線が引かれた語の意味を下の欄に日本語で記入してください。</th>
<th>この単語を知っていましたか？</th>
</tr>
</thead>
<tbody>
<tr>
<td>意味：</td>
<td>□はい  □いいえ</td>
</tr>
</tbody>
</table>

(Direction: Write down the meaning of the underlined words in the blank space below in Japanese.)

(Question: Did you already know this word before?)

(Choices: □Yes   □No)