The Effects of Morphological and Contextual Clues on EFL Readers’ Lexical Inference

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Abstract

The present study investigates the effects of morphological and contextual clues on Japanese EFL reader’s lexical inferences. A total of 148 undergraduates participated in the experiment. Group A (n = 70) completed the word-form based lexical inference test which examines the effects of morphological clues, while Group B (n = 78) completed the context based lexical inference test which examines the effects of contextual clues on determining the word class and inferring the meaning. After they completed each test, both groups took part in a common lexical inference test which aims at examining the effects of two types of inference processes: morphology based, and context based processes. The results demonstrated that: (a) contextual clues had stronger effects on the success of the judgment of word classes; (b) the knowledge of derivational suffixes helped the word class judgment; (c) contextual clues had advantages over morphological clues on inference of the meaning; and (d) differences of two lexical inference processes did not have much effect on the success of inference. Based on these results, some implications for further research and instructions of lexical inference strategy are provided.

1. Introduction

Learners’ vocabulary knowledge is important to be a proficient reader. There are several strategies for readers to cope with unknown words, such as consulting a dictionary, ignoring, and inferring the meaning (e.g., Fraser, 1999; Nation, 2001). Inferring word meanings is an effective strategy for development of reading skills because it minimizes the risk of impeding the reading process (Camrée, Kameenui & Coyle, 1984). Moreover, inference is recommended in the Course of Study for high schools (Ministry of Education, Culture, Sports, Science, and Technology, 1999) as a strategy to foster readers’ abilities and the positive attitudes toward reading. In this recommendation for instruction, lexical inference is defined as an activity in which we utilize context information and knowledge of sentence structure, word formation and derivatives.

Although the use of many clues is recommended in the definition, it is not clear how each of the clues works in the inference process and what type of inference processes work better than others. As Nagy and Scott (1997, p. 275) state “context and morphology (word parts) are the two major sources
of information immediately available to a reader who comes across a new word,” the present study focuses on these clues and examine their effects on the lexical inference.

2. Literature Review

2.1 Lexical Inference Processes

There are two types of processes in the lexical inference: (a) The word-form based process, which “involves unlocking a word’s meaning by examining its morpheme, or meaningful parts, such as morpheme, prefixes and suffixes, inflected endings, and Latin or Greek roots” (Baumann et al., 2002, p. 153); and (b) The context based process that “involves inferring a word’s meaning by scrutinizing surrounding text, which includes syntactic and semantic linguistic cues provided by preceding and succeeding words, phrases, and sentences” (Baumann et al., p. 153). Many preceding studies examined a reader’s lexical inference process employing think-aloud protocols. Some of them reported that a reader uses the word-form based process when they guess the meaning of a word (e.g., Huckin & Bloch, 1993). On the other hand, other research results suggested that a reader infers a word meaning from contexts (e.g., van Daalen-Kapteijns et al., 2001; Yamauchi, 1995). Yamauchi examined Japanese EFL students’ lexical inference processes and found that they used the same context based process as a strategy proposed by Clarke and Nation (1980), which will be introduced in the next section.

2.2 Strategies of Lexical Inference

Baumann et al. (2002) compared the effects of morphological and contextual analysis instruction on fifth-grade students’ (L1 = English) lexical inferences, and found a strong effect from both instruction. However, most of the strategy instruction do not recommend the use of morphological clues and propose the context based lexical inference strategy. A well known strategy among them is Clarke and Nation’s (1980) inductive procedure, which has five steps: (a) determine the part of speech; (b) search clues in the immediate context; (c) search for clues in the wider context; (d) guess the meaning; and (e) check the inferred meaning based on the following four clues: (1) the part of speech, (2) the context, (3) the meaning of the word parts, or (4) a definition provided in a dictionary (Nation, 2001, p. 257). It is worth noting that a morphological clue, which is perceived in an automatic manner in the written word recognition process (Taft, 1991), is not used as the clue to derive an inference in this strategy. Nation explains that it is because the chances of failure rise as the result of their misunderstanding of word parts, such as roots or suffixes. Huckin and Bloch (1993) also mention that the incorrect use of morphological information results in learners reshaping the grammatical context to fit their inference and they report the positive effects of contexts on readers’ lexical inferences. Therefore, contextual clues are predicted to be more advantageous than morphological clues on guessing a word meaning.

Although the meaning could be misunderstood by incorrect morphological analyses, the knowledge of affix will help a reader to judge the part of speech, which is the first step of the five-step
procedure mentioned above (Clarke & Nation, 1980). In recent studies, the relationship between the knowledge of affixes and vocabulary size is examined. Mochizuki and Aizawa (2000), for instance, found medium correlation ($r = .65$) between EFL learners' vocabulary size and affix knowledge, and also mentioned “[s]uffix knowledge facilitates inferring the meaning of a new word by indicating the word class of the word” (p. 293). Furthermore, according to Nation (2001, p. 265), 21.9% of the different types in a written text are inflected and 12.8% have derivational affix. Those affixes help a reader to judge the part of speech even if the reader is unable to grasp the contextual clues or even when the context does not give any clue. Hence, it would lead a learner to successfully use morphological clues in determining the word classes.

2.3 Hypotheses and a Research Question

Although many researchers investigated how a reader processes unknown words and proposed some procedures to infer their meanings, no study directly compared the effects of morphological and contextual clues on the judgement of a word class and inference of a meaning. Thus, this study aimed at examining the effects of morphological and contextual clues on the success rates of lexical inference in each aspect and the following hypotheses and a research question are addressed.

Hypothesis 1: Readers who used morphological clues perform better than readers who used contextual clues on the judgement of a word class.

Hypothesis 2: Readers who used contextual clues perform better than readers who used morphological clues on the inference of a word’s meaning.

Research Question: Which of the inference processes lead to greater success in the inference of unknown words’ meanings: word-form based process, or context based process?

3. Method

3.1 Participants

A total of 148 university students participated in this study, whose Majors were biology, sciences, medical technology, and Japanese linguistics and cultural study. Participants were divided into two experimental groups (Group A: $n = 70$; Group B: $n = 78$) to which different sets of tests were administered.

3.2 Materials

First, participants in both Groups A and B took part in the reading proficiency test which consisted of three passages selected from a reading section of TOEFL practice test (Educational Testing Service, 2002). The number of items was reduced to 21 by removing questions asking a reader the word meaning. Secondly, two types of the Lexical Inference Test I, the word-form based inference test (WBT) and the context based inference test (CBT), were administered to Group A and Group B,
respectively. The examples were presented in Table 1 below. The WBT, which contained ten target words in isolation from the contexts, was aimed at examining the effects of morphological clues on the success rates of lexical inferences. Three questions followed each item: (a) Do you know this word; (b) What does it mean; and (c) What is its word class? On the other hand, the CBT was aimed at examining the effects of contextual clues on the success rates of lexical inferences. This test contained ten short passages in which the target words were replaced by blanks. Each item was followed by two questions: (1) What part of speech suits the blank; and (2) What word fills the blank? Lastly, both Groups A and B completed the common Lexical Inference Test II, which presented the ten target words in short passages, and asked participants their knowledge of the word and to write its meaning either in Japanese (L1) or English (L2). Ten target words were selected from two books designed for learners of English, Temma (1985), and McCarthy and O'Dell (2002).

<table>
<thead>
<tr>
<th>Type of Tests</th>
<th>An Example from Each Test Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lexical Inference Test I</td>
<td>WBT <strong>Recourse</strong></td>
</tr>
<tr>
<td></td>
<td>CBT The police officer tried to get the demonstrators to stop blocking traffic, but they refused. In the end, the only ____ was to arrest them.</td>
</tr>
<tr>
<td>Lexical Inference Test II</td>
<td>The police officer tried to get the demonstrators to stop blocking traffic, but they refused. In the end, the only <strong>recourse</strong> was to arrest them.</td>
</tr>
</tbody>
</table>

*Note. WBT was provided only for Group A, and CBT was provided only for Group B as the Lexical Inference Test I. The target word was underlined.*

3.3 Procedure

The tests were carried out in four 75-minute regular English classes in the first term of 2003. The reading proficiency test was conducted in thirty minutes. Then, the Lexical Inference Test I was conducted in fifteen minutes followed by the Lexical Inference Test II which lasted for twenty minutes. The time allocation was decided based on the results of a pilot test.

3.4 Scoring and Data Analyses

Participants’ responses to the lexical inference tests were scored by two raters. The responses which fitted to both the definition of a word and the context were marked 2 points. Those which did not carry an important semantic feature of the target word but which were close to the meaning of the target word and appropriate for the context were marked 1 point. Those which fitted neither a definition nor a context were marked 0 points. The final inter-rater reliability on overall scales was high ($r = .96$). Rating discrepancies were solved by a third rater by considering each rater’s scoring justifications. Participants’ responses to the Lexical Inference Test I were also scored in terms of the word classes of target words. The right responses were given 1 point. There were discrepancies in the total numbers of items since some participants knew several target words; therefore, success rates were
analyzed by the proportion of correct answers. Two-way ANOVAs, with the significance level $p < .05$, were used with SPSS 10.0 for Windows.

4. Results and Discussions

4.1 Reading Proficiency

According to the results of the reading proficiency test, participants in Groups A and B were classified into three groups: the high group (HG: Group A, $n = 18$; Group B, $n = 19$), the middle group (MG: Group A, $n = 34$; Group B, $n = 36$), and the low group (LG: Group A, $n = 18$; Group B, $n = 24$). A $2 \times 3$ (Group $\times$ Reading Proficiency) ANOVA indicated no interaction between two independent variables: $F(2, 142) = 8.183$, n.s. The main effect was significant only for L2 reading proficiency: $F(5,142) = 150.466$, $p = .000$. The Tukey post hoc test confirmed significant differences among three proficiency groups (HG: $M = 17.41$, $SD = 1.32$; MG: $M = 13.10$, $SD = 1.37$; LG: $M = 7.93$, $SD = 1.90$). Therefore, two groups were well divided according to the participants' reading proficiencies.

4.2 Effects of Morphological and Contextual Clues on Judgments of Word Classes

Addressing Hypothesis 1, a $2 \times 3$ (Clue Types $\times$ Reading Proficiency) ANOVA was performed on the results of the Lexical Inference Test I in order to examine the effects of morphological and contextual clues on the judgement of words' classes. Figure 1 presents each group's score on the judgement of word class: Group A, $M = 47.14$, $SD = 11.92$; and Group B, $M = 75.55$, $SD = 14.27$. The results of a two-way ANOVA indicated no interaction effects between two independent variables: $F(2, 142) = 8.183$, n.s. The main effect for test type was significant, while the main effect for L2 reading proficiency was not significant: $F(1, 142) = 170.151$, $p = .000$; $F(2, 142) = .059$, n.s., respectively. Those results suggested the advantages of contextual clues over morphological clues on the word class judgements regardless a learner's proficiency level (HG: $M = 61.90$, $SD = 20.14$; MG: $M = 61.33$, $SD = 17.46$; LG: $M = 63.61$, $SD = 22.02$). Therefore, the Hypothesis 1 was not supported.

![Figure 1. Success rates of words class judgements](image-url)
When we examined the score on word class judgment of each word more closely, the necessity of both contexts and morphological clues became clearer. For example, there were four target words to which a suffix -(e)d was attached: detested, prevaricated, misconstrued, and incarcerated. Group B performed well above Group A in three of them: detested (Group A = 8.70; Group B = 98.72); prevaricated (Group A = 4.55; Group B = 94.67); and misconstrued (Group A = 10.94; Group B = 67.16). This was because there were two available word classes indicated by the suffix -(e)d: the past or past participle form of a verb, or an adjective. Hence, readers needed the surrounding context to obtain feedback on their judgement in such cases. On the other hand, there were four cases, dissension, implacable, incarcerated, and repast, in which Group A's means were better than Group B. In all cases, except the case of repast, the target word had either a derivational or an inflectional suffix. In the case of repast, the scores of both groups were low (Group A = 26.15; Group B = 24.62), particularly the scores of Group B was not as high as the other cases. As the result, the score of Group A became higher than that of Group B. In the other three cases, the success rates of Group A exceeded 90.00 (97.01 for dissension, 96.92 for implacable, and 94.12 for incarcerated). Those results indicated the positive effects of derivational suffixes, which were the indexes of only one word class, on the success. For example, a derivational suffix -ion indicated a noun, and a derivational suffix -able indicated an adjective.

Overall results suggested that it is better to search syntactic clues in surrounding context in determining word classes. However, morphological analysis also leads to success when a derivational suffix is attached to the word.

4.3 Effects of Morphological and Contextual Clues on Inference of Word Meanings

Next, a 2 × 3 (Clue Types × Reading Proficiency) ANOVA was conducted on the results of the Lexical Inference Test I in the aspect of meaning addressing the Hypothesis 2. As it is presented in Figure 2 below, the scores of Group B (HG: $M = .73, SD = .41$; MG: $M = .48, SD = .26$; LG: $M = .40, SD = .25$) were higher than Group A (HG: $M = .06, SD = .10$; MG: $M = .04, SD = .00$; LG: $M = .06, SD = .00$) in all proficiency groups. The results of a two-way ANOVA indicated an interaction effect between two independent variables: $F(2, 142) = 4.919, p = .009$. The main effects for test type and L2 reading proficiency were significant: $F(1, 142) = 155.239, p = .000$; $F(2, 142) = 5.997, p = .003$, respectively. As the result indicated, a learner's reading proficiency affected the success rates of meaning inferences. The Tukey post hoc test confirmed the significant differences between HG and MG ($p = .015$), and HG and LG ($p = .016$), but the difference between MG and LG was not significant. Those results supported the Hypothesis 2: contextual clues were more effective than morphological clues to infer the target words' meanings.

It was notable that one of the independent variables, L2 reading proficiency, affected the inference of a meaning in Group B, while it did not affect the judgement of a word class. The results indicated that learners with higher L2 reading proficiency were able to guess the word meanings better than those who have middle or lower L2 reading proficiency when a surrounding context of a target word
was presented. This was because the range of contexts needed to judge word classes and meanings were different. More precisely, a word class of a target word could be determined from a relatively small context, while a reader must understand a wider context in order to infer what the unknown word means. For example, the target word’s part of speech in the following example could be judged if a reader understood the passive structure marked by be and by. However, the meaning of the target word, misconstrued or its synonyms, could not be inferred without understanding the entire sentence. Thus, a learner’s L2 reading proficiency affected his or her comprehension of a larger context, which in turn affected the inference of a word meaning.

*Even plain and basic English can be badly ________ by speakers of other languages.* (target word: misconstrued)

There was another notable point on the participants’ responses to the CBT. The learners wrote their answers in L2 whereas those who completed the WBT answered in L1 even though both of them were permitted to write their answers either in their L1 or L2. The participants in Group B responded in L2 because they activated their knowledge of L2 word associations and engaged in the inference through the medium of L2 when they attempted to find a word which does not interfere with the flow or consistency of a passage. On the other hand, no participants in Group A answered in L2 because they could not find any link to search for relevant L2 synonyms only from the form of an unknown word. This suggested that learners needed known words to activate the L2 lexicon. Furthermore, the students in both Groups A and B answered in L1 on the Lexical Inference Test II, in which both word form and contexts were provided. This also indicated that the participants inhibited the activation of the L2 mental lexicon and started searching for L1 equivalent words once they paid attention to the form of unknown word in a passage.

Hence, as Carnine, Kameenui, and Coyle (1984) stated, it can be concluded that the strategy to infer the meaning from surrounding context minimized the risk of impeding the L2 reading process because readers activate L2 mental lexicon using known words in a passage.

*Figure 2. Success rates of meaning inference (I)*  
*Figure 3. Success rates of meaning inference (II)*
4.4 Effects of Inference Process on Inference of Word Meanings

Addressing the Research Question, a $2 \times 3$ (Types of Inference Processes × Reading Proficiency) ANOVA was performed on the success rates of meaning inferences on the Lexical Inference Test II. As the Figure 3 above presents, the mean score of Group A ($M = .79$, $SD = .37$) became higher than that of Group B ($M = .69$, $SD = .36$). The results indicated no interaction effects between two independent variables; $F (2, 142) = .252$, n.s. The main effect was significant only for L2 reading proficiency; $F (2, 142) = .983$, $p = .000$. The Tukey post hoc test confirmed the differences among three proficiency groups: HG ($M = .41$, $SD = .44$) > MG ($M = .27$, $SD = .30$), $p = .042$; HG > LG ($M = .25$, $SD = .26$), $p = .000$; and MG > LG, $p = .049$. Those results demonstrated that the success rates of meaning inferences were not affected by the type of lexical inference processes, whereas a learner’s L2 reading proficiency had influences on inference of word meanings.

The scores on the Lexical Inference Test II were not significantly different, but Group A ($M = .79$, $SD = .37$) performed slightly better than that of Group B ($M = .69$, $SD = .36$) which indicated the opposite results of the Lexical Inference Test I (Group A: $M = .05$, $SD = .00$; Group B: $M = .51$, $SD = .32$). The success rates of each word’s inference on the Lexical Inference Tests I and II were closely examined in order to investigate the effects of the inference processes (see Table 2 for data).

| Table 2 Mean Score of Inference of Each Target Word on the Lexical Inference Tests I and II |
|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|
| Group A                                         | Test I                                           | 0.06                                           | 0.03                                           | 0.10                                           | 0.12                                           | 0.01                                           | detected                                       |
| Group A                                         | Test II                                          | 0.59                                           | 0.99                                           | 1.01                                           | 0.10*                                          | 0.27                                           | disension                                      |
| Group B                                         | Test I                                           | 0.18                                           | 0.93                                           | 1.25                                           | 0.63                                           | 0.76                                           | expenditure                                    |
| Group B                                         | Test II                                          | 0.23                                           | 1.01                                            | 1.24*                                          | 0.35**                                          | 1.05                                           | implacable                                     |
| Group A                                         | Test I                                           | 0.00                                           | 0.00                                           | 0.00                                           | 0.00                                           | 0.19                                           | incarcerated                                   |
| Group A                                         | Test II                                          | 0.29                                           | 0.64                                           | 0.46                                           | 0.83                                           | 0.09*                                          | Repast                                         |
| Group B                                         | Test I                                           | 0.57                                           | 1.06                                           | 0.53                                           | 1.00                                           | 1.00                                           | unwind                                        |
| Group B                                         | Test II                                          | 0.27**                                         | 0.72**                                         | 0.32**                                         | 0.83*                                          | 0.97*                                          | prevaricated                                  |

Note. Test I: Lexical Inference Test I; Test II: Lexical Inference Test II; Group A completed the WBT as the Test I, whereas Group B completed the CBT. Full marks are 2.00. The asterisks indicate the decrease of mean scores from Test I to Test II.

There were four target words, implacable, repast, unwind, and prevaricated, to which the double asterisks were attached resulted the marked (10% or more) decrease of scores on the second test compared with the first. In particular, all of them except in case of implacable showed decreases only in Group B: repast (-.30), unwind (-.34), and prevaricated (-.21). The wrong responses on those items, which are presented in Table 3, were examined closely and some interesting features were revealed.
Table 3 Responses on the Inference of Three Target Words, Repast, Unwind, and Prevaricated

<table>
<thead>
<tr>
<th>repast</th>
<th>unwind</th>
<th>prevaricated</th>
</tr>
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<tbody>
<tr>
<td>again (もう一度・再び)</td>
<td>windless (無風の・風のない・風が吹かない), do not make waves (波風を立てない), being quiet (静かになる), calm area (風がない所)</td>
<td>take precautions (千防線をはっておく), make a barrier (前に壁を作る), preventing something (防ぐ、先に防いだ), build a wall around oneself (壁に閉じこもった)</td>
</tr>
<tr>
<td>for a long time (長い間), remind (思い出す), pass (過ぎて)</td>
<td></td>
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</table>

Note. Original answer was written in the brackets. Translations were given by the author.

The participants’ wrong responses indicated the possibility of incorrect morphological analyses. For example, the word repast was disassembled into re- and past, which made a reader to infer the meaning in relation to time or a verb pass such as for a long time (長い間) or pass (過ぎて). In the case of a word unwind, participants’ attempt to break it down into un- and wind was correct. However, they perceived the root, wind (twist), to be its heteronym, wind (airstreams), and inferred the meaning as windless (無風の). As for the word, prevaricated, another misleading factor was involved in the participants’ perception of the sound. They disassembled the word into three parts, pre-, varicate, and -e)d, and replaced the middle part by a word with similar sound, barricade. Hence, they inferred the meaning as something related to barrier or defense: for instance, make a barrier (前に壁を作る). Those examples pointed out the deficits of morphological clues as reported by Huckin and Bloch (1993). They called those errors mistaken ID in which a reader perceived a word as another one with similar sound or broke down a word that cannot be divided into meaningful parts. The participants in the present study also made mistakes in identifying the target words or their roots and perceived them as more familiar words and generated an incorrect lexical inference.

The decreases of Group B’s scores indicated that morphological clues raise the risk of impeding the success when they were used as the confirmation clue. The learner might change the correct inference, which was based on contextual clues, to the wrong inference when he or she misunderstood word morphology. In such cases, there would be a danger for a reader to distort the overall meaning of the passage.

5. Conclusions

The present study investigated the effects of morphological and contextual clues in the lexical inferences. There are two findings in relation to the Hypothesis 1: (a) Contextual clues are more reliable in the judgement of word classes than morphological clues regardless a learner’s proficiency; and (b) Knowledge of derivational suffixes helps the word class judgement. As for the Hypothesis 2, there are also two main findings: (1) Contextual clues have advantages over morphological clues on the inference of the meaning; and (2) L2 reading proficiency has an immediate connection with the comprehension of a larger context which in turn affects the ability to guess a target word’s meanings.
The results of the Research Question demonstrated that the types of lexical inference processes do not have much effect on the success of inference. However, the use of morphological clues on the confirmation step (e.g., Clarke & Nation, 1980) is problematic because readers will be misled by their insufficient knowledge of word parts to change to the correct inference based on contextual clues.

There are two limitations in the present study: (a) Passages in this study were not long enough to provide wider contextual clues; and (b) The variety of suffixes was not enough to examine the effects of morphological clues. However, the findings have two pedagogical implications. First, the morphological analysis should be applied only for words to which a derivational suffix is attached. Therefore, it would be preferable to teach students useful suffixes both for the development of lexical inference abilities and for vocabulary learning (e.g., Mochizuki & Aizawa, 2000). Second, the gap filling tasks, which has similar format to the context based inference test in this study, will be useful for readers to practice guessing the target word’s meanings from surrounding contexts. This method also helps a reader to make association between new words with known words because they search a known word which is the synonym of the new word.

References


