The Effects of Language Proficiency on Unfamiliar Word Processing in Listening Comprehension

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Abstract

This study examines the effects of language proficiency on unfamiliar word processing in listening comprehension. Data were collected using the procedures of immediate retrospection without recall support and with stimulated recall. Twenty subjects of two proficiency levels participated in the procedures. Both qualitative and quantitative analyses were made. The results indicate that language proficiency affects the subjects’ use of strategies (inferencing and ignoring) and knowledge sources (e.g. semantics, morphology, and background knowledge) to infer word meaning. Proficient subjects used the inferencing strategy more frequently than less proficient subjects. Proficient subjects also displayed marked differences from less proficient subjects in the use of the knowledge sources. Noticeably, proficient subjects were more able to use their overall understanding of the texts to infer word meaning, whereas less proficient subjects more frequently used clues from the target words, and prosodically salient or heavily repeated words to infer word meaning. The pedagogical implications of these findings are then discussed.

Introduction

Vocabulary is basic to competent listening since it frequently influences subsequent analyses at the higher levels of syntactic and semantic analyses. Vocabulary is frequently recognized as a key problem in second language (L2) listening comprehension (Flowerdew & Miller, 1992; Kelly, 1991; Rost, 1994; Vandergrift, 1999; Vogley, 1995). Developing a large vocabulary is therefore undoubtedly a very important priority for listening comprehension. However, even with a large vocabulary, there may still be words unknown to listeners. Failure to work out the meaning of essential words may impede the overall understanding of the oral text. Therefore, it is crucial for listeners to develop ‘on-line’ skills or strategies to handle unfamiliar vocabulary. While unfamiliar word processing has received considerable attention in second language (L2) reading research, knowledge about how L2 learners process unfamiliar words in listening is limited. The present study was conducted to investigate unfamiliar word processing in listening. In particular, it focuses on the effects of language proficiency on the use of the lexical inferencing strategy in listening.

Listening Strategies

As a result of a growing interest in the cognitive processes underlying L2 listening activities, research on the use of strategies in L2 listening comprehension has
proliferated in the past three decades (e.g. Cai, 2003; Cai & Wu, 2005; Goh, 1997, 2000; Graham & Macaro, 2008; Graham, Santo, & Vanderplank, 2008; Mendelsohn, 1995; O’Malley, Chamot, & Kupper, 1989; Vandergrift, 1996, 1997, 1998, 1999, 2002, 2003). Two types of listening strategy are frequently discussed in the listening literature: metacognitive strategies and cognitive strategies (e.g. O’Malley et al., 1989; Vandergrift, 1996; 2003). Metacognitive strategies are used to ‘oversee, regulate, or direct’ the listening process (Vandergrift, 1999, p. 170) and include planning, monitoring, evaluation and problem identification (Vandergrift, 2003). Cognitive strategies, on the other hand, are used to apply a particular technique to the listening task (Vandergrift, 1999) and include inferencing, elaboration, imagery, summarization, translation, transfer and repetition (Vandergrift, 2003). Findings of this line of research show that the effective use of strategies is crucial to successful listening comprehension and that skilled listeners use the strategies more effectively than less skilled listeners (Bacon, 1992; O’Malley et al., 1989; Vandergrift, 1996, 1997, 2003). For instance, O’Malley et al. (1989) found that proficient listeners were better able to use cognitive strategies to infer the meaning of important unknown words from context (the inferencing strategy), and relate what they heard to general world knowledge and personal experience (the elaboration strategy). They were also more able to apply metacognitive strategies to monitor and control their listening process.

The importance of the use of the inferencing strategy has emerged from these studies. Some researchers have defined inferencing in the L2 context (e.g. O’Malley & Chamot, 1990; Vandergrift, 1996). For instance, in proposing a taxonomy of listening comprehension strategies, Vandergrift (1996, p. 209) defines inferencing as ‘using information within the text or conversational context to guess the meaning of unfamiliar language items associated with a listening task, to predict outcomes, or to fill in missing information’. This definition, together with others provided by the broad literature on inferencing, suggests that inferencing can be classified into different types (linguistic versus non-linguistic inferencing) and into different levels (inferencing at word level versus sentence level and text level) (Britton, van Dusen, Glynn, & Hemphill, 1990; Graesser & Clark, 1985). The focus of the present study is on linguistic inferencing at the word level, i.e. lexical inferencing.

In examining lexical inferencing in reading comprehension, Haastrup (1991, p. 40) defines lexical inferencing as ‘making informed guesses as to the meaning of a word in the light of all available linguistic cues in combination with the learner’s general knowledge of the world, her awareness of the co-text and her relevant linguistic knowledge’. This definition specifies the knowledge sources involved in the lexical inferencing process; the knowledge sources may be linguistic or non-linguistic, and they may be taken from the text or outside the text. However, this definition does not specify the cognitive nature of the inferencing process. According to Rickheit, Schnotz, and Strohner (1985), inferences are cognitive processes in comprehenders’ minds as they construct a new mental representation based on textual information and context. Following these, lexical inferencing may then be defined as a constructive cognitive process in which comprehenders use linguistic cues, their general knowledge of the world, their understanding of the co-text and their linguistic knowledge to establish a word meaning that results in a coherent interpretation of the text.
Although the use of the lexical inferencing strategy has not received separate research attention in listening comprehension, studies examining the listening strategies in general shed some light on this issue. For instance, Vandergrift (1997) found that both novice-level and intermediate-level listeners used the inferencing strategy frequently. Novice listeners tended to use cognates, and contextual as well as extralinguistic cues (e.g. background noise, tone of voice, and relationships between speakers) for inferencing as a result of their weak linguistic processing ability. Goh (2002) found that L2 listeners used contextual clues, known content words, general world knowledge and linguistic knowledge of L2 to infer the meaning of unknown words. In a more recent study, Vandergrift (2003) observed that proficient and less proficient learners used the inferencing strategy to a similar extent and that they could use known words, tone of voice and/or paralinguistics, background sounds, and relationships between speakers to infer word meaning. However, less proficient listeners were less able to generate inferences which are appropriate for establishing a coherent mental representation of the text as they did not monitor their comprehension properly. In another study, Graham and Macaro (2008) argued that the use of inferencing would be unavoidable when learners listened to a challenging text, and effective inferencing would result from the use of a cluster of strategies, such as the verification strategy (verifying the correctness of the inference based on textual information).

Researchers generally agree that the use of compensatory strategies to infer what is unknown is crucial for successful listening (Vandergrift, 2007). However, studies which specifically investigate how L2 learners process unfamiliar words in listening comprehension are very limited. The only existing study is Cai and Wu (2005). Using the verbal reporting method, they investigated the knowledge sources that L2 learners used to infer word meaning in listening comprehension and the effect of language proficiency on the use of knowledge sources. They found that the local co-text was the most frequently used knowledge source. The subjects also used the co-text combined with world knowledge and morphology to some extent. In terms of the effect of language proficiency on the use of knowledge sources, they found that less proficient learners used general world knowledge more often than more proficient learners. In contrast, more proficient learners were more able to use linguistic knowledge and combined knowledge sources to infer word meaning. However, it is worth noting that the subjects in Cai and Wu were asked to infer the meaning of unfamiliar words chosen by the researchers in advance. The inferences observed when learners’ focus of attention was on problem words did not represent those that would be generated spontaneously in the course of ‘normal’ listening when learners’ focus of attention was on text understanding. The current study thus aims to examine the spontaneous processing of unfamiliar words by L2 listeners when they aim at a general understanding of the text.

Effects of Language Proficiency on the Listening Comprehension Process

Listening is a ‘bundle of related processes’ (Lynch & Mendelsohn, 2002, p. 193) in which listeners need to discriminate sounds, recognize words, parse words into meaningful units and interpret what they abstract from the message in relation to their background knowledge and context. Listeners make use of linguistic knowledge or bottom-up processing and non-linguistic knowledge or top-down processing to
comprehend the oral text. The term bottom-up processing is largely used to refer to basic linguistic processing, such as sound discrimination, word decoding, and syntactic parsing, whereas top-down processing is often used to mean the use of context and world knowledge to make sense of a text (Vandergrift, 2007).

In language comprehension, the different processes interact and their use may not be balanced. Stanovich (1980) proposes the influential Interactive-Compensatory Model to detail the relationships of the processes. According to this model, linguistic processing at different levels and non-linguistic processing interact; a process at any level can compensate for deficiencies at any other levels. Some studies lend support to this model. For instance, Wu (1998) found that less proficient listeners were prone to greater reliance on non-linguistic (i.e. top-down) processing to compensate for their inefficient linguistic processing. Tsui and Fullilove (1998) argued that less proficient listeners relied heavily on context as a result of their inefficient linguistic skill.

However, some other studies seem to suggest that the compensation of the different processes is subject to the influence of certain factors, such as learners’ proficiency level. Conrad (1985, as cited in Goh, 1998) found that the weaker the listeners were in listening, the more they relied on linguistic cues. Goh (1998) further found that when less proficient listeners had problems recognizing important words, they were unable to activate schemata to assist their comprehension; in contrast, proficient listeners had fewer problems with unfamiliar words and had more cognitive capacity for higher-level processing by drawing on their prior knowledge. Similarly, Peterson (2001) seems to link the interactive nature of the listening process to high-proficiency listeners:

[W]ith higher levels of language proficiency, the listener works more efficiently and is able to maintain activity on all levels simultaneously. At beginning proficiency levels, perceptual (bottom-up) operations require great amounts of conscious attention, so that little capacity remains for higher level operations. (p. 88)

Recently, Graham, Santos, and Vanderplank (2010) investigated the strategies and knowledge sources French learners used in listening comprehension and the role learners’ linguistic knowledge played in the use of strategies and knowledge sources. They found that learners, regardless of their linguistic knowledge levels, tended to over-rely on linguistic knowledge while world knowledge could play a facilitative role. However, learners with higher levels of linguistic knowledge were better able to use more than one knowledge source in listening.

The above studies seem to suggest that the interaction and compensation amongst the different levels of processing is more characteristic of the listening comprehension process of high-proficiency learners than of low-proficiency learners. Furthermore, a certain minimum threshold of linguistic processing ability seems to be necessary in order for the initial use of background knowledge to be possible. The current study will investigate these two claims by addressing the following research questions:

1. Does listening proficiency affect L2 learners’ use of strategies to process unfamiliar words in listening comprehension?
2. Does listening proficiency affect L2 learners’ use of knowledge sources for lexical inferencing in listening comprehension?

The Experiment

Subjects

Twenty Chinese students from a tertiary institution in China participated in the experiment. They were second-year English majors. Two English proficiency levels—high (HP) and low (LP)—were distinguished among the 20 subjects according to two criteria. One criterion was the composite score of eight listening tests regularly administered by the English as a Second Language (ESL) program. The total of each of the tests was 100. The mean score of the eight tests was used for selecting the subjects. The other criterion was based on assessments made by the subjects’ listening instructor. The instructor assessed the subjects’ listening abilities based on their performances in class (in particular, subjects answering questions and doing listening exercises in class), assignments and tests. The 10 HP subjects were those with the highest mean scores of the eight listening tests and placed in the high-proficiency group by their instructors. The 10 LP subjects were the students with the lowest mean scores of the eight listening tests and placed in the low-proficiency group by their instructors.¹

Listening Materials

In the experiment, the subjects were asked to listen to nine texts (see Appendix for sample texts). The nine texts were based on popular science and mostly selected from *New Scientist*. The reasons why we used originally written texts are that (1) a lot of spoken texts we hear are in fact originally scripted, such as speeches and news broadcasts, and that (2) it is not unusual for researchers (for example, Shohamy & Inbar, 1991; Tsui & Fullilove, 1998) to use prewritten texts as listening materials.

Some modifications were made to the original texts. For instance, some low-frequency words were replaced by high-frequency ones. A pilot test was administered with 10 students from another university. Like the students participating in the actual experiment, they were also second-year English majors. Words which were unfamiliar to 80% of these students were replaced by corresponding synonyms of higher frequency. To confirm the quality of the language after revision, two native speakers of American English edited the language of the revised texts when necessary. A pretest in the form of a cloze test was also conducted on 10 native speakers of English. The cloze test included the nine experimental texts with the target words being replaced by blanks. The subjects were asked to fill in the blanks with words that semantically fit into the text. The words given by the subjects were either the original words or their synonyms.

Each text comprised four to five sentences and was approximately 80 words. There was one word to be inferred in each text. To ensure that no subject had previous knowledge of the target words, we used novel words in place of the original words. These words retained the morphological features of the original words, whether inflectional or derivational. For instance, in one text, the target novel word ‘gomered’ retained the inflectional ending ‘-ed’ of the original word ‘covered’; in another text,
the novel word ‘sloration’ replaced ‘extinction’, retaining the derivational suffix ‘-ion’. Using novel words is the most efficient and secure way to ensure that subjects do not know the target words, which is vital for the current study. L2 listeners whose listening proficiency is not well developed may not be able to distinguish between unfamiliar actual words and novel words. This is especially so when the novel words are possible English words, retaining real morphological constituents similar to the original words. In this study, subjects were not aware of nor did they detect the use of novel words in the listening materials. All novel words were treated by them as though they were actual but unfamiliar English words. Clues for inferring the word meaning could be found in the co-text, either in the target word sentence or beyond.²

**Procedure**

The experiment took the form of individual interviews. In each interview, the subjects listened to the texts, answered questions raised by the interviewer and recalled the content of the texts. The purpose of having the subjects recall the content was to ensure that they focused their attention on comprehending the text, rather than on the problem words. They were told from the outset that the goal of the listening task was to recall the content of the text.³ They were at liberty to use either English or Chinese to answer questions and recall text contents, but they were not allowed to take notes while listening. The whole interview session was tape-recorded.

In each interview, the subjects first received an introduction from the interviewer outlining the task which they were expected to do. A warm-up exercise similar to the actual experiment was provided to familiarize them with the experiment procedure. The interviewer then proceeded with the actual experiment. In the experiment, the subjects listened to each text twice. The reasons why we asked them to listen to the texts twice, echoing Buck (2001, p. 171), are that (1) ‘playing the recording only once places an undue psychological stress on the test-taker’, and (2) ‘playing the text a second time does not appear such an unnatural thing to do’, given that in normal listening situations, listeners ‘often have a chance to ask clarification questions and negotiate the meaning in some way’. Since our subjects were not able to ask questions or seek clarifications from a pre-recorded listening task, allowing them to listen to the listening materials twice helped to compensate for these deficits. After they had listened to the text twice, they were asked to answer several questions.

As is shown in Figure 1, the first question asked was ‘What does the word mean?’ (X standing for the target word). If they reported the meaning of the word, they were then asked the question: ‘How did you get the meaning of the word?’ After they reported their ways of deriving the word meaning, the target word sentence (the retrieval cue) was then replayed and they were asked to report the word meaning and how they got the word meaning when they listened to the text earlier. This is marked as route (a) in Figure 1 and coded as the use of the inferencing strategy. If the subjects reported that they did not know the meaning of the word from the outset, the stimulated recall procedure was initiated where the target word sentence was replayed. The subjects were then asked the question: ‘Did you hear the word when you listened to the text earlier?’ If their answer was yes, they would be asked: ‘What did you think the meaning of the word was when you listened to the text earlier?’ If they reported that they did not know the meaning of the word, they would be asked to recall the content of the text.
Figure 1. Questions asked during the experiment

Notes:  
(a) indicating the route taken when the inferencing strategy was used  
(b) indicating the route taken when the ignoring strategy was used  
(c) indicating the route taken when ‘no attention’ was used

This is marked as route (b) and coded as the use of the lexical ignoring strategy, since in this instance, the participants did notice the word earlier but chose to ignore it. If they reported the word meaning, it was coded as the use of the inferencing strategy. If the subjects reported that they did not hear the target word, they would proceed to
recall the content of the text. This is marked as route (c) in Figure 1 and coded as ‘no attention’. It should be noted that ‘no attention’ is not a strategy. Its use does not involve learners’ conscious control of the thought process. ‘No attention’ is reported here for completeness of account.

Data were collected using verbal reporting methods in the form of the immediate retrospection procedure without and with recall support. Verbal reporting has been used increasingly in second language listening comprehension studies and results of these studies have shown that this method provides useful data on the listening comprehension process (Buck, 1991; Goh, 1998; Ross, 1997; Wu, 1998). However, major concerns of the use of this method relate to the completeness and accuracy of the verbal report in revealing the actual thought processes. (For a full discussion of the verbal reporting method, see Ericsson and Simon [1993]). One way of enhancing the efficiency of the method is to minimize the delay between the comprehension process and the verbal reporting process. As Gass and Mackey (2000, p. 17) point out, ‘when the time between the event reported and the reporting itself is short, there is a greater likelihood that the reporting will be accurate’. A different method is to provide subjects with retrieval cues at the time of giving the verbal report. This method is called the stimulated recall procedure. Given the limited capacity of the working memory, information previously heeded may extinguish (Ericsson & Simon, 1980), and the stimulated recall procedure is used to reactivate the information. As to be explained in the later sections, the present paper incorporated the above two concerns in its design. Care was taken to ensure that there was no interruption between the comprehension process and the verbal reporting process; retrieval cues (replaying parts of the recording) were given to the subjects at the time of giving the report.

Analysis of Tape Transcripts

All the protocols were transcribed and coded for strategies for processing unfamiliar words and knowledge sources for inferring word meaning by the second author. To determine the intercoder reliability, a doctoral student in linguistics was also asked to code the data independently. We obtained an intercoder agreement of 95% for the use of strategies and of 93% for the use of knowledge sources. The inconsistencies were resolved by consulting another doctoral student in linguistics to reach 100% agreement among the three coders. The coding systems are described below.

Coding Strategies for Processing Unfamiliar Words

Definitions and examples of the use of strategies are presented in Table 1. In all the protocols cited in this paper, ‘I’ stands for ‘Interviewer’ and ‘S’ stands for ‘Subject’.
Table 1
Definitions of strategies and examples of the use of strategies

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Example</th>
</tr>
</thead>
</table>
| **The inferencing strategy:** | (Before receiving the retrieval cue)  
Subjects reported the meaning of the word and the knowledge sources for deriving the meaning.  
I: What does the word ‘bosherate’ mean?  
S1: Disappear.  
I: How did you get the meaning of the word when you listened to the text earlier?  
S1: According to the context. The following parts mention the world would slip into the bottom of the ocean and the carbon-based life would be in danger. |
| **The ignoring strategy:** | (Before receiving the retrieval cue)  
Before receiving the retrieval cue, subjects reported that they did not know the meaning of the target word. After receiving the retrieval cue, they reported that they heard the word but did not derive its meaning earlier.  
I: What does the word ‘gomered’ mean?  
S2: I don’t know.  
I: Did you hear the word when you listened to the text earlier?  
S2: Yes.  
I: What does the word ‘gomered’ mean?  
S2: I don’t know. |
| **No attention:** | (Before receiving the retrieval cue)  
Before receiving the retrieval cue, subjects reported that they did not know the meaning of the target word. After receiving the retrieval cue, they reported that they did not hear the word earlier.  
I: What does the word ‘sigotive’ mean?  
S3: I don’t know.  
I: Did you hear the word ‘sigotive’ when you listened to the text earlier?  
S3: No. |

**Key:** I = Interviewer; S = Subject

Coding Knowledge Sources for Lexical Inferencing

Wherever the inferencing strategy was identified, the relevant transcripts were coded for the knowledge sources involved. A taxonomy of knowledge sources is developed, as shown in Table 2.

Table 2
A taxonomy of knowledge sources for lexical inferencing

<table>
<thead>
<tr>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Textual knowledge</td>
<td>Co-text</td>
<td>Local co-text</td>
<td>Semantics 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Paralinguistics</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Global co-text</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Semantics 2 (specific words)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Semantics 3 (overall co-text)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Target word</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phonology</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Word class</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Morphology</td>
</tr>
</tbody>
</table>

Extra-textual knowledge
In this taxonomy, four levels of knowledge sources are identified. Level 1 includes textual knowledge and extra-textual knowledge, which is the most general level and covers all the other three levels. At Level 2, textual knowledge is further divided into the co-text and target word. At Level 3, the co-text is further divided into the local co-text (referring to the target word sentence) and global co-text (referring to the text other than the target word sentence), and so on. At Level 4, we find the most basic knowledge sources: semantics in the local co-text (Semantics 1); paralinguistics (such as intonation and pitch); semantics of specific words in the global co-text (Semantics 2); semantics of the overall co-text (Semantics 3); the phonology, word class and morphology of the target word; extra-textual knowledge. Given space constraints, this paper reports the use of the knowledge sources at Level 4 only. Definitions and examples of the use of the knowledge sources at Level 4 are presented in Table 3.

**Table 3**

Definitions of knowledge sources and examples of the use of knowledge sources

<table>
<thead>
<tr>
<th>Knowledge source</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Semantics 1:</strong></td>
<td>(Before receiving the retrieval cue)</td>
</tr>
<tr>
<td>Semantics of words in the target word sentence</td>
<td>I: What does the word ‘moop’ mean? S2: Sleeplessness. I: How did you get the meaning of the word when you listened to the text earlier? S2: ‘That is sleeplessness’ explains it. <em>Note:</em> ‘That is sleeplessness’ appeared in the target word sentence.</td>
</tr>
<tr>
<td><strong>Paralinguistics:</strong></td>
<td>(Before receiving the retrieval cue)</td>
</tr>
<tr>
<td>Rhythm, intonation, pitch, etc</td>
<td>I: What does the word ‘sigotive’ mean? S5: Harmful. I: How did you get the meaning of the word when you listened to the text earlier? S5: … And I feel the man’s tone, yes, the tone is low when he said coffee is always sigotive.</td>
</tr>
<tr>
<td><strong>Semantics 2:</strong></td>
<td>(Before receiving the retrieval cue)</td>
</tr>
<tr>
<td>Semantics of specific words in the text other than the target word sentence</td>
<td>I: What does the word ‘reboam’ mean? S15: Part of the computer. I: How did you get the meaning of the word when you listened to the text earlier? S15: The text mentioned ‘chips in the computer’. <em>Note:</em> ‘Chips in the computer’ appeared in the text other than the target word sentence.</td>
</tr>
<tr>
<td><strong>Semantics 3:</strong></td>
<td>(Before receiving the retrieval cue)</td>
</tr>
<tr>
<td>Semantics of the overall co-text</td>
<td>I: What does the word ‘bosherate’ mean? S6: Become worse. I: How did you get the meaning of the word when you listened to the text earlier? S6: According to the context. The text talks about the bad results if we human beings don’t have volcanoes. <em>Note:</em> The meaning is derived from the overall co-text, and not from any specific words found in the target word sentence or other sentences.</td>
</tr>
</tbody>
</table>
Language proficiency and unfamiliar word processing in listening comprehension

Phonology: (Before receiving the retrieval cue)
The similarity of two phonological forms
I: What does the word ‘moop’ mean?
S17: Depressed.
I: How did you get the meaning of the word when you listened to the text earlier?
S17: I heard ‘trouble’. I think ‘moop’ should be related to ‘mood’. Then ‘experience mood’ must be ‘experienced depressed mood’. 
Note: S17 heard ‘moop’ as ‘mood’.

Word class: (Before receiving the retrieval cue)
The part of speech of the word
I: What does the word ‘reboam’ mean?
S11: Fan.
I: How did you get the meaning of the word when you listened to the text earlier?
S11: It’s after ‘they’, so it should be a verb ….

Morphology: (Before receiving the retrieval cue)
Prefix, stem or suffix
I: What does the word ‘reboam’ mean?
S12: Bang again.
I: How did you get the meaning of the word when you listened to the text earlier?
S12: ‘Re’ is a prefix which means again. ‘Bang’, is a word I know, like ‘hit’ ….
Note: S12 heard ‘boam’ as ‘bang’.

Extra-textual knowledge: (Before receiving the retrieval cue)
Background knowledge
I: What does the word ‘broamed’ mean?
S15: Sank.
I: How did you get the meaning of the word when you listened to the text earlier?
S15: It is so famous. I have seen the film.
Note: The text is about the sinking of the Titanic.

Results and Discussion

Research question 1: Does listening proficiency affect L2 learners’ use of strategies to process unfamiliar words in listening comprehension?

Table 4 presents the frequency and chi-square statistics of the use of inferencing, ignoring and ‘no attention’ across proficiency groups. Given that the focus of this paper is the lexical inferencing strategy, ‘ignoring’ and ‘no attention’ are reported here for completeness of account.

Table 4
Frequency of use of strategies and chi-square statistics for strategies by language proficiency levels

<table>
<thead>
<tr>
<th>Strategy</th>
<th>HP</th>
<th></th>
<th>LP</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Token</td>
<td>Percentage</td>
<td>Token</td>
<td>Percentage</td>
</tr>
<tr>
<td>Inferencing</td>
<td>66</td>
<td>73.3</td>
<td>43</td>
<td>47.8</td>
</tr>
<tr>
<td>Ignoring</td>
<td>15</td>
<td>16.7</td>
<td>12</td>
<td>13.3</td>
</tr>
<tr>
<td>No attention</td>
<td>9</td>
<td>10.0</td>
<td>35</td>
<td>38.9</td>
</tr>
<tr>
<td>Total</td>
<td>90</td>
<td>100</td>
<td>90</td>
<td>100</td>
</tr>
</tbody>
</table>

\( \chi^2 = 20.550, \text{df} = 2, p = .000 \)

Key: HP = High Proficiency; LP = Low Proficiency
A statistically significant relationship between the use of strategies and language proficiency levels was revealed. HP subjects (73.3%) used the inferencing strategy more often than LP subjects (47.8%), whereas LP subjects (38.9%) used ‘no attention’ more often than HP subjects (10.0%). Both HP and LP subjects used the ignoring strategy to a similar extent (16.7% versus 13.3%).

**Research question 2:** Does listening proficiency affect L2 learners’ use of knowledge sources for lexical inferencing in listening comprehension?

A chi-square analysis was performed to answer this question. In coding the data, we found that the subjects used either a single knowledge source or a combination of knowledge sources in inferring the word meaning. Before the chi-square analysis was performed, we deleted all the knowledge sources or combined knowledge sources whose occurrences across the proficiency groups were below 5. We also grouped two categories of knowledge sources or combined knowledge sources together: morphology combined with extra-textual knowledge, and Semantics 2 combined with extra-textual knowledge. The rationale for grouping these two combined knowledge sources is that the use of both knowledge sources generally involves false textual clues and inappropriate background knowledge, as revealed in protocol examples (4) and (5) cited in the following section. See Table 5 for the four groupings.

**Table 5**  
*Frequency and chi-square statistics of use of knowledge sources across proficiency groups*

<table>
<thead>
<tr>
<th>Knowledge source</th>
<th>HP</th>
<th>LP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Token</td>
<td>Percentage</td>
</tr>
<tr>
<td>Semantics 1</td>
<td>8</td>
<td>15.4</td>
</tr>
<tr>
<td>Semantics 3</td>
<td>21</td>
<td>40.4</td>
</tr>
<tr>
<td>Semantics 1 + extra-textual knowledge</td>
<td>22</td>
<td>42.3</td>
</tr>
<tr>
<td>Morphology/Semantics 2 + extra-textual knowledge</td>
<td>1</td>
<td>1.9</td>
</tr>
<tr>
<td>Total</td>
<td>52</td>
<td>100</td>
</tr>
</tbody>
</table>

$X^2 = 38.375$, df = 3, $p = .000$

**Key:** HP = High Proficiency; LP = Low Proficiency; Semantics 1 = semantics in the local co-text; Semantics 2 = semantics of words in the global co-text; Semantics 3 = semantics of the overall co-text

The chi-square statistics revealed a statistically significant association between the use of the knowledge sources and language proficiency levels. Table 5 shows that both HP and LP subjects relied heavily on Semantics 1 combined with extra-textual knowledge (42.3% and 36.7% respectively) to infer word meaning. In addition to this knowledge source, HP subjects also used Semantics 3 (40.4%) frequently, whereas LP subjects used morphology combined with extra-textual knowledge or Semantics 2 combined with extra-textual knowledge (56.7%) frequently. The data reveal both similarities and differences in the use of the knowledge sources for lexical inferencing by the two groups. In the following section, we will discuss the details of the use of these knowledge sources by the two proficiency groups.
**The Use of Semantics 1 Combined with Extra-textual Knowledge**

Although the results showed that both HP and LP subjects frequently used Semantics 1 (semantics of the local co-text) combined with extra-textual knowledge (42.3% and 36.7% respectively), individual differences were found in the use of this combined knowledge source.

First, LP subjects often failed to identify the correct clue words and were forced to activate their background knowledge to make sense of the target word. Consider the word ‘moop’ which appeared in the sentence ‘Some species even go to the trouble of preparing a resting place as without doing so they will experience moop, that is sleeplessness’ (see Text 1 in Appendix 1 for the whole text). The clue for inferring the meaning of ‘moop’ was the clause immediately following the word: ‘that is sleeplessness’. The clue is rather explicit and straightforward. However, some LP subjects failed to identify it (see example 1).

1. I: What does the word ‘moop’ mean?  
   S1: Extinction.  
   I: How did you get the meaning of the word when you listened to the text earlier?  
   S1: Some species have trouble because they can’t rest. After a long period, they will, the species will extinguish. In history, some animals disappear because they have trouble in living, such as can’t find food, can’t get a peaceful environment.

In this example, the subject failed to identify the correct clue words, which actually followed immediately after the target word. Instead, he picked out other words in the target word sentence, such as ‘some species’, ‘trouble’ and ‘rest’. However, he could not understand the target word based solely on these words. Therefore he had to activate his background knowledge that some species became extinct because of the trouble they experienced in life, such as the lack of food and a suitable living environment.

Secondly, when using Semantics 1 combined with extra-textual knowledge, LP subjects often misrecognized words in the target word sentence. In example 2, a subject attempted to infer the meaning of ‘depermate’. ‘Depermate’ appeared in the sentence ‘The turtle and the dinosaur, the first depermate in size and sea-dwelling, the second gigantic and land-living, seem as remote from each other in function as they are in form’ (see Text 2 in Appendix 1 for the whole text).

2. I: What does the word ‘depermate’ mean?  
   S2: Lie.  
   I: How did you get the meaning of the word when you listened to the text earlier?  
   S2: Following the word ‘depermate’ is ‘inside’; usually the turtle lie inside of its shell.

This subject apparently misrecognized the words ‘in size’ as ‘inside’. Then he related the misrecognition ‘inside’ to his background knowledge that turtles lie inside their shells. Naturally the inference generated based on these knowledge sources was
wrong. Again, we may infer from this example that when learners misidentify a word, they have to activate their background knowledge to make the wrong explanation fit into the context.

There were other instances where LP subjects misidentified words. Often there were other information sources (such as learners’ linguistic knowledge and semantic information in the text) which should have alerted them to the mistakes. However, they failed to use these information sources to correct the mistakes. Rather, they were distracted by the misidentified words which in turn affected their understanding. They often formed an interpretation of a portion of a text based on the misidentifications. Because the interpretation of this portion of the text was not coherent with their interpretation of the preceding text, they had to resort to their background knowledge. This observation confirms Field’s (2008) finding that L2 learners could have difficulties adjusting their initial interpretations to new information sources in listening and that a failure to adjust improper interpretations can lead to incorrect understanding of subsequent parts.

The results indicated that not only LP but also HP subjects committed misidentification mistakes. This is perhaps a problem characteristic of L2 learners who have not mastered the phonological system of the target language. However, in cases where misidentification occurred, HP subjects were more successful in applying clues in the co-text to correct the mistake than LP subjects. In example 3, the HP subject inferred the meaning of ‘reboam’. ‘Reboam’ appeared in the sentence ‘Instead, researchers at Tufts University in Maryland are studying the structure of butterfly wings to find out how they reboam heat’ (see Text 3 in Appendix 1 for the whole text).

3. (Before receiving the retrieval cue)
   I: What does the word ‘reboam’ mean?
   S3: I don’t know.
   (After receiving the retrieval cue)
   I: Did you hear the word ‘reboam’ when you listened to the text earlier?
   S3: I remembered. I heard this word. At first, I thought it means repeatedly. Then I changed my mind. I thought it means get rid of.
   I: How did you get the meaning of the word?
   S3: At first I heard ‘hit’, you know, when butterfly flies, they repeatedly hit their wings. Then I found there is no word after ‘hit’. Then I realized this word is not ‘hit’, maybe ‘heat’. According to the content, it must be ‘get rid of’.

This is a typical example where the subject recognized the misidentification error, and then used the co-text to correct the error. At first, the subject confused the minimal pair of ‘heat’ and ‘hit’, a problem that L2 learners frequently encounter. Fortunately, her linguistic knowledge that ‘hit’ is a transitive verb prompted her to expect a noun after ‘hit’. Failure to find such a noun alerted her to the fact that the correct word was ‘heat’, rather than ‘hit’.

This example also demonstrates the importance of metacognitive awareness, particularly comprehension monitoring, in lexical inferences. HP subjects showed more metacognitive awareness, and were able to detect the use of inappropriate
knowledge sources and to correct inferences which were not coherent with the understanding of the text. This finding lends support to Vandergrift’s (2003, p. 486) observation that metacognitive awareness plays a crucial role in the use of the inferencing strategies as it determines whether the inferences ‘attain the depth necessary for forming a robust, coherent mental representation of the text’.

**The Use of Morphology/Semantics 2 Combined with Extra-textual Knowledge**

As revealed in Table 5, compared with HP subjects, LP subjects more frequently used morphology combined with extra-textual knowledge, or Semantics 2 (semantics of words in the global co-text) combined with extra-textual knowledge (56.7%). Protocol example (4) illustrates the use of morphology combined with extra-textual knowledge. In this example, the subject inferred the meaning of ‘reboam’ (see Text 3 in Appendix 1 for the whole text).

4. I: What does the word ‘reboam’ mean?
   S12: Bang again.
   I: How did you get the meaning of the word when you listened to the text earlier?
   S12: ‘Re’ is a prefix which means again. ‘Bang’, is a word I know, like ‘hit’. We know that when butterflies fly, they repeatedly hit their wings.

The subject used the false prefix ‘re’-’ and another English word ‘bang’ to make sense of the word ‘reboam’. He then used his background knowledge to make the understanding of the word reasonable. Given that the present study used pseudo words without morphological clues from prefixes and word stems, the use of such clues invariably led to incorrect understanding of the words.

Similarly, when LP subjects used Semantics 2 (semantics of specific words in the global co-text) combined with extra-textual knowledge, they often used false clues in the texts (particularly prosodically salient words or heavily repeated words in the global co-text); their background knowledge was further activated to fit the inference into the representation of the entire text. This is why we grouped these two combined knowledge sources together. In example (5), the subject used this combined knowledge source to make sense of the word ‘minkered’. ‘Minkered’ appeared in the sentence ‘Anyone handling a butterfly will end up with their fingers minkered in a fine powder’ (see Text 4 in Appendix 1 for the whole text).

5. I: What does the word ‘minkered’ mean?
   S5: 装饰
   zhuāngshì
decorate
   ‘To decorate’
   I: How did you get the meaning of the word when you listened to the text earlier?
   S5: When you see a butterfly, you will find it has been decorated with the best colors. It is not easily found.
   I: Best colors?
S5: Yeah. The best colors. The article mentions bright color. Bright color for decorating.

In this example, the subject deduced incorrectly the meaning of the word ‘minkered’ as ‘decorated’ (instead of ‘covered’), based on the words ‘bright’ and ‘color’. ‘Bright’ and ‘color’ appeared in the text other than the target word sentence. The reason why the subject related the target word ‘minkered’ to the two words was perhaps due to the observation that ‘bright’ was a prosodically salient word and that ‘color’ was a heavily repeated word (‘color’ occurring four times in a text of 81 words). Her low linguistic decoding ability made her miss other important words necessary for a reasonable understanding of the text. Naturally she could not make sense of the word ‘minkered’ based solely on these two words, so her background knowledge (i.e. bright colors could be used for coloring [decorating] things) was activated to fill the gaps where the original words got lost. This background knowledge helped her to create a ‘reasonable’ interpretation of the text: Butterflies have beautiful colors for the purpose of decoration. She then used this understanding of the text to infer the meaning of ‘minkered’.

The Use of Semantics 3

The frequent use of Semantics 2 (semantics of specific words in the global co-text) combined with extra-textual knowledge by LP subjects can in turn be interpreted in relation to HP subjects’ extensive use (40.4%) of semantics of the overall co-text (Semantics 3). HP subjects were better able to abstract the gist of a text (Semantics 3) to deduce word meaning than LP subjects. In example (6), an HP subject used his general understanding of the overall co-text to deduce the meaning of ‘bosherate’. ‘Bosherate’ appeared in the sentence ‘Scientists say that without volcanoes life on earth would bosherate’ (see Text 5 in Appendix 1 for the whole text).

6. (Before receiving the retrieval cue)
   I: What does the word ‘bosherate’ mean?
   S6: Become worse.
   I: How did you get the meaning of the word when you listened to the text earlier?
   S6: According to the context. The text talks about the bad results if we human beings don’t have volcanoes.

In this example, the subject based his inferencing of the meaning of ‘bosherate’ on an integrated understanding of the text. Results from the present study showed that both HP and LP learners were able to use the global co-text to infer word meaning, but they used different types of global co-text: HP learners tended to use the overall co-text (Semantics 3), whereas LP learners tended to use specific words in the text other than the target word sentence (Semantics 2).

The above results also suggest that this is not because of the inability to use background knowledge that LP subjects’ lexical inferencing suffers. On the contrary, because of their less efficient linguistic processing, LP subjects rely on their background knowledge more heavily than HP subjects to infer word meaning. This finding echoes Stanovich’s (1980) view that deficiency at one level of processing can be compensated for by another level of processing. It is also consistent with Wu’s
(1998) and Tsui and Fullilove’s (1998) findings that less skilled listeners showed a greater reliance on non-linguistic processing.

The present findings however do not support the observation made by Conrad (1985, as cited in Goh, 1998), Goh (1998), and Peterson (2001). As reviewed earlier, they seem to suggest that there should be a certain minimum threshold of linguistic processing ability in order for the initial use of background knowledge to be possible. The current study shows that such a threshold may not exist. LP learners in this study used any background knowledge they had (whether appropriate or inappropriate), even in cases where linguistic processing was faulty or minimal. The problem with LP subjects’ use of background knowledge was that they could not select appropriate background knowledge because of their weak linguistic processing. Therefore the current study seems to show that a minimum threshold of linguistic processing may not be necessary for the initial (and often inappropriate) use of background knowledge, although a certain minimum threshold of linguistic processing ability may be needed for the use of appropriate background knowledge.

Conclusions and Pedagogical Implications

The results of the current study suggest that language proficiency is an important factor affecting learners’ use of strategies and knowledge sources to process unfamiliar words. Proficient subjects used the inferencing strategy more frequently than less proficient subjects. Proficient subjects also displayed marked differences in the use of the knowledge sources from less proficient subjects. Noticeably, proficient subjects were more able to use their overall understanding of the texts to infer word meaning, whereas less proficient subjects more frequently used clues from the target words, and prosodically salient or heavily repeated words to infer word meaning.

Inferencing is a very complex comprehension activity. It may be subject to the influence of other independent variables besides learners’ language proficiency level, such as text type, text difficulty, and the background knowledge subjects may bring to bear in interpreting the texts. Further research can be done to investigate how learners’ language proficiency functions in systematic ways across a variety of variables, such as variation in text difficulty, the linguistic properties of texts, and subjects’ background knowledge.

There are some limitations of the study. First, the study involved a relatively small sample: twenty subjects listening to nine texts. Ideally we could have used a larger sample size, although the current sample size met our research requirement and is comparable to other studies (e.g. Wu, 1998) using the verbal reporting method. Secondly, the present study used originally written texts which were presented orally. As prewritten texts represent only one type of listening material, claims made in this paper regarding listening comprehension should therefore be understood in the context of originally written texts which are presented orally. Thirdly, as discussed earlier, the subjects were allowed to listen to each text twice, which might be different from normal listening. Care should therefore be taken not to overgeneralize our claims to spontaneous oral texts.

Finally, we would like to discuss briefly some of the pedagogical implications of our study. Our study showed that listeners of both proficiency levels used the
inferencing strategy to a substantial extent (73.3% and 47.8%). This is an encouraging result for language teachers. Teachers should therefore make students fully aware of their potential ability to infer word meaning in listening comprehension.

However, our study also showed that less proficient listeners experienced difficulty in using appropriate knowledge sources to infer word meaning, and that incorrect inferences led to an erroneous understanding of the text. Therefore we should be cautious when we encourage less proficient students to infer word meaning in listening comprehension. Teachers should teach students to use the knowledge sources judiciously by training them to monitor their use of knowledge sources, in particular their background knowledge, and the resulting inferences. Teachers should help students develop awareness of consistency of their inferred meaning with subsequent textual information. This echoes Field’s (2008) recommendation that listeners should check their interpretations against incoming information. One classroom activity that teachers could use is to ask students to listen to texts seeded with unfamiliar words. After listening to the texts, the teacher could ask students to identify unfamiliar words, report what they think the meanings of the words are, and how they arrive at the meanings of the words. Then the teacher could ask the students to listen to the texts again and to encourage them to check if their inference is coherent with the existing textual information.

Our study also showed that less proficient listeners used ‘morphological clues’ heavily even when the inference made from the ‘morphological clues’ contradicted information found in the rest of the co-text. As a large number of English words contain misleading morphological clues, teachers should train learners not to overly rely on such clues. Rather, they should learn to check such inferences against co-textual information. We should however point out that whether listeners are able to check inferences based on morphological clues against co-textual information in real-time listening requires further research. Overall, the current study reveals that inefficient linguistic processing hinders less proficient listeners from working out the meaning of unfamiliar words. This suggests that teachers should enhance students’ linguistic processing ability. For instance, teachers could give students training in distinguishing minimal pairs.

We should emphasize that we are not suggesting that learners should focus their attention on all unfamiliar words in listening. When to use the inferencing strategy relates to the importance of the unfamiliar words. In real-time listening, listeners should only infer the meaning of unfamiliar words contributing to the understanding of the overall theme of the texts. Training in the use of the inferencing strategy should focus on helping the learner to determine when to use the inferencing strategy and how to use it when the need arises.

Notes
1 We regret to report that over the past years, we have somehow misplaced the record of the mean scores of the subjects and are therefore unable to report the actual mean scores here. We apologize for the carelessness.
2 A native speaker of American English provided the recording, with an average spoken word rate of 140 words per minute.
3 The requirement of recalling the content of the texts was to ensure that the subjects focused on the overall comprehension of the texts, rather than on any familiar words. This resembles ‘normal’ listening in that a listener’s attention is usually focused on text
understanding than on particular words, unless of course the listener has been asked specifically to listen out for particular words.

There are existing taxonomies of knowledge sources for lexical inferencing in reading comprehension. The most comprehensive taxonomy is given by Haastrup (1991). The major problem with her taxonomy is that the constituent categories are not mutually exclusive (i.e. some of her categories seem to overlap with each other). (For a fuller discussion of the taxonomy, see Cai, 2003.) In another study, Dubin and Olshtain (1993, p. 183) delineate five components of textual support for unfamiliar words, including extra-textual knowledge (‘the reader’s general knowledge extending beyond the text’), thematic knowledge (‘the reader’s overall grasp of the content of this particular text’), Semantic I (‘information extending over large discourse units in the text beyond the paragraph level’), Semantic II (‘information available locally at the sentence or paragraph level’) and syntactic (‘relationships within the immediate sentence or paragraph’). Since the two taxonomies are proposed for reading comprehension, they do not include knowledge sources specifically used in listening comprehension. Given the limitations of previous taxonomies, a new taxonomy was developed for our purpose, which incorporated some knowledge sources specifically adapted to the data collected in this study, i.e. the knowledge sources used in the listening modality (e.g. paralinguistics and phonology). The chief improvement of our taxonomy is that the constituent knowledge sources were delineated more tidily such that the overlapping knowledge sources of the various categories were minimized.

In the case where Chinese is used in the protocol, Chinese characters, romanized Pin Yin with tones, glosses and English translations are listed on the first, second, third and fourth lines respectively.

References


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Vandergrift, L. (2002). It was nice to see that our predictions were right: Developing metacognition in L2 listening. Canadian Modern Language Review, 58, 555–575.


Appendix  Sample Texts

Text 1
Most fish can’t shut their eyes, so it’s easy to assume that they don’t sleep, but that’s like assuming humans don’t sleep because we can’t shut our ears to keep out sound. In fact, many species of fish take time out during the day or at night to enter a sleeplike stage. Some of these fish float in place; others lie on the bottom. Some species even go to the trouble of preparing a resting place as without doing so they will experience *moop*, that is sleeplessness.

Text 2
Some evolutionary biologists suspect that warm-blooded dinosaurs were the ancestors of living birds. Scientists have recently proposed that research into the ways of turtles may explain the great mystery of the dinosaurs. This may sound astonishing. The turtle and the dinosaur, the first *depermate* in size and sea-dwelling, the second gigantic and land-living, seem as remote from each other in function as they are in form. It seems hard to imagine any relationships between them.

Text 3
The chips in your computer could soon be kept cool thanks to help from butterfly wings. This does not mean that when you open up your new computer you will find a host of butterflies inside furiously fanning the chip with their wings. Instead, researchers at Tufts University in Maryland are studying the structure of butterfly wings to find out how they *reboam* heat. They are hoping to copy the tricks butterflies have developed and use them to keep chips within their working temperatures.

Text 4
Anyone handling a butterfly will end up with their fingers *minkered* in a fine powder. It is this powder that lends color to the wings which serves several purposes. Bright colors may serve to warn birds that a particular butterfly is bad-tasting. Other butterflies, although perfectly edible, may have colors that mimic the bad-tasting species and thereby gain protection for themselves. Finally, certain color patterns may help the butterfly blend into its background and be protected from birds by background resemblance.

Text 5
Scientists say that without volcanoes life on Earth would *boshurate*. For one thing, without volcanic and other forces to build mountains, weather would erode the land, and the entire world would slip below the sea level. Second, rainfall is constantly washing key elements of life, such as carbon, into the world’s oceans. If nothing reversed these processes, the world’s carbon would be locked up on ocean floors, which is too bad for all of Earth’s carbon-based life forms from flowers to fish to human beings.