Attending to Phonological Information and Orthographic Information in English Vocabulary Learning by Japanese Elementary School Students

Makoto HOTTA
Ryu Minami Elementary School, Kai City, Yamanashi Prefecture

Abstract

The aim of this study is to investigate the characteristics of attention of Japanese children in English vocabulary learning. The participants were 3rd and 6th grade students in a public elementary school. In the experiment, they were divided into two groups: a single task performance group (SEP) and a dual task performance group (SIM). The former group learned phonological information and orthographic information of target words separately, whereas the latter group learned the phonological information and the orthographic information of the target words simultaneously. In the analyses, posttest scores were compared with pretest scores of listening and reading tests with regard to the target words. As a result, it could be suggested that the participants in the SEP had paid more attention to the orthographic information of the target words than the participants in the SIM, and that the participants in the SIM had paid attention to the phonological information as well as the participants in the SEP. Thus, it could be conjectured that 3rd and 6th grade students in the SIM had regarded the phonological information of the target words as primary information and the orthographic information of the target words as secondary.

1. Background

Attention is indispensable to learning (Schmidt, 1990, 1995; Robinson, 1995). Eysenck (2001) emphasized that it was very important to distinguish two aspects of attention: focused attention and divided attention. On one hand, focused attention refers to attending to only one stimulus even if two or more stimuli are presented concurrently. On the other hand, divided attention is defined as attention which is paid to two or more stimuli simultaneously. Attention is thought of as a cognitive resource which has a limited capacity (Eysenck, 2001; Miller, 1985;
Robinson, 1995; Samuels, 1994; Schmidt, 2001). The resource is exhausted only for task management when focused attention needs to operate; however, the divided resources are allocated to the management of two tasks when divided attention needs to operate. In a single task situation, the cognitive resource is spent on only one stimulus. Because of this, single task performance achieves very high results (Eysenck, 2001). In a dual task situation, however, the limited information processing resource is apportioned to two tasks. If satisfactory processing resources are allotted to each task management, dual task management is well performed. To the contrary, if satisfactory processing resources are not allocated to each dual task management, dual task managements are not performed successfully. In general, focused attention is more helpful to achieve effective task performance than divided attention.

2. Research Question

The research question was: How do Japanese elementary school students who are in Grade 3 and Grade 6 attend to phonological information and orthographic information in the process of English vocabulary learning under different instructional conditions (single task condition and dual task condition)? The participants were divided into two groups in the experiment. They were a Separate Instruction Group (SEP) and a Simultaneous Instruction Group (SIM). The participants in the SEP performed a single task, whereas the participants in the SIM carried out a dual task. In the experiment, the learning gain of the SEP was compared with that of the SIM. By examining the learning gains in the experiment, the present study investigates where learners will focus their attention. If sufficient attention is paid to some linguistic aspects of target words, a noticeable gain in linguistic knowledge of the target words must be observed. Consequently, results of the tests in the experiment were discussed on the presupposition that the gain in vocabulary learning was influenced by learner’s attention. Thus, this comparison between the two conditions will help to reveal the mechanism of children’s attention.

3. Method

3.1 Participants

Participants were Grade 3 and Grade 6 students in a public elementary school. The students had taken English conversation lessons with an emphasis on listening and speaking, not on phonics, reading and writing. Grade 6 students began to learn English in the academic year of 2000 when they were third-graders. Grade 3 students began to learn English when they entered elementary school in 2001. The total number of the students was 135. The students took an alphabet test before the experiment in order to examine their knowledge of the English alphabet. As a result, 43 students were left out for the purpose of keeping the SEP and the SIM equal in terms of knowledge of the alphabet. Moreover, the following 14 students were eliminated from
the experiment: students who did not take the pretest or posttest, and students who failed to attend any of treatment lessons. Finally, 78 students participated in the experiment. Table 1 indicates the number of participants for each group from the two grades. The equality between the SEP and the SIM in each grade in terms of the alphabet test scores was guaranteed by the result of ANOVA for the alphabet test scores ($F (1, 74) = 0.00, ns$).

Table 1

<table>
<thead>
<tr>
<th>Number of Participants in the Experiment</th>
<th>Grade 6</th>
<th>Grade 3</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Separate Instruction Group (SEP)</td>
<td>22</td>
<td>17</td>
<td>39</td>
</tr>
<tr>
<td>Simultaneous Instruction Group (SIM)</td>
<td>22</td>
<td>17</td>
<td>39</td>
</tr>
<tr>
<td>Total</td>
<td>44</td>
<td>34</td>
<td>78</td>
</tr>
</tbody>
</table>

3.2 Materials

3.2.1 Target Words Used in the Experiment

The following eight target words were determined: purse, tweezers, broom, ladder, giraffe, camel, chimney, and finger. Hotta (2003) investigated elementary school students’ knowledge of phonological information and orthographic information of 60 English words which children frequently saw in their everyday life. The target words had low correct answer rates in the investigation.

3.2.2 Pretest and Posttest

Participants took an identical test as a pretest and a posttest. The test was composed of a listening test and a reading test. The number of test items in each test was 16. Eight words were the target words. The other eight words were chosen as distracter items. Analyses for the pretest and the posttest scores in the listening and reading tests were carried out with regard to the target words.

The listening test was developed in order to examine the participants’ knowledge of phonological information of the target words. In the test, the participants listened to each word on a tape and chose the best picture to depict the meaning of the word from among four choices. Each test word was read aloud twice by a female native speaker of English. Each test item was read after an interval of 15 seconds. The total time for the test was 4 minutes.

The reading test was produced so as to examine the participants’ knowledge of orthographic information of the target words. The order of test items was not the same as the listening test. In the test, the participants read each printed word and chose the best picture to describe the meaning.
of the word from among four choices. The letters were printed in Microsoft Sans Serif in Microsoft Word. The total time for the test was 8 minutes.

3.2.3 Picture Cards, Letter Cards, and Picture Letter Cards

The following four cards were examples used in the experiment (see Figure 1, Figure 2, Figure 3, and Figure 4).

![Figure 1](image1.png) **Figure 1.** Picture card (Card 1). One card was a card 24 by 27 centimeters. The picture was black and white.

![Figure 2](image2.png) **Figure 2.** Letter card (Card 2). One card was a card 24 by 27 centimeters. The letters were black and printed in Microsoft Sans Serif in Microsoft Word.

![Figure 3](image3.png) **Figure 3.** Picture and Letter card (Card 3). One card was a card 24 by 27 centimeters. The picture was black and white. The letters were black and printed in Microsoft Sans Serif in Microsoft Word.

![Figure 4](image4.png) **Figure 4.** Small Picture card (Card 4). One card was a card 7.5 by 11 centimeters, and the picture was black and white.

3.3 Procedure

The experiment was conducted on the 12th, 13th, 19th and 20th of June in 2003. Treatments in the SEP were composed of four treatments: Treatment 1 (T1), Treatment 2 (T2), Treatment 3 (T3), and Treatment 4 (T4). On the other hand, treatments in the SIM were composed of two treatments: Treatment 5 (T5) and Treatment 6 (T6). The number of exposures to the phonological and the orthographic information was exactly the same both in the treatments of the SEP and the SIM. The participants in the SEP were exposed to the phonological information 16 times and were exposed to the orthographic information 16 times per the target word through the whole instruction. The participants in the SIM were exposed to the phonological information 16 times
and were exposed to the orthographic information 16 times per the target word through the whole instruction. The details of the treatments are explained in 3.3.1 and 3.3.2.

3.3.1 Treatments in the SEP
(a) Procedure of T1

I was the instructor of the treatment sessions and said to the participants in English, “Today, we will study eight English words. We will use these words when we play a game later.” At first, the participants were asked to have a careful look at Card 1, for example, of a purse (Card 1), and to guess what it was. They replied in Japanese, “It’s a purse.” I gave them the reply, “Yes! That’s right. Please look at this (Card 1)! ” I provided the phonological information of the target word twice pointing to the card, “Purse. Purse.” After showing the card to the children, I put it up on the blackboard. I gave the students the same instruction on the remaining target words.

(b) Procedure of T2

In T2, the participants played a game using the phonological information, which was called What’s This? game. The children were directed to get into groups of six. I said to the participants, “Now, let’s play the What’s This? game. I will say a word twice. Please pick up a card (Card 4) of the word. I will give you the command, ‘1, 2, 3, Go!’ You can take the card (Card 4) the moment you hear ‘Go!’ OK?” The students picked out a card (Card 4) among the cards on the desk after the command. Then, I pointed my finger toward the correct card (Card 1) on the blackboard in order to give the correct answer to the students, and said once to them, “This is a purse.” The same directions were repeated eight times.

(c) Procedure of T3

I said to the participants, “Today, we will study eight words. We will use these words when we play a game later.” At first, the students were asked to have a careful look at Card 3 of a purse. Pointing toward the letters on the card, I said to the students, “Please look at this!” This direction was repeated twice. I did not present the students with the phonological information of the target word at that time. After that, I put Card 3 out of sight and put up Card 1 on the blackboard. This instruction was done one after another for the eight target words.

(d) Procedure of T4

The participants were directed to get into groups of six. I said to the participants, “Now, let’s play What’s This? game. I will show you a letter card (Card 2). Please pick up a small card (Card 4) of the word. I will give you the command, ‘1, 2, 3, Go!’ You can take the card (Card 4) the moment you hear ‘Go!’ OK?” I showed a card (Card 2) to the participants and put Card 2 out of sight. I did it once more. After listening to the signal, the participants picked up a card (Card 4). After that, I pointed my finger toward the correct card (Card 1) on the blackboard and concurrently showed Card 2 concerning the word to the participants in order to give the correct answer. I did not provide the children with the phonological information of the target word. The same directions were repeated eight times.
3.3.2 Treatments in the SIM

(a) Procedure of T5

I said to the participants, “Today, we will study eight English words. We will use these words when we play a game later.” At first, the participants were asked to have a careful look at the Card 3 and to guess what it was. They replied in Japanese, “It’s a purse.” I gave them the reply, “Yes! That’s right. Please look at this (Card 3)!” I provided the phonological information of the target word twice, “Purse. Purse,” and simultaneously gave the orthographic information to the participants through pointing at the printed target word. After showing the card to the children, I put the card out of sight and put up Card 1 of a purse on the blackboard. I gave the students the same instruction on the remaining target words.

(b) Procedure of T6

The participants were directed to get into groups of six. I said to the participants, “Now, let’s play What’s This? game. I will tell you a word twice and show you a letter card (Card 2) of the word twice. Please pick up a card (Card 4) of the word. I will give you the command, ‘1, 2, 3, Go!’ You can take the card the moment you hear ‘Go!’ OK?” I showed a card (Card 2) to the participants, and said the word to them one second later. This direction was repeated again. After listening to the command, the students picked up a card (Card 4) among the cards on the desk. In order to give the correct answer, at first, I pointed my finger at the correct card (Card 1) on the blackboard. Next, I pointed my finger at the printed word on Card 2. Then I said the word once to the students. The participants were provided with the phonological information and the orthographic information concurrently. The same direction was repeated eight times.

3.4 Data Analysis

Three-way ANOVAs (A: Groups × B: Grades × C: Tests) were performed. In the analyses of ANOVA, the interaction between Group (A) × Test (C) was chiefly analyzed both for the listening test and the reading test of Grades 3 and 6 in order to discuss the research question. If the interaction is observed in the analysis of ANOVA, it can be assured that there was a significant difference in the learning gain between the SEP and the SIM. Thus, the analyses investigated whether there were statistically significant differences in the gain of the two groups: the SEP and the SIM in each grade with regard to the listening test and the reading test.

4. Results

Table 2 and Table 3 give the basic data concerning the target words. Table 2 shows Grade 6 students’ mean scores and standard deviations of the two listening tests and reading tests (pretest and posttest). Table 3 contains those of Grade 3 students. Generally, the results indicate that all the groups of 3rd and 6th grade students improved from the pretest to the posttest in the listening test and the reading test. However, there were a similarity and a difference in the extent of
improvement between groups.

Table 2
*Grade 6 Students’ Mean Scores and Standard Deviations (N = 44)*

<table>
<thead>
<tr>
<th>Group</th>
<th>n</th>
<th>M</th>
<th>SD</th>
<th>M</th>
<th>SD</th>
<th>gain</th>
<th>Pretest</th>
<th>Posttest</th>
<th>Reading Test</th>
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<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SEP</td>
<td>22</td>
<td>2.00</td>
<td>1.93</td>
<td>6.82</td>
<td>1.11</td>
<td>4.82</td>
<td>1.23</td>
<td>1.56</td>
<td>6.86</td>
</tr>
<tr>
<td>SIM</td>
<td>22</td>
<td>1.55</td>
<td>1.37</td>
<td>6.05</td>
<td>1.66</td>
<td>4.50</td>
<td>1.59</td>
<td>1.64</td>
<td>4.68</td>
</tr>
</tbody>
</table>

*Note.* Maximum score = 8.

Table 3
*Grade 3 Students’ Mean Scores and Standard Deviations (N = 34)*

<table>
<thead>
<tr>
<th>Group</th>
<th>n</th>
<th>M</th>
<th>SD</th>
<th>M</th>
<th>SD</th>
<th>gain</th>
<th>Pretest</th>
<th>Posttest</th>
<th>Reading Test</th>
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</thead>
<tbody>
<tr>
<td></td>
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<td></td>
</tr>
<tr>
<td>SEP</td>
<td>17</td>
<td>1.59</td>
<td>0.97</td>
<td>4.41</td>
<td>2.09</td>
<td>2.82</td>
<td>0.94</td>
<td>1.00</td>
<td>5.24</td>
</tr>
<tr>
<td>SIM</td>
<td>17</td>
<td>1.35</td>
<td>0.90</td>
<td>5.00</td>
<td>1.53</td>
<td>3.65</td>
<td>0.59</td>
<td>0.77</td>
<td>3.35</td>
</tr>
</tbody>
</table>

*Note.* Maximum score = 8.

4.1 An ANOVA for the Listening Test

It was found that the gain in the mean score of the SIM was not different from the gain in the mean score of the SEP because the Group (A) × Test (C) interaction was not significant (F (1, 74) = 0.29, ns), and the main effect of Group (A) was not significant (F (1, 74) = 0.66, ns). Furthermore, it was ensured that there was no difference between Grade 3 and Grade 6 in a point that the SIM improved as well as the SEP because the interaction between Group (A) and Grade (B) was not significant (F (1, 74) = 2.17, ns).

4.2 An ANOVA for the Reading Test

It was affirmed that the learning gain of the SEP was significantly larger than that of the SIM because the Group (A) × Test (C) interaction was significant (F (1, 74) = 16.21, p < .01). In
addition, it was confirmed that the SEP students' learning gain was larger than the SIM students' learning gain both in Grade 3 and Grade 6 because the Group (A) × Grade (B) interaction was not significant ($F(1, 74) = 0.09, ns$).

5. Discussion

Grade 3 students and Grade 6 students showed similar tendencies in terms of the comparison between the SIM and the SEP. In the reading test of 3rd and 6th grade students, the gain in the mean score of the SEP was significantly larger than the gain in the mean score of the SIM; by contrast, in the listening test of Grade 3 and Grade 6, there was no significant difference in the gain of the listening test scores between the SEP and the SIM. The results of the reading and the listening tests reveal how the students in the SEP or the SIM paid attention to the orthographic information and the phonological information of the target words in the experiment.

On one hand, the result of the reading test indicates that Grade 3 and Grade 6 in the SIM could not pay attention to the orthographic information as well as Grade 3 and Grade 6 in the SEP. The SIM students had to pay attention not only to the phonological information but also to the orthographic information simultaneously in the dual task situation. So, the limited attentional resource of 3rd and 6th graders in the SIM had to be allocated both to the phonological information and the orthographic information. If 3rd and 6th grade students in the SIM had been able to provide attentional resources for the orthographic information processing as well as 3rd and 6th grade students in the SEP, the SIM would have improved as well as the SEP in the reading test. In fact, Grade 3 and Grade 6 in the SIM did not improve as well as Grade 3 and Grade 6 in the SEP. Thus, it can be inferred that students in the SIM could supply the orthographic information processing with less attentional resource than the students in the SEP. In contrast, 3rd and 6th grade students in the SEP had only to focus their attention on the orthographic information in the single task situation (T3 and T4). The attentional resource of students in the SEP was spent on the orthographic information only. Students in the SEP could provide sufficient attentional resource to the orthographic information. Thus, the SEP students may have been able to improve better than the SIM students in the reading test because those in the SEP had spent more attentional resources on the orthographic information processing than 3rd and 6th grade students in the SIM.

On the other hand, the result of the listening test demonstrates that students in the SIM paid attention to the phonological information as well as Grade 6 and Grade 3 in the SEP. In the experiment, there were two possibilities with regard to how the participants in the SIM paid attention to two stimuli (the orthographic information and the phonological information). One is that the participants in the SIM pay attention to the two stimuli equally. The other is that the participants in the SIM intentionally focused their attention on one of the two stimuli. In the present study, the latter conjecture is plausible because the results of the experiment showed that
the SIM improved as well as the SEP in the listening test and did not improve as well as the SEP in the reading test. Grade 3 and Grade 6 students in the SIM were not informed which information was central in the treatments (T5 and T6), but nevertheless 3rd and 6th graders in the SIM focused their attention mainly on the phonological information. There might be two reasons why the SIM students regarded the phonological information processing as the primary task. The first one is based on the task difficulty. The difficulty of the orthographic information processing may have influenced the judgment of the task priority. It may have been difficult for 3rd and 6th graders in the SIM to manage the orthographic information. So, 3rd and 6th grade students might have considered the phonological information processing to be easier than the orthographic information processing. Consequently, the phonological information processing might have taken priority over the orthographic information processing. The second one is grounded on the task familiarity. The familiarity with the phonological information processing may have affected the judgment of the task priority. The SIM students might have reckoned the phonological information processing as the primary task because the participants had been accustomed to the phonological information processing in their usual English conversation lessons at their school. Therefore, 3rd and 6th grade students in the SIM may have given priority to the phonological information processing. Thus, in the present study, one of the two reasons or both of the two reasons may have had an effect on the judgment of the task priority.

6. Conclusion

The purpose of the present study was to explore how 3rd and 6th grade students attend to the phonological information and the orthographic information in the process of the English words learning under different instructional conditions. The following three findings were summarized as to the mechanism of attention. First, the present study revealed that 3rd and 6th grade students in the single task condition had paid sufficient attention to the orthographic information satisfactorily. Conversely, it was suggested that Grade 3 and Grade 6 students in the dual task situation had paid less attention to the orthographic information than those in the SEP. Secondly, it was demonstrated that the dual task group had paid attention to the phonological information as well as the single task group. The third finding is that 3rd and 6th grade students in the SIM may have considered the phonological information as primary information and the orthographic information as secondary.

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References


