The Development of English Reading Ability of Japanese High School Students: Focusing on Explanatory Factors

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Abstract

This study longitudinally investigated the development of Japanese high school students' reading ability, focusing on its explanatory factors. The participants were given six English tests, and based on the data path models illustrating the structures of the participants' English reading ability were presented. The main findings were the major explanatory variables in the lower grades were knowledge of written language including grammar, and in the upper grades, their phonological ability including listening played an active role. These diachronic shifts were also confirmed in the comparison of better readers and low-level readers' models. More skilled readers had phonological abilities as the explanatory factors of their English reading performance, while in low-level readers grammatical knowledge was a constant determinant factor. As a pedagogical implication, for low-level readers, a training to improve their lexical and grammatical knowledge combined with phonological awareness is recommended.

1. Background of the Study

English reading is an essential skill in English proficiency of Japanese EFL learners. Even in the recent communication-oriented English education in Japan, a lot of class time is spent to learn how to read better. Complex tasks, including L2 reading, are characterized by a hierarchical structure, consisting of sub-tasks and their components. The execution of one part of the task requires the completion of various smaller components. The structure is modified and reorganized according to learners' proficiency levels (McLaughlin, 1990).

In order to create an effective training method to improve Japanese learners' English reading ability, it is important to know what linguistic constituents make up their English reading ability. The constituents are expected to vary as learners move from stage to stage in development. The full path of their development over time will be made possible only by a longitudinal study, in which the same
participants are observed over a period of time. Therefore, the main purpose of this paper is the analysis of the explanatory variables of Japanese high school students’ English reading ability from a diachronic perspective. The results will provide basic data on how Japanese high school students develop their English reading ability.

Kanatani (1995) introduces two-phased process for L2 reading. The first stage is concerned with language processing, in which graphic information is processed at the levels of word recognition, lexical retrieval, and sentence structure, proposition encoding and text-modeling. In the next stage, readers’ background knowledge and schema are activated for comprehension.

Focusing on L2 reading’s subordinate language skills, the importance of vocabulary and grammar is emphasized by several researchers. One of them is Kobayashi (1995), which proved the strong correlation between Japanese junior high school students’ English reading performance and their lexical knowledge. Motooka (2001) investigated the explanatory factors of Japanese EFL learners’ English reading ability in terms of English language proficiency and Japanese proficiency and metacognitive ability. She insists that as far as low-level readers are concerned, English proficiency, especially vocabulary, is the most important.

Lexical access is not accomplished only by visual input of written language. The concept of dual-route access is widely accepted (Kanatani, 1995; Tono, 1997; Kadota & Tamai, 2004), which suggests that the meaning is reached by way of subvocalization, or phonological coding, of graphic input at the very first stage of language processing.

As in Goodman’s (1968) models, this dual-route lexical access is thought to be peculiar to beginning readers. In the lowest proficiency level graphic input detours to aural input, and oral language and finally reaches the meaning, while in the highest proficiency level the graphic input directly retrieves the meaning. This automated lexical access enables readers to devote attention to higher levels of processing.

Besides, the easy transfer from listening ability to reading ability is shown in Asher (1972), and L2 reading and L2 listening are, in spite of their different sensory organs, expected to have the same kind of processing procedures.

What are the models of Japanese high school students’ reading ability like? It is difficult to propose one single model to explain L2 learners’ reading ability (Kanatani, 1995). Advanced readers will have a model similar to L1 readers, while less skilled readers will process English text word by word. From the previous studies cited above, it is expected that for Japanese high school readers the lexical and grammatical knowledge serve as determinant factors, and phonological ability will also have a supporting role. From a diachronic perspective, the structure will be reorganized and restructured as their proficiency level advances, and the shifts may also be reflected in the models of different ability readers. In order to clarify their models focusing on subordinate language skills, the following study was designed.
2. Objectives

The objectives of the present study are:
1. To clarify the diachronic change of the explanatory variables of Japanese high school students’ English reading performance.
2. To clarify the difference in the diachronic shifts of the explanatory variables between more skilled and less skilled readers.

3. Method

3.1 Participants

The participants were 71 students at a Japanese technical high school, with 39 boys and 32 girls. The participants were divided into the upper and lower groups according to their English reading test scores in the first year. More skilled readers’ reading test scores ranged from 7 to 13, while the scores of less skilled readers were from 3 to 6.

3.2 Instruments

The tests administered were as follows.

(a) English reading test (16 questions 30 minutes)

The reading test of the Benesse English Communication Test was used. The participants read two English passages and were requested to answer comprehension questions and choose correct statements about the story.

(b) English listening test (40 questions 20 minutes)

As the material for this test, Benesse English Communication Test was used.

(c) Aural word recognition test (50 questions 15 minutes)

In this test, the participants wrote Japanese equivalents on the answer sheet as soon as they heard English words. The word selection was based on Chugaku eitango deru deru 1200 (Negishi 1999, Toshin Books), and these junior high school level words were expected to be visually familiar to the participants, even though they failed to recognize them aurally.

(d) English cloze test (20 questions 20 minutes)

The test passage of the present study was taken from “Hello Kitty” in Look and try (Taniguchi 1998, Kirihara Shoten), whose topic was familiar to the participants. With first two sentences unmodified, every seventh word of the passage was deleted from the passage.

(e) English vocabulary test (25 questions 15 minutes)

(f) English grammar test (25 questions 15 minutes)

The questions of these two tests were chosen from Word power 1500, Word power 3000 (Hill 1982 Oxford University Press)
3.3 Procedure

The same tests were given to the same participants three times with intervals of one year. The tests were administered in a classroom or multi-media room by the author during class hours within two weeks each year. The data of the students who participated in all the tests in all the three times were computed. Based on the computed scores, path analyses were performed to show the relationship between each year's English reading performance and the component variables. The path models were presented for the whole group, the upper and lower groups. All the analyses were performed with statistical packages SPSS 12.0 and Amos 5.0.

4. Results

4.1 Results of the Whole Group

Table 1 lists the maximum, minimum, and average scores and standard deviations of each test in each year.

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>1st Year</th>
<th>2nd Year</th>
<th>3rd Year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Max.</td>
<td>Min.</td>
<td>Mean</td>
</tr>
<tr>
<td>(English Tests)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading</td>
<td>13</td>
<td>3</td>
<td>6.75</td>
</tr>
<tr>
<td>Listening</td>
<td>32</td>
<td>15</td>
<td>22.52</td>
</tr>
<tr>
<td>Aural Word Recognition</td>
<td>34</td>
<td>12</td>
<td>23.90</td>
</tr>
<tr>
<td>Cloze</td>
<td>15</td>
<td>4</td>
<td>8.27</td>
</tr>
<tr>
<td>Vocabulary</td>
<td>17</td>
<td>6</td>
<td>12.06</td>
</tr>
<tr>
<td>Grammar</td>
<td>19</td>
<td>6</td>
<td>14.03</td>
</tr>
</tbody>
</table>

As indicated in Table 2, the scores of all the tests show statistically significant increases. In the right column of the table, the years when the statistically significant changes occurred were specified by Tukey's tests.

<table>
<thead>
<tr>
<th>English Tests</th>
<th>df</th>
<th>F</th>
<th>P</th>
<th>The Year with Significant Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading</td>
<td>2</td>
<td>42.363</td>
<td>0.000 ***</td>
<td>1st year &lt; 2nd Year - 3rd Year</td>
</tr>
<tr>
<td>Listening</td>
<td>2</td>
<td>35.725</td>
<td>0.000 ***</td>
<td>1st Year - 2nd Years &lt; 3rd Year</td>
</tr>
<tr>
<td>Aural Word Recognition</td>
<td>2</td>
<td>14.739</td>
<td>0.000 ***</td>
<td>1st year &lt; 2nd Year - 3rd Years</td>
</tr>
<tr>
<td>Cloze</td>
<td>2</td>
<td>17.983</td>
<td>0.002 ***</td>
<td>1st Year - 2nd Year - 3rd Year, 1st Year &lt; 3rd Year</td>
</tr>
<tr>
<td>Vocabulary</td>
<td>2</td>
<td>56.103</td>
<td>0.000 ***</td>
<td>1st Year &lt; 2nd Year &lt; 3rd Year</td>
</tr>
<tr>
<td>Grammar</td>
<td>2</td>
<td>13.880</td>
<td>0.000 ***</td>
<td>1st and 2nd Years &lt; 3rd Year</td>
</tr>
</tbody>
</table>

***p<0.005
Based on the computed test scores, the following path models were presented. In the models, the reciprocal relationship among component variables, as well as their contribution to English reading performance, is illustrated.

![Path Model Diagram]

Note: CMIN=6.581(P=0.681), df=9, GFI=0.971, AGFI=0.931, RMSEA=0.000, CFI=1.000

Figure 1-1 The Whole Group's Path Model for the 1st Year

![Path Model Diagram]

Note: CMIN=3.763(P=0.584), df=5, GFI=0.983, AGFI=0.930, RMSEA=0.000, CFI=1.000

Figure 1-2 The Whole Group's Path Model for the 2nd Year

![Path Model Diagram]

Note: CMIN=3.902(P=0.791), df=7, GFI=0.982, AGFI=0.946, RMSEA=0.000, CFI=1.000

Figure 1-3 The Whole Group's Path Model for the 3rd Year

The squares in the models refer to measured variables, which are the test scores in the present study, and the names inside specify the year and the test: 1ER=1st year English reading, 1EL=1st year English listening, 1EA=1st year aural recognition of English words, 1EC=1st year English cloze, 1EV=1st year English vocabulary, 1EG=1st year English grammar. Circles represent measurement...
errors. One-way arrows show a direct contribution and the values beside them are path coefficients which indicate the degree of influence. Two-way curved arrows show that two variables are correlated, and the figures are correlation coefficients. The criteria for being a good model are as follows (Oshio, 2004): \( p > .05 \), GFI (Goodness of Fit Index) > .90, AGFI (Adjusted Goodness of Fit Index) > .90, RMSEA (Root Mean Square Error of Approximation) < .05, CFI (Comparative Fit Index) > .90.

Figures 1-1 to 1-3 show the relationship between the participants’ English reading performance and the component variables. Judging from the fit indices listed above, the models have satisfactory fit.

The first year model shows that the participants’ English reading performance were mainly explained by two variables, cloze and grammar test scores, with the coefficients of .19 and .16, respectively. The second year model has two major differences from the first year model. For one thing, in the second year, English listening ability replaced grammar, serving as the second explanatory variable with the coefficient of .29. Another difference lies in the closer reciprocal relationship among component factors themselves. In the third year the participants’ English reading performance had three immediate explanatory variables, listening, aural word recognition and vocabulary, with the coefficients of .25, .33, and .21, respectively. These values got higher as they went up to the upper grades, and the closer mutual relationship among components continued.

In summary, the diachronic shifts of three path models are characterized by (1) the transition of the explanatory variables from the knowledge of written language, including grammar, to the combination of written language and phonological ability, (2) the increase of explanatory variables, (3) the higher coefficient values, and the components’ closer reciprocal relationship in the upper grades.

4.2 Results of Different Ability Groups

In this section, the differences between the upper and the lower groups are focused on.

<table>
<thead>
<tr>
<th>English Tests</th>
<th>The Upper Group (N=36)</th>
<th>The Lower Group (N=35)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1st Year</td>
<td>2nd Year</td>
</tr>
<tr>
<td>Reading</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Reading</td>
<td>8.61</td>
<td>1.626</td>
</tr>
<tr>
<td>Cloze</td>
<td>8.69</td>
<td>2.081</td>
</tr>
<tr>
<td>Vocabulary</td>
<td>12.06</td>
<td>2.305</td>
</tr>
</tbody>
</table>

Table 3 lists the mean scores and standard deviations for both groups of each test in each year.
Although the upper group consists of more skilled readers of the first year English reading test, their scores were higher than those of the lower group in all tests in every year, excluding vocabulary test in the first year when both groups had 12.06.

The following Figures 2-1 to 2-3 show the relationship between the upper group's English reading performance and component variables. Judging from the criteria for being a good model listed earlier, Figures 2-1 and 2-3 have satisfactory fit. In Figure 2-2, AFGFI is .890 (good fit > .90) but in other criteria it is an acceptable model.

In the upper group, in the first year, their English listening ability played a major role in explaining their English reading ability, with the coefficients of .10. In the second year, in addition to their listening ability, aural word recognition served as another contributor to English reading ability,
with the coefficient of .30. In the third year, vocabulary test scores served as an immediate contributor, following listening, with the values of .36 and .40, respectively. Therefore the better readers’ diachronic development may be characterized by (1) the increase of explanatory variables, (2) the consistent role of phonological ability in reading, and (3) higher coefficient values in the upper grades.

In Figures 3-1 to 3-3 below, the models of the lower group are presented. Except for AGFI values (good fit> .90) in Figures 3-2 (.890) and 3-3 (.862), they are generally acceptable as good fit.

Figure 3-1 The Lower Group’s Path Model for the 1st Year

Figure 3-2 The Lower Group’s Path Model for the 2nd Year

Figure 3-3 The Lower Group’s Path Model for the 3rd Year

In the first year path model for the lower group, the grammatical knowledge and cloze test results are two major explanatory variables, with the coefficient of .25 and .20, respectively. In the second year, grammar served as the only one determinant of successful reading with the coefficient of .46. The component factors, compared with those in the first year, were more closely related with the others. The third year’s only determinant was the ability of aural word recognition with the
coefficient of .58, which was in turn supported by English listening and grammar (.57 and .21).

The diachronic changes of these three models of this group can be characterized by (1) the consistent contribution of grammatical knowledge to reading performance, (2) no increase of explanatory factors, (3) higher coefficient values and closer reciprocal relationship among component variables in the upper grades.

The major findings from the comparison of the two groups are summarized as follows:
(1) In the upper group, phonological ability was a major explanatory variable of English reading, while in the lower group, grammatical knowledge consistently contributed to their reading comprehension.
(2) In the upper group, the explanatory variables increased in number, while in the other they did not.
(3) In both groups, the coefficient values of the explanatory variables were higher in the upper grades, which means that their influence got stronger.
(4) Regardless of their proficiency levels, the reciprocal relationship among the components became closer as they went up to advanced grades.

5. Discussion

The whole group’s diachronic model shifts revealed that their reading ability was firstly explained by the proficiency of written English, but according to the progression of grades, the major role was replaced by phonological ability, including listening and aural word recognition. This may mean the participants firstly depended on graphic input for reading comprehension and as their English proficiency developed, their phonological ability facilitated lexical access. This may be supportive of Asher’s (1972) positive transfer from listening to reading, and also the concept of subvocalization, or phonological coding (Kanatani, 1995; Tono, 1997; Kadota & Tamai, 2004). However it was contradictory to Brown’s (1968) models to illustrate the different ability readers’ different lexical access routes. It may be possible that, unlike native speakers, Japanese EFL learners, who begin to learn written language and spoken language at the same time in the classroom, may take some time before they are ready to combine reading activity with phonological coding. Another finding from the model shifts was that component variables were more closely related with each other according to the progression of the grades. As McLaughlin (1990) pointed out, the subordinate skills began to be networked with each other, reorganizing and restructuring the hierarchical structure of L2 reading.

In the analysis of readers of differing degrees of English reading ability, the difference lay in the contribution of phonological ability. Whereas more skilled readers’ ability in the first year was more explained by phonological ability such as English listening and aural word recognition, and vocabulary did not work as an explanatory variable until the third year, less skilled readers firstly more depended on their knowledge of written English without making use of phonological processing. The differences of the two groups were similar to the diachronic shifts of the whole group’s models from the first to the third years.
6. Conclusion

In the present study, in order to clarify the language subordinate skills that made the greatest contribution to the English reading ability of Japanese EFL high school students, six tests in English were given to 71 Japanese high school students three times with the intervals of one year. Based on the computed test score, path models was made to discover which language abilities are the main contributors to English reading. In the whole groups, the diachronic difference of the explanatory variables was characterized by the transition from written language knowledge to phonological processing ability. The comparison of the diachronic path model shifts of different ability groups also revealed the major role of phonological ability in the upper group and the low-level readers’ dependence on grammatical knowledge for comprehension.

These results enable us to shed some light on the question of how Japanese learners develop their English reading ability by networking subordinate skills. This may imply that in order to develop their English reading performance, they should be exposed to sufficient input of spoken English as well as written English according to their developmental stages. In addition, for further research, it needs to be investigated whether developing less skilled readers’ lexical and grammatical knowledge combined with phonological awareness would improve their English reading performance.

References


