Brief Note

Word Accent Repetition in Japanese Children With Reading Difficulties

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The purpose of this study was to examine whether school-age children with reading difficulties have difficulty in word accent repetition by comparing the data of young children (Sakono, Ito, Fukuda, & Fukuda, 2011). Participants were nine school-age children with reading difficulties. The data of 38 typically developing children (Letter-by-letter group; 21 children, Fluent group; 17 children) aged five to six (Sakono et al., 2011) were also used. Stimuli with 3-mora non-familiar words were presented to each child with three types of accent patterns. Participants were required to repeat them aloud. The results were as follows; the mean number of words repeated correctly in the children with reading difficulties was significantly lower than that of the fluent group, and similar to that of the letter-by-letter group for the first- and second-syllable accented words. These results suggest that Japanese school-age children with reading difficulties have problems in word accent production, which is similar to those with letter-by-letter reading.

Key Words: reading difficulties, accent, Japanese

Introduction

Several researchers now argue that prosodic sensitivity is important and is a predictor of reading ability (Goswami, Gerson, & Astruc, 2010; Leong, Hämäläinen, Soltész, & Goswami, 2011). Accent is one of the features of the prosody.

de Bree, Wijnen, and Zonneveld (2006) investigated word stress acquisition in three-year-old children at risk of dyslexia and normally developing Dutch children. The children had to repeat non-words with stress patterns varying in regularity. Both the at-risk and control children performed better on imitation of regular stress patterns than irregular and prohibited stress patterns. However, the at-risk children showed more difficulty imitating irregular and prohibited patterns, and had lower percentages on correct phonemes than the control group. Moreover, it was also reported that Dutch children diagnosed with dyslexia experienced more difficulty on word stress tasks than age-matched controls (de Bree, 2007).

However, few studies have focused on the relationship between word accent repetition and reading performance in Japanese. Sakono, Ito, Fukuda, and Fukuda (2011) investigated these relationships in young Japanese children from five to six years of age. The participants were divided into a group who could not read words fluently (letter-by-letter group), and a group who could read all the stimulus words fluently (fluent group). The children were required to repeat non-familiar words with three types of accent patterns; non-accented, first-syllable accented, and second-syllable accented. The results showed that the mean number of words repeated correctly in the letter-by-letter group was significantly lower than that of the fluent group for all types of accent patterns which suggested that the children in the letter-by-letter group had difficulty with suprasegmental features of speech.

Then, how about the children with reading difficulties (RD)? According to Inoue, Higashibara, Okazaki, and Maekawa (2012), we call the children who could
be called dyslexia as RD. The reason was that we do not have a standard test of dyslexia in Japan. It has not been reported whether or not Japanese children with RD have difficulty in word accent repetition. If the children with RD have the difficulty of supra-segmental features, it is expected from the results of Sakono et al. (2011) that Japanese children with RD would also have problems with accent assignment similar to those of the children from the letter-by-letter group, and that the characteristics of errors would be similar between the children with RD and the letter-by-letter group.

The purpose of the present study was to investigate whether school-age Japanese children with RD have difficulty in word accent repetition similar to what has previously been found in young children by Sakono et al. (2011), and to examine whether the characteristics of correct and error response would be similar between the children with RD and the letter-by-letter group in young children (Sakono et al., 2011).

**Method**

**Stimulus Words**

Stimulus words for word accent production were identical to those used by Sakono et al. (2011). Six non-familiar words were used. The reason is that Kondo and Amano (2001) reported that when non-words were used as stimuli, one must consider whether they maintain the phonological characteristics of Japanese language. Their familiarity with stimulus words was less than 3.4 according to Amano and Kondo (1999). It is rated by seven-point scale from 1 (low familiarity) to 7 (high familiarity).

The Japanese language is known to have two types of lexical words, namely, accented and unaccented (Kubozono & Ogawa, 2004). In Tokyo dialect, accented words involve an abrupt pitch fall, whereas their unaccented counterparts are pronounced with a flat pitch (Kubozono, 2006b). Stimulus words were presented with three types of accent patterns (Table 1). The first was a non-accented pattern of low-high-high pitch pattern (e.g., /tomatsu/). The second was one in which the first syllable was accented: a high-low-low pitch pattern. (e.g., /tómatsu/). The third one had the second syllable accented: a low-high-low pitch pattern (e.g., /tomátsu/). The marking /´/ indicates the position of the abrupt pitch fall.

<table>
<thead>
<tr>
<th>Table 1 Stimulus Words</th>
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<tbody>
<tr>
<td>Non-accented</td>
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<tr>
<td>kitatsu</td>
</tr>
<tr>
<td>sakoro</td>
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<td>shikona</td>
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<tr>
<td>takaha</td>
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<td>tomatu</td>
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<td>makomo</td>
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Note. *´* indicates the position of abrupt pitch fall.

**Participants**

The participants were 9 school-aged children with RD (7 boys, 2 girls). They were all attending speech and hearing classes in elementary schools in Tokyo. Their ages ranged from 7 to 12, with a mean age of 10;1. Children with RD were defined according to the following criteria of Inoue, Higashibara, Okazaki, and Maekawa (2011): (1) they reportedly had difficulty in acquisition of reading and writing, (2) general intelligence levels within normal limits (>80) on a verbal or performance IQ estimate from WISC-III or WISC-IV, (3) no history of neurological problems, (4) no problems of hearing or vision, and (5) no other developmental disorders such as pervasive developmental disorders (PDD). We confirmed that they met those criteria by parental or teachers' reports. Based on the Screening Test for Reading and Writing for Japanese Primary School Children (STRAW) (Uno, Haruhara, Kaneko, & Wydell, 2006), eight children had difficulty with reading. One child rejected the screening test. According to his speech and hearing class teacher, he always rejected every reading test because of his reading problem.

The data of 38 typically developing (TD) children who ranged from 5 years (range 5; 0 to 5; 11) to 6 years of age (range 6; 0 to 6; 7) were also used in this study. These were the same as in Sakono et al. (2011). They were enrolled in a public nursery school and judged to be “developing normally” by the teachers of their school. In Japanese, the relationship between orthography and phonology in the writing syllabary is perfectly regular and rule-governed (Sasanuma, Ito, Patterson, & Ito, 1996). Therefore, the difficulty in reading was expected to be reflected in reading fluency rather than in the number of errors. Thus, the children’s fluent readings were analyzed in Sakono et al. (2011), and TD children were divided into two
groups; the letter-by-letter group (21 children) and the fluent group (17 children). The former were children who read all the stimulus words letter-by-letter, and the latter were those who read all the words fluently.

Prior to enrollment and participation, all children with RD were informed of the experimental design. Permissions to participate for the RD children were obtained from teachers of their speech and hearing classes, and from the parents of RD by their teachers. Permissions for the TD children's participation were received from their nursery school.

**Procedure**

The same word accent production task, which was used in Sakono et al. (2011), was conducted in the present study. The participants with RD were tested individually in a quiet room at their school. The stimulus words were presented to the children auditorily from a speaker (YSP-U501, MATSUMOTO KIKI) which was attached to a notebook computer (CF-SX2CEPBR, PANASONIC). The participants were then required to repeat them aloud. The task took approximately 2 minutes. Responses were recorded using a digital audio recorder (ICD-SX900, SONY) and a microphone (ECM-959DT, SONY).

Data of 38 TD children were the same as those reported in Sakono et al. (2011). The stimulus words were presented auditorily to the children by a TCD-D10 Sony digital audio tape recorder. The participants were required to repeat them aloud. Responses were tape-recorded using a digital audio tape recorder (TCD-D10, SONY) and a microphone (ECM-959DT, SONY).

**Data Analysis**

**Correct responses.** When a stimulus word was repeated correctly, both in terms of its accent pattern and exact phonemes, the word was judged to be produced correctly. The rate of agreement between the two graduate students who judged accuracy was 95.4%, calculated by dividing the number of agreed upon words by the total of the number of agreed plus disagreed words, and multiplying it by 100.

**Error responses.** In order to compare the errors in word accent production of children with RD group to those of TD children (the letter-by-letter group and the fluent group), we analyzed the error focusing on accent shift and segmental errors. The percentage of accent shift errors was calculated by dividing the number of accent shift errors by the total number of errors per group, and multiplying it by 100. The percentage of segmental errors was calculated by dividing the number of responses with segmental errors by the total number of responses for all participants per group, and multiplying it by 100.

**Results**

Figure 1 illustrates the mean number of words repeated correctly by word-accent assignment in the RD group, the letter-by-letter group, and the fluent group. The vertical axis shows the mean number of words repeated correctly, and the horizontal axis shows three types of groups. A two-way analysis of variance (ANOVA) was conducted. This analysis examined the performance of three groups on the three types of accent pattern. The interaction between the group and the accent pattern was significant ($F(4, 88)=5.71, p<.01$).

In the non-accented words, the mean number of words repeated correctly was more than 5.0 out of a maximum of 6.0 points in all groups, and no significant differences were observed among the three groups. In contrast, for the first-syllable accented words, the mean number of words repeated cor-
rectly in both the RD and the letter-by-letter group was significantly lower than that of the fluent group ($Mse=0.70, p<.05$). Similarly, in the second-syllable accented words, the mean number of words repeated correctly by both the RD and the letter-by-letter group was significantly lower than that in the fluent group ($Mse=0.70, p<.05$).

When we give attention to each group, in the RD group, the mean number of words repeated correctly for the non-accented words was significantly higher than that for both the first- and second-syllable accented words ($Mse=0.70, p<.05$). Furthermore, the mean number of words repeated correctly among the first-syllable accented words was significantly higher than that of the second-syllable accented words ($Mse=0.70, p<.05$). Similarly, for the letter-by-letter group, a significant difference was observed between the non-accented and the first-syllable accented words, and between the first- and second-syllable accented words ($Mse=0.70, p<.05$). In contrast, for the fluent group, the mean number of words repeated correctly was higher than 5.0 points not only in the non-accented but also in the first-syllable accented words, and no significant difference was observed in the mean number of words repeated correctly between the non-accented and the first-syllable accented words.

Table 2 shows the number and the percentages of accent shift in the three groups. When the stimuli were non-accented, the accent shift was not observed in any groups. As for the first-syllable accented stimuli, the errors shifted to the non-accented were observed to be 55.6% in the RD group, 75.0% in the letter-by-letter group, and 100% in the fluent group. Moreover, in the first-syllable accented words, the errors shifted to the second-syllable accented were 44.4% in the RD group, 25.0% in the letter-by-letter group, and 0% in the fluent group. For the second-syllable accented stimuli, the percentage of errors shifted to the non-accented (52.6%) was similar to that shifted to the first-syllable accented (47.4%) in the RD group. Also, for the letter-by-letter group, the percentage of errors shifted to the non-accented (53.8%) was similar to that shifted to the first-syllable accented (46.2%) in the second-syllable accented words. In contrast, the percentage of errors shifted to the non-accented (84.6%) was remarkably higher than those shifted to the first-syllable accented (15.4%) in the fluent group.

Table 3 shows the number and the percentages of segmental errors in the three groups. The total percentages of segmental errors in both the RD and the letter-by-letter group were higher than that in the fluent group. While the percentage of responses with segmental errors was the highest in the non-accented stimuli (2.47%) for the RD group, the second-syllable accented stimuli (3.7%) was highest in the letter-by-letter group.

**Discussion**

This study aimed to examine whether the children with RD have difficulty in word accent repetition which has previously been found in young children.
We compared the performance of the children in the RD group to those of the nursery school TD children (the letter-by-letter group and the fluent group) as reported by Sakono et al. (2011).

In both the RD and the letter-by-letter group, the mean number of words repeated correctly was significantly lower than that of the fluent group for the first- and second-syllable accented words. This result suggests that the children with RD and the letter-by-letter group experience more difficulty with the assignment of word accent than the fluent group. In Dutch, it was reported that both the children at risk for dyslexia and those diagnosed with dyslexia experienced more difficulty on word stress tasks than age-matched controls (de Bree, 2007; de Bree et al., 2006). Our findings in Japan are consistent with their results. Therefore, it was suggested that the Japanese children with RD have a similar difficulty to those with letter-by-letter in suprasegmental phonology. In addition, it was also suggested that the ability of word accent repetition in school-age children with RD was lower than that of the nursery school fluent reader.

Moreover, both in the RD and the letter-by-letter group, the mean number of words repeated correctly of the non-accented words was significantly higher than both of those for the first- and second-syllable accented words, and the mean number of correctly repeated first-syllable accented words was significantly higher than those of the second-syllable accented words. These findings suggest that the RD and the letter-by-letter group are easily affected by accent patterns. Sakono et al. (2011) suggested that such children with poor reading skills might have poor phonological processing skills. Therefore, the result of this study suggests that the children with RD also may have difficulty in poor phonological processing skills in suprasegmental phonology.

As for the results of accent shift, the results of the RD group were also similar to those of the letter-by-letter group. For the first-syllable accented words, while the errors of shifting to the second-syllable accent were observed in both the RD and the letter-by-letter group, they were not observed in the fluent group. Furthermore, for the second-syllable accented words, while the percentage of errors shifting to the non-accent and the first-syllable accent was similar (nearly 50%) in the RD and the letter-by-letter group, for the fluent group, the percentage of errors shifting to the non-accent (about 90%) was much higher than that of shifting to the first-syllable accent.

Kubozono (2006a) reported that in Japanese, the frequency of non-accented words was 52%, while that of words accentuated in the first-syllable was 42%, and only 4% of words were accentuated in the second syllable. Thus, the results of the mean number of words repeated correctly in this study and in Sakono et al. (2011) indicate that the degree of difficulty in the word accent production task corresponds to the markedness of the accent patterns in Japanese. Therefore, we could say that in the production of the first-syllable accented words, the errors shifting to non-accent were thought to be a shift to an easier to produce accent pattern, while those shifting to second-syllable accent were thought to shift to a more difficult-to-produce accent pattern. Similarly, in the case of the second-syllable accented words, the errors shifting to the non-accent and the first-syllable accent were thought to reflect a shift to an accent pattern easier to produce. Therefore, one can say that it is remarkable that for the fluent group, the errors were a shift to an accent pattern that is easier to produce. By contrast, for both the RD and the letter-by-letter group...
group, errors involving a more difficult accent pattern were also observed. These results suggest that the representation of word accent in the RD and letter-by-letter group is not as complete as that in the fluent group, and that word accent is related not only to speech production or repetition, but to reading ability.

In both the RD and the letter-by-letter group, the total percentage of segmental errors was higher than that of the fluent group. This result indicates that the segmental aspect in the RD group was lower than that of the fluent group, and similar to that of the letter-by-letter group.

Taken together, the results of this study suggest that Japanese school-age children with RD have a problem in word accent production, which is similar to those with letter-by-letter reading.

However, the participants were 9 children with RD in this study. In order to obtain a more precise clarification of the accent production in Japanese children with RD, studies with a larger number of participants will be necessary.

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**References**


