RELATIONSHIP BETWEEN PHONEMIC AWARENESS AND SYLLABIC AWARENESS DURING THE INITIAL STAGE OF LEARNING TO READ IN JAPANESE CHILDREN

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ABSTRACT

This study examined the phase of the relationship among the development of phonemic awareness, development of syllabic awareness and the beginning process of learning to read in Japanese children. 45 nursery school children (63-77 months) were requested to conduct syllable segmentation and identification tests, Kana naming and reading tests, and the phoneme deletion test including the training session and the modeling phonemic structure test. The result indicated that we could find a considerable relationship between syllabic awareness and phonemic awareness when considering the level of manipulation of syllables at the task. The phase of syllabic awareness on a verbal level speech would lead to the phase of the development of phonemic awareness being mediated by the phase of learning Kana explosively.

Key words: Phonemic awareness, Syllabic awareness, Japanese speaking children, Reading development, Development of phonological awareness

INTRODUCTION

Various studies have demonstrated that phonological awareness is an important predictor of learning to read (Goswami, 1999). Moreover, the majority of these studies have indicated that the development of phonological awareness correlates with the initial process of learning to read (for reviews, see Amano, 1987; Adams, 1990). However, various definitions of phonological awareness have been used in these studies, based on the dominant units of phonological awareness which is different in each linguistic environment. The following three levels of phonological units could be distinguished in previous studies; the level of phonemes, onsets and rimes, and syllables (Goswami, 1999). In numerous studies from English-speaking countries, which have significantly contributed to various issues in this field, the phonemes or onsets and rimes have been considered as relatively dominant phonological units when considering the relationship with the initial process of learning to read. One reason for this might be that in English-speaking societies, they do

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not use syllabic characters but phonemic alphabets upon beginning reading. For example, Nation & Hulme (1997) investigated whether phonemic awareness or onset-rime awareness was more appropriative predictor of learning to read in early childhood. However, they did not deal with syllabic awareness and its relationship with the initial process of learning to read.

On the other hand, a number of previous studies in English-speaking countries suggested that the development of phonological awareness progresses from the syllabic level to phonemic level. For example, Liberman, Shankweiler, Fischer and Carter (1974) asked 135 English-speaking children aged from 4 to 7 years to tap out the phonemic or syllabic number of segments in spoken utterance. They showed that analysis into syllables of words was significantly easier and accomplished earlier than analysis into phonemes. Treiman and Zukowski (1991) also asked children that were similar in number, age, and background to those of Liberman et al. (1974) to judge whether the words had any sounds in common. Their results supported the above developmental process of phonological awareness. Considered together, the above studies indicate that the task of syllabic analysis of reading words is generally easier than the task of phonemic analysis.

In contrast to English-speaking areas, syllables have been regarded as relatively dominant phonological units in the beginning process of learning to read in Japanese. However, the sequence and relationship between the processes of phonological awareness, i.e., syllabic and phonemic awareness, are not clearly defined in Japanese-speaking regions. Several researchers have studied phonemic awareness and the beginning of the reading process in Japanese children (see Matsumoto, 2004). Mann (1986) and Endo (1991) showed that the development of syllabic awareness preceded the development of phonemic awareness. On the other hand, Ijiri (1991) indicated that there is no causal relationship between the two processes. Regression analysis using syllabic awareness as the dependent variable found that age and reading development accounted for a significant portion of the variance, beyond that accounted for by phonemic awareness and other factors. Furthermore, regression analysis using phonemic awareness as the dependent variable found reading and phonological/orthographic activities at home accounted for a significant portion of the variance in phonemic awareness beyond that accounted for by syllabic awareness, age, intelligence quotient (IQ), and other factors.

We now need to consider how we can understand these results. When we come to think of the difference in the definition of phonological unit, it is easy to understand that the manipulation of syllable in words is generally easier than that of phoneme, since a syllable is a unit based on an articulation while the phoneme is a unit based on auditory discrimination. Taking the above background information into consideration, there is a need to study the conditions that enhance complex process of the development from awareness of syllables to awareness of phonemes. Previous studies in Japanese-speaking communities have indicated that syllabic awareness is an important predictor in the beginning process of learning to read syllabic characters, i.e. Kana (Amano, 1986), and that phonemic awareness may develop accompanied with the initial process of reading (Ijiri, 1991; Matsumoto, 2002). However, it is not clear how the development of phonemic awareness affects the interaction between syllabic awareness and beginning process of learning to read, and whether the development of phonemic awareness is facilitated by the

development of syllabic awareness or not, and vice versa. Similarly, it is also not clear whether the development of phonemic awareness is facilitated by reading Kana, or not.

Before addressing these issues, we need to consider the various cognitive levels of the tasks used in assessing phonological awareness, as recommended by Ijiri (1991). It is noteworthy that identification of the period of genesis and development of syllabic or phonemic awareness depends on the type of task used for assessment. Thus, any method based on simple correlation analysis between phonological awareness or multiple regression analysis without considering the level of task would not be suitable for addressing these issues. In other words, we need to detect the cognitive level of tasks used in assessing phonological awareness and to address the qualitative relationship between them on the basis of the level of tasks.

In this paper, I will analyze the qualitative relationship between phonemic awareness and syllabic awareness in the beginning process of learning to read Japanese according to the level of manipulation of syllables at the task. Subsequently, I will discuss the phase of the relationship among the development of phonemic awareness, development of syllabic awareness and the beginning process of learning to read in Japanese children.

METHODS

Participants

Participants in this study were 45 children (21 girls and 24 boys; mean age 5 years 10 months; range: 63-77 months; SD=4.6) from one nursery school in Hachioji-city, a suburb of Tokyo. Based on reports from school teachers, none of the participants had any perceptual and neurological problems, and none of them was mentally retarded. All participants spoke Japanese at home.

In the Japanese educational system, most children start their schooling at three years of age at kindergarten or between two months and three years of age at a nursery school. Subsequently, they enter primary school at seven years of age. Japanese children start systematically learning to read with formal instructions after entering primary school. Thus, participants in this study were not directly instructed about reading at the school while they engaged in this study.

Measures and procedures

The following three tasks were conducted in this study. The order of each task was decided based on the study of Matsumoto (2002) taking into consideration the interference between syllable tasks and phonemic tasks; 1) Syllable awareness tasks, 2) Beginning Reading tasks, and 3) Phonemic awareness tasks. All the tasks were administered in a suitable room of the nursery school.

Syllabic awareness task

This task is composed of syllable segmentation and identification tests, which are similar to the tests used by Amano (1993). Participants were required to divide the task words into each syllable, and abstract and pronounce the initial, medial and final syllables of word one at a time in random order. In the first half (6 words; 3 three syllable words and 3 five syllable words), the child was verbally presented with the task word with

drawings of the word and was required to use medium tools; drawings and five square wooden blocks. In the second half (6 words; 3 three syllable words and 3 five syllable words), the child was presented with the task word verbally only and required to do with using no medium tools.

Beginning Reading task

These tasks consisted of the following two types of tests; 1) Kana letters naming test, and 2) special syllable Kana words reading test. In the former test, participants were required to read 71 regular letters that are composed of a cluster of letters that represent a syllable of vowel only, consonant-vowel or a nasal coda. These were presented in a random order. In the latter task, they were required to read task words including five kinds of syllables that are read irregularly. Those syllables are represented by plural letters or have another pronunciation. The materials and procedure were similar to those used in the nationwide survey by the National Institute for Japanese Language (NIJL) in 1967 (National Institute for Japanese Language [NIJL], 1972).

Phonemic awareness task

Phonemic awareness level of each participant was assessed using two types of tasks, in which the child manipulated phonemes of the word item; the phoneme deletion task and the phonemic model construction, i.e. the "modeling phonemic structure" task, which was similar to that described by Matsumoto (2002). The tasks were administrated through two separate sessions; 1) Training session including the consonant deletion tasks. 2) Test session including the consonant deletion tasks and the modeling phonemic structure task. In both types of tasks, I used an apparatus with picture and a diagram illustration of phonemic structure of the word item and counters to place in the diagram according to the phonemic structure of the word. Two kinds of colors were used on the counters; a red counter for a consonant (including nasal coda) and a blue counter for a vowel. The details of procedure used in each session are as follows.

1) Training session

This session is composed of a set for instruction of phonemic analysis of words and a set for practice of phonemic analysis.

Set for instruction of phonemic analysis of words

First, the set used 6 word items of two phonemes which were composed of vowel only (V+V), such as "ei" (means ray in the sea), or vowel plus nasal coda (V+N), such as "an" (means bean jam), in order to master phonemic analysis of words using medium tools. The participant was presented with the above apparatus and required to name the object illustrated in it, and then to abstract and pronounce the target phoneme of word one at a time in random order. If the participant did correctly, s/he was required to fill the appropriate position of the phonemic diagram with the counters. If s/he made a mistake on the first try, the examiner instructed the child to pronounce more slowly, together with pointing and tracing the diagram of phoneme construction and allowed the child to try one additional time.

Next, the set used 3 word items of three phonemes composed of consonant-vowel combinations plus vowel only (CV+V), such as "kao" (means face), or vice versa (V+CV), such as "ume" (means Japanese apricot). The participant was presented with the apparatus and required to name the object illustrated, and then to abstract and pronounce the target phoneme of word one at a time. The order of the target phoneme was as follows; the first was the phoneme of vowel only, the next was the vowel phoneme of CV syllables, and the last was the consonant. That is, for example "ike" (means pond), the first was "i", the next "e", and the last "k". If the child made a mistake at the vowel phoneme of CV syllables or the consonant phoneme, s/he was helped by the examiner to be aware of the phonemic structure by providing instructions on how to pronounce CV syllable more slowly such as "k-e". If the child was still failed to accomplish the task correctly, the examiner gave a demonstration of the pronunciation and allowed the child to repeat after the examiner in order to encourage her/him to be aware of the phonemic structure. If the child did correctly, s/he was required to fill an appropriate position of the phonemic diagram with the counters. Then, the examiner demonstrated pronunciation of the word more slowly, for example "i-k-e", with pointing and tracing the diagram of phonemic construction in order to check the phonemic structure of words with the participant, irrespective of the performance of the child.

When the target phoneme was consonant, the pronunciation sounding as if accompanied by the vowel phoneme of CV syllables, such as "ke", as well as the pronunciation consonant only was encoded as the correct response. This is because phonemic awareness is not defined as articulating a single phoneme, but as manipulating a phoneme of words (Yopp, 1988). It is especially difficult for Japanese preschool children, who have no experience in hearing and articulating a single consonant phoneme without nasal coda, to articulate each phoneme of word if they could manipulate phonemes of the word item (Matsumoto, 2004). Therefore, tasks that need analysis and manipulation of phonemes of the word item without articulating it were prepared in this study.

After the above process had finished, the participant was requested to abstract, pronounce and fill diagrams about 3 word items of three phonemes again irrespective of their performance in the task. If the child did all word items correctly, s/he was requested to conduct the phoneme deletion task using the above 3 word items for assessment of phonemic awareness according to the following procedure. The examiner removed the counter of consonant and asked the participant how the item would be pronounced if the sound marked red, which is consonant, was removed. If the participant did not correctly or made no response on the first try, the examiner demonstrated the pronunciation as above to help the child and allow her/him to try up once again. Subsequently, the examiner allowed the child to check the correct response and the phonemic structure of word with pointing and tracing the diagram of phonemic construction and pronouncing whether s/he did correctly or not.

If the child correctly did all of the tasks on the phoneme deletion test, s/he was requested to try the next set of the training session, otherwise, the child was allowed to try this set on another day once again. This set was abandoned if the child failed to do correctly on the additional trial.

Set for practice of phonemic analysis

In the first half, the set used 8 word items of three phonemes which were composed of consonant-vowel combinations plus nasal coda (CV+N), such as "kan" (means canister), consonant-vowel combinations plus vowel only (CV+V), such as "kai" (means shellfish), or vice versa (V+CV), such as "ame" (means candy). In the latter half, it used 6 word items of four phonemes, which were composed of consonant-vowel combinations (CV+CV), such as "kame" (means tortoise). All consonants included in the words were "k" or "m" which were also used as consonants of the word item in the previous step.

Participants were required to name, abstract and pronounce, and fill the diagrams using the same procedure described above. They were allowed to try again one additional time. If they made correct responses, they were required to conduct the phoneme deletion task for each consonant of the word item. The phoneme deletion task in the latter half was encoded as incorrect response when the consonant that was not the target phoneme in the word was articulated as if accompanied by the vowel phoneme of CV syllables. For example, "ka-i" was the correct response but "ka-a-i" was incorrect response when the child was asked to delete the target consonant "m" from the word item "kami" (means paper) and articulate. The reason for this is that the participants can be understood to regard the phoneme diagram of consonant as each CV syllable diagram when they articulate such a response.

They were requested to pass to the test session if they correctly did more than 11 items on this set. If they did not correctly, they were permitted to try on another day once again. This set was abandoned and they were unable to try the test session if they did not perform correctly on the additional trial.

2) Test session

This session is composed of a set for the consonant deletion task and a set for the modeling phonemic structure task.

Set for the consonant deletion task

The set used 3 word items of three phonemes, which were composed of consonant-vowel combinations plus nasal coda (CV+N), such as "ban" (means evening), vowel only plus consonant-vowel combinations (V+CV), such as "ude" (means arm), and 6 word items of four phonemes, which were composed of consonant-vowel combinations (CV+CV), such as "kuda" (means pipe). The consonants which were included in the words were "k" and "m", which were also used as the consonants of the word item into the training session, and "b", "d", and "z", which were the target consonant to be deleted in this task. Participants were requested to conduct the phoneme deletion regarding each consonant of the word item following the procedure used in the training session.

Set for the modeling phonemic structure task

The set used 6 word items for the practice trial and 6 word items for the test set. They consisted of phonemes from two to four, that is, V+V, CV+V, V+CV, and CV+CV. The consonants included in the words were "k", "m", "b", "d", and "z", which were also used as the consonants of the word item used in the previous sessions. Participants were

presented with the apparatus and required to name similar to the previous sessions. Subsequently, the examiner demonstrated in a practice trial how to place a counter in the appropriate square of the diagram and pronounce each phoneme of the word slowly. The participant was required to imitate the examiner. The child was instructed that s/he will be permitted to perform with pronouncing if they did without pronouncing. When they finished each word item, the examiner allowed them to check the correct response and the phonemic structure of the word according to the previous session whether they did correctly or not. After having finished the entire item with practice trial, they were requested to do it using an apparatus whose diagram of phonemic structure was covered. Subsequently, the test set was conducted irrespective of whether they did correctly with the practice trial or not. The diagram of phonemic structure in the apparatus for test set was also covered. If they made incorrect response to the word item, they were permitted to try that item once again.

RESULTS

Data coding procedure and Results of each task

The ordinary scales that reflected the quality of each developmental process and used in previous studies were used for analysis of data of each three tasks. The data for the syllabic awareness task were encoded into the following four levels according to the most dominant type of analysis of the syllabic structure of the word on the task, similar to the method reported by Amano (1993). The number and rate of participants in each level were as follow. I) Level of operation with object (n=7; 16%). II) Level of operation with overt oral speech (n=13; 29%). III) Level of operation with muttering in process of transferring to inner speech (n=21; 47%), and IV) Level of operation at entirely inner speech (n=4; 9%).

The data for the beginning reading task were encoded into five levels which were defined based on NIJL (1972) and Akita & Hatano (1999). The definitions and the number and rate of participants in each level were as follow. 1) Level of naming 0-9 letters, in which children could read the letters composed of their name plus a few letters (n=4; 9%). 2) Level of naming 10-59 letters, in which the speed of learning Kana was accelerated (n=8; 18%). 3) Level of naming 60-71 letters, in which children almost finished learning regular Kana (n=5; 11%). 4) Level of naming 60-71 letters and mastering 1-4 kinds of syllables read irregularly (n=19; 42%). 5) Level of naming 60-71 letters and completely mastering syllables read irregularly (n=9; 20%).

The data for the phonemic awareness task were encoded into five levels that were defined based on the criterion for passage on training session and the score on the test session. The definitions and number and percentage of participants at each level were as follow. 1) Level of hardly manipulating phonemes despite intervention, in which the child could not pass the set for instruction in phonemic analysis of words on the training session (n=13; 29%), 2) Level of managing to manipulate phonemes depending on the instruction, in which the participant could pass the set for instruction but not the set for practice of phonemic analysis on the training session (n=9; 20%). 3) Level of manipulating phonemes within experience, in which the child passed the training session but achieved relatively lower score (range: 0 to 6) in the consonant deletion task on the test session (n=4; 9%). 4) Level of manipulating various phonemes regardless of experience, in which the child

achieved relatively higher score at the deletion task on the test session but relatively lower score (range: 0 to 4) at the modeling phonemic structure task (n=13; 29%). 5) Level of manipulating various phonemes by various methods, in which the child achieved a relatively higher score at both tasks (n=6; 13%).

Relationship among phonemic awareness, syllabic awareness and beginning reading skill

Tables 1, 2, and 3 provide detail of the relationship among phonemic awareness, syllabic awareness and beginning reading skill.

Table 1.
Number of participants in each level of Phonemic Awareness for each level of Syllabic Awarene:

	Level of Syllabic Awareness				
Level of Phonemic Awareness	I	II	III	IV	Total
1	6	4	3	0	13
2	1	4	4	0	9
3	0	1	3	0	4
4	0	4	6	3	13
5	0	0	5	1	6
Total	7	13	21	4	45

Table 2.
Number of participants in each level of Phonemic Awareness for each level of Beginning Readin:

	Level of Beginning Reading					
Level of Phonemic Awareness	1)	2)	3)	4)	5)	Total
1	4	7	1	1	0	13
2	0	1	2	5	1	9
3	0	0	1	3	0	4
4	0	0	1	8	4	13
5	0	0	0	2	4	6
Total	4	8	5	19	9	45

Table 3.
Number of participants in each level of Syllabic Awareness for each level of Beginning Reading

	Level of Syllabic Awareness				
Level of Beginning Reading	I	II	III	IV	Total
1)	3	0	1	0	4
2)	4	3	1	0	8
3)	0	3	2	0	5
4)	0	7	12	0	19
5)	0	0	5	4	9
Total	7	13	21	4	45

Table 1 shows the relationship between phonemic awareness and syllabic awareness. Children could hardly achieve level 2 and above of phonemic awareness unless they performed on level II and above of syllabic awareness. That is, children could hardly manipulate phonemes of words until they were able to use no medium object to analyze the syllabic structure of words. Furthermore, they achieved higher level of manipulating various phonemes when they could master using inner speech to analyze syllables.

Table 2 shows that almost all children could achieve level 2 and above of phonemic awareness when they performed level 3 and above of the beginning reading. These results suggest that children can hardly manipulate phonemes of words until they almost finish learning regular Kana. Table 3 shows that children could achieve level 3 and above of the reading skill if they performed level II and above of syllabic awareness. In other words, the period at which children can analyze syllables without medium object corresponds to the period at which they almost finish learning regular Kana and begin to master syllables read irregularly. This finding provides support to the data of Amano (1993) on the interactional process between learning to read Kana and development of syllabic awareness.

DISCUSSION

The methodology used in the present study to define the relationship between phonemic awareness and syllabic awareness in the beginning process of learning to read Japanese is obviously different from those used in previous studies (e.g., Mann, 1986; Endo, 1989; Ijiri, 1991). In previous studies, the total score of the tasks of variables of phonological awareness were estimated and the data were analyzed by simple correlation analysis or multiple regression analysis. In contrast to this, the cognitive level in which children conduct the tasks was considered in this study. For example, Ijiri (1991) tested children using medium tools for analyzing syllables. Consequently, the cognitive level was limited to that of operation with objects, and the author could not help discuss the relationship without considering the quality of performing the tasks. The author concluded that there was no causal relationship between syllabic awareness and phonemic awareness. However, there are several levels at which children analyze the syllabic structure of words. In this study, I tried to detect the level in each child using the concept of Amano (1993) to consider the issue. The result of this study indicates that there is a considerable relationship between syllabic awareness and phonemic awareness. That is different from the result of Ijiri (1991) based on multiple regression analysis. We now need to discuss the importance of this difference.

Amano (1993) showed that the ability of the child to analyze syllables of words without medium object was the necessary condition for facilitating learning exponentially in the process of beginning reading. In fact, the findings were confirmed in present study (see Table 3). Thus, the condition for facilitating learning Kana almost corresponds with that for manipulating phonemes of words. On the other hand, the dominantly explanatory variable for the development of phonemic awareness identified by Ijiri (1991) was not syllabic awareness but reading development. This discrepancy is probably attributed to differences in the method used for data analysis. Further studies are needed to address how we can explain the novel finding from the viewpoint of the relationship with the

beginning reading process.

This issue can be restated as follows: what phases of the relationship among the development of phonemic awareness, that of syllabic awareness, and the beginning process of learning to read are assumed in Japanese speaking regions? In order to discuss the issue, we need to consider the interactive relationship between analyzing syllabic structure of words and learning to read in the process of beginning reading. Previous studies by Amano (Amano, 1986; 1993) confirmed that analysis of syllabic structure of words using an object is a prerequisite for starting learning to read Kana, and that the latter facilitates the development of syllabic awareness in the level from with the object to with overt oral speech, and that explosively learning to read Kana occurs after the development of syllabic awareness on the level with overt oral speech is accomplished. The sequence of learning to read Kana is that regular unvoiced Kana whose letter corresponds to a syllable and nasal coda are the first, voiced while semi-voiced letters are the next, and the syllables that are read irregularly are the last (Akita & Hatano, 1999; NIJL, 1972). Hence, we can understand that the period of accomplishing the development of syllabic awareness with speech is not only the period of learning to read voiced and semi-voiced letters but also the period of being possible to manipulate phonemes. This consistency of the period seems to suggest that learning to read voiced and semi-voiced letters facilitates the development of phonemic awareness.

The process of learning to read voiced and semi-voiced letters in Japanese speaking children cannot be regarded as an associative learning between one character and one syllable because the process of learning usually starts from the regular unvoiced letters and includes the phase in which the speed of learning accelerates explosively. Children must compare the voiced or semi-voiced letter with the unvoiced letter matching it, and try to learn reading it in the beginning process of learning to read. Therefore, manipulation of phonemes is part of the learning process for Japanese speaking children. Taking this process into account and based on our data, it is conceivable that accomplishing syllabic awareness on a verbal level is necessary for children to manipulate phonemes of words. The phase of syllabic awareness in the level of operation with oral speech would lead to the phase of the development of phonemic awareness being mediated by the phase of learning Kana explosively. This finding could be useful when studying and discussing issues related to the development of phonemic awareness and the beginning process of learning to read in Japanese children, which were reviewed by Matsumoto (2004).

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Key words: Phonemic awareness, Syllabic awareness, Japanese speaking children, Reading development, Development of phonological awareness

INTRODUCTION

Various studies have demonstrated that phonological awareness is an important predictor of learning to read (Goswami, 1999). Moreover, the majority of these studies have indicated that the development of phonological awareness correlates with the initial process of learning to read (for reviews, see Amano, 1987; Adams, 1990). However, various definitions of phonological awareness have been used in these studies, based on the dominant units of phonological awareness which is different in each linguistic environment. The following three levels of phonological units could be distinguished in previous studies; the level of phonemes, onsets and rimes, and syllables (Goswami, 1999). In numerous studies from English-speaking countries, which have significantly contributed to various issues in this field, the phonemes or onsets and rimes have been considered as relatively dominant phonological units when considering the relationship with the initial process of learning to read. One reason for this might be that in English-speaking societies, they do

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not use syllabic characters but phonemic alphabets upon beginning reading. For example, Nation & Hulme (1997) investigated whether phonemic awareness or onset-rime awareness was more appropriative predictor of learning to read in early childhood. However, they did not deal with syllabic awareness and its relationship with the initial process of learning to read.

On the other hand, a number of previous studies in English-speaking countries suggested that the development of phonological awareness progresses from the syllabic level to phonemic level. For example, Liberman, Shankweiler, Fischer and Carter (1974) asked 135 English-speaking children aged from 4 to 7 years to tap out the phonemic or syllabic number of segments in spoken utterance. They showed that analysis into syllables of words was significantly easier and accomplished earlier than analysis into phonemes. Treiman and Zukowski (1991) also asked children that were similar in number, age, and background to those of Liberman et al. (1974) to judge whether the words had any sounds in common. Their results supported the above developmental process of phonological awareness. Considered together, the above studies indicate that the task of syllabic analysis of reading words is generally easier than the task of phonemic analysis.

In contrast to English-speaking areas, syllables have been regarded as relatively dominant phonological units in the beginning process of learning to read in Japanese. However, the sequence and relationship between the processes of phonological awareness, i.e., syllabic and phonemic awareness, are not clearly defined in Japanese-speaking regions. Several researchers have studied phonemic awareness and the beginning of the reading process in Japanese children (see Matsumoto, 2004). Mann (1986) and Endo (1991) showed that the development of syllabic awareness preceded the development of phonemic awareness. On the other hand, Ijiri (1991) indicated that there is no causal relationship between the two processes. Regression analysis using syllabic awareness as the dependent variable found that age and reading development accounted for a significant portion of the variance, beyond that accounted for by phonemic awareness and other factors. Furthermore, regression analysis using phonemic awareness as the dependent variable found reading and phonological/orthographic activities at home accounted for a significant portion of the variance in phonemic awareness beyond that accounted for by syllabic awareness, age, intelligence quotient (IQ), and other factors.

We now need to consider how we can understand these results. When we come to think of the difference in the definition of phonological unit, it is easy to understand that the manipulation of syllable in words is generally easier than that of phoneme, since a syllable is a unit based on an articulation while the phoneme is a unit based on auditory discrimination. Taking the above background information into consideration, there is a need to study the conditions that enhance complex process of the development from awareness of syllables to awareness of phonemes. Previous studies in Japanese-speaking communities have indicated that syllabic awareness is an important predictor in the beginning process of learning to read syllabic characters, i.e. Kana (Amano, 1986), and that phonemic awareness may develop accompanied with the initial process of reading (Ijiri, 1991; Matsumoto, 2002). However, it is not clear how the development of phonemic awareness affects the interaction between syllabic awareness and beginning process of learning to read, and whether the development of phonemic awareness is facilitated by the

development of syllabic awareness or not, and vice versa. Similarly, it is also not clear whether the development of phonemic awareness is facilitated by reading Kana, or not.

Before addressing these issues, we need to consider the various cognitive levels of the tasks used in assessing phonological awareness, as recommended by Ijiri (1991). It is noteworthy that identification of the period of genesis and development of syllabic or phonemic awareness depends on the type of task used for assessment. Thus, any method based on simple correlation analysis between phonological awareness or multiple regression analysis without considering the level of task would not be suitable for addressing these issues. In other words, we need to detect the cognitive level of tasks used in assessing phonological awareness and to address the qualitative relationship between them on the basis of the level of tasks.

In this paper, I will analyze the qualitative relationship between phonemic awareness and syllabic awareness in the beginning process of learning to read Japanese according to the level of manipulation of syllables at the task. Subsequently, I will discuss the phase of the relationship among the development of phonemic awareness, development of syllabic awareness and the beginning process of learning to read in Japanese children.

METHODS

Participants

Participants in this study were 45 children (21 girls and 24 boys; mean age 5 years 10 months; range: 63-77 months; SD=4.6) from one nursery school in Hachioji-city, a suburb of Tokyo. Based on reports from school teachers, none of the participants had any perceptual and neurological problems, and none of them was mentally retarded. All participants spoke Japanese at home.

In the Japanese educational system, most children start their schooling at three years of age at kindergarten or between two months and three years of age at a nursery school. Subsequently, they enter primary school at seven years of age. Japanese children start systematically learning to read with formal instructions after entering primary school. Thus, participants in this study were not directly instructed about reading at the school while they engaged in this study.

Measures and procedures

The following three tasks were conducted in this study. The order of each task was decided based on the study of Matsumoto (2002) taking into consideration the interference between syllable tasks and phonemic tasks; 1) Syllable awareness tasks, 2) Beginning Reading tasks, and 3) Phonemic awareness tasks. All the tasks were administered in a suitable room of the nursery school.

Syllabic awareness task

This task is composed of syllable segmentation and identification tests, which are similar to the tests used by Amano (1993). Participants were required to divide the task words into each syllable, and abstract and pronounce the initial, medial and final syllables of word one at a time in random order. In the first half (6 words; 3 three syllable words and 3 five syllable words), the child was verbally presented with the task word with

drawings of the word and was required to use medium tools; drawings and five square wooden blocks. In the second half (6 words; 3 three syllable words and 3 five syllable words), the child was presented with the task word verbally only and required to do with using no medium tools.

Beginning Reading task

These tasks consisted of the following two types of tests; 1) Kana letters naming test, and 2) special syllable Kana words reading test. In the former test, participants were required to read 71 regular letters that are composed of a cluster of letters that represent a syllable of vowel only, consonant-vowel or a nasal coda. These were presented in a random order. In the latter task, they were required to read task words including five kinds of syllables that are read irregularly. Those syllables are represented by plural letters or have another pronunciation. The materials and procedure were similar to those used in the nationwide survey by the National Institute for Japanese Language (NIJL) in 1967 (National Institute for Japanese Language [NIJL], 1972).

Phonemic awareness task

Phonemic awareness level of each participant was assessed using two types of tasks, in which the child manipulated phonemes of the word item; the phoneme deletion task and the phonemic model construction, i.e. the "modeling phonemic structure" task, which was similar to that described by Matsumoto (2002). The tasks were administrated through two separate sessions; 1) Training session including the consonant deletion tasks. 2) Test session including the consonant deletion tasks and the modeling phonemic structure task. In both types of tasks, I used an apparatus with picture and a diagram illustration of phonemic structure of the word item and counters to place in the diagram according to the phonemic structure of the word. Two kinds of colors were used on the counters; a red counter for a consonant (including nasal coda) and a blue counter for a vowel. The details of procedure used in each session are as follows.

1) Training session

This session is composed of a set for instruction of phonemic analysis of words and a set for practice of phonemic analysis.

Set for instruction of phonemic analysis of words

First, the set used 6 word items of two phonemes which were composed of vowel only (V+V), such as "ei" (means ray in the sea), or vowel plus nasal coda (V+N), such as "an" (means bean jam), in order to master phonemic analysis of words using medium tools. The participant was presented with the above apparatus and required to name the object illustrated in it, and then to abstract and pronounce the target phoneme of word one at a time in random order. If the participant did correctly, s/he was required to fill the appropriate position of the phonemic diagram with the counters. If s/he made a mistake on the first try, the examiner instructed the child to pronounce more slowly, together with pointing and tracing the diagram of phoneme construction and allowed the child to try one additional time.

Next, the set used 3 word items of three phonemes composed of consonant-vowel combinations plus vowel only (CV+V), such as "kao" (means face), or vice versa (V+CV), such as "ume" (means Japanese apricot). The participant was presented with the apparatus and required to name the object illustrated, and then to abstract and pronounce the target phoneme of word one at a time. The order of the target phoneme was as follows; the first was the phoneme of vowel only, the next was the vowel phoneme of CV syllables, and the last was the consonant. That is, for example "ike" (means pond), the first was "i", the next "e", and the last "k". If the child made a mistake at the vowel phoneme of CV syllables or the consonant phoneme, s/he was helped by the examiner to be aware of the phonemic structure by providing instructions on how to pronounce CV syllable more slowly such as "k-e". If the child was still failed to accomplish the task correctly, the examiner gave a demonstration of the pronunciation and allowed the child to repeat after the examiner in order to encourage her/him to be aware of the phonemic structure. If the child did correctly, s/he was required to fill an appropriate position of the phonemic diagram with the counters. Then, the examiner demonstrated pronunciation of the word more slowly, for example "i-k-e", with pointing and tracing the diagram of phonemic construction in order to check the phonemic structure of words with the participant, irrespective of the performance of the child.

When the target phoneme was consonant, the pronunciation sounding as if accompanied by the vowel phoneme of CV syllables, such as "ke", as well as the pronunciation consonant only was encoded as the correct response. This is because phonemic awareness is not defined as articulating a single phoneme, but as manipulating a phoneme of words (Yopp, 1988). It is especially difficult for Japanese preschool children, who have no experience in hearing and articulating a single consonant phoneme without nasal coda, to articulate each phoneme of word if they could manipulate phonemes of the word item (Matsumoto, 2004). Therefore, tasks that need analysis and manipulation of phonemes of the word item without articulating it were prepared in this study.

After the above process had finished, the participant was requested to abstract, pronounce and fill diagrams about 3 word items of three phonemes again irrespective of their performance in the task. If the child did all word items correctly, s/he was requested to conduct the phoneme deletion task using the above 3 word items for assessment of phonemic awareness according to the following procedure. The examiner removed the counter of consonant and asked the participant how the item would be pronounced if the sound marked red, which is consonant, was removed. If the participant did not correctly or made no response on the first try, the examiner demonstrated the pronunciation as above to help the child and allow her/him to try up once again. Subsequently, the examiner allowed the child to check the correct response and the phonemic structure of word with pointing and tracing the diagram of phonemic construction and pronouncing whether s/he did correctly or not.

If the child correctly did all of the tasks on the phoneme deletion test, s/he was requested to try the next set of the training session, otherwise, the child was allowed to try this set on another day once again. This set was abandoned if the child failed to do correctly on the additional trial.

Set for practice of phonemic analysis

In the first half, the set used 8 word items of three phonemes which were composed of consonant-vowel combinations plus nasal coda (CV+N), such as "kan" (means canister), consonant-vowel combinations plus vowel only (CV+V), such as "kai" (means shellfish), or vice versa (V+CV), such as "ame" (means candy). In the latter half, it used 6 word items of four phonemes, which were composed of consonant-vowel combinations (CV+CV), such as "kame" (means tortoise). All consonants included in the words were "k" or "m" which were also used as consonants of the word item in the previous step.

Participants were required to name, abstract and pronounce, and fill the diagrams using the same procedure described above. They were allowed to try again one additional time. If they made correct responses, they were required to conduct the phoneme deletion task for each consonant of the word item. The phoneme deletion task in the latter half was encoded as incorrect response when the consonant that was not the target phoneme in the word was articulated as if accompanied by the vowel phoneme of CV syllables. For example, "ka-i" was the correct response but "ka-a-i" was incorrect response when the child was asked to delete the target consonant "m" from the word item "kami" (means paper) and articulate. The reason for this is that the participants can be understood to regard the phoneme diagram of consonant as each CV syllable diagram when they articulate such a response.

They were requested to pass to the test session if they correctly did more than 11 items on this set. If they did not correctly, they were permitted to try on another day once again. This set was abandoned and they were unable to try the test session if they did not perform correctly on the additional trial.

2) Test session

This session is composed of a set for the consonant deletion task and a set for the modeling phonemic structure task.

Set for the consonant deletion task

The set used 3 word items of three phonemes, which were composed of consonant-vowel combinations plus nasal coda (CV+N), such as "ban" (means evening), vowel only plus consonant-vowel combinations (V+CV), such as "ude" (means arm), and 6 word items of four phonemes, which were composed of consonant-vowel combinations (CV+CV), such as "kuda" (means pipe). The consonants which were included in the words were "k" and "m", which were also used as the consonants of the word item into the training session, and "b", "d", and "z", which were the target consonant to be deleted in this task. Participants were requested to conduct the phoneme deletion regarding each consonant of the word item following the procedure used in the training session.

Set for the modeling phonemic structure task

The set used 6 word items for the practice trial and 6 word items for the test set. They consisted of phonemes from two to four, that is, V+V, CV+V, V+CV, and CV+CV. The consonants included in the words were "k", "m", "b", "d", and "z", which were also used as the consonants of the word item used in the previous sessions. Participants were

presented with the apparatus and required to name similar to the previous sessions. Subsequently, the examiner demonstrated in a practice trial how to place a counter in the appropriate square of the diagram and pronounce each phoneme of the word slowly. The participant was required to imitate the examiner. The child was instructed that s/he will be permitted to perform with pronouncing if they did without pronouncing. When they finished each word item, the examiner allowed them to check the correct response and the phonemic structure of the word according to the previous session whether they did correctly or not. After having finished the entire item with practice trial, they were requested to do it using an apparatus whose diagram of phonemic structure was covered. Subsequently, the test set was conducted irrespective of whether they did correctly with the practice trial or not. The diagram of phonemic structure in the apparatus for test set was also covered. If they made incorrect response to the word item, they were permitted to try that item once again.

RESULTS

Data coding procedure and Results of each task

The ordinary scales that reflected the quality of each developmental process and used in previous studies were used for analysis of data of each three tasks. The data for the syllabic awareness task were encoded into the following four levels according to the most dominant type of analysis of the syllabic structure of the word on the task, similar to the method reported by Amano (1993). The number and rate of participants in each level were as follow. I) Level of operation with object (n=7; 16%). II) Level of operation with overt oral speech (n=13; 29%). III) Level of operation with muttering in process of transferring to inner speech (n=21; 47%), and IV) Level of operation at entirely inner speech (n=4; 9%).

The data for the beginning reading task were encoded into five levels which were defined based on NIJL (1972) and Akita & Hatano (1999). The definitions and the number and rate of participants in each level were as follow. 1) Level of naming 0-9 letters, in which children could read the letters composed of their name plus a few letters (n=4; 9%). 2) Level of naming 10-59 letters, in which the speed of learning Kana was accelerated (n=8; 18%). 3) Level of naming 60-71 letters, in which children almost finished learning regular Kana (n=5; 11%). 4) Level of naming 60-71 letters and mastering 1-4 kinds of syllables read irregularly (n=19; 42%). 5) Level of naming 60-71 letters and completely mastering syllables read irregularly (n=9; 20%).

The data for the phonemic awareness task were encoded into five levels that were defined based on the criterion for passage on training session and the score on the test session. The definitions and number and percentage of participants at each level were as follow. 1) Level of hardly manipulating phonemes despite intervention, in which the child could not pass the set for instruction in phonemic analysis of words on the training session (n=13; 29%), 2) Level of managing to manipulate phonemes depending on the instruction, in which the participant could pass the set for instruction but not the set for practice of phonemic analysis on the training session (n=9; 20%). 3) Level of manipulating phonemes within experience, in which the child passed the training session but achieved relatively lower score (range: 0 to 6) in the consonant deletion task on the test session (n=4; 9%). 4) Level of manipulating various phonemes regardless of experience, in which the child

achieved relatively higher score at the deletion task on the test session but relatively lower score (range: 0 to 4) at the modeling phonemic structure task (n=13; 29%). 5) Level of manipulating various phonemes by various methods, in which the child achieved a relatively higher score at both tasks (n=6; 13%).

Relationship among phonemic awareness, syllabic awareness and beginning reading skill

Tables 1, 2, and 3 provide detail of the relationship among phonemic awareness, syllabic awareness and beginning reading skill.

Table 1.
Number of participants in each level of Phonemic Awareness for each level of Syllabic Awarene:

	Level of Syllabic Awareness				
Level of Phonemic Awareness	I	II	III	IV	Total
1	6	4	3	0	13
2	1	4	4	0	9
3	0	1	3	0	4
4	0	4	6	3	13
5	0	0	5	1	6
Total	7	13	21	4	45

Table 2.
Number of participants in each level of Phonemic Awareness for each level of Beginning Readin:

	Level of Beginning Reading					
Level of Phonemic Awareness	1)	2)	3)	4)	5)	Total
1	4	7	1	1	0	13
2	0	1	2	5	1	9
3	0	0	1	3	0	4
4	0	0	1	8	4	13
5	0	0	0	2	4	6
Total	4	8	5	19	9	45

Table 3.
Number of participants in each level of Syllabic Awareness for each level of Beginning Reading

	Level of Syllabic Awareness				
Level of Beginning Reading	I	II	III	IV	Total
1)	3	0	1	0	4
2)	4	3	1	0	8
3)	0	3	2	0	5
4)	0	7	12	0	19
5)	0	0	5	4	9
Total	7	13	21	4	45

Table 1 shows the relationship between phonemic awareness and syllabic awareness. Children could hardly achieve level 2 and above of phonemic awareness unless they performed on level II and above of syllabic awareness. That is, children could hardly manipulate phonemes of words until they were able to use no medium object to analyze the syllabic structure of words. Furthermore, they achieved higher level of manipulating various phonemes when they could master using inner speech to analyze syllables.

Table 2 shows that almost all children could achieve level 2 and above of phonemic awareness when they performed level 3 and above of the beginning reading. These results suggest that children can hardly manipulate phonemes of words until they almost finish learning regular Kana. Table 3 shows that children could achieve level 3 and above of the reading skill if they performed level II and above of syllabic awareness. In other words, the period at which children can analyze syllables without medium object corresponds to the period at which they almost finish learning regular Kana and begin to master syllables read irregularly. This finding provides support to the data of Amano (1993) on the interactional process between learning to read Kana and development of syllabic awareness.

DISCUSSION

The methodology used in the present study to define the relationship between phonemic awareness and syllabic awareness in the beginning process of learning to read Japanese is obviously different from those used in previous studies (e.g., Mann, 1986; Endo, 1989; Ijiri, 1991). In previous studies, the total score of the tasks of variables of phonological awareness were estimated and the data were analyzed by simple correlation analysis or multiple regression analysis. In contrast to this, the cognitive level in which children conduct the tasks was considered in this study. For example, Ijiri (1991) tested children using medium tools for analyzing syllables. Consequently, the cognitive level was limited to that of operation with objects, and the author could not help discuss the relationship without considering the quality of performing the tasks. The author concluded that there was no causal relationship between syllabic awareness and phonemic awareness. However, there are several levels at which children analyze the syllabic structure of words. In this study, I tried to detect the level in each child using the concept of Amano (1993) to consider the issue. The result of this study indicates that there is a considerable relationship between syllabic awareness and phonemic awareness. That is different from the result of Ijiri (1991) based on multiple regression analysis. We now need to discuss the importance of this difference.

Amano (1993) showed that the ability of the child to analyze syllables of words without medium object was the necessary condition for facilitating learning exponentially in the process of beginning reading. In fact, the findings were confirmed in present study (see Table 3). Thus, the condition for facilitating learning Kana almost corresponds with that for manipulating phonemes of words. On the other hand, the dominantly explanatory variable for the development of phonemic awareness identified by Ijiri (1991) was not syllabic awareness but reading development. This discrepancy is probably attributed to differences in the method used for data analysis. Further studies are needed to address how we can explain the novel finding from the viewpoint of the relationship with the

beginning reading process.

This issue can be restated as follows: what phases of the relationship among the development of phonemic awareness, that of syllabic awareness, and the beginning process of learning to read are assumed in Japanese speaking regions? In order to discuss the issue, we need to consider the interactive relationship between analyzing syllabic structure of words and learning to read in the process of beginning reading. Previous studies by Amano (Amano, 1986; 1993) confirmed that analysis of syllabic structure of words using an object is a prerequisite for starting learning to read Kana, and that the latter facilitates the development of syllabic awareness in the level from with the object to with overt oral speech, and that explosively learning to read Kana occurs after the development of syllabic awareness on the level with overt oral speech is accomplished. The sequence of learning to read Kana is that regular unvoiced Kana whose letter corresponds to a syllable and nasal coda are the first, voiced while semi-voiced letters are the next, and the syllables that are read irregularly are the last (Akita & Hatano, 1999; NIJL, 1972). Hence, we can understand that the period of accomplishing the development of syllabic awareness with speech is not only the period of learning to read voiced and semi-voiced letters but also the period of being possible to manipulate phonemes. This consistency of the period seems to suggest that learning to read voiced and semi-voiced letters facilitates the development of phonemic awareness.

The process of learning to read voiced and semi-voiced letters in Japanese speaking children cannot be regarded as an associative learning between one character and one syllable because the process of learning usually starts from the regular unvoiced letters and includes the phase in which the speed of learning accelerates explosively. Children must compare the voiced or semi-voiced letter with the unvoiced letter matching it, and try to learn reading it in the beginning process of learning to read. Therefore, manipulation of phonemes is part of the learning process for Japanese speaking children. Taking this process into account and based on our data, it is conceivable that accomplishing syllabic awareness on a verbal level is necessary for children to manipulate phonemes of words. The phase of syllabic awareness in the level of operation with oral speech would lead to the phase of the development of phonemic awareness being mediated by the phase of learning Kana explosively. This finding could be useful when studying and discussing issues related to the development of phonemic awareness and the beginning process of learning to read in Japanese children, which were reviewed by Matsumoto (2004).

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