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## Development of phonemic awareness and the beginning process of learning to read in Japanese speaking children

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### Abstract

Several studies indicated that phonological awareness is an important factor in the process of learning to read. In this paper, I review the findings of four previous studies on the phonemic awareness in Japanese speaking children and compare the following three different viewpoints; 1) the critical factors that explain the genesis and the development of phonemic awareness, 2) the tasks used to assess phonemic awareness, 3) the relationship with beginning reading skill. In order to understand the factors involved in the developmental process of phonemic awareness in Japanese children, it is important to use a bundle of tasks that correspond to the different levels of phonemic awareness and that such test includes a training session and considers that the phoneme is not unit for articulation. Such tests will allow description and assessment of the dynamic interactions of development of phonemic awareness with informal linguistic activities, development of syllabic awareness, and other factors. The use of such tests should consequently help in the design of suitable teaching methods for early reading of Roma-ji and Kana.

**Key Words:** Phonemic awareness, Beginning reading process, Syllabic awareness, Development of phonological awareness, Japanese speaking children

### Introduction

The study of development of phonological awareness is important for understanding the process of learning to read in children. In this paper, I will address the relationship between the development of phonemic awareness and the process of early learning to read in Japanese, in which we begin to learn “Hiragana” i.e., syllabaries. Several studies have focused on the level of phonemic analysis abilities and the characteristics of phonemic awareness in Japanese speaking children. In this paper, I review and compare various studies on phonemic awareness in Japanese children, in the hope of designing in the future new programs for evaluation of phonemic awareness.

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### The Relationship between Phonological Awareness and Beginning Process of Learning to Read in Japanese

Most Japanese speaking children start learning to read Kana at about three years of age and at the latest at six. That is, most Japanese children learn to read Kana at pre-school age and such learning begins without formal instructions at a school.

Several studies have confirmed that phonological awareness is an important factor in the initial process of learning to read in virtually every orthography that has been studied (Goswami, 1999). The relationship between phonological awareness and acquisition of reading in Japanese was previously investigated by Amano (1986, 1989), Takahashi (1999), and others. In general, this relationship includes an interactive process, i.e., fundamental phonological awareness facilitates learning to read Kana. In turn, learning to read enhances phonological awareness in children, and which in turn facilitates learning to read other Kana letters (Akita & Hatano, 1999).

A considerable number of these previous studies of phonological awareness in Japanese focused on the "syllabic" or "moraic" form of phonological awareness because of characteristics of Japanese orthographies. In Japanese, there are four types of orthographies; two types of Kana syllabaries (i.e. Hiragana and Katakana), Chinese logographs (i.e. Kanji), and alphabets called "Roma-ji". Almost all Japanese-speaking children start learning to read Hiragana first from others. In case of Hiragana, a differentiable character has a single and unique pronunciation whose phonological unit is a syllable or mora in principal. After an initial reading phase, in which children read a string of characters representing their own name as a word's gestalt or sign, the developmental process of learning to read starts by reading these Kana syllabaries one by one, rather than reading words. However, this process is completely different from the associative learning between one character and one pronunciation. Considering that a speech sound can segment no particular fixed unit, beginning reading must be viewed through the following processes; 1) analysis of a phonological structure of a word and segmentation of the sound into phonological units, and then, 2) assignment each unit into a suitable character and learning the relationship between both of them. That is, the process of reading includes the skill of segmenting words and identifying each phonological component of it, in other words, phonological analysis and awareness. It seems that Japanese-speaking children generally need to segment into and identify a syllabic or moraic unit at the start of the reading process. Accordingly, several studies in this field have focused on a syllabic or moraic awareness.

In comparison, previous studies of phonological awareness in other orthographies, such as English, German, and other Western orthographies, focused on phonemic awareness in addition to syllabic one. One reason for this is that a phoneme is the smallest and one of the regularly used units of speech sounds in most Western languages written with alphabets. This allows us to consider the following issues in this field; which form of phonological awareness (syllabic, onset-rime, phonemic awareness or awareness of other units) correlates significantly with the early process of learning to read in general, and whether this form of phonological awareness is the same across different linguistic environments. These issues have been discussed until now partly as the theoretical basis of teaching program for beginning reading. Goswami (1999), for example, considered

the following two issues. The first one was whether the same sequence of phonological development can be observed in children who are growing up in different linguistic environments. The author argued that the results of previous studies indicated that phonological development would show the same process which is from awareness of syllables to awareness of onset and rime, and awareness of phonemes in spite of some variation in the phonological unit in each orthography. However, Goswami (1999) also pointed out that little cross-linguistic research of this kind had been done. The second issue was whether awareness of the same phonological units predicts reading development in these different linguistic environments. The author pointed out that it could be found the special link between rhyming and early reading in English, while there was no such link in Portuguese, which has large number of multisyllabic words and relatively simple syllabic structures (Cardoso-Martins, 1995), and in German, which has very consistent grapheme-phoneme correspondences (Wimmer, Landerl, & Frith, 1999), the time at which such link could be found was late. Hence she argued that the answer to second question would seem to be that it did not.

After considering the above issues, let me raise the following points in relation to Japanese-speaking children. In Japanese children, who use syllabaries when they start learning to read, what are the characteristics of phonemic awareness? What are the critical factors for genesis and development of phonemic awareness? When and how does development occur? Which task is the most suitable for the assessment of phonemic awareness in Japanese children? Finally, what is the relationship between development of phonemic awareness and the beginning process of learning to read? Discussing and considering these issues should contribute positively to the solution of the general issues related to the initial process of learning to read. In the next section, I will review four studies in this field and compare their findings.

### Review of Previous Studies of Phonemic Awareness in Japanese Children

There have been five previous studies of the phonemic awareness and beginning reading process in Japanese children. In this section, four studies except for Matsumoto (2002) will be reviewed for the later section of General discussion.

#### Study of Mann (*Mann, 1986*)

This is the pioneering study of phonemic awareness in Japanese Children. In that study, the author tried to examine the development of awareness of syllables and phonemes and discussed its influences on the development of phonological, especially phonemic awareness by learning Kana, Japanese syllabaries, instead of the alphabet. This study included four experiments on pupils at primary school in Japan and the US. First grade and third- through sixth-grade Japanese children participated in the first and second experiments. To assess their phonemic awareness, they were asked to carry out a phoneme-counting task in which they tapped the number of phonemes in each word item on the task. The results were compared with the data reported in the study of Liberman, Shankweiler, Fischer, & Carter (1974), which is one of the best known studies on syllabic and phonemic awareness in American children available at that time. Japanese and American first graders participated in the third experiment and Japanese fourth and sixth

graders participated in the fourth experiment. A phoneme deletion task was used in these two experiments, in which the children were asked to pronounce the presented word item without the first sound.

The main finding of the study of Mann (1986) was that the development of phonemic awareness in Japanese children was apparently influenced by reading experience. Japanese first graders received significantly lower scores on the tasks of phonemic awareness than American first graders, although they received significantly higher scores on the task of syllabic awareness. On the other hand, marked improvement of the scores on the tasks of phonemic awareness was noted only between the third and fourth grades in Japanese, while there was no significant difference between the fourth and fifth grades. Considering that Japanese children generally receive some instruction in reading Roma-ji at the end of the fourth grade, these findings indicate that phonemic awareness in Japanese children develops with age despite the lack of formal instructions in Roma-ji.

Based on these findings, Mann argued that the development of phonemic awareness in Japanese was facilitated by learning to read syllabary or secondary language activities like word games or versification, and did not necessarily depend on learning to read an alphabet or the knowledge of it. Therefore, learning to read syllabary facilitates not only syllabic awareness but also phonemic awareness. On the other hand, she emphasized that the time at which the development of phonemic awareness begins strongly depends on the experience of learning to read an alphabet. Learning to read a phonological orthography, whether an alphabet or not, generally leads to the development of phonemic awareness. This development, however, simply takes more time if the orthography is a syllabary, i.e. Kana, rather than if it is an alphabet.

#### Study of Spagnoletti et al. (*Spagnoletti, Morais, Alegria, & Dominicy, 1989*)

The study of Spagnoletti et al. (1989) was inspired by the finding of Mann (1986). They tried to replicate Mann's findings in Japanese first graders (Morais, 1991). The purpose of this study was to consider the syllabic and phonemic analysis abilities of Japanese first graders who are learning to read syllabaries. The study consisted of two experiments. The participants were first graders who attended a Japanese school in Brussels, Belgium. They were separated into two groups according to their alphabetic experience; one group lacked such experience, while the other had alphabetic experiences in a Belgian primary school. The following three types of task were used in the two experiments to assess their phonemic awareness of the participant children; the phoneme counting task and the phoneme deletion task, which were similar to those used by Mann, and a free classification task in which the children were asked to decide which two utterances, among a series of three, sound similar. The first experiment was carried out during the first term of the first grade, and the second one was performed between the end of the second term and the beginning of the third term so that they had received almost all instructions for reading Hiragana by the end of the second term of the first grade.

The main findings of these two experiments was that Japanese first grader had a good ability to accomplish the tasks of phonemic and syllabic awareness except for the phoneme-counting task. The result were surprisingly better than expected. Moreover,

learning the alphabet does not contribute to relatively dominant performances of these tasks. According to Mann (1986), the result can be explained from the point of view that learning to read syllabary or secondary language activities facilitates the development of phonemic awareness. However, Spagnoletti et al. presented other explanation after analyzing each result in detail. They indicated that Mann underestimated the importance of the orthographic information and the role of the basic matrix of Kana, which is called "Goju-on hyo". They reported that much better scores were obtained when the number of phonemes matched the number of syllabaries on the task item than when there was no such correspondence. In addition, the analysis of errors showed that the majority of incorrect responses corresponded to the number of written units. In short, the results of these experiments were closely linked to the Kana spelling of the each task item rather than to phonemic awareness. Spagnoletti et al. (1989), therefore, indicated that Japanese first graders managed to accomplish the tasks of phonemic awareness without manipulating the phonemic representation of each task item. They used spelling-based strategies based on reference to the basic matrix of Kana. The results could be interpreted that the orthographies which are used to represent a language tend to dominate the conscious perceptual representation of phonology of that language. That is, children spontaneously use to their knowledge of the orthographies if they are asked about the phonological components of speech sounds with no explicit reference to written representations. Based on this point of view, they considered the following two main factors to be involved in the development of phonemic awareness in Japanese: 1) the presence of the nasal coda and diacritic signs to distinguish voiced consonants from their unvoiced counterparts, and 2) the activity to represent new syllables contained words of foreign origin like "disco". They indicated that the emergence of some phonemic representation in the language represented the moment of development of phonemic awareness.

#### **Study of Endo (Endo, 1991)**

It seems that the study of Endo (1991) is the first investigation of phonemic awareness in Japanese children written in Japanese. The author examined phonemic awareness in relationship to the number of reading a type of special syllables called "Yoo-On" comprising two preceding consonants, the second of which is usually a glide, and one vowel. The purpose of this study was to investigate their relationship. The participants were six-year-old children in Japanese kindergarten. To assess their phonemic awareness, they were asked to carry out the rhyming task, in which they selected a card, among two, including the same onset or last phoneme as the target one. In contrast to this, no task of syllabic awareness was carried out.

The main findings of the study were as follows. The percentage of children who accomplished this task was higher than the percentage of Japanese first grader who accomplished the task of phonemic awareness described in the study of Mann (1986). In addition, the children who accomplished this task could accomplish the task of reading and spelling Yoo-on syllables better than others. The scores on the rhyming task, especially the detection of the last phoneme, were correlated significantly with the scores of reading Yoo-on syllables. Based on these findings, Endo indicated that phonemic awareness was also developed in Japanese kindergartners and this kind of awareness

explained the fundamental ability for children to infer the rules with writing Yoo-on syllables and apply it with reading them.

#### Study of Ijiri (*Ijiri, 1991*)

In her doctoral dissertation at Northwestern University, Illinois, Ijiri (1991) examined the syllabic and phonemic awareness of Japanese kindergartners and assessed the instructional activities applied at home and school that are associated with such awareness, through means and purposes different from those of Endo (1991). The main purpose of the study was to consider and determine the following three issues; 1) To what extent can Japanese kindergartners demonstrate syllabic and phonemic awareness? 2) To what extent does the amount of instructional activity provided at home contribute to syllabic and phonemic awareness? and 3) To what extent do Japanese kindergartens provide their children with information about the phonological structure of words and the way in which Kana maps onto this structure? The participants were Japanese kindergartners ranging in age from four to six years. The task used to assess phonemic awareness was phoneme segmentation task, which consists of training and test sessions. They were asked to construct the phonemic model of presented word item with segmenting one and placing wooden blocks corresponding to the number of phonemes in the word item. With regard to the tasks of syllabic awareness, a syllable segmentation and identification task and a syllable deletion task were carried out.

The main findings of the study was that Japanese kindergartners could demonstrate a degree of phonemic awareness although they lacked experience with alphabetic transcription. Regression analysis with phonemic awareness as the dependent variable identified reading and phonological/orthographic activities at home to account for a significant portion the variance in phonemic awareness compared with that of age, IQ, and other factors. On the other hand, the regression analysis of reading as the dependent variable found phonemic awareness, syllabic awareness and phonological/orthographic activities at home to account for a significant portion of the variance in reading compared with that of age, IQ, and other factors. In contrast, an ability to name alphabets did not correlate significantly with phonemic awareness although a surprising number of children were able to name some of the alphabets and the Japanese language can be represented at phonemic level, i.e. "Roma-ji".

Considering these findings, Ijiri (1991) concluded that the development of phonemic awareness in Japanese children was facilitated by phonological/orthographic activities at home such as participation in verbal games, and did not necessarily depend on learning to read an alphabet or the knowledge of it. The author pointed out that previous studies had indicated significant correlations between such home activities and reading ability but did not pay attention to the effect of such activities on development of phonological awareness. The findings of this study agree with the claims that such activities play an important role in the development of phonemic awareness, as proposed by Mann (1986) and other authors.

#### Comparison of the Findings of These Studies

Table 1 compares the major findings and conclusions of above studies. The major

Table 1. Comparison of the studies of phonemic awareness in Japanese children

	1) Critical factors for genesis and development	2) Tasks for assessment	3) Relationship with reading
Mann (1986)	Age, learning to read Kana and language-related informal activities	Phoneme counting and deletion	Facilitated by reading Kana
Spagnoletti et al. (1989)	Emergence of signs or activities for representing phonemes in Japanese	Phoneme counting, deletion and classification	Not facilitated by merely reading syllabaries
Endo (1991)	Age (maturation of the cognitive system)	Rhyming	Facilitating learning to read Yoo-on
Ijiri (1991)	Language-related informal activities and reading	Phoneme segmentation and model construction	One of facilitators for learning to read (interactive relationship)

points of such comparison are the critical factors to explain the genesis and development of phonemic awareness, the tasks used to assess phonemic awareness, and the relationship with beginning reading skill.

With regard to critical factors involved in the genesis and development of phonemic awareness, the following three different factors can be confirmed. The first is maturation with age (Mann, 1986; Endo, 1991). The second is the emergence of signs or activities accompanied by its emergence for representing phonemes, such as the diacritic signs to distinguish voiced consonants from their unvoiced counterparts, because they suppose that orthographies in a language strongly influence to the forms of phonological segmentation in that language (Spagnoletti et al., 1989). The third is mediation by informal activities concerning to a language, such as word play.

With regard to tasks suitable for the assessment of phonemic awareness, the following two types of tasks can be confirmed according to the level of manipulating phonemes of the word items on the task. The first task is rhyming, which is associated with auditory discrimination without manipulating phonemes of words. The second is phoneme segmentation or deletion, which requires manipulating the phonemes of words in order to be accomplished. Various studies have considered which types of tasks are suitable for the assessment of development of phonemic awareness in Japanese as well as in other languages. Yopp (1988) demonstrated that the latter, i.e., the task that requires manipulation of phonemes of words, is more suitable for the assessment of phonemic awareness closely linked to the beginning reading process. However, Spagnoletti et al. (1989) reported that some such tasks could be accomplished without manipulating the phonemic representation of each task item.

With regard to tasks suitable for the assessment of phonemic awareness, Mann (1986) concluded that phonemic awareness is facilitated by reading Kana, while Spagnoletti et al. (1989) concluded that phonemic awareness is not facilitated by merely reading Kana because the orthographies are closely linked to the phonological unit. Endo (1991) demonstrated that phonemic awareness facilitates learning to read Yoo-on, and Ijiri suggested an interactive relationship between phonemic awareness and learning to read based on the regression analysis. On the other hand, all four studies have shared

the conclusion that learning an alphabet is not necessarily a premise for the development of phonemic awareness.

These findings should make us aware of the different issues in this field, which are included under discussion. In the following section, I will discuss and consider these issues in order to provide the framework for further of research.

### General Discussion

The major issues related to the development of phonemic awareness and the beginning process of learning to read in Japanese children are the characteristics of phonemic awareness for Japanese speaking children, the critical factors for genesis and development of phonemic awareness, and the time and mechanisms of such development. In other words, issues related to the characteristics of phonemic awareness, developmental factors and developmental process of phonemic awareness. Another important aspect of this research is identifying the most suitable task that is for assessment of phonemic awareness in Japanese children, i.e., the conditions of such task.

It has been generally considered that children become aware of syllables much earlier than they become aware of phonemes (Cf. Liberman et al., 1974). This can be probably accounted for by difference between syllables and phonemes, that is, a syllable is a unit based on articulation while a phoneme is a unit based on auditory discrimination. Syllables, therefore, are more readily accessible linguistic units for children. This leads to the issue of using a suitable task for assessment of phonological awareness. In case of syllabic awareness, which is based on articulation and duration, it would be difficult to use a counting task, like the tapping test, to test the development of syllabic awareness to learn to read. The reason for this is that a counting task can be accomplished without analyzing the phonological structure of the word item although the syllabic awareness to learn to read must include the understanding of each phonological component of words. In this task, children appear to be able to tap correctly according to the articulated rhythms. On the other hand, it is relatively easier for children to identify and abstract each syllable of word than to do each phoneme of word. Hence, the task that can identify and abstract each syllable is the most suitable to test that a child has developed well enough syllabic awareness to learn to read, as used by Amano (1986). In contrast, for phonemic awareness, it would be especially difficult for Japanese children to abstract and articulate each phoneme of word because it is not an articulation-based unit and they have no experience in hearing and articulating a single phoneme. In fact, Matsumoto (2002) suggested that it was difficult for Japanese speaking children to articulate a single consonant unless they underwent an appropriate training session. Hence, a task that requires analysis the phonemic structure of words and manipulation of phonemes of words without articulating them, such as the phoneme segmentation and model construction task at Matsumoto (2002), or even if with articulation, tasks that require both through a training session with every possible help for articulation, such as the task of Ijiri (1991), are suitable for the assessment of phonemic awareness. We should simultaneously pay attention to the possibility, as indicated by Spagoletti et al. (1989), that children can accomplish the tasks of phonemic awareness without manipulating phonemic representation of each task item. We have to prepare and test novel assessment tasks

and discuss the characteristics of phonemic awareness in Japanese-speaking children. In this regard, the rhyming task used by Endo (1991) does not seem to be appropriate for assessing phonemic awareness by analyzing phonemic structure of words and manipulating phonemes of words. However, the test is suitable for assessment of ability for auditory discrimination of words. In fact, Endo named the test “the task of sensitivity to rhyming” in the original Japanese text. In the process of verbal communication in daily life, we can successfully discriminate the words /biru/ (“building” in Japanese) and /bi:ru/ (“beer” in Japanese) auditorily and understand the difference in their referents. However, this does not mean that one is aware of the difference in the phonemic structure between them. This shows that assessment using rhyming task alone is insufficient to test for the development of phonemic awareness. Citing the study of Perfetti, Beck, Bell & Hughes (1987), Ijiri (1991) indicated that phonological awareness cannot be regarded as an all-or-none phenomenon but rather a constellation of abilities. This suggests that the most suitable tasks for the assessment of phonemic awareness should be composed of a bundle of the tasks of different levels, i.e., several tasks which correspond to different levels of phonemic awareness.

This understanding the characteristics of phonemic awareness may be available to discuss the issue of developmental factors underlying the process of phonemic awareness as well as to identify the most suitable task for assessment in Japanese-speaking children. If phonemic awareness is a constellation of various level of abilities, we have to shift research focuses on phonemic awareness from a static view, such as “present or absent”, to a dynamic view that include description and consideration of the developmental process between phonemic awareness and various factors, such as informal linguistic activities at home pointed out by Mann (1986) and Ijiri (1991), the level of syllabic awareness reported by Matsumoto (2002), the level of knowledge about the basic matrix of Kana and the words of foreign origin done by Spagnoletti et al. (1989), and the others. In this regard, methods which include a training session, such as those reported by Ijiri (1991) and Matsumoto (2002) would be useful because they allow describe the process of development in separated levels while it is difficult to do this in methods based on simple correlational or multiple regression analyses.

The third issue related to the development of phonemic awareness and the beginning process of learning to read in Japanese children is the relationship between the development of phonemic awareness and the process of beginning learning to read Kana and Roma-ji alphabet.

In case of learning to read Hiragana, Spagnoletti et al. (1989) and Endo (1991) pointed out that such process correlated with the process of learning to read special syllables, though their interpretation of such relationship was quite different. There may be interactive relationship between the development of phonemic awareness and learning to read special syllables. In the next step, we have to consider which level of the phonemic awareness is correlated with learning to read special syllables. In addition, we have to study the interactive relationship between language-related informal activities at home, development of phonemic awareness, and learning to read as pointed out by Ijiri (1991), as well as formal instructions for learning to read at the school.

With regard to learning to read alphabet letters, almost all studies concluded that

learning an alphabet does not necessarily contribute to the development of phonemic awareness in Japanese children. These studies, however, considered “alphabetic experience at French class” (Spagnoletti et al., 1989) or “ability to name alphabets” (Ijiri, 1991) as learning to read alphabets in Japanese children. When children practice to read word written in Roma-ji alphabets, they must learn another rule between the alphabets and the phonemes. Although Mann (1986) referred to such relationship, no other investigators examined the following empirical issues; i.e., is the relationship a mere correlation or a causal relationship? can interventional training of phonemic awareness facilitate learning to read Roma-ji? In the study of Ijiri (1991), none of the participants could read the words written in Roma-ji although a surprising number of children in the Japanese kindergarten could name some of the alphabets. Taking into consideration the findings of various studies that examined the relationship between the development of phonological awareness and the beginning process of learning to read, any level of phonemic awareness may be an important predictor of the process of learning to read Roma-ji. Therefore, there is a need to design appropriate methods for early learning to read Roma-ji that are based on the developmental level of phonemic awareness, which may be mediated by the emergence of signs or activities for representing phonemes in Japanese.

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