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PHONOLOGICAL AWARENESS AND READING EXPERIENCE: A CROSS-LINGUISTIC PERSPECTIVE

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Introduction

The use of spoken languages does not require an explicit awareness of the fact that speech is composed of such phonological units as phonemes and syllables. Written languages, however, can make this requirement and recognition of this fact has led several investigators to ask whether the awareness of phonological structure depends upon the experience of learning to read a phonological orthography. Thus far, the primary focus has been on the question of whether phoneme awareness depends on knowledge of an alphabet, and different studies have yielded different answers. For example, studies of pre-literate children in America and Europe have shown that these children's awareness of phonemes can be a true antecedent of success in learning to read (for reviews, see Wagner and Torgesen, 1986; Mann and Brady, in press). Yet, studies of alphabet-illiterate adults in Portugal (Morais, Carey, Alegria and Bertelson, 1979) and in China (Read, Zhiang, Nie and Ding, 1986) have shown that the awareness of phonemes can critically depend upon knowledge of an alphabet. It has been difficult to resolve this apparent contradiction, as the studies which have supported different conclusions have also tended to employ different tasks in studying subjects who vastly differ in age and cultural background. This consideration motivated me to conduct a series of experiments which sought to clarify the determinants of phonological awareness and its relation to alphabetic literacy through a direct comparison of Japanese and American children at different ages.

Some Reasons Why Japanese and American Children Might Differ in Their Level of Phonological Awareness

The advantage of comparing the phonological awareness of Japanese and American children follows from the clear differences in the "secondary language activities" that are available in Japanese and English. Secondary language activities include reading and writing, word play and versification devices. They are to be contrasted with the primary language activities of listening and speaking, because they require an explicit awareness of the internal phonological structure of words (Liberman, 1973; Mattingly, 1972, 1984). Some secondary language activities

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require the manipulation of syllable-sized units, others require the manipulation of phoneme-sized units, and languages can, in principle, differ according to the type of manipulation they cultivate. What is important about the different secondary language activities of Japanese vs. English is their different focus on syllable- vs. phoneme-sized units.

To explicate this point more fully, let me note that syllables are manipulated in both cultures through versification devices and word games that operate on syllable-sized units as determinants of meter or rhyme. However, when we examine the writing systems of the two cultures we find that only the Japanese Kana orthography cultivates syllable awareness in any direct way. As for activities that manipulate phoneme-sized units, phonemes are manipulated by English language users who use such versification devices as alliteration and who play word games like "geography" that are also phoneme-based. These activities have no direct counterparts in Japanese, where verse and word play are mora-based (i.e. syllable-based). Perhaps most important is the fact that the English language writing system employs an alphabet which more-or-less transcribes phonemes.

Given these differences, we may now return to the question of whether phoneme awareness depends upon reading experience, placing it in the context of a more general question about whether phonological awareness depends upon some special experience with a secondary language activity which manipulates the phonological unit of interest. It may be reasoned that, if secondary language experience plays a specific, enabling role in phonological awareness, American children should be aware of both syllables and phonemes, whereas Japanese children should be aware of syllables alone (i.e. Japanese mora). If the experience of learning to read and write is of critical importance, then Japanese children should be more aware of syllables than their American counterparts, who should be more aware of phonemes.

An Experimental Study of Phonological Awareness in Japanese vs. American Children

With the above predictions in mind, I conducted a series of four experiments, using two different tasks to assess the awareness of syllables and phonemes among children at different ages. There was a special focus on comparisons between children who had been exposed to an alphabet and those who had not. The first two experiments involved Japanese and American children in the first grade. In Experiment I, Japanese children were given phoneme- and syllable-counting tests that were Japanese versions of similar tests that had been developed by Liberman, Shankweiler, Fischer and Carter (1974) and used in a previous study of American first graders. Twenty Japanese children were required to deduce the rules of a game in which words received between two and four "taps" according to the number of phonemes they contained, and twenty other Japanese children performed the same task but with

the number of "taps" corresponding to the number of syllables instead of the number of phonemes. The results of Liberman and her colleagues had shown that most first graders in America tend to be able to count both syllables and phonemes. In contrast, I found that almost all first graders in Japan were able to count syllables but relatively few could count phonemes.

To show that the difference in phonological awareness was more than a simple artifact of the counting task, which had used different items in the two different languages, I conducted a second experiment, which used a phoneme-deletion task and a syllable-deletion task that were modeled along the same lines as the deletion tasks that had been used in Morais et al's (1979) and Read et al's (1986) previous studies of alphabet-illiterate adults. The materials for this experiment were nonsense words which could be used in testing either American or Japanese children. Twenty Japanese children and twenty American children were required to deduce the rules of a game which involved deleting the first syllable from a nonsense word; twenty Japanese children and twenty American children deduced the rules of a game which involved deleting the first phoneme from a nonsense word. Despite the change in task, this experiment yielded the same result as the counting task. Both Japanese and American children could perform the syllable deletion task, but whereas many of the American children excelled on the phoneme deletion task, relatively few of the Japanese children did so.

The results of these first two experiments are quite compatible with what is known about alphabet-illiterate adults: alphabet-illiterate subjects do not seem to be as aware of phoneme as are subjects who are readers of an alphabetic script. The difference between the Japanese and American children may readily be attributed to the different type of reading experience available to children in each country: Japanese first graders learn to read a syllabary whereas American first graders learn to read an alphabet. Apparently, for most children at this age, awareness of phonemes may require experience with alphabetic transcription, whereas awareness of syllables may be facilitated by experience with a syllabary, but less dependent upon it. However, it should not be forgotten that in both Experiments I and II a few Japanese children performed unexpectedly well on the phoneme-based tasks, and we were unable to attribute their excellence to home-based instruction, Juku, etc. Also, we found that, in general, awareness of phonemes was related to reading ability in both countries. Theoretical considerations and previous research predict an association between awareness of phonemes and success in learning to read a phoneme-based transcription such as the English alphabet. However, no such prediction binds the awareness of phonemes and the ability to read the Hiragana syllabary, since that system represents syllable-sized units but does not transcribe phonemes in any direct way. Perhaps the relation between phoneme awareness and the ability to read a syllabary should be interpreted as evidence for a more general capacity for phonological awareness which associates with

success in learning to read any phonologically-based orthography, be it a syllabary or an alphabet.

In studies where one is concerned with a controversial issue, it is important to approach that issue from more than one direction. For example, if we predict that the awareness of phonemes depends upon instruction in the use of an alphabet, then it should be possible to demonstrate not only that first graders in Japan are less aware of phonemes than their American counterparts, but also that Japanese children become equivalent to American first graders at that point in their education when they learn to use the "Romaji" alphabet. As a test of this second prediction, I conducted two further experiments in which I administered the phoneme counting and phoneme deletion tests from Experiments I and II to Japanese children in the later elementary grades. Some of these children had received instruction in alphabetic transcription, whereas others had not, and comparisons between these two groups can reveal the extent to which the ability to manipulate phonemes is produced by exposure to an alphabetic orthography.

In my third experiment, two groups of children were of interest, normal children in the third through sixth grades, because they routinely receive a month of instruction in the "Romaji" alphabet towards the end of fourth grade, and a special group of "re-entry" children in the fourth through sixth grades because they were entering the Japanese educational system after having spent the first few years of their education in a country which employed an alphabetic orthography. Administration of the phoneme counting test during the middle of the school year revealed that many Japanese children become aware of phonemes by age ten whether or not they have received instruction in alphabetic transcription. At this age and thereafter, the children who knew how to use an alphabet performed no better than those who did not.

Experiment IV involved administering the phoneme deletion test to a second group of normal fourth and sixth grades, and it corroborates the results of Experiment III. In this experiment, the fourth graders had not yet been taught about "Romaji", whereas the sixth graders had learned Romaji a full year and a half before they participated in the experiment. When their results were compared to those of the American first graders tested in Experiment II, it was found that the sixth-graders in Japan had surpassed all other subjects, and that the Japanese fourth graders and the American first graders had performed at the same level. Once again, there was evidence of phoneme awareness in the absence of alphabetic literacy; there was also evidence that the facilitating effects of alphabetic instruction depended on the age of the child.

In Experiments III and IV, the older Japanese children's awareness of phonemes failed to correlate with reading ability in any of the subject groups. This result, unlike that obtained with

the younger subjects, may be explained by the fact that, whereas early reading ability reflects knowledge of the Kana syllabaries, reading ability in the later elementary grades reflects knowledge of the Kanji logography. Kanji is a morphology-based writing system which does not map onto phonological structure of words at either the level of the syllable or the level of the phoneme. It would seem to be the case that the ability to read a non-phonological orthography associates with skills other than phonological awareness.

Why are Japanese Children Aware of Phonemes?

In my studies, I discovered an unexpected level of phoneme-awareness among some older Japanese children who had not been educated in the use of the alphabet. As this stands in contrast with the lack of phoneme awareness among alphabet-illiterate adults in China and Portugal, some explanation is required. Task variables are one factor which could be considered. The present results held equally for two different tasks, one of which is a deletion task comparable to those used in studies of alphabet-illiterate adults. So the difference between the children and the adults would not seem to reflect the use of different tasks. However, one might examine task variables for another reason, asking whether completion of the tasks truly reflects phoneme awareness, as opposed to something else.

As regards the possibility that responses could reflect something other than phoneme awareness, it was evident, from the pattern of the Japanese children's responses in all four experiments, that many of them had applied an orthography-based strategy of 'spelling' the test items in kana and basing their response on the kana syllabary. This strategy will have obvious effects on tests of syllable awareness, and it can even lead to a modicum of success on phoneme-awareness tests. In the counting test, for example, some children had counted the number of characters needed to spell a word and then added one thereby achieving a better than chance score on the phoneme-counting task. Yet, this strategy alone cannot explain the superior performance of the older, alphabet illiterate children, for their errors did not strongly support the 'kana-plus-one' strategy. In the deletion test, a similar point is evident from responses to the phoneme deletion items. On those items, some children had spelled the word, then consulted a mental image of the kana syllabary chart to establish a "character substitution strategy" that would yield the correct answer. Yet this strategy alone cannot account for the superior performance of the older, alphabet-illiterate children, although the prevalence of such strategies in this and other research points to the role of orthographic knowledge in children's deductions about what spoken language games are "all about" (as discussed by Ehri and Wilce, 1980).

Spelling strategies aside, we may return to exploring the role of reading experience in phonological awareness. First of

all, there is evidence that at least some types of phonological awareness need not depend on the ability to read. My second study, for example, showed that American children's awareness of syllables does not depend upon knowledge of a syllabary. This is consistent with the fact that syllables, as compared to phonemes, are isolable acoustic segments; they are more superficial, less encoded components of the speech signal. It also accords with some other evidence that the majority of preliterate children can manipulate syllables by the time they are six years old without having been instructed in the use of a syllabary or an alphabet (Amano, 1970; Liberman et al, 1974; Mann and Liberman, 1984), and the ability to manipulate syllables is not strongly influenced by the kind of reading instruction, "whole-word" or "phonics", that children receive in the first grade (Alegria, Pignot and Morais, 1982). Thus it is possible that syllable awareness is both easier to achieve and a more natural achievement of such factors as cognitive maturation and primary language development, requiring less special cultivating experience than awareness of phonemes, although resolution of the question of whether syllable awareness depends upon word play or versification will require further experimentation.

The question of whether awareness of phonemes is completely dependent upon knowledge of an alphabet was answered positively by previous studies of alphabet-illiterate adults. However, this same question receives a firm "no" from the results of Experiments III and IV. Thus we must ask ourselves what other factors are responsible for the surprising behavior of the Japanese children. One factor which could be considered is the Kana reading experience of the Japanese children and the adults studied in Portugal and China. Although the Japanese children did not know an alphabet, they did know the Kana syllabaries, and this could have promoted their awareness of both syllables and phonemes. this would be consistent with the correlations between Kana reading ability and phoneme awareness that were observed in Experiments I and II.

Yet, if any phonological orthography promotes the awareness of all aspects of phonological structure, one might expect that knowledge of Chinese would have a similar effect. That is because Chinese is not as "logographic" as it seems; many characters (the phonetic compounds) are digraphs in which the different parts of the character mark the syllable rime (i.e. the vowel and any consonant cluster) and the syllable onset (i.e. the initial consonant or consonant cluster) as separable segments of the speech stream. Several pieces of evidence suggest that this representation of phonological structure is exploited by skilled readers of Chinese (Seidenberg, 1985; Fang et al, 1986). I would like to suggest that readers who are sensitive to the phonological aspects of the Chinese writing system might be capable of performing a phoneme deletion task, since performing that task in Chinese is equivalent to deleting the onset of a syllable. From the fact that Read et al's (1986) subjects could not delete phonemes, one could speculate that these readers did not know how

to use the Fanzi principle -- but it remains to be determined whether knowledge of Fanzi supports phoneme awareness.

In searching for other factors which could have promoted the increased phonological awareness of the Japanese children, we might speculate that Japanese children are passively exposed to a lot of alphabetic advertisements, but this would also be the case for the Portuguese adults who have the added benefit of speaking a language in which alliteration is a poetic device. Perhaps the children in the present study were more motivated, perhaps they were brighter, the list could go on and on. Perhaps they were special simply because they were children.

In this regard, there is considerable evidence that children acquire their primary language with the aid of a special language acquisition device which somehow atrophies after puberty. Mattingly (1984) has suggested that the capacity to become aware of phonemes and other aspects of phonological structure is part and parcel of the language acquisition device. That phonological awareness is a "natural" outcome of language development is consistent with some indications that awareness of syllables seems to arise whether or not one is exposed to a syllabary, but it seems to be at odds with the fact that it is not until relatively late in their childhoods that Japanese children succeed in performing phoneme deletion and counting tasks. But there may be some virtue in postulating a later occurrence of phoneme awareness, as this may offer an account of the performance differences between the American first graders and the Japanese sixth graders on the phoneme deletion task. The American first graders had more alphabetic reading experience; they had received a full six months of instruction in the alphabet than the Japanese sixth graders who had received a single month of instruction a year and a half before the test session was conducted. Testing at the end of the experimental session also revealed that the American first graders could read alphabetic transcriptions of the test materials far more successfully than the Japanese sixth graders. Yet it is the Japanese sixth graders who achieved the highest scores. Reading experience is surely pertinent to the awareness of phonemes, but its impact is somehow contingent on the maturational, linguistic, and cognitive status of the child.

Conclusion

Clearly the determinants of phonological awareness are complex indeed, and the complexities of Japanese children's performance show us that it would be a mistake at this point to hold any one factor such as reading experience responsible. The results of my four experiments (reported in detail in Mann, 1986) would seem to illustrate that experience of learning a phonological orthography may nurture phonological awareness. At the same time, the superior performance of alphabet-illiterate children relative to alphabet-illiterate adults raises the question of whether a pre-pubescent status with respect to

language development may enable children to gain access to the phonological structure of words more readily than mature language users and thereby be more likely to deduce the principles behind phonologically-based orthographies, word games and versification devices.

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