Phonological awareness: The role of reading experience*

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Abstract

A cross-cultural study of Japanese and American children has examined the development of awareness about syllables and phonemes. Using counting tests and deletion tests, Experiments I and III reveal that in contrast to first graders in America, most of whom tend to be aware of both syllables and phonemes, almost all first graders in Japan are aware of mora (phonological units roughly equivalent to syllables) but relatively few are aware of phonemes. This difference in phonological awareness may be attributed to the fact that Japanese first graders learn to read a syllabary whereas American first graders learn to read an alphabet. 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. To further clarify the role of knowledge of an alphabet in children's awareness of phonemes, Experiments II and IV administered the same counting and deletion tests to Japanese children in the later elementary grades. Here the data reveal that many Japanese children become aware of phonemes by age whether or not they have received instruction in alphabetic transcription. Discussion of these results focuses on some of the other factors that may promote phonological awareness.

Introduction

The primary language activities of listening and speaking do not require an explicit awareness of the internal phonological structure of words any more

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than they require an explicit awareness of the rules of syntax. Yet a "metalinguistic" awareness that words comprise syllables and phonemes is precisely what is needed when language users turn from the primary language activities of speaking and listening to the secondary language activities of reading, versification and word games (Liberman, 1971; Mattingly, 1972, 1984). While all members of a given community become speakers and hearers, not all become readers, nor do they all play word games or appreciate verse. This difference raises the possibility that the development of phonological awareness might require some special cultivating experience above and beyond that which supports primary language acquisition.

Several different research groups have reported that adults who cannot read an alphabetic orthography are unable to manipulate phonemes (Byrne & Ledez, 1983; Liberman, Rubin, Dugues, & Carlisle, 1986; Morais, Cary, Alegría, & Bertelson, 1979; Read, Zhang, Nie, & Ding, 1984), raising the possibility that knowledge of the alphabet is essential to awareness of phonemes. In further pursuit of the factors which give rise to phonological awareness, the present study has explored the awareness of syllables and phonemes among Japanese children and American children. This particular cross-linguistic comparison is prompted by certain differences between the English and Japanese orthographies, and by certain differences in the word games and versification devices that are available to children in the two language communities.

Children in America learn to read the English orthography, an alphabet which represents spoken language at the level of the phoneme. Many of them also play phoneme-based word games such as "pig-Latin" and "Geography,\(^1\) and learn to employ versification devices such as alliteration that involve manipulations of phonemes, as well as word games and versification devices that exploit meter and thus operate on syllable-sized units. In contrast, virtually all of the secondary language activities that are available to Japanese children manipulate mora-phonological units that are roughly equivalent to syllables—if they manipulate phonological structure at all. Japanese children learn to read an orthography that comprises two types of transcription: Kanji, a morphology-based system and Kana, a phonology-based system. Kanji is derived from the Chinese logography and represents the roots of words without regard to grammatical inflections, whereas Kana is of native origin and comprises two syllabaries, Hiragana and Katakana, which can represent the

\(^1\) "Geography" is a game played by two or more people, which begins with the first player naming a place (a state, city, country, etc.), "Georgia", for example. The next player must then produce another place whose name starts with the same last phoneme (for pre-literate children) or letter (for literate children) as "Georgia" and has not previously been used in the game. He could respond "Argentina", for example. Each subsequent player must respond with the name of a place that begins with the last phoneme of the preceding player's response, with the order of play recycling back to the first player and continuing until a player cannot give a response. That player then drops from the game and play continues until one player is left as the "winner."
root and inflection of any word in terms of their constituent mora. Typically, the two orthographies function together, with Kanji representing most word roots and Kana representing all word inflections and the roots of those words that lack Kanji characters. As for other secondary language activities, Japanese word games such as "Shiritori" (a mora-based equivalent of "Geography") and versification devices such as Haiku manipulate mora.

In short, Japanese secondary language activities do not manipulate language at the level of the phoneme, whereas several English secondary language activities are phoneme-based, most notably the alphabetic orthography. Both Japanese and English afford versification devices and word games which manipulate syllable-sized units, but the Japanese orthography is unique in its inclusion of a syllabary. Given these similarities and differences between the orthographies and other secondary language activities in English and Japanese, it may be reasoned that, if experience with secondary language activities plays a specific role in the development of awareness about syllables and phonemes, Japanese children should be aware of mora (syllables) whereas American children should be aware of both phonemes and syllables. Should the experience of learning to read a given type of orthography play a particularly critical factor, Japanese children should be more aware of syllables than their American counterparts who should be more aware of phonemes. It seems unlikely that the possession of primary language skills is sufficient to make Japanese and American children equivalent in awareness of phonemes, given findings that alphabet-illiterate adults are not aware of phonemes. However it remains possible that children in the two countries will be equivalent in phonological awareness should reading experience or some other form of secondary language experience that draws the child's attention to the phonological structure of language promote the awareness of both syllables and phonemes.

The possibility that reading experience plays a particularly important role in the development of phonological awareness arises from the many studies which reveal an association between phonological awareness and success in learning to read an alphabetic orthography. These reveal that performance on tasks which require manipulations of phonological structure not only distinguishes good and poor readers in the early elementary grades (see, for example, Alegria, Pignot, & Morais, 1982; Fox & Routh, 1976, Katz, 1982; Liberman, 1973; Rosner and Simon, 1971) but also correlates with children's scores on standard reading tests (see, for example, Calfee, Lindamood, & Lindamood, 1973; Fox & Routh, 1976; Perfetti, 1985; Stanovich, Cunning-

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2 "Shiritori" is played in a manner analogous to "Geography", except that players must produce a place whose name starts with the same mora (for pre-literate children) or Kana character (for literate children) that ended the previous response. Thus, the first player might respond "Osaka" and the second player might respond "Kamakura".
ham, & Freeman, 1984b; Treiman & Baron, 1983).

In many studies of reading ability and phonological awareness, the question of cause and effect has been broached, but never completely resolved. One of the earliest studies revealed that American children's awareness of phonological structure markedly improves at just that age when they are beginning to read (Liberman, Shankweiler, Fischer, & Carter, 1974): Among a sample of 4-, 5- and 6-year-olds, none of the youngest children could identify the number of phonemes in a spoken word, while half could identify the number of syllables; of the 5-year-olds, 17% could count phonemes while, again, half could count syllables. Most dramatically, 70% of the 6-year-olds could count phonemes and 90% could count syllables. Did the older children become aware of syllables and phonemes because they were learning to read, was the opposite true, or both?

Certain evidence suggests that phonological awareness can precede reading ability or develop independently. First of all, various measures of phoneme awareness and syllable awareness are capable of presaging the success with which preliterate kindergarten children will learn to read the alphabet in the first grade (see, for example, Bradley & Bryant, 1983; Helfgott, 1976; Jusczyk, 1977, Liberman et al. 1974; Lundberg, Olofsson, & Wall, 1980; Mann & Liberman, 1984; Mann, 1984; Stanovich, Cunningham, & Cramer, 1984a). Second, there is evidence that explicit training in the ability to manipulate phonemes can facilitate preliterate children's ability to learn to read (Bradley & Bryant, 1985). Third, the awareness of syllables, in particular, does not appear to depend upon reading experience, as the majority of preliterate children can manipulate syllables by age six without having been instructed in the use of a syllabary or an alphabet (Amano, 1970; Liberman et al., 1974; Mann & 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, & Morais, 1982).

Other evidence, however, has revealed that at least one component of phonological awareness—awareness of phonemes—may depend on knowledge of an alphabet. As noted previously, several different investigators have reported that the ability to manipulate phonemes is markedly deficient in adults who cannot read alphabetic transcription. Awareness of phonemes is deficient among semi-literate American adults (Liberman et al., 1986), reading-disabled Australian adults (Byrne & Ledez, 1973), illiterate Portuguese adults (Morais et al., 1979) and Chinese adults who can read only the Chinese logographic orthography (Read et al., 1984). In addition, the type of reading instruction which children receive can influence the extent of their awareness: first-graders who have been taught to read the alphabet by a “phonics” ap-
proach tend to be more aware of phonemes than those who have learned by a "whole-word" method (Alegria, Pignot, & Morais, 1982).

Present evidence, then, suggests that the relationship between phonological awareness and reading ability is a two-way street (Perfetti, 1985) which may depend on the level of awareness being addressed. Awareness of syllables is not very dependent on reading experience and could be a natural cognitive achievement of sorts, whereas awareness of phonemes may depend upon the experience of learning to read the alphabet, in general, and on methods of instruction that draw attention to phonemic structure, in particular. As a test of this view, the present study examined the phoneme and syllable awareness of children in a Japanese elementary school, predicting that these children would be aware of syllables, but would not be aware of phonemes until that point in their education when they receive instruction in the use of alphabetic transcription.

The design of the study involves four experiments which focus on the awareness of syllables (mora) and phonemes among children at different ages. Two different experimental paradigms are employed as a control against any confounding effects of task-specific variables. One paradigm is the counting test developed by Liberman and her colleagues, a test used in several studies of phonological awareness among American children (see, for example, Liberman et al., 1974; Mann & Liberman, 1984). The other is a deletion task, much like that employed by Morais et al. (1979) and Read et al. (1984) in their studies of alphabet-illiterate adults.

Experiment I used the counting test paradigm to study Japanese first graders who had recently mastered the Kana syllabaries. To clarify the impact of knowledge of a syllabary vs. an alphabet, the results are compared with those reported in Liberman et al.'s (1974) study of American first graders. The relation between reading and phonological awareness is also probed by an analysis of the relation between phoneme and syllable counting performance and the ability to read Hiragana, in which case a nonlinguistic counting test guards against the possibility that any correlations might reflect attention capacity, general intelligence, etc. To further clarify the role of knowledge of the alphabet, Experiment II extended use of the counting test paradigm to Japanese children in the third to sixth grades. In Japan, children routinely receive some instruction in alphabetic transcription (Romaji) at the end of the fourth grade. There also exist certain "re-entry" programs for fourth through sixth graders who have spent the first few years of their education abroad and who have learned to read an alphabetic orthography. Comparisons among the re-entering pupils and normal pupils at various grade levels clarifies the relative contribution of alphabetic knowledge vs. knowledge of Kana and Kanji.
Experiment III used the deletion test paradigm to replicate and extend the findings of Experiment I. Aside from the change in procedure, its major innovation was to employ nonsense words as stimuli, constructing them in a fashion to permit parallel testing of first graders in Japan and in America. Analysis of the results concerns performance on each deletion test in relation to reading experience and reading ability. Finally, Experiment IV used the same paradigm in a partial replication of Experiment II, comparing Japanese fourth graders who had not received instruction in Romaji with sixth graders who had been taught about Romaji 1½ years prior to the test session.

Experiment I

Methods

Subjects
The subjects were 40 children attending the first grade of the primary school attached to Ochanomizu University, 20 girls and 20 boys chosen at random from the available population and serving with the permission of their parents and teachers. Mean age was 84.4 months at the time of testing, which was the beginning of the second trimester of the school year. As a measure of Hiragana reading ability, each child rapidly read aloud a list of 30 high-frequency nouns, adjectives and verbs (Sasanuma, 1978), and the total reading time and the number of errors were recorded. Each child was also rated by his or her teacher as above-average, average, or below-average in Kana reading ability.

Materials
The experiment employed three sets of materials designed to measure the ability to count three types of items: mora, phonemes, and 30° angles (a nonlinguistic unit). All three sets were modelled after the materials of Liberman et al. (1974). Each contained four series of training items which offered the child an opportunity to deduce the nature of the unit being counted, followed by a sequence of test items. In the mora counting test and phoneme counting test, all training and test items were common Japanese words which had been judged by four informants (a linguist, a speech scientist, a teacher of Japanese and a librarian) to be readily familiar to young children. In the angle counting test, the items were simple line drawings of abstract designs and common objects. A more complete description of each test follows.
**Mora counting test**

Mora are rhythmic units of the Japanese language which more-or-less correspond to syllables. Each mora is either an isolated vowel, a vowel preceded by a consonant, an isolated [n], or the first consonant in a geminate cluster. It is a basic difference between mora and English syllables that mora cannot contain consonant clusters, in general, or consonants in final position. It is further the case that a single syllable of English may correspond to two mora of Japanese. This owes to the fact that, in a Japanese word such as “hon”, [n] can be a mora, whereas [n] cannot be a syllable of English, and to the fact that differences in vowel duration (one or two mora) and consonant closure duration (normal or an extra mora) distinguish minimal pairs of Japanese words but are not contrastive in English.

In the mora-counting test, each training series contained three words: two-, three- and four-mora in length. Within the first three series, the words formed a progressive sequence, as in “hito” (man), “hitotsu” (one), “hitotsubu” (a grain or drop) but the words of the fourth series bore no such relation to each other (i.e., “ima” (now), “kitte” (stamp), “chiisai” (small)). To introduce some of the complexities of Japanese phonology, the third series included a devoiced vowel, and the fourth included a long vowel and a geminate consonant. To avoid biasing the child’s decision as to whether the task was to count the mora in a word (a phonological strategy) or the number of Kana characters needed to spell the word (a spelling strategy), the training items included only those mora which are spelled with a single character. Thus it was left ambiguous whether the task was to count orthographic units, or phonological ones.

The test sequence consisted of 14 two-mora words, 14 three-mora words and 14 four-mora words presented in a fixed random order and they represented common combinations of mora including the nasal mora, geminate vowels, geminate consonants and devoiced vowels. There were four VV words, two CVV words, six CVVC words and two CVC words in the two-mora pool; two VCVC words, two VVVC words, two CVVCV words, three CVVCVC words, two CVCCV words, two CVVCCV words and one CVCVCV word in the three-mora pool and four VCVCVCV words, two VCCVCV words, one VCVCVCC word, four CVVCVCVC words, two CVCCVCV words and one CVCCCVCCV word in the four-mora pool. As a probe for whether children were counting mora or orthographic units, three of the test items included one of the Japanese mora which are spelled with two characters.

**Phoneme counting test**

The design was analogous to that for the mora-counting test but items manipulated the number of phonemes instead of the number of mora. The four training series contained a variety of the possible two-, three- and four-
phoneme sequences of Japanese, including nasal mora, devoiced vowels, long vowels and geminate consonants, and each of the first three contained a progressive sequence of items (i.e., "ho" (sail), "hon" (book), "hone" (bone)) whereas the fourth did not (i.e., "ta" (field), "kau" (buy), "shita" (under)). The test sequence contained 14 two-phoneme words, 14 three-phoneme words and 14 four-phoneme words arranged into a fixed random order, and they comprised a broad sample of the permissible phoneme sequences in Japanese, including nasal mora, geminate consonants and vowels and devoiced vowels, which avoided systematic relationships between the number of phonemes a word contained, and either the number of mora in that word, or the number of Kana needed to spell it. There were four VV words, eight CV words, and two VC words in the two-phoneme pool; two VVV words, four VCV words, four CVV words and four CVC words in the three-phoneme pool, and six CVVC words, two CVVV words, two VCCV words, two VCVV words and two VVVC words in the four-phoneme pool.

**Angle counting test**

The materials were simple black-and-white line drawings that appeared on 3 in × 5 in cards. From one to three 30° angles were embedded in each drawing and the task was to count the number of these angles. In keeping with the design of the phoneme- and mora-counting tests, there were four series of training trials; in the first three series, the items were a progressive set of simple geometric shapes, but in the fourth they were objects that bore no systematic relationship to each other. The test sequence comprised drawings of objects, seven with one angle, seven with two angles and seven with three angles, arranged in a fixed random sequence.

**Procedure**

Prior to testing, the children were divided into two groups of 10 girls and 10 boys each. One group received the mora counting test, the other received the phoneme-counting test, and both received the angle-counting test at the onset of the session and the reading test at the end. The procedure for all three counting tests was the same. The instructor (a native speaker of Japanese) took two small hammers and told the child that they would be playing a "counting game". He then demonstrated the first training series in progressive order by saying each word in a normal fashion (or displaying each card) and then tapping the number of mora, phonemes or angles. Next, the demonstration was repeated, with the child copying the instructor (saying each word first), and then items in the series were presented in a fixed random order, and the child responded without benefit of demonstration. If an error was made, the item was repeated and presentation of another randomized series followed. Otherwise, training proceeded to the next series, until, on
completion of the fourth training series, the test items were presented and
the child was instructed to "count" each item without the benefit of response
feedback.

Results and discussion

In evaluating children's responses on the mora and phoneme counting mate-
rials, two different scores were computed: the number of correct responses
(as in Mann & Liberman, 1984), and a pass/fail score in which the criterion
for passing was six consecutive correct responses (as in Liberman et al.,
1974). Both appear in Table 1 along with mean age and mean reading scores
for children in each group. The children who counted mora were equivalent
to those who counted phonemes in terms of mean age, measures of reading
ability, and performance on the angle-counting test (p > .05). However,
whereas scores on the mora-counting test approached ceiling, scores on the
phoneme-counting test were considerably lower, t(38) = 20.20, p < .0001.
In addition, all of the children had passed the mora counting test, whereas
only 10% had passed the phoneme counting one.
The percentage of Japanese children who passed each test can be compared
with the percentage of American first graders who had passed comparable

Table 1. The ability of Japanese first graders to count mora vs. phonemes

<table>
<thead>
<tr>
<th></th>
<th>Subject group</th>
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<tbody>
<tr>
<td></td>
<td>Mora counting</td>
<td>Phoneme counting</td>
<td></td>
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<tr>
<td>Phonological counting</td>
<td></td>
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<tr>
<td>Mean no. correct</td>
<td>38.1</td>
<td>18.1</td>
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<tr>
<td>(Max. = 42)</td>
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<tr>
<td>Percentage passing</td>
<td>100.0</td>
<td>10.0</td>
<td></td>
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<tr>
<td>Angle counting</td>
<td></td>
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<tr>
<td>Mean no. correct</td>
<td>11.9</td>
<td>11.8</td>
<td></td>
</tr>
<tr>
<td>(Max. = 21)</td>
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<tr>
<td>Kana reading ability</td>
<td></td>
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<tr>
<td>Mean speed</td>
<td>61.1</td>
<td>60.7</td>
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<td>(in s)</td>
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<tr>
<td>Mean errors</td>
<td>1.6</td>
<td>1.8</td>
<td></td>
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<tr>
<td>(Max. = 30)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean teacher rating</td>
<td>1.9</td>
<td>2.0</td>
<td></td>
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<tr>
<td>(Good = 1, avg. = 2, poor = 3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean age (in months)</td>
<td>83.7</td>
<td>84.1</td>
<td></td>
</tr>
</tbody>
</table>
tests in Liberman et al.'s original study: 90% for syllable counting, and 70% for phoneme counting. Apparently, first-grade children who have been educated in the use of the alphabet tend to perform better on the phoneme counting test than those who have not, and while children who have been educated in a syllabary might do slightly better on the syllable counting test, any difference is less dramatic. At present no strong conclusion can be reached about these differences and their implications: Different test materials were used in the two countries, and children were not told explicitly to focus on the spoken word as opposed to its orthographic representation. Both problems are surmounted in Experiment III, which employed (1) a common set of materials in the testing of Japanese and American first graders, and (2) instructions to manipulate the sound pattern of each item.

Performance on each test gave indications of the influence of knowledge of Kana. In the mora-counting test, children appeared to deduce the task as involving the counting of orthographic units rather than the counting of phonological units. The majority gave an extra “tap” to the three items that contained a mora spelled with two characters instead of one, as if they were counting the number of characters needed to spell the word, instead of the number of moras. Other, much less frequent errors on this test involved words which contained geminate consonants or long vowels, both of which tended to be underestimated and were missed only by the poorest readers of the group.

Analogous adherence to a “spelling strategy” can be found in children’s responses to the phoneme counting materials. During a post-hoc interview, some of the children reported that they had tapped the number of Kana characters needed to spell a given word, and then added one to arrive at the correct response. Use of a “kana plus one” strategy could not allow children to reach the criteria of six consecutive correct responses, but it certainly inflated the number of correct responses. Items (N = 25) for which the “Kana-plus-one” strategy yielded the appropriate response were correctly counted by an average of 55% of the children (which is significantly better than chance, t(24) = 2.62, p < .05). In contrast, only an average of 38% had been correct on each item (N = 17) for which that strategy yielded the incorrect response (which is significantly less than the percentage of children giving correct responses to the strategy-appropriate items, t(40) = 5.4, p < .001 and not significantly better than chance p > .05).

A final concern of this experiment was the relation between performance on each counting test and the ability to read Kana. For the children, who learned to count mora, the number of correct responses on the mora counting test was significantly related to teacher ratings (r(20) = .72, p < .0001), Hiragana reading speed (r(20) = −.58, p < .003), and the number of errors
(r(20) = −.47, p < .02), but not to age, sex, or performance on the angle counting test. This is consistent with Amano’s (1970) report that mora counting ability is related to the acquisition of the first few Kana characters by pre-school children, and extends his finding to children in the first grade who possess considerably greater knowledge of the Kana syllabary. For the children who learned to count phonemes, the number of correct responses on the phoneme counting test was also significantly related to teacher ratings (r(20) = .56, p < .005), reading speed (r(20) = −.65, p < .001), and reading errors (r(29) = −.57, p < .004), but not to age, sex, or angle counting performance.

Thus it would appear that performance on the phoneme counting test is related to the ability to read Kana even though Kana does not represent phonemes in any direct way. As both phoneme and syllable counting performance are related to the ability to read Hiragana, just as they are related to the ability to read an alphabet, it is tempting to posit a general capacity for phonological awareness which is related to experience in reading any phonologically-based orthography. This capacity need not be part of general intelligence, given the results of some recent studies of American children (Mann & Liberman, 1984; Stanovich et al., 1984b), and the present finding that there is no significant correlation between measures of reading ability and performance on the angle counting test. It could be a general product of learning to read a phonological orthography rather than the cause of reading success, commensurate with children’s reliance on Kana-based strategies. We will return to these issues in the final discussion.

The results of Experiment I are consistent with previous reports that awareness of phonemes depends on the experience of learning to read an alphabet, insofar as the majority of children could not pass the phoneme counting test. Nonetheless, two of the Japanese children did pass the test and our post-hoc interviews of them indicated that they had received no instruction in the alphabet either at home, school or “juku” (i.e., afternoon training programs). Thus, while there may be some facilitating effects of learning a syllabary on awareness of both phonemes and syllables, some other factors may lead to individual variations. As a further test of the view that awareness of phonemes depends on the experience of learning to read an alphabet, we now turn to Experiment II which focused on the phoneme counting ability of Japanese children in the third through sixth grades, comparing children at different grade levels in normal and “re-entering” classrooms.
Experiment II

Method

Subjects

The subjects were children attending the normal third through sixth grade classes and the special "re-entry" class at Ochanomizu University. The "normal class" subjects included 64 children in the third and fourth grades, and 32 children in the fifth and sixth grades. The "re-entry class" subjects included 13 fourth graders, 14 fifth graders and 12 sixth graders, all of whom had learned to read either the English or German alphabet. Approximately equal numbers of boys and girls were included in each group and all served with parental permission, and were tested during the second trimester of school, such that children in the normal fourth-grade classes had not yet received training in the alphabet. Consultation with the teachers, the principal and the children themselves confirmed that none of the subjects in normal classrooms had received instruction in the alphabet at home or "Juku".

Materials and procedure

The materials were the mora- and phoneme-counting materials employed in Experiment I, administered by the same instructor. For convenience, the procedure was adapted for group testing in which case an entire class of children received the basic instructions and practice items with feedback, and learned to "count" each word by drawing slashes through the appropriate number of boxes in a five-box answer grid instead of by tapping the number of syllables/phonemes with a hammer. As in Experiment I, feedback was provided during training, but no feedback was provided during presentation of the test items. To insure the feasibility of group testing, the mora counting materials were administered as a control measure to 32 of the third graders and 32 of the fourth graders. All of the remaining subjects received the phoneme counting materials.

Results and discussion

The data were scored in the manner of Experiment I, by computing both the number of correct responses and a pass/fail score. The results obtained from the mora counting materials indicate the utility of the group testing procedure, as all of the third- and fourth-grade children had passed criterion with
mean scores of 38.7 and 39.0, respectively. They also attest to the continuing power of the Kana orthography to mold the Japanese child's concept of language: As was the case in Experiment I, almost all of the children had made errors on the three test words in which the number of kana characters needed to spell the word surpasses the number of mora it contains.

Performance on the phoneme counting test is summarized in Table II, according to the age of the subjects, and whether they were in the normal or re-entry classes. On the basis of previous findings that alphabet-illiterate adults are not aware of phonemes, it might be expected that normal Japanese third and fourth graders would be no more aware of phonemes than the Japanese first graders studied in Experiment I, whereas the normal fifth and sixth graders and all of the re-entry students would be comparable to the American first-graders studied by Liberman et al. (1974). Yet, the data fail to uphold that prediction. First, for children in the normal classrooms, whose data appear in the upper portion of Table 2, the only marked improvement in phoneme counting scores occurs between the third and fourth grades, prior to any instruction in the alphabetic principle. There is also no sharp spurt in the awareness of phonemes between fourth and fifth grades ($p > .05$), such as would be expected if instruction in the alphabet were critical. Second, fourth-graders in the re-entry group performed at the same level as their peers in the normal classrooms ($p > .05$), despite the fact that they alone had learned to read an alphabet. Third, and finally, the proportion of Japanese fourth graders who had passed criterion is comparable to that among the

| Table 2. Phoneme counting ability among Japanese children in the third to sixth grades: Normal vs. re-entering students |
|---|---|---|---|
| Grade | Third | Fourth | Fifth | Sixth |
| Normal students | 21.5 | 30.3 | 31.2 | 31.5 |
| Mean no. correct | 21.5 | 30.3 | 31.2 | 31.5 |
| (Max. = 42) | 21.5 | 30.3 | 31.2 | 31.5 |
| Percentage passing | 56.2 | 73.5 | 81.3 | 75.0 |
| Age (in months) | 108.5 | 120.1 | 131.2 | 143.7 |
| Re-entering students | 27.2 | 28.6 | 27.7 | 27.7 |
| Mean no. correct | — | 27.2 | 28.6 | 27.7 |
| (Max. = 42) | — | 27.2 | 28.6 | 27.7 |
| Percentage passing | — | 60.0 | 60.0 | 80.0 |
| Age (in months) | — | 118.9 | 132.7 | 144.4 |
American children in Liberman et al.'s (1974) study, despite the fact that the Japanese children had not yet learned to read the Romaji alphabet.

As in Experiment I, the importance of orthographic knowledge is illustrated by the pattern of errors, which suggests that at least some children were relying on the “Kana-plus-one” strategy of counting the number of characters needed to spell the word, and then adding one. Children at all ages tended to be most successful on items for which this strategy yielded the correct response: for strategy-appropriate items the average percent correct was 58%, 80%, 81%, and 82%, for third through sixth graders, respectively, whereas that for the strategy-inappropriate items was 42%, 56%, 64%, 67%, respectively. Here, however, performance on both types of items surpassed the chance level of 33% correct ($p < .05$), suggesting that appreciable many children at each age had been counting phonemes.

A popular organization of the Kana syllabary places the characters in a grid with the vowel mora in a different column to the far right of those containing characters for other moras and this organization had allowed us to anticipate that some of the subjects in Experiments I and II would use a strategy of giving the vowel mora one count and all other moras two counts. However, in post-hoc interviews of our subjects we found that none of them described such a strategy. Likewise, none of the children reported special treatment of the kana which can receive diacritics to mark the voicing of an initial stop consonant or fricative. Certainly it is possible that knowledge of Kana may have in some other way provoked children to reflect on the internal structure of words and thereby promoted phoneme awareness, but we were unable to determine why, although children master Kana by the very early stages of first grade, the sharpest increase in phoneme counting performance occurs between third and fourth grade. Either increased experience of a very general sort or some maturational factors could be responsible.

In summary, although the findings of Experiment I suggest that both phoneme and syllable counting ability in the first grade might be facilitated by knowledge of an orthography that transcribes language at the level of that unit, the findings of Experiment II suggest that, analogous to the many American children who become aware of syllables by age 6 without having learned to read a syllabary, many Japanese children may become able to count phonemes by age 9 or 10, despite a lack of formal instruction in the alphabet. Moreover, at that age, training in the use of an alphabet does not particularly enhance the ability to count phonemes. This finding stands in contrast to findings that most alphabet-illiterate adults appear to lack an awareness about phonemes.

One possible explanation of the performance differences between alphabet-illiterate adults and Japanese children is that they reflect task differ-
ences rather than differences in phonological awareness, per se. Japanese children might appear to be more aware of phonemes because the counting tasks employed in Experiments I and II were not explicit as to whether "sounds" or characters were to be counted, leading to reliance on a Kana-based strategy which inflated the number of correct responses. However, use of such a strategy could not account for changes in the percentage of children who passed the phoneme counting test, which raises the possibility that children passed the test because it provided a less conservative measure of phoneme awareness than the deletion tasks used in studies of adults. The results of at least one study are commensurate with this letter possibility. Performance on counting tasks and deletion tasks emerged as separate factors in a study of the relation between phonological awareness and the reading progress of semi-literate adults enrolled in a remedial reading class (Read & Ruyter, 1985). Another study, however, reveals that task-differences are not of critical importance to the relation between phonological awareness and the future reading success of kindergarten children in America (Stanovich, Cunningham, & Cramer, 1984a). Yet as this latter study did not include counting tests, it remains a possibility that performance on counting tasks involves a more accessible level of phonological awareness than performance on deletion tests, hence the apparently greater awareness of phonemes on the part of Japanese children relative to alphabet-illiterate adults.

If the above explanation is correct, the present findings should not extend to use of an deletion test. On such a test, Japanese children should behave as poorly as alphabet-illiterate adults. With this prediction in mind, we turn to Experiments III and IV which attempted to replicate Experiments I and II with deletion tasks analogous to those employed by Morais et al. (1979) and by Read et al. (1984). Two sets of nonsense-word materials were designed, one for phoneme deletion and one for mora deletion. Nonsense words had been among the most difficult items for the adult subjects and therefore offer a maximally conservative measure of children's performance; they also permit parallel testing of Japanese and American children.

Experiment III

Method

Subjects

The subjects were 40 Japanese first graders and 40 American first graders, equally many girls and boys who served with parental and teacher permission.
The Japanese children were drawn from an available population of children who had not participated in Experiment I. Mean age was 84.4 months at the time of testing, which was midway through the second trimester of the school year. The American children were comparable in age and SES and were attending the Bolles Primary School in Jacksonville, Florida. Mean age was 84.1 months at the time of testing, which was early in the second semester of the school year. Measures of children's reading ability were obtained by having the teachers rate each child as good, average, or poor in reading ability, and by giving each child a test of word decoding skill: the Hiragana reading test described in Experiment I for Japanese children, and the Word Identification and Word Attack Subtests of the Woodcock Reading Mastery Test (Woodcock, 1973) for American children.

Materials

As in Experiment I, two parallel sets of materials were designed, one for assessing syllable deletion ability and one for assessing phoneme deletion ability. The design of each was prompted by the methodology of Morais et al. (1979) and Read et al. (1984): Each set of materials assessed deletion of two different tokens of the segment of interest, with blocked sequences of training items followed by test items. To make the items suitable for use in English and Japanese it was necessary that they contain only those Japanese mora which bear a one-to-one relationship to English syllables. Thus all items contained consonants and vowels shared by the two languages, and none of them contained long vowels, syllabic [n], geminate consonants, diphthongs, consonant clusters, or syllable-final consonants. Each test item, and the item formed by removing its initial mora (or phoneme, as appropriate) was judged to be meaningless in Japanese (by the informants who judged the items of Experiment I) and in English (by comparable English-speaking informants).

Syllable materials

These materials assessed children's ability to remove an initial syllable (mora), [ta] or [u], from a three-syllable/three-mora nonsense word. Twenty items started with [ta] and twenty with [u], the second and third syllable of each word varied freely. For the purpose of testing, the items were blocked with respect to initial syllable, and each block was subdivided into 10 practice items and 10 test items.

Phoneme materials

These materials assessed children's ability to remove an initial phoneme, [ʃ] or [k], from a four- or six-phoneme (i.e. two or three syllables/mora)
nonsense word. Twenty items started with [s] and 20 with [k], the second phoneme of each word was always one of the five permissible vowels such that, across the items, each initial phoneme was followed by each vowel once in a four-phoneme word, and once in a six-phoneme word, with the remaining portion of each item varied freely. For the purpose of testing, the items were blocked with respect to initial phoneme, and each block was divided into 10 practice items and 10 test items (such that two- and three-syllable words were equally divided between practice and test items, as were the five vowels which could occur in the second-phoneme position).

Procedure

Children were tested individually by native speakers who used comparable instructions on the two languages. Within each country, half of the children received the syllable deletion test, half received the phoneme deletion test, and all received the reading test at the conclusion of the session. For each deletion test, presentation of practice and test trials was blocked with respect to initial segment (i.e., [ta] or [u], [s] or [k]) with order counterbalanced across subjects. The instructor explained that the task involved repeating a word and then trying to say it without the first sound. He or she then proceeded to demonstrate the first five practice items: saying each word, repeating it and then saying it without the first syllable or phoneme. Next, each of these was repeated and the child was requested to imitate the instructor by repeating the item and then saying it "without the first sound." Then the final five practice items were administered without benefit of demonstration, but with response feedback. Completion of the practice items was followed by the 10 test items which were administered without response feedback. Completion of the first block of trials was followed immediately by presentation of the second block of training and test items.

Results and discussion

Attempts to remove the initial segment from each item were scored as correct or incorrect, and the mean number of correct responses appear in Table 3, separately for the American and Japanese children, according to the type and token of the segment being manipulated. When averaged across tasks and tokens, the scores of American children are slightly superior \((F(1,76) = 7.31, p < .009)\). With regard to the type of segment being deleted, children in both countries found the phoneme deletion task more difficult than the syllable (mora) deletion one, \((F(1,76) = 87.64, p < .0001)\). However, the extent of the
Table 3. Mora (syllable) elision ability vs. phoneme ability: A comparison of first graders in Japan and America

<table>
<thead>
<tr>
<th></th>
<th>Mora elision</th>
<th>Phoneme elision</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>[u]</td>
<td>[i]</td>
</tr>
<tr>
<td>Japanese children</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mora group</td>
<td>9.15</td>
<td>9.55</td>
</tr>
<tr>
<td>(Max. = 10, Age = 83.8 mo.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phoneme group</td>
<td>1.75</td>
<td>3.10</td>
</tr>
<tr>
<td>(Max. = 10, Age = 85.1 mo.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>American children</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Syllable group</td>
<td>8.90</td>
<td>8.80</td>
</tr>
<tr>
<td>(Max. = 10, Age = 83.5 mo.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phoneme group</td>
<td>5.72</td>
<td>5.61</td>
</tr>
<tr>
<td>(Max. = 10, Age = 84.8 mo.)</td>
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</table>

difference between scores on the two tasks was greater for the Japanese children, \((F(1,76) = 13.01, p < .0006)\). As compared to the American children, the Japanese children received higher scores on the syllable deletion task \((r(38) = .73, p < .05)\), but lower scores on the phoneme deletion task \((r(38) = .09, p < .01)\). There were no significant effects of token differences, nor interactions between this manipulation and other factors.

A further analysis considered the relations between phoneme and syllable deletion performance (summed across tokens) and reading ability in each country. As anticipated by the results of Experiment I, the mora deletion performance of the Japanese children was related to the speed \((r(20) = -.69, p < .001)\) and number of errors made on the Hiragana test \((r(20) = -.72, p < .001)\), and also to the teacher's ratings of reading ability \((r(20) = .54, p < .005)\). Likewise, their phoneme deletion ability also proved to be related to speed \((r(20) = -.37, p < .05)\), and errors on the Hiragana test \((r(20) = -.38, p < .05)\), and to teacher ratings \((r(20) = .47, p < .02)\). For the American children, phoneme deletion ability was related to the sum of raw scores on the Woodcock tests \((r(20) = .61, p < .005)\) and to the teacher’s ratings \((r(20) = .57, p < .008)\), but syllable deletion ability was not related to either measure of reading ability. In neither language community was the age or sex of
the first graders related to reading ability, mora deletion ability or phoneme deletion ability ($p > .1$).

The relative superiority of the American children in the case of the phoneme deletion task corroborates previous indications that awareness about phonemes is facilitated by the learning of an alphabetic orthography. The analogous finding that Japanese children perform at a superior level on the syllable deletion task suggests that awareness about syllables may be likewise facilitated by learning to read a syllabary. Nonetheless, the finding that both Japanese and American children achieved higher levels of performance on the syllable deletion test than on the phoneme deletion test suggests that the ability to read a syllabary is less critical to awareness about syllables than the ability to read an alphabet is to awareness about phonemes. We now turn to Experiment IV which attempted to replicate the findings of Experiment II regarding the contribution of orthographic knowledge to the phoneme deletion performance of Japanese children in normal fourth and sixth grade classrooms.

Experiment IV

Method

Subjects

The subjects were 20 fourth graders and 20 sixth graders attending the normal classes of the Ochanomizu Elementary School, equally many boys and girls at each age chosen at random from among the available pool of children who had not participated in Experiment II (i.e., those whose only experience with alphabetic instruction had occurred in school) and serving with teacher and parental permission. Testing was conducted during the first trimester of the school year such that only the sixth graders had been educated in the use of an alphabetic orthography. Mean ages for each group were 117.1 and 142.5 months, respectively.

Materials and procedure

The materials and procedure for Experiment IV were the phoneme deletion materials employed in Experiment III, the only innovation being that, at the completion of the test session, each subject was given two of the test items to which he or she had responded correctly and was asked to explain how the correct response had been derived. This provided a test of whether subjects had relied on either a Kana-based or a Romaji-based spelling strategy.
Results

The mean number of correct responses appears in Table 4, separated according to grade level and the phoneme token ([f] or [k]) being manipulated. It can be seen that the performance of the sixth graders surpassed that of the fourth graders ($F(1,38) = 18.49, p < .0001$), consistent with the fact that only the sixth graders had learned to use alphabetic transcription. When the present results were compared with those obtained in Experiment III (and shown in Table 3), it was found that both the Japanese fourth and sixth graders had surpassed the Japanese first graders in mean performance on the phoneme deletion task ($t(38) = 4.08, p < .01$ for fourth graders, $t(38) = 4.53, p < .01$ for sixth graders). The Japanese fourth graders performed at the same level as the American first graders ($p > .1$), and the Japanese sixth graders had actually surpassed them ($t(38) = 5.11, p < .01$).

To gain some appreciation of the Japanese children's knowledge of Romaji, we conducted an informal post-hoc interview with the five children who performed best at each grade level. We found that none of the fourth graders could read the nonsense test materials written in Romaji, whereas three of the sixth graders could do so. In contrast, although we had not asked the American children to try to read the test materials, they had been able to read an appreciable number of nonsense words on the Woodcock word-attack test. It may be remembered that the Japanese fourth graders had not received any instruction in Romaji, whereas the sixth graders had received approximately 4 weeks of instruction a full year and a half prior to the test session. The American first graders, on the other hand, had been receiving intensive phonics-based instruction in the use of the English alphabet for

<table>
<thead>
<tr>
<th>Table 4. Phoneme elision performance among older Japanese children</th>
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<tbody>
<tr>
<td>Phoneme elision</td>
</tr>
<tr>
<td>[f] [k]</td>
</tr>
<tr>
<td>Grade in school</td>
</tr>
<tr>
<td>Fourth grade</td>
</tr>
<tr>
<td>Mean no. correct: 4.82</td>
</tr>
<tr>
<td>(Max. = 10, Age = 117.1 mo.)</td>
</tr>
<tr>
<td>Sixth grade</td>
</tr>
<tr>
<td>Mean no. correct: 8.33</td>
</tr>
<tr>
<td>(Max. = 10, Age = 142.5 mo.)</td>
</tr>
</tbody>
</table>
more than 6 months immediately prior to the test session.

A further analysis reveals an effect of token variations: Both fourth and sixth graders tended to give more correct responses to items which began with [k] than to those which began with [ʃ], ($F(1,38) = 20.73, p < .0001$). This may be explained by hypothesizing a “character-substitution” strategy based on the previously mentioned grid for representing the Kana syllabary as a matrix of rows and columns in which mora which share a vowel lie in the same row, and those which share a consonant lie in the same column. Within that matrix, the character for [a] is to the immediate right of that for [ka], [i] is to the immediate right of [ki], [u] to [ku], etc., and children might be tempted to spell a word, replace the first character with the character which lies to its immediate right on the matrix. Use of this strategy could cause [k] to be easier to delete than [ʃ] because characters containing [k] are immediately adjacent to those for isolated vowels, whereas most which contain [ʃ] are spelled with digraphs composed of the character for [ʃi] with a subscripted character for [ya], [ye], [yu] or [yo] (according to the identity of the vowel), and these lie at the opposite end of the grid from the vowel characters making it less obvious how to derive the character for the relevant vowel from that which represents the CV.

In this regard, we had actually asked children to explain how they had been able to arrive at a correct response. Of the fourth graders, seven were unable to describe their strategy at all, nine gave evidence of using the “character substitution strategy,” and four subjects described a “phonological” strategy which more or less amounted to doubling the vowel of the first syllable in a word and then removing the initial consonant-vowel portion (i.e., making [ki-pi] into [ki-i-pi], and then deleting [ki] to yield [i-pi]. The children who reported the “phonological strategy” had achieved some of the best scores in their age group, and they tended to be equally accurate in their responses to items containing [k] and [ʃ]. As for the sixth graders, all of whom had been exposed to the alphabet, only four appeared to have employed the “character substitution strategy”, and they achieved some of the lowest scores in their age group especially for items which began with [ʃ]. Fifteen of the remaining children reported some version of the “phonological strategy”, and only a single child reported a strategy of using Romaji.

General discussion

The present study asked whether Japanese children's awareness of syllables and phonemes differs from that of American children, as a consequence of their having learned to read a syllabary instead of an alphabet. The results
clearly showed that Japanese children’s approach to phonological counting and deletions tests is influenced by their reading experience. Knowledge of the Kana syllabary tended to confound performance on tasks which attempted to assess the ability to manipulate phonological units, whether they involved the counting or deletion of phonemes or syllables, and whether instructions were ambiguous or explicit as to whether orthographic or sound units were being counted. Younger children in particular tended to manipulate the characters which spell a word rather than the phonological units which the characters transcribe. This tendency has previously been observed among American children (Ehri & Wilce, 1980) and has been one form of evidence that knowledge of an alphabet is responsible for phoneme awareness.

The results further reveal performance differences between first graders in Japan and America and these illustrate that knowledge of a syllabary/logography as opposed to an alphabet can have a very specific effect on phonological awareness. Relative to first graders in Japan, first graders in America can more accurately count the number of phonemes in words and can more accurately remove the initial phonemes from nonsense words. Thus the experience of learning to read an alphabet must facilitate children’s awareness of phonemes at this age. The analogous finding that Japanese children can perform slightly better than American children on tasks that call for syllable manipulation likewise reveals that experience with a syllabary can facilitate the awareness of syllables. However, children, in general, find syllable manipulation an easier task than phoneme manipulation which suggests that the experience of learning to read a syllabary vs. an alphabet is not the sole determinant of phonological awareness.

What might the other determinants be? First of all, the development of phonological awareness may be a multi-faceted process that depends on the abstractness of the unit at issue. Syllables, as compared to phonemes, are isolable acoustic segments; they are more superficial, less encoded components of the speech signal. Thus it is reasonable that syllable awareness should be an easier to achieve, more natural achievement of such factors as cognitive maturation and primary language development, requiring less special cultivating experience than awareness of phonemes. The results of previous research favor this view (Liberman et al., 1974; Alegria et al., 1982; Read et al., 1984). While awareness of syllables may be a precursor of awareness of phonemes it is not sufficient, given that some individuals can manipulate syllables but not phonemes. Previous research had suggested that the ability to manipulate phonemes depends on knowledge of an alphabet (Byrne & Ledez, 1983; Liberman et al., 1986; Morais et al., 1979; Read et al., 1984), but the present study suggests that other factors can also play a role.
The findings of Experiments II and IV emphasize the role of factors other than knowledge of the alphabet in the development of phoneme awareness, by revealing that, whereas most Japanese first graders could manipulate syllables but not phonemes, the majority of Japanese children were able to manipulate both syllables and phonemes by the fourth grade, whether or not they had been instructed in the use of an alphabet. Thus, with increasing age and educational experience Japanese children may become more and more capable of manipulating phonemes whether or not they are alphabet-literate.

This finding stands in contrast to previous reports that adults who do not know how to read an alphabet are not aware of phonemes, and some explanation is required. We may disregard the possibility that the differences between Japanese children and the alphabet-illiterate adults are due to task differences rather than differences in phonological awareness, per se. A concern with this possibility prompted Experiments III and IV which employed deletion tasks analogous to those used in previous studies of illiterate adults, and the results obtained in these experiments are much the same as those obtained with the counting tasks employed in Experiments I and II. This accords with some other observations that the task-unique cognitive demands posed by different tests of phonological awareness do not appreciably confound conclusions about young children’s phonological awareness and its role in reading acquisition (Stanovich et al., 1984a).

Perhaps a more reasonable interpretation is to accept the differences between the present findings and those obtained with alphabet-illiterate adults as differences in phonological awareness. We might then explore the possibility that other types of secondary language activity are responsible for the superior phonological awareness of the older Japanese children. One clear likelihood is that awareness of both syllables and phonemes is promoted by the experience of learning Kana, owing to the fact that it is a phonological orthography. This accords with the fact that many of the adults who proved deficient in phoneme awareness were functional illiterates (i.e., the American and Portuguese adults). It would also accord with the correlations between Kana reading ability and both syllable and phoneme awareness, observed in Experiments I and III (although the correlation leaves causality ambiguous). It might seem inconsistent with certain findings (i.e., Experiment III and Mann, 1984) that syllable awareness fails to correlate with the ability to read the alphabet, but ceiling effects are a possible confounding factor, and other studies have reported a correlation between syllable awareness and reading ability (see, for example, Mann & Liberman, 1984; Alegria et al., 1982).

A more serious problem with the view that knowledge of a phonological orthography promotes all aspects of phonological awareness concerns the lack of phoneme awareness among adult readers of the Chinese orthography.
(Read et al., 1984). As noted by Gelb (1963), Chinese, the most logographic of all the writing systems, is not a pure logographic system because from the earliest times certain characters have represented not words but phonological units. Many Chinese characters, the “phonetic compounds,” are digraphs—compounds composed of a radical and a phonetic—each of which otherwise represents a word of the language. As noted by Leong (in press), since 600 A.D. the “fanqui” principal has been employed for decoding phonetic compounds, a strategy which calls for blending the first part (initial consonant) and the tone of the word represented by the phonetic with the final part (syllable rime) of the word represented by the radical. Thus a compound composed of the radicals representing “t’u” and “liau” decodes as “t’iau.” Several Chinese colleagues inform me that classical methods of education in the Chinese logography have explicitly called the reader’s attention to the phonetic radicals. Moreover, although historical changes have necessarily altered the relationship between phonetic compounds and the words they represent, one recent study reveals that the adult readers of Chinese make use of the phonetic insofar as they name low-frequency (but not high-frequency) characters which involve phonetic compounds faster than non-phonetic compound characters (Seidenberg, 1985). Likewise, adult readers of Chinese can use phonetic radicals productively (Fong, Horn, & Tzeng, in press), to give consistent pronunciations for nonsense logographs composed of phonetics and radicals that do not usually co-occur. Given these findings, it is somewhat puzzling that exposure to phonetic compounds did not promote phonological awareness among Read et al.’s subjects, if exposure to any phonological orthography facilitates phoneme awareness.

Placing aside the role of reading experience, it is possible that phoneme awareness is facilitated by some other secondary language experience that is available to Japanese children but not to the adults studied in Portugal and China. For Japanese children, the appropriate experience might involve learning to analyze or manipulate the phonological structure of spoken words while playing word games like “Shiritori” or while learning about Haiku. That the experience facilitating phonological awareness need not be limited to reading is evident from previous findings about the utility of explicit training in phonemic analysis (see Treiman & Baron, 1983, for example). Exposure to nursery rhymes and other poetry, for example, could help to explain why many American children are aware of syllables, before they learn to read. But it would have to be argued that experience with such secondary language activities facilitates the development of all aspects of phonological awareness, in a very general way, else how are we to explain the fact that Japanese children became able to manipulate phonemes despite a lack of experience with games and versification devices which directly manipulate
phoneme-sized units? Even if it is postulated that any secondary language experience which manipulates phonological structure can give rise to awareness of both syllables and phonemes, there remains a problem insofar as meter and rhyme are exploited by both Chinese and Portuguese verse, song lyrics, etc. and would probably have been available to the illiterate adults who nonetheless lacked phoneme awareness. A further problem arises from the fact that, in the present study, all of the children were familiar with the Kana syllabary and the same types of word games and versification devices, yet only a small minority of the first graders (10%) were able to count phonemes whereas the majority of fourth graders could do so.

A similar argument can be made against the view that Japanese children knew about phonemes because they had seen signs, labels, etc. written in the Romaji alphabet. Any explanation that passive exposure to the Romaji alphabet is responsible for the phoneme awareness of Japanese children would have to account for the fact that all children are exposed to Romaji signs and logos, yet only those aged 9 and older had profited from that exposure. It would also have to account for the fact that passive exposure to alphabetically-written material failed to promote phoneme awareness among the Portuguese adults studied by Morais et al. (1979).

One final explanation of the differences between the present results and those obtained with alphabet-illiterate adults remains. The ability to manipulate both syllable and phoneme-sized units could be a natural concomitant of primary language development which is exploited by many secondary language activities such as reading, versification and word games. But if this capacity is a natural concomitant of primary language, how can it be deficient in alphabet-illiterate adults? Perhaps the ability to manipulate phonemes tends to atrophy unless maintained by appropriate reading experience. It has often been speculated that children acquire their primary language with the aid of a language acquisition device that is not present in adults. That the capacity for manipulating phonemes could be part and parcel of a language acquisition device follows from a suggestion made by Mattingly (1984), in answer to the question of why readers might be able to gain access to the otherwise reflexive processes that support the processing of phonological structure in spoken language. He suggests that an ability to analyze the phonological structure of spoken words might serve to increase the language learner’s stock of lexical entries, and this, together with some other evidence that children have a privileged ability to acquire new lexical entries (Carey, 1978), could lead to the speculation that children have a privileged ability to manipulate phonological structure which somehow facilitates their ability to engage in secondary language activities that involve manipulations of phonological units. The prevalence of this capacity in childhood could pro-
mote children's acquisition of phonological orthographies during their elementary school years and by postulating that this capacity atrophies in the absence of appropriate orthographic knowledge, one might explain the lack of phoneme awareness observed among alphabet-illiterate adults. However, this view is not without its problems, one being the fact that Japanese children could not do well on either the counting or elision tasks until relatively late in their childhood. Here, the cognitive demands of tests that are used to measure phoneme awareness and the confounding role of orthographic knowledge cannot be disregarded. Ongoing research with a broader battery of tests and a broader range of ages may further elucidate the basis of phonological awareness in the interplay between cognitive skills, primary language skills and experience with secondary language activities such as reading.

References


Leong, C.K. (in press). What does accessing a morphophonemic script tell us about reading and reading
Résumé

Lors d'une étude trans-culturelle sur des enfants japonais et américains, nous avons examiné le développement de la conscience des syllabes et des phonèmes. Les expériences I et III, qui utilisent des tests de comptage et d'effacement, montrent que, à la différence des élèves américains de première année d'école primaire, qui ont en général conscience à la fois des phonèmes et des syllabes, presque tous les élèves en première année d'école primaire au Japon ont conscience d'unités phonologiques de l'ordre de la syllabe alors qu'assez peu ont conscience des phonèmes. Cette différence est attribuable au fait que les élèves japonais apprennent à lire un syllabaire alors que les élèves américains apprennent à lire un alphabet. Pour la plupart des enfants de cet âge, la conscience des phonèmes nécessite l’expérience d’une transcription alphabétique, alors que la conscience des syllabes peut être facilitée par l’expérience d’un syllabaire, sans en dépendre aussi fortement.

Pour éclaircir davantage le rôle de la connaissance d’un alphabet sur la conscience des phonèmes chez les enfants, nous avons fait effectuer des tâches de comptage et d’effacement (expériences II et IV) à des enfants japonais en fin d’école primaire. Les résultats montrent que beaucoup d’enseignants japonais prennent conscience des phonèmes vers dix ans d’âge, qu’ils aient ou non appris une transcription alphabétique. La discussion de ces résultats porte sur certains autres facteurs qui peuvent produire la conscience phonologique.