Hong Kong Chinese Kindergartners Learn to Read English Analytically

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Research Article

HONG KONG CHINESE KINDERGARTNERS LEARN TO READ ENGLISH ANALYTICALLY

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Abstract—*We examined the extent to which young Hong Kong Chinese children, taught to read English as a second language via a logographic "look and say" method, used information about letter names and letter sounds to learn English words. Forty children from each of three kindergarten grade levels (mean ages 3.8, 5.0, and 5.9 years old, respectively) were taught to pronounce novel English spellings that were based on letter-name (e.g., DK = Deke), letter-sound (DK = Dick), or visual (**D**K = Jean) cues. By the 2nd year of kindergarten, children performed significantly better in the name condition than the other conditions. The 3rd-year kindergartners performed better in the sound condition than the visual condition as well. The results point to the importance of letter-name and letter-sound knowledge for learning to read English, regardless of native-language background or method of instruction.*

Children in the United States know a good deal about the building blocks of printed words, the letters, even before they start to read. U.S. children's early experiences with letters usually emphasize the letters' names. Knowledge about letters' sounds is typically not acquired until learning of letter names is well under way (Adams, 1990; Worden & Boettcher, 1990). Consistent with the idea that knowledge about letter names and knowledge about letter sounds are distinct (McBride-Chang, 1999; Treiman, Tincoff, Rodriguez, Mouzaki, & Francis, 1998), the two types of knowledge play different roles in learning to read for U.S. children. Letter-name knowledge is used to connect speech and print from an early age. For example, even prereaders who have some knowledge of letter names take advantage of this knowledge to learn the association between the novel word BT and the pronunciation "beet" (Treiman & Rodriguez, 1999; Treiman, Sotak, & Bowman, 2001). These children do not rely solely on visual cues (e.g., recognizing *queen* on the basis of its initial "tail"), the *logographic* method, to identify words. Later, as children begin to read, they become able to use letter-sound information in learning words (Treiman & Rodriguez, 1999; Treiman et al., 2001). The ability to link letters and phonemes plays an important role in the acquisition of reading and spelling (e.g., Foorman, Francis, Novy, & Liberman, 1991).

The results just reviewed suggest that young U.S. children are analytic learners. They go beyond rote memorization to try to make sense of print-speech relationships by using what they know about the names and the sounds of letters. In the present study, we asked whether this conclusion also applies to a group of children to whom it might not be expected to apply—young children in Hong Kong who are learning English as a second language. There are several reasons why Hong Kong children might rely heavily on a logographic method when learning to read English. If they nevertheless use letter names and letter sounds to connect print and speech, as U.S. children do, this would suggest that children are analytic learners who search for structure in a system even under circumstances that do not favor its discovery.

One reason why Hong Kong children might rely primarily on a logographic approach in learning to read English is that reading instruction in Hong Kong neglects the alphabetic principle. It emphasizes, instead, the visual configurations of words. Hong Kong children are taught to read both Chinese and English by the "look and say" method (Holm & Dodd, 1996; Huang & Hanley, 1995). In this method, the teacher shows children a character or word, names it, and asks the children to repeat the name. When this technique is applied to English, little attention is drawn to individual letter sounds or letter names within a word. Rather, the word's holistic visual configuration is emphasized. Elsewhere in China and in Singapore, students are taught a coding system that represents each Chinese character phonemically. A system based on onsets and rimes is taught in Taiwan. Because no such coding system is used in Hong Kong, students there may rely exclusively on rote memorization to learn not only Chinese (Hanley, Tzeng, & Huang, 1999) but also English words.

A second reason why Hong Kong children may not appreciate the relations between spellings and sounds in English is that their phonemic awareness, even in Chinese, is relatively poor. Both Hong Kong children (Huang & Hanley, 1995) and adults (Holm & Dodd, 1996) demonstrate low phonemic awareness relative to other Chinese- or English-reading groups. This low phonemic awareness may reflect the teaching methods just described (Holm & Dodd, 1996; Huang & Hanley, 1995). It may also reflect the nature of spoken Chinese. Chinese languages have virtually no consonant clusters, whereas such clusters are relatively common in English. Previous researchers (Caravolas & Bruck, 1993; Cheung, Chen, Lai, Wong, & Hills, 2001; but see Cossu, Shankweiler, Liberman, Katz, & Tola, 1988, for a different view) have suggested that experience with complex spoken syllables, even before children learn to read, can prime the development of phonemic awareness. Given their low phonemic awareness, Hong Kong Chinese might bypass phonology in learning to read and rely, instead, on visual cues.

An additional reason for Hong Kong children to bypass phonology may be that English is their second language. Previous studies from the United States have suggested that initially teaching bilingual children to read in English, a second language with which they have limited proficiency, may impede their ability to relate print to speech (Tabors & Snow, 2001). Studies from other cultures, such as studies of Berber-speaking children learning to read Arabic (Wagner, 1993), also indicate that children who begin to read in a second language have special difficulties with speech-print correspondences. For Hong Kong children, as for other bilingual learners, these difficulties may reflect limited knowledge of the phonology of the second language.

Transfer of specific reading strategies from the first language to the second language provides yet another reason why Hong Kong children might rely on a logographic approach for English. Tzeng and Wang (1983) have argued that visual processing is essential in learning to read Chinese, as the majority of characters do not fully encode pronunciation. Hong Kong teachers follow this reasoning in their ho-

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listic, visually oriented approach to the identification of both Chinese characters and English words. A variety of visual processing skills have been shown to correlate with Chinese character recognition in Chinese-speaking children (Huang & Hanley, 1995; Lee, Stigler, & Stevenson, 1986). Hong Kong children might use the visual skills that serve them well for Chinese when learning to read in English.

Despite various instructional, linguistic, and cultural factors that might encourage Hong Kong children to use a logographic approach in learning to read English, it is possible that these children take advantage of the alphabetic principle that underlies English orthography. Older Chinese children have demonstrated analytic abilities in previous studies of Chinese character recognition (Chan & Nunes, 1998; Ho & Bryant, 1997a; Shu & Anderson, 1997). For example, the phonetic radical of a Chinese character may help in learning its pronunciation, and semantic components may give clues to characters' meanings. Chinese children are not explicitly taught to use this information (Hanley et al., 1999). Nevertheless, from age 6, they use phonetic and semantic radicals in mastering a variety of literacy skills; such analytic skills increase with age. The present study was designed to examine the analytic abilities of younger Hong Kong children who are learning to read a second language.

We investigated the roles of visual cues, letter names, and letter sounds in Hong Kong children's reading of English by means of a word-learning task similar to tasks that have been used with native English-speaking children by Ehri and Wilce (1985), Treiman and Rodriguez (1999), and Treiman et al. (2001). In those studies, children were taught to pronounce novel words that embodied various types of relationships between print and sound. For one set of words, those in the *name condition*, the name of the first letter in each printed word was heard in its pronunciation (e.g., BT = beet). In a *sound condition*, the typical phoneme was present but the entire letter name was not (e.g., BT = bait). In a *visual condition*, the pronunciations of the words were not consistent with English letter names or letter sounds (e.g., B**T** = ham). However, the letters varied in size and placement so that the stimuli in each to-be-learned set were relatively distinctive from a visual point of view. Children who rely solely on a logographic approach would be expected to perform best in the visual condition. In the present study, we asked whether Hong Kong kindergartners take advantage of connections between print and speech that are based on letter names and letter sounds, or whether they perform best in the visual condition.

Our Hong Kong participants attended kindergarten schools that are administratively separate from primary schools, as do 95% of preschool children in Hong Kong (McBride-Chang & Ho, 2000). Children attend these schools for 3 years, beginning at age 3. Hong Kong is a competitive city, and most parents want their children to become proficient in Chinese, mathematics, and English from an early age. Therefore, most students learn some academic skills, including the names of English letters and a few Chinese characters, even in their 1st year of kindergarten. The majority of Hong Kong children learn English only in school. Kindergartners typically receive about a half hour of "English time" per school day, singing songs, reading stories, or learning to read and write.

Our study took advantage of the fact that many formal names must be learned in Hong Kong. Parents often give English names, in addition to Chinese names, to their children. Other children take on English names in early primary school. Names of Hong Kong people we know include "Apple," "Perenty," "Moon," "Potato," and "Him." Hong Kong children thus encounter names with a wide variety of sound patterns, and we capitalized on this fact with the stimuli for our word-learning study.

Our primary goal was to examine Hong Kong children's performance in the name, sound, and visual conditions of the word-learning task. By comparing performance across the three conditions and across the three kindergarten grade levels, we hoped to learn what types of information Hong Kong children use in learning to read new English words and when they use various types of information. A second goal was to examine how performance in the word-learning task relates to reading ability in English and Chinese and knowledge about English letters. If Hong Kong students rely on visual memorization in the laboratory word-learning task and in reading words outside the laboratory, then reading scores should correlate more highly with performance in the visual condition of the word-learning task than with performance in the name or the sound condition. If Hong Kong children are analytic learners, sensitive to speech-sound information, then their performance in the name and sound conditions might be more strongly associated with measures of word recognition and letter knowledge than is their performance in the visual condition.

METHOD

Participants

We tested 40 children at each of the three kindergarten grade levels, K1, K2, and K3. The children's mean ages were 3.8 years (range: 3.3–4.9 years), 5.0 years (range: 4.5–6.0), and 5.9 years (range: 5.4–6.4) for K1, K2, and K3, respectively. Each child attended one of three different kindergartens. All were native speakers of Cantonese. Across grades, 63 boys and 57 girls participated.

Measures

Word-learning task

Three sets of stimuli, each consisting of five items, were constructed. Table 1 shows the stimuli and their pronunciations. All the printed stimuli contained two consonant letters. The pronunciations were always consonant-vowel-consonant syllables. In the name condition, the pronunciation of the first letter's entire name could be heard in the spoken stimulus. In the sound condition, the pronunciation began with the phoneme that fit the first letter of the printed stimulus, but the letter's entire name was not heard. In both the name and the sound conditions, the final consonant of the spoken syllable corresponded to the typical sound of the second letter of the printed stimulus. The pronunciations in the visual condition did not contain any of the phonemes corresponding to the letters in the printed stimulus. In the name and sound conditions, the stimuli were printed in uppercase letters 2.6 cm high. In the visual condition, the letters varied in height from 1.0 to 2.6 cm and were printed in a variety of fonts to enhance their distinctiveness. Detailed information about the fonts and sizes of letters in the visual stimuli is available from the authors. Within each set of five printed stimuli, no two items shared the same initial or final letter.

English reading task

We used a 30-item list of English words that was based on an examination of six different Hong Kong kindergarten curricula. The children were asked to pronounce all the items one by one, or to indi-

Table 1. *Stimuli and pronunciations for the word-learning task*

Stimulus	Pronunciation		
	Name condition	Sound condition	Visual condition
		Set A	
KL	Kale	Kyle	Bett
JN	Jane	June	Duck
BT	Beat	Bat	Pice
DK	Deke	Dick	Jean
PC	Peace	Pace	Kole
		Set B	
KN	Kane	Kine	Dim
JK	Jake	Jack	Peg
BL	Beale	Bull	Keen
DM	Deam	Dome	Joke
PT	Pete	Pat	Bill
		Set C	
KT	Kate	Kit	Pam
JD	Jade	Jude	Dale
BS	Beece	Bess	Kite
DN	Dean	Dunn	Jeal
PL	Peel	Paul	Boss

Note. In the visual condition, the letters varied in height from 1.0 to 2.6 cm and were printed in a variety of fonts to enhance their distinctiveness.

Table 2. *Stimuli for the letter-sound task in alphabetical order*

Picture	Letter choices
Ant	E A M Q
Bar	D W B A
Corn	H G E C
Dish	O D P L
Egg	E F T A
Food	V U N F
Gift	E T G Z
Hot	H J I D
Ill	E I S J
Jet	U K M J
Kid	G K E F
Lip	R A L S
Map	M O N D
Net	I Y M N
Oats	U Q J O
Pearl	E P D C
Queen	Q U L W
Rain	R I L F
Sing	A Z Y S
Tap	L E T J
Up	U O W K
Vine	F E Z V
Whale	W I Q K
Yams	P G Y I
Zip	U Z Q S

cate that they did not know an item. In a study of U.S. kindergarten and first-grade children (McBride-Chang & Kail, 2002), this task correlated .85 with the Word Identification subtest of the Woodcock Reading Mastery Test (Woodcock, 1989). Its internal-consistency reliability in the present study was .95.

Chinese reading task

The students were given the Chinese character recognition task of Ho and Bryant (1997b), which includes 27 single Chinese characters and 34 two-character words. Its internal-consistency reliability in the present study was .98.

Letter-name task

Twenty-six cards (5.3 cm high) were prepared, each with an uppercase letter printed on it. The children were shown the cards in a random order and were asked to name each letter. The obtained internal-consistency reliability for this task was .87.

Letter-sound task

Because isolated letter sounds are not taught in Hong Kong, letter-sound knowledge cannot be tested explicitly in Hong Kong children. As we confirmed in pilot testing, these students do not understand what is required of them when they are asked to provide the sounds of individual letters. To test letter-sound knowledge implicitly, we showed children line drawings of objects, told them the English pronunciation of each object, and asked them to select (by pointing or naming) from among four choices displayed under each picture the letter that was most likely to begin each word. Picturable items were selected on the basis of the judgments of two college students that the names for these items were likely to be in the spoken Chinese vocabularies of Hong Kong kindergartners. Hong Kong kindergarten teachers confirmed that neither the spoken nor the printed English forms of most of the words were taught in the kindergartens. The choices for each item included the correct letter, two incorrect consonant letters, and one incorrect vowel letter. There was one item for each letter of the alphabet except *x*, whose most frequent sound does not fall at the beginning of any English word. The items were administered in a fixed random order to all children. They are displayed in Table 2. The internal-consistency reliability for this task was .68.

Procedure

Each child participated in four sessions over a 2-week period and was tested individually in a quiet room of his or her school by one of two college graduates with degrees in psychology. Each session lasted from 10 to 25 min. The children participated in each of the three word-learning conditions in Sessions 1 to 3. A different stimulus set was used for each condition for a given child, and the order of conditions was balanced across children. In Session 4, the children were tested on English reading, Chinese reading, and letter-name and letter-sound knowledge. The children received a small prize at the end of each session.

Each session of the word-learning task consisted of a demonstration phase and up to eight test trials. The experimenter began by explaining that the child would learn some English "made-up names." The experimenter then showed the child a card and indicated what the "name" said, running her fingers under the letters of the printed stimulus. The experimenter then used the name in a sentence of the form

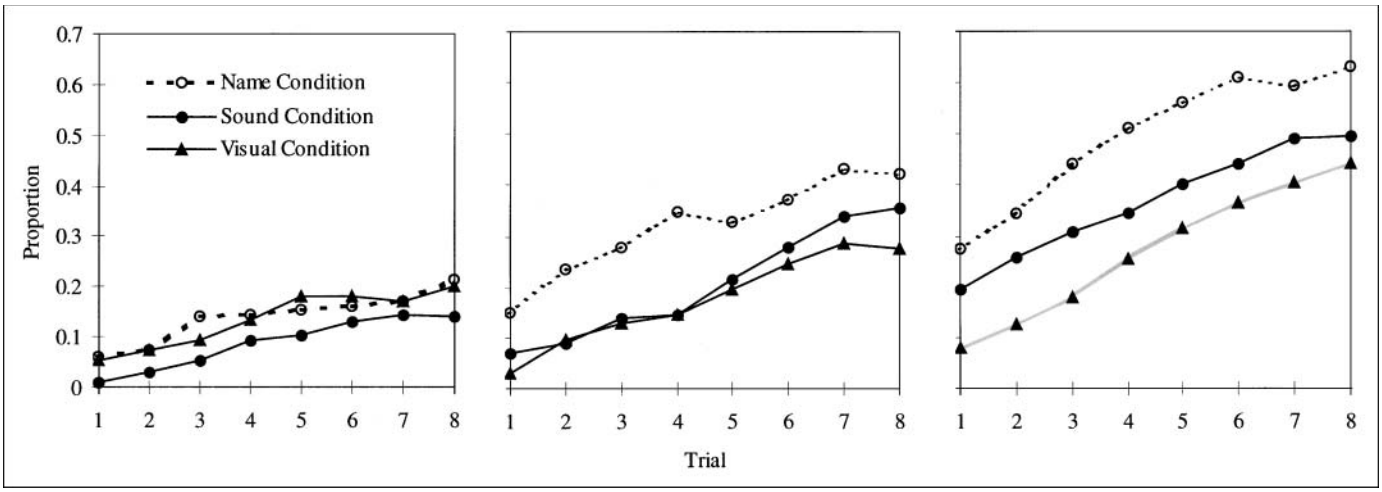

Fig. 1. Mean proportion of correct responses across trials in the name, sound, and visual conditions in K1 (left panel), K2 (middle panel), and K3 (right panel).

"This boy/girl is called ____." This procedure was repeated for all five stimuli, their order randomly chosen for each child. For the first test trial, the experimenter showed the child one of the cards and asked whether he or she remembered the name to which it corresponded. The child was praised for a correct answer, and the experimenter provided the correct answer if the child responded incorrectly. All five stimuli in the set were tested in a random order using this procedure. The subsequent test trials were conducted the same way. If the child responded correctly to all items on two consecutive test trials, no further trials were administered in that condition. We assumed that the child would have responded correctly on further trials if this criterion was met.

RESULTS AND DISCUSSION

Figure 1 shows the mean proportion of correct responses in the word-learning task as a function of condition (name, sound, and visual) and trial (1 through 8) at each of the three kindergarten grade levels. The total scores across trials are shown in Table 3, which also shows the children's mean levels of performance on the reading tasks and letter-name and letter-sound tasks. The word-learning data were analyzed using the factors of condition, trial, and grade level. There was a main effect of condition, $F(2, 116) = 18.32$, $p < .001$. Overall, children performed best in the name condition, intermediate in the sound condition, and most poorly in the visual condition. The main effect of condition was modified by a significant interaction with grade, $F(4, 234) = 4.45$, $p < .01$. The main effect of grade was also significant, $F(2, 117) = 37.10$, $p < .001$, reflecting the improvement in performance across the three kindergarten levels. There was also a main effect of trial, $F(7, 111) = 37.97$, $p < .001$. Trial interacted with grade, $F(14, 224) = 2.77$, $p < .01$, as K2 and K3 children showed more improvement across trials than K1 children.

Follow-up planned comparisons using the factors of condition and trial were carried out for each grade level. For K1 children, the effect of condition was not significant, $F(2, 38) = 2.83$, $p > .05$. The effect of condition was significant at the K2 level, $F(2, 38) = 7.76$, $p < .01$.

Table 3. *Mean number of correct responses and* F *value for the effect of grade level for each task*

Task	Grade level			
	K1	K2	K3	$F(2, 117)$
Letter name (max. = 26)	21.0 (4.4)	25.1 (1.6)	25.6 (0.6)	33.73*
Letter sound (max. = 25)	7.7 (2.4)[a]	9.4 (3.4)[a]	13.2 (4.0)[b]	28.82*
English reading (max. = 30)	0.7 (2.2)	6.1 (5.4)	16.3 (5.8)	111.41*
Chinese reading (max. = 61)	15.4 (9.8)	41.7 (9.4)	58.2 (3.9)	280.81*
Word learning, name condition (max. = 40)	5.6 (7.3)	12.7 (8.6)	19.8 (9.7)	27.03*
Word learning, sound condition (max. = 40)	3.6 (4.8)	8.1 (7.1)	14.7 (8.3)	25.42*
Word learning, visual condition (max. = 40)	5.5 (5.3)	7.0 (5.7)	10.8 (7.0)	8.24*

Note. Standard deviations are in parentheses.
[a]Performance was not significantly different from chance.
[b]Performance was significantly better than chance.
*$p < .001$.

Table 4. *Correlations among the tasks*

Task	Word learning, name condition	Word learning, sound condition	Word learning, visual condition	Letter name	Letter sound
Word learning, sound condition	.60**				
Word learning, visual condition	.35**	.39**			
Letter name	.44**	.34**	.27*		
Letter sound	.54**	.51**	.28*	.41**	
English word reading	.59**	.67**	.41**	.49**	.66**
Chinese word reading	.56**	.58**	.34**	.66**	.57**

*$p < .01$ (two-tailed). **$p < .001$ (two-tailed).

The K2 students performed significantly better in the name condition than in the sound condition, $t(39) = 3.10$, $p < .01$, or visual condition, $t(39) = 3.83$, $p < .001$. The sound condition and the visual condition did not differ significantly from one another for K2 children, $t(39) = 0.88$. For K3 students, there was also a significant effect of condition, $F(2, 38) = 11.27$, $p < .01$. Like the K2 students, these students performed better in the name condition than the sound condition, $t(39) = 3.38$, $p < .01$, or visual condition, $t(39) = 4.80$, $p < .001$. However, the K3 students also demonstrated a significant superiority for the sound condition over the visual condition, $t(39) = 2.65$, $p < .05$. The effect of trial was significant at all three grade levels: K1—$F(7, 33) = 4.83$, $p < .01$; K2—$F(7, 33) = 11.22$, $p < .01$; K3—$F(7, 33) = 27.38$, $p < .01$.

Among K1 students, no child reached the criterion of two consecutive correct test trials in any condition. In K2, 1 student reached the criterion in the name and sound conditions, and none did in the visual condition. By K3, 8 children reached criterion in the name condition, 2 did in the sound condition, and 1 did in the visual condition.

These results show that the young Hong Kong children derived and made use of letter-name and letter-sound knowledge from the English alphabet when learning to read English. By the 2nd year of kindergarten, they applied the knowledge of letter names that they acquired in school to the recognition of novel English words. By the 3rd year of kindergarten, they used their implicit knowledge of the sounds of English letters in learning to recognize new alphabetic stimuli. This pattern—early development of letter-name knowledge and early use of this information in learning to read new words, later development of letter-sound knowledge and later use of this information in learning to read new words—is remarkably similar to that observed among U.S. children learning to read English as a first language (Treiman & Rodriguez, 1999; Treiman et al., 2001). Early use of letter names has also been observed in children learning to read other alphabetic orthographies (de Abreu & Cardoso-Martins, 1998; Levin, Patel, Margalit, & Barad, 2002).

Even the finding that the 1st-year kindergartners failed to show an advantage for the visual condition over the name condition may reflect the power of the alphabetic principle. Because these children knew most of the English letter names (see Table 3), they may have found the visual-condition stimuli somewhat confusing because the pronunciations had no associations with the spellings. The children's knowledge of the alphabet may have offset, to some degree, the early tendency to rely on visual cues to recognize print (e.g., Ehri & Wilce, 1985).

Table 4 shows the correlations among the children's abilities to read English and Chinese words, identify letter names and letter sounds, and perform accurately in the name, sound, and visual conditions. The name and sound conditions were significantly more highly associated with one another than either was with the visual condition ($p < .05$). Both English and Chinese reading ability correlated significantly more highly with performance in the name and sound conditions of the word-learning task than with performance in the visual condition ($p < .05$). This finding suggests that the analytic skills tapped by our name and sound conditions are important in learning to read outside the laboratory. That similar results were obtained for Chinese and English reading ability fits with the idea that phonological skill predicts initial reading acquisition in both languages (e.g., Ho & Bryant, 1997b; Huang & Hanley, 1997; McBride-Chang & Kail, 2002). Although the associations of the letter-name task with the name, sound, and visual conditions did not differ reliably, performance on the letter-sound task correlated significantly more highly with performances in the name and sound conditions than with performance in the visual condition ($p < .01$).

Our findings attest to the power and utility of the alphabetic principle even for children who are learning to read English as a second language. Young children, regardless of their educational and cultural background, appear to show a remarkable degree of linguistic insight when dealing with printed words. Similar insights have been found among older readers of Chinese (Chan & Nunes, 1998; Ho & Bryant, 1997a; Shu & Anderson, 1997). Studies of the acquisition of spoken and signed languages provide further evidence of children's ability to learn and create structure in language (e.g., Bickerton, 1984; Senghas & Coppola, 2001). Our results suggest that second-language learners of English are remarkably similar to native English learners in their acquisition of the alphabetic principle, despite great differences in curricula and language exposure.

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