

Phonological Processing and Reading in Different Orthographies

Susumu Ideguchi

Abstract

Phonological processing include phonological awareness, phonological memory, and rapid automatized naming (e.g., Wagner & Torgesen, 1987; Torgesen, Wagner, Rashotte, Rose, Lindamood, Conway & Garvin, 1999). Phonological processing skills are suggested to have a crucial role in reading English. Past studies have shown that depending on the type of orthography of the language learned, phonological processing skills are also important but seem to affect reading to different degrees. Reading (and writing) involve multi-component skills, and sub-skills such as letter identification, word recognition and production and so forth. However, studies on phonological processing skills and reading ability among different orthographies imply that more attention is required to their phonological aspect of the language (e.g., Schneider, Kuspert, Roth, Vise, & Marx, 1997; Hu & Catts, 1998; Wydell, Patterson & Humpreys, 1993). This is particularly important for students and teachers of Japanese as L2 since studies on phonological processing skills and learning of Japanese as L2 is much less compare to those of English as L2. This paper concludes that more emphasis on the relationships between phonological processing skills and learning other types of orthographies is needed for learning Japanese as L2.

Key terms: phonological processing; orthography; reading; learning

1. Introduction

In this paper, involvement of phonological processing in reading among different orthographies, namely English, Chinese, Japanese, Turkish and Welsh, are introduced. In addition, the problems and the relationship between phonological processing and reading ability is discussed as well as some suggestions for language learning. In the literature of language learning, English as L2 in particular are relatively established (e.g., Koda, 1989; 2000; Wang, Koda & Perfetti, 2003) compared to learning Japanese as L2. This paper tries to shed new light the importance of this particular aspect of cognitive processes in language learning.

Phonological processing

Phonological processing typically includes phonological awareness, phonological memory, and rapid automatized naming (e.g., e.g., Wagner & Torgesen, 1987; Torgesen, Wagner, Rashotte, Rose, Lindamood, Conway & Garvin, 1999). People with deficits in one or more of these kinds of phonological processing abilities may experience more difficulty in learning to read than those who do not. Findings of impairments in phonological processing remain the most prominent in all studies of dyslexia (e.g., Ramus, Rosen, Dakin, Day, Castellote, White & Frith, 2003). Impairment in transcoding written words into pronunciations (phonology), via the application of grapheme-phoneme conversion rules leads to poor reading of nonwords compared to reading real words.

2. Phonological processing in different orthographies

English

Learning to read English is essentially acquiring complex mappings of sub-syllabic phonological components (i.e. phonemes) to the letter level (graphemes), orthographies such as English can be categorised as quasi-regular since the relationship between letter and sound is one-to-many, as well as the sound and letter relationship. Acquiring appropriate sub-syllabic skills is extremely crucial in English. The lack of phonological awareness and processing skills will result in poor word recognition skills and is a deficit that persists through adulthood (e.g. Bruck, 1990; 1992). Thus, there is much research that show the effectiveness of phonological processing measures to predict as well as promote reading achievement in English.

Chinese

More recently, research on phonological processing in different orthographies suggested that phonological processing is important not only in relatively transparent alphabetic orthographies such as German (e.g., Schneider, Kuspert, Roth, Vise, & Marx, 1997) but also in logographic orthographies such as Chinese (e.g., Hu & Catts, 1998). Reading Chinese is considered to be achieved primarily by visual access to the meaning rather than by correspondence between letter and sound (e.g., Baron & Strawson, 1976; Wong & Cheng, 1999). However, more recent studies have demonstrated that phonological processing is also involved in non-alphabetic 'deep' orthographies such as Chinese (e.g., Perfetti & Zhang 1991, Tan & Perfetti, 1999) and Japanese kanji (Wydell, Patterson, & Humphreys, 1993).

The number of homophones present in a Chinese character can be a factor in determining whether phonology mediates access to its meaning. In Chinese, it is estimated that one-character words make up 34% of a 1,310,000-word corpus. Two-character words make up 64% (Modern Chinese Frequency Dictionary, 1986). There is thus a possibility that reading processes involving two types of words could be different. Disregarding tones, around 11 Chinese characters share one pronunciation (Tan & Perfetti, 1999). Tan and Perfetti (1999) examined whether phonological mediation occurs in accessing a character's meaning. Tan and Perfetti studied the role of phonology in reading using single-character Chinese words. The experimental paradigm they employed was a primed naming task. Three types of primes were used in the study: (1) a prime that was synonymous but neither visually nor phonologically similar to the target; (2) a prime that was homophonic with the synonym prime but had no graphic, phonological or semantic similarity to the target, and (3) a control prime that had no graphic, phonological or semantic similarity to the target. The results showed that the naming latency for a target word was facilitated by a prime that was homophonic to a synonym of the target, as well as by the synonym of itself. This phonological mediation effect was found to work for primes with few homophones but not for primes with many homophones. This suggests that phonological mediation in reading a Chinese character is restricted by the size of a character's homophone neighbourhood.

Skills in phonological processing are thought to be important in reading Chinese too. Children's early phonological processing skills also predict their later reading performance even in Chinese (e.g., Ho & Bryant, 1997; Hu & Catts, 1998). However, when Huang and Hanley (1995) examined the performance of phonological processing skills, visual skills and reading ability among 8-year-old children from Britain, Hong Kong and Taiwan, differences in phonological processing skills were not a prime cause of the differences in reading ability amongst Chinese children. Instead, after a regression analysis, visual skills were more closely related to the reading ability of children from Hong Kong and Taiwan. It was also suggested that superior visual memory skills are crucial especially where they are learning a new Chinese character. It is however premature to conclude that phonological processing skills in reading Chinese are not important. Huang and Hanley also

found that the children's performance on phoneme deletion was significantly correlated to reading Chinese characters among Chinese children. One of the reasons for these mixed results is probably due to the fact that phoneme deletion performance of children from both Hong Kong and Taiwan was influenced by "one's experience of learning alphabetic script in the language in which one is being tested" (Huang & Hanley, 1995). The Hong Kong children performed well on English phoneme deletion because they learned an alphabetic script for English but not for Chinese. Conversely, the Taiwan children performed well on Chinese phoneme deletion because they learned an alphabetic script for Chinese. There is less support for the traditional account of learning to read Chinese characters than is achieved primarily by visual memory. The visual memory measures used in Ho and Catts's study for example, did not show significant correlation with word reading ability. On the other hand, phonological processing measures showed a strong correlation to children's reading ability.

Japanese

The Japanese writing involves two qualitatively different scripts: logo/morphographic kanji and syllabic kana. Some consider reading Kanji, derived from Chinese characters, to be achieved primarily by visual access to the meaning rather than by correspondence between letter and sound. What makes this issue more complicated is that Japanese kanji has both Kun- and On-reading. 62% of commonly-used kanji are assigned a Japanese way of pronunciation (Kun-readings). However, when Chinese characters were introduced in Japan, their pronunciations were adopted as On-reading. Thus, among Japanese two-kanji compound words, appropriate pronunciation is determined by the specific combinations of two or more kanji characters. These complex characteristic of kanji pronunciation made researchers claim that phonological activation does not occur during reading of kanji (Goryo, 1987; Saito, 1981; Sasanuma, 1974). However, Wydell, Patterson and Humpreys (1993) showed that phonological information contributes to the semantic activation of two-kanji compound words.

Wydell *et al.* (1993) examined the role of phonological activation by using a semantic categorisation task with homophones. Participants were presented with a category name (e.g., よい結果 /yoi kekka/ 'good result') followed by a target word (e.g., 青果 /seika/ 'fruits and vegetables') and were asked to make a decision whether or not the target word was a correct exemplar of the category (in this case, a homophone of correct exemplar is 成果 /seika/). Sakuma, Sasanuma, Tatsumi and Masaki (1998) provided a further support for the involvement of phonology during kanji reading by using semantic decision tasks that were similar to the semantic categorisation tasks used by Wydell *et al.* (1993).

Turkish and Welsh

In transparent orthographies such as Turkish and Welsh, phonological processing skills are also as important as in English. For example, Oktay and Aktan (2002) studied the relationship between the development of primary school children's phonological processing skills and subsequent reading ability in Turkish. Oktay and Aktan observed that as these Turkish children became literate, their phonological processing skills increased dramatically. Another Turkish study (Durgunolu & Oney, 2002) found that phonological processing skills are important in reading not only among children but also among adults.

There are other studies in transparent orthographies showing similar outcomes to Turkish, such as Welsh (e.g., Spencer & Hanley, 2004). It is suggested that a straightforward relationship between grapheme and phoneme seems to promote phonological processing skills. The relationship eventually produces more rapid development of word-decoding skills for learning to read transparent orthographies than for reading opaque orthographies such as English (Wimmer, 1993).

It has been shown that 'larger' units (syllable, onset and rhyme) are easier for young children to manipulate than smaller phonemes (e.g., Bruck and Treiman, 1990; Treiman & Zukowski, 1991). Different levels of

phonological processing are also suggested to be closely related to reading ability, depending on the degree of transparency. Spencer and Hanley (2004) studied reading and letter recognition and phonological skills of 5-year-old children educated in a Welsh-English speaking primary school. They found that rhyme test performance (testing 'larger' units) was significantly correlated with learning to read English but not Welsh. This is consistent with the view that awareness of larger units such as rhyme ability is more closely related to reading opaque English than to reading transparent orthographies (e.g., Wimmer, Landerl & Schneider, 1994). This is largely due to the fact that many inconsistent grapheme-phoneme correspondences (e.g., -ough in *rough*, *through*, *ought*) exist in English.

3. Phonological Processing and Japanese Language learning

The relationship between phonological processing and Japanese language learning is largely neglected in Japanese as L2 study. Nevertheless, reading and writing skills are considered to involve multi-component skills, for example, sub-skills which include as letter identification, word recognition and production, semantic access and so forth.

Learning Japanese as L2 indeed do need the sub-skills mentioned above due to its unique writing system (with syllabic Kana and logo/morphographic Kanji). In addition, relative reliance on orthographic than phonological information is necessary in reading Kanji. However, studies introduced in previous sections suggest that more attention is required in their phonological aspects of the language.

In practical term, not much research done in this area thus, there is little can be mentioned at this stage. However, both learners and teachers of Japanese at least share information that phonological processing of Japanese involves both syllable (for Kana) and syllable-morpheme (for Kanji) phonology level. The role of phonology is thus different from alphabetic writing systems.

4. Conclusion

Phonological processing skills seem to have an important role in reading in all orthographies. However, phonological processing skills seem to affect reading to different degrees depending on the type of orthography of the language learned. In addition, it is important to note that these particular aspects of cognitive skills in language (i.e. phonological processing) and their relations to language learning should be more highlighted more and treated carefully.

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