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Cultural background influences the liminal perception of Chinese characters: An ERP study

Gang Peng [a,b,*], James W. Minett [a], William S.-Y. Wang [a]

[a] Language Engineering Laboratory, Department of Electronic Engineering, The Chinese University of Hong Kong, Shatin, New Territories, Hong Kong
[b] State Key Laboratory of Brain and Cognitive Sciences, The University of Hong Kong, Hong Kong

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ABSTRACT

The event-related brain potentials elicited by rapid visual presentation of Chinese characters and non-characters were studied for two groups of adult native Chinese speakers: one group of Putonghua speakers, who could read Simplified Chinese characters, and one group of Hong Kong Cantonese speakers, who could read Traditional Chinese characters. For Putonghua participants, but not Hong Kong Cantonese participants, liminally perceived characters were found to elicit significantly greater P300 amplitude than non-characters. Based on the context updating hypothesis, this result indicates that Putonghua participants discriminated stimuli according to their linguistic function (character versus non-character) more easily than Hong Kong Cantonese participants. Putonghua participants were also better able to discriminate characters based on their physical properties (high symmetry character versus low symmetry character). These findings are consistent with the hypothesis that Simplified character readers have greater visual discrimination skill than Traditional character readers. The results also provide the first evidence that cultural background shapes sensitivity in the liminal perception of Chinese characters, an important step toward a general theory of the cognitive processes involved in reading.

* Corresponding author. Language Engineering Laboratory, Department of Electronic Engineering, The Chinese University of Hong Kong, Shatin, New Territories, Hong Kong. Tel.: +852 3163 4346; fax: +852 2603 5558.
E-mail addresses: gpeng@ee.cuhk.edu.hk (G. Peng), jminett@ee.cuhk.edu.hk (J.W. Minett), wsywang@ee.cuhk.edu.hk (W.S.-Y. Wang).

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1. Introduction

Written language makes use of graphemes to encode the corresponding spoken language (Daniels & Bright, 1996). In most cases, languages that differ significantly in their spoken forms also differ significantly in their corresponding written forms. However, the languages of the Sinitic (Chinese) family are unusual in that, although many of them are mutually unintelligible (Cheng, 1996; Tang & van Heuven, 2009), they share essentially the same written language (albeit with two character sets and some lexical differences). Written Chinese uses a logographic script that consists of thousands of characters, each comprising a hierarchical arrangement of strokes (Wang, 1973). Two character sets are commonly used in written Chinese: Traditional characters, which were previously used throughout China, but which are now used in Hong Kong, Macau, Taiwan, and some other Chinese-speaking communities around the world, and Simplified characters, which were adopted in Mainland China in 1956, and are now also used in Singapore and Malaysia. The Simplified characters were designed with fewer strokes than their Traditional counterparts with the aim of making the task of learning the written language easier (Wang, 1973). The two character sets nevertheless share a subset of characters that have identical forms in each set, and which are therefore familiar to all literate Chinese individuals.

In Mainland China, Putonghua (abbreviated here as PTH; i.e., Modern Standard Chinese, also often referred to as Mandarin) is the official language, with Simplified characters as its writing system. From kindergarten, children are taught the pronunciations of characters using the *Pinyin* phonemic coding system (McBride-Chang, Chow, Zhong, Burgess, & Hayward, 2005). PTH is used as the medium of instruction for schooling at all levels except in a few outlying regions where the medium of instruction is the local dialect. In contrast, in Hong Kong, the 'mother tongue' is Cantonese (abbreviated here as HKC); Traditional Chinese characters are used for its writing system. Children are typically taught to read characters by rote memorization, with no instruction given using a phonemic coding system, such as *Pinyin*, to aid pronunciation (McBride-Chang et al., 2005). The medium of instruction used in most primary schools is HKC. The medium of instruction adopted in secondary schools, however, has varied. Hong Kong was a British colony for 155 years until its sovereignty returned to China in 1997. Before the return of sovereignty, English was used as the medium of instruction during secondary schooling (Pierson, 1994). Since then, most secondary schools have adopted 'mother tongue' instruction in HKC, although English continues to be used as the medium of instruction in about twenty percent of secondary schools (Lai, 2005). Table 1 summarizes the main sociolinguistic differences between native PTH and HKC speakers.

Reading Chinese characters, as well as other logographic scripts, requires a greater involvement of visual processing and memory than does reading alphabetic scripts (Tzeng & Wang, 1983). As a number of studies with child participants have shown, visual processing is a vital component in learning to read Chinese characters proficiently. For example, Huang and Hanley (1994) observed that performance in two tests of visual skill provided a better predictor of Chinese reading ability than did performance in two tests of phonological awareness, both for eight- and nine-year-old HKC-speaking children in Hong Kong and for similarly aged Mandarin-speaking children in Taiwan. In contrast, for eight-year-old English-speaking children in Britain, performance in the phonological tests provided the better predictor of English reading ability. Later, Ho and Bryant (1997) found that performance in the Frostig

Table 1
Sociolinguistic differences between native Putonghua and Hong Kong Cantonese speakers.

	Mother tongue	Character set	Phonemic coding system	Primary school medium of instruction		Secondary school medium of instruction	
				Spoken	Written	Spoken	Written
PTH speakers	Putonghua	Simplified	*Pinyin*	Putonghua	Chinese	Putonghua	Chinese
HKC speakers	Cantonese	Traditional	None[a]	Cantonese	Chinese	Cantonese; some English	Chinese; some English

[a] Note that a phonemic coding system – *The Linguistic Society of Hong Kong Romanization Scheme*, more commonly known as *Jyutping* – for Hong Kong Cantonese does exist, but it is not in widespread use (Lun, S. C. (2008). The road of Jyutping (Cantonese Romanization) in Hong Kong and its social implications and applications. *Sociolinguistics Symposium: Micro and Macro Connections*, Amsterdam, The Netherlands, 3–5 April, 2008).