Routes to Learning Chinese Characters: Strategies Used by Japanese and Korean Chinese as Foreign Language Learners

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Abstract

This study investigates the strategies used in novel character processing among 44 Chinese as foreign language (CFL) learners with either Japanese or Korean as their first language. The CFL learners completed a picture mapping task under three conditions: no cue, phonetic cue (pronunciation of the character) and semantic cue (description related to the character) provided conditions. Their strategies to map picture with pseudo-characters are analyzed. Positional strategy is found to be the dominant strategy in both Japanese and Korean learners. Japanese learners use more semantic strategy than Korean learners under semantic cued condition while correct pronunciation of the character positively predicts the use of phonetic strategy and positional strategy in Korean learners but not Japanese learners. The result supports that there is language transfer when learning a foreign language and the transfer is governed by orthographic distance.

Keywords: Chinese as foreign language learners, language transfer, orthographic distance

Routes to learning Chinese characters: Strategies used by Japanese and Korean Chinese as foreign language learners

Learning Chinese as foreign language has become an increasing trend (Lu & Xi, 2008). This is due to the growing cultural and economic power of China (Lu & Xi, 2008; Ding & Saunders, 2006; Naughton, 2007; Poncet, 2003). As shown in a recent survey, Chinese is expected to become the most valuable business language together with English in the future by 38% of financial and human resource directors in Australia, Europe and New Zealand (Lu & Xi, 2008; Ding & Saunders, 2006). Moreover, there are increasing amount of business expatriates in China. Proficiency in Chinese language is beneficial to them in both general and work adjustments (Selmer, 2006). Therefore, there are more and more people around the world started to learn Chinese (Lu & Xi, 2008; Welles, 2004). However, this is not an easy task because Chinese is regarded as the most challenging foreign language in the world (Shen, 2005). Among all the domains of Chinese language, writing is the most difficult to learn (Everson, 1998). The difficulty is mostly caused by the logographic nature of Chinese orthography (Shen, 2005). The complex characters and the lack of correspondence of sound and script sometimes lost interest in Chinese as foreign language (CFL) learners (Everson, 1998). Therefore, uncovering the strategies to reading Chinese characters in learners with different language background may be helpful to CFL learners to overcome the difficulty in learning Chinese. In this study, we seek to address this issue by examining the strategies used by Japanese and Korean in Chinese pseudo-characters recognition.

Second language linguists have suggested that L2 word recognition is affected and perhaps facilitated by L1 reading experience (Koda, 1996; Bassetti, 2005). Second language learners read their second language in a different way compared with the native users as first language writing systems will affect awareness of linguistic units (Bassetti,

2005). Foreign language learners tend to use the awareness of linguistic units built up in learning their L1, to analyze their L2 (Bassetti, 2005). Many researches proved the existence of language transfer in learning foreign languages (Bassetti, 2005; Han et al., 2003; Nakada, Fujii & Kwee, 2001; Koda, 1999; Wang, Koda, & Perfetti, 2003; Akamatsu, 2003). For example, Nakada et al. (2001) investigated the neuroanatomical relationship of reading in first and second language through fMRI and found that although the participants are reading the same language, the area activated in the brain was different in Japanese group and English group. When asked to read English text, left fusiform gyrus, left lingual gyrus and right lingual gyrus were activated in native English readers while left fusiform gyrus and left inferior temporal sulcus were activated in Japanese readers. An interesting finding is that, the area of activation in Japanese learners when they read English is the same as the area when they read Japanese. This indicates that Japanese learners used their first language experience to read their second language (English) in this study. Moreover, Koda (1996) suggests that the effect of language transfer is governed by orthographic distance. Orthographic distance is defined as the extent to which orthographic systems of L1 and L2 share representational and structural properties (Koda, 1996). There are some studies confirmed that performance in L2 word recognition is better in learners with related L1 orthographic background than those with unrelated L1 orthographic background (Koda, 1999; Wang et al., 2003). However, note that most studies focused on learning alphabetic languages as foreign language, and few or no research to date has examined this issue on learning Chinese, a typical non-alphabetic language.

There is one study by Everson (1998) that investigates whether there is any correlation between naming ability and reading ability in beginning CFL learners with alphabetic language backgrounds. The study found a strong positive correlation between ability to name and to read, which indicated that CFL learners rely on the pronunciation in

reading Chinese characters. While previous researches had shown that native Chinese readers rely more on visual-orthographic information in reading (Akamatsu, 2003; Wang et al., 2003). It seems plausible that there is also transfer of reading experience of L1 to L2 reading in CFL learning. However, no comparison of strategies of learning Chinese characters in learners with logographic and non-logographic language background was done before. Therefore, the current study investigats whether the similarity and differences of two writing systems will influence the strategy used to read Chinese characters in Chinese as foreign language learners. Specifically, we want to investigate learners from Japan and Korea as Chinese, Japanese, and Korean are three East Asian languages that share certain similarities (Taylor & Taylor, 1995). This question is practically important to improve the teaching method for CFL learners, and it is also theoretically important to inform how learning strategy is shaped or influenced by L1 orthographic system.

Similarities and Differences among Chinese, Japanese and Korean

There are several similarities and differences among the three languages. In terms of phonology, each of the basic writing unit of the three languages, i.e. Chinese characters, Korean Hangul, and Japanese Kana, represents one syllable (Shen, 2005; Taylor & Taylor, 1995). However, the correspondence of phonology and the writing unit is very different among the three languages. There is little correspondence of orthography and phonology in Chinese (Shen, 2005; Taylor & Taylor, 1995; Wang et al., 2003). But one can directly map Korean Hangul orthography and Japanese Kana orthography to corresponding phonology (Cho& Chen, 1999; Wang et al., 2003; Taylor & Taylor, 1995; see examples in Table 1.). In terms of morphology, morphemes of the three languages are composed of different numbers of syllables (Taylor & Taylor, 1995). In Chinese, each character represents a morpheme (Shen, 2005; Taylor & Taylor, 1995), while morphemes are made up of one or more syllables in Japanese and Korean (Taylor & Taylor, 1995). For the orthography, the three languages

share the use of Chinese characters (Everson, 1998; Taylor & Taylor, 1995). But Hangul is used in majority in Korean and Kana is used together with Kanji in Japanese (Cho& Chen, 1999; Wang et al., 2003). The use of Chinese characters in the three languages is summarized in Table 1. Due to the shared use of Chinese characters, readers of the three languages can read the other two scripts to some extent. However, besides the use of Chinese characters, reading and writing in the three languages is quite different.

Table 1

Comparison of Chinese, Japanese and Korean Language System

	Chinese	Japanese	Korea
Writing system	Logographic	Syllabic	Alphabetic
Basic writing unit	Character	Kana	Hangul
Shape (pronunciation)	阿 (/a/)	あ (/a/)	ㅏ (/a/)
Example of Chinese characters	山 (Shan1)	山 (San)	山 (San)
Shape (pronunciation)	学 (xue2)	学 (gaku)	學 (hak)
Number of frequently used characters	3500	2000	1800
Proportion in literature	100%	40-50% in official documents; 30-40% in newspapers and modern literature	10% (From survey on Korean newspapers)

(Cho & Chen, 1999; Hatta, Kawakami, & Tamaoka, 1998; Tamaoka, 1991; Taylor & Taylor, 1995; Wang et al., 2003)

Chinese orthography is logographic (Wang at el., 2003), which means each grapheme represents a morpheme. In Chinese, words are composed of Chinese characters. Each character represents one morpheme (Shen, 2005; Taylor & Taylor, 1995). There is

little correspondence of orthography and phonology in Chinese (Shen, 2005; Taylor & Taylor, 1995; Wang et al., 2003). Therefore, it is believed and proved in researches that Chinese readers will utilize more visual-orthographic information in word recognition tasks (Akamatsu, 2003; Bi, Xu, & Caramazza, 2009; Cao, 2009; Wang et al., 2003). For example, Cao's (2009) research showed that there was an increase in reliance on visual-orthographic processes over age when native Chinese learners of different age were asked to perform reading tasks.

Japanese orthography is syllabic and logographic which uses both Kana and Kanji. Kana is the writing unit of Japanese which each represents a syllable. Kana is derived from Chinese character that the pronunciation and shape of a kana is similar to the corresponding Chinese character but with a much simple shape (Taylor & Taylor, 1995). Due to the Chinese characters origin of Kana and the use of Kanji, despite the fact that Japanese is also syllabic, research still considered Japanese as logographic language (Akamatsu, 2003). In Akamatsu's (2003) study, university students are required to read an English passage that may be case alternated, that is there may be upper case and lower case letters mixed in a word. Result has found that Japanese natives are more affected by case alternation than the Persian group. This indicates that Japanese readers use more visual-orthographic information in word recognition. Besides the use of visual-orthographic information, study has found that Japanese uses also more semantic information than phonetic information in word recognition. In the study of lexical decision with phonological and semantic primes in Japanese native readers (Chen, Yamauchi, Tamaoka, & Vaid, 2007), semantic priming effect was more significant.

Korean is considered as alphabetic despite the use of Hanja in most literatures (Cho & Chen, 1999; Koda, 1999; Taylor & Taylor, 1995; Wang et al., 2003) because of the majority use of Hangul. Hangul is the alphabetic script used in Korean (Cho & Chen, 1999;

Taylor & Taylor, 1995). It is a kind of non-linear alphabet (unlike English, which is linear) that symbols are shaped into a square like block (e.g. 산, meaning mountain) which resembles the shape of Chinese characters (e.g. 山, meaning mountain; Wang et al., 2003). Because of this unique shape of Hangul syllables, some consider Korean as logographic (Taylor & Taylor, 1995). But due to the direct mapping of Hangul orthography to phonology (Cho & Chen, 1999; Taylor & Taylor, 1995; Wang et al., 2003), Korean is considered as alphabetic here. Also, research has been done and phonology was found to play a crucial role in Korean word reading (Cho & Chen, 1999). Participants were asked to perform a semantic categorization task in which stimuli are homophone foil, visually-similar foil or controls. Korean natives are found to be more affected by the homophone foil thus phonology was found to affect word reading in Korean.

Overview of the present study

Due to the differences in the three languages in terms of phonology, morphology and orthography, it is hypothesized that Japanese Chinese-as-foreign-language (CFL) learners will adopt different strategies with Korean CFL learners in reading Chinese Characters. We will address three specific questions. The first one is whether L1 orthography affects L2 Chinese character reading and how does it affect. The second centers on how different writing systems influence Chinese character processing strategy. The last one is whether the CFL learners' strategy in Chinese character recognition will change under no cue, semantic and phonetic cue provided conditions.

Method

Participants

A total of 44 Chinese as foreign language (CFL) learners took part in this study. This study applies a non-probability sampling in which population that the researcher has easy access was recruited. There were 22 Japanese (12 male and 10 female; age M = 31.95,

SD = 11.32) and 22 Korean (6 male and 16 female; age *M* = 22.14, *SD* = 4.155) in the study. Table 2 shows the demographic characteristics of the participants. They all have normal hearing and no history of speech and language problems. Although four participants learnt traditional Chinese characters, they were all able to read the simplified Chinese characters used in the testing materials.

Table 2

The Demographic Characteristics of the Participants under Study

	Japanese *M* (*SD*)	Korean *M* (*SD*)	T-test (*t*)
Years of learning Mandarin	4.57 (4.32)	4.18 (3.19)	.34
Starting Age (years)	21.89 (8.01)	15.9 (4.14)	3.10**
Years of using Mandarin	9.45 (8.32)	5.05 (3.58)	2.28*
Percentage of using Mandarin	17.73 (17.51)	13.44 (21.20)	.73
Number of languages known	3.14 (.77)	3.41 (.59)	-1.31

* = $p < .05$

** = $p < .01$

Picture-Symbol Mapping

A picture-symbol mapping based on an Orthosemantic-mapping task (Tong & McBridge-Chang, 2010) was conducted. The task was used to explore the learners' sensitivity in pseudo-characters recognizing according to the semantic, phonetic and positional information under various cueing conditions.

There were three practiced items and 38 tested items which were ranked in order of increasing difficulty (See Appendix C). Each item consisted of a line drawing of a specific concept or a concrete object that were used across high, middle, and low frequency regularly (Leung, Liao, & Pi, 2009). Five pseudo-characters were presented together with the line drawing. The pseudo-characters were constructed by interchanging the radicals of the

character represented by the picture with other radicals of Chinese characters. Figure 1 shows an example of the stimuli (Bridge, Chinese: 橋, Japanese: 橋, Korean: 다리) and Table 3 shows an example of the strategy information carried in each choice.

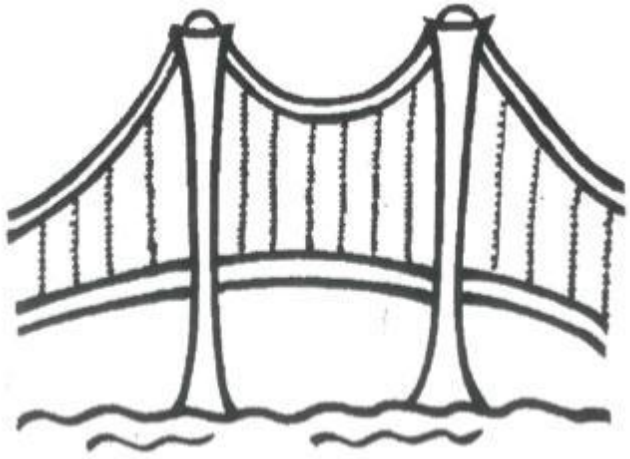

Figure 1. An example of stimuli picture for picture-symbol mapping task.

Table 3

An Example of Coding Scheme for Strategy Information Provided in Choices of Picture-symbol Mapping Task

Pseudo-characters	Semantic	Phonetic	Positional
桮	1	0	1
舛	1	0	0
乢	0	1	0
诙	0	1	1
眭	0	0	0

Note. 1 = Pseudo-characters consists the strategy information, 0 = Pseudo-characters does not consists that strategy information.

The picture-mapping task was done in three conditions for each participant to see

how the participants respond to phonetic or semantic cues when processing the pseudo-characters. In the no cue condition, the participants were asked to select the pseudo-characters that best represent the picture according to their first impression. For the phonetic cued condition, the participants were asked to name the picture first. The experimenter then gave the correct pronunciation to the participant before they select the pseudo character that best represent the picture. One mark was given for each correct pronunciation. For the semantic cued condition, the examiner provided a short description of the line drawing before asking the participant to select the pseudo-characters that best representing the picture according to the semantic cue. For the example showed in Figure 1, the experimenter would provide the semantic cue by saying 古代的桥是用木造的 (In ancient times, bridges are made of wood) (See Appendix C). Participants' responses were then coded into different strategies according to the coding scheme shown in Table 3.

Chinese characters read aloud task

Two tests were conducted to monitor the participant's proficiency in Chinese. The single character Chinese word read aloud task (SCCRA) and the two characters Chinese word read aloud task (TCCRA). There are 397 characters in SCCRA that are extracted from New Practical Chinese Reading Book 1, which was a textbook for CFL teaching in The University of Hong Kong (Lau, 2010) (See Appendix B). The single characters were comprised of simple characters (N = 85); top-bottom compound characters (N = 111), and left-right compound characters (N = 204). The characters consisted of transparent (N = 44), semi-transparent (N = 53) and opaque (N = 227) characters. There were also regular (N = 44), semi-regular (N = 110) and irregular (N = 170) characters. The TCCRA word list was comprised of 166 pairs of two characters words (See Appendix B), which were assembled from the 397 single characters in SCCRA (See Appendix A).

Language background and posttest questionnaires

The language background questionnaire consisted of 14 questions concerning the participants' language experience and proficiency, their parents' mother tongue, countries of residence and also their usage of Mandarin in daily life (See Appendix D). The posttest questionnaire with five open-ended questions was used to investigate the participants' own thinking process throughout the test (See Appendix E).

Procedure

Testing was done on individual basis in a university library room or through net-meeting software Skype if the participant is not in Hong Kong. Chinese characters recognition tasks (SCCRA and TCCRA), Picture mapping task, Language background questionnaire and posttest questionnaire were administered in one testing session. For the Picture mapping task, the participants were randomly assigned to two sequence of carrying out the task, either in sequence of no cue condition, phonetic cue condition and semantic cue condition or in sequence of no cue condition, semantic cue condition and phonetic cue condition. This was done to balance any practice effect of the task. The complete testing session for each participants lasted for approximately one hour to one hour and 15 minutes depending on the participants' response time.

Results

Independent t-test was done on the total scores of single character Chinese word read aloud task, t (42) = 1.19, p = .24, and two characters Chinese word read aloud task, both correct: t (42) = .8, p = .43; first character correct: t (42) = -.45, p = .66; second character correct: t (42) = .83, p = .41; none character correct: t (42) = -.99, p = .33. There was no significant difference in the total score of the two tests. Therefore, the Chinese proficiency of the Japanese CFL learners and Korean CFL learners was comparable. The means and standard deviations of strategies used among Japanese and Korean Chinese as foreign language (CFL) learners were summarized in Table 4.

Table 4

The Mean Score and Standard Deviation of Semantic, Phonetic and Positional Strategy Used under Three Conditions by Japanese and Korean CFL Learners.

Strategy		No cue provided		Phonetic cue provided		Semantic cue provided	
		Japanese	Korean	Japanese	Korean	Japanese	Korean
Semantic	*M*	19.32	20.41	11.95	10.41	35.23	31.59
	(*SD*)	(6.15)	(5.01)	(8.02)	(4.77)	(5.63)	(4.93)
Phonetic	*M*	21.5	19.68	28.59	27.64	5.41	8.09
	(*SD*)	(6.20)	(5.02)	(6.20)	(5.00)	(5.58)	(4.56)
Positional	*M*	36.59	32.27	37.59	34.23	36.55	33.59
	(*SD*)	(3.95)	(5.50)	(2.65)	(5.14)	(3.46)	(4.19)

Note. *M* = Mean, *SD* = Standard deviation

In order to examine the strategies used among Japanese and Korean Chinese as foreign language (CFL) learners under different conditions on pseudo-characters decoding, a 3 (Strategy: Semantic, Phonetic and Positional strategy) x 3 (Condition: No cue, Phonetic cue, Semantic cue provided condition) x 2 (Script: Japanese and Korean) repeated measure two-way analysis of variance (ANOVA) with strategy and condition as within-subject variables and group as between-subject variable was conducted on the score of picture-symbol mapping task.

The main effect of strategy was statistically significant, F (2, 84) = 243.41, $p < .001$, $\eta_p^2 = .85$, indicating that participants' use of strategy is significantly different from each other. Pairwise comparison with Bonferroni adjustment suggested significant use of positional strategy over the other two strategies (both ps $< .001$) and significant use of semantic strategy over phonetic strategy ($p < .05$). The main effect of script was significant, F (1, 42) = 15.58, $p < .001$, $\eta_p^2 = .27$, indicating that the response differed among Japanese and Korean learners.

Pairwise comparison with Bonferroni adjustment suggested Japanese learners' total score was significantly higher than that of Korean learners. However, the main effect of condition was not significant, F (2, 84) = .13, p = .88, η_p^2 = .00, suggesting that the participants' response did not differ across condition.

The interaction of strategy and condition was statistically significant, F (4, 168) = 152.07, $p < .001$, η_p^2 = .78, indicating that the participants' strategy used differed under different condition. The interaction of strategy and script was marginally significant, F (2, 84) = 2.43, p = .094, η_p^2 = .06, indicating that the participant with different first language used different strategies. The interaction between condition and script was not significant, F (2, 84) = .85, p = .43, η_p^2 = .02, indicating that the learners use of strategy across condition did not differ between the two groups. Additionally, the interaction of strategy x condition x script was not significant, F (4, 168) = 1.79, p = .132, η_p^2 = .04, suggesting that there was no significant difference in the interaction effect of strategy and condition among Japanese and Korean learners or in the interaction effect of strategy and script across conditions.

In order to examine the interaction effect of strategy and condition, a simple main effect analysis was conducted separately for each condition. A one way repeated measure analysis of variance (ANOVA) was conducted with strategy as within group independent variable and script as between group variable for each condition. Result revealed significant difference in strategy used.

In no cue provided condition (See Figure 2), the overall effect of strategy was significant, F (2, 84) = 76.70, $p < .001$, η_p^2 = .66. Pairwise comparison with Bonferroni adjustment showed that there was significant dominant in use of positional strategy over the other two (both $p < .001$), but no significant difference between semantic strategy and phonetic strategy (p = 1.00). The overall effect of script was also significant, F (1, 42) = 10.46, $p < .05$, η_p^2 = .20, indicating the strategy used in no cue provided condition was

significantly different between the two groups. The interaction between strategy and script was not significant, F (2, 84) = 2.09, p = .13, η_p^2 = .05, indicating that the pattern of strategy used did not differ between Japanese and Korean learners.

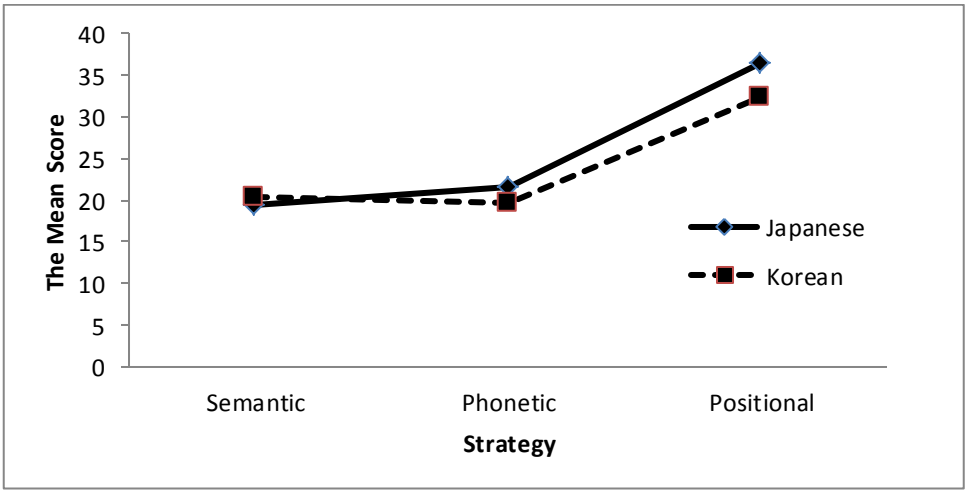

Figure 2. The mean score of strategy used across two groups in no cue provided condition

In phonetic cue provided condition (see Figure 3.), the main effect of strategy was significant. F (2, 84) = 162.41, p < .001, η_p^2 = .80. Pairwise comparison with Bonferroni adjustment showed that there was significant difference between all three strategies (all ps < .001). The pattern suggested significantly dominant use positional strategy and phonetic strategy was used significantly more than semantic strategy. The overall effect of script was also significant, F (1, 42) = 12.23, p < .05, η_p^2 = .23, indicating the strategy used in phonetic cue provided condition was significantly different between the two groups. The interaction between strategy and script was not significant, F (2, 84) = .40, p = .67, η_p^2 = .01, indicating that the pattern of strategy used did not differ between Japanese and Korean learners.

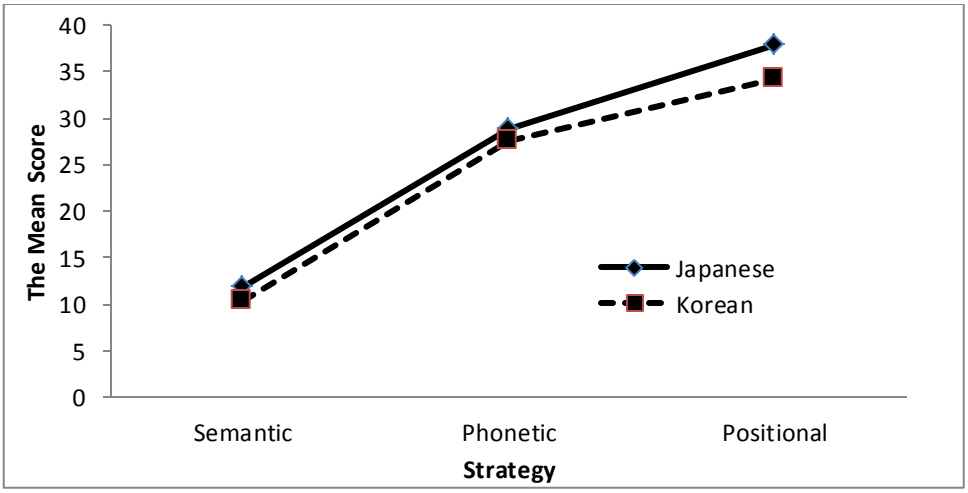

Figure 3. The mean score of strategy used across two groups in phonetic cue provided condition

In semantic cue provided condition (see Figure 4.), the main effect of strategy was significant, $F(2, 84) = 356.12$, $p < .001$, $\eta_p^2 = .90$. Pairwise comparison with Bonferroni adjustment showed that semantic cue and positional cue was significantly used more than phonetic cue (both ps $< .001$) but there was no significant difference between the use of semantic cue and positional cue ($p = .13$). The overall effect of script was also significant, $F(1, 42) = 8.851$, $p < .05$, $\eta_p^2 = .17$, indicating the strategy used in semantic cue provided condition was significantly different between the two groups. The interaction between strategy and script was also significant, $F(2, 84) = 4.24$, $p < .05$, $\eta_p^2 = .09$, indicating that the pattern strategy used differed between Japanese and Korean learners.

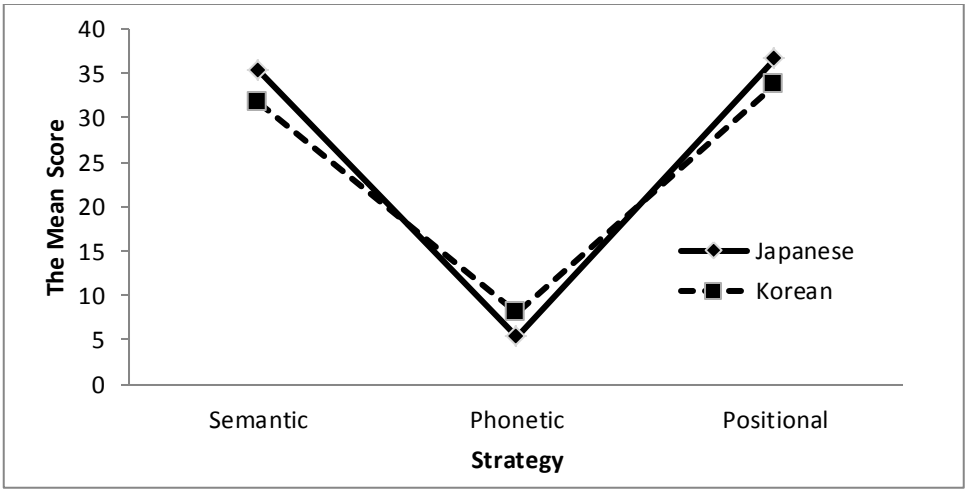

Figure 4. The mean score of strategy used across two groups in semantic cue provided condition

In order to further investigate the effect of script, the strategies used between Japanese and Korean learners under different conditions were compared. Independent *t*-tests with script as independent variable was conducted for each condition and strategy (see Table 5). In no cue condition and phonetic cue given condition, Japanese learners' use of positional strategy was significantly higher than that of Korean learners, $t\,(42) = 2.99$, $p < .05$ for no cue condition and $t\,(42) = 2.73$, $p < .05$ for phonetic cued condition. But no significant difference was found for semantic strategy and phonetic strategy. In semantic cue given condition, Japanese learners was found to be using significantly more semantic cue and positional cue than Korean learners, $t\,(42) = 2.28$, $p < .05$ for using semantic strategy and $t\,(42) = 2.55$, $p < .05$ for using positional strategy. Moreover, the use of phonetic strategy was found to be marginally significant, $t\,(42) = -1.75$, $p < .1$, indicating that Korean used more phonetic cue than Japanese, even though they are under semantic cued condition.

Table 5

Means of Strategy Used across Condition for Japanese and Korean Learners

Condition	Strategy	Script		*t*(42)
		Japanese	Korean	
		M (*SD*)	*M* (*SD*)	
No cue	Semantic	19.32 (6.15)	20.41 (5.01)	-.65
	Phonetic	21.5 (6.20)	19.68 (5.02)	1.07
	Positional	36.59 (3.95)	32.27 (5.50)	2.99**
Phonetic cue	Semantic	11.95 (8.02)	10.41 (4.77)	.78
	Phonetic	28.59 (6.20)	27.64 (5.00)	.52
	Positional	37.59 (2.65)	34.23 (5.14)	2.73**
Semantic	Semantic	35.23 (5.63)	31.59 (4.93)	2.28*
	Phonetic	5.41 (5.58)	8.09 (4.56)	-1.75+
	Positional	36.55 (3.46)	33.59 (4.19)	2.55*

+ = p <.10

* = p <.05

** = p <.01

In order to investigate the relationship between pronunciation skill and the use of different strategy for the two groups, hierarchical regression analysis was conducted for phonetic cue provided condition. We first entered years of learning Mandarin, years of using Mandarin, and starting age of learning Mandarin as controlled variables, and then we entered the total score of pronunciation under phonetic cued condition of the picture-symbol mapping task to evaluate the contribution of phonetic information on the use of strategy. The analyses were reported in Table 6 with coefficients of β, R^2, R^2 changes.

Table 6

Hierarchical Regression Predicting Use of Strategies in Mapping Task from Pronunciation Accuracy in Picture-symbol Mapping Task under Phonetic Cued Condition.

Variable	Japanese									Korean								
	Semantic			Phonetic			Positional			Semantic			Phonetic			Positional		
	R^2	ΔR^2	β	R^2	ΔR^2	β	R^2	ΔR^2	β	R^2	ΔR^2	β	R^2	ΔR^2	β	R^2	ΔR^2	β
Controlled variables	.13	.13		.15	.15		.17	.17		.05	.05		.17	.17		.17	.17	
Pronunciation accuracy	.23	.10	-.35	.26	.11	.37	.28	.11	.37	.12	.07	-.47	.35	.18	.74*	.34	.17	.71+

+ = p <.10

* = p <.05

Under phonetic cued condition, total score of pronunciation positively accounts for significant additional variance to the use of phonetic strategy and positional strategy for Korean participants but not in Japanese participants. The total score of pronunciation explained 18% of variance of the use of phonetic strategy and 17% of variance of the use of positional strategy for Korean participants. This shows that total pronunciation score was a unique predictor for the use of phonetic strategy and positional strategy for Korean participants but not in Japanese participants.

Discussion

The present study seeks to examine the use of strategies in Chinese character recognition among Chinese as foreign language (CFL) learners with Japanese or Korean as first language and how does different cueing affect the learners with different language background. We find that positional strategy is used significantly in dominant across the three conditions and in both Japanese and Korean learners while the use of semantic strategy and phonetic strategy depends on the condition. However, the use of positional strategy is significantly more in Japanese learners than in Korean learners across all conditions. We also find out that under semantic cued condition, Japanese learners use significantly more semantic strategy than Korean learners do and Korean learners use significantly more phonetic strategy than Japanese learners. In addition, under phonetic cued condition, we find that pronunciation accuracy of the characters in mapping task is a positive predictor of the use of phonetic and positional strategy in Korean learners but not in Japanese learners.

The first major finding is that positional strategy is used in dominant over semantic strategy and phonetic strategy across the three conditions in both Japanese and Korean learners. This finding is consistent with the previous study by Yip (2012) but she studied CFL learners from various language backgrounds including the European languages. A possible explanation of the dominant use of positional strategy is that recognition of Chinese

characters is highly relied on the visual orthographic representation in CFL learners. Being logographic in nature, Chinese character consists of different combination of radicals and strokes and each combination represents a morpheme. Positional information, which refers to the correct position of radicals in the pseudo-characters, is closely linked to the visual orthographic representation of a Chinese character. This finding shows that visual-orthographic information is not only important in Chinese character recognition in Chinese natives (Akamatsu, 2003; Bi, Xu, & Caramazza, 2009; Cao, 2009; Wang et al., 2003), but also important in Chinese as foreign language learners regardless of the writing system of their first language. Another possible explanation lies on the use of Chinese characters in both Korean and Japanese language. With the exposure of Chinese characters, Korean and Japanese learners acquired the use of visual-orthographic information to decode Chinese characters in their native language. Therefore, they would be able to utilize the strategy to decode the pseudo-characters in our study.

The second important finding is that, even though the Korean CFL learners and the Japanese CFL learners do not differ in Chinese proficiency, the use of positional strategy is significantly more frequent in Japanese CFL learners across all three conditions. This can be explained by the theory of language transfer in learning foreign language (Koda, 1996; Bassetti, 2005; Han et al., 2003). As found in previous studies, Japanese uses more visual-orthographic information in reading Japanese text (Akamatsu, 2003). With the theory of language transfer, we hypothesize that Japanese learners use visual-orthographic information in recognizing Chinese characters. The significant difference in the use of positional strategy across all condition provides evidence to our hypothesis and shows that Japanese learners utilize positional strategy, i.e. visual-orthographic information, more than Korean learners in Chinese character recognition. The current study shows evidence that language transfer occurs also in Chinese as foreign language (CFL) learning. Another

possible explanation of the significant difference is related to the orthographic distance. Koda (1996) suggests that language transfer effect is governed by orthographic distance. Being also a logographic script, Japanese has a shorter orthographic distance to Chinese than Korean has, as Korean is alphabetic. The more frequently used positional strategy in Japanese learners than in Korean learners found in the current study is consistent with previous studies that performance in L2 word recognition is facilitated in foreign language learners with shorter orthographic distance (Koda, 1999; Wang et al., 2003). The current study extends the proof of effect of orthographic distance to Chinese, a non-alphabetic language. The third explanation of the significant difference lies on the frequency of Chinese characters used in Japanese and Korean language. In modern Korean, Chinese characters (Hanja in Korean) are used for about 10% in literature only (See Table 1). Hanja is used far less frequently than Hangul (Cho & Chen, 1999). However, in Japanese, Chinese characters are used for 30-40% in modern literature and newspapers (Tamaoka, 1991). The higher exposure to Chinese characters for Japanese is likely to account for the fact that Japanese learners used positional strategy more frequently than Korean learners.

The third important finding is that, in the comparison of the use of strategies between the two groups under semantic cued condition, Japanese learners are more sensitive to the semantic cues and use the semantic strategy significantly more frequent than Korean learners while Korean learners use phonetic strategy significantly more frequent than Japanese learners. This provides more evidence on the transfer of L1 to L2 in Chinese as foreign language (CFL) learning that Japanese learners are able to use their dominance in use of semantic information in L1 recognition (Chen et al., 2007) to recognize a foreign language. So Japanese learners are more sensitive to semantic cues and used semantic strategy significantly more frequent than Korean learners. On the other hand, Korean learners use more phonetic information in word recognition in their L1 (Cho & Chen, 1999) and transfer

this dominance to word recognition in L2. Therefore, Korean learners use phonetic strategy more frequently than Japanese. The difference in the use of strategies under semantic cued condition in Japanese learners and Korean learners can be also explained with reference to the learners' explicit understanding and implicit understanding of the semantic cues. Implicit understanding is the intuition used in unplanned language that does not depend on conscious recollection (Ellis, 1994) while explicit understanding refers to conscious controlled processing that is used in planned language (Ellis, 1994). Under semantic cued condition, Japanese learners are able to make use of the semantic description of the stimuli to aid their decoding of the pseudo-characters because of the transfer of semantic strategy. Korean learners, however, are unable to utilize the semantic description provided as well as Japanese learners as they are less sensitive to semantic cues. With the smaller proportion of explicit understanding to implicit understanding, Korean learners use more intuition, in this case, phonetic strategy than Japanese learners under semantic cued condition.

The transfer of phonetic information dominance is also manifested in the fourth major finding. Under phonetic cued condition, Korean learners' use of strategy but not Japanese learners' is found to be predicted by the pronunciation accuracy of the stimuli. Being able to correctly pronounce the character contributes to the increase of using phonetic strategy and positional strategy under phonetic cued condition. This finding suggests that Korean learners rely on phonetic information to recognize the pseudo-characters. This further provides evidence to the theory of language transfer in learning foreign language (Koda, 1996; Bassetti, 2005; Han et al., 2003) discussed before. The direct mapping of writing unit to pronunciation in Korean native language contributes to the dominance in use of phonetic information in word recognition of their L1. The result in current study provides evidence of the transfer of this phonetic information dominance to word recognition of Chinese and provides evidence that language transfer in Chinese as foreign language (CFL)

learning occurs also in languages with different writing systems, i.e. from alphabetic language to logographic language.

There are several limitations of the study. First of all is the small sample size. The small sample size has decreased the statistical power. Secondly, the significant difference of starting age of learning Mandarin and the years of using Mandarin in the two groups may affect the use of strategy in Chinese word recognition. The fact that some participants are multi-lingual that they have language background of alphabetic language and also another logographic language (e.g. native Korean that learned Japanese before learning Chinese) may also attribute to the difference in use of strategy. Further study direction can investigate on whether the dominance in semantic strategy and phonetic strategy used in decoding characters can be utilized in teaching foreigners Chinese characters. Foreigners of different language background without Chinese experience can be recruited to learn Chinese characters and the learning method can be manipulated to be by pronunciation or by meaning of the characters. Their Chinese proficiency after a period of time can be measured to see whether learners with alphabetic language background that learned Chinese by pronunciation perform better than learners that learned by meaning of the characters.

The present study provides several directions towards future Chinese character teaching approach. The significant influence of positional strategy in spite of different language background suggests that teaching of Chinese characters can focus on teaching the positional information of the radicals. As learners regardless of language background are all sensitive to positional information, this can facilitate the learner's recognition of Chinese characters. For learners with logographic language background, such as Japanese or Vietnamese, as they more responsive to semantic cues, the teaching approach can focus on giving more semantic information of the character on top of the positional information. In this way they can utilize the semantic information to recognize Chinese characters. For

learners with alphabetic language background, such as Korean or English, pronunciation is a positive predictor for the use of phonetic strategy and positional strategy. The teaching approach for learners with alphabetic language background can focus more on pronunciation on top of positional information to facilitate their use of phonetic strategy and positional strategy in Chinese word recognition.

In conclusion, the current study extends the research on language transfer to the non-alphabetic language, Chinese. L1 orthography affects L2 word recognition in Chinese as foreign language learning. Japanese learners use more visual-orthographic information and semantic information in word recognition than Korean did in recognizing Chinese characters while Korean learners use more phonological information than Japanese did. Both Japanese and Korean learners are sensitive to the cues and use different strategies across condition but Japanese learners are more sensitive to semantic cues than Korean. These findings imply that foreign language learners are able to utilize the decoding strategy used in their native language to decode the orthography of a foreign language, regardless of the nature of orthography of L1 or L2.

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Appendix A

Single Character Read Aloud Task

1	有	21	你	41	前	61	便	81	听	101	太
2	中	22	小	42	数	62	华	82	住	102	易
3	上	23	会	43	家	63	子	83	根	103	口
4	不	24	点	44	国	64	道	84	问	104	找
5	种	25	水	45	想	65	进	85	节	105	型
6	时	26	作	46	生	66	另	86	极	106	合
7	我	27	分	47	外	67	学	87	心	107	期
8	人	28	日	48	力	68	体	88	块	108	论
9	用	29	过	49	物	69	头	89	明	109	动
10	要	30	九	50	全	70	低	90	据	110	流
11	都	31	则	51	加	71	手	91	方	111	场
12	所	32	给	52	省	72	位	92	常	112	钱
13	大	33	已	53	们	73	机	93	字	113	件
14	年	34	几	54	面	74	经	94	毛	114	谁
15	还	35	高	55	天	75	写	95	门	115	木
16	下	36	间	56	开	76	打	96	吃	116	片
17	地	37	起	57	电	77	快	97	张	117	马
18	出	38	百	58	叫	78	米	98	达	118	半
19	能	39	条	59	知	79	跟	99	热	119	文
20	很	40	法	60	本	80	名	100	指	120	立

121	跑	141	差	161	属	181	吸	201	教	221	香
122	话	142	初	162	岁	182	冷	202	茶	222	欲
123	送	143	云	163	现	183	怕	203	师	223	杨
124	车	144	活	164	意	184	视	204	目	224	房
125	请	145	汉	165	女	185	波	205	律	225	州
126	提	146	英	166	份	186	陈	206	思	226	答
127	金	147	信	167	院	187	跳	207	慢	227	星
128	土	148	室	168	城	188	功	208	致	228	药
129	斤	149	难	169	烧	189	酒	209	造	229	井
130	号	150	换	170	零	190	照	210	情	230	假
131	西	151	样	171	您	191	盘	211	母	231	程
132	记	152	史	172	关	192	费	212	针	232	妈
133	钟	153	德	173	轻	193	河	213	果	233	丁
134	工	154	决	174	买	194	乱	214	感	234	雪
135	员	155	唱	175	海	195	注	215	晚	235	贵
136	言	156	田	176	烟	196	宋	216	领	236	核
137	红	157	理	177	读	197	雨	217	专	237	语
138	球	158	复	178	亲	198	喂	218	谓	238	忙
139	音	159	题	179	火	199	助	219	爸	239	刻
140	需	160	报	180	修	200	宜	220	挂	240	笔

241	喝	261	剧	281	容	301	惊	321	玩	341	巧
242	士	262	饭	282	蛋	302	店	322	招	342	勿
243	愿	263	瓦	283	租	303	济	323	牙	343	贺
244	调	264	货	284	抱	304	谢	324	汗	344	卧
245	耳	265	术	285	习	305	拼	325	构	345	觉
246	床	266	念	286	登	306	征	326	介	346	烤
247	拍	267	玉	287	爷	307	欧	327	溜	347	寿
248	瓶	268	遍	288	适	308	俄	328	亡	348	拥
249	帮	269	弓	289	弯	309	午	329	恐	349	舞
250	羊	270	楼	290	狗	310	舍	330	孩	350	授
251	京	271	识	291	育	311	影	331	妹	351	锻
252	娘	272	堂	292	拔	312	际	332	验	352	堡
253	孙	273	链	293	兴	313	恒	333	祝	353	漂
254	议	274	聚	294	鸭	314	职	334	炼	354	昨
255	礼	275	认	295	姓	315	冒	335	厅	355	饼
256	课	276	游	296	规	316	杯	336	圣	356	旅
257	替	277	衣	297	诉	317	龄	337	贝	357	韵
258	男	278	淡	298	历	318	释	338	欢	358	售
259	练	279	歌	299	睡	319	景	339	脏	359	拒
260	态	280	脑	300	息	320	傅	340	扫	360	戈

361	估	369	央	377	矢	385	血	393	和		
362	肚	370	系	378	践	386	厨	394	宿		
363	奶	371	婆	379	邮	387	嗓	395	解		
364	绍	372	夕	380	犬	388	婉	396	陆		
365	宾	373	糕	381	苹	389	娜	397	鹳		
366	朗	374	哲	382	歉	390	蕉				
367	括	375	餐	383	泳	391	参				
368	禾	376	靶	384	雀	392	诞				

Appendix B

Two Characters Read Aloud Task

1	有力	25	水母	54	吃面	88	方块	138	球场
2	中间	26	作家	56	开饭	89	明天	145	汉语
3	上下	27	分店	57	电脑	93	字据	146	英文
4	不要	28	红日	59	知识	94	毛毯	147	信心
6	时差	33	已经	62	华语	95	门口	148	室外
7	我们	35	高楼	63	子女	96	太热	153	德国
8	人物	36	中间	64	道路	103	口型	155	唱歌
9	用餐	37	起床	68	体育	104	找钱	160	报纸
12	所有	39	条件	70	低头	106	合作	161	亲属
13	大小	40	法律	71	手指	109	动物	169	烧烤
14	年岁	41	前年	73	机场	116	糖片	172	关门
15	还有	42	数学	75	写字	119	文学	175	烟海
16	下海	43	家人	76	打球	121	跑马	179	火花
17	地租	44	国家	77	快慢	122	话剧	182	怕冷
18	出血	46	生日	78	米酒	123	送礼	186	陈酒
19	能力	47	外国	80	名师	126	提子	187	跳舞
21	你们	49	物理	81	听音	127	金钱	188	功课
22	小狗	50	全天	83	木根	128	土地	191	地盘
23	会议	51	加州	84	问题	130	记号	193	河流
24	点心	52	省份	85	节日	135	员工	201	教师

202	茶 楼	250	羊 群	282	蛋 白	354	昨 天
203	师 傅	251	京 都	286	登 报	356	旅 游
205	法 律	252	娘 亲	287	爷 奶	373	糕 点
206	思 念	253	孙 儿	288	适 合	375	餐 饮
211	母 亲	254	议 论	289	弯 弓	386	厨 房
214	感 情	255	礼 物	295	姓 名	395	和 解
215	晚 上	256	课 堂	296	规 则		
217	专 业	258	男 孩	298	历 史		
220	挂 念	259	练 习	299	睡 床		
221	香 港	261	剧 场	307	欧 洲		
223	杨 柳	262	饭 碗	309	午 饭		
224	房 屋	264	货 源	311	影 片		
225	州 份	268	遍 地	314	职 业		
226	答 案	270	楼 堂	322	招 数		
228	药 物	274	聚 会	324	汗 水		
234	雪 靴	275	认 识	330	孩 子		
238	忙 碌	276	游 泳	333	祝 寿		
246	床 单	277	衣 服	336	圣 经		
247	拍 照	279	歌 喉	346	烤 鸭		
249	帮 助	280	脑 袋	351	锻 练		

Appendix C

Picture-symbol mapping task

Item number	Stimuli	Semantic description of the stimuli
I	桥	古代的橋是用木造的
II	笔	古代的筆是用竹子造的
III	树	樹和木是紧密联系的
1	狗	狗是動物
2	花	花是植物
3	旗	旗是給人方向的
4	饭	飯是食物的一种
5	河	河是与水有关的
6	眼	眼是用來看東西的
7	盆	盆是一种器皿
8	钱	金是与錢有关的
9	窗	窗是用來遮掩东西的
10	棋	古代的棋是用木造的
11	帽	帽和毛巾一样是用來遮頭的
12	虎	虎是動物
13	路	路是用腳行的
14	鸭	鴨是由鳥演变的
15	雪	雪是由雨水形成的
16	灯	古代的灯是可以看到火的
17	船	船等於舟
18	床	古代的床是用木造的
19	碗	古代的碗是用石头造的
20	脸	臉好像月亮那麼圓
21	纸	古代的紙是用絲造的
22	虾	蝦好像一條蟲
23	墙	墻是由泥堆成的
24	嘴	嘴等於口
25	妈	媽是女人
26	家	家是有盖的地方
27	裤	褲是衣服的一种
28	箭	古代的箭是用竹造的
29	糖	古代的糖是用米做的
30	豹	豹是野生動物
31	琴	古代只有王室才能学琴
32	鞋	古代的鞋是用皮革造的
33	毯	毯是用毛造的
34	球	古代的球是王室家族玩的
35	穗	穗是稻禾的头部

36	歌	唱歌和打哈欠有些联系
37	缸	缸像一個盘
38	鯨	鯨很像魚

Appendix D

Language Background Questionnaire

First Language 母語:_____

Parents' first language(s) 父母的母語: Mother 母親_____, Father 父親_____

Place of birth (city/town, province, country) :_____

出生地 （城市／省分／國家）:_____

If you are born outside of Hong Kong, at what age did you arrive in Hong Kong? _____

如果不是在香港出生，請問你幾歲搬到香港？_____

Please list out all the countries you have lived in for more than six months, specifying corresponding duration of residence:

請列出你曾經居住超過六個月的地方，並列明居住時期：

Country（國家）_____ From age（從）_____（歲）to age（到） _____（歲）

Country（國家）_____From age（從）_____（歲）to age（到） _____（歲）

Please list out all the languages you know, how long you have used or studied them, at what age you began with each one, and how well you speak, read and write them.

請列出你能使用的語言，學習的時間，從幾歲開始學習，和你聽，說，讀，寫該語言的能力。

Language （語言）	Age at which you began to study that language （開始學習的歲數）	Number of years you have studied/used it （學習／使用了多少年）	Indicate your level of ability by circling （請圈出你的能力程度） Number 1= very little; Number 5=very well （１＝很低，５＝很高）			
			Speaking	Reading	Writing	Hearing
			1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
			1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
			1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
			1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

Are you right-handed or left-handed? *Right* *Left*

你是左撇子還是右撇子？ *右* *左*

Have you taken or are you taking any Mandarin courses? *Yes* *No*

你是否曾經上過普通話課？ *有* *沒有*

If yes, where and when did you attend the Mandarin courses? _____

如果有，你在哪裡及在何時上過普通話課？_____

How often did you go to the Mandarin courses? _____

當時你一星期上多少次普通話課？_____

Which type of Chinese characters did you learn? *Traditiona* *Simplified*

你學習的是哪一種中文字？ *繁體字* *簡體字*

How did your Chinese teacher teach you Chinese characters? _____

你的中文老師是怎樣教你中文字？_____

Which language (including your first language) do you use the most on a daily basis?

你日常生活中使用最多的語言是什麼（包括母語）？

_____

Please estimate to the nearest 10% how much do you speak in the language you just stated in the following places or situations.

請剔出你在以下地方使用上述語言的頻率（約至１０％）。

Percentage (%)	0	10	20	30	40	50	60	70	80	90	100
While at home 在家時											
Visiting family 探訪親人時											
At work 工作時											
At church 在教堂時											
Visiting friends 探訪朋友時											
While on vacation 放假時											
While shopping 購物時											
At parties and social gatherings 在派對及聚會時											

Please estimate to the nearest 10% how much do you speak Chinese in the following places or situations.

請剔出你在以下地方使用中文的頻率（約至１０％）。

Percentage (%)	0	10	20	30	40	50	60	70	80	90	100
While at home 在家時											
Visiting family 探訪親人時											
At work 工作時											
At church 在教堂時											
Visiting friends 探訪朋友時											
While on vacation 放假時											
While shopping 購物時											
At parties and social gatherings 在派對及聚會時											

Do you have hearing problems? *Yes* *No*

你有聽力問題嗎? *有* *沒有*

Do you have any history of language/reading problems? *Yes* *No*

你有語言/閱讀困難嗎? *有* *沒有*

If yes, please provide any details you can. _____

如果有，請提供詳細情況：_____

Appendix E

Post-test Questionnaire

1) Please describe specific strategies that you used to make judgments about whether the given symbol could represent the picture.

請形容你決定符號是否能代表圖畫時所用的策略。

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2) How did you decide if the symbol could represent the target pictures?

請問你如何決定該符號能代表該圖片？

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3) What sorts of criteria did you use to make your judgments?

請問你作出決定是有什麼條件？

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4) How did you learn Chinese characters? Please select the one that best describe you learning approach. (Please circle your answer)

請問你如何學習中文字？請從以下項目選出最適合的學習方法。（請圈起答案）

a) Through pinyin 透過拼音

b) Analyze character into phonetic radicals and semantic radicals 分析中文字的聲旁和形旁

c) Learn the character as a whole 記下整個中文字形狀

d) Others, please specify _____ 其他，請註明：_____

5) Do you think that there exists similarity between Chinese and your native language? If yes, what are they?

你認爲中文和你的母語有相似之處嗎？如果有，是什麼？
