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Chapter 18 Processing of the Japanese language by native Chinese speakers

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1. Introduction

A great number of native Chinese speakers have been learning Japanese as a foreign language. According to the Japan Foundation (Kokusai Kōryū Kikin) (2011), the numbers of Japanese learners in 2009 were: 2,362 at elementary schools, 59,526 at secondary schools, and 529,508 at higher education institutions in mainland China, and 2,440 at elementary schools, 77,139 at secondary schools, and 119,898 at higher education institutions in Taiwan. Out of 128,161 foreign nationals who studied Japanese in Japan in 2011, the largest population enrolled in Japan's 1,832 higher education institutions were Chinese speakers (63,249 from mainland China and 4,134 from Taiwan) according to the Agency for Cultural Affairs in Japan (Bunka-chō) (2011). Approximately half (52.58%) of the total learners studying Japanese in Japan were estimated to be native Chinese speakers. As the number of learners increases, various issues have been identified in their processing of Japanese. However, many studies regarding these issues have been published in journals in Japan, the majority of which are in Japanese. Given the nature of this handbook, I will introduce a variety of Japanese publications to English-speaking audiences, including the latest studies on lexical pitch accent, lexical access, and sentence processing by Chinese speaking learners of Japanese. While doing so, I will clarify the ultimate goals and issues of current second language processing research. The organization of this chapter is as follows: Section 2 discusses studies on lexical pitch accents and Section 3 provides a summary of studies on processing *kanji* compounds. Morpho-syntactic processing will be discussed in Section 4 and finally, the summary of this chapter and future challenges will be provided in Section 5.

2. Activation of lexical pitch accents

Tones in Mandarin Chinese (considered standard Chinese) spoken in Beijing are assigned to each syllable corresponding to a Chinese character. In contrast, Japanese pitch accents are fixed to each one of the moras in a word. Japanese pitch accent is linguistically said to be an attribute of lexical items (e.g., Sugito 1982, 1989; Taylor

2011a, 2011b). In this sense, Japanese pitch accents are assumed to be lexically stored with phonological representations at the word level, and are then possibly activated together with the pronunciation of a word (e.g., Cutler and Otake 1999; Sekiguchi 2006). Then, if this is true for native Japanese speakers, the question arises whether native Chinese speakers learning Japanese activate pitch accents when processing Japanese lexical items.

2.1 Perception of Japanese pitch accent by native Japanese speakers

The number of possible pitch accents in Japanese is the number of moras plus one (i.e., N + 1) (Sugito 1982). For instance, any word constructed of 3 moras has four different pitch accent patterns, and likewise, words of 4 moras have five. Regardless of the number of pitch accents possible, all words in the Tokyo-standard Japanese (i.e., *hyōjun-go* meaning 'the standard language') are classified into the following four patterns (Saito 2006; Vance 2008).

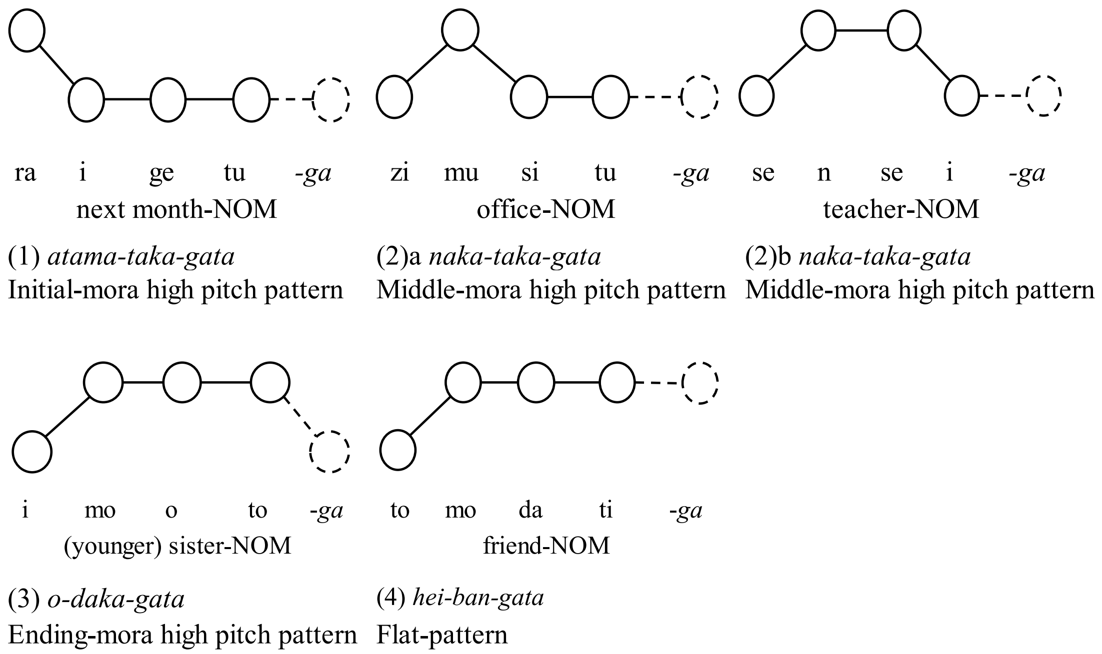

Figure 1. Four Japanese pitch patterns exemplified by 4-mora words with nominative case particle *-ga*

As shown in Figure 1, the first pattern is called *atama-taka-gata*, an example being the 4-mora-word HLLL+L (H here refers to high pitch and L refers to low pitch) /raigetu-*ga*/ NP('next month')-NOM with the nominative case particle *–ga*. In this pattern, the first mora has a high pitch which drops on the second mora, and then levels out on the rest of moras. In fact, *atama* means 'initial', *taka* 'high', and *gata* 'pattern', so that the compound word literally means 'the initial-mora high pitch pattern'. The second pattern is called *naka-taka-gata*, meaning 'the middle-mora high pitch pattern'. In this pattern, the pitch rises from low to high, drops on the following mora, and levels out on the rest of moras. A 4-mora-word example of this pattern includes two different patterns as in LHLL+L /zimusitu-*ga*/ NP('office')-NOM and LHHL+L /sensei-*ga*/ NP('teacher')-NOM, depicted in Figure 1, since there are two middle moras in 4-mora words. The third pattern is called *o-daka-gata*, meaning 'the ending-mora high pitch pattern'. In this pattern, pitch rises from low on the first mora to high on the second mora, then levels out on the rest of the moras. The fourth pattern, called *hei-ban-gata* meaning 'flat-pattern', has the same pitch pattern as the third in isolated words. The third and fourth patterns can only be distinguished by means of the pitch of the following particle (Vance 2008). By adding the nominative case particle *-ga* to a noun, the third pattern of *imooto-ga*, NP('sister')-NOM is pronounced as LHHH+L whereas the fourth or flat pattern of a CV+CV+CV+CV-patterned word (where C and V refer to a consonant and a vowel, respectively), *tomodati-ga*, NP('friend')-NOM is pronounced as LHHH+H. In this manner, the pitch of the following particle changes the accent pattern.

There are some non-accented dialects sprinkled throughout Japan, in prefectures such as Miyagi, Yamagata and Fukushima. Otake and Cutler (1999) reported that Japanese pitch accents were used to distinguish the appropriate lexical items by not only speakers of the Tokyo standard dialect but also by non-accented dialect speakers. According to this finding, native Japanese speakers can fundamentally perceive pitch accent regardless of whether they are from an accented or non-accented dialect region. Yet, Otake (2002) further conducted a comparative experiment, showing that accented dialect speakers were more sensitive to pitch accents than non-accented dialect speakers. Although both speakers of accented and non-accented dialects would likely be sensitive to the Tokyo standard accent, speakers of accented dialects perceive pitch patterns more accurately than those from non-accented dialects. Overall, as indicated by the findings from native speakers until now, Japanese pitch accents seem to be activated during word processing.

Nevertheless, regional differences in pitch accent are abundant (e.g., Hattori 1951; Hirayama 1957, 1968; Kindaichi 1974; Kubozono and Ota 1998; Sugito 1982, 2006, 2012). Accents in the Osaka region often show pitch reversal compared to the Tokyo-standard accents, such as 4-mora CV+CV+φV+CV-structured (φ refers to an empty consonant) *boosi-ga* 'a hat' NP('hat')-NOM, which is LHHH in Tokyo versus HLLL in Osaka. A study on perception of the Tokyo-standard accent by speakers of different dialect backgrounds was conducted by Ayusawa (1998). This study used the pitch accent test developed by Nishinuma (1994), which has 72 items consisting of 3 to 5-mora words such as *megane* 'glasses', *katakana* 'katakana script', and *otokonoko* 'boy'. With no statistical analyses conducted on these data, Ayusawa (1998) commented that a majority of native Japanese speakers are likely to correctly perceive the Tokyo-standard accent (Ayusawa 1998: 70-71). However, this inference is misleading. Even by merely glancing at the figures of the graphs shown in Ayusawa (1998: 72), it is quite obvious that participants in the Tokyo-standard areas show significantly higher accuracies than participants in other dialect areas on various types of words.

Furthermore, we can gather the following conclusions from Ayusawa (1998) by simply looking at the accuracy rates. Thirty participants from Ibaraki and Fukushima prefectures showed a lesser degree of accuracy on perception for the first (mora) accented items for 3-mora words, the first and the second (mora) accented words for 4-mora words, and the second and the third (mora) accented words for 5-mora accented words in comparison to 30 participants from Tokyo. Likewise, 30 participants from the Osaka and Kobe areas showed an even less accurate trend for perception of first mora accented items for 3-mora words, the first and second mora accented words for 4-mora words, and the first, second, and third mora accented words for 5-mora accented words. In contrast, it is interesting that participants from the Chugoku area showed higher accuracy across all conditions, similar to those from Tokyo. It is still an unanswered question as to whether Japanese native speakers obligatorily activate pitch accents along with lexical items due to dialectic variations.

2.2 Influence of Japanese language proficiency on pitch accent acquisition

Even though pitch accents show diverse differences across the regions of Japan, Tokyo-standard accents are taught intensively at a majority of Chinese universities. Widely-used Japanese textbooks for native Chinese speakers at universities in China (e.g., Hong 2010; Pan 2011; Zhang 2011; Zhao 2012; Zhou and Chen 2009, 2010, 2011a, 2011b) describe the position of a word's pitch accent when introducing Japanese vocabulary. For example, in the three-mora CV+CV+φV-structured adjective *warui* meaning 'bad', a high pitch accent is indicated as being placed on the second mora *ru*, denoting a LHL pattern. Since Japanese accents are thoroughly instructed when Chinese students learn Japanese words, Chinese learners of Japanese quite possibly memorize pitch accents as they learn new words, activating these accents when processing Japanese lexical items.

Lee, Murashima and Shirai (2006) conducted a longitudinal study on three Chinese learners of Japanese, Jane, Mary, and Ann. These three native Cantonese speakers were born and raised in Hong Kong, and were all 18 years old at the start of the research. They tested these learners' production of pitch accents at three times, December 1999, February 2001, and February 2002. They showed that these three Chinese learners of Japanese did not display any changes in production accuracies for Japanese pitch accent over three testing periods as in Table 1.

Table 1. Three Chinese Speaking Learners of Japanese

	December 1999	February 2001	February 2002
Jane	67.6%	54.3%	70.6%
Mary	70.6%	62.9%	74.3%
Ann	74.3%	77.1%	70.6%

It was also reported that the three Chinese learners of Japanese varied in their overall Japanese language proficiency at the conclusion of two years of study. Nevertheless, there were no differences in production accuracy of Japanese pitch accents among them. Thus, they concluded that these learners showed no improvement in the production of Japanese word accents during the two years. If this finding is taken as indicated, Chinese learners of Japanese would not activate standard pitch accents when processing Japanese words.

Lee, Murashima and Shirai (2006), however, used only three participants for investigating pitch accent production. Although it is not a production study, Pan (2003) conducted a study on perception of Japanese pitch accent with a larger group of native Chinese speakers. This study measured accuracy of accent perception on two-mora words.

The task was conducted with three groups of native Chinese speakers studying at a university in Taiwan: 36 Japanese learners majoring in Japanese language, 30 not majoring in Japanese, and 21 native Chinese speakers with no Japanese learning experience. Accuracies of two-mora words clearly differed among the three groups, as in Table 2.

Table 2. Accuracies of two-mora words by group

	Two mora words	Flat	Early high pitch	Late high pitch
Japanese majors	95.36%	98.61%	95.84%	91.32%
Non-Japanese majors	74.86%	76.25%	80.00%	68.33%
No Japanese learning	48.22%	42.86%	60.12%	41.67%

Pan also reported accuracies based on the three different accent patterns, namely, the flat (*heiban*), the early high pitch (*atama-taka-gata*), and the later high pitch (*o-daka-gata*) patterns for two mora words, as in Table 2 above. The students specializing in Japanese showed very high perception accuracies whereas the non-majors showed a significant difference in ascending order from the highest in the early high pitch pattern, the flat pattern, and the later high pitch pattern. Since Japanese majors were expected to have a higher Japanese proficiency than those who were non-majors, Pan demonstrated that Japanese language proficiency contributes to higher accuracy on pitch accent perception, unlike Lee et al.'s (2006) case study. Chinese speaking Japanese majors are likely to efficiently acquire the ability to accurately perceive the Tokyo standard pitch accents.

If Japanese pitch accent is an attribute of lexical items (e.g., Sugito 1982, 1989; Taylor 2011a, 2011b), and if accent is activated during word processing (e.g., Cutler and Otake 1999; Otake 2002; Otake and Cutler 1999), accent should be stored as lexical knowledge in the mental lexicon and utilized for word processing. As we discussed above, Chinese speaking learners of Japanese in Lee et al. (2006) did not show any improvement in pitch accent production over two years of Japanese study and those in Pan's (2003) study demonstrated a notable difference in perception accuracy between Japanese majors and non-Japanese majors. The differences in these studies may come from the difference between production and perception studies. To clarify the findings, it is necessary to conduct more production and perception studies on Japanese pitch accent with participants whose Japanese language proficiency levels, especially, lexical knowledge, are controlled. With the appropriate control, one can truly observe whether accuracy of pitch accent improves as Japanese proficiency increases.

2.3 Dialectal variation in Japan influencing pitch accent acquisition

As noted earlier, pitch accent patterns vary regionally across Japan (e.g., Hattori 1951; Hirayama 1957, 1968; Kindaichi 1974; Kubozono and Ota 1998; Sugito 1982, 2006, 2012). However, we do not know exactly how dialect difference affects accent production and perception by Chinese learners of Japanese. In an attempt to address this question, Yang (2011) conducted an interesting study on native Chinese speakers who had been studying Japanese in the Kansai region, in which accent differs greatly from the Tokyo-standard pattern. Yang (2011) compared 30 native Chinese speakers studying Japanese in Taiwan with 30 native Chinese speakers learning Japanese in the Kansai region. The study reported that Chinese learners of Japanese studying in Taiwan performed significantly better in both production and perception of the Tokyo-standard pitch accent than those studying in Kansai. This difference in accent performance may be created by a dialect accent specific to the Kansai region. However, before reaching the conclusion of dialect influence, two factors must be pointed out in Yang's study, which possibly resulted in lower accuracy. First, the Japanese proficiency of the native Chinese speakers studying in Taiwan and in the Kansai region should have been controlled because Pan (2003) showed an effect of Japanese language proficiency on perception ability. Second, native Chinese speakers studying in areas where the Tokyo-standard accent is spoken should have been contrasted with those in the Kansai area in order to directly examine a potential disadvantage of learners studying in non-standard dialect areas.

Japanese regional accents do display great diversity. Yang showed a lesser degree of accuracy among Chinese speakers studying in the Kansai region in comparison to those studying in Taiwan. If native Chinese speakers were taught Japanese in the Tokyo-standard accent at a university or in a Japanese language school in Taiwan, they may be able to gradually memorize a single type of pitch accent. In contrast, Chinese speakers studying in the Kansai region have to face conflicting input from the environment, of which accent patterns differ from the Tokyo-standard accent. In all likelihood, these learners study new words with the Tokyo-standard accent within their Japanese classrooms. However, once they set foot outside of the classroom, they are immersed in a different accent environment. Chinese-speaking learners have to constantly face conflicting accentual input in their daily lives. Thus, it is hypothesized that a certain dialect environment whose accent greatly differs from the Tokyo-standard type would interfere with the acquisition of the Tokyo-standard accent. How dialect accents interfere with the Tokyo-standard accent is an important pedagogical issue to investigate. An ideal way to investigate the dialect interference is to have two groups of Chinese-speaking learners of Japanese sampled from the Kansai and Kanto areas and matched by Japanese language proficiency, then tested for accuracy of production and perception in the Tokyo-standard pitch accent. Moreover, since pitch accent may not be a very reliable cue for lexical access during spoken word recognition, the usefulness of pitch accents could be measured by the magnitude of contribution to listening comprehension.

2.4 Dialect diversity of Chinese influencing Japanese pitch accent

Dialect diversity also exists in Chinese tone accents. Tone accents in the Beijing dialect, which is considered standard Chinese (i.e., Mandarin Chinese), are put on each syllable, whereas tones in the Shanghai dialect are realized at the word level (Hayata 1999; Xu and Tang 1988; You 2004). Iwata (2001) suggests that tones in the Shanghai dialect resemble Japanese pitch accents in that both accents are realized at the word level. If this is true, Chinese learners of Japanese from the Shanghai dialect should show an advantage in acquisition of Japanese pitch accents over those of the Beijing dialect.

The influence of different Chinese dialects on the acquisition of Japanese pitch accent was investigated by Liu (2010), who tested 18 Beijing dialect participants and 21 Shanghai dialect participants. Liu conducted a production study of verb-plus-verb-structured (V+V) compound verbs (e.g., *tumi+ageru* ‘pile’ and *tori+kaesu* ‘take back’). Japanese has an abundance of compound verbs produced by combining two native Japanese (*yamato kotoba*) verbs. When two verbs are combined, a compound verb changes the position of its pitch accent. For example, the verb *tori* ‘take’ has a HL accent (*atama-taka-gata*). Another verb *kaesu* ‘return’ has an HLL pattern, which is also categorized as *atama-taka-gata*. When these two verbs are combined, the result is the compound verb *torikaesu* ‘take back’. In the compounding process, the accent of the first verb *toru* is altered to the flat accent of HH, becoming a LHHLL accent, or the flat accent LHHHH (Liu 2010: 17). Due to the complexity of this accent variation, Japanese compound verbs are expected to be difficult to acquire for native Chinese speakers. Liu (2010), therefore, hypothesized that native Chinese speakers of the Shanghai dialect would perform better in perceiving and producing the correct pitch accents of compound verbs than those of the Beijing dialect.

The results (see Liu 2010: 18, Table 3) were rather intricate. The speakers of the Shanghai dialect produced the pitch accents of compound verbs more accurately than those of the Beijing dialect when the compound verbs were accented on the penultimate mora (or denoted as -2 accent) or the flat accent (or 0 accent). However, with compound verbs accented on the third mora (or -3 accent) or the flat accent (or 0 accent), the result was reversed in such a way that speakers of the Beijing dialect performed better than those of the Shanghai dialect. Therefore, it cannot be simply assumed that Chinese learners of Japanese whose accents are realized at the word level (i.e., the Shanghai dialect) perform better at producing pitch accents than those with tone accents at the syllable level (i.e., the Beijing dialect).

Before making any further comments, three basic methodological problems in Liu's study (2010) should be pointed out. First, the Japanese ability of native Chinese speakers of the Beijing and the Shanghai dialects was controlled as having learned Japanese for two years. As commonly observed, two years of learning does not guarantee equal levels of attainment of Japanese language ability. A preferred alternative would be to conduct a Japanese vocabulary test to balance the two groups based on lexical knowledge. Second, Liu (2010) asked five native Japanese speakers of the Tokyo dialect to evaluate the accuracy of pitch accents produced by Chinese learners of Japanese. However, there is no report of consistency and reliability of these evaluators' judgments. It is hard to imagine that all five evaluators scored the participants in the same way. Third, pitch accent accuracy was scored from 1 (disagree), 2 (slightly disagree), 3 (slightly agree) and 4 (agree). Liu (2010) assigned 'correct' for 2-4 scores and assigned 'wrong' for a 1 score. This correct/incorrect judgment would have skewed ratings toward the higher possibility for a 'correct' judgment. If Liu (2010) had used a correct-or-wrong dichotomous scale for analysis, the five evaluators could have made judgments on the basis of either 'correct' or 'incorrect'.

China is diverse in its regional dialects and accents. When Chinese speakers from different dialects meet, it is frequently observed that they cannot understand one another's speech. The diversity in Chinese dialects may possibly influence acquisition of Japanese pitch accent (if we assume some kind of L1 transfer). As Liu (2010) reported, Chinese speakers of the Beijing dialect differed in production accuracy of Japanese pitch accent from those of the Shanghai dialect. Although I value regard Liu's study highly for its having dealt with the unique perspective of Chinese dialects, it had some methodological issues that concern us as pointed out earlier. Therefore, a similar comparative study should be conducted in the future. It should be noted, however, that tone accent in the Chinese language fundamentally differs from Japanese pitch accent, so that results suggesting that Chinese dialectal differences cross-linguistically influence Japanese pitch accent should be carefully interpreted.

2.5 Cross-linguistic studies on Japanese pitch accent

An investigation of cross-linguistic differences in the acquisition of Japanese pitch accent conducted by Ayusawa (1998) indicated a strong effect of first language on perception of Japanese pitch accent. An interesting trend in Japanese pitch accent production was reported among native Korean speakers learning Japanese (Fukuoka 2008). When Japanese words contain a voiced plosive sound in word initial position, Korean speakers are likely to put a low pitch on the initial mora. In contrary, when Japanese words contain a voiceless plosive sound in word initial position, Korean speakers are likely to put a high pitch on the initial mora. This trend in laryngeal contrast is observed in the Korean language (Kim and Duanmu 2004). Thus, this tendency could be the result of influence adapted from the learners' mother tongue of Korean (L1 transfer).

Nevertheless, Taylor (2012) points out that it is very difficult to determine whether the accent trend is caused by a learner's mother tongue. She shows examples of some trends across multiple languages based on the examination of previous studies on pitch accent (e.g., Andreev 2002; Lee, Murashima and Shirai 2006; Nakato 2001; Toda 1999; Sukegawa 1999): i) A tendency to overuse pitch accent on the penultimate mora of a word, which is observed not only among English speaking learners of Japanese but also Korean, Chinese, and Bulgarian speaking learners, and ii) a tendency to place pitch accent on heavy syllables, which is reported among Korean, Portuguese, and Bulgarian speaking learners. In a cross-language comparison study, needless to say, an important condition would be to control the levels of Japanese language proficiency, as some speakers such as Chinese and Korean speaking learners are likely to reach a high level of Japanese language proficiency within a few years, and these languages have unique linguistic differences which could aid in the investigation of native language effects on not only Japanese pitch accent but also other features in units of lexical processing such as syllable-timed vs. mora-timed languages.

2.6 Contribution of pitch accent in distinguishing homophones

One of the important basic functions of pitch accent is to differentiate homophonic words and identify the proper homophone in a sequence of utterances. A homophone is a word that shares the same pronunciation with another word while differing in meaning. For example, *ame* meaning 'candy' is produced with a LH pitch, while the segmentally identical word *ame* produced with a HL pitch becomes 'rain'. To accomplish homophonic distinction, Chinese learners of Japanese must memorize the concept of the word with the proper pitch accent. In other words, they must activate the pronunciation of the word *ame* with both its pitch accents of LH for 'candy' and HL for 'rain' to identify the intended meaning.

Mathematical linguists have calculated the possibility of distinction among Japanese homophones, and have suggested that Japanese pitch accent is not necessarily crucial for accessing lexical meaning when distinguishing homophonic words. According to Shibata and Shibata (1990), 13.57% of the homophones in Japanese are distinguished by pitch accent, while in Chinese tone accent distinguishes 71.00% of homophones. Given this difference, they claimed that tone in Chinese is used for distinguishing homophones while pitch in Japanese is not. Shibata and Shibata (1990) propose only a minor role for Japanese pitch accent in homophone distinction.

Furthermore, Kitahara (2006) investigated the distribution of homophonic pairs distinguished by pitch accent (i.e., accentual oppositions) in Japanese, using the lexical database of Amano and Kondo (1999, 2000).[1] Using Amano and Kondo's (2000) frequency index, Kitahara (2006) also pointed out that homophonic minimal pairs include those which greatly differ in frequency such as /hito/ for 'human', counted 121,162 times and /hito/ as 'use of an expense', counted only twice. Therefore, once these frequency-divergent homophone pairs, which native Japanese speakers are unlikely to know, or at least will not contrast by pitch accent, were excluded, the pitch distinguishability rate of accentual oppositions will drop to less than 10 percent.

To check whether native Chinese speakers really distinguish homophones by pitch accent in Japanese, it is possible to run the following test. A sentence with the correctly-accented target word based on the Tokyo-standard accent should be presented as in (5a), where the underlined word is the target word.

(5) a. *Kodomo ni mainiti <u>ame</u> o katte ageteiru.*
child DAT everyday candy ACC buy give
'Everyday [I] buy <u>candy</u> for children.'

b. *Kodomo ni mainiti <u>ame</u> o katte ageteiru.*
child DAT everyday rain ACC buy give
'#Everyday [I] buy <u>rain</u> for children.'

In the same sentence, the LH-accented target word *ame* 'candy' is replaced, as in (5b) by changing *ame* to HL. Of course, we do not give 'rain' to children, so the word 'rain' is incorrectly matched with the semantic context of the sentence. A set of homophone pairs can be used to investigate whether native Chinese speakers really activate pitch accent when accessing the concept of a lexical item.

3. Processing of Japanese kanji and their compound words

The writing system of the modern Japanese language consists of the *kanji* and *kana* scripts (for detail, see Hadamitzky and Spahn 1981; Kess and Miyamoto 1999; Miller 1967; Tamaoka 1991). Kanji are logographic morphological units, adapted from the script of the Chinese language. In contemporary Japanese, kanji represent not only lexical items originating from Chinese (*kango*) but also Japanese (*wago*), which were created by Japanese speakers. Kanji-compound words are extremely common in Japanese. Token frequencies of kanji-compound words encompass 41.3% of all Japanese vocabulary, as reported by Kokuritsu Kokugo Kenkyujo (1964). More dramatically, kanji compounds make up approximately 70% of the entries in a typical Japanese dictionary (Yokosawa and Umeda 1988). A kana symbol is a phonogram which fundamentally represents a single mora on a one-to-one basis. The kana script further consists of two orthographies, *hiragana* and *katakana*. The hiragana script is cursive in shape (あ for /a/) and used for grammatical morphemes as well as for some content words. The katakana script is angular in shape (ア for /a/), and usually used for writing loanwords from alphabetic languages, as well as the names of animals and plants. The hiragana and katakana scripts describe Japanese sounds on the basis of mora-to-kana correspondence. The three scripts—kanji, hiragana, and katakana—are simultaneously used in modern written Japanese texts.

A great number of Japanese *kanji* have visually similar shapes as the Chinese characters from which they were originally derived. Among a selection of 4,600 Japanese kanji-compound words, Chen (2002) counted 54.5% in mainland China and 55.1% in Taiwan that are written with the same characters and imply the same meaning as their Chinese counterparts. Additionally, 14.9% of these words in mainland China and 13.3% in Taiwan have the same characters and similar meanings, and only 4.1% in mainland China and 3.5% in Taiwan share the same characters but different meanings. In total, 73.5% of the kanji compounds used in mainland China and 71.9% in Taiwan share the same characters in both Chinese and Japanese. Moreover, Hishinuma (1983, 1984) further comments that, if the slight differences in orthographic shapes between Chinese and Japanese are ignored, it can be assumed that native Chinese speakers know 98.1% of the commonly-used Japanese kanji prior to learning the Japanese language. This great similarity of kanji morphemic units explains the commonly-observed tendency of native Chinese speakers to depend heavily on kanji meanings to understand written Japanese texts.

3.1 Advantage of kanji orthographic similarity in lexical processing

In studies on English as a second language (ESL), knowledge of 98% of the words in a written text is required to achieve accurate understanding of the text (Hu and Nation 2000; Nation 2001; Stahl and Nagy 2006). In Japanese, Komori, Mikuni and Kondo (2004) indicated that knowledge of 96% of the words in a written text is necessary for comprehension. This figure implies that the threshold for an appropriate level of reading comprehension would entail that less than 4% of the vocabulary in a given text be unknown. Since many Japanese words are shared with Chinese as indicated by the numbers presented above, native Chinese speakers are expected to have a great advantage in reading comprehension. Then, how much of an advantage do native Chinese speakers have in the processing of kanji-compound words? First, let's compare them with native English speakers who have no kanji knowledge. Tamaoka (1997) measures the difference in processing efficiency (i.e., speed and accuracy) of lexical decisions for Japanese kanji-compound words by 10 native Chinese and 17 native

English speakers studying Japanese from two to three years at the same university in Canada under the same curriculum.[2] A great difference between the two groups was found as in Table 3.

Table 3. Mean response times and accuracy rates by group

	Reading times (milliseconds)	Accuracy
Chinese speaking learners	982 ms	71.3%
English speaking learners	1,808 ms	63.7%

Native Chinese speakers performed 826 milliseconds faster and 7.6% more accurately than native English speakers. Interestingly, the Chinese group processed two-kanji compound words with both few and many strokes equally well, whereas the English group were slower in processing compounds with many strokes than those with fewer strokes.

A script advantage for learners of Japanese with different script backgrounds was also investigated by Tamaoka (2000). He examined the effects of L1 scripts when native Chinese and English speakers phonologically processed the same Japanese words presented in three different scripts of kanji, hiragana and *romaji* (alphabetic transcription of Japanese). Fifteen native Chinese speakers and 13 native English speakers learning Japanese participated in the study; all studied Japanese for two to three years under the same curriculum at a university in Australia. The Chinese students all came from China as international students. A summary of the results are in Table 4.

Table 4. Mean naming times and accuracy rates by group

	Naming times (milliseconds)			Accuracy		
	Kanji	Hiragana	Romaji	Kanji	Hiragana	Romaji
Chinese group	1,027 ms	1,098 ms	1,295 ms	89.52%	99.05%	89.52%
English group	1,635 ms	1,009 ms	783 ms	53.85%	94.51%	95.60%

Average naming latencies (the time from visual presentation of a word to initialization of its pronunciation) of 21 Japanese words presented in kanji (e.g., 会話, /kaiwa/ ‘conversation’) were faster with a higher accuracy for the Chinese group than the

English group. A clear advantage for Chinese speakers was demonstrated by the difference in overall performance of 608 ms and 33.77%. In striking contrast to the case of kanji, the same words presented in hiragana (e.g., かいわ) yielded nearly identical processing performance in both language groups. Furthermore, the same words in romaji (e.g., *kaiwa*) displayed an opposite trend. The L1 script (i.e., the familiarity of the script) exhibited strong effects on phonological processing of L2 Japanese words, facilitating the processing of kanji compounds for the Chinese group and romaji for the English group. As Djojomihardjo, Koda and Moates (1994) indicated in L2 English learners, script consistency between L1 and L2 strongly facilitates the speed of L2 lexical and text processing.

Yamato and Tamaoka (2009) conducted a lexical decision task with 21 Chinese speaking learners of Japanese with higher lexical knowledge and 18 with lower lexical knowledge based on a vocabulary test (for details of the test, see Miyaoka, Tamaoka and Sakai 2011). Both proficiency groups had been learning Japanese in Japan. This study was analyzed as a 2 (participants' lexical knowledge; higher and lower lexical groups) × 2 (kanji-compound words; high- and low-frequency) design. A summary of the results are stated in table 5.

Table 5. Mean response times and accuracy rates of kanji-compound words by group

	High- frequency		Low-frequency	
	Response times	Accuracy	Response times	Accuracy
Higher lexical knowledge	754 ms	98.1%	937 ms	90.7%
Lower lexical knowledge	760 ms	97.2%	976 ms	78.3%

Both groups of higher and lower Japanese lexical knowledge processed high-frequency kanji-compound words and low-frequency ones at almost the same speed. Of interest were the results of the processing accuracy measure. Although both groups with higher and lower Japanese lexical knowledge processed high-frequency kanji-compound words at high accuracy, the group with lower Japanese lexical knowledge showed lower accuracy than the group with higher lexical knowledge. They found that the response times between the higher and lower lexical groups showed no difference whereas the higher lexical group performed more accurately on low frequency words than the lower lexical group. Regardless of Japanese word frequency and lexical knowledge, all native

Chinese speakers seemed to be able to process Japanese kanji compounds quickly using their first language knowledge of Chinese characters. However, kanji compounds used in Japanese lexical items occasionally differ from their semantic usages in Chinese, which would predictably result in lower accuracy. These Japanese words tend to be low frequency words among native Chinese speakers who have not acquired the large Japanese vocabulary.

Their finding can be explained in the framework of lexical processing as follows. Native Chinese speakers quickly reach orthographic activation of a two-kanji compound word based on their (L1) character knowledge, which further activates its concept. Then, they have to determine whether this compound word really exists in the Japanese lexicon. At this stage, their Japanese knowledge of concepts begins to influence their lexical decision. If they do not have sufficient lexical knowledge of Japanese two-kanji compounds, they have no way to correctly determine the existence of the target word. Therefore, while fast speed for lexical processing was accomplished by quick activations of orthographically interconnected representations of the two languages, the difference in accuracy was created by conceptual lexical knowledge of the Chinese speakers. This can be supported by the case of native English speakers who displayed slower response times and lower accuracy for lexical decisions on two-kanji compound words (Tamaoka 1997), because the English speakers have no kanji orthographic knowledge in their first language. The English speaking learners' slow processing of Japanese words must be caused by a slower bottom-up processing which involves orthographic analysis of kanji elements, activation of each kanji, combining two kanji, and finally activating its lexical concept.

3.2 Advantages and disadvantages of kanji orthographic similarity in text understanding

The importance of lexical knowledge for *text understanding* is well-documented not only in English as a second language (ESL) but also in Japanese as a second/third language (JSL). Text understanding refers to the skills necessary to comprehend a text which is presented visually for reading and aurally for listening. An advantage of native Chinese speakers' knowledge of Japanese kanji in text understanding was found in tests conducted by Matsunaga (1999) at a university in southern California. She tested 12 Chinese students (one had insufficient English ability, and was excluded from the analysis) and 28 students with non-kanji backgrounds including three Spanish speakers, two Korean speakers, and one Thai speaker. A summary of the results are stated in Table 6, where the maximum comprehension scores were 100 points.

Table 6. Mean comprehension scores and reading times by group and passage type

	Narrative passages		Descriptive passages	
	Comprehension	reading times	Comprehension	reading times
Chinese speakers (*n*=11)	89.00	234.00 sec	85.47	129.27 sec
Non-kanji background (*n*=28)	79.09	333.53 sec	61.05	258.32 sec

Students with a kanji background showed significantly higher comprehension scores and faster oral reading speed for narrative passages than students with a non-kanji background. Likewise, students with a kanji background showed significantly higher comprehension scores and faster oral reading speed for descriptive passages than those with a non-kanji background. As such, a clear tendency towards an advantage for Chinese students (i.e., kanji background) was observed among the learners at a university in an English speaking country. Matsunaga (1999), however, used English translations to check participants' understanding of the Japanese text, so that English ability must have influenced their performance.

Advantages in kanji processing by native Chinese speakers were also shown in the on-line processing of Japanese text comprehension by Yamato and Tamaoka (2013). In their study, 20 matched pairs of native Chinese and Korean speakers were selected so that they were equal in both lexical and grammar skills. This sampling method is called *pair-matched sampling*. In this method, each pair of native Korean and Chinese speakers learning Japanese at a university in their own country from two to three years was made by matching scores on two tests, a Japanese vocabulary test (maximum 48 points) and a grammar test (maximum 36 points). Participants were selected so that the average scores matched exactly between the two groups (see Table 7): The vocabulary test was exactly matched at the same average between 20 native Chinese speakers and 20 native Korean speakers. The grammar test scores also displayed nearly the same average between native Chinese speakers and native Korean speakers. This approach guarantees a direct comparison of the two different linguistic groups.

Using the fixed-window *self-paced reading* technique, the selected native Chinese and Korean groups were asked to read two texts, one with many kanji words, and one with many katakana words. In the fixed window self-paced reading, each phrase is presented to a participant one at a time in the center of a computer monitor. When a participant presses the space bar, the next phrase is displayed in the same position on the screen, and this process continues until the whole story of the text has been displayed. The time between each press of the space bar is considered to be the time required for reading each phrase. Some weaknesses of this method should be noted, however, in that participants performing self-paced reading cannot re-read a text once they press the space bar. In addition, participants may be able to read a phrase faster than the time it takes to press the space bar.

Table 7. Mean test scores and reading times for kanji and katakana words by group

	Vocabulary (SD)	Grammar (SD)	Kanji	Katakana
Chinese speakers (*n*=20)	37.90 (4.90)	32.40 (2.93)	1,227 ms	2,104 ms
Korean speakers (*n*=20)	37.90 (5.60)	32.90 (2.81)	1,741 ms	1,716 ms

Due to the great similarity of Japanese kanji and Chinese characters, native Chinese speakers processed visually-presented kanji compound words in a text much faster than native Korean speakers. For example, *gyoosei too kara* 'from such areas as administration', which consisted of three kanji ('such areas as administration') and two hiragana ('from') and was embedded in the text, was processed with a difference of 514 ms between the two groups (see Table 7 above). In contrast, native Korean speakers processed katakana-presented alphabetic loanwords faster than native Chinese speakers. The phrase *konbiniensu sutoaa de* 'at the convenience store' written with 10 katakana ('the convenience store') and one hiragana ('at') was processed 388 milliseconds faster by Korean learners than by Chinese learners. The similarity of phonetic symbols (the symbol-to-sound conversion) between Japanese kana and Korean Hangeul scripts may have helped native Korean speakers process alphabetic loanwords quicker than native Chinese speakers. In other words, Koreans can quickly convert kana-to-sound since they frequently experience this similar conversion process in their Hangeul script. The script similarity between L1 Japanese and L2 Chinese/Korean created a diverging pattern of differences in lexical processing speed of Japanese—Chinese were superior at processing kanji compound words, while Koreans were better at alphabetic loanwords, even embedded in a text.

Sharing a majority of Japanese kanji with Chinese characters is not always beneficial (Tamaoka 1997, 2000). Due to the great resemblance of kanji, native Chinese speakers heavily rely on orthography to process two-kanji compound words in accessing their meanings. They are, in turn, likely to pay little attention to the phonological aspect of kanji compound words to understand a spoken text, as observed by the misunderstanding and dropping of information in listening comprehension (e.g., Hong 2004; Ishida 1986; Komori 2005; Yin 2002). Due to strong ties between orthography and concepts (or semantics) in kanji and their compounds, it may be the case that native Chinese speakers learning Japanese only establish weak connections from orthography to phonology.

A cross-linguistic comparison of reading and listening comprehension by native Chinese and Korean speakers learning Japanese was conducted by Komori (2005). Chinese showed a large discrepancy of 12.75% between 66.09% in reading comprehension and 53.30% in listening comprehension whereas Korean showed only a small difference of 3.61% between 75.09% in reading comprehension and 78.70% in listening comprehension.

This study, however, contains two essential methodological problems. First, reading and listening comprehension tests were not conducted on the same Chinese and Korean groups. The reading comprehension test was conducted with 22 native Chinese speakers and 39 native Korean speakers learning Japanese at a private university in Tokyo. However, the listening comprehension test was conducted with 9 native Chinese speaking and 15 native Korean speaking participants recruited from students at the same university. These two groups were fundamentally different, so that Komori has to make an unproved assumption that two paired-groups of Koreans and Chinese are equivalent in Japanese proficiency. Second, texts used for reading comprehension differed from those for listening comprehension. The level of lexical difficulty in the texts used by the researcher was controlled according to lexical levels on the former Japanese Proficiency Test (Japan Foundation and Japan Educational Exchange and Services 2002). However, it is not ideal to use different texts to compare results of reading and listening comprehension. It would be desirable to see a similar study conducted on the same group, especially native Chinese speakers, by counterbalancing texts for reading and listening comprehension. Putting these issues aside, the study roughly depicted a cross-linguistic difference in reading and listening comprehension between native Chinese and Korean speakers learning Japanese. See also Sawasaki (2006).

3.3 Effects of kanji orthographic similarity between Japanese and Chinese

Chinese characters used in mainland China have undergone simplification. Soon after the foundation of the People's Republic of China on October 1, 1949, the movement to implement simplified Chinese characters got underway. A draft of the simplified Chinese character list was announced in 1955, and the first newspaper using simplified Chinese characters was published the following year, in 1956. In 1964, the Chinese government combined the simplified characters into the Total List of Character Simplification or *Jian Hua Zi Zhong Biao*. This list was reformed a few times, and the Chinese government has been collecting public comments for a modified list of simplified characters since 2009 (see details, Endo, 1986). The series of simplifications resulted in some orthographic differences between Chinese characters and Japanese kanji.

Kayamoto (1995a) measured orthographic similarity or difference between Chinese characters and Japanese kanji on a scale of 0 to 4. Characters given a 0 are identical in Chinese and Japanese, such as 常 and 道. One is given to a difference of only a dot or a line of a character (歩 and 海 for Japanese, and 步 and 海 for Chinese). Two refers to a difference of a part in a character (話 and 許 for Japanese, and 话 and 许 for Chinese). Next, three indicates a large difference of a part or both sides of a character (練 and 動 for Japanese, and 练 and 动 for Chinese). Finally, four represents a complete difference of the entire character (専 and 異 for Japanese, and 专 and 异 for Chinese). A correlation between this 0-to-4 scale and subjective character-difference judgments by native Chinese speakers was reported to be very high, at 0.90 (p<.001), by Kayamoto (1995a). Thus, Kayamoto's scaling seems to be reliable to use as an index for orthographic similarity between Chinese and Japanese.

Using the 0-to-4 scale, Kayamoto (1996) investigated effects of the orthographic similarity in processing of Japanese two-kanji compound words. Naming latency, which was defined as the latency from the onset of visual-presentation of a stimulus item to the offset of the first amplitude in its pronunciation, indicated that Japanese kanji compounds similar in both languages (M=597 ms) were named faster in Chinese sounds than dissimilar ones (M=669 ms) by native Chinese speakers leaning Japanese at the advanced level. After the naming task, these participants reported that they pronounced these Japanese kanji as if newly-simplified Chinese characters. Unlike Chinese pronunciations, when they were asked to name the same kanji compounds in Japanese, no difference was observed between those similar in both languages (M=1,101 ms) and those that are dissimilar (M=1,080 ms). As seen in the difference between processing as Chinese and Japanese sounds, Japanese kanji orthographic units are strongly mapped onto Chinese sounds, even though they are not exactly identical to Chinese characters. On the contrary, these kanji are less tightly mapped onto Japanese sounds regardless of orthographic similarity.

A null effect of orthographic similarity on naming was confirmed by Kayamoto (2002). Orthographic similarity per se had no facilitation in the phonological processing of two-kanji compounds as in Table 8. On the other hand, semantic similarity was the main factor for naming of kanji compounds, with semantically-same kanji showing a naming latency that was 42 milliseconds faster than semantically-dissimilar kanji. Once a semantic element is added to orthographic similarity, the difference in naming latency of two-kanji compounds was amplified to 93 ms between orthographically- and semantically-same kanji and orthographically- and semantically-dissimilar kanji. Thus, with the addition of semantic similarity, orthographic similarity becomes a significant factor, even for phonological processing of kanji.

Table 8. Mean naming latency for orthographically and semantically similar and different compounds

	Orthographic	Semantic	Orthographic & Semantic
Similar	850 ms	841 ms	826 ms
Dissimilar	873 ms	882 ms	919 ms

Two types of behavioral tasks, naming and lexical decision, provide us with a clearer picture of the kanji processing mechanism. Lexical decision tasks require participants to judge whether a two-kanji compound exists as a real Japanese word. The time from the onset of visual-presentation to the judgment, indicated by pressing a YES/NO key, is measured as the reaction time. Resembling the results of the naming task, Kayamoto (2002) showed no difference between orthographically-similar kanji and orthographically-dissimilar kanji in a lexical decision task involving two-kanji compounds, as in Table 9. Again, semantic similarity was the major factor. Semantically-same kanji were processed faster than semantically-dissimilar kanji. Putting all the results of Kayamoto's studies (1995a, 1996, 2002) together, the orthographic similarity between Chinese characters and Japanese kanji has little effect on both phonological and orthographic processing of two-kanji compounds.

Table 9. Mean response times for orthographically and semantically similar and different compounds

	Orthographic	Semantic
Similar	645 ms	642 ms
Dissimilar	681 ms	685 ms

The null effects of kanji orthographic similarity reported by Kayamoto (1995a, 1996, 2002), however, may create some confusion. Her 0-to-4 scale depicting orthographic similarity is based on the measurement of a kanji unit, but the experiments were conducted on the processing of lexical kanji-compound units. Taking an example from Kayamoto (2002), an orthographically different item 階段 'stairs' (阶段 in Chinese) contains only a single orthographic difference in the kanji 階 (阶 in Chinese) which is compared against items that are orthographically identical in Japanese and Chinese such as 印刷 'print'. It is quite possible that null orthographic effects could arise from this manipulation method, in that an orthographic difference was controlled by contrasting only a single kanji in a two kanji compound. On the contrary, semantic difference/similarity was defined at the lexical level, which takes into account both characters of the compound. It is easily assumed that, since the lexical decision and naming tasks in Kayamoto (2002) involve in a combination of two kanji at the lexical level, similarity in lexical concepts naturally exerts a strong influence on lexical processing, and that lexical-level processing overrides the effects of orthographic similarity/difference at the kanji morphemic level.

Inhibitory effects of visual complexity by native speakers were found not only in Chinese characters (Leong, 1986) but also in Japanese kanji with low frequency (Tamaoka and Kiyama, 2013). As shown in Figure 2, the 1,945 kanji in the former List of Commonly-Used kanji (Jōyō kanji-hyō) have an average of 10.84 strokes with a 3.76 standard deviation (Tamaoka, Kirsner, Yanase, Miyaoka and Kawakami 2002). Using both kanji correctness decision and kanji naming tasks, Tamaoka and Kiyama (2013) found that visual complexity inhibited the processing of low-frequency kanji among native Japanese speakers, whereas such consistency was not observed in the processing of high-frequency kanji. Kanji with medium complexity were processed faster than high-frequency simple and complex kanji. This result echoes the rather common conclusion that visually complex figures fundamentally require longer decoding times than simple ones for kanji with low frequency while high-frequency kanji display a different pattern. These studies on visual complexity were conducted under a monolingual condition with native Chinese or Japanese speakers (Leong 1986; Tamaoka and Kiyama 2013), so that effects of visual complexity and frequency on processing Japanese kanji by native Chinese speakers learning Japanese should be further re-examined in comparison with Chinese simplified characters used in mainland China and traditional complex characters used in Taiwan.

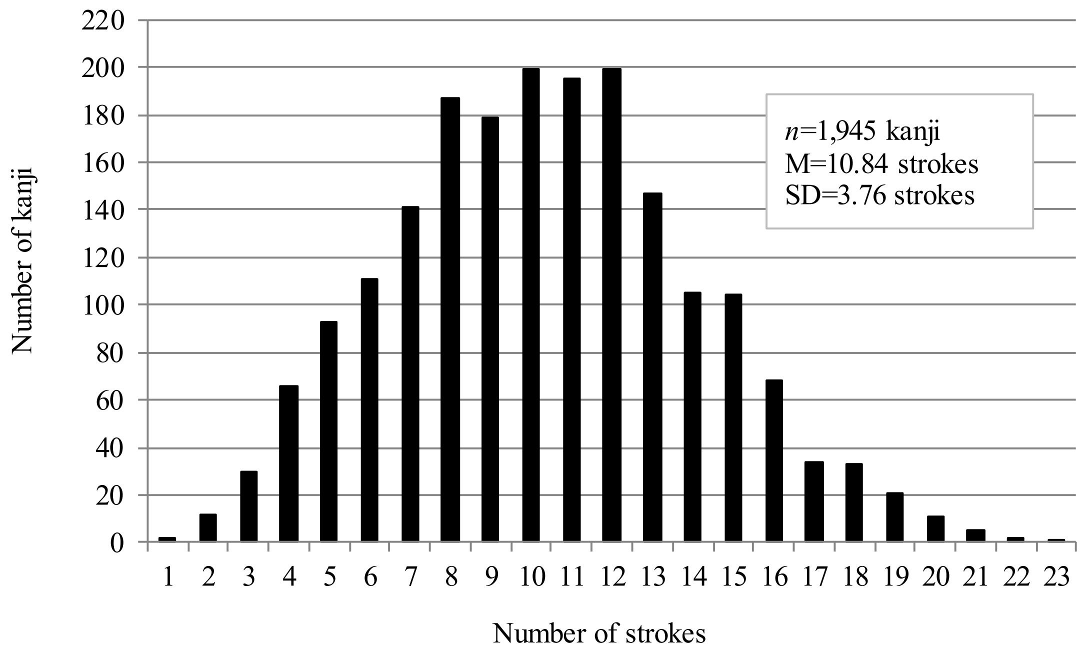

Figure 2. Stroke distribution of the 1,945 kanji in the former list of commonly-used kanji (Data taken from Tamaoka, Kirsner, Yanase, Miyaoka and Kawakami 2002)

Finally, regarding the orthographically- and semantically-same words (frequently-referred as S-type words), native Chinese or Japanese speakers do not know in which language context these words are used; they have no indication whether these words are Chinese or Japanese. Following this line of reasoning, Cai and Matsumi (2009) suggested that these words are shared in the mental lexicon of both languages. This claim by Cai and Matsumi (2009) can be investigated by the following two approaches. First, these words differ in word frequencies depending on the language, therefore word frequency effects will manifest differently in the speed of lexical processing between the two languages. In such a case, these words are separately stored in a different orthographic lexicon in each language. Second, word production size, or the number of compound words which can be produced by a single Japanese kanji or Chinese character, will differ between the two languages. Therefore, these words will behave differently depending upon the language in use. Unless these possibilities are empirically confirmed, the notion of shared word representations in a single orthographic lexicon cannot be held as a certainty.

3.4 Effects of kanji phonological similarity between Japanese and Chinese

Words originating from the Chinese language or created in Japan using Chinese characters often exhibit great similarity in phonology. For instance, the word 'attention' is written with two identical characters as 注 and 意 in both Japanese and Chinese. Pronunciations in both languages are very similar, spoken as /tyuu i/ in Japanese and /zhu4 yi4/ in Chinese. Like the 0-to-4 scale of orthographic similarity, Kayamoto (1995b) measured phonological similarity with a 1-to-7 point scale using subjective judgments by 11 native Chinese speakers studying at Hiroshima University whose Japanese learning experience ranged from 2 to 13 years. She used comparisons of paired kanji-pronunciations of Japanese and Chinese, such as the Japanese kanji 想 with the On-reading (a Chinese-originated sound) /soo/ in Japanese and /xiang3/ in Chinese.[3] In the actual measurement, each paired sound was presented as ソウ (/soo/) in katakana for Japanese and 'xiang' (without indication of type 3 tone) in Pinyin for Chinese. Native Chinese speakers were asked to subjectively or intuitively compare these sounds visually presented in katakana and Pinyin. In total, 1,107 pairs were presented to participants. The average rating on the 1-to-7 phonological similarity scale was 2.38 points with a standard deviation of 1.32 points, indicating that the kanji phonological similarity was rather low in its range of distribution.

Kayamoto (2000) investigated effects of phonological similarity in naming a single kanji, using a 2 × 2 design of phonologically similar and dissimilar characters between Japanese and Chinese, and Japanese On-readings and Kun-readings (Japanese-origin sounds). She tested 12 native Japanese speakers, 12 native Chinese speakers with superior-level Japanese proficiency (or superior-level Chinese), and 12 native Chinese speakers with advanced-level Japanese (advanced-level Chinese). Phonologically similar kanji were /an/ for 案 in On-reading and /an4/ for Chinese, and /bi/ for 鼻 in On-reading and /hana/ in Kun-reading, and /bi2/ in Chinese. Phonologically dissimilar kanji were /kyoo/ for 京 in On-reading and /jing1/ in Chinese, and /tyoo/ for 鳥 in its On-reading and /tori/ in the Kun-reading, and /niao3/ in Chinese. Both advanced and superior-level native Chinese speakers named On-readings faster than Kun-readings while no difference was found among native Japanese speakers. Facilitation effects of phonological similarity were observed only among advanced-level Chinese at 79 millisecond faster in On-readings of similar and dissimilar kanji, and 50 milliseconds faster in Kun-readings of similar and dissimilar kanji, as in Table 10. Effects of phonological similarity seem to disappear, as native Chinese speakers progress in their Japanese proficiency.

Table 10. Mean naming latency and error rates for On- and Kun-readings

	On reading (error rate)	Kun reading (error rate)
Similar	787 ms (10.3%)	860 ms (17.3%)
Dissimilar	866 ms (12.2%)	910 ms (10.3%)

It should be noted, however, that phonological similarity measured by Kayamoto (1995b) is defined based on On-readings, not Kun-readings. Phonological similarity does not refer to a similarity index for Kun-readings. Furthermore, kanji with Kun-readings are always accompanied with On-readings in Kayamoto (2000). Since multiple readings, including both On- and Kun-readings are activated when native Japanese speakers encounter kanji (Verdonschot, La Heij, Tamaoka, Kiyama, You and Schiller 2013), native Chinese speakers must puzzle over which On-reading or Kun-reading they should chose to pronounce. A delay in Kun-reading could be a result of this selection process amongst multiple phonological activations of a single kanji such as /zi/ in the On-reading and /mimi/ in the Kun-reading for 耳, or /seki/ in the On-reading and /aka/ in the Kun-reading for 赤. Therefore, Kayamoto (2000)'s conclusion must be limited to only kanji with On-readings, but not to kanji with

Kun-readings as such: Advanced-level Chinese had facilitation effects of phonological similarity on phonological processing of On-readings, and these disappear once they reach a higher level of Japanese proficiency.

Kayamoto (2002) also investigated phonological similarity effects on naming compound words constructed with two On-reading kanji (e.g., 感謝 /kansya/, 銀行 /ginkoo/ and 無心 /musin/). Results indicated facilitation effects among native Chinese speakers learning Japanese such that phonologically-similar two-kanji compounds (M=829 ms) were named faster than phonologically-dissimilar ones (M=893 ms), while no difference was found in the lexical decision task. Unlike Kayamoto (2000), Kayamoto (2002) used a naming task involving two-kanji compound words which usually have only a single reading. Thus, it is safe to conclude that phonological similarity facilitates naming speed for two-kanji compound words with a combination of On-readings.

3.5 Semantic similarities and differences in kanji compound words between Japanese and Chinese

The Agency for Cultural Affairs in Japan (1978) provided a lexical typology of Japanese kanji-compound words corresponding to Chinese words. The agency classified kanji compounds into four types. (1) Same-type (S-type) refers to the same meaning between Japanese and Chinese. Two-thirds of all kanji-compound words are classified into this S-type, e.g., *ondo* 温度 'temperature' and *mirai* 未来 'future'. Native Chinese speakers indeed have a great advantage learning Japanese vocabulary of S-type. (2) Overlapping-type (O-type) is defined as meanings partly overlapped between the two languages. Words in O-type have intricate interactions between the two languages, e.g., *binboo* 貧乏 'poverty', and *hakusi* 白紙 'white paper' or 'annul'. (3) Different-type (D-type) implies kanji-compound words semantically different from their Chinese meanings, e.g., *tegami* 手紙 'letter' in Japanese but 'toilet paper' in Chinese, and *monku* 文句 'complain' in Japanese but 'sentence and phrase' in Chinese. (4) Nothing-type (N-type) implies no corresponding words ('nothing') exist in Chinese, e.g., *taikutu* 退屈 'boredom' and *okubyoo* 臆病 'timidity'. Previous studies (e.g., H. Chiu 2002, 2003; Y. Chiu 2006, 2007; Hayakawa 2010; Hayakawa and Tamaoka 2012) conducted experiments on lexical processing by comparing S-type and N-type words (see details, Sections 3.5). The meanings of some N-type Japanese words are easier to guess from the knowledge of Chinese characters, but some are not. It is possible to classify a fifth type of words or kanji combinations which only exist in Chinese, such as 公司 /gong1 si1/ 'company', but this category is unnecessary for the purpose of comparing Japanese and Chinese.

Komori and Tamaoka (2010) classified O-type compounds into three sub-categories as shown in Figure 3 (i) those with meanings particular to Chinese, (ii) those with meanings particular to Japanese, and (iii) those with meanings particular to both Japanese and Chinese.

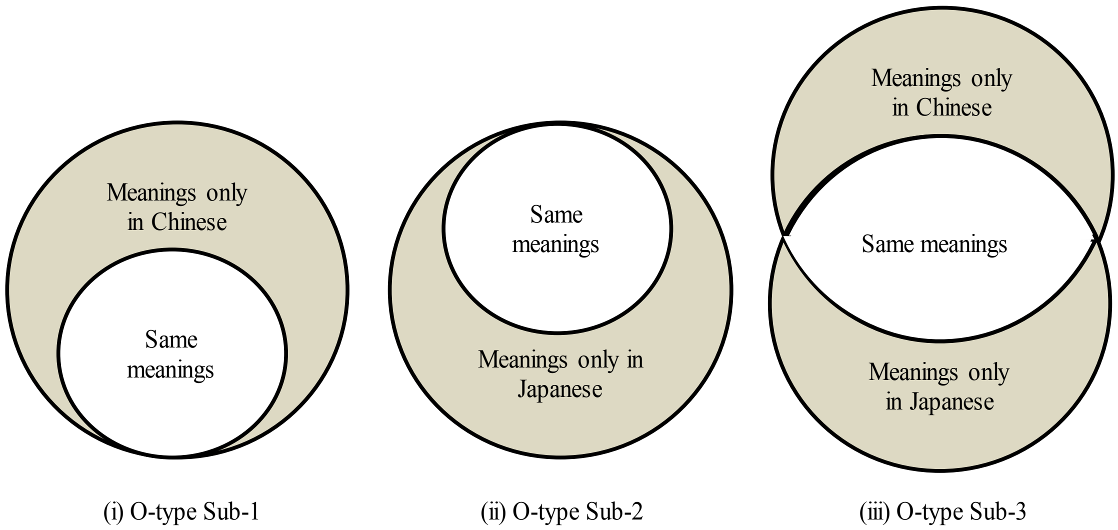

Figure 3. Sub-categories of overlapping-type (O-type) kanji compound words (The figure is from Komori and Tamaoka (2010: 166) with partial modification)

The first sub-category of (i) O-type Sub-1 is defined as kanji-compound words that partly share the same meaning(s) in both Japanese and Chinese, but for which Chinese contains its own extended meanings. For example, 貧乏 /bin boo/ 'poor' in Japanese can be used as in 'poor life' expressed as *binboo-na seikatu* 貧乏な生活 in Japanese, and *pinfa shenghuo* 贫乏生活 in Chinese. The meaning of this word is extended to use with 'experience' as 'poor experience' *pinfa jingyan* 贫乏经验 in Chinese, but not in Japanese. Likewise, 贫乏 in Chinese can be used with 'thinking', 'thought', and 'idea' as in *sixiang pinfa* 思想贫乏 'poor in thought'. Because of these extended meanings in Chinese, native Chinese speakers are likely to overextend the usage of this word to produce incorrect Japanese expressions such as *keiken-ga binboo-da* 経験が貧乏だ

‘(my/your) experience is poor’, and *kangaekata-ga* *binboo-da* 考え方が貧乏だ ‘(my/your) way of thinking is poor’.

The second sub-category of (ii) O-type Sub-2 is defined as those words partly sharing the same-meaning(s) in both Japanese and Chinese, but featuring extended meanings in Japanese. The word 貴重 /ki tyoo/ meaning ‘valuable’ or ‘precious’, for example, can be used as 貴重品 *kityoo-hin* ‘a valuable article’ in Japanese and as *guizhong-pin* 贵重品 in Chinese. The word is used with ‘time’ as in *kityoo-na zikan* 貴重な時間 ‘valuable time’ and with ‘experience’ as in *kityoo-na keiken* 貴重な経験 ‘valuable experience’ in Japanese, but not in Chinese. Instead, 宝贵 /bao3 gui4/ is used in Chinese as in *baogui shijian* 宝贵时间 ‘valuable time’, and as *baogui jingyan* 宝贵经验 ‘valuable experience’. Because of these differences in usages, it is difficult to acquire expressions containing O-type Sub-2 words like *kityoo-na zikan-o saite* 貴重な時間を割いて ‘to spare valuable time’. Yet, if native Chinese speakers avoid using these Japanese expressions which are not found in Chinese, they will not make mistakes.

The third sub-category of (iii) O-type Sub-3 is defined as those words which partly share the same meaning(s) in both Japanese and Chinese, but which contain extended meanings both in Japanese and Chinese. For example, 是非 pronounced /ze hi/ in Japanese and /shi4 fei1/ in Chinese has multiple meanings. In both Japanese and Chinese, this word can be used with the meaning of ‘right or wrong’ as in the expression *zehi-no kubetsu-ga aimai-da* 是非の区別があいまいだ ‘A distinction of right and wrong is unclear’ in Japanese, and *bu fen shifei* 不分是非 in Chinese. This word can also be used differently in Japanese and Chinese. In Japanese, this word is used to mean ‘please’ in *zehi go-sanka kudasai* 是非ご参加ください ‘Please participate in it’, but there is no such usage in Chinese. Contrarily, this word is used to mean ‘a quarrel’ in Chinese as in *re shifei* 惹是非 ‘Picking quarrels’, but has no such meaning in Japanese.

Komori and Tamaoka (2010) investigated how native Chinese speakers learning Japanese process words of O-type Sub 1 and O-type Sub 2. Using their original Cloze Test, they selected 22 Chinese with higher-level Japanese proficiency (M=71.45, SD=3.88) and 22 Chinese with lower-level Japanese proficiency (M=44.68, SD=4.31) from 64 participants studying in Japan. The Cloze Test required the participants to fill in the missing words removed from a text. They obtained a very high Cronbach’s alpha reliability of 0.946 (*n*=64, M=58.09, SD=11.96). A priming experiment was then conducted in which a priming word was presented for 280 milliseconds, and a target word presented following a 120 millisecond interval. The interval between the prime onset and the target onset times (i.e., stimulus-onset asynchrony, SOA) was 400 milliseconds. In Experiment 1 of the processing of O-type Sub-1 words, they conducted the Chinese lexical decision task under the priming condition. The results showed that primed Chinese words of both shared meanings (e.g., 方位 'direction') and the meanings particular to Chinese (e.g., 物品 'commodity') significantly facilitated the lexical decision times of the target Chinese words (e.g., 东西) to the same degree regardless of the level of Japanese proficiency. For the Japanese lexical decision task in Experiment 2, which required processing of O-type Sub-2 words among Chinese speakers with high Japanese proficiency, primed Japanese words with shared meanings (e.g., 細心 'scrupulous') facilitated the lexical decision times of the target Japanese words (e.g., 注意), but words with meanings unique to Japanese did not (e.g., 警告 'warning'). By contrast, among Chinese with lower Japanese proficiency, neither primed words of shared meaning nor those unique to Japanese facilitated processing of the target Japanese words.

The results of priming effects in Experiment 1 (L1 Chinese condition) of Komori and Tamaoka (2010) suggest that orthography and concepts were very strongly linked in the Chinese mental lexicon. However, null priming effects found among native Chinese speakers with lower Japanese proficiency in Experiment 2 (L2 Japanese condition) indicate smaller and weaker connections from orthography to concepts in the Japanese mental lexicon. This contrasting finding further suggests that the size and strength of lexical connections in L2 Japanese between orthography and concepts are less robust than those of the first language (Chinese). Yet, the fact that priming effects of the shared meanings were apparent among those with higher Japanese proficiency indicates that the higher the proficiency level they reach in their second language, the stronger the connections between lexical and conceptual representations become in their second language. However, since null priming effects were found for words with the Japanese-particular meanings, it seems that the Japanese-unique meanings are difficult for native Chinese speakers to acquire. As such, the difficulty with the Japanese-particular meanings and usages among O-type Sub 2 and Sub 3 words are revealed in the priming study.

3.6 Differences in On- and Kun-readings in kanji phonological processing

Using the index of kanji On-reading ratios calculated by Kaiho and Nomura (1983), Tamaoka and Taft (2010) reported that kanji with a 50 percent On-reading ratio randomly embedded with kanji in an On-reading dominant environment were mostly pronounced in On-readings; likewise, the same target kanji embedded with kanji in a Kun-reading dominant environment were mostly pronounced in Kun-readings. Native Japanese speakers easily shifted between On- and Kun-readings, depending on the phonological context. That is, separate On- and Kun-reading sub-lexica exist within the phonological lexicon.

If native Chinese speakers have a well-established sub-lexicon of On-readings associated with characters and their compound words in L1 Chinese, they can produce On-readings faster than Kun-readings. In fact, H. Chiu (2003) showed that kanji compounds with On-readings were named faster than those with Kun-readings among native Chinese speakers who had attained the first and second level of the Japanese Proficiency Test. Thus, native Chinese speakers are likely to associate phonology in Chinese to On-readings more easily than to Kun-readings. A question arises whether phonological suppression by inter-lexical interference for cognates (Hayakawa 2010; Hayakawa and Tamaoka 2012) conflicts with the advantage of On-readings over Kun-readings. Kun-readings are fundamentally used for non-cognates, and the number of kanji compounds with Kun-readings (*wago*) is much smaller than those with On-readings (*kango*). Because On-readings are associated with both cognates and non-cognates, the advantage of On-readings and the phonological suppression for cognates should be treated as a separate issue.

3.7 Lexical processing differences for cognates and non-cognates

The term *cognate* is often used in bilingual studies on languages spoken in Europe. In linguistics, this term refers to words of a common etymological origin. A typical example of a cognate in Indo-European languages is the word *night* in English. Spelling or orthography of this word differs depending on the language, as in French *nuit* and German *Nacht*, and the Dutch *nacht,* with the same spelling as German. In psycholinguistics, cognates are denoted as words similar in orthography, phonology, and semantics. Thus, cognates described in linguistics do not totally overlap with those in psycholinguistics. When explaining studies on kanji processing in this section, I will follow the psycholinguistic definition, ignoring the etymological connotation of the term.

Bilingual studies on European languages have clearly indicated that cognates (similar in spelling, sound, and meaning) are processed faster than non-cognates (e.g., Costa, Caramazza and Sebastián-Gallés 2000; de Groot, Delmaar and Lupker 2000; Dijkstra and van Heuven 2002; Green 1998; van Heuven, Dijkstra and Grainger 1998; van Heuven, Schriefers, Dijkstra and Hagoort 2008). Cognates for kanji-compound words between Chinese and Japanese are defined as orthographically-similar and semantically-same words. For example, the Japanese two-kanji compound word 法則 is represented as the two orthographically-similar kanji 法则 in Chinese, having the same meaning 'law'. This word is pronounced quite differently /hoo soku/ in Japanese, and /fa3 ze2/ in Chinese though; consequently, the term cognate does not refer to phonological similarity. Conversely, the term *non-cognates* is defined as orthographically- and semantically-different words. An example is 財布 'wallet' /sai hu/ in Japanese. This combination of two kanji does not exist in Chinese, with 'wallet' being 钱包 /qian2 bao1/ in Chinese. This Chinese word can be written using two orthographically-similar kanji 銭包 in Japanese, which, of course, does not exist in Japanese. Since a majority of kanji are basically shared in both languages, the real difference between cognates and non-cognates among kanji-compound words is the way in which kanji are combined.

A unique difference was found between cognates and non-cognates in processing Japanese kanji-compound words by native Chinese speakers. H. Chiu (2003) conducted a naming experiment on three different types of words: cognates, non-cognates with On-readings, and non-cognates with Kun-readings. The experiment was conducted with four different groups; native Chinese speakers (studying Japanese at a university in Taiwan) with the second (n=17) and first (n=19) levels of the Japanese Proficiency Test, those with highly advanced Japanese (n=15) studying in Japan, and also native Japanese speakers (n=20). She controlled participants' age of acquisition (AoA) of kanji-compound words. AoA is defined as the age at which a word is learned in acquiring spoken language. Morrison and Ellis (1995) found a strong AoA effect when word frequency was controlled, but no word frequency effect when AoA was controlled. The stimulus manipulation of AoA by H. Chiu (2003), however, differs from Morrison and Ellis (1995). She divided the stimuli into two groups—beginner level for Japanese words with an early AoA and intermediate level for words with a late AoA—based on difficulty-levels of words provided by the Japan Foundation and Japan Educational Exchange and Services (2002). In order to avoid confusion with AoA studies in English, in which some studies have only reported minor effects (e.g., Zevin and Seidenberg 2002) in contrast with Morrison and Ellis (1995), I describe early AoA as easy words and late AoA as difficult words in the following explanation of Chiu's results.

H. Chiu (2003) found unexpected results between cognates and non-cognates in her naming task. Native Chinese speakers of the second level (intermediate Japanese) showed a trend in ascending order of naming latencies on easy words; non-cognates with On-readings, cognates, and non-cognates with Kun-readings as in Table 11. This trend was much clearer among difficult words, with an ascending order of non-cognates with On-readings, cognates, and non-cognates with Kun-readings.

Table 11. Mean naming latency for cognates and non-cognates in *On-* and *Kun*-readings

		On reading		Kun reading
	Words	Non-cognates	Cognates	Non-cognates
2nd Level (Intermediate)	Easy	846 ms	893 ms	1,151 ms
	Difficult	948 ms	1,135 ms	1,232 ms
1st Level (Advanced)	Easy	852 ms	806 ms	991 ms
	Difficult	875 ms	948 ms	987 ms

In comparison, Chinese learners of the first level (advanced Japanese) displayed no difference between cognates and non-cognates with On-readings on easy words. However, cognates were named faster than non-cognates with Kun-readings. Among difficult words, the previous trend was observed again in the ascending order of non-cognates with On-readings, cognates, and non-cognates with Kun-readings. This trend was observed neither among Chinese-speaking learners with highly-advanced Japanese, nor among native Japanese speakers. Error rates also indicated a very similar overall tendency.

Unlike the facilitation effects of cognates in European languages (e.g., Costa, Caramazza and Sebastián-Gallés 2000; de Groot, Delmaar and Lupker 2000; Dijkstra and van Heuven 2002; Green 1998; van Heuven, Dijkstra and Grainger 1998; van

Heuven, Schriefers, Dijkstra and Hagoort 2008), inhibitory effects were found in H. Chiu (2003) that cognates were named much more slowly than non-cognates among native Chinese speakers who were less proficient (both easy and difficult words) and who were advanced speakers in Japanese (only difficult words). Based on this result, H. Chiu (2002, 2003) proposed that the processing routes of kanji-compound words varies depending on the lexical relationship between Japanese and Chinese, and she constructed a phonological processing model which contrasts cognates and non-cognates. As depicted in (i) of Figure 4, cognates are first processed through the phonological route in Chinese, and then further to their concepts. In contrast, as shown in (ii) of Figure 4 non-cognates do not exist as Chinese words, so that newly-acquired non-cognates are easily processed through the Japanese sound route. Due to the difference of these two phonological processing routes, the naming of cognates in Japanese is slowed down, whereas non-cognates are pronounced more quickly in Japanese than cognates.

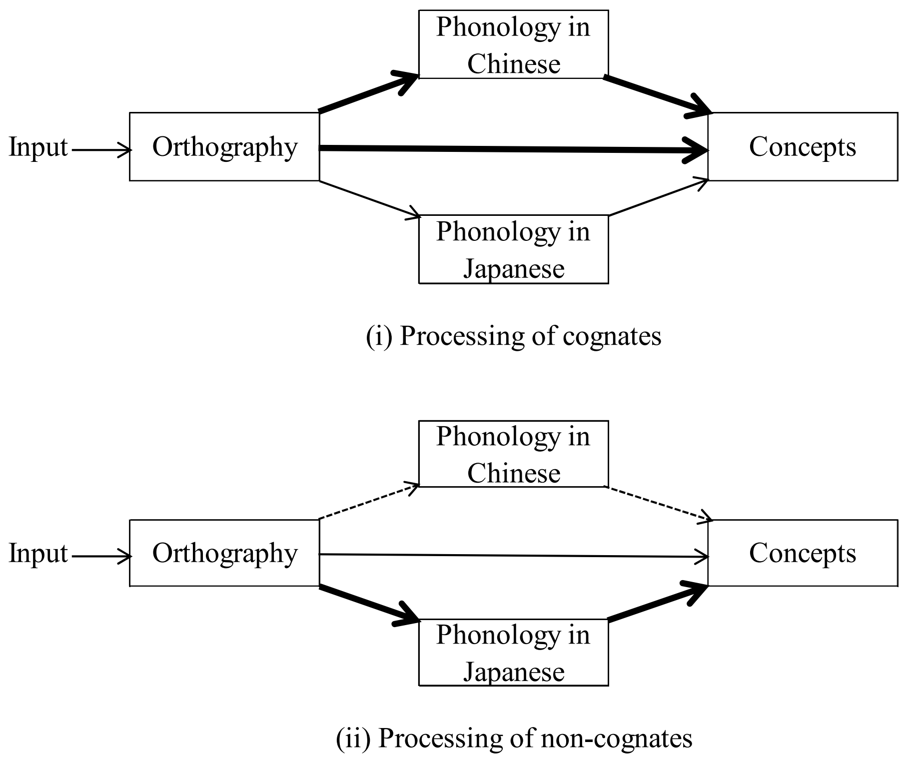

Figure 4. Difference in phonological processing of cognates and non-cognates by native Chinese speakers learning Japanese (The figure is taken from H. Chiu (2002) and translated into English)

The model in Figure 4 (H. Chiu 2002, 2003) was supported by several studies (Y. Chiu 2006; Hayakawa 2010; Hayakawa and Tamaoka 2012; Komori 2005) and partly by a paper by Y. Chiu (2007). Komori (2005), as previously described, showed that Chinese speakers have an advantage in reading comprehension, but not in listening comprehension due to their kanji orthographic knowledge. This study further described that cognates (56.35% accuracy) were understood nearly as well as non-cognates (51.18% accuracy) in listening comprehension, while cognates (80.57% accuracy) yielded a greater advantage than non-cognates (64.07% accuracy) in reading comprehension. Y. Chiu (2006) conducted an experiment with 12 native Chinese speakers who had passed the first level of the Japanese Proficiency Test, employing a lexical decision task for words embedded in a sentence. In her study, a sentence containing parentheses as in (　　)で勉強したので，とても眠い ‘Because I studied (　　), I am very sleepy’ was visually presented, followed by the auditory presentation of a compound word. In this sentence, a possible correct response is the word /tetuya/ ‘all night’. Participants were required to decide whether this word appropriately fits into the parentheses in the sentence. Kanji compound words which were cognates required more time for participants to make a lexical decision than non-cognates. Since stimulus words were auditorily presented, as shown in Figure 4, non-cognates must be strongly tied to both Japanese phonology and concepts, while cognates must have only loose ties with Japanese phonology.

Hayakawa (2010) and Hayakawa and Tamaoka (2012) provided support for the model in Figure 4. Hayakawa (2010) tested 48 Chinese speaking learners of Japanese (26 at the first level and 22 at the second level of the Japanese Proficiency Test). In order to investigate the effects of traditional Chinese characters, which are used primarily in Taiwan, she selected kanji compounds based on orthographic figures of traditional characters. For the lexical decision task using auditory-presented words, Hayakawa (2010) chose three different types of 16 kanji compound words each (48 target words in total): (1) S-type (e.g., 記憶 in Taiwan and Japan) – orthographically-/semantically-same compounds that are considered to be cognates in H. Chiu (2003), (2) D-type (e.g., 作業 in Japan 工作 in Taiwan) – orthographically-similar but semantically-different, and (3) N-type (e.g., 退屈 only used in Japan) – two-kanji combinations that do not exist in Chinese and are considered non-cognates in H. Chiu (2003).

Table 12. Mean response times for auditory-presented cognates and non-cognates

	S-Type	D-Type	N-Type
2nd Level (Intermediate)	1,400 ms	1,283 ms	1,192 ms
1st Level (Advanced)	1,201 ms	1,143 ms	1,086 ms

Although H. Chiu (2003) did not obtain a clear trend among Chinese learners of advanced Japanese on difficult words (or late AoA), Hayakawa found an ascending order of both N-type, D-type, and S-type among the Intermediate level learners (*n*=22), and N-type, D-type, and S-type among the advanced learners (*n*=26), as in Table 12. With this result, phonological inhibitory effects for cognates were extended to a wider population of native Chinese speakers including those at the advanced learners or those who passed the first level of the Japanese Proficiency Test.

Furthermore, Hayakawa and Tamaoka (2012) examined phonological processing of S-type (cognates) and N-type (non-cognates) in lexical decisions of auditory-presented words, using 38 native Chinese speakers from mainland China and 38 Korean speakers (control group) learning Japanese. Once again, lexical decisions were slower for S-type than N-type among Chinese, whereas no difference was found between S-type and N-type among Koreans, as in Table 13. Since Koreans use little of the kanji script in their language, and since S-type and N-type were classified based on similarity in Chinese character words, null effects among the Korean control group strengthened the results found with the Chinese participants.

Table 13. Mean response times for auditory-presented cognates and non-cognates

	S-Type	N-Type
Chinese (*n*=38)	1,188 ms	1,111 ms
Korean (*n*=38)	1,168 ms	1,157 ms

Hayakawa (2010) and Hayakawa and Tamaoka (2012) explained the processing mechanism in detail as follows. Cognates of kanji compounds already have phonological representations in the Chinese mental lexicon. For instance, 未来 is pronounced /wei4 lai2/ in Chinese. To acquire this word in Japanese, a native Chinese speaker has to memorize its Japanese sound /mi rai/ in addition to their prior knowledge of the Chinese sound. In doing so, the orthography of the cognate 未来 becomes simultaneously connected to two different phonological representations, /wei4 lai2/ in Chinese and /mi rai/ in Japanese. The connection from orthography (未来) to phonology (/wei4 lai2/) in the first language is very strong, but the newly-learned sound of the word (/mi rai/) has a relatively weak connection. As a result, when the cognate is presented auditorily, the newly-learned Japanese phonology /mi rai/ delays the activation of the Chinese pronunciation in reaching its necessary threshold. On the other hand, since there is no lexical phonology in Chinese for non-cognates, the newly-learned sound of a non-cognate is easily activated without competition from existing Chinese phonological representations.

4. Processing syntactically different features

Are native Chinese speakers learning Japanese unable to break free from the spell of Chinese syntactic features when processing the Japanese language? Due to the great syntactic difference between Japanese and Chinese, or so-called *longer linguistic distance* in syntax, it is frequently presumed that native Chinese speakers have greater difficulties in processing Japanese sentences compared to native Korean speakers whose language, in terms of syntax, is considered to exhibit *shorter linguistic distance* (Horiba and Matsumoto 2008; Koda 1993, 2005). However, according to Fan and Wu (2006), among second-year native Chinese speakers majoring in the Japanese language at Xi’an International Studies University, 79.79% in 2002 and 82.26% in 2003 passed the fourth level of the Japanese language specialization test (i.e., Nihongo Senmon Shiken 4; NSS4) conducted by the Ministry of Education in the People’s Republic of China. The fourth level is said to be equivalent to the second level of the newer Japanese language proficiency test (i.e., N2) administered by the Japan Foundation. Furthermore, although there is no specific data available, it is commonly known among instructors of the Japanese language in China that approximately half of the native Chinese speakers majoring in Japanese at the eight major universities of foreign languages in China (i.e., two in Beijing, and one in Dalian, Guangzhou, Shanghai, Sichuan, Tianjin, and Xi’an) can pass the highest level of the Japanese language proficiency test (i.e., N1) at the end of three years of Japanese study, even when starting with no Japanese knowledge. Given this remarkable improvement in such a short period of learning Japanese, it may not be difficult for Chinese students to overcome syntactic differences between Chinese and Japanese to the degree that researchers have previously assumed.

4.1 Morphosyntactic inflections and differences in Chinese and Japanese

Many learners of Japanese with no kanji background devote numerous hours to memorizing kanji orthography. By contrast, thanks to the high degree of orthographic similarity between Japanese kanji and Chinese characters, native Chinese speakers can allocate the majority of their classroom and study hours to learning Japanese grammar or syntactic features from the early stages of study. If so, despite the Chinese language being syntactically dissimilar to Japanese (i.e., a longer linguistic distance in syntax), high levels of achievement would be expected in acquiring Japanese grammar over a short period among Chinese students. This implies a strong version of the predicted learning potential of native Chinese speakers in that they will likely encounter little syntactic difficulty in learning Japanese.

The Chinese language has no morphosyntactic inflections. This poverty of syntactic features is expected to present difficulties in the acquisition of Japanese verb inflections (if one assumes L1 transfer). Chu, Tamaoka and Yamato (2012) investigated how 102 native Chinese speakers learning Japanese acquire verb inflections during only a four month period at a university in China. Participants were tested on *te*-form verb inflections which were reported as being very difficult for Japanese learners (e.g., Nagatomo 1997; Sakamoto 1993). Cronbach's reliability for 54 target verbs by Chu et al. was very high at α=0.86. Their verbs were taken from four sources, (i) 15 verbs from the students' textbook (e.g., *oyogu* 'swim' and *au* 'meet'), (ii) 15 verbs not in the textbook (e.g., *mayou* 'lost' and *susumu* 'progress'), (iii) 15 nonsense verbs created by the authors (e.g., *kaziku* and *miaru*), and (iv) 9 recently-coined verbs (e.g., *tikuru* 'secretly tell someone' and *kokuru* 'confess one's feelings'). All students were asked to write the *te*-form inflections of all 54 verbs. For example, when *yomu* 'read' is presented, participants must write the correct *te*-form *yonde* for 1 point.

The results of Chu et al. (2012) are indicated below in descending order of accuracy; 90.33% for verbs from the textbook < 88.00% for nonsense verbs = 87.20% for verbs not in the textbook = 86.44% for newly-created verbs. Verbs taken from the textbook and used in their classroom were better than those from other categories. What is more surprising is that Chinese students exhibited over 86% accuracy on all four categories. They further reported difficulty levels of *te*-inflections depending on forms, indicated in descending order of accuracies; *–tte* form (98.13%, e.g., *atte* ‘meeting’) > *–site* form (94.04%, e.g., *zyunbisite* ‘preparing’) = *–te* form (90.76%, e.g., *mite* ‘seeing’) > *–ite/ide* form (85.59%, e.g., *oyoide* ‘swiming’) > *-nde* form (74.03%, e.g., *susunde* ‘progressing’). Besides the *–nde* form, all other forms displayed high performance at over 85% accuracy.

It is amazing that native Chinese speakers could apply the *te*-form inflection rules to nonsense verbs after a mere four months of Japanese study; a difference in accuracy of only 2.33% between verbs in the textbook and nonsense verbs (90.33% - 88.00%). Proper application of inflectional morphology for nonsense verbs is considered an indication of well-formed, rule-based knowledge. According to these results, native Chinese speakers learning Japanese, even for a period of only four months, adequately apply their acquired knowledge of *te*-inflection rules to various verbs, despite the absence of inflectional morphology in their first language. In this sense, language acquisition researchers generally seem to be overestimating the negative effects of linguistic differences in syntax between Chinese and Japanese. The absence of syntactic features may not be a crucial obstacle for acquiring Japanese, although it provides no facilitation. It should, however, be noted that Chu et al. (2012) simply asked native Chinese speakers to inflect a verb stem. They did not test the actual use of verbs in a sentence. Therefore, acquisition of verbal inflections should be further investigated by means of on-line processing of a sentence predicate.

Difficulties in processing two-kanji compounds by native Chinese speakers could be found when noun compounds are used as verbs (i.e., verbal nouns). Native Chinese speakers are likely to apply their knowledge of Chinese to Japanese, even though some verbal nouns differ in their usage, such as transitive/intransitive and active/passive. For example, as shown in examples (6a) and (6b), a majority of verbal nouns are used for active and passive in both Japanese and Chinese (e.g., *kakunin* ‘check’). Yet, some verbal nouns are used in active form in both Japanese and Chinese, but with the passive used only in Japanese (e.g., *zyunbi* ‘prepare’) as shown in (7a) and (7b).

(6) a. Active form used in both Chinese and Japanese

Suuti o *aratani* *kakuninsita.*

numerical value ACC newly check PST
'(He) newly checked the numerical values.'

b. Passive form used in both Chinese and Japanese
Suuti ga aratani kakuninsareta.
numerical value NOM newly check PASS PST
'The numerical values were newly checked.'

(7) a. Active form used in both Chinese and Japanese
Siryoo o keikakutekini zyunbisita.
reference ACC deliberately prepare PST
'(He) deliberately prepared the reference.'

b. Passive form used only in Japanese
Siryoo ga keikakutekini zyunbisareta.
reference ACC deliberately prepare PASS PST
'The reference was deliberately prepared.'

A majority of two-kanji compound nouns shared by Chinese and Japanese are fundamentally used in the same way as shown in (6a) and (6b). As a result, native Chinese speakers are predicted to show no qualitative differences among sentence types in (6a), (7a), and (6b). However, if the morphosyntactic knowledge of Chinese words is merely applied to Japanese, lower accuracy and possibly slower speed are expected to occur in the processing of passive sentences like in (7b), which is not used in Chinese. This type of subtle difference observed in verbal nouns is expected to lead to occasional, but unavoidable mistakes. Morphosyntactic knowledge of Chinese will therefore likely cause considerable influence on the processing of second language Japanese two-kanji compounds. The question of on-line predicate processing by Chinese speakers still remains to be answered in future studies.

4.2 Word order and processing Japanese sentences

Japanese base word order is SOV while Chinese one is SVO. Due to the different word order in their L1 and the target language, Chinese speaking learners of Japanese may face difficulty in the processing of even simple Japanese sentences because of the different base word order and flexible word order, i.e., scrambling (for processing of Japanese scrambled sentences, see Koizumi's and Chang's chapters in this volume.)

They are required not only to process SOV-ordered Japanese sentences, but also to comprehend sentences with a phrasal movement operation of OSV scrambled order. According to word order typology by Dryer (2012), SVO and SOV are the two major types, with 41.08% being SVO (488 languages) and 47.56% being SOV (565 languages) out of 1,188 languages (a total of 1,377 minus 189 languages lacking a dominant word order). Both the Chinese and Japanese languages are included in the two major language typologies.

An early cross-linguistic study by Koda (1993) measured sentence correctness among Chinese, English, and Korean speaking learners of Japanese at an American university. Note that her study indexes the end result of sentence processing because she did not measure the reaction time of each sentence. The study showed the null effect on scrambling by Koreans. This result must have been caused by a measurement limitation in which the Korean speakers had reached the performance ceiling in terms of comprehension of the 12 total sentence stimuli in both canonical (M=11.5) and scrambled (M=12.0) order under the condition where case particles were present. Without case particles, however, they seemed to lose cues for processing, resulting in lower scores for both canonical (M=8.5) and scrambled (M=8.6) sentences, though there was still no scrambling effect. Here it should be noted that sentences without case particles are considered to be incorrect in Japanese, so that it is problematic to estimate the mechanism for those sentences processed by any of the three language groups.[4]

In contrast with Koreans, the scrambling effect was apparent for both the American (native English speakers) and Chinese groups (see Koda 1993, Table 1). Koda drew the rather unclear conclusion that Japanese sentence processing of canonical and scrambled orders by L2 learners involves both L1 and L2 effects. It is tempting to interpret these results in such a way that American and Chinese learners were able to establish a filler-gap dependency (the relationship between the moved landing site and the original position where it was moved from) for processing scrambled sentences in a similar way to native Japanese speakers, yielding lower accuracy in the scrambled condition. However, the interpretation of gap-filling parsing is a great logical jump to apply to the results since Koreans, whose first language has case particles similar to Japanese, did not show the scrambling effect.

Selecting participants from students at an American university invites two major potential weaknesses. First, it is difficult to know how efficiently these students can handle their first languages of Chinese and Korean, as their length of residence in the US was unknown. Second, all participants may have a great deal of variation of proficiency in English. Some of the Chinese speakers may no longer have Chinese as their dominant language; instead, English may have become the more highly activated of their two languages. So-called ‘heritage’ learners who grew up in the US with Chinese/Korean parents are likely to be more English dominant. On the other hand, for students who arrived in the US after attending high school in their home country, Chinese/Korean usually remains their dominant language. With potentially low Chinese ability, can we still say these participants are good representatives of native Chinese speakers? In contrast, as far as they can proficiently speak the Korean language, Koreans may have the advantage of speaking an SOV-ordered language because Japanese also has the same SOV-order. In fact, the ceiling score in Koda’s study may be the result of syntactic similarity between Japanese and Korean. Nevertheless, both the Chinese and Korean participants must have already obtained an excellent level of English ability as their second or possibly first language, and thus, Japanese must necessarily be the third language for them. The effect from their English knowledge remains unknown.

In addition to accuracies on sentence correctness decisions, Koda conducted a reading comprehension test. A regression analysis showed that case particle knowledge (R^2=0.4795) was a highly significant predictor of reading comprehension (p<.0001).[5] This result clearly established a causal relation between the knowledge of case particles and reading comprehension. However, because she did not report group differences on the reading comprehension scores, the question to be raised is whether the Korean participants were higher achievers than the American and Chinese participants at the time when they were tested. Future cross-linguistic studies should be conducted by controlling the Japanese ability of different first-language groups, ideally focusing on Japanese being learned in the second language environment, not a foreign language environment.

Experimental approaches measuring reaction times are rather scarce in the study of Japanese sentence processing by Chinese speaking learners of Japanese. One of the few examples is Tamaoka (2005, Experiment 1) which investigated how Chinese learners who studied Japanese for two to four years at a university in Dalian, China, processed and made correctness decisions on active transitive-verb sentences with canonical and scrambled orders. Because sentence processing requires a heavy cognitive load, Tamaoka selected 24 participants out of 87 native Chinese speakers with scores higher than 22 points or 91.7% accuracy based on the results of a grammar test with 25 multiple choice questions (i.e., a maximum score of 25).

The results showed that simple active sentences in canonical order were more quickly and accurately processed than the same sentences in scrambled order as in Table 14.

Table 14. Mean response times and accuracy for canonical and scrambled sentences

	Response times	Accuracy
Canonical	3,566 ms	87.5%
Scrambled	3,933 ms	78.0%

A scrambling effect of 367 milliseconds in reaction time and 9.5% accuracy suggests the possibility that it is highly probable that the Chinese participants generated the base structure [$_{S}$ NP$_{\text{-NOM}}$ [$_{VP}$ NP$_{\text{-ACC}}$ V]] for active transitive-verb sentences and established a filler-gap dependency for scrambled-ordered sentences, as with native Japanese speakers (Aoshima, Phillips and Weinberg 2002; Koizumi and Tamaoka 2004, 2006, 2010; Mazuka, Itoh and Kondo 2002; Miyamoto and Takahashi 2002; Sakamoto 2002; Tamaoka et al. 2005).

Native Chinese speakers learning Japanese understood simple Japanese active sentences with a transitive verb in the SOV-canonical order like ‘My elder sister ate an apple’ more quickly and accurately than OSV-scrambled orders. This provides evidence that they may manipulate syntactic operation for the scrambled order. If so, at least, this finding does not support the *shallow structure hypothesis* proposed by Clahsen and Felser (2006), which claims that second language learners can process semantic roles such as lexical items, but not syntactic information, even at the advanced level. Rather, the result supports the claim by White (2003) that syntactic features related to functional categories could be acquired in an early stage of second language acquisition, although some features such as the definiteness of determiners *a* and *the* in English are very difficult for Japanese and Chinese speaking L2 learners to acquire because their L1 lacks such a feature (Trenkic 2002).

The Chinese language has no overt *wh*-movement. *Wh*-words stay *in situ* in Chinese

(He 2000; Huang 1981; Lin 1998). For example, English sentence (8a) is expressed as (8b) in Chinese. Likewise, (9a) is expressed as (9b).

(8) a. *What do you eat?*
b. 你吃什么?
ni3 chi1 shen2-me0.
you NOM eat PRS what ACC
(9) a. *Whom do you like?*
b. 你喜欢谁?
ni3 xi3-huan0 shui2.
you NOM like PRS whom ACC

Syntactic operations of English *wh*-questions include an additional fronting operation of a *wh*-word, compared to yes/no-questions that require the insertion of *do* when verbs are regular (not BE). Yet, adult native Chinese speakers, who have been studying at universities where English is the instructional language, seem to be able to handle *wh*-questions in English fairly well. Thus, it is anticipated that they can also process scrambled sentences in Japanese using a filler-gap parsing operation.

Experiment 2 in Tamaoka (2005) further examined potential sentences whose case particles conflicted with the grammatical information of subject and object taken from the stimuli of Experiment 4 in Tamaoka et al. (2005). For example, in the potential sentence (10a) the subject is marked by the dative case particle *–ni*, having a syntactic structure of [$_s$ NP-*ni* [$_{vp}$ NP-*ga* V]]. In this sentence, NP-*ni* is the subject whereas NP-*ga* is the object. Thus, case particles cannot provide the proper information to construct base structure. In contrast, according to case particle order suggesting that nominative proceeds dative and accusative, the canonical order should be (10b). If native Chinese speakers utilize case particles, they will have great difficulty processing the nominative-marked inanimate noun Greek-NOM. If they can understand Greek-NOM as actually being the object, and if they can comprehend that the dative-marked animate noun Takashi-DAT is the subject, then they can properly understand a potential sentence based on the base structure [$_S$ NP$_{\text{-subject (marked by the dative -}ni\text{)}}$ [$_{VP}$ NP$_{\text{-object (marked by the nominative -}ga\text{)}}$ V]].

(10) a. *Takasi ni* *girisyago ga* *kakerudarooka.*
Takashi DAT Greek NOM write-POTEN-wonder-Q
'Can Takashi write Greek?'
b. *girisyago ga* *Takasi ni* *kakerudarooka*.
Greek NOM Takashi DAT write-POTEN-wonder-Q

The processing of Japanese potential sentences by native Chinese speakers showed a trend that differed from non-potential active sentences. Tamaoka (2005, see Table 2 in Experiment 2) indicated that potential sentences in canonical order (M=3,405 ms) did not significantly differ in reaction times from the same sentences in scrambled order (M=3,774 ms). Taking null scrambling effects into account, it is possible to interpret that native Chinese speakers learning Japanese have not figured out the base structure of potential sentences, and therefore, the gap-filling parsing in the processing of potential sentences with scrambled order cannot apply to these Chinese speakers.

Before discussing the results of the response times, let's examine accuracies. Canonical order had an average of 69.1% with a high standard deviation of 23.9%, whereas the scrambled order had an average of 56.9% with an even higher standard deviation of 29.7%. This difference of 12.8% (Tamaoka 2005 showed 12.9%, but this was caused by a rounding error) between the canonical and scrambled orders was significant. Yet, the standard deviations of both the canonical and scrambled orders were very high, at over 20%. Individual participants are depicted below in Figure 5, by plotting participants' (or students') accuracies on canonical order sentences on the horizontal axis and scrambled order on the vertical axis. To highlight participants' individual differences, the hierarchical cluster analysis for accuracies of canonical and scrambled orders revealed three clusters drawn on top of the plotting in Figure 5.

Let's consider three illuminating facts on individual differences of the clusters. First, three participants among the members of Cluster III in Figure 5, lying exactly on the horizontal axis, rejected all potential sentences with scrambled order as incorrect. In the scrambled order of OSV, an inanimate noun such as 'Greek' comes in the initial specifier position of the sentence, as in (10b), which is repeated below with the schematic structure.

(10) b. *girisyago ga* *Takasi ni* *kakerudarooka*.

Greek NOM   Takashi DAT   write-POTEN-wonder-Q

[$_{S}$ NP-*ga*$_{1}$ [$_{S'}$ NP-*ni* [$_{VP}$ *gap*$_{1}$ V]]

'Greek' is in a subject position in (10b), marked by the nominative case particle –*ga*, which usually indicates the subject of a sentence. These three native Chinese speakers must have employed a simple and strict strategy that an inanimate subject did not take the nominative case particle –*ga*, especially when placed in the initial specifier position, possibly indicating the subject of a sentence. For them, the following dative-marked animate noun adds the clear indication of incorrect marking.

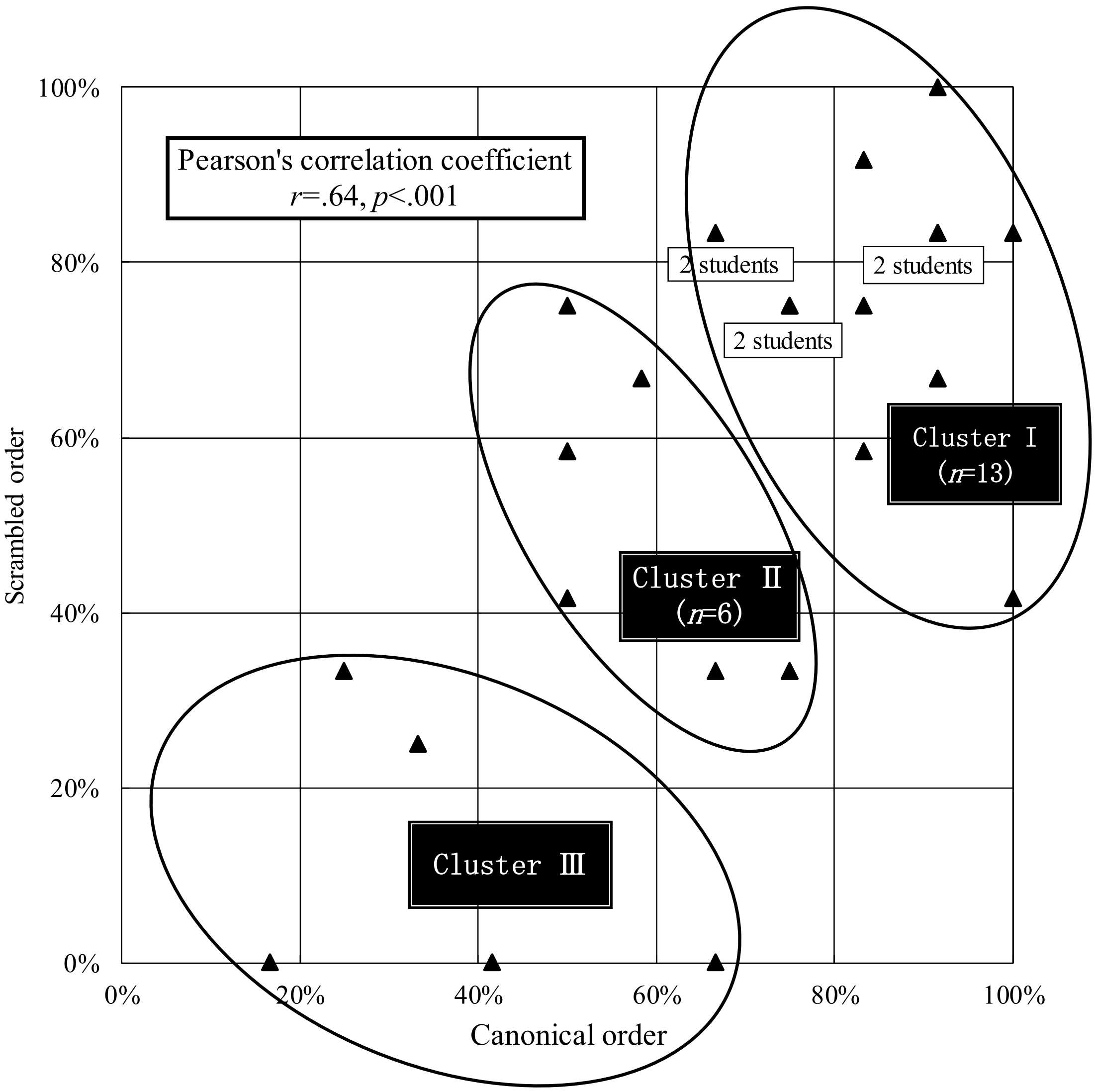

Figure 5. Accuracy plotting of canonical- and scrambled-ordered potential sentences (This figure is taken and translated from Tamaoka (2005: 103), *n*=24).

As some researchers (e.g., Lamers and de Hoop 2005) suggest that animacy information plays a crucial role on language comprehension studies, native Chinese speakers may have utilized this strategy (see also Yamashita 2008). In fact, considering the typical events in daily life, animacy information is usually correct in that an animate actor as a subject acts upon an inanimate object, such as in ‘My brother eats breakfast’, ‘My mother cooked clam chowder’, and ‘My father runs a vegetable shop’. The strategy of animacy, however, is not universally true, having some exceptions including potential sentences. The strategy of animacy with case particles must be deeply embedded in these three Chinese participants, allowing for no flexibility.

The second illuminating fact is that the five participants among the members of Cluster I in Figure 5 could process potential sentences at an accuracy rate higher than 80% in both canonical and scrambled orders. This is noteworthy in light of the possibility that a few native Chinese speakers could produce the base structure [$_{S}$ NP$_{\text{-subject (marked by the dative }\textit{-ni}\text{)}}$ [$_{VP}$ NP$_{\text{-object (marked by the nominative }\textit{-ga}\text{)}}$ V]] for potential sentences, apparently moving beyond the conflicting nature of animacy and case particles. We must also bear in mind that these five participants were originally taken from a pool of 87 Chinese students majoring in Japanese language based on scores on a grammar test. This places them in approximately the top 5 % of this group (more precisely 5.74%). It is quite possible that a few, possibly 5% of native Chinese speakers learning Japanese at a Chinese university, may understand potential sentences at a high rate of accuracy, which leaves open the great possibility that these learners could produce the base structure for potential sentences, and that they could also process scrambled-order potential sentences by gap-filling parsing.

The third fact is that accuracies on potential sentences of two participants among the members of Cluster II ranged between 40% and 60% in both canonical and scrambled order. They displayed a random pattern of decision making without a clear guideline for potential sentences. These two native Chinese speakers must have been puzzled to encounter potential sentences, in which animacy and case particles did not match correctly in terms of the nature of subject and object.

The contribution of individual differences to Japanese sentence processing must be measured as a reflection of Japanese language proficiency levels. This aspect was scrutinized by Tamaoka et al. (2010). They examined the degree of understanding of orally-presented single sentences in canonical and scrambled order based on Japanese ability. A listening comprehension test with a maximum of 8 points was conducted with 92 native Chinese speakers learning Japanese from one to three years at a university in Taiwan. Based on the test scores, a total of 48 participants were divided into higher (6-7 points), middle (4 points), and lower (2-1 points) listening comprehension groups (16 participants each) to undergo an experiment to investigate the understanding of orally-presented simple sentences (maximum of 11 points each). Two ditransitive active sentences in canonical and scrambled order were presented to the 48 native Chinese speaking participants. After canonical and scrambled active sentences were orally presented, the participants were asked two questions about the content of each sentence; one was related to the canonical sentence and another to the scrambled sentence. If a correct response was given, it was counted as one point. The study found a clear trend among the three groups. Scores of canonical ordered sentences significantly increased as comprehension levels increased: lower, middle, and higher. Scores of scrambled order sentences were comparatively lower for each group, with the higher group scoring significantly above the lower and middle groups, as in Table 15.

Table 15. Mean comprehension scores for canonical and scrambled sentences by group

	Canonical	Scrambled
Lower	6.19	5.06
Middle	7.44	4.88
Higher	8.31	7.19

Possible interpretations are that the lower group might have confused both canonical and scrambled order, which may have been caused by the difference in both parameter setting of the verb phrase and scrambling of subject and object noun phrases between Chinese and Japanese. The middle group was able to overcome the difference in word order of the verb phrase, and began to be able to handle the processing of Japanese sentences with canonical order. The higher group was able to establish a dependency between the initially-presented dative/accusative-marked phrase as *filler*, and its *gap* in the verb phrase (i.e., *filler-gap parsing*), resulting in higher scores in understanding both canonical and scrambled order sentences.

In sum, as seen in Figure 5, a great diversity was found among learners of Japanese with the same language background of Chinese. Once these individual differences are taken into consideration, it seems that researchers applying the theory of generative grammar to second language acquisition might be overly sensitive to the syntactic aspects of language. The shallow structure hypothesis by Clahsen and Felser (2006) cannot explain these individual differences in the manipulation ability of scrambled sentences. Rather, as White (2003) put forward, functional categories must be acquired at a relatively early stage of Japanese acquisition among native Chinese speakers. The progressive increase of scores in sentence comprehension shown by Tamaoka et al. (2010) must reflect the development of learners' facility with word order and advancement of parsing ability as native Chinese speakers improve their proficiency in the Japanese language.

5. Concluding remarks

Various studies with Chinese speaking learners of Japanese were reviewed in this chapter. As discussed, future studies can be categorized in three research areas: First, native English speakers showed an "awfully random" pattern of Japanese pitch accent acquisition regardless of the length of learning and proficiency (Taylor 2011a, 2011b, 2012), but native Chinese speakers displayed both random trends (Lee et al. 2006) and improvement as their learning progresses (Pen 2003). Since Chinese has tone accent, comparable to pitch accent, and since the position of the pitch accent in each word is thoroughly taught when introducing Japanese vocabulary at universities in China (e.g., Hong 2010; Pan 2011; Zhang 2011; Zhao 2012; Zhou and Chen 2009, 2010, 2011a, 2011b), Chinese learners may exhibit some progress in acquiring Japanese pitch accent and advantage compared to learners of other L1 languages. Then, future studies on acquisition of pitch accent should pay special attention to dialectic influences in both Japanese and Chinese, differences in pitch accent patterns, and function of homophonic distinctions by controlling Japanese language proficiency of Chinese learners.

Second, due to the script similarity in kanji between L1 Chinese and L2 Japanese, Chinese learners demonstrate specific advantages and disadvantages in reading Japanese. Advantages are found in processing visually presented kanji compound words (e.g., Matsunaga 1999; Tamaoka 1997, 2000; Yamato and Tamaoka 2009, 2013). In contrast, because Chinese speakers heavily rely on their orthographic knowledge to understand Japanese words, their phonological processing of kanji compound words does not display advantage, and occasionally even showed inhibitory effects (e.g., H. Chiu 2003, 2003; Y. Chiu 2006; Hayakawa 2010; Hayakawa and Tamaoka 2012). In addition, semantic similarities and differences between L1 Chinese and L2 Japanese seem to exhibit complex processing trends in Chinese learners' understanding Japanese kanji compound words (e.g., Komori and Tamaoka 2010; Hayakawa and Tamaoka 2012). Therefore, future studies on advantages and disadvantages of L1 Chinese kanji knowledge for understanding L2 Japanese words should be conducted on the processing of phonologically similar/dissimilar words, kanji compound words with On- and Kun-readings, and semantic differences between the two languages, again with a population whose L2 Japanese language proficiency is controlled.

Third, Japanese and Chinese are considerably different in their syntactic features. Japanese word order is SOV while Chinese is SVO. Japanese has case particles while Chinese does not. Japanese allows scrambling (word permutation) while Chinese fundamentally does not. Because both languages are considered to have *longer linguistic distance* in syntax, difficulties in processing or understanding Japanese sentences are predicted (e.g., Horiba and Matsumoto 2008; Koda 1993, 2005). However, Chinese speakers' kanji knowledge allows them to allocate their Japanese learning hours to syntax, while those with no kanji language background spend many hours to memorize kanji. Thus they are likely to concentrate on syntax from the beginning stage of learning, resulting in high accuracies on morphosyntactic inflections of verbs (Chu et al. 2012). They also display the scrambling effect in processing SOV and OSV sentences (Tamaoka 2005; Tamaoka et al. 2010), as native Japanese speakers do (e.g., Aoshima, Phillips and Weinberg 2002; Koizumi and Tamaoka 2004, 2006; Mazuka, Itoh and Kondo 2002; Miyamoto and Takahashi 2002; Sakamoto 2002; Tamaoka 2004, 2006, 2010; Tamaoka et al. 2005). Difficulties by Chinese learners seem to come from slightly different verb and adjective usages between L1 and L2, such as transitive/intransitive and active/passive. These usage differences should be investigated in future studies.

Notes

1. This database was created from the corpus of the *Asahi Newspaper* from 1985 to 1998, which contains 341,771 words for type frequency and 287,792,797 words for token frequency. Within the high familiarity range (familiarity index taken from Amano and Kondo 1999) the unaccented-accented opposition or flat pattern versus other accented

patterns is more prevalent than the accent-location oppositions.

2. It should be noted that these Chinese university students are native Chinese speakers who came from a country where Chinese is spoken. They are sometimes referred to as ‘visa students’.

3. Japanese kanji pronunciation can be divided into two types: On-readings derived from the original Chinese pronunciations, and Kun-readings originating from Japanese pronunciations (for details about kanji see Hadamitzky and Spahn 1981; Hirose 1998; Kess and Miyamoto 1999; Miller 1967; Tamaoka 1991). For example, the kanji 海 meaning ‘ocean’ is pronounced /kai/ in its On-reading (or Sino-Japanese) but /umi/ in its Kun-reading. On-readings are frequently used for multiple kanji compound words such as 海岸 /kaigan/ meaning ‘seashore’, 海賊 /kaizoku/ meaning ‘pirate’, and 海藻 /kaisoo/ meaning ‘seaweed’. The Kun-reading frequently appears in isolated kanji, often having a concrete meaning of its own. In the case of 海, this single kanji meaning ‘ocean’ or ‘sea’ is pronounced /umi/ in the Kun-reading. On- and Kun-readings are used distinctly for different words: On-readings for *kango* (Chinese-derived words) and Kun-readings for *wago* (Japanese-based words).

4. Koda (1993) was testing the strengths of different cues (e.g., animacy, case particles, word order) in the competition model (Bates and MacWhinney 1987). Thus, she used the unnatural sentences. See Shirai’s chapter in this volume on the competition model.

5. In her article, the R^2 value of 47.95 is printed in Table IV, which, I assume, must have a mistake in the decimal point.

References

Amano, Shigeaki and Tadahisa Kondo. 1999. *Nihongo no goi tokusei – Shinmitudo [Lexical characteristics of Japanese words – Familiarity]*. Tokyo: Sanseido.

Amano, Shigeaki and Tadahisa Kondo. 2000. *Nihongo no goi tokusei – Shiyōhindo [Lexical characteristics of Japanese words – Frequency]*. Tokyo: Sanseido.

Andreev, Anton. 2002. Burugariajin gakushūsha no nihongo akusento – kēsu sutadī [Word-accent and Bulgarian learners of Japanese: A case study]. *Gengo kagaku ronshū [Journal of Linguistic Science, Tohoku University]* 6. 1–12.

Aoshima, Sachiko, Colin Phillips and Amy Weinberg. 2002. Active filler effects and reanalysis: A study of Japanese *Wh*-scrambling constructions. *University of Maryland Working Papers in Linguistics* 12. 1–24.

Ayusawa, Takako. 1998. Nihongo gakushūsha ni totte no Tōkyō akusento [The Tokyo accent for Japanese learners]. *Gekkan Gengo [Monthly Linguistics]* 27(1). 70–75.

Bates, Elizabeth and Brian MacWhinney. 1987. Competition, variation, and language learning. In Brian MacWhinney (ed.), *Mechanisms of language acquisition*, 157-193. Hillsdale, NJ: Erlbaum.

Bunka-chō [Agency for Cultural Affairs in Japan]. 1978. *Chūgokugo to taiō suru kango [Kanji-compound words corresponding to Chinese]*. Tokyo: Agency for Cultural Affairs in Japan

Bunka-chō [Agency for Cultural Affairs in Japan]. 2011. *Kokunai no nihongo kyōiku no gaiyō [The outline of Japanese language education in Japan]*. Tokyo: Agency for Cultural Affairs in Japan.

Cai, Feng-Xiang and Norio Matsumi. 2009. Chūgokugo o bogo to suru jōkyū nihongo gakushūsha ni okeru nihongo kanji tango no shori katei – dōkongo to hidōkongo o mochiita gengokan puraimingu-hō ni yoru kentō [The processing of kanji words in Chinese proficient learners of Japanese: Using cross-language priming paradigm with cognates and non-cognates]. *Nihongo kyōiku* 141. 13–24.

Chang, Franklin. 2015. The role of learning in theories of English and Japanese sentence processing. In Mineharu Nakayama (ed.), *Handbook of Japanese psycholinguistics*. Boston: De Gruyter Mouton.

Chen, Yu Min. 2002. Nihongo niji kanji goi to sore ni taiō suru chūgokugo niji kanji goi wa onazi ka – Taiwan oyobi chūgoku no chūgokugo to no hikaku [Are two-kanji compounds in Japanese the same as those in Chinese – A comparison with the Chinese language in Taiwan and the mainland China]. *Gengo Bunka to Nihongo Kyōiku [Language Culture and Japanese Education]* 24. 40–53.

Chiu, Hsueh Chin. 2002. Taiwanjin nihongo gakushūsha ni okeru nihongo kanji jukugo no shori katei – Nitchū 2-gengo kan no dōkongo to hi-dōkongo no hikaku [The processing routes of Japanese kanji words for the Taiwanese learners of Japanese: The comparison of cognates and non-cognates between Japanese and Chinese]. *Hiroshima Daigaku Daigakuin Kyōikugaku Kenkyūka Kiyō – Dai 2-bu [Bulletin of Graduate Studies of Education at Hiroshima University – Part 2]* 51. 357–365.

Chiu, Hsueh Chin. 2003. Taiwanjin nihongo gakushūsha no nihongo kanji jukugo no on'in shori nitsuite – tango taipu/tango no shūtoku nenrei/shūzyukudo no kanten kara no kōsatsu [The phonological processing of Japanese kanji words by

Taiwanese learners of Japanese: An analysis of word type, age of acquisition, and fluency level]. *Nihongo Kyōiku [Journal of Japanese Language Teaching]* 116. 89–98.

Chiu, Yu Yuan. 2006. Taiwanjin nihongo gakushūsha ni okeru nihongo tango no chōkakuteki ninchi – Nihongobun no imihandan kadai o mochiita kentō [Auditory recognition of Japanese words in Taiwanese learners of Japanese: Discussion on meaning decision task of Japanese sentences]. *Hiroshima Daigaku Daigakuin Kyōikugaku Kenkyūka Kiyō – Dai 2-bu [Bulletin of Graduate Studies of Education at Hiroshima University – Part 2]* 55. 267–273.

Chiu, Yu Yuan. 2007. Taiwanjin nihongo gakushūsha ni okeru nihongo tango no chōkakuteki ninchi – Dōkongo, hi-dōkongo, hiragana-tango, katakana-tango no hikaku [Auditory recognition of Japanese words in Taiwanese learners of Japanese: Comparison of Chinese-Japanese cognates with non-cognates, hiragana words, and katakana words]. *Nihongo Kyōiku [Journal of Japanese Language Teaching]132.* 108–117.

Chu, Xiang Juan, Katsuo Tamaoka and Yuko Yamato. 2012. Shokyū chūgokujin nihongo gakushūsha no *te*-kei shūtoku [Acquisition of *te*-form by native Chinese speakers learning Japanese at the beginner's level]. *Nihon Kyōka Kyōiku Gakkaishi [The Bulletin of Japanese Curriculum Research and Development]. 35(2).* 63–72.

Clahsen, Harald and Claudia Felser. 2006. Grammatical processing in language learners. *Applied Psycholinguistics* 27. 3–42.

Costa, Albert, Alfonso Caramazza and Núria Sebastián-Gallés. 2000. The cognate facilitation effect: Implications for models of lexical access. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 26(5). 1283–1296.

Cutler, Anne and Takashi Ōtake. 1999. Pitch accent in spoken-word recognition in Japanese. *Journal of the Acoustical Society of America* 105. 1877–1888.

de Groot, Annette M. B., Philip Delmaar and Stephen J. Lupker. 2000. The processing of interlexical homographs in translation recognition and lexical decision: Support for non-selective access to bilingual memory. *Quarterly Journal of Experimental Psychology* 53A. 397–428.

Dijkstra, Tom and Walter J. B. van Heuven. 2002. The architecture of the bilingual word recognition system: From identification to decision. *Bilingualism: Language and Cognition* 5. 175–197.

Djojomihardjo, Muljani, Keiko Koda and Danny R. Moates. 1994. Development of L2 word recognition. In Qicheng Jing, Houcan Zhang and Danling Peng (eds.), *Information processing of Chinese language*.153-161. Beijing: Beijing Normal University Publishing.

Dryer, Matthew S. 2012. Order of subject, object and verb. The world atlas of language structures online. In Matthew S. Dryer and Martin Haspelmath (eds.), Munich: Max Planck Digital Library. [Online] Retrieved on 21 October 2012 from: http://wals.info/chapter/81.

Endo, Shotoku. 1986. Hayawakari chūgoku kantaigi [Quickly understanding of Chinese character simplification]. Tokyo: Kokusho Kankokai.

Fan, Jing and Shao Hua Wu. 2006. Xi'an waiguoyu xueyuan 2002 ji 2003 nian riyu zhuanye kaoshi jieguo fenxi [Results of the Japanese specialized test at the Xi'an International Studies University in 2002 and 2003]. *Shanxi shifan daxue xuebao (Zhexue shehui kexueban) [Journal of Shanxi Normal University (Philosophy and Social Sciences Edition)]* 35. 415–419.

Fukuoka, Masako. 2008. Kankokujin nihongo gakushūsha no akusento shūtoku ni okeru bogo kanshō: Gotō haretsuon o fukumu go no akusento [Interference of the mother tongue on acquisition of Japanese accent by native Korean speakers learning Japanese: An accent of words including an explosive sound at word initial position], *Mie daigaku kokusai kōryū sentā kiyō [Bulletin of the Center for International Education and Research at Mie University]* 3. 45–59.

Green, David. W. 1998. Mental control of the bilingual lexico-semantic system. *Bilingualism: Language and Cognition* 1. 67–81.

Hadamitzky, Wolfgang and Mark Spahn. 1981. *Kanji and kana: A handbook and dictionary of the Japanese writing system*. Tokyo: Charles E. Tuttle Company.

Hattori, Shiro. 1951. *Onsei-gaku [Phonology]*. Tokyo: Iwanami Shoten.

Hawkins, Roger. 2001. *Second language syntax: A generative introduction.* Malden, MA: Blackwell Publishing.

Hayakawa, Kyoko. 2010. Chūgokugo o bogo to suru nihongo gakushūsha ni yoru kanjigo no on'in shori [Phonological processing of kanji compounds by native

Chinese speakers learning Japanese]. *Nitchū Gengo Kenkyū to Nihongo Kyōiku [Journal of Japanese and Chinese Linguistics and Japanese Language Education]*. 3. 100–110.

Hayakawa, Kyoko and Katsuo Tamaoka. 2012. Chūgokujin/Kankokujin nihongo gakushūsha ni yoru chōkaku/shikaku-teiji no gengokan-dōkeidōgi/gengokan-ikeidōgi no niji kanjigo no shori [Processing of auditory- and visually-presented orthographically/semantically similar and different two-kanji compound words by native Chinese and Korean speakers learning Japanese]. *Koide kinen nihongo kyōiku kenkyūkai ronbunshū [Koide Memorial Journal of Japanese Language Education]*. 20. 17–32

Hayata, Teruhiro. 1999. *Onchō no taiporojī [Typology of tones].* Tokyo: Taishukan Shoten.

He, Yuan Jian. 2000. Di 7 zhang: Yiwenci yiwei yu hanyu yiwenci de yufa fenbu [Chapter 7: *Wh*-movements and phrasal rules of Chinese questions]. In Yang Shen, Yuanjian He, and Yang Gu (eds.), *Shengcheng yufa lilun yu hanyu yufa yanjiu [The theory of generative grammar and the study of Chinese grammar],* 159–190. Haerbin, China: Heilongjiang Jiaoyu Chubanshe.

Hirayama, Teruo. 1957. *Nihongo Onchō no kenkyū [Study on Japanese accents]*. Tokyo: Meiji Shoin.

Hirayama, Teruo. 1968. *Nihongo no hōgen [Dialects in Japan]*. Tokyo: Kodansha.

Hirose, Hitoshi. 1998. Identifying the On- and Kun-readings of Chinese characters: Identification of On versus Kun as a strategy-based judgment. In Chen Kan Leong and Katsuo Tamaoka (eds.), *Cognitive processing of the Chinese and the Japanese languages*, 375–394. Dordrecht, Netherlands: Kluwer Academic Publishers.

Hishinuma, Toru. 1983. Nihongo to chūgokugo no jōyō jitai [commonly-used kanji in Japanese and Chinese]. *Chūgoku Kenkyū Geppō [Monthly-journal of Chinese studies]* 428. 1–20.

Hishinuma, Toru. 1984. chūgokugo no hyōjun jitai to nihon no jōyō jitai [The standard orthography in Chinese and the common orthography in Japanese]. *Nihongogaku [Japanese Linguistics]* 3. 32–40.

Hong, Lin. 2010. *Jichu riyu zonghe jiaocheng 1 [Basic Japanese general course 1]*. Beijing, China: Gaodeng Jiaoyu Chubanshe.

Hong, Shu Juan. 2004. Kikitori no purosesu ni okeru kanji no eikyō – Taiwanjin nihongo gakushūsha (dikuteishon bunseki) o chūshin ni [Effects of kanji for listening process – focusing on Taiwanese learning Japanese (dictation analysis)]. *Tsukuba Daigaku Chiiki Kenkyū [Area Studies Tsukuba]* 22. 155–176.

Horiba, Yukie and Junko Matsumoto. 2008. Bunmyakubun no fukuzatsusa ga bunpō kōmoku no rikai ni oyobosu eikyō: Bogo haikei no kotonaru dai-2 gengo gakushūsha no hikaku kara [Effects of syntactic complexity on comprehension of sentences with contexts: From a comparative study of the second language learners with different backgrounds of mother tongues]. *Scientific approaches to languages (Kanda gaigo daigaku gengo kenkyū sentā kiyō [The Bulletin of the Center for Language Sciences, Kanda University of International Studies])* 7. 181–207.

Hu, Marrcella Hsuch-chao and Nation I. S. Paul. 2000. Unknown vocabulary density and reading comprehension. *Reading in a foreign language* 13. 403–430.

Huang, C-T. James. 1981. Move *wh* in a language without *wh*-movement. *Linguistic Review* 82(1). 369–416.

Ishida, Toshiko. 1986. Eigo chūgokugo, kankokugo kenbetsu nihongoryoku no bunseki [Analysis of Japanese proficiency among areas of English, Chinese and Korean]. *Nihongo Kyōiku [Journal of Japanese Language Teaching]* 58. 162–194.

Iwata, Rei. 2001. Chūgokugo no seichō to akusento [Chinese tones and accents]. *Onsei Kenkyū [Journal of the Phonetic Society of Japan]* 5(1). 18–27.

Japan Foundation [Kokusai Kōryū Kikin] and Japan Educational Exchange and Services [Nihon Kokusai Kyōiku Shien Kyōkai]. 2002. *Nihongo nōryoku shiken shutsudai kijun - kaiteiban [The production standard of Japanese proficiency tests – Revised version].* Tokyo: Japan Foundation and Japan Educational Exchange and Services.

Japan Foundation [Kokusai Kōryū Kikin]. 2011. *Kaigai no nihongo kyōiku no genjō: Nihon-go kyōiku kikan chōsa 2009 – Gaiyō [Demographic figures of Japanese language education outside of Japan: A survey on institutes of Japanese language education in 2009 - Summary]*. Tokyo: Japan Foundation.

Kaiho, Hiroyuki and Yukimura Nomura. 1983. *Kanji jōhō shori no shinrigaku [Psychology of kanji information processing]*. Tokyo: Kyoiku Shuppan.

Kayamoto, Yuriko. 1995a. *Nihongo kanji no yomi ni oyobosu bogo no on'in jōhō no eikyō – chūgokugo bogo washa no baai [Effects of phonological information from mother-tongue in pronouncing Japanese kanji – A case study of native Chinese speakers]*. Hiroshima: Hiroshima University MA thesis.

Kayamoto, Yuriko. 1995b. Dōitsu kanji ni okeru chūgokugoon to nihongo no on'yomi no ruijido ni kansuru chōsa [Similarities and differences between readings of Chinese characters and On-readings of Japanese kanji]. *Hiroshima Daigaku Nihongo Kyōikugakka Kiyō [Bulletin of Graduate School of the Japanese Language Education at Hiroshima University]* 5. 67–75.

Kayamoto, Yuriko.1996. Nihongo kanji to chūgokugo kanji no keitaiteki/on'inteki sai ga chūgokugo bogowasha ni yoru nihongo kanji no yomi ni oyobosu eikyō [Effects of orthographic/semantic differences between Chinese characters and Japanese kanji on naming Japanese kanji by native Chinese speakers]. *Hiroshima Daigaku Kyōiku Gakubu Kiyō [Bulletin of Department of Education at Hiroshima University]* 45. 345–352.

Kayamoto, Yuriko. 2000. Nihongo o gakushūsuru chūgokugo bogo washa no kanji no ninchi [Processing phonological information: Recognition of Japanese characters by advanced- and superior-level native speakers of Chinese]. *Kyōiku Shinrigaku Kenkyū [Journal of Educational Psychological Research]* 48. 315–322.

Kayamoto, Yuriko. 2002. Goi handan kadai to meimei kadai ni okeru chūgokugo bogo washa no nihongo kanji akusesu [Lexical access to Japanese kanji by native speakers of Chinese: Evidence from lexical decision and naming task]. *Kyōiku Shinrigaku Kenkyū (Journal of Educational Psychology)*. 50. 436–445.

Kess, Joseph F. and Tadao Miyamoto 1999. *The Japanese mental lexicon: Psycholinguistic studies of kana and kanji processing*. Philadelphia, PA: John Benjamins Publishing Company.

Kim, Mi-Ryoung and San Duanmu. 2004. "Tense" and "lax" stops in Korean. *Journal of East Asian Linguistics* 13. 59–104.

Kindaichi, Haruhiko. 1974. *Kokugo akusento no shiteki kenkyū – Genri to hōhō [Historical study of Japanese accent – Principle and method]*. Tokyo: Hanawa Shobo.

Kitahara, Mafuyu. 2006. Akusento tairitsu no bunpu ni tsuite [On the distribution of accentual oppositions]. *Bunpō to onsei [Speech and Grammar]* 5. 147–158.

Koda, Keiko. 1993. Transferred L1 strategies and L2 syntactic structure in L2 sentence comprehension. *The Modern Language Journal* 77. 490–500.

Koda, Keiko. 2005. *Insights into second language reading: A cross-linguistic approach*. New York: Cambridge University Press.

Koizumi, Masatoshi. 2015. Experimental syntax: word order in sentence processing. In Mineharu Nakayama (ed.), *Handbook of Japanese psycholinguistics*. Boston: De Gruyter Mouton.

Koizumi, Masatoshi and Katsuo Tamaoka. 2004. Cognitive processing of Japanese sentences with ditransitive verbs. *Gengo Kenkyū* 125. 173–190.

Koizumi, Masatoshi and Katsuo Tamaoka. 2006. Bun kaiseki jikken ni yoru nihongo fukusirui no gojun no hantei [Determination of basic word order of adverbs in Japanese by a sentence-processing experiment]. *Ninchi Kagaku [Cognitive Studies]* 13. 392–403.

Koizumi, Masatoshi and Katsuo Tamaoka. 2010. Psycholinguistic evidence for the VP-internal subject position in Japanese. *Linguistic Inquiry* 41. 663–680.

Kokuritsu Kokugo Kenkyūjo [National Institute for Japanese Language and Linguistics] . (1964). *Gendai zasshi kyūjūsshu no yōgo yōrei dai-3 bunsatsu bunseki* [Usages and examples in 90 different modern journals: The 3rd separate volume - analysis]. Tokyo: Shuei Shuppan.

Komori, Kazuko. 2005. Daini gengo toshite no nihongo no bunshōrikai ni okeru daiichi gengo no tango ninchi shori hōryaku no ten'i – shikaku nyūryoku to chōkaku nyūryoku no sōi o chūshin ni [Transfer of a word recognition processing strategy of the first language on text understanding of Japanese as a second language – Focusing on differences between visual input and auditory input]. *Yokohama kokuritsu daigaku ryūgakusei sentā kiyō [Journal of the International Student Center]* 12. 17–39.

Komori, Kazuko and Katsuo Tamaoka. 2010. Chūgokujin nihongo gakushūsha niyoru dōkei ruigigo no ninchi shori [The cognitive processing of lexical homographs by native Chinese speakers learning Japanese]. *Lexicon Forum,* 5. 165-200.

Komori, Kazuko, Junko Mikuni and Atsuko Kondo. 2004. Bunshō rikai o sokushin suru goi chishiki no ryōteki sokumen – kichigo ritsu no ikichi tansaku no kokoromi [What percentage of known words in a text facilities reading comprehension?: A case study for exploration of the threshold of known words coverage]. *Nihongo Kyōiku [Journal of Japanese Language Teaching]* 120. 83–92.

Kubozono, Haruo and Satoshi Ota. 1998. *On'in kōzō to akusento [Phonological structure and accents]*. Tokyo: Kenkyusha.

Lamers, Monique and Helen de Hoop. 2005. Animacy information in human sentence processing: An incremental optimization of interpretation approach. Henning Christiansen, Peter Rossen Skadhauge and Jørgen Villadsen (eds.), *Constraint solving and language processing - Lecture notes in computer science volume 3438*, 158–171, Berlin: Springer.

Lee, Wood Hung, Ken'ichiro Murashima and Yasuhiro Shirai. 2006. Prosodic development in the acquisition of Japanese: A longitudinal study of three native speakers of Chinese. *Nihongakukan [Journal of Japan Studies]* 10. 38–51.

Leong, Che Kan. 1986. What does accessing a morphemic script tell us about reading and reading disorders in an alphabetic script? *Annals of Dyslexia* 36. 82–102.

Lin, Jo-Wang. 1998. On existential polarity *wh*-phrases in Chinese. *Journal of East Asian Linguistics* 7. 219–255.

Liu, Jia Qi. 2010. Chūgokugo bogo washa (pekin to shanhai shusshinsha) ni yoru fukugō dōsi no Tōkyō akusento no shūtoku [A study on the acquisition of Japanese accent of compound verbs by Chinese speaking learners (from Beijing and Shanghai)]. *Waseda nihongo kyōikugaku [the Study of Japanese Education in Waseda]* 8. 15–28.

Matsunaga, Sachiko. 1999. The role of kanji knowledge transfer in acquisition of Japanese as a foreign language. *Japanese-Language Education around the Globe,* 9. 87–100.

Mazuka, Reiko, Kenji Itoh and Tadahisa Kondo. 2002. Costs of scrambling in Japanese sentence processing. In Mineharu Nakayama (ed.), *Sentence processing in East Asian languages,* 131–166. Stanford, A: CSLI Publications.

Miller, Roy Andrew. 1967. *The Japanese language*. Chicago, IL: The University of Chicago Press.

Miyamoto, Edson T. and Shoichi Takahashi. 2002. Sources of difficulty in the processing of scrambling in Japanese. In Mineharu Nakayama (ed.), *Sentence processing in East Asian languages,* 167–188. Stanford, CA: CSLI Publications.

Miyaoka Yayoi, Katsuo Tamaoka and Hiromu Sakai. 2011. Nihongo goi tesuto no kaihatsu to shinraisei: Chūgokugo o bogo tosuru nihongo gakushūsha no dēta ni yoru tesuto hyōka [Development of reliability of Japanese lexical knowledge test: Test evaluation by data taken from native Chinese speakers learning Japanese]. *Hiroshima Keizai Daigaku Kenkyū Ronshū [Bulletin of Hiroshima University of Economic]* 34(1). 1–18.

Morrison, Catriona M. and Andrew W. Ellis. 1995. Roles of word frequency and age of acquisition in word naming and lexical decision. *Journal of Experimental Psychology: Learning, Memory and Cognition* 21. 116–133.

Nagatomo, Kazuhiko. 1997. Dōsi *te*-kei ni kakawaru on'in kisoku no shūtoku to gengo no fuhensei [Acquisition of phonological rules involved in the verbal *te*-form]. *Daini gengo to shite no nihongo no shūtoku kenkyū [Acquisition of Japanese as a Second Language]* 1. 1–8.

Nakato, Yasue. 2001. Tango yomiage ni okeru kankokujin nihongo gakushūsha no pitchi jitsugen [Pitch realization of sounding words by Korean learners of Japanese]. *Nihongo kyōiku [Japanese Language Education]* 109. 80–89.

Nation, I. S. Paul. 2001. *Learning vocabulary in another language.* Cambridge: Cambridge University Press.

Nishinuma, Yukihiro. 1994. How do the French perceive tonal accent in Japanese? Experimental evidence. *Proceedings of the fourth international conference on spoken language processing (ICSLP)*. Philadelphia, USA, 646–649.

Otake, Takashi and Anne Cutler. 1999. Perception of suprasegmental structure in a nonnative dialect. *Journal of Phonetics* 27. 229–253.

Otake, Takashi. 2002. A role of prosody in spoken-word recognition. *Journal of the Phonetics Society of Japan* 6(2). 56–65.

Pan, Shou-Jun. 2011. *Jichu riyu zonghe jiaocheng 2 [Basic Japanese general course 2]*. Beijing, China: Gaodeng Jiaoyu Chubanshe.

Pan, Xin Ying. 2003. Taiwanjin no nihongo akusento chikaku ni okeru shoyōin [Factors in Japanese accent perception by Taiwanese]. *Tsukuba ōyō gengogaku kenkyū [Study of Applied Linguistics in Tsukuba]* 10. 83–96.

Saito, Sumio. 2006. *Nihongo onseigaku nyuūmon – kaiteiban [Introduction to Japanese phonology – Revised version]*. Tokyo: Sanseido.

Sakamoto, Tadashi. 1993. Eigo washa ni okeru '*te*-kei' keiseikisoku no shūtoku ni tsuite [Acquisition of *te*-form constructing rules by native English speakers]. *Nihongo Kyōiku [Journal of Japanese Language Teaching]* 80. 125–135.

Sakamoto, Tsutomu. 2002. Processing filler-gap constructions in Japanese. In Mineharu Nakayama (ed.), *Sentence processing in East Asian languages,* 189–221. Stanford, CA: CSLI Publications.

Sawasaki, Koichi. 2006. *L2 reading by learners of Japanese: A comparison of different L1s.* Columbus, OH: The Ohio State University dissertation.

Sekiguchi, Takahiro. 2006. Effects of lexical prosody and word familiarity on lexical access of spoken Japanese words. *Journal of Psycholinguistic Research* 35. 369–384.

Shibata, Takeshi and Ritei Shibata. 1990. Akusento wa dōongo o donoteido benbetsu shiuru no ka?: Nihongo, eigo, chūgokugo no baai [How much can accent distinguish homophones?: cases of Japanese, English and Chinese]. *Keiryō Kokugogaku [Mathematical Linguistics]* 17. 317–327.

Shirai, Yasuhiro. 2015. L2 acquisition of Japanese. In Mineharu Nakayama (ed.), *Handbook of Japanese psycholinguistics*. Boston: De Gruyter Mouton.

Stahl, Steven A. and William E. Nagy 2006. *Teaching word meanings*. Mahwah, NJ: Lawrence Erlbaum Associates.

Sugito, Miyoko. 1982. *Nihongo no akusento kenkyū [The study on Japanese accents]*. Tokyo: Sanseido.

Sugito, Miyoko. 1989. *Hana to hana [Nose and flower]*. Osaka, Japan: Izumi Shoin.

Sugito, Miyoko. 2006. *Nihongo onseigaku nyūmon – kaiteiban [Introduction to Japanese phonology – Revised version].* Tokyo: Sanseido.

Sugito, Miyoko. 2012. *Nihongo no akusento, eigo no akusento [Japanese accent and English accent].* Tokyo: Hituzi Syobo.

Sukegawa, Yasuhiko. 1999. Burajirujin nihongo gakushūsha no 2-mōra to 3-mōra go no pitchi jitsugen [Pitch realization of 2/3-mora-words by Brazilian learners of Japanese]. *Onsei Kenkyū [Journal of the Phonetic Society of Japan]* 3(3). 13–35.

Tamaoka, Katsuo. 1991. Psycholinguistic nature of the Japanese orthography. *Gengo Bunka Kenkyū [Studies in Language and Literature]* (Matsuyama University). 11(1). 49–82.

Tamaoka, Katsuo. 1997. Chūgokugo to eigo o bogo tosuru nihongo gakushūsha no kanji oyobi kana hyōki goi no shori hōryaku [The processing strategy of words presented in kanji and kana by Chinese and English speakers learning Japanese]. *Gengo Bunka Kenkyū [Studies in Language and Literature]* (Matsuyama University) 17(1). 65–77.

Tamaoka, Katsuo. 2000. Chūgokugo oyobi eigokei nihongo gakushūsha no bogo no hyōki keitai ga nihongo no on'inshori ni oyobosu eikyō [The effects of mother-tongue scripts on the phonological processing of the Japanese language by Chinese and English speakers]. *Dokusho Kagaku [The Science of Reading]* 44(3). 83–94.

Tamaoka, Katsuo. 2005. Chūgokugo o bogo tosuru nihongo gakushūsha niyoru seijun/kakimaze gojun no nōdōbun to kanōbun no rikai [Comprehension of Japanese active and potential sentences with canonical and scrambled word orders by native Chinese speakers learning the Japanese language]. *Nihongo Bunp*ō *[Japanese Grammar]* 5(2). 92–109.

Tamaoka, Katsuo, Kim Kirsner, Yushi Yanase, Yayoi Miyaoka and Masahiro Kawakami. 2002. A web-accessible database of characteristics of the 1,945 basic Japanese kanji. *Behavior Research Methods, Instruments, & Computers* 34. 260–275.

Tamaoka, Katsuo, Hiromu Sakai, Jun Kawahara, Yayoi Miyaoka, Hyun Jung Lim and Masatoshi Koizumi. 2005. Priority information used for the processing of Japanese sentences: Thematic roles, case particles or grammatical functions? *Journal of Psycholinguistic Research* 34. 273–324.

Tamaoka, Katsuo and Marcus Taft. 2010. The sensitivity of native Japanese speakers to On and Kun kanji readings. *Reading and Writing* 23. 957–968.

Tamaoka, Katsuo, Hsueh Chin Chiu, Yayoi Miyaoka and Sachiko Kiyama. 2010. Chūgokugo o bogo to suru nihongo gakushūsha ni yoru kakimaze gojun no bunrikai: Chōkai nōryoku de waketa jōi, chūi, kai gun no hikaku [Understanding of sentences with scrambled word order by native Chinese speakers learning Japanese: Comparisons of higher, middle, and lower groups divided by listening comprehension]. *Nihongo Bunpō [Japanese Grammar]* 5(2). 92–109.

Tamaoka, Katsuo and Sachiko Kiyama. 2013. The effects of visual complexity for Japanese kanji processing with high and low frequencies. *Reading and Writing* 26. 205–223.

Trenkic, Danijela. 2002. Form-meaning connections in the acquisition of English articles. *The EUROSLA (European Second Language Association) Yearbook* 2. 115–133.

Taylor, Becky. 2011a. Variability and systematicity in individual learners' Japanese accent. *Pozanan Studies in Contemporary Linguistics* 47. 146–158.

Taylor, Becky. 2011b. Do English learners of Japanese produce isolated nouns with standard Japanese lexical accent? *Second Language* 10. 15–31.

Taylor, Becky. 2012. *Eigo washa ni yoru nihongo no go-akusento no shūtoku [The acquisition of Japanese lexical accent by English speakers].* Nagoya, Japan: Nagoya University dissertation.

Toda, Takako. 1999. Nihongo gakushūsha ni yoru gairaigo shiyō no jittai to akusento shūtoku ni kansuru kōsatu – Eigo, chūgokugo kankokugo washa no kaiwa dēta ni motozuite [Usage and acquisition of accent of English loanwords by Japanese learners: An analysis based on conversational data from English, Chinese and Korean Speakers]. *Bungei gengo kenkyū – Gengo-hen [The Journal of Literature and Language Studies – Language]* 36. 89–111.

Vance, Timothy J. 2008. *The sounds of Japanese.* Cambridge, UK: Cambridge University Press.

van Heuven, Walter. J. B., Tom Dijkstra and Jonathan Grainger. 1998. Orthographic neighborhood effects in bilingual word recognition. *Journal of Memory and Language* 39. 458–483.

van Heuven, Walter J. B., Herbert Schriefers, Tom Dijkstra and Peter Hagoort. 2008. Language conflict in the bilingual brain. *Cerebral Cortex* 18. 2706–2716.

Verdonschot, Rinus G., Wido La Heij, Katsuo Tamaoka, Sachiko Kiyama, Wen Ping You and Niels O. Schiller. 2013. The multiple pronunciations of Japanese kanji: a masked priming investigation. *Quarterly Journal of Experimental Psychology.* On-line first.

White, Lydia. 2003. *Second language acquisition and Universal Grammar.* Cambridge UK: Cambridge University Press.

Xu, Bao Hua and Zhen Zhu Tang. 1988. *Shanghaishiqu fangyan zhi [A study on the Shanghai dialect].* Shanghai, China: Shanghai Jiaoyu Chubanshe [Shanghai Educational Publishing].

Yamashita, Hiroko. 2008. Effects of sentence processing strategy proximity on the comprehension of second languages. *Second Language* 7. 43–82.

Yamato, Yuko and Katsuo Tamaoka. 2009. Chūgokujin nihongo gakushūsha no nihongo kanjigo no shori ni okeru bogo no eikyō [Effects of mother tongue by native Chinese speakers learning Japanese on processing kanji-compound words]. *Kotoba no kagaku [The Science of Languages]* 22. 117–135.

Yamato, Yuko and Katsuo Tamaoka. 2013. Chūgokugo bogowasha to kankokugo bogowasha no nihongo tekisuto no yomi shori ni okeru bogo to no gengoteki ruijisei no eikyō [Effects of linguistic similarity on Japanese text processing by native Chinese and Korean speakers]. *Koide kinen nihongo kyōiku kenkyūkai ronbunshū [Koide Memorial Journal of Japanese Language Education]* 21. 229–268.

Yang, Wen Jin. 2011. Taiwanjin nihongo gakushūsha no akusento: Akusento no jittai/shūtoku ni kakawaru yōin kyōiku e no yōbō [Accents of Taiwanese learning Japanese: Situation of accent acquisition, its factors and educational implement]. *Hōgen onsei kenkyū [Dialect and Phonetic Studies]* 5. 1–16.

Yin, Song. 2002. Patān gakushū wa rikai o sokushin saseruka – rajio nyūsu no chōkai no baai [Does pattern teaching improve students' listening comprehension?: The case of radio news comprehension]. *Nihongo Kyōiku [Journal of Japanese Language Teaching]* 112. 35–44.

Yokosawa, Kazuhiko and Michio Umeda. 1988. Processes in human Kanji-word recognition. *Proceedings of the 1988 IEEE International Conference on Systems, Man, and Cybernetics* 377–380. August 8-12, Beijing and Shenyang, China.

You, Ru Jie. 2004. *Hanyu fangyanxue jiaocheng [A study on Chinese dialects]*. Shanghai, China: Shanghai Jiaoyu Chubanshe [Shanghai Educational Publishing].

Zevin, Jason D. and Mark S. Seidenberg. 2002. *Age of acquisition effects in word reading and other tasks. Journal of Memory and Language* 47. 1–29.

Zhang, Hui-Fen. 2011. *Jichu riyu zonghe jiaocheng 3 [Basic Japanese general course 3]*. Beijing, China: Gaodeng Jiaoyu Chubanshe.

Zhao, Hua-Min. 2012. *Jichu riyu zonghe jiaocheng 4 [Basic Japanese general course 4]*. Beijing, China: Gaodeng Jiaoyu Chubanshe.

Zhou, Ping and Xiao-Fen Chen. 2009. *Xin bian riyu 1 [A newly-edited Japanese language 1]*. Shanghai, China: Shanghai Waiyu Jiaoyu Chubanshe.

Zhou, Ping and Xiao-Fen Chen. 2010. *Xin bian riyu 2 [A newly-edited Japanese language 2]*. Shanghai, China: Shanghai Waiyu Jiaoyu Chubanshe.

Zhou, Ping and Xiao-Fen Chen. 2011a. *Xin bian riyu 3 [A newly-edited Japanese language 3]*. Shanghai, China: Shanghai Waiyu Jiaoyu Chubanshe.

Zhou, Ping and Xiao-Fen Chen. 2011b. *Xin bian riyu 4 [A newly-edited Japanese language 4]*. Shanghai, China: Shanghai Waiyu Jiaoyu Chubanshe.