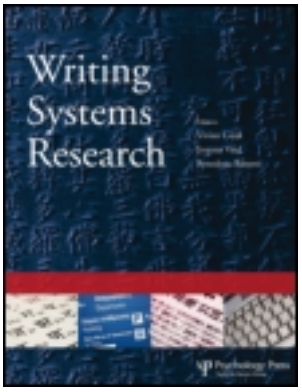

Writing Systems Research
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/pwsr20

How do native Chinese speakers learning Japanese as a second language understand Japanese kanji homophones?

Katsuo Tamaoka [a] , Sachiko Kiyama [a] & Xiang-Juan Chu [a b]
[a] Graduate School of Languages and Cultures, Nagoya University, Nagoya-shi, Japan
[b] Department of Japanese Studies, Tianjin Foreign Studies University, Tianjin, China
Version of record first published: 01 Jun 2012.

To cite this article: Katsuo Tamaoka , Sachiko Kiyama & Xiang-Juan Chu (2012): How do native Chinese speakers learning Japanese as a second language understand Japanese kanji homophones?, Writing Systems Research, 4:1, 30-46

To link to this article: http://dx.doi.org/10.1080/17586801.2012.690008

WRITING SYSTEMS RESEARCH
2012, 4 (1), 30–46

Psychology Press
Taylor & Francis Group

How do native Chinese speakers learning Japanese as a second language understand Japanese kanji homophones?

Katsuo Tamaoka[1], Sachiko Kiyama[1], and Xiang-Juan Chu[1,2]

[1]Graduate School of Languages and Cultures, Nagoya University, Nagoya-shi, Japan
[2]Department of Japanese Studies, Tianjin Foreign Studies University, Tianjin, China

The present study investigated causal relations between lexical/grammatical knowledge and the ability to make homophonic distinctions among 170 native Chinese speakers learning Japanese as a second language (L2). The result of a structural equation modelling (SEM) analysis indicated that the ability to distinguish homophones depending on sentential context was strongly affected by grammatical knowledge, though not by lexical knowledge. Therefore, grammatical knowledge greatly assists Chinese learners of L2 Japanese to identify the specific homophone appropriate in a sentential context among multiple candidates.

Keywords: Japanese kanji; Homophone; Chinese native speakers learning Japanese.

Learning to read a second language (L2) seems to be much easier when L2 uses symbols similar to those of the writing system of the first language (L1). As a major part of the writing system, the Japanese language has adapted Chinese characters, called *kanji* in Japanese. As a result, due to the application of their knowledge of Chinese characters, native Chinese speakers learning Japanese as a second language seem to be able to process Japanese kanji more quickly than native English speakers who use the alphabet script (e.g., Tamaoka, 1997, 2000). There are at least three times as many homophones in Japanese as in Chinese (Mochizuki, 1981), so that the correct word usually must be identified with the help of the kanji script (Tamaoka, 1991; Tamaoka & Makioka, 2004a). Thus, like native Japanese speakers, native Chinese speakers learning Japanese (hereafter, Chinese learners of L2 Japanese) make homophonic errors as they learn many words written in kanji. They experience difficulties avoiding the *homophonic trap* embedded in the Japanese writing system. The present study therefore tested Chinese learners of L2 Japanese to investigate which factors affect their ability to identify the specific homophone among multiple candidates that fit into a Japanese sentence.

Correspondence should be addressed to Katsuo Tamaoka, Graduate School of Languages and Cultures, Nagoya University, Furo-cho, Chikusa-ku, Nagoya-shi, Aichi-ken 464-8601, Japan. E-mail: ktamaoka@lang.nagoya-u.ac.jp

http://www.tandfonline.com/pwsr http://dx.doi.org/10.1080/17586801.2012.690008

KANJI ORTHOGRAPHY-AND-PHONOLOGY MAPPING AND KANGO AND WAGO HOMOPHONES

The writing system for the modern Japanese language consists of the *kanji* and *kana* scripts. Kanji are morphological units adapted from Chinese. In contemporary Japanese, kanji represent not only lexical items originated from Chinese (*Kango*) but also native Japanese vocabulary (*Wago*) created by Japanese speakers. Two-kanji compound words are extremely common, making up approximately 70% of the entries in a typical Japanese dictionary (Yokozawa & Umeda, 1988).

The kana script further consists of two sets, *hiragana* and *katakana*. The hiragana script is cursive in shape and used for grammatical morphemes as well as for some content words. The katakana script is angular in shape, and usually used for writing loanwords from languages written with alphabets, as well as the names of animals and plants. The hiragana and katakana scripts fundamentally describe Japanese sounds on the basis of *mora*-to-kana correspondence. Three scripts of kanji, hiragana, and katakana are simultaneously used in modern written Japanese texts.

Mochizuki (1981) counted type frequency of homophones listed in a Japanese dictionary, *Shin-meikai Kokugo-jiten* [New Coherent Japanese Dictionary] published in 1972. He found 21,270 homophones out of the total of 58,431 words, or 36.40%. In contrast, using a Chinese dictionary, *Hanyu Pinyin Cihui* [Chinese Pinyin Dictionary] published in 1963, Mochizuki counted 5,249 homophones out of the total of 45,200 words, or 11.61%. This includes the use of tonal differences to distinguish homophones. Thus, although the percentages of homophones identified by Mochizuki among Japanese and Chinese words are not directly comparable, it may allow us to estimate that there are approximately three times as many homophones in Japanese as in Chinese.

From the point of view of mapping between orthography and phonology, we will consider two directions for kanji mappings. First is the direction from orthography to phonology. A single Japanese kanji often has two different types of readings or pronunciations: *On*-readings derived from the original Chinese pronunciation and *Kun*-readings originating from the Japanese pronunciation (see Hirose, 1992; Kess & Miyamoto, 1999; Leong & Tamaoka, 1995; Tamaoka, 1991; Tamaoka & Makioka, 2004b). As depicted in Figure 1, the kanji 星 meaning "stars" is pronounced *hoshi* in Kun-reading and *see* or *shoo* in On-reading. Kun-readings frequently appear as a single kanji, often having a concrete meaning by themselves. In contrast, On-readings are generally used for multiple-kanji compound words such as 星座 *see za* meaning "constellation", 衛星 *ee see* "satellite", and 星条旗 *see joo ki* "the Stars and Stripes". Kun-reading is also occasionally used for multiple-kanji compounds as in 星空 *hosi zora* "a starry sky".

In a recent experiment, Tamaoka and Taft (2010) presented kanji that are given an On-reading around 50% of the time. These kanji were presented in a context of other kanji that had either a highly dominant On-reading or a highly dominant Kun-reading. The kanji reading was very much biased towards the type of phonological environment in which it was embedded. Native Japanese speakers easily shifted between On- and Kun-readings, depending on phonological context, suggesting that separate On and Kun sublexica exist within the phonological lexicon. Generally speaking, On-readings are used for Kango while Kun-readings are used for Wago. As such, a single kanji is mapped into multiple phonological units of On and Kun sublexica, as depicted in Figure 1.

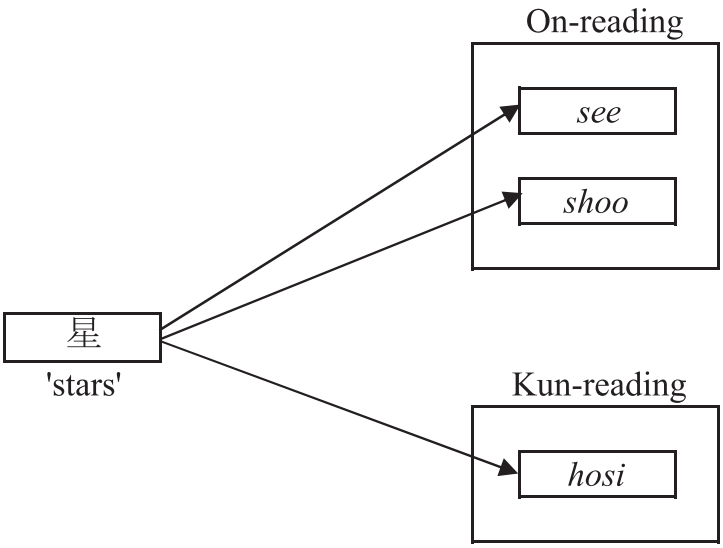

Figure 1. Kanji orthography to phonology mapping.

The second mapping direction is from phonology to orthography. The standard Mandarin form of Chinese has the four tones, which greatly contribute to distinguish multiple homophones. However, the Japanese sound system does not have tones to differentiate homophones. The Japanese pitch accent may help identify a word, but it varies depending on dialect, so pitch is often unreliable for this purpose. Different ways of pronouncing kanji were borrowed from China during various periods (Miller, 1967; Saito, Inoue, & Nomura, 1979). Consequently, different pronunciations simultaneously exist in the pronunciation of kanji used in modern Japanese. In simplifying pronunciations of the Chinese tones and adapting three different ways of pronouncing forms borrowed from China, the Japanese language created a great number of kanji whose On-readings are homophonic. As shown in Figure 2, a mora or syllable is mapped into multiple kanji. For instance, according to Tamaoka, Kirsner, Yanase, Miyaoka, and Kawakami (2002), a sound *koo* (which consists of two morae, *ko* and *o*, or a single syllable *koo*) can be written with 65 different kanji among the *Jyoyoo Kanji* (旧常用漢字, the list of 1,945 commonly used kanji formerly used in public education), including one Kun-reading. In the same way, a single mora sound *ka* can be written with 37 different kanji, including three Kun-readings.

A two-kanji compound word *kooka* is made by combining the two sound units *koo* and *ka* as shown in Figure 2. This combined sound *kooka* can represent at least eight relatively high-frequency two-kanji compound Kango words, as depicted in Figure 3: 校歌 (school song), 高価 (expensive price), 工科 (technological faculty), 硬化 (calcification), 効果 (effect), 硬貨 (coin), 降下 (descent), and 高架 (elevated). These compound words are all On-reading combinations.

Homophones are also seen in Wago. For example, as depicted in Figure 4, *toru* can be written using at least eight different kanji as 採る "wild-craft" or "adapt", 取る "take", 撮る "take (a picture)", 盗る "steal", 録る "record", 捕る "catch", 摂る "consume", and 執る "administer". Meanings of these homophones are distinguished by the orthographic aspect of kanji, which carry concepts. However, it is context that determines which of the homophones fits in a certain sentence.

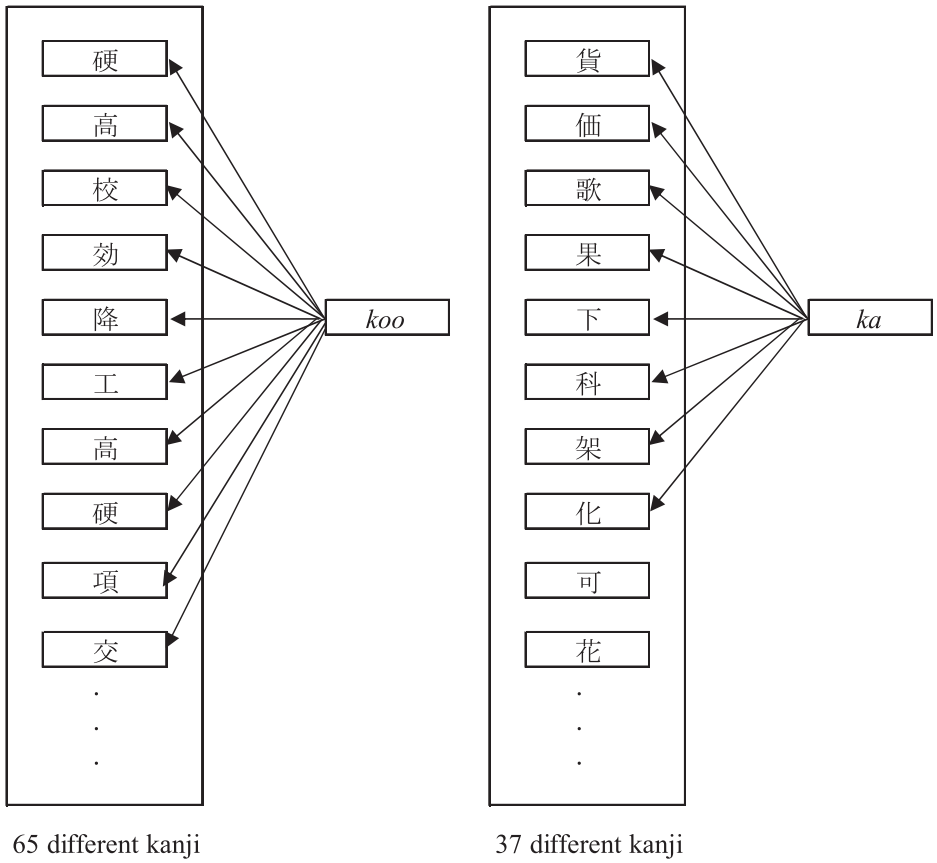

Figure 2. Kanji phonology to orthography mapping.

In the present study, kanji homophones are defined as the same sound shared by different kanji, regardless of verb inflections. For instance, 付く *tsuku* is an intransitive verb while 付ける *tsukeru* is a transitive verb. These words inflect differently, 付く (*tsuk+u*) inflects as a *godan* verb while 付ける (*tsuke+ru*) as an *ichidan* verb. For this study, however, since both verbs share the same kanji 付, they are considered as (kanji) homophones. In fact, test items used by the Japan Association for Testing Japanese Kanji Abilities (Nihon Kanji Nooryoku Kentei Kyookai, 日本漢字能力検定協会) similarly include homophones which differ in verb inflections.

Given the large number of homophones existing among Japanese words, incorrect homophonic kanji or two-kanji compound words are occasionally selected even by native Japanese speakers when they write an essay (e.g., Hatta, Kawakami, & Tamaoka, 1998, 2002). Of the types of errors that native Japanese speakers make, phonologically related kanji writing errors were the most numerous (60.0%), followed by orthographically related errors (43.6%) and semantically related errors (29.7%). Based on the large percentage of phonologically related kanji errors, we can assume that native Japanese speakers activate multiple kanji or their compounds by a single sound, and occasionally replace the target with another inappropriately activated homophonic kanji. In fact, psycholinguistic studies (e.g., Sakuma, Sasanuma, Tatsumi, & Masaki, 1998; Tamaoka, 2005, 2007; Wydell, Patterson, & Humphreys,

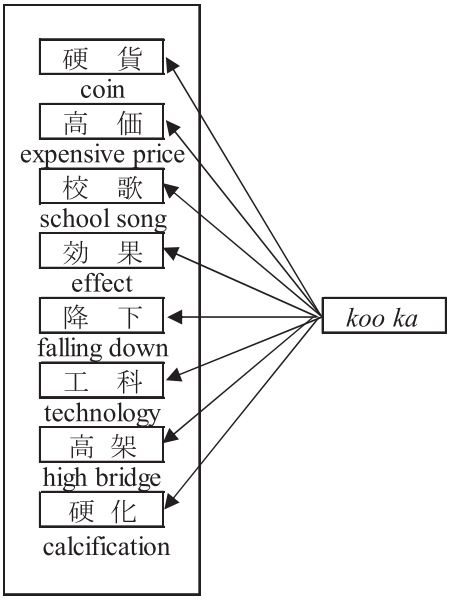

Figure 3. Homophones in Kango.

1993) found that multiple kanji and their compound words are simultaneously activated from a single phonological form.

KNOWLEDGE USED FOR HOMOPHONIC DISTINCTIONS BY CHINESE L2 JAPANESE LEARNERS

Learning kanji homophones is a major focus of L2 Japanese kanji learning above the intermediate level (e.g., Ishida, 1999; Okazaki, 1993). Like native Japanese speakers, L2 Japanese learners activate multiple homophonic units in lexical items as they memorise many kanji-presented words. Since Chinese learners of L2 Japanese can easily use their knowledge of Chinese characters to understand Japanese kanji (Tamaoka, 1997, 2000; Yamato & Tamaoka, 2009, 2011), they are expected to make homophonic errors similar to those native Japanese speakers do. Then, how do Chinese learners of L2 Japanese find the appropriate kanji from multiple homophonic candidates?

An earlier study of native Japanese speakers by Inoki (1976) found context effects on retrieving homophones among native Japanese speakers. In other words, native Japanese speakers select the proper kanji-presented lexical item out of multiple homophonic words based on context. Likewise, Kawaguchi (1993) and Takebe (1989) suggest that the acquisition of homophonic words by L2 learners requires not only kanji knowledge but also contextual knowledge for each homophone. As Chinese learners of L2 Japanese already know a reasonable number of words written in kanji at the intermediate level of Japanese language-learning, or at least their L1 lexical knowledge is fundamentally applicable to understand L2 Japanese lexical items, their kanji knowledge is expected to play a major role in identifying the proper homophone among multiple candidates. To accomplish this process, basic grammatical knowledge enables Chinese learners of L2 Japanese to properly understand the meanings of sentences prior to identifying an appropriate homophone.

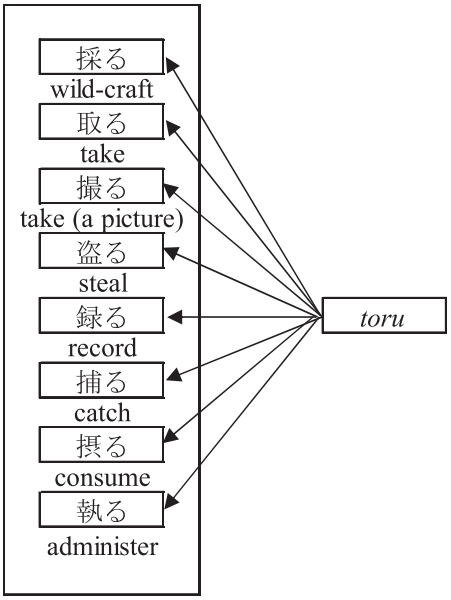

Figure 4. Homophones in Wago.

The present study, therefore, aimed to clarify causal relations between lexical/grammatical knowledge and the ability to make homophonic distinctions depending on sentence context among native Chinese learners of L2 Japanese. Using a structural equation modelling (SEM) analysis, a causal model of lexical/grammatical knowledge affecting the ability to distinguish homophones was tested against the obtained data.

METHOD

Participants

A total of 170 native Chinese-speaking undergraduate students learning Japanese in China (17 males and 153 females) participated in the study. Ages ranged from 18 years and 0 months to 23 years and 3 months for a mean of 20 years and 5 months with a standard deviation of 10 months. All participants were majoring in the Japanese language, and had just completed their first ($n = 65$) or second year ($n = 105$) coursework.

Three latent variables for structural equation modelling (SEM)

Three latent variables for SEM, homophonic distinction, lexical knowledge, and grammatical knowledge, were measured by actual tests (i.e., observed variables). The means, standard deviations, correlations, and reliabilities of these tests are reported in Table 1.

Tests of homophonic distinction

Homophonic distinction was measured by using two tests for Kango and Wago homophonic words. Two sentences written in kana were given to participants. Participants were asked to select appropriate words to complete the two different sentences from a list of four homophonic words. For example, two kana sentences

TABLE 1
Means, standard deviations, and correlations for observed and latent variables

No.	*Observed variables*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
Lexical knowledge ($\alpha = .867$)										
1	Japanese origins (Wago)	–								
2	Chinese origins (Kango)	0.515***	–							
3	Alphabetic loanwords	0.606***	0.550***	–						
4	Function words	0.410***	0.551***	0.543***	–					
Grammatical knowledge ($\alpha = .679$)										
5	Morphological inflections	0.323***	0.326***	0.356***	0.266***	–				
6	Local dependency	0.133*	0.150*	0.104	0.142*	0.311***	–			
7	Complex structure	0.256***	0.367***	0.337***	0.370***	0.366***	0.437***	–		
Homophonic distinction ($\alpha = .678$)										
8	Wago homophones	0.104	0.151*	0.100	0.184**	0.231***	0.186**	0.318***	–	
9	Kango homophones	0.182**	0.254***	0.185**	0.328***	0.212**	0.236***	0.379***	0.533***	–
	Mean	8.06	8.96	8.79	6.59	9.22	9.38	8.75	6.69	8.15
	Standard deviation	2.87	1.82	2.09	2.72	1.66	1.61	1.97	1.99	1.87

Note: $n = 170$. *$p < .05$; **$p < .01$; ***$p < .001$.

Osanai koro-o (kaisoo) shita "(I) looked back on my childhood" and *Rookyuuka shita tenpo-o (kaisoo) shita* "(I) renovated a decrepit shop" were given to participants, who were then asked to select two homophones out of four kanji-presented choices, all pronounced as *kaisoo*, to complete the above two sentences. There were 11 pairs in Kango and 12 pairs in Wago, with two correct homophones presented among four choices for each pair of sentences. These two observed variables construct ability of homophonic distinctions. The reliability of the 23 question items ($n = 170$) as measured by Cronbach's alpha was .678.

The 11 pairs or 22 homophones of Kango are listed in Table 2. All these words and their embedded sentences with four homophone choices are presented in the Appendix. As shown in Table 2, 15 homophones out of 22 are not included in the lexical list of the formerly used Japanese Language Proficiency Test (Japan Foundation, 2002). Yet, 16 Kango homophones out of 22 exist in the Chinese language: native Chinese speakers in the present study were expected to be able to guess the meanings of a majority of the Kango homophones. Word frequency of each word was established using Amano and Kondo (2000, 2003 for the CD-ROM version). This index of word frequency was calculated using a corpus from editions of the *Asahi Newspaper* printed from 1985 to 1998, containing a total type frequency of 341,771 morphemic units (not word units) and a total token frequency of 287,792,797 morphemic units. According to this database, the average word frequency of the 22

TABLE 2
Chinese originated homophones (Kango) used for the test items of homophonic distinction

		Japanese characteristics				*Chinese characteristics*	
No.	*Targets*	*Sound*	*Meaning*	*Japanese proficiency level*	*Word frequency*	*Corresponding Chinese words*	*Sound*
1	雄志	*yuushi*	High aspiration	Beyond the levels	140	Not existing	*xiongzhi*
	有志	*yuushi*	Volunteers	Beyond the levels	1,929	Existing	*youzhi*
2	強制	*kyoosee*	Forcing	1st level	8,779	Existing	*qiangzhi*
	矯正	*kyoosee*	Correction	Beyond the levels	579	Existing	*jiaozheng*
3	固辞	*koji*	Firm refusal	Beyond the levels	759	Not existing	*guci*
	誇示	*koji*	Ostentation	Beyond the levels	1,296	Existing	*kuashi*
4	意向	*ikoo*	Inclination	1st level	23,158	Existing	*yixiang*
	移行	*ikoo*	Transition	1st level	9,480	Not existing	*yixing*
5	回想	*kaisoo*	Recollection	Beyond the levels	1,066	Existing	*huixiang*
	改装	*kaisoo*	Renovation	Beyond the levels	1,410	Existing	*gaizhuang*
6	奉仕	*hoosi*	Volunteers	1st level	2,082	Not existing	*fengshi*
	胞子	*hoosi*	Spores	Beyond the levels	114	Existing	*baozi*
7	継承	*keeshoo*	Inheritance	Beyond the levels	3,847	Existing	*jicheng*
	警鐘	*keeshoo*	Warning	Beyond the levels	933	Existing	*jingzhong*
8	交歓	*kookan*	Enjoyment	Beyond the levels	398	Not existing	*jiaohuan*
	好感	*kookan*	Favourable impression	Beyond the levels	1,609	Existing	*Haogan*
9	景気	*keeki*	Cyclical	2nd level	43,255	Existing	*jingqi*
	契機	*keeki*	Moment	2nd level	3,702	Existing	*qiji*
10	巧妙	*koomyoo*	Artifice	1st level	246	Existing	*Qiaomiao*
	光明	*koomyoo*	Light	Beyond the levels	285	Existing	*guangming*
11	丹精	*tansee*	Painstaking	Beyond the levels	144	Not existing	*danjing*
	嘆声	*tansee*	Sigh	Beyond the levels	33	Existing	*tansheng*

Note: "Beyond the levels" refers to a word not included in the lexical list of the formerly used Japanese-Language Proficiency Test.

Kango homophones tested was 4,784 occurrences with a standard deviation of 9,809, varying from 33 times for 嘆声 to 43,255 times for 景気.

Likewise, as listed in Table 3, 12 pairs or 24 Wago homophones were used for the present study. All these words and the sentences where they are embedded with four homophone choices are presented in the Appendix. As shown in Table 3, three homophones were at the lowest proficiency level, the fourth level of the formerly used Japanese-Language Proficiency Test (Japan Foundation, 2002), 13 at the 2nd level, 3 at the 1st level, and 5 beyond the levels of the test. A large majority of the kanji used for stems of Kango homophones (22 out of 24 kanji) exist in the Chinese language. Thus, native Chinese speakers in the present study can guess the meanings of a majority of the items. Word frequency of each word was established using Amano and Kondo (2000, 2003 for the CD-ROM version). According to the database, the average word frequency of the 24 Wago homophones was 4,808 occurrences with a standard deviation of 7,495, varying from 70 times for 更ける to 32,981 times for 図る.

Tests of lexical knowledge

Lexical knowledge was gauged by four tests classified on the basis of word categories (Miyaoka, Tamaoka, & Sakai, 2011): function words, Kango, Wago, and loanwords (*Gairaigo*). This test has been used multiple times, almost always with high reliability.

TABLE 3
Japanese originated homophones (Wago) used for test items of homophonic distinction

	Japanese characteristics						*Chinese characteristics*	
No.	*Kanji*	*Word*	*Sound*	*Meaning*	*Japanese proficiency level*	*Word frequency*	*Corresponding Chinese kanji*	*Sound*
1	挙	挙げる	*a-geru*	Give (example)	Fourth level	21,449	Existing	*ju*
	揚	揚げる	*a-geru*	Fry	Second level	1,084	Existing	*yang*
2	勧	勧める	*susu-meru*	Invite	Second level	5,002	Existing	*quan*
	薦	薦める	*susu-meru*	Recommend	Beyond levels	241	Existing	*jian*
3	採	採る	*to-ru*	Recruit	Second level	3,834	Existing	*cai*
	撮	撮る	*to-ru*	Take (picture)	Fourth level	6,648	Existing	*cuo*
4	継	継ぐ	*tsu-gu*	Continue	First level	3,149	Existing	*ji*
	次	次ぐ	*tsu-gu*	Follow	Second level	11,554	Existing	*ci*
5	更	更ける	*hu-keru*	(Night) go	Second level	70	Existing	*ceng*
	老	老ける	*hu-keru*	Age	First level	101	Existing	*Lao*
6	刈	刈る	*ka-ru*	Mow	Second level	439	Not existing	–
	駆	駆る	*ka-ru*	Urge	Beyond the levels	121	Existing	*qu*
7	換	換える	*ka-eru*	Cash	Second level	1,017	Existing	*huan*
	替	替える	*ka-eru*	Make up	Second level	1,640	Existing	*ti*
8	要	要る	*i-ru*	Need	Fourth level	1,334	Existing	*yao*
	射	射る	*i-ru*	Shoot	Beyond the levels	357	Existing	*she*
9	絶	絶つ	*ta-tsu*	Break off	Beyond the levels	2,786	Existing	*jue*
	断	断つ	*ta-tsu*	Forswear	First level	1,390	Existing	*duan*
10	着	着く	*tsu-ku*	Arrive	Second level	6,037	Existing	*zhao/zhe*
	付	付ける	*tsu-keru*	Add	Second level	7,085	Existing	*fu*
11	修	修める	*osa-meru*	Pursue	Beyond the levels	147	Existing	*xiu*
	納	納める	*osa-meru*	Pay	Second level	3,986	Existing	*na*
12	図	図る	*haka-ru*	Promote	Second level	32,981	Not existing	–
	測	測る	*haka-ru*	Measure	Second level	2,932	Existing	*ce*

Note: "Beyond the levels" refers to a word not included in the lexical list of the formerly used Japanese-Language Proficiency Test.

These words were taken from the vocabulary list of the Japanese Language Proficiency Test (Japan Foundation, 2004). There were 12 words for each of the lexical categories of Kango, Wago, and Gairaigo, consisting of four nouns, four adjectives, and four verbs. In addition, 12 words from each category were cross-matched with lexical difficulties among the three lexical categories using the first to fourth level of the Japanese-Language Proficiency Test (Japan Foundation, 2004). Kango were selected from two-kanji compound words such as *guchi* (“complaint”), *fukyoo* (“recession”), *shumi* (“hobby”), *yuuboo-da* (“promising”), *kengaku-suru* (“to visit”), and *chuumon-suru* (“to order”). Examples of Wago are *arasuji* (“story”), *sakasama* (“upside-down”), *yayakoshi-i* (“complicated”), *detarame-na* (“nonsense”), *hakadoru* (“to make progress”), and *unazuku* (“to nod and agree”). Gairaigo are taken from alphabetic languages, in this case English, such as *saizu* (“size”), *kyaria* (“career”), *dorai-da* (“dry, unsentimental”), *ruuzu-da* (“loose”), *massaaji-suru* (“to massage”), and *sutoppu-suru* (“to stop”). As items of function words, we used grammatical words consisting of more than two morphemes such as *-ga-hayai-ka* (“no sooner … than …”), *-ta-tokoro-de* (“even if…”), *itaru-made* (“until…” or “up to…”), *kawa-kiri-ni* (“start by…”), and *yogi-naku-sa-reru* (“be obliged to…”). Lexical knowledge showed a high Cronbach’s alpha reliability of .867 (48 items, $n = 170$).

Tests of grammatical knowledge

Grammatical knowledge was measured by three tests: morphological inflections, local dependency, and complex structure. Morphological inflections can be correctly judged within a single lexical unit requiring inflections. For example, a participant had to choose a correct answer to fill in an empty bracket of a sentence, *Ayamatte kabin-o kowashita watashi-o, chichi-wa* ( ). “My father (did not blame) me who mistakenly broke the flower vase” out of the four choices of *seme-nakat-ta* (a correct form for “did not blame”), *seme-nai-dat-ta*, *semeru-nakat-ta*, and *seme-naku-te-dat-ta* (incorrect forms for “did not blame”). In this question item, the correct answer can only be the lexical unit *seme-nakat-ta,* as the others are not grammatically correct. In contrast, local dependency is defined as reference to two neighbouring units to determine a correct expression. For instance, the correct answer for the empty bracket of the sentence *Kanojo-wa itsumo tamagoyaki-o* ( ) *tsukuru* “She always cooks omelets (very well)” cannot be determined by only referring to a single lexical unit. Among the four choices, *joozu-ni* (correct answer for “very well” in the item), *joozu-de*, *joozu-no*, and *joozu-na* all four choices are grammatically correct expressions by themselves. The correct choice is only identified by noting that the verb *tsukuru* (to cook) follows it and require a word ending in *-ni*. This is a complex structure which requires reference to a whole sentence in order to determine the correct answer. In another example sentence, *Don’nani kanojo-ga* ( ), *ano daigaku-niwa gookaku shinai daroo* “(No matter) how hard she (tries), she would not pass an entrance examination at that university”, the four choices for the empty bracket are *ganbat-temo* (correct answer for “no matter … tries hard”), *ganbat-te*, *ganbaru-noni*, and *ganbaru-ga*. Each of these four expressions is grammatically correct by itself. However, since an unexpected negative conclusion follows the prior sentence *don’nani … temo* [no matter how …], the correct choice has to be *ganbat-temo*. Grammatical knowledge items showed a Cronbach’s alpha reliability of .679 (36 items, $n = 170$).

RESULTS

Results of SEM

The SPSS AMOS 17.0J (2008) package was used to conduct SEM in order to investigate a causal model constructed with two latent variables of lexical and grammatical knowledge predicting one latent variable of homophonic distinction. Each latent variable was measured by the observed variables of the tests previously described. The model fitting of the present SEM analysis converged to a proper solution with excellent fit [$n = 170$, $\chi^2(24) = 34.613$, $p = .074$, *ns.*; GFI = .957; AGFI = .919; CFI = .975; RMSEA = .051]. The correlation between lexical and grammatical knowledge ($r = .59$, $p < .001$), between lexical knowledge and homophonic distinction ($r = .54$, $p < .001$) and between grammatical knowledge and homophonic distinction ($r = .89$, $p < .001$) were all significantly high. As shown in Figure 5, the four observed variables of lexical knowledge showed excellent factor loadings indicating 0.70 for Wago, 0.74 for Kango, 0.79 for Gairaigo and 0.69 for function words. The three observed variables of grammatical knowledge also showed good factor loadings of 0.54 for morphological inflections, 0.52 for local dependency, and 0.77 for structural complexity. The two observed variables of homophonic distinction showed relatively high factor loading of 0.66 for Kango and reasonable factor loading of 0.43 for Wago. All these factor loadings were statistically significant. A causal relation leading from grammatical knowledge to homophonic distinction was significant ($\beta = .58$, $p < .001$). However, no significant causal relation from lexical knowledge to homophonic distinction was found ($\beta = .01$, *ns.*). Therefore, only grammatical knowledge was a major factor for Chinese learners of L2 Japanese in distinguishing lexical homophones.

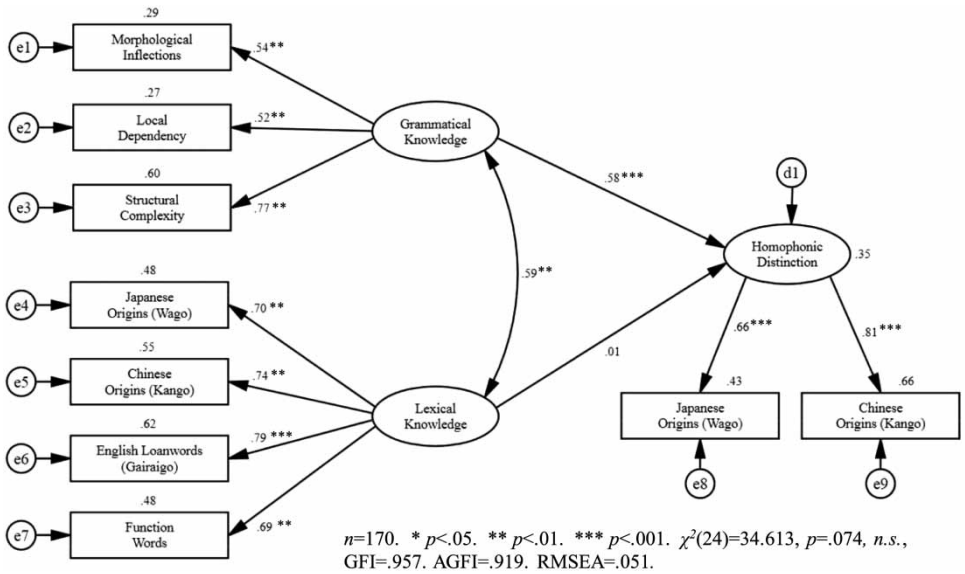

Figure 5. SEM analysis with standardised path coefficients—A causal model which solves the acquisition process of L2 learners' homophonic distinction by native Chinese speakers learning Japanese.

DISCUSSION

The present study indicated that grammatical knowledge has a strong influence on identifying the proper word from multiple homophones in a sentential context. The results suggest that the ability of Chinese learners of L2 Japanese to distinguish homophones was strongly affected by grammatical knowledge, though not by lexical knowledge. This accords with arguments by Kawaguchi (1993) and Takebe (1989) with respect to the importance of contextual knowledge regarding homophones. Since participants in the present study were all native Chinese speakers who had already acquired Chinese characters, which share the same origins as Japanese kanji, they could roughly guess homophonic stems or words presented in kanji. Therefore, only their grammatical knowledge was a significant predictor of understanding homophones in a sentence.

In order to distinguish multiple homophones in a sentential context, Chinese learners of L2 Japanese needed to have sound grammatical knowledge for selecting the appropriate homophone. *Morphological inflections* assist proper selection of verb homophones, including different verb conjugation of *ichidan* and *godan*. The present study also tested *local dependency* as one part of grammatical knowledge. Knowledge for two neighbouring units helped to determine a correct expression. Furthermore, knowledge of *complex structures* was also an important key in improving the ability to make homophonic distinctions in determining appropriate homophones for complex sentential conditions.

The results of the present study can only be applied to native Chinese speakers learning L2 Japanese. Japanese learners with different language backgrounds may display different results. For native Korean speakers learning L2 Japanese, due to a lack of kanji and kanji-presented word knowledge, lexical knowledge may contribute strongly to identifying a proper homophonic word among multiple candidates. Otherwise, both lexical and grammatical knowledge may be needed to distinguish homophones. Thus, a further study should be conducted to identify any actual influential factors for understanding Japanese lexical homophones among speakers of different L1 backgrounds with different degrees of lexical/grammatical knowledge.

REFERENCES

Hepburn style romanization with no vowel repeated for a long vowel is used for describing Japanese proper nouns, and the same style with vowel repeated for a long vowel is used for article titles.

Amano, N., & Kondo, K. (2000). *Nihongo no Goi Tokusei – Dai-7-kan* [Lexical properties of Japanese – Vol. 7]. Tokyo: Sanseido.

Amano, N., & Kondo, K. (2003). *Nihongo no Goi Tokusei – Dai-2-ki CD-ROM-ban* [Lexical properties of Japanese – The second volume of CD-ROM verison]. Tokyo: Sanseido.

Hatta, T., Kawakami, A., & Tamaoka, K. (1998). Writing errors in Japanese kanji: A study with Japanese students and foreign learners of Japanese. *Reading and Writing*, *10*, 457–470.

Hatta, T., Kawakami, A., & Tamaoka, K. (2002). Errors in writing Japanese kanji: A comparison of Japanese schoolchildren, college students and second-language learners of Japanese. *Asian Pacific Journal of Speech, Language and Hearing*, *7*, 157–166.

Hirose, H. (1992). Jyukugo no ninchi katei ni kansuru kenkyuu: Puraimingu-hoo ni yoru kentoo [An investigation of the recognition process for jukugo by use of priming paradigms]. *The Japanese Journal of Psychology*, *63*, 303–309.

Inoki, S. (1976). Doo'on igigo no sainin kioku ni oyobosu bunmyaku kooka [Effects of changed context on recognition memory of homographs]. *Japanese Journal of Psychology*, *47*, 217–221.

Ishida, T. (1999). *Nihongo Kyoojyu Hoo* [Japanese teaching method]. Tokyo: Taishukan.

Japan Foundation. (2002). *Nihongo Nooryoku Shiken Shutsudai Kijyun (Kaitei-ban)* [The standard of testing items (revised version)]. Tokyo: Bonjinsha.

Kawaguchi, Y. (1993). Komyunikatibu apuroochi no kanji shidoo [A communicative approach for teaching kanji]. *Nihongo Kyooiku* [Japanese Language Education], *80*, 15–27.

Kess, J. F., & Miyamoto, T. (1999). *The Japanese mental lexicon: Psycholinguistic studies of Kana and Kanji processing*. Amsterdam: John Benjamins.

Leong, C. K., & Tamaoka, K. (1995). Use of phonological information in processing kanji and katakana by skilled and less skilled Japanese readers. *Reading and Writing*, *7*, 377–393.

Miller, R. A. (1967). *The Japanese language*. Chicago: The University of Chicago Press.

Okazaki, M. (1993). Nihongo kyooiku ni okeru kanji shidoo no arikata [The way of teaching Kanji (Chinese character) on Japanese language education]. *Artes Liberals*, *52*, 11–28.

Miyaoka, Y., Tamaoka, K., & Sakai, H. (2011). Nihongo no goi tesuto no kaihatsu to shinraisei: Chuugokugo o bogo to suru nihongo gakushuusha no deeta niyoru tesuto hyooka [Development and reliability of a test of Japanese vocabulary: Test evaluation by the data taken from native Chinese speakers learning Japanese]. *Hiroshima Keizai Daigaku Kenkyuu Ronshuu* [Bulletin of Hiroshima University of Economics], *34*(1), 1–18.

Mochizuki, Y. (1981). *Chuugokugo kenkyuu gakushuu soosho 13: Chiigokugo to nihongo* [Studies and learning of Chinese. Vol. 13: Chinese and Japanese] (2nd Edition). Tokyo, Japan: Kooseikan.

Saito, H., Inoue, M., & Nomura, Y. (1979). Information processing of kanji (Chinese characters) and kana (Japanese characters): The close relationship among graphemic, phonemic, and semantic aspects. *Psychologia*, *22*, 195–206.

Sakuma, N., Sasanuma, S., Tatsumi, I., & Masaki, S. (1998). Orthography and phonology in reading Japanese kanji words: Evidence from the semantic decision task with homophones. *Memory and Cognition*, *26*, 75–87.

Takebe, Y. (1989). *Kanji no oshiekata – Nihongo o Manabu Hikanjikei Gaikokujin no Tameni* [How to teach Kanji – Learners of Japanese with non-logographic backgrounds]. Tokyo: Aruku.

Tamaoka, K. (1991). Psycholinguistic nature of the Japanese orthography. *Gengo Bunka Kenkyuu* [Studies of Languages and Cultures], *11*(1), 49–82. (Matsuyama University).

Tamaoka, K. (1997). Chuugokugo to eigo o bogo tosuru nihongo gakushuusha no kanji oyobi kana hyooki goi no shori hooryaku [The processing strategy of words presented in kanji and kana by Chinese and English speakers learning Japanese]. *Gengo Bunka Kenkyuu* [Studies of Languages and Cultures], *17*(1), 65–77. (Matsuyama University).

Tamaoka, K. (2000). Chuugokugokei oyobi eigokei nihongo gakushuusha no bogo no hyooki keitai ga nihongo no on'in shori ni ataeru eikyoo [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*, 83–94.

Tamaoka, K. (2005). The effect of morphemic homophony on the processing of Japanese two-kanji compound words. *Reading and Writing*, *18*, 281–302.

Tamaoka, K. (2007). Rebounding activation caused by lexical homophony in the processing of Japanese two-kanji compound words. *Reading and Writing*, *20*, 413–439.

Tamaoka, K., Kirsner, K., Yanase, Y., Miyaoka, Y., & Kawakami, M. (2002). A Web-accessible database of characteristics of the 1,945 basic Japanese kanji. *Behavior Research Methods, Instruments & Computers*, *34*, 260–275.

Tamaoka, K., & Makioka, S. (2004a). Frequency of occurrence for units of phonemes, morae and syllables appearing in a lexical corpus of a Japanese Newspaper. *Behavior Research Methods, Instruments & Computers*, *36*(3), 531–547.

Tamaoka, K., & Makioka, S. (2004b). New figures for a Web-accessible database of the 1,945 basic Japanese kanji, fourth edition. *Behavior Research Methods, Instruments & Computers*, *36*(3), 548–558.

Tamaoka, K., & Taft, M. (2010). The sensitivity of native Japanese speakers to On and Kun kanji readings. *Reading and Writing*, *23*, 957–968.

Wydell, T. N., Patterson, K. E., & Humphreys, G. W. (1993). Phonologically mediated access to meaning for kanji: Is a rows still a rose in Japanese Kanji? *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *19*, 491–514.

Yamato, Y., & Tamaoka, K. (2009). Chugokujin nihongo gakushuusha no nihongo kanjigo no shori ni okeru bogo no eikyoo [The effects of mother-tongue on the processing of Japanese kanji-compound words by native Chinese speakers learning Japanese]. *Kotoba no Kagaku* [The Science of Languages], *22*, 117–135.

Yamato, Y., & Tamaoka, K. (2011). Nihongo no Onrain yomi ni okeru kanji hyookigo to katakana hyookigo no shori: Chuugokujin nihongo gakushuusha no goi nooryoku jyooigun to kaigun no hikaku [The online processing of kanji- and katakana-presented words in Japanese text: A comparison of greater and lesser

lexical knowledge groups of native Chinese speakers learning Japanese]. *Koide Kinen Nihongo Kyooiku Kenkyuu Ronbun Shuu* [Koide Memorial Journal of Japanese Language Education], *16*, 73–86.

Yokosawa, K., & Umeda, M. (1988). Processes in human Kanji-word recognition. *Proceedings of the 1988 IEEE International Conference on Systems, man, and Cybernetics* (pp. 377–380). August 8–12, 1988, Beijing and Shenyang, China.

Appendix. Test items of homophonic distinctions

Kunrei-style romanization with two vowels repeated for a long vowel (e.g., *oo*, *uu*) is used to transcribe Japanese sentences.

Chinese originated homophones (Kango)

1 (1) 雄志 ユウシを抱き上京を決意した。
Yuushi o idaki zyookyoo o ketui sita.
(I) decided to move to Tokyo with high aspiration.
(2) 有志 職場のユウシでチームを作った。
Syokuba no yuusi de tiimu o tukutta.
Volunteers built a team in our workplace.
Choice 雄志 有志 融資 有史

2 (1) 強制 会議に出席するようキョウセイされた。
Kaigi ni syusseki suruyoo kyoosee sareta.
(I) was forced to attend the meeting.
(2) 矯正 娘の歯並びをキョウセイする。
Musume no hanarabi o kyoosee suru.
(I) let (my) daughter have orthodontic treatment.
Choice 強制 矯正 共生 強勢

3 (1) 固辞 会長に推されたがコジした。
Kaityoo ni osareta ga kozi sita.
(I) was nominated as the president, but (I) refused firmly.
(2) 誇示 対立国に自国の力をコジした。
Tairitukoku ni zikoku no tikara o kozi sita.
(We) showed off the power of our country toward the conflicting country.
Choice 固辞 誇示 孤児 故事

4 (1) 意向 先方のイコウを確認する。
Senpoo no ikoo o kakunin suru.
(I) check the other side's inclination.
(2) 移行 新しい制度へのイコウを検討している。
Atarasii seido eno ikoo o kentoo siteiru.
(We) consider transition to a new system.
Choice 意向 移行 威光 以降

5 (1) 回想 幼い頃をカイソウした。
Osanai koro o kaisoo sita.
(I) recalled when (I) was a child.
(2) 改装 老朽化した店舗をカイソウした。
Rookyuu ka sita tenpo o kaisoo sita.
(We) rebuilt the dilapidated store.
Choice 回想 改装 階層 回送

6 (1) 奉仕 地域へのホウシ活動に力を注ぐ。
Tiiki eno hoosi katudoo ni tikara o sosogu.
(I) devoted (my) energy for volunteer activities in the community.
(2) 胞子 この植物はホウシで増える。
Kono syokubutu wa hoosi de hueru.
This plant reproduces by means of spores.
Choice 奉仕 胞子 芳志 法師

7 (1) 継承　事業のケイショウを決意した。
Zigyoo no keesyoo o ketui sita.
(I) determined to take over the enterprise.
(2) 警鐘　その事件が社会全体へのケイショウとなった。
Sono ziken ga syakai zentai eno keesyoo to natta.
The case served as a warning against the entire society.
Choice 継承　警鐘　軽傷　敬称

8 (1) 交歓　学生主催でコウカン音楽会を開く。
Gakusei syusai de kookan ongakukai o hiraku.
Students host an enjoyable concert.
(2) 好感　明るい性格にコウカンを抱いた。
Akarui seikaku ni kookan o idaita.
(I) had a favorable impression of his/her cheerful character.
Choice 交歓　好感　交換　公刊

9 (1) 景気　新聞でケイキの変動を調べる。
Sinbun de keeki no hendoo o siraberu.
(I) check cyclical changes in newspapers.
(2) 契機　事故をケイキに歩道ができた。
Ziko o keeki ni hodoo ga dekita.
A sidewalk was built after the accident.
Choice 景気　契機　刑期　計器

10 (1) 巧妙　コウミョウな手口で人をだます。
Koomyoo na teguti de hito o damasu.
(I) deceive someone with a clever trick.
(2) 光明　暗闇に一筋のコウミョウを見出す。
Kurayami ni hitosuzi no koomyoo o miidasu.
(I) see a ray of light in the dark.
Choice 巧妙　光明　高名　功名

11 (1) 丹精　タンセイを込めて植木を育てる。
Tansee o komete ueki o sodateru.
(I) lovingly take care of garden trees.
(2) 嘆声　見事な庭園にタンセイを発した。
Migoto na teien ni tansee o hassita.
(I) let out a sigh about the fabulous garden.
Choice 丹精　嘆声　端正　単性

Japanese originated homophones (Wago)

1 (1) 挙　具体例をアげて説明した。
Gutairee o āgete setumee sita.
(I) illustrated with some specific examples.
(2) 揚　夕食にてんぷらをアげる。
Yuusyoku ni tenpura o ageru.
(I) fried Tempura for dinner.
Choice 挙　揚　上　騰

2 (1) 勧　野球部への入部をススめる。
Yakyuubu eno nyuubu o susumeru.
(I) invite (him) to join the baseball club.
(2) 薦　会長候補に彼女をススめた。
Kaityoo kooho ni kanozyo o susumeta.
(I) recommended her as a candidate for the chair.
Choice 勧　薦　奨　進

3 (1) 採　今年も新入社員をトる予定です。
Kotosi mo sin'nyuusyain o toru yotee desu.
(We) again plan to recruit new employees this year.

(2) 撮　ここで記念写真を<u>ト</u>りましょう。
Kokode kinensyasyin o <u>to</u>rimasyoo.
Let's <u>take</u> a commemorative photo here.
Choice 採 撮 捕 執

4 (1) 継　ついに父の志を<u>ツ</u>ぐ決意をした。
Tuini tyityi no kokorozasi o <u>tu</u>gu ketui o sita.
(I) eventually decided to <u>continue</u> my father's objective.
(2) 次　東京に<u>ツ</u>ぐ都市と自負している。
Tookyoo ni <u>tu</u>gu tosi to zihu siteiru.
(We) feel proud of our city as <u>the second after</u> Tokyo.
Choice 継 次 告 接

5 (1) 更　秋の夜が次第に<u>フ</u>けていく。
Aki no yo ga sidai ni <u>hu</u>kete iku.
An autumn's night gradually <u>goes</u> on.
(2) 老　年齢よりも<u>フ</u>けて見られる。
Nenree yori mo <u>hu</u>kete mirareru.
(I) look <u>older</u> than (I) actually am.
Choice 更 老 吹 拭

6 (1) 刈　農地で稲の<u>カ</u>り入れが始まる。
Nootyi de ine no <u>ka</u>riire ga hazimaru.
In rice farming lands, <u>harvest</u> time has begun.
(2) 駆　突然不安に<u>カ</u>られる。
Totuzen huan ni <u>ka</u>rareru.
(I) suddenly <u>get</u> a feeling of dread.
Choice 刈 駆 借 狩

7 (1) 換　銀行で手形を現金に<u>カ</u>える。
Ginkoo de tegata o genkin ni <u>ka</u>eru.
(I) <u>exchage</u> a bill at the bank.
(2) 替　日曜日に出勤したので月曜日に休日を振り<u>カ</u>えた。
Nityiyoobi ni syukkin sita node getuyoobi ni kyuuzitu o huri <u>ka</u>eta.
Because of working on Sunday, (I) <u>made up</u> a compensating holiday on Monday.
Choice 換 替 買 変

8 (1) 要　アパートを借りるには保証人が<u>イ</u>る。
Apaato o kariru niwa hosyoonin ga <u>i</u>ru.
A guarantor is <u>required</u> for renting an apartment.
(2) 射　的を<u>イ</u>た質問だった。
Mato o <u>i</u>ta situmon datta.
It was a well-<u>directed</u> question.
Choice 要 射 入 炒

9 (1) 絶　友人との交流を<u>タ</u>つ。
Yuuzin tono kooryuu o <u>ta</u>tu.
(I) <u>break off</u> relations with friends.
(2) 断　願掛けで好きなお茶を<u>タ</u>つ。
Gankake de suki na otya o <u>ta</u>tu.
(I) make a wish to a god and <u>forswear</u> tea which (I) like.
Choice 絶 断 立 発

10 (1) 着　電車は予定通りに駅に<u>ツ</u>いた。
Densya wa yotee doori ni eki ni <u>tu</u>ita.
The train <u>arrived</u> at the station on time.
(2) 付　条件を<u>ツ</u>けて許可する。
Zyooken o <u>tu</u>kete kyoka suru.
(I) give permission <u>with</u> reservations.
Choice 着 付 突 就

11 (1) 修　大学で物理学をオサめる。
Daigaku de buturigaku o osameru.
(I) pursue physics at university.
(2) 納　期日内に税金をオサめる。
Kizitu nai ni zeekin o osameru.
(I) pay taxes by the due date.
Choice 修 納 治 収

12 (1) 図　事業の合理化をハカる。
Zigyoo no goorika o hakaru.
(We) promote the streamlining of the enterprise.
(2) 測　保健所で血圧をハカる。
Hokenzyo de ketuatu o hakaru.
(I) measure (my) blood pressure at a healthcare center.
Choice 図 測 量 謀