

## Errors in writing Japanese kanji: a comparison of Japanese schoolchildren, college students and second-language learners of Japanese

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### Abstract

*The present study examined handwriting errors of kanji by Japanese schoolchildren, college students and second-language learners of Japanese. Errors made by all these three groups of participants were collected and used as research data. Japanese college students made phonologically related errors in writing kanji rather than orthographically related or semantically related errors. In contrast, Japanese schoolchildren in Grade 7 made mainly orthographically related errors when writing kanji. Since they are still at the stage of mastering kanji, they are likely to mix up constructing elements of kanji and use them incorrectly to make a single complex kanji. Australian university students (with no previous kanji knowledge) often wrote various non-existent kanji. Because they have not yet clearly learned the orthography of kanji elements, they were likely to create figures that resembled kanji or kanji elements that did not exist in Japanese. As such, depending on the learning stage of kanji, different types of writing errors were observed.*

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**Key words:** kanji writing errors, error analysis, error types, substitution.

### Introduction

Japanese children begin at the age of six to learn the Japanese writing system, which is a mixture of the three major Japanese scripts, Arabic numerals and the Roman alphabet. Since sentences are mainly written using a combination of kanji, hiragana and katakana, children first learn these three Japanese scripts. Arabic numerals are introduced in mathematics classes but they, too, are often used in Japanese sentences. The script called Roma-ji is also taught to children, beginning in the fourth grade, as a way to write down Japanese utterances using letters of the Roman alphabet. In recent years, more than 95% of 15-year-old Japanese students go on to a senior high school to complete Grades 10 to 12, after having already completed nine years of compulsory school education. Furthermore, more than 45% of high school graduates go on to further their education at colleges/universities. It is during the school years after Grade 9 that students continue to improve

upon their writing skills in Japanese (see Tamaoka, 1991; Taylor and Taylor, 1995; Tamaoka and Yamada, 2000; Kess and Miyamoto, 2000).

Although Japanese children are expected to master the Japanese writing system by Grade 9, in reality, this expectation is not always met. College graduates sometimes have difficulties in reading and writing kanji properly and often many writing errors can be observed. Though perhaps not so frequently, the average Japanese adult also makes errors in writing kanji even in relaxed settings. Such errors suggest that one's long-term memory of kanji is weak. Therefore, analysis of writing errors in kanji seems to be promising as an effective way to find out more about cognitive processing in the writing of kanji. For example, by analysing writing errors, one may get a better understanding about the long-term storage of kanji and about the mental kanji lexicon itself. The question also rises as to why people make such errors in writing kanji, even after 12 years of study and practice at school. Are there any patterns in kanji errors? In order to answer these questions, the present study investigated kanji writing errors made not only by well-educated native speakers, but also by children and foreign students learning the Japanese language. The main purpose of this study was to explore cognitive mechanisms in play during the writing of kanji and to provide some suggestions for improving the way it is currently taught.

Cohen (1980) analysed spelling errors in English by adults and classified them into four types: A-Type (substitution with a real homophone; e.g. blue – blew), B-Type (substitution with a real non-homophone; e.g. blue – blow), C-Type (substitution with a compatible pseudo-homophone; e.g. blue – bloo), and D-Type (substitution with an incompatible pseudo-homophone; e.g. blue – bloe). Likewise, Hatta and Kawakami (1997) and Hatta et al. (1998) analysed writing errors in kanji made by college students according to their own classification system and proposed a cognitive model explaining how these errors were generated. Since kanji requires a two-dimensional orthographic drawing, Hatta and colleagues (Hatta and Kawakami, 1997; Hatta et al., 1998) classified kanji writing errors into 10 categories:

- (1) substitution with a kanji having the same pronunciation or phonological elements (P type);
- (2) substitution with orthographically similar kanji (O type);
- (3) substitution with semantically similar kanji (S type);
- (4) mixed error types of P and O (P+O type);
- (5) mixed error types of P and S (P+S type);
- (6) mixed error types of O and S (O+S type) ;
- (7) mixed error types of P, O and S (P+O+S type);
- (8) non-existent kanji substitution;
- (9) misplaced order of kanji elements;
- (10) others.

Samples of errors in each category are given in Table 1.

The present study used the same classification system outlined above to examine the errors made by its participants in writing kanji and to try to pinpoint the influential factors involved in this error process. These factors were expected to differ in accordance with the type of past learning experience each participant had with regard to kanji: (1) Japanese college students with many years of reading and

**Table 1: Classification of kanji error types**

Error types	Samples of kanji errors	Proper kanji combination			
		Kanji	Hiragana	Phonemes	Meaning
(1) Phonological (P)	社 回	社 会	しゃ かい	/sya kai/	society
(2) Orthographical (O)	社 委 回 節	社 季 会 節	き せつ	/ki setu/	season
(3) Semantic (S)	社 潜 存	社 潜 伏	せん ぶく	/seN puku/	concealment
(4) P + O	社 潜 意 織	社 潜 意 識	い しき	/i siki/	consciousness
(5) P + S	社 精 心	社 精 神	せい しん	/sei siN/	mind
(6) O + S	社 待 続	社 持 続	じ ぞく	/zi zoku/	to maintain
(7) P + O + S	社 侵 透	社 浸 透	しん とう	/siN toR/	penetration
(8) Non-existent kanji substitution	社 保 建	社 保 健	ほ けん	/ho keN/	sanitation
(9) Misplaced order	社 断 判	社 判 断	はん だん	/haN daN/	judgement
(10) Others	社 牧 激	社 判 刺 激	し げき	/si geki/	stimulus

*Note:* Pronunciation of words with proper kanji combinations is transcribed by using Japanese phonetic symbols which indicate three special sounds in Japanese: /N/ for nasal, /Q/ for geminate and /R/ for long vowel. The sound /N/ is written ん in hiragana and never appears at the beginning of words.

writing practice, and thus a good knowledge of kanji, (2) Japanese schoolchildren learning kanji for the first time at school, and (3) Australian university students with little experience of learning kanji and almost no exposure to it.

### Data collection

Kanji writing errors were collected from three groups of participants. Writing errors of Japanese schoolchildren were collected. They came from work sent in to the distance education tutorial programme called *Red-pen Teaching*. Red-pen is a commercially based educational service by mail, which provides corrections and comments to answers sent in by students. In the Red-pen service, there is a section where students write letters to teachers. The present data made use of the errors in kanji made by Grade 7 Japanese schoolchildren (13 years old) who had written in to the Red-pen tutorial teaching programme. Second, kanji writing errors made by 39 Japanese-as-a-second-language (JSL) students were collected. These data came from written work (particularly from 10 weekly-administered tests) done in a particular Japanese language course offered at an Australian university. Written work by native Chinese speakers in this course was not included in the data collection. Subjects' ages ranged from 19 to 38 years old, but the majority were aged 19 to 22. All 38 of the Australian students had a relatively high level of educational background (at least grade 12 completion), as they were qualified to enter and study at an Australian university. At the time of testing, they were just beginning to learn kanji at the introductory level of the Japanese language course. All the students were taught a certain number of kanji every week in a classroom. This was also facilitated by computer-assisted instruction (CAI) in which they could learn basic kanji at any time. This kanji CAI program used a pictorial method of approach in the mastering of kanji. Third, writing errors were also collected from Japanese college students. This source included written essays and responses to teachers on examination answer sheets. The Japanese college students were from five different colleges: two nurse training colleges, one teacher training college, one college for kindergarten teachers, and one specialized college in geriatrics. All these students were high school graduates and therefore had at least 12 years of education. In total, 374 errors were collected from Japanese college students, 209 errors from schoolchildren, and 408 errors from Australian second-language learners of Japanese.

### Analysis and results

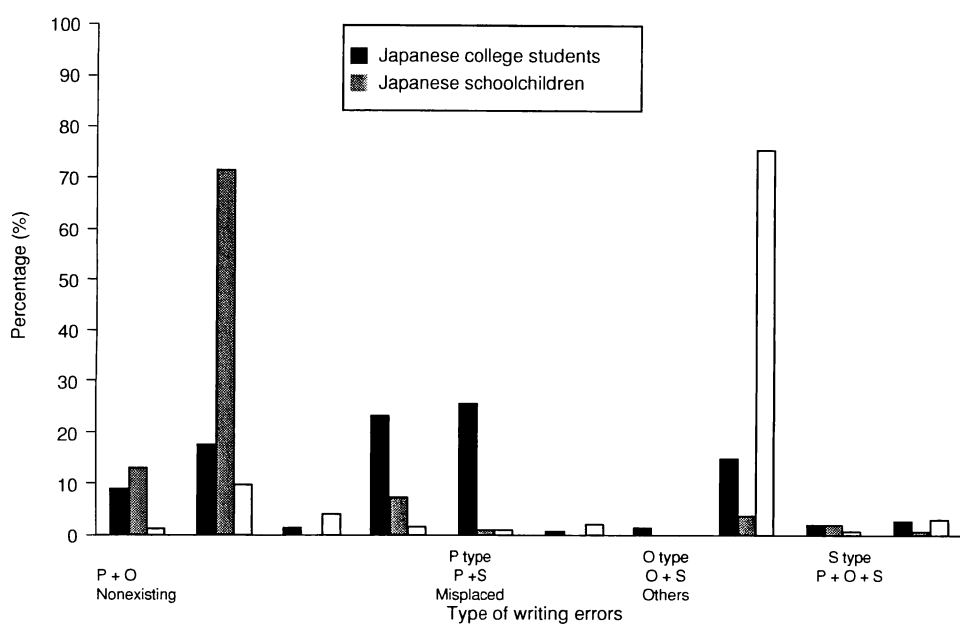
Percentages of kanji writing errors according to the 10 error types are given in Table 2 and visually presented in Figure 1. In addition, the percentages based on phonologically related, orthographically related and semantically related kanji writing errors were totalled and are given in Table 2 with an illustration of these calculations in Figure 2. The error patterns among the three different groups of participants differ greatly.

Japanese college students are considered to have a well-established knowledge of kanji. Even with this being the case, they still produced 17.9% of purely orthographic errors. The overall percentage of errors made that were orthographically related was 43.6%, calculated by adding the percentages of kanji errors of the O type, the P + O type, the O + S type and the P + O + S type. Although Japanese college students study kanji for more than nine years at school, they still made a

**Table 2: Percentage of writing errors**

Error types	Japanese college students (%)	Japanese schoolchildren (%)	Australian university students (%)
(1) Phonological (P)	9.1	13.2	1.2
(2) Orthographical (O)	17.9	71.9	10.0
(3) Semantic (S)	1.6	0.0	4.2
(4) P + O	23.5	7.5	1.7
(5) P + S	25.9	1.0	1.0
(6) O + S	0.5	0.0	2.2
(7) P + O + S	1.6	0.0	0.0
(8) Non-existent kanji substitution	15.0	3.9	76.0
(9) Misplaced order	2.1	2.0	0.5
(10) Others	2.7	0.5	3.2
Phonologically related	60.0	21.7	3.9
Orthographically related	43.6	79.4	13.9
Semantically related	29.7	1.0	21.3

*Notes:* As error types 8–10 were not related to phonological, orthographical or semantic factors, they were not included in the calculation of the totals for P-related, O-related and S-related errors.

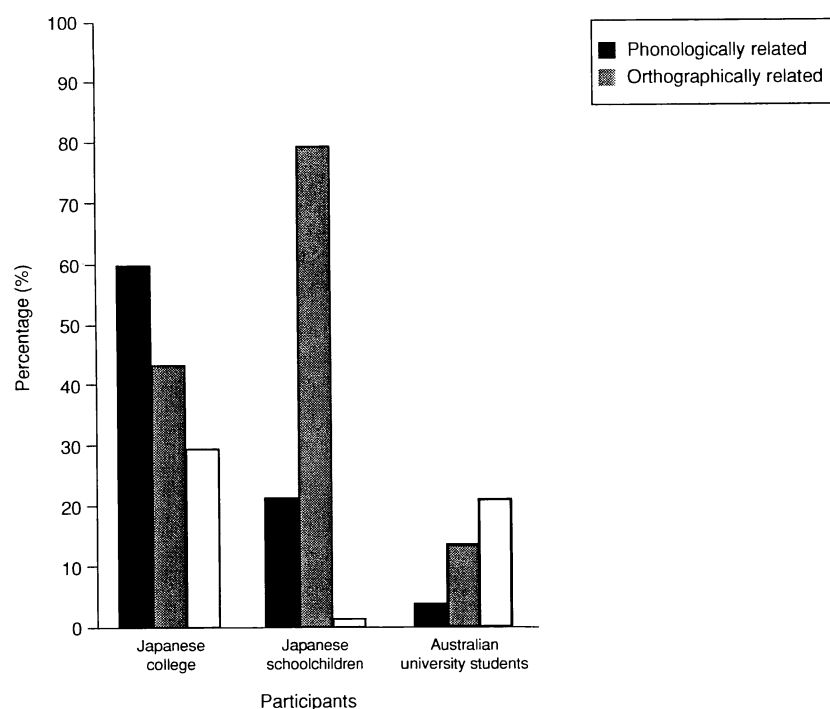


**Figure 1:** Percentage of kanji error types made by Japanese college students, schoolchildren and Australian university students.

relatively high percentage of orthographic errors. Their percentage of purely phonological errors was 9.1%. However, it was rather surprising to find that phonologically related mixed error types were unexpectedly high. The amount of errors according to the substitution type of writing kanji with the same pronunciation but with slightly different orthography (i.e. P + O type) was found to be 23.5% and of those with the same pronunciation but with slightly different meaning was 25.9%. In total, 60.0% of the errors made by Japanese college students were phonologically related errors, as shown in Figure 2. Although it is often believed that Japanese kanji are strongly associated with their meanings, the percentage of semantically related errors made by college students was 29.7%, which is much lower than orthographically related or phonologically-related errors.

Japanese schoolchildren in Grade 7 are considered to be in the middle of the kanji learning stage. According to the Japanese language curriculum (Ministry of Education, Science, Sports and Culture, Government of Japan, 1998), 1006 kanji are required to be taught in Grades 1–6. Kanji writing errors made by Japanese schoolchildren showed a very clear trend, easily seen in both Figures 1 and 2. The substitution of orthographically similar kanji was outstandingly high at 71.9%. The percentage of orthographically related errors was 79.4%. After learning about 1000 kanji, these students seem to master various kanji elements but do not clearly memorize how kanji elements are placed in a two-dimensional kanji character.

Australian students learning Japanese at an Australian university are considered to be at the beginning stage of learning kanji where they do not have a clear sense of the orthographical characteristics of kanji. As expected, their writing errors were



**Figure 2:** Kanji errors made by the three groups of participants.

mostly of the substitution by non-existent kanji type, as indicated by a figure of 76.0% in Table 2. Thus, they have not obtained a configurational sense of kanji components including the 'radicals' used for classifying kanji in a dictionary. They are not yet at the stage of making phonological errors that require knowledge of the various kanji homophones. This was evidenced by their error rate of 1.2% for purely phonological error types and 3.9% for phonologically related types.

### Discussion

In a study on English spelling errors done by Ellis (1980), literate adults mostly made spelling errors due to a lack of knowledge related to phoneme-to-grapheme conversion rules. The factor of phonology was most crucial in the making of spelling errors. The present study of errors made by Japanese college students displayed a similar trend to that of spelling errors made by native English-speaking adults, in that a high percentage of kanji writing errors were found to be phonologically related. Unlike phoneme-to-grapheme conversion rules established in English, Japanese kanji do not have clear mappings between orthography and phonology. Calculated on the basis of their kanji database (Tamaoka et al., 2001), Tamaoka et al. (submitted) indicated that 29 different sounds could each be represented by more than 20 kanji out of the 1945 Basic Japanese Kanji. Furthermore, among the 1945 basic kanji, the mean number of kanji homophones was 17.37 with a standard deviation of 14.74. This great number of kanji homophones, therefore, serves as one

of the major factors in phonologically related kanji writing errors. Thus, contrary to common belief that kanji is 'pictographic', phonological factors play an important role in writing kanji properly.

More interestingly, kanji writing by Japanese college students in this study created overlapping errors related to phonology and semantics (P + S), or phonology and orthography (P + O). For example, instead of the proper combinations of 地 and 震 pronounced as /zi siN/ (/N/ refers to the Japanese nasal sound) meaning 'earthquake', college students wrote incorrect combinations of kanji such as 地 and 振 pronounced as /zi siN/. The kanji 振 and 震 not only have the same sound, but also share a similar meaning of 'shake'. Since these kanji differ only in orthography, college students had great difficulty identifying the proper combinations for the word 'earthquake'. Owing to the fact that many kanji homophones exist in Japanese, writing mistakes, especially those with improper kanji combinations, are easily made by college students because of their relatively well-established kanji lexicon. Consequently, Japanese college students show acquired knowledge of kanji constructing elements, but they have some difficulties putting kanji together to create proper combinations of compound words.

In contrast, Japanese children in Grade 7, who are required to master 1006 kanji by Grade 6, produced errors of the orthographical type almost exclusively. These mistakes were mostly seen in the replacement of kanji constructing elements. Among the multiple elements that create a majority of Japanese kanji, one of these elements is considered to be essential. Japanese kanji dictionaries usually classify kanji by way of these 214 essential elements or 'radicals' (for detail of these radicals see Kaiho and Nomura, 1983; Todo, 1987, 1990; Tamaoka, 1991; Leong and Tamaoka, 1995; Saito, 1997; Saito et al., 1998; Kess and Miyamoto, 2000; Shirakawa, 2000a, 2000b). Radical frequency, which indicates how many of the 1945 basic kanji share the same radical, shows that a great many kanji share the same small number of radicals (Tamaoka et al., submitted). Only 24 radicals are used in constructing 54.34% or 1057 of the 1945 basic kanji. Among these radicals, 'Sanzui', representing 'water', is the most frequently found radical in more than 5.30% of the basic kanji or 103 out of the 1945 basic kanji. In Japan, schoolchildren in Grade 7 obtain a good knowledge of the orthography related to kanji and their constructing elements. However, they are still unsure of the proper usage of these kanji elements to create a single kanji. One probable cause for kanji writing errors might be the misplacement of kanji elements in a two-dimensional structure of kanji.

In this study, kanji writing errors made by Australian university students learning Japanese as a second language were analysed. Australian participants displayed a different pattern of errors as compared with the two groups of Japanese participants. Their errors were found to be of the substitution type of non-existent kanji or non-existent kanji elements. This tendency of errors suggests that Australian students have not yet established the correct orthographic representations of kanji and their elements. For example, the kanji 現, meaning 'to appear', is constructed by the two parts of 王 'king' and 見 'to see'. One has to at least know these two kanji in order to write the kanji 現. As explained in the case of Japanese schoolchildren, many kanji elements are repeatedly used as constructing parts of various kanji. Thus, these frequently used kanji elements should also be taught to Australian university students showing them the various kanji sharing the same elements.



In sum, the present study found that depending on the levels of kanji acquisition, different patterns of kanji writing errors are made. This was seen in: (1) Japanese college students who made a high percentage of phonologically related errors, (2) Japanese schoolchildren who produced exclusively orthographically related errors, and (3) Australian university students learning Japanese who wrote various non-existent kanji.

It is too early to offer critical implications based on the present preliminary experiment. However, we can suggest one thing: mastery of the actual segments and clarification as to their proper locations/positions is crucially important in kanji writing. For non-native Japanese learners and primary school children, it is important to teach single kanji and kanji segments clearly because less emphasis has been placed on the ways in which kanji words are constructed and how two given kanji combine to form meaning.

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