Cross-Linguistic Orthographic and Phonological Similarity Between Chinese and Japanese: Perceptual Sensitivity and Lexical Processing Mechanisms

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Abstract

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Full Text

Preamble

[Manuscript] Cross-Linguistic Orthographic and Phonological Similarity Between Chinese and Japanese: Perceptual Sensitivity and Lexical Processing

Mechanisms

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Abstract

Cross-linguistic similarity plays a crucial role in bilingual lexical processing, especially in language pairs such as Chinese–Japanese that share a writing system but differ substantially in phonology. This study investigates how orthographic and phonological similarity is perceived by Japanese native speakers and how these similarity dimensions influence lexical processing in Japanese learners of Chinese.

Two studies were conducted. Study 1 constructed a similarity rating database based on subjective evaluations of orthographic and phonological similarity for 149 high-frequency Chinese words, collected from Japanese native speakers with no prior Chinese learning experience. The results showed a strong correlation between orthographic and phonological similarity ratings; however, Japanese native speakers consistently provided lower similarity scores compared with Chinese native speakers.

Study 2 examined the effects of these similarity dimensions on Chinese word

recognition by highly proficient Japanese learners of Chinese, analyzing both reaction times and accuracy using mixed-effects models. The results revealed a significant effect of phonological similarity on reaction times, whereas orthographic similarity showed no reliable influence on either measure. These findings highlight asymmetrical cross-linguistic effects in Chinese–Japanese lexical processing and contribute to Japanese Studies by clarifying how shared scripts and divergent phonological systems

shape bilingual cognition in East Asian contexts.

Key Words: Chinese–Japanese bilingualism; lexical processing; phonological similarity; orthographic similarity; lexical decision; mental lexicon

1. Introduction

Chinese characters (Kanji) occupy a central place in the Japanese language and represent one of the most enduring outcomes of historical script sharing and cultural exchange in East Asia (Nakayama 2002, Cai et al. 2025). Because Japanese and Chinese rely on closely related logographic writing systems, the

two languages share a large number of visually similar characters. Despite this orthographic resemblance,

however, these characters often diverge substantially in their phonological realizations and, in some cases, their semantic mappings (e.g., Fei et al. 2022). As a result, readers and language learners frequently encounter words that appear familiar in form while differing markedly in pronunciation or meaning, creating a distinctive challenge for cross-linguistic lexical processing.

Previous research on bilingual lexical processing has demonstrated that orthographic and phonological similarity can lead to both facilitative and inhibitory effects, depending on learners' experience, proficiency, and task demands (Kaushanskaya et al. 2011, Cai et al. 2025, Song et al. 2025). In the Chinese–Japanese context, shared orthographic forms have been shown to facilitate visual word recognition, particularly for Chinese learners of Japanese, who can often rely on stable form–meaning mappings from their first language (Cai and Matsumi 2009). At the same time, divergence in phonological representations may induce cross-language competition, resulting in processing costs in both visual and auditory tasks (Fei and Matsumi 2012, Fei et al. 2022). Accumulating evidence further indicates that bilingual lexical access is fundamentally non-selective, such that representations from both

languages may be activated even when only one language is required by the task (Van Hell and Dijkstra 2002).

These issues are especially salient in regions such as East and Southeast Asia, where Japanese and Chinese are learned and used in close relation. Understanding how learners perceive and process similarity between Chinese characters and Japanese kanji is therefore relevant not only for models of bilingual lexical processing, but also for

Japanese Studies more broadly, as it bears on reading behavior and second language acquisition in historically interconnected writing systems (Nakayama 2002). Within this context, the present chapter reports an empirical study based on experimental methods. It examines how Japanese native speakers perceive orthographic and phonological similarity between Chinese words and Japanese kanji, and how advanced acquisition of Chinese shapes lexical processing in Japanese speakers. Two complementary studies are presented. Study 1 establishes baseline similarity judgments from Japanese speakers with no prior experience learning Chinese, while Study 2 employs a visual lexical decision task with advanced learners of Chinese to assess how similarity in written form and sound affects reaction times and accuracy.

2.1. Lexical Representation and Bilingual Lexical Processing in Alphabetic

Languages Lexical processing has long been a core concern in cognitive psychology and psycholinguistics, as it provides insight into how linguistic knowledge

is represented

and accessed in the human mind (Stella et al. 2024). The mental lexicon is generally understood as an organized yet flexible system that stores and activates multiple types of linguistic information, including orthographic, phonological, morphological, and semantic representations (Aitchison 2012, Wulff et al. 2019). Lexical access is therefore not a unitary operation but the outcome of interactions across multiple representational levels.

For bilingual speakers, lexical processing is inherently more complex because two languages coexist within a shared cognitive system. A central theoretical question concerns how lexical and conceptual representations from the first language (L1) and the second language (L2) are organized, and how activation in one language influences processing in the other. Early and influential accounts of bilingual lexical organization converge on the assumption that L1 and L2 share conceptual representations while maintaining largely separate lexical form representations, particularly at lower levels of L2 proficiency (Chen and Leung 1989, Chen and Ng 1989, Kroll and Stewart 1994).

Within this concept mediation framework, beginning L2 learners are assumed to access meaning primarily via their L1, with L2 words activating concepts indirectly through L1 lexical representations.

As L2 proficiency increases, direct links between L2 lexical forms and conceptual representations are strengthened, reducing reliance on L1 mediation (Jiang 2000). This developmental shift is formalized in the Revised Hierarchical Model, which emphasizes asymmetric connections between L1 and L2 that gradually reorganize with increased experience and proficiency (Kroll et al. 2010). From this

perspective, bilingual lexical organization is not static but dynamically shaped by learning history, frequency of use, and contextual demands (Jiang 2000, Song et al. 2025). Proficiency and language dominance therefore play a critical role in determining how tightly integrated or functionally separate the two lexicons are during online processing.

Much of the empirical evidence supporting existing models of bilingual lexical

processing comes from studies of alphabetic language pairs. In alphabetic languages, cross-linguistic form overlap has often been shown to facilitate lexical processing, as shared orthographic and semantic representations jointly enhance activation during word recognition (Van Hell and Dijkstra 2002, Kroll et al. 2010). At the same time, similarity does not invariably lead to facilitation. Under certain conditions, cross-linguistic overlap can also give rise to competition. For example, Boukrina and Marian (2006) reported that phonological overlap facilitated word recognition in the non-native language but inhibited recognition in the native language, revealing an asymmetry in phonological processing and supporting a parallel, non-selective account of bilingual word recognition.

Related asymmetries have also been observed with respect to linguistic distance.

Kaushanskaya et al. (2011), for instance, showed that English–Spanish bilinguals with high Spanish proficiency exhibited improved English reading fluency, whereas English–Mandarin bilinguals with high Mandarin proficiency demonstrated reduced English fluency. These results suggest that cross-language interaction is shaped not only by proficiency, but also by typological distance, with closer language

pairs more likely to show positive transfer and more distant pairs more susceptible to competition.

Linguistic distance alone, however, may not fully account for cross-linguistic interaction in all bilingual contexts. In language pairs that share a writing system but diverge substantially in phonological realization, such as Chinese and Japanese, the relationship between orthography and phonology differs from that observed in

alphabetic languages. In these systems, orthographic and phonological similarity are often only partially aligned and may exert independent or competing influences on lexical access. It therefore remains unclear whether models derived primarily from alphabetic language pairs can be directly extended to logographic systems, highlighting the need to examine bilingual lexical processing in language pairs characterized by shared script and divergent phonology.

2.2. Cross-Linguistic Similarity and Its Impact on Chinese-Japanese Bilingual

As noted above, Chinese–Japanese bilingualism represents a distinctive case in bilingual lexical research, as the two languages share Chinese characters (Kanji) while differing substantially in their phonological systems. In Chinese, the mapping between characters and pronunciation is relatively opaque, with individual characters often associated with multiple pronunciations depending on lexical or contextual factors. In Japanese, Kanji likewise have multiple readings, including "on-yomi" (音読み) and "kun-yomi" (訓読み), and are embedded within a mixed writing system that also incorporates the phonetic scripts of Hiragana and Katakana. This complex orthographic and phonological relationship provides a unique window into how bilingual individuals manage cross-linguistic activation and competition during visual word recognition.

employs the syllabic scripts Hiragana and Katakana. As a result, orthographic similarity at the character level does not necessarily correspond to phonological similarity across the two languages. This structural dissociation allows orthographic and phonological similarity to exert partially independent effects on lexical processing in Chinese–Japanese bilingual contexts (e.g., Nakayama 2002, Fei et al. 2022).

Research with native Chinese speakers learning Japanese consistently shows

Research has demonstrated that orthographic similarity between Chinese characters and Japanese Kanji facilitates lexical processing, while phonological sim-

ilarity tends to hinder it. For example, Cai and Matsumi (2009) found that Chinese–Japanese cognates, such as 椅子 (yǐzi) and isu (“chair”), were processed faster than non-cognates, suggesting that shared Kanji forms speed up lexical access. Matsushima and Fei (2011) found that Japanese Kanji characters that were more orthographically similar to Chinese resulted in shorter naming latencies.

Conversely, Fei and Matsumi (2012) demonstrated that when Chinese characters and Japanese Kanji shared phonology but not necessarily meaning, Chinese learners' auditory recognition of Japanese words was slower, indicating phonological interference. Follow-up studies confirmed these results: orthographic similarity consistently facilitated L2 processing, while phonological similarity caused interference (e.g., Fei 2013, Fei 2015, Fei et al. 2022). These findings suggest that shared orthography benefits lexical processing, while shared phonology introduces cross-language competition.

However, the existing literature has been strongly skewed toward Chinese native speakers learning Japanese, with relatively little attention paid to the effects of

L2 acquisition on L1 processing or to Japanese learners of Chinese. Recent work by Cai et al. (2025) begins to address the former issue by showing that acquiring Japanese as an L2 can influence native Chinese lexical processing. Their results indicate that orthographic and phonological similarity between Chinese and Japanese exert detectable but overall weak effects on L1 processing, and that the impact of L2 proficiency is closely tied to L2 processing efficiency. Importantly, this line of

research still centers on Chinese learners of Japanese.

Studies that do target Japanese learners of Chinese have largely focused on vocabulary learning outcomes rather than online lexical processing. For example, Li (2022) examined the effects of form–meaning relations in Chinese–Japanese homographs on Japanese learners' Chinese vocabulary acquisition using paper-based tests, showing that homographic cognates were learned most successfully, followed by homographs with divergent meanings, with learning outcomes further modulated by proficiency level. Similarly, Zhang and Tamaoka (2025) examined naming performance in Japanese learners of Chinese and reported complex interactions among script type, pronunciation, and proficiency. Their findings highlight persistent difficulty in suppressing Japanese phonological activation during Chinese word processing. While this line of research offers important insights into learning strategies and phonological control, it has not systematically addressed how phonological and orthographic similarity independently contribute to lexical processing.

Overall, prior research shows a clear asymmetry in both research direction and focus. Most experimental studies examine Chinese learners of Japanese, whereas

research on Japanese learners of Chinese remains limited and has largely emphasized offline learning outcomes. Moreover, few studies have systematically

examined how orthographic and phonological similarity independently shape online lexical processing in Japanese native speakers learning Chinese. Addressing this gap is essential for developing a more balanced account of Chinese–Japanese bilingual

lexical processing.

2.3. The Present Study

Building on the foregoing discussion, the present study investigates lexical processing in Japanese native speakers learning Chinese, with a particular focus on the roles of phonological and orthographic similarity. Two complementary empirical studies were conducted.

Study 1 examined baseline perceptions of cross-linguistic similarity by recruiting Japanese adults with no prior experience in learning Chinese. Participants rated phonological and orthographic similarity separately between Chinese characters and their corresponding Japanese Kanji on a seven-point scale, yielding speaker-specific similarity norms grounded in visual form and phonological perception.

Study 2 investigated online lexical processing in highly proficient Japanese learners of Chinese using a visual lexical decision task, in which phonological and orthographic overlap between Chinese words and their Japanese counterparts were systematically manipulated and reaction times and accuracy were analyzed. By integrating subjective

ratings with behavioral data, this study aims to contribute to a more nuanced account of bilingual lexical organization beyond alphabetic language pairs.

3. Study 1: Construction and Preliminary Validation of an Orthographic and

Phonological Similarity Rating Database

3.1. Methods

3.1.1. Participants Twenty native speakers of Japanese (11 females, 9 males; mean age = 23.9 years) participated in the similarity rating task. All participants were undergraduate or master's students with no prior experience learning Chinese: none had received formal instruction in Chinese, lived in China for an extended period, or had substantial exposure to Chinese before adulthood. Participation was voluntary, and all data were anonymized prior to analysis to ensure confidentiality. The study was conducted in accordance with relevant institutional ethical guidelines.

3.1.2. Materials To control for potential effects of lexical difficulty, 149 target words were selected from the HSK Level 4 list and below. Word selection followed three criteria.

First, only two-character Chinese words were included, in accordance with the HSK Vocabulary Handbook (Jiang 2017a, 2017b). Second, only Chinese-Japanese cognates with identical written forms and equivalent meanings were selected. Orthographic identity was determined with reference to Pan (1995) and Shi (2013), and semantic

equivalence was verified using the Dictionary of Chinese-Japanese Homographic (Wang et al. 2007), the Modern Chinese Dictionary (The Commercial Press, 2016), and Kōjien (Iwanami Shoten, 1998). Third, only items whose Japanese counterparts are read exclusively with on-yomi, rather than kun-yomi, were included.

These criteria ensured that all items were relatively familiar and of moderate difficulty for Japanese learners of Chinese, thereby minimizing confounding effects

related to lexical knowledge and proficiency in subsequent analyses.

3.1.3. Procedure All similarity ratings were completed at participants' own pace. Participants first completed the phonological similarity rating task. For each item, an audio recording of the Japanese pronunciation was presented first, followed by the corresponding Chinese pronunciation. After listening to both recordings, participants rated the degree of phonological similarity on a seven-point Likert scale, ranging from 1 (completely different) to 7 (completely identical). After completing the phonological similarity ratings, participants proceeded to the orthographic similarity rating task. In this phase, target words were visually presented, and participants were asked to judge the degree of orthographic similarity between the Chinese characters and the corresponding Japanese Kanji using the same seven-point scale.

Following the completion of all rating tasks, participants' language backgrounds were reconfirmed to ensure that none had prior Chinese learning experience or prolonged exposure to Chinese.

3.2. Results of Study 1

3.2.1. Descriptive Statistics Descriptive statistics for the overall similarity ratings are presented in Supplemental Table. Across the full dataset (149 items), orthographic similarity was rated substantially higher than phonological similarity. The mean orthographic

similarity rating was 5.51 (SD = 1.63), whereas the mean phonological similarity rating was 2.89 (SD = 1.51). To statistically compare these two dimensions, a paired-samples t-test was conducted. The results revealed a significant difference between the orthographic and phonological similarity ratings [$t(148) = 15.35$, $p < .001$], with a mean difference of 2.62 (SE = 0.17). This indicates that, at the group level, Japanese native speakers perceived the Chinese-Japanese character pairs as significantly more similar in orthographic form than in phonological realization. These findings confirm a clear dissociation between

the two dimensions of similarity, with orthographic overlap being judged as considerably stronger than phonological overlap.

3.2.2. Comparison of Phonological Similarity Ratings Between Japanese and Chinese Native Speakers To further examine whether Japanese native speakers' phonological similarity judgments align with those of Chinese native speakers, we conducted a cross-group comparison using data from Tome et al. (2012). That study collected Chinese–Japanese phonological similarity ratings from native speakers of Chinese

with no prior knowledge of Japanese. Because the item set in Tome et al. (2012) was not fully identical to that used in the present study, the comparison was restricted to the subset of items common to both datasets.

First, a correlation analysis was performed on the phonological similarity ratings assigned by Japanese and Chinese native speakers. The results revealed a strong and significant positive correlation between the two sets of ratings ($r =$

0.76, $p < .001$), indicating that both groups exhibited similar sensitivity to relative phonological similarity across items. However, despite this high correspondence at the item level, a paired-samples t-test showed a significant difference in absolute rating values. Japanese native speakers assigned significantly lower phonological similarity scores than Chinese native speakers [$t(45) = 6.57$, $p <$ $.001$]. This pattern suggests that while both groups converge in their relative judgments of phonological similarity, they differ in their evaluative baselines, likely reflecting differences in linguistic knowledge and phonological representations.

3.3. Summary of Study 1

Study 1 yielded three key findings. First, Japanese native speakers consistently distinguished between phonological and orthographic similarity, rating orthographic similarity significantly higher than phonological similarity. Second, the resulting ratings formed a structured similarity database, capturing speaker-specific perceptions of cross-linguistic similarity. Third, when compared with data from native Chinese speakers, the Japanese ratings showed a strong alignment in relative phonological

similarity judgments, while Japanese speakers tended to assign lower absolute similarity ratings overall.

Together, these findings demonstrate that perceptions of cross-linguistic similarity are both structured and language-specific. The similarity database developed in Study 1 provides a solid empirical foundation for examining how orthographic and phonological similarity influence lexical processing in Japanese learners of Chinese, as

explored in Study 2.

4. Study 2: Effects of Phonological and Orthographic Similarity on Lexical

Processing

4.1. Methods

4.1.1. Participants Twelve advanced learners of Chinese whose native language was Japanese (7 females, 5 males) participated in the experiment. The participants had a mean age of 23.8 years and had studied Chinese for an average of 4.41 years (SD = 2.13). At the time of testing, all participants were residing in China, with a mean length of residence of 2.13 years, and had attained an advanced level of Chinese proficiency, as evidenced by having passed HSK Level 5 or Level 6. Participation was entirely voluntary, and written informed consent was obtained prior to the experiment. No personally identifying information was collected, and all data were anonymized before analysis.

None of the participants reported any history of neurological or language-related

disorders. The study was conducted in accordance with relevant institutional ethical guidelines.

4.1.2. Materials Based on the similarity ratings obtained in Study 1, the present experiment examined the effects of phonological and orthographic similarity separately, by

contrasting high- and low-similarity conditions for each dimension. Given that orthographic similarity ratings were generally higher than phonological similarity ratings, materials were selected independently for the two analyses.

To control for lexical frequency and item difficulty, both Chinese log-transformed word frequency (from the Center for Chinese Linguistics [CCL] Corpus) and Japanese log-transformed word frequency (from the Balanced Corpus of Contemporary Written Japanese [BCCWJ]) were taken into account. From the full set of rated items reported in the Supplemental Table, materials were selected separately for the phonological and orthographic similarity analyses.

For phonological similarity, items were drawn from the top 21 items (14.1%) and the bottom 24 items (16.1%) of the rating distribution. For orthographic similarity, items were selected from the top 56 items (37.6%) and the bottom 18 items (12.1%).

The larger pool for the high orthographic similarity condition reflects a ceiling effect in the ratings, as many items received the maximum score of 7 and thus met the selection criterion. From each similarity condition, 15 words were ultimately selected, ensuring balanced frequency distributions across conditions.

[Phonological Similarity Manipulation] For the phonological similarity analysis, independent-samples t-tests confirmed a significant difference between the high

Figure 1

Figure 1: Figure 1

and low phonological similarity conditions [t(28) = 34.70, p < .001]. Importantly, the two conditions did not differ in orthographic similarity [t(28) = 0.04, p = .966].

Additionally, no significant differences were found for Chinese word frequency [t(28) = 1.34, p = .190], or Japanese word frequency [t(28) = 0.01, p = .995]. These results

confirm that phonological similarity was successfully manipulated while orthographic similarity and lexical frequency were adequately controlled. [Orthographic Similarity Manipulation] For the orthographic similarity analysis, independent-samples t-tests showed a significant difference between the high and low orthographic similarity conditions [t(28) = 21.71, p < .001]. In contrast, phonological similarity did not differ significantly between the two conditions [t(28) = 1.13, p = .270]. Similarly, no significant differences were observed for Chinese word frequency [t(28) = 1.04, p = .309], or Japanese word frequency [t(28) = 0.15, p = .881].

Together, these results indicate that orthographic similarity was selectively manipulated without confounding effects from phonological similarity or lexical frequency.

In addition to real Chinese words, an equal number of pseudo-words were created and included as fillers in the lexical decision task to prevent response bias.

4.1.3. Procedure

The experiment employed a visual lexical decision task programmed in PsychoPy (version 2021.2.3). As illustrated in Figure 1

, each trial began with a fixation cross (“*”) presented at the center of the screen for 1000 ms, followed by a 500 ms blank screen. A stimulus item then appeared centrally, and participants were instructed to decide as quickly and accurately as possible whether the item was a real Chinese word, responding via key press. The stimulus remained on the screen for a

maximum of 5000 ms. If no response was made within this time window, the trial was recorded as a non-response. Each trial ended with a 500 ms blank screen before the next trial began. Reaction time was measured from stimulus onset to the key press and was recorded automatically by the computer. After completing the task, participants were asked whether any of the stimuli were unfamiliar and were again queried about their Chinese learning background and study-abroad experience.

4.2. Results of Study 2

4.2.1. Descriptive Statistics and Statistical Analysis Descriptive statistics for the variables in Study 2 are presented in Table 1 .

Accuracy and log-transformed correct reaction times were analyzed using (generalized) linear mixed-effects models. Phonological similarity and orthographic similarity were included as fixed effects, while Participant and Item were treated as random effects.

The initial models included random intercepts and random slopes, which were simplified where necessary to ensure model convergence.

Phonological Similarity condition

Accuracy

Reaction Times (ms)

condition

Accuracy

Reaction Times (ms)

Orthographic Similarity

4.2.2. Effect of Phonological Similarity Accuracy data were analyzed using a generalized linear mixed-effects model with a binomial distribution. The results, as shown in Table 2 , revealed no significant effect of phonological similarity on accuracy, with no reliable difference between the high and low phonological similarity conditions [$\chi^2(1) = 0.33$, p = .567].

Parameter Estimates (Fixed Coefficients) Names

Effect

(Intercept) Condition

Low - High

Estimate

Random Components Groups

Variance

(Intercept)

Participant

(Intercept)

Residual

Notes. Number of observations = 360, Number of groups: Item = 30, Participant = 12.

Log-transformed correct reaction times were analyzed using a linear mixed-effects model. The results, as shown in Table 3 , revealed a significant main effect of phonological similarity on reaction time. The omnibus test of fixed effects indicated that phonological similarity significantly predicted reaction time [F(1, 27.80)

= 4.88, p = .036], with reaction times being significantly longer in the low phonological similarity condition than in the high phonological similarity condition.

Parameter Estimates (Fixed coefficients) Names

Effect

(Intercept) Condition

Low - High

Estimate

<.001

Random Components Groups

Variance

(Intercept)

Participant

(Intercept)

Residual

Notes. Number of observations = 357, Number of groups: Item = 30, Participant = 12.

4.2.3. Effect of Orthographic Similarity Accuracy data were analyzed using a generalized linear mixed-effects model with a binomial distribution. The results, as shown in Table 4 , indicated that the main effect of orthographic similarity on accuracy was not significant. The omnibus test of fixed effects did not reach significance [$\chi^2(1) = 0.98$, p = .321], suggesting no reliable difference in response accuracy between the high and low orthographic similarity conditions.

Parameter Estimates (Fixed Coefficients) Names

Effect

Estimate

Low - High

Groups

Variance

Participant

(Intercept)

(Intercept) Condition Random Components

Residual

Notes. Number of observations = 360, Number of groups: Item = 30, Participant = 12.

Log-transformed correct reaction times were analyzed using a linear mixed-effects model. As shown in Table 5 , the omnibus test of fixed effects did not reach significance [F(1, 27.91) = 2.37, p = .135]. These results suggest that orthographic similarity did not exert a significant effect on reaction time in the present task.

Parameter Estimates (Fixed coefficients) Names (Intercept)

Effect

Estimate

<.001

Condition

Low - High

Random Components Groups

Variance

(Intercept)

Participant

(Intercept)

Residual

Notes. Number of observations = 356, Number of groups: Item = 30, Participant = 12.

4.3. Summary of Study 2

Study 2 examined the effects of phonological and orthographic similarity on lexical processing in advanced Japanese learners of Chinese using a lexical decision task. The results revealed an asymmetrical pattern between the two similarity dimensions. Phonological similarity significantly affected reaction times, with slower responses observed in the high phonological similarity condition compared to the low similarity condition, indicating increased processing cost during lexical access.

However, phonological similarity did not yield a significant effect on accuracy. In contrast, orthographic similarity showed no significant effect on either accuracy

or reaction time, suggesting that orthographic similarity did not substantially modulate lexical decision performance in this group of advanced learners.

Taken together, these findings suggest that at an advanced proficiency level, phonological similarity between Chinese and Japanese exerts a stronger influence on online lexical processing speed than orthographic similarity, while neither dimension

significantly compromises accuracy. This pattern indicates that phonological overlap may induce competition or interference during lexical access, whereas orthographic similarity alone is insufficient to elicit measurable processing effects in the present task.

5. Discussion

The present study examined how phonological and orthographic similarity between Chinese characters and Japanese Kanji are perceived and how these dimensions influence lexical processing in advanced Japanese learners of Chinese. By combining speaker-specific similarity ratings with a lexical decision task, we assessed both perceptual baselines and online processing effects. The findings reveal two key patterns: (1) Japanese raters produced systematic norms for orthographic and phonological similarity, and when compared to Chinese raters, they judged phonological similarity lower in absolute terms, although the item-level profiles were highly correlated; (2) in the lexical decision task, phonological similarity significantly predicted reaction times, with lower similarity leading to slower responses, whereas orthographic similarity did not significantly affect reaction speed.

5.1. Perceptual Norms and Cross-Group Comparison

Study 1 yielded a structured set of phonological and orthographic similarity ratings from Japanese native speakers. Comparison with ratings from Chinese native speakers revealed a clear pattern: although Japanese raters assigned lower absolute

phonological similarity values, the two groups showed strong agreement in the relative ordering of items. This indicates that both groups were sensitive to item-level phonological relationships, while differing in how similarity was calibrated, likely as a function of language-specific phonological experience. The finding supports the view that perceptual similarity reflects not only stimulus-intrinsic properties but also the linguistic background of the rater.

Importantly, this cross-group comparison highlights the need to consider language-specific calibration when using similarity judgments in bilingual research.

High item-wise correspondence suggests that many phonological relationships are robust across language communities, but differences in absolute ratings cau-

tion against applying fixed similarity thresholds across groups. This pattern is consistent with previous findings showing that L1 phonological structure and phonotactic knowledge shape cross-language judgments and processing (Boukrina and Marian 2006, Kaushanskaya et al. 2011). Together, these results underscore the value of speaker-specific similarity norms for accurately modeling bilingual lexical processing.

5.2. The Role of Phonological and Orthographic Similarity in Lexical Processing

The present study examined the influence of both phonological and orthographic similarity on lexical processing in advanced Japanese learners of Chinese.

Our results revealed distinct patterns in how these two dimensions of similarity affected reaction times and accuracy. Specifically, phonological similarity significantly influenced reaction times, with lower phonological overlap resulting in slower

responses, suggesting that phonological information plays a functional role in visual word recognition. This finding aligns with nonselective activation theories of bilingual lexical access, which propose that phonological representations in both languages can be co-activated during lexical processing (Kroll and Stewart, 1994, Van Hell and Dijkstra 2002).

Interestingly, the phonological effect observed in the present study was facilitative, with faster responses in the high phonological similarity condition. This pattern contrasts with earlier findings reporting inhibitory effects of phonological overlap, particularly in studies of Chinese learners processing Japanese (e.g., Fei and Matsumi 2012, Fei 2013). Such divergence suggests that the role of phonological similarity is contingent on multiple factors, including task demands, proficiency level, and language direction. For advanced Japanese learners of Chinese, phonological similarity may support more efficient lexical access by facilitating the mapping from orthographic input to phonological or lexical representations. By contrast, for Chinese learners of Japanese, phonological overlap may introduce competition between activated phonological codes, especially in tasks that emphasize auditory processing or production. These findings indicate that phonological similarity does not exert a uniform effect in bilingual processing, but rather operates in a direction-sensitive and task-dependent manner.

Orthographic similarity, however, did not significantly affect either reaction times or accuracy in the lexical decision task. This finding warrants further consideration, particularly in light of previous studies reporting facilitative effects of

orthographic overlap in the Chinese-to-Japanese direction (Matsushima and Fei 2011, Cai and Matsumi 2009). One important factor is directionality and the structure of learners' native writing systems. Chinese learners of Japanese generally come from a writing system in which character form is closely tied to

meaning, and many have some degree of familiarity with traditional–simplified character correspondences. As a result, when encountering Japanese Kanji, Chinese learners can often map visual form directly onto existing conceptual representations, yielding robust orthographic facilitation. In contrast, Japanese learners of Chinese operate within a writing system in which character forms are associated with multiple readings and frequently co-occur with Kana. Japanese readers therefore do not rely on a one-to-one mapping between character form and lexical identity. When processing Chinese characters, shared visual form alone may not reliably activate the corresponding Japanese lexical entry or meaning. Consequently, orthographic overlap may provide weaker cues for lexical identification in the Japanese-to-Chinese direction, especially when phonological realization diverges across languages.

Second, the high proficiency of our participants likely contributed to the null effect of orthographic similarity. At advanced proficiency levels, basic character recognition becomes highly automatic, reducing the impact of small differences in orthographic similarity on reaction times. Phonological processing, which requires integration across systems, may remain a stronger indicator of processing difficulty in such contexts. This interpretation is consistent with models suggesting that the relative influence of orthographic versus phonological information changes with experience.

Finally, the nature of the task itself could explain the lack of an orthographic effect. Lexical decision tasks may not capture early form-based effects as well as other methods with finer temporal resolution, such as masked priming or eye-movement tracking. Orthographic facilitation might occur at early stages of visual recognition but may not translate into significant differences in reaction times, especially when later processing stages (e.g., semantic integration) dominate variance.

5.3. Implications for Bilingual Lexical Processing Models

The present findings contribute to a more nuanced understanding of bilingual lexical processing in typologically distinct language pairs such as Chinese and Japanese. The asymmetric effects of phonological and orthographic similarity observed in this study highlight the dynamic and context-sensitive nature of bilingual lexical access. Phonological similarity reliably influenced processing speed in advanced Japanese learners of Chinese, indicating that phonological integration remains important even at later stages of L2 acquisition. In contrast, orthographic similarity did not yield significant effects, possibly reflecting the complexity of Japanese orthographic knowledge and the high proficiency of the learners tested.

These results suggest that the roles of phonological and orthographic similarity vary as a function of processing direction, learner experience, and task demands.

Orthographic similarity appears most beneficial when learners can rely on stable L1 form–meaning mappings, as often observed in Chinese learners of Japanese,

whereas phonological similarity may play a more prominent role in the reverse direction.

Consistent with dynamic models of bilingual lexical organization, this study underscores the need to consider directionality and proficiency when evaluating cross-linguistic similarity effects (Jiang 2000, Kroll et al. 2010). The speaker-specific similarity norms developed here provide a useful methodological basis for future research on bilingual lexical access in languages that share scripts but diverge in phonological systems.

6. Conclusion, Limitations, and Future Directions

This study investigated the effects of phonological and orthographic similarity on lexical processing in Japanese–Chinese bilinguals, combining speaker-specific similarity norms with behavioral modeling. The results revealed that despite differences in absolute ratings, there was a high level of agreement between Japanese and Chinese native speakers in perceiving phonological similarity. In the lexical decision task, phonological similarity significantly influenced reaction times for advanced Japanese learners of Chinese, whereas orthographic similarity did not. These findings suggest an asymmetric, direction-sensitive pattern of cross-linguistic influence, underscoring the continued significance of phonological similarity in visual word recognition.

Despite these insights, several limitations should be considered when interpreting the results, and these provide opportunities for future research. First, although phonological similarity ratings were available for both Japanese and Chinese speakers, orthographic similarity ratings from Chinese speakers were not collected,

leaving a gap in cross-linguistic comparison. Second, our behavioral evidence is based solely on a visual lexical decision task with advanced learners. It is likely that different tasks, such as naming, translation, or auditory tasks, would yield distinct patterns of similarity effects, especially when varying learner proficiency. Third, while mixed-effects models accounted for random variation by participants and items, factors such as lexical frequency, stroke complexity, and semantic transparency were not explicitly modeled.

To address these limitations, future research should pursue several directions.

First, parallel orthographic similarity norms from Chinese native speakers are needed to allow a full cross-linguistic comparison. Second, behavioral paradigms should be expanded to include methods sensitive to early stages of processing, such as masked priming, eye-tracking, and ERP, in order to capture the temporal dynamics of orthographic and phonological similarity effects. Third, learners across a broader range of proficiency levels, including beginners, should be examined to trace developmental changes in similarity effects. Finally, future models should incorporate objective phonological distance measures and explicitly control for lexical covariates such as frequency, familiarity, and stroke count.

These approaches will help clarify the relative contributions of phonological and orthographic similarity and advance a more comprehensive account of Chinese-Japanese bilingual lexical processing.

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Supplemental Table

Chinese

Japanese

Orthographic Similarity

Phonological Similarity