

Bi-script readers of simplified and traditional Chinese have script-specific radical representations

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Background: Readers automatically activate a common, case-independent representation for the two forms of a letter [1]. However, it is unclear whether abstract representations also occur when a sub-lexical unit are realized as different orthographic variants in different writing systems. For instance, the Chinese verb *ya*₁ (meaning “to crush”) is written as “軋” in traditional Chinese and “轧” in simplified Chinese, with the same semantic radical in the characters realized as different forms “車” and “车”. But are these different orthographic variants have the same underlying representation in bi-script readers of simplified and traditional Chinese during visual word recognition?

Method: In four experiments, bi-script readers who predominantly used simplified Chinese characters (Exp 1 and 4) or traditional Chinese characters (Exp 2 and 3) were briefly exposed to a prime character for 50 ms and then judged whether a target (in the simplified script in Exp 1 and 3 and in the traditional script in Exp 2 and 4) was a real or pseudo character (Figure 1). If simplified and traditional radical variants are associated with a shared, script-independent abstract identity, we would expect an inhibitory priming effect when the prime and target share the same radical across different scripts [2]. Alternatively, if simplification has led to distinct, script-specific representations, we expect no such cross-script inhibition.

Results: In Exp 1 and 2 (with target characters in participants’ dominant script), we observed an inhibitory priming effect within the same script when prime and target shared the same radical (e.g., the prime “轮” and the target “轧”, sharing the radical “車/车” meaning “car”), compared to when they do not share the same radical (e.g., the prime “论” and the target “轧”)

(see Table 1 and Figure 2); no such effect emerged when prime and target came from different scripts (e.g., the prime “輪” and the target “軋”, sharing the radical “車/车” meaning “car”, vs. the prime “論” and the target “軋”, without shared radical). In Exp 3 and 4 (with target characters in participants’ non-dominant script, no inhibitory priming emerged from either within-script or cross-script priming (see Figure 3).

Discussion: These findings suggest that orthographic variants of the same radical are represented distinctly across simplified and traditional Chinese, rather than being mapped onto a shared abstract sub-lexical representation. This indicates that even closely related writing systems can develop script-specific sub-lexical representations in skilled readers. Moreover, the absence of inhibitory priming from the non-dominant script suggests that bi-script fluency plays an important role in how abstract sub-lexical units are processed across scripts.

Reference

- [1] Kinoshita, S., Whiting, D., & Norris, D. (2021). What masked priming effects with abbreviations can tell us about abstract letter identities. *Journal of memory and language*, 117, 104209.
- [2] Li, S., Law, S., Lau, K., & Rapp, B. (2020). Functional orthographic units in Chinese character reading: Are there abstract radical identities? *Psychonomic Bulletin & Review*, 28(2), 610-623.

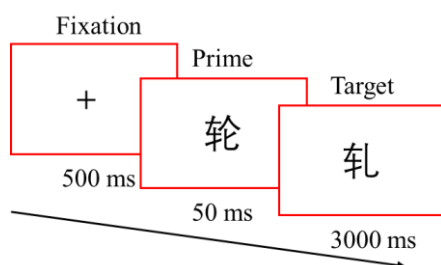


Figure 1: A trial in the character decision task in Exp 1. Participants were first shown a fixation cross for 500 ms. Then they were shown a prime character for 50 ms, followed by a target simplified character. They decided whether the target character was a real character within 3000 ms. Exp 2, 3, and 4 adopted an identical procedure, except that target characters were presented in their corresponding traditional script forms in Exp 2 and 4.

Table 1 LME results of reaction time in Exp 1 (left) and Exp 2 (right).

Effect	β	SE	p
Intercept	654.47	11.46	<.001
Scripts	-1.73	5.42	0.750
Radicals	15.36	5.42	0.005**
Scripts:radicals	29.62	10.85	0.006**

Effect	β	SE	p
Intercept	739.96	19.32	<.001
Scripts	27.15	8.85	0.003**
Radicals	23.49	8.25	0.004**
Scripts:radicals	32.52	16.51	0.049*

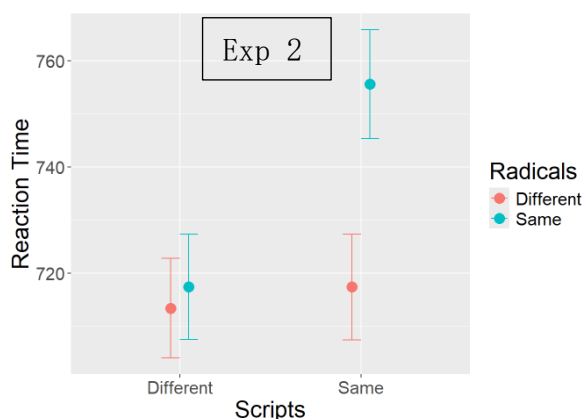
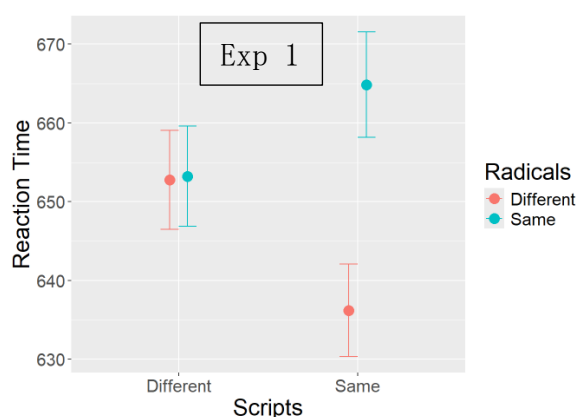


Figure 2. Reaction times for Exp 1 (Simplified users) and Exp 2 (Traditional users). In both experiments, targets were judged in the readers' dominant script; only within script inhibitory priming was observed (interaction effect between scripts and radicals).

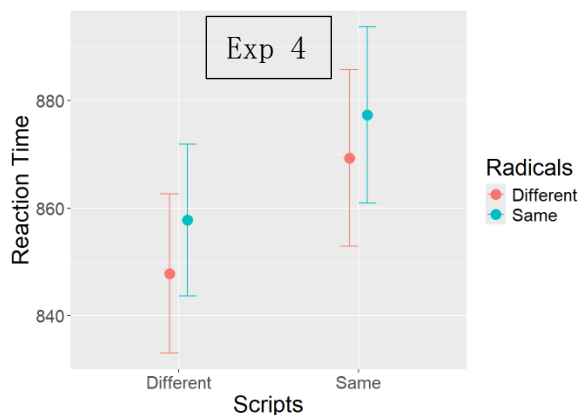
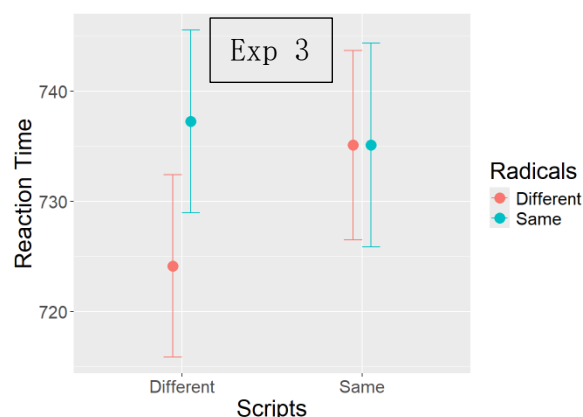


Figure 3. Reaction times for Exp 3 (Simplified users) and Exp 4 (Traditional users). In both experiments, targets were judged in the readers' non-dominant script; no within- or cross-script inhibitory priming was observed (no significant interaction effect).