THE EFFECTS OF SEMANTIC RADICAL CONSISTENCY ON CHINESE CHARACTER NAMING: A CORPUS-BASED APPROACH

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Within the triangle modeling framework of reading (Seidenberg & McClelland, 1989), reading can be achieved via two main pathways, the orthography-phonology-semantics (OPS) pathway and the orthography-semantics (OS) pathway. The interaction of both pathways in Chinese character reading has been demonstrated by Dang et al. (2019) using a word naming task. The cooperative nature between OPS and OS pathways revealed that successful reading requires the integration of phonological and semantic information. In Chinese, semantic radicals usually carry information about the meaning of Chinese characters. A semantic transparent character refers to the fact that the meanings of characters can be inferred from their semantic radicals. Past studies used semantic rating tasks to measure semantic transparency and revealed a robust effect on word reading (e.g. Dang et al.,2019). However, this rating approach cannot measure semantic transparency from a large sample size. Moreover, it is subjective and time-consuming. Therefore, this study provided a novel, corpus-based measure for semantic transparency in Chinese character reading, termed *semantic radical consistency* (SRC). SRC was computed on the basis of the Chinese Word2Vec space based on Academia Sinica Balanced Corpus 4.0 (Huang & Chen, 1998). We first grouped Chinese characters based on their semantic radicals, and then calculated the mean pair-wised cosine similarity scores between semantic vectors of Chinese characters within the group.

To evaluate the SRC, two approaches were used. First, we conducted linear mixed-effect modelling (LMM) analyses to verify the explanatory power of SRC on character naming RTs, taken from a large-scale Chinese psycholinguistic database (Chang et al., 2016). Specifically, we used LMM models to examine the interaction between SRC and phonetic radical consistency (PRC) (i.e., a predictor that has been regarded a pivotal factor in character naming). Secondly, we conducted a word naming task in a 2 (SRC: transparent, opaque) x 2 (PRC: consistent, inconsistent) factorial design. Forty participants were recruited to participate in the naming task. Importantly, the SRC level was calculated by our novel SRC measure.

In line with the behavioral study by Dang et al. (2019), we anticipated finding faster RTs for transparent characters during low PRC conditions, which was an important indication of the use of phonological and semantic reading pathways in Chinese character processing. As predicted, the LMM results revealed significant interactions between PRC and SRC (Fig.1A). Similarly, the word naming results revealed not only significant SRC and PRC effects, but also the critical interaction effect between SRC and PRC (Fig.1B) in the RT analysis.

Overall, both the LMM and factorial naming results were consistent with the findings reported in Dang et al. (2019), showing that our SRC measure is a reliable predictor that accounts for Chinese naming performance. Moreover, our results also demonstrated the cooperative nature between phonological and semantic reading pathways, suggesting that when the information carried by phonetic radicals was not reliable, the information carried by semantic radicals was likely to be employed for character naming.
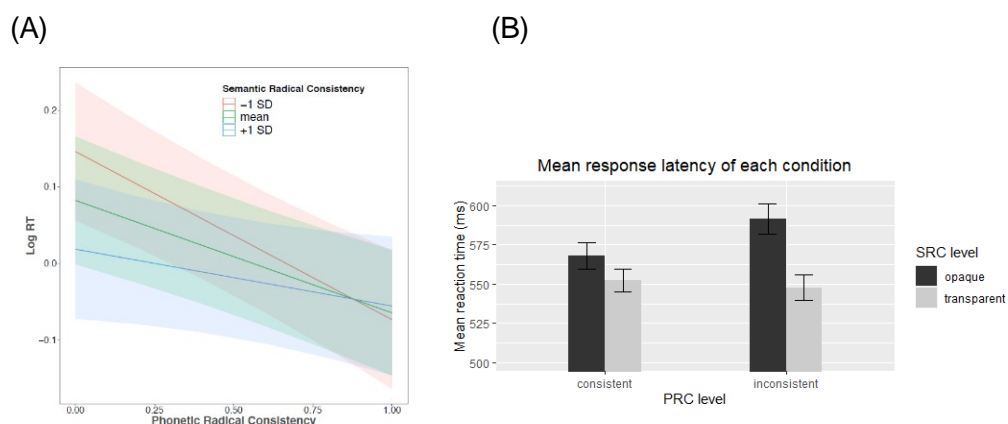
(A)   (B)

Figure 1. The interaction between SRC and PRC in LMM analyses (A) and ANOVA analyses of the word naming task (B).