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The Semantic Radical Combinability Effects in Chinese Character Recognition: an rTMS study

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Introduction

Whether the human foveal representation is split along a vertical meridian and contralaterally projected to the two hemispheres has until recently been a controversial issue. Lavidor and Walsh (2003) applied repetitive Transcranial Magnetic Stimulation (rTMS) over left and right occipital cortex to disrupt visual input to the left and right hemispheres in a lexical decision task and examined the extent to which the split fovea claim can account for the recognition of English words controlled for lexical neighbourhoods. Here we describe a further rTMS investigation of the split fovea claim, examining semantic radical combinability effects in a Chinese character semantic transparency judgement task. The square shape of Chinese characters, easily fitted within fovea vision, and their distinct condensed structure make them a more severe test case for the split fovea claim than English words.

Experiment

A character is the unit of pronunciation. A central paradigm, the *phonetic compound*, exists in which a phonetic radical, usually on the right, specifies pronunciation information, and a semantic radical, usually on the left, specifies information about meaning ("SP characters", see Fig. 1).

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Fig. 1: An SP character, meaning "pluck". Its semantic radical (left) means "hand"; its phonetic radical (right) is pronounced as "cai3" in Pinyin, the same as the character.

A radical's **combinability** is the number of combinations that it can enter into to form characters (Feldman & Siok, 1999). Hsiao, Shillcock, and Lavidor (*submitted*) reported that large semantic combinability facilitated character semantic transparency judgements (see also Chen & Weekes, 2000), in which participants were asked to judge whether a presented SP character was semantically directly related to its semantic radical, according to its most frequent meaning.

If the foveal representation is vertically split about fixation, the semantic radical of an SP character will be initially projected to the contralateral right hemisphere. Large combinability semantic radicals are less useful than small combinability ones in determining character meaning,

since there are many characters sharing the same radical; the phonetic radicals hence are relatively more informative (Hsiao et al., *submitted*). We predict that unilateral rTMS will have different effects on the processing of large and small combinability semantic radicals.

Results & Conclusion

There was a significant interaction between rTMS site (left vs. right) and semantic radical combinability (Fig. 2): applying rTMS over the left (but not right) occipital cortex eliminated the semantic radical combinability effect. This interaction provides further support for foveal splitting in word recognition and allows us to reanalyze the combinability effect in Chinese in terms of the information carried by the left and right part of the character.

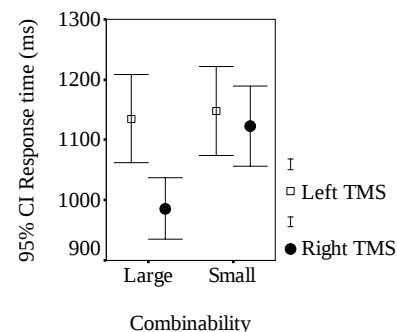


Fig. 2: Interaction between rTMS site and semantic radical combinability.

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