

The sensorimotor interaction in lexical tone processing

Hui-Chuan Chang, Wen-Jui Kuo

Institute of Neuroscience, National Yang-Ming University

It has been proposed that the interaction between the left auditory cortex, which is specialized in processing small sound units such as segment, and the left frontal regions during speech production gives rise to the left-lateralized language circuit (Pulvermüller, Kiff, & Shtyrov, 2012). Following the same logic, this study aims to examine whether the specialization of the right auditory cortex in pitch also results in a right-lateralized processing circuit, even for lexical tones. With existing (nan4) or novel (nan3) syllable-tone combinations in Mandarin Chinese, we generated sound pairs differing in either one consonant or one tone. With fMRI techniques, imaging data were collected from 24 participants during a discrimination task before and after an articulatory training session. We predicted that the activation pattern in the frontal regions during auditory perception would be modulated by training only for the novel syllable-tone combination, and were particularly interested in whether such modulation would be different for consonant and tone. We found longer naming latency for the novel sounds only in the beginning of the training session. The imaging results showed that compared to all the other conditions, pre-training novel tone elicited more activation in bilateral IFG, while similar contrast for segment showed no significant effect. These results indicate that production training does modulate the underlying neural circuits for auditory perception and that such effect differs for tone and segment. On closer examination of the data, further interpretations of our results will be provided.

