

DISCRETE CORTICAL AREAS RESPONSIBLE FOR SEMANTIC PROCESSING OF CHINESE CHARACTERS AND SENTENCES AS IDENTIFIED WITH FMRI

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LANGUAGE

Abstract

INTRODUCTION: The study focuses on how cortical activations are modulated by the processing of different linguistic units when people perform semantic language tasks. From the perspective of cognitive science, semantic activation entails a process of combining the meanings of small parts (units) into a large whole (4). Brain mapping data indicated a significant difference in semantic retrieval of Chinese single characters and phrases (1, 3). Here we hypothesize that distinct brain areas are recruited in processing different linguistic units semantically (2). We used sentences and characters in this study to verify this hypothesis. **METHODS:** Nine native Chinese speakers participated. There were two experimental tasks, character semantic judgment and sentential semantic judgment. Each task was contrasted with its own baseline which controlled for the influence of processing efforts. The study was performed on a 2 T GE/Elscint Prestige whole-body scanner. A T2*-weighted gradient-echo EPI sequence was used, with the slice thickness = 6 mm, in-plane resolution = 2.9mm x 2.9mm, and TR/TE/FA= 2000 ms/45 ms/90 degree. Eighteen contiguous axial slices were acquired to cover the whole brain. SPM99 was used for image analysis. **RESULTS AND CONCLUSION:** Areas common to semantic processing of characters and sentences included left infeo-frontal gyrus (BA 45 and 47). Left middle temporal and precuneus gyri (BA 19, 39, 37) contributed to semantic representation of sentences, but not characters. Other areas mediating the semantic processing of sentences were cuneus, lingual gyrus, pre-and post-central gyri, supero-medial frontal cortex, and cingulate. Our fMRI results showed that while left inferior frontal cortex is responsible for activation of semantic valence of language stimuli in general, meaning processing of large linguistic units recruits cortical areas that are not active in processing simple language units.

References

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