

Abstract of thesis entitled

**Functional MRI Research on Language Processing in
Chinese Children and Adults**

Submitted by

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Functional magnetic resonance imaging (fMRI) was used to investigate whether left-lateralized brain networks for language processing have been established in Chinese children by age 7. I scanned twelve normal right-handed native Chinese-speaking children, (mean age = 7 years and 5 months, ranging from 7 years and 3 months to 7 years and 9 months) and nine normal right-handed native Chinese-speaking adults (mean age = 21 years and 5 months, ranging from 19 years and 5 months to 24 years and 10 months), with two experimental paradigms: covert semantic word generation and phonological tone judgment. In the word generation paradigm, subjects silently generated a word that was semantically related to a viewed Chinese stimulus. It was found that children and adults showed highly similar activation patterns with strong left lateralization in frontal and temporal regions and



right-lateralized occipital activity. This pattern of findings converges with that from a previous fMRI study with adults and the same language task, suggesting that Chinese language dominance has been well developed in young children. An assessment of language lateralization based on a subject-by-subject analysis showed that in typical language areas involving frontal and temporal cortices, approximately 72.5% of the right-handed Chinese children had their language-processing networks reside in the left hemisphere. This proportion of left hemispheric language dominance is in harmony with previous estimates based on Chinese aphasia in adult stroke patients. However, in the tone judgment paradigm, where subjects judged whether two presented Chinese characters had the same tone, more frontal areas and a more bilateral network of activation were obtained in children than in adults. Language lateralization in phonological processing, thus, seems to be still developing at age 7, implying developmental brain plasticity. The present study helps to establish normal parameters in order to identify language laterality in young epilepsy and brain-damaged patients. Findings are also important for elucidating and comparing the developmental maturation of neural networks between Chinese and English.

