

Abstract of the thesis entitled

**Brain Development in Chinese: Effects of Age, IQ and Reading
Experience**

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Studies have shown that the human brain changes with age. This regional cerebral variance is assumed to be associated with development of cognitive functions and skills. Prior studies focused mainly on the neuroanatomical development of Westerners, and thus whether the function-structure relationships in the human brain are universal or culture-dependent is unknown. This thesis presents a developmental study of the brain in a Chinese population using MRI and voxel-based analysis methods, in which the cerebral changes related to age, IQ and reading performance were assessed in native Chinese speakers at ages ranging from 7 to 25.

Sixty children and twenty-three adults were included to examine the age effect on the cortical changes in Chinese. Results showed that with increasing age, dramatic gray matter loss occurred in bilateral parietal lobes and frontal lobes, in line with the studies with Westerners. Importantly, significant gray matter loss was also found in



bilateral perisylvian areas, in contrast to the increased gray matter thickness in Westerners in these regions. Furthermore, striking gray matter gain were observed in anterior and inferior temporal lobes bilaterally, which have never been reported in previous studies of Westerners. Considering the behavioral and functional imaging findings on perceptual and cognitive differences between Chinese and Westerners, the distinct changing patterns of gray matter are suggested to be associated with writing-based Chinese learning strategies and the holistic thinking style for Chinese people.

The sixty children, divided into early childhood group and late childhood group, were involved in assessing the influences of general intelligence and reading ability on regional cortical volume. Results revealed that the related brain areas coincided with the regions responsible for the specific cognitive functions, such as the prefrontal lobes for universal general intelligence (in agreement with the findings for Westerners) and the middle frontal gyrus specifically for Chinese reading (in contrast with perisylvian areas for English reading). Age was also observed to have an effect on the correlation between gray matter and cognition, with more negative relationship in the early age and more positive relationship later.

In sum, these findings demonstrated culture-related brain maturation with age. Cultures seem to shape the brain not only at a functional, but also at a structural level.

(363 words)

