Chinese dyslexia is characterized by multiple problems without a core deficit

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Reading is an important means to acquire world knowledge. Without proper skills in reading and writing, children will be hampered in their educational outcomes, social-emotional development, and eventual quality of life. According to recent estimates, approximately 7-15% of children can be classified as dyslexic readers who exhibit severe problems with reading that are unaccountable by any kind of deficit in general intelligence, sensory acuity, educational opportunity, and motivational factors. For readers of alphabetic (e.g. English) languages, reading impairment is critically associated with a core phonological processing deficit which does not co-exist with a general visual processing dysfunction in the majority of dyslexics. Recent neuroimaging studies have demonstrated that the phonological deficit is associated with weak reading-related activity in left temporoparietal and occipitotemporal regions, and this activity difference may reflect reductions in gray matter volume in these areas.

In a series of fMRI experiments, we scanned Chinese dyslexics while they performed various visual tasks including homophone decision, rhyme judgment, physical size decision, semantic decision, and working memory. Two major findings are demonstrated: (1) Although Chinese dyslexic children exhibit a phonological deficit, this deficit is mediated by the left middle frontal gyrus rather than by the left temporoparietal regions. In addition, dyslexic Chinese readers exhibit reduced gray matter volume in a left middle frontal gyrus region, but do not show functional or structural (i.e., volumetric gray matter) differences from normal subjects in the more posterior brain systems that have been shown to be abnormal in alphabetic-language dyslexics. (2) Developmental dyslexia in Chinese is commonly associated with the co-existence of a visuospatial deficit and a phonological disorder, unlike the majority of English dyslexics. Combined with previous behavioral findings, we conclude that Chinese dyslexia is characterized by multiple problems without any identifiable core deficit. Our results suggest that the behavioral and pathophysiological profiles of developmental dyslexia vary across cultures.