

Brain white matter structure and language ability in preschool-aged children

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Abstract

Brain alterations are associated with reading and language difficulties in older children, but little research has investigated relationships between early language skills and brain white matter structure during the preschool period. We studied 68 children aged 3.0–5.6 years who underwent diffusion tensor imaging and participated in assessments of Phonological Processing and Speeded Naming. Tract-based spatial statistics and tractography revealed relationships between Phonological Processing and diffusion parameters in bilateral ventral

white matter pathways and the corpus callosum. Phonological Processing was positively correlated with fractional anisotropy and negatively correlated with mean diffusivity. The relationships observed in left ventral pathways are consistent with studies in older children, and demonstrate that structural markers for language performance are apparent as young as 3 years of age. Our findings in right hemisphere areas that are not as commonly found in adult studies suggest that young children rely on a widespread network for language processing that becomes more specialized with age.

Keywords: Magnetic resonance imaging, Diffusion tensor imaging, Language, Reading, White matter, Phonological processing