

Corpus callosum microstructure is associated with motor function in preschool children

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Abstract

The preschool period is a time of significant physical and behavioral growth, including the improvement of gross and fine motor skills. Although motor development has been comprehensively mapped from infancy to adulthood, the neural correlates associated with motor advancements during early childhood remain unclear. The current study used diffusion tensor imaging (DTI) to delineate key motor pathways and characterize their relationships with motor performance in 80 typically developing preschool children, aged 3–6 years. The Movement Assessment Battery for Children-2nd edition (MABC-II) was used to assess motor functioning. Partial correlations between DTI parameters and motor performance, controlling for sex and age, revealed

a positive correlation between motor performance and fractional anisotropy of corpus callosum motor fibers, as well as negative correlations of motor performance with mean and radial diffusivity. These results appear to be driven by females, as correlations were significant in girls but not boys when analyzed separately. Mean corticospinal tract (CST) diffusion parameters were not significantly related to motor performance, but relationships were observed at regionally specific locations along the bilateral CST. These findings suggest preschool-aged children with better motor performance show more mature white matter patterns within motor pathways, and that the structural variation in these pathways may partially account for the natural variability in motor performance.

Keywords: Brain, Motor, Corticospinal tract, Corpus callosum, Diffusion tensor imaging, White matter