Effects of Methylphenidate on Default Mode, Dorsal Attention, and Frontoparietal Neural Networks among Children with Attention-Deficit/Hyperactivity Disorder

Current research on methylphenidate treatment for Attention-Deficit/Hyperactivity Disorder (ADHD) highlights modulation of functional connectivity within and between neural networks, such that patterns of network communication appear closer to individuals without ADHD. This study sought to examine the modification of network functional connectivity by methylphenidate, and utilized resting-state and cognitive-state fMRI neuroimaging and a double-blind, randomized administration of short-acting methylphenidate and placebo to drug-na√Øve children with ADHD (n=20). An ROI approach was used to estimate functional connectivity in three networks: the default mode (DMN), the frontoparietal (FPN), and the dorsal attention (DAN). Graph theory metrics (i.e., segregation and integration) were used to compare network topology with either acute methylphenidate treatment or placebo. Methylphenidate was associated with a reduction in segregation of the DMN during the resting-state and also of the DAN during the cognitive control task. These findings provide a model for how methylphenidate may exert functional effects by reducing segregation of actively recruited networks.