Differential effects of methylphenidate and atomoxetine on intrinsic brain activity in children with attention deficit hyperactivity disorder.

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Abstract

BACKGROUND:
Methylphenidate and atomoxetine are commonly prescribed for treating attention deficit hyperactivity disorder (ADHD). However, their therapeutic neural mechanisms remain unclear.

METHOD:
After baseline evaluation including cognitive testing of the Cambridge Neuropsychological Test Automated Battery (CANTAB), drug-naive children with ADHD (n = 46), aged 7-17 years, were randomly assigned to a 12-week treatment with methylphenidate (n = 22) or atomoxetine (n = 24). Intrinsic brain activity, including the fractional amplitude of low-frequency fluctuations (fALFF) and regional homogeneity (ReHo), was quantified via resting-state functional magnetic resonance imaging at baseline and week 12.

RESULTS:
Reductions in inattentive symptoms were related to increased fALFF in the left superior temporal gyrus and left inferior parietal lobule for ADHD children treated with methylphenidate, and in the left lingual gyrus and left inferior occipital gyrus for ADHD children treated with atomoxetine. Hyperactivity/impulsivity symptom reductions were differentially related to increased fALFF in the methylphenidate group and to decreased fALFF in the atomoxetine group in bilateral precentral and postcentral gyri. Prediction analyses in the atomoxetine group revealed negative correlations between pre-treatment CANTAB simple reaction time and fALFF change in the left lingual gyrus and left inferior occipital gyrus, and positive correlations between pre-treatment CANTAB simple movement time and fALFF change in bilateral precentral and postcentral gyri and left precuneus, with a negative correlation between movement time and the fALFF change in the left lingual gyrus and the inferior occipital gyrus.

CONCLUSIONS:
Our findings suggest differential neurophysiological mechanisms for the treatment effects of methylphenidate and atomoxetine in children with ADHD.