

# Causal connectivity abnormalities of regional homogeneity in children with attention deficit hyperactivity disorder: a rest-state fMRI study

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ADMET & DMPK 5(4) (2017) 242-252

doi: <http://dx.doi.org/10.5599/admet.5.4.485>

## Abstract

The present study aimed to investigate individual differences of causal connectivity between brain regions in attention deficit hyperactivity disorder (ADHD) which was a psychiatric disorder. Resting-state functional magnetic resonance imaging (R-fMRI) data of typically-developing controls (TDC) children group and combined ADHD (ADHD-C) children group were distinguished by the support vector machine (SVM) with linear kernel function, based on regional homogeneity (ReHo), amplitude of low frequency fluctuation (ALFF) and fractional ALFF (FALFF). The highest classification accuracy yielded by ReHo was 90.91%. Furthermore, the granger causality analysis (GCA) method based on the classified weight map of regions of interesting (ROIs) showed that five causal flows existed significant difference between TDC and ADHD-C. That is, the averaged GCA values of three causal connections (i.e. left VLPFC - left CC1, right PoCG - left CC1, and right PoCG - right CC2) for ADHD-C were separately stronger than those for TDC. And the other two connections (i.e. right FEF - right SOG and right CC1 - right SOG) were weaker for ADHD-C than those for TDC. In addition, only two causality flows (i.e. left VLPFC - left CC1 and right PoCG - right CC2) presented that their GCA values were positively correlation with ADHD index scores, respectively. Our findings revealed that ADHD children represented widespread abnormalities in the causality connectivity, especially involved in the attention and memory related regions. And further provided evidence that the potential neural causality flows could play a key role in characterizing individual's ADHD.