Diagnostic model for attention-deficit hyperactivity disorder based on interregional morphological connectivity

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Abstract

Previous brain morphology-related diagnostic models for attention-deficit hyperactivity disorder (ADHD) were based on regional features. However, building a model of individual interregional morphological connectivity is a challenging task. This study aimed to identify children with ADHD utilizing a novel interregional morphological connectivity model and discover the discriminative patterns in patients. Therefore, novel interregional morphological patterns rather than regional patterns were extracted via surface-based analysis. The interregional morphological features were trained and tested using a hybrid machine learning method, which was implemented using the leave-one-out cross-validation (LOOCV) method to produce the optimized discriminative model and discriminative patterns. The inclusion of interregional morphological connectivity significantly improved the performance of the diagnostic models compared to the performance of the model constructed using regional features. The optimized discriminative model exhibited a total accuracy of 74.65%, a sensitivity of 75% and a specificity of 74.29%. The brain regions displaying altered morphological connectivity included the insula, the caudal anterior cingulate cortex, the frontal pole, and the postcentral cortex, among others. In addition, the altered connections correlated with the clinical symptoms. In summary, patients with ADHD exhibited altered morphological connectivity, which might be a potential biomarker for the classification of ADHD. The discriminative features will potentially benefit studies investigating the brain network mechanisms of ADHD.