Identification of brain regions associated with neurodevelopment

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Abstract

Initial studies using resting-state functional magnetic resonance imaging on the trajectories of the functional brain network from childhood to adulthood found evidence of functional integration and segregation over time. The comprehension of how healthy individuals' functional integration and segregation occur is crucial to enhance our understanding of possible deviations that may lead to brain disorders. Recent approaches have focused on the framework wherein the functional brain network is organized into spatially distributed modules that have been associated with specific cognitive functions. Here, we tested the hypothesis that the clustering structure of brain networks evolves during development. To address this hypothesis, we defined a measure of how well a brain region is clustered (network fitness index - NFI), and developed a method to evaluate its association with age. Then, we applied this method to a functional magnetic resonance imaging data set composed of 397 males under 31 years of age collected as part of the Autism Brain Imaging Data Exchange (ABIDE) Consortium. As results, we identified two brain regions for which the clustering change over time, namely, the left putamen and the right frontal pole. Since the NFI is associated with both integration and segregation, our findings suggest that the two identified brain regions play a role in the development of brain systems.

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