Parsing heterogeneity in attention-deficit hyperactivity disorder using EEG-based subgroups

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Abstract

Background
Attention-deficit/hyperactivity disorder (ADHD) is a heterogeneous condition for which multiple efforts to characterize brain state differences are underway. The objective of this study was to identify distinct subgroups of resting electroencephalography (EEG) profiles among children with and without ADHD and subsequently provide extensive clinical characterization of the subgroups.

Methods
Latent class analysis was used with resting state EEG recorded from a large sample of 781 children with and without ADHD (N = 620 ADHD, N = 161 Control), aged 6–18 years old. Behavioral and cognitive characteristics of the latent classes were derived from semistructured diagnostic interviews, parent completed behavior rating scales, and cognitive test performance.

Results
A five-class solution was the best fit for the data, of which four classes had a defining spectral power elevation. The distribution of ADHD and control subjects was similar across classes suggesting there is no one resting state EEG profile for children with or without ADHD. Specific latent classes demonstrated distinct behavioral and cognitive profiles. Those with elevated slow-wave activity (i.e. delta and theta band) had higher levels of externalizing behaviors and cognitive deficits. Latent subgroups with elevated alpha and beta power had higher levels of internalizing behaviors, emotion dysregulation, and intact cognitive functioning.

Conclusions
There is population-level heterogeneity in resting state EEG subgroups, which are associated with distinct behavioral and cognitive profiles. EEG measures may be more useful biomarkers of ADHD outcome or treatment response rather than diagnosis.