Diagnostic utility of brain activity flow patterns analysis in attention deficit hyperactivity disorder.


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Abstract

BACKGROUND:
A previous small study suggested that Brain Network Activation (BNA), a novel ERP-based brain network analysis, may have diagnostic utility in attention deficit hyperactivity disorder (ADHD). In this study we examined the diagnostic capability of a new advanced version of the BNA methodology on a larger population of adults with and without ADHD.

METHOD:
Subjects were unmedicated right-handed 18- to 55-year-old adults of both sexes with and without a DSM-IV diagnosis of ADHD. We collected EEG while the subjects were performing a response inhibition task (Go/NoGo) and then applied a spatio-temporal Brain Network Activation (BNA) analysis of the EEG data. This analysis produced a display of qualitative measures of brain states (BNA scores) providing information on cortical connectivity. This complex set of scores was then fed into a machine learning algorithm.

RESULTS:
The BNA analysis of the EEG data recorded during the Go/NoGo task demonstrated a high discriminative capacity between ADHD patients and controls (AUC = 0.92, specificity = 0.95, sensitivity = 0.86 for the Go condition; AUC = 0.84, specificity = 0.91, sensitivity = 0.76 for the NoGo condition).

CONCLUSIONS:
BNA methodology can help differentiate between ADHD and healthy controls based on functional brain connectivity. The data support the utility of the tool to augment clinical examinations by objective evaluation of electrophysiological changes associated with ADHD. Results also support a network-based approach to the study of ADHD.