Personalized features for attention detection in children with Attention Deficit Hyperactivity Disorder.

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Abstract

Measuring attention from electroencephalogram (EEG) has found applications in the treatment of Attention Deficit Hyperactivity Disorder (ADHD). It is of great interest to understand what features in EEG are most representative of attention. Intensive research has been done in the past and it has been proven that frequency band powers and their ratios are effective features in detecting attention. However, there are still unanswered questions, like, what features in EEG are most discriminative between attentive and non-attentive states? Are these features common among all subjects or are they subject-specific and must be optimized for each subject? Using Mutual Information (MI) to perform subject-specific feature selection on a large data set including 120 ADHD children, we found that besides theta beta ratio (TBR) which is commonly used in attention detection and neurofeedback, the relative beta power and theta/(alpha+beta) (TBAR) are also equally significant and informative for attention detection. Interestingly, we found that the relative theta power (which is also commonly used) may not have sufficient discriminative information itself (it is informative only for 3.26% of ADHD children). We have also demonstrated that although these features (relative beta power, TBR and TBAR) are the most important measures to detect attention on average, different subjects have different set of most discriminative features.