Heart rate variability enhances the EEG-based machine learning prediction of Internet gaming disorder [†]

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Abstract

Electroencephalography (EEG) identifies amplitude changes in the evoked response potential (ERP) among patients with internet game disorder (IGD) or Alcohol use disorder (AUD), so it can be a biomarker for predicting IGD or AUD. Recently, with the high-dimensional EEG features, various machine learning methods have been applied and they achieved satisfactory prediction performance. Meanwhile, heart rate variability (HRV) is also being proved that it is associated with disorders like IGD which involves disrupted regulatory function. In this study, we propose the use of HRV as well as EEG for classifying the IGD and AUD patients from normal subjects. We compare various machine learning methods such as XGBoost, Random forest, Elastic Net, and so on. Because the combined predictors are high-dimensional, we first employ two types of iterative sure independence screening (ISIS) to select relevant features. Even though the number of predictors is dramatically reduced, we showed the machine learning results with ISIS are better than the results with whole predictors in terms of both prediction and interpretability. We investigated the utility of HRV on overall performance and found that the integration of EEG and HRV outperforms the single modality method especially in predicting IGD.

Keywords: Electroencephalography, Heart rate variability, Machine learning, Internet gaming disorder

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