Actigraph measures discriminate pediatric bipolar disorder from attention-deficit/hyperactivity disorder and typically developing controls.


Background
Distinguishing pediatric bipolar disorder (BD) from attention-deficit hyperactivity disorder (ADHD) can be challenging. Hyperactivity is a core feature of both disorders, but severely disturbed sleep and circadian dysregulation are more characteristic of BD, at least in adults. We tested the hypothesis that objective measures of activity, sleep, and circadian rhythms would help differentiate pediatric subjects with BD from ADHD and typically developing controls.

Methods
Unmedicated youths (N = 155, 97 males, age 5–18) were diagnosed using DSM-IV criteria with Kiddie-SADS PL/E. BD youths (n = 48) were compared to typically developing controls (n = 42) and children with ADHD (n = 44) or ADHD plus comorbid depressive disorders (n = 21). Three-to-five days of minute-to-minute belt-worn actigraph data (Ambulatory Monitoring Inc.), collected during the school week, were processed to yield 28 metrics per subject, and assessed for group differences with analysis of covariance. Cross-validated machine learning algorithms were used to determine the predictive accuracy of a four-parameter model, with measures reflecting sleep, hyperactivity, and circadian dysregulation, plus Indic’s bipolar vulnerability index (VI).

Results
There were prominent group differences in several activity measures, notably mean 5 lowest hours of activity, skewness of diurnal activity, relative circadian amplitude, and VI. A predictive support vector machine model discriminated bipolar from non-bipolar with mean accuracy of 83.1 ± 5.4%, ROC area of 0.781 ± 0.071, kappa of 0.587 ± 0.136, specificity of 91.7 ± 5.3%, and sensitivity of 64.4 ± 13.6%.

Conclusions
Objective measures of sleep, circadian rhythmicity, and hyperactivity were abnormal in BD. Wearable sensor technology may provide bio-behavioral markers that can help differentiate children with BD from ADHD and healthy controls.