A Parent General Behavior Inventory Subscale to Measure Sleep Disturbance in Pediatric Bipolar Disorder

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Objective: Sleep disturbance is a reliable marker for differentiating children with bipolar spectrum disorders from those with attention-deficit/hyperactivity disorder. Sleep-related items were extracted from the Parent General Behavior Inventory (P-GBI) to determine whether these items, as a scale unto themselves, demonstrate adequate psychometrics to be useful as a possible endophenotypic marker for bipolar spectrum disorders.

Method: From July 2003 to July 2007, 625 youths and their parents completed semistructured Schedule for Affective Disorders and Schizophrenia for School-Age Children-Present and Lifetime version interviews. Parents also completed the 73-item P-GBI.

Results: Participants with bipolar spectrum disorders (DSM-IV criteria) scored significantly higher than all other participants on all 7 of the sleep variables ($p < .005$). On receiver operating characteristic (ROC) analysis, the sleep subscale did substantially as well at discriminating participants with bipolar spectrum disorders as did either of the 2 built-in GBI scales, depression and hypomanic/biphasic (area under the ROC curve = 0.74 vs. 0.75 and 0.77, respectively).

Conclusion: The P-GBI sleep subscale, developed in this study, is a reliable measure of a wide range of mood-related sleep problems in youths diagnosed with bipolar spectrum disorders. Sleep disturbance appears to be a promising endophenotype for further clinical investigation, and the P-GBI sleep scale may provide an inexpensive way of quantifying this trait for research. Further research needs to evaluate how parent report compares to objective measures of sleep efficiency, such as actigraphy or polysomnography.

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A decreased need for sleep is listed in the *Diagnostic and Statistical Manual of Mental Disorders*, Fourth Edition (DSM-IV) as a marker symptom in the criteria for manic, hypomanic, or mixed mood episodes.[1] In adults, decreased need for sleep is also one of a number of prodromal symptoms that predicts relapse in bipolar disorder,[2] and there is a significant degree of general sleep dysfunction during periods of remission.[3] Previous research has shown that this symptom is a reliable marker for differentiating children with bipolar spectrum disorders from those with attention-deficit/hyperactivity disorder (ADHD) and normal controls, using the semi-structured interview format of the Schedule for Affective Disorders and Schizophrenia for School-Age Children (K-SADS).[4,5] The Parent General Behavior Inventory (P-GBI)[6,7] has been demonstrated to be a valid measure of depressive and hypomanic, biphasic, or mixed mood symptoms. In the present study, sleep-related items (see Table 1) were isolated from the P-GBI. The aim was to determine whether these items, as a scale unto themselves, demonstrate validity in the screening of pediatric bipolar spectrum disorders. Decreased need for sleep may represent an important endophenotype for pediatric bipolar disorder, indicating a behavior that is more tightly connected to biological and perhaps genetic processes.

METHOD

Participants

The protocol was approved by the institutional review boards of University Hospitals of Cleveland, Case Western Reserve University, and Applewood Centers (Cleveland, Ohio). Participants were recruited from July 2003 to July 2007 on a random basis from the stream of routine clinical intake appointments at an urban community mental health center serving families and children and by referral to a mood disorders specialty clinic at a university-based medical center. The exclusion criterion was lack of facility in spoken English sufficient to fully participate in the structured interviews, on the part of either the child or the parent. Clients aged 5 to 18 years were invited to participate.

Measures

Schedule for Affective Disorders and Schizophrenia for School-Age Children-Present and Lifetime version. For each dyad, the parent and child were interviewed, in

succession, by a highly trained research assistant (item level $\kappa \geq 0.85$) using the Schedule for Affective Disorders and Schizophrenia for School-Age Children-Present and Lifetime version (K-SADS-PL),[8] enhanced by the addition of questions from the mood disorders modules of the Washington University K-SADS.[9] Interviewers were blind to the clinical diagnoses assigned at the intake session and/or telephone screening interview.

Parent General Behavior Inventory. The P-GBI is an adaptation of the General Behavior Inventory,[10] modified so that parents complete it to rate the depressive, hypomanic, manic, and biphasic mood symptoms of their children ages 5 through 18 years. The 2 scales of depressive and hypomanic/biphasic symptoms have strong construct validity and exceptionally high internal consistency (e.g., α of .97 for depression and .94 for hypomanic/biphasic[6]).

Procedure

The subjects enrolled at the university-based medical center were referred for the express purpose of obtaining a research-oriented assessment of mood and general psychological functioning. The participants from the community mental health center were those from the general pool of clients presenting for clinical intake who volunteered to participate in a study unrelated to their clinical care. Parents completed the P-GBI on the same day as the K-SADS-PL interview. Research diagnoses were finalized while the K-SADS-PL interviewer and consensus diagnostic review team were blind to P-GBI scores.

Statistical Methods

Descriptive analyses verified that generally accepted statistical assumptions were met. Principal components analysis was carried out to test whether the sleep items cohered into a single dimension, and Cronbach α measured the internal consistency of the scale. Finally, receiver operating characteristic (ROC) analysis was undertaken to evaluate the ability of the sleep scale to discriminate among diagnostic groupings, relative to the established GBI scales.

RESULTS

Participants

The sample consisted of 625 youths, ranging in age from 5 to 18 years. Participants were 59% male and 72% African American. In most cases (72%), the consenting adult was the biological mother and 69% reported their marital status as divorced or single. There were no adverse events reported consequent to the completion of the research interviews and measures.

Bipolar spectrum disorders were diagnosed in 113 of 625 cases (21 with bipolar I). One hundred eighty cases were diagnosed with unipolar affective disorder (major depressive disorder, dysthymic disorder, or depressive disorder not otherwise specified); 272 of the participants with no mood disorder carried ADHD and/or disruptive behavior disorder diagnoses, and 60 other participants had anxiety or adjustment disorders as their primary diagnosis. Comorbidity was common, with 56% of the sample having 3 or more Axis I diagnoses. All diagnoses were made using DSM-IV criteria.

Table 1. Items Comprising the Parent General Behavior Inventory Sleep Subscale With Subsample Mean (SD) Scores[a]

Item	Summary of Scale Content	Subsample Mean (SD) Score: Bipolar	Subsample Mean (SD) Score: Nonbipolar
5	Increased fatigue and increased sleep, regardless of mood and energy levels	0.99 (0.98)	0.53 (0.88)
15	Decreased need for sleep and full of energy	1.10 (1.00)	0.53 (0.86)
18	Increased fatigue and decreased productivity	0.84 (0.92)	0.43 (0.76)
25	Terminal insomnia	0.96 (1.06)	0.53 (0.85)
31	Elation and increased energy with initial insomnia	1.35 (1.02)	0.58 (0.86)
37	Middle insomnia, regardless of mood and energy levels	1.19 (1.07)	0.58 (0.85)
52	Depressed mood with sleep-onset insomnia	0.96 (0.94)	0.51 (0.82)

[a]Adapted with permission from Depue.[10]

Table 2. Parent General Behavior Inventory Sleep Subscale Scores Across Diagnostic Groups[a]

Diagnostic Group	N	Sleep Subscale Score, Mean (SD)
Any bipolar spectrum diagnosis	113	7.35 (4.66)
Any unipolar spectrum diagnosis	180	5.16 (4.42)
ADHD and/or any DBD (no mood disorder)	272	2.98 (3.63)
Other (no mood, attention, or behavior disorder)	60	2.48 (3.50)
Overall sample	625	4.46 (4.44)

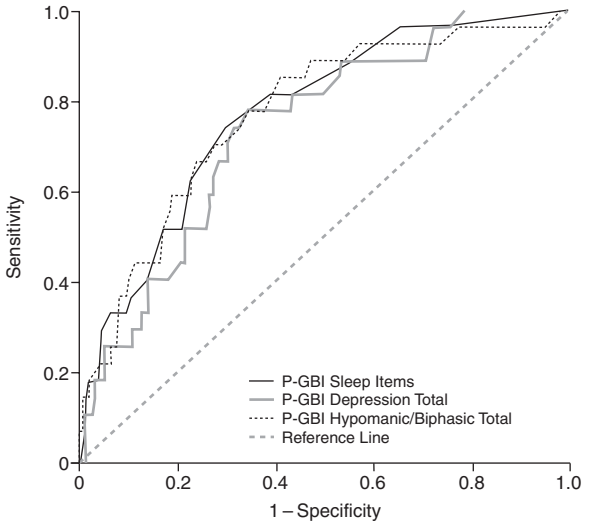
[a]Sleep scale range is 0–21.
Abbreviations: ADHD = attention-deficit/hyperactivity disorder, DBD = disruptive behavior disorder.

GBI Sleep Items

The nonparametric Mann-Whitney test indicated significant differences between the participants with bipolar spectrum disorders and all others on all 7 of the sleep items ($p < .005$). The mean score in the bipolar spectrum disorder group was significantly higher on all of the sleep items despite the fairly wide range of item content, which covered decreased need for sleep, insomnia, and increased fatigue (Tables 1 and 2). All 7 items were included in the formation of the sleep subscale.

Principal components analysis indicated that the 7 items measured 1 dimension, on the basis of all of the 3 most accurate decision rules—Minimum Average Partials, the scree test, and Glorfeld's extension of Parallel Analysis.[11] As a scale, this group of items demonstrated good reliability, with a Cronbach α of .83.

Figure 1. Receiver Operating Characteristic (ROC) Plot of the Diagnostic Efficiency of a Parent General Behavior Inventory (P-GBI) Sleep Subscale, Alongside P-GBI Depression and Hypomanic/Biphasic Scales



On ROC analysis, the sleep subscale's performance in discriminating participants with bipolar spectrum disorders was within the same range as the 2 built-in GBI scales, depression and hypomanic/biphasic (area under the ROC curve = 0.74 vs. 0.75 and 0.77, respectively; Figure 1). Results were very similar for the bipolar spectrum disorders versus ADHD discrimination (area under the ROC curve = 0.74, 0.78, and 0.75).

DISCUSSION

This study was conducted for the purpose of determining if a scale of sleep functioning derived from the P-GBI, a larger scale of mood symptoms, would aid in the identification of children with bipolar spectrum disorders and distinguish them from those with ADHD. Results indicate that the sleep scale performs about as well as the overall P-GBI hypomanic/biphasic scale. This level of performance is particularly impressive given that the greater length of the hypomanic/biphasic scale gives it psychometric advantages in terms of reliability as well as much broader content coverage (the 28-item scale covers the entire range of the A and B criteria for a manic episode). The high internal consistency of the extracted sleep scale also suggests that it is providing a psychometrically sound rating that could quantify an endophenotype related to bipolar disorder.

Limitations

Certain weaknesses inherent in this study's design and methodology must be acknowledged. First of all, the sleep scale is extracted from a larger measure of mood disturbance, as opposed to comprising a comprehensive item set for assessing sleep patterns. There are well-established measures of sleep disturbance, including specialized sleep questionnaires (e.g., Sleep Evaluation Questionnaire[12] and Pittsburgh Sleep Quality Index[13]), sleep diaries, actigraphy, and especially, the gold standard measure, polysomnography,[14] which provide a more comprehensive assessment of sleep functioning. However, the P-GBI sleep scale offers the advantage of concentrating on aspects of sleep that are related to bipolar disorder, based on both clinical observation and the present statistical analyses. This advantage may make the P-GBI sleep scale a more direct measure of an endophenotype related to bipolar disorder. Secondly, the present data rely solely upon parent report, which may be a poor estimate of sleep problems in pediatric bipolar disorder.[15] This concern is tempered by the evidence that parent report is one of the most accurate sources of information about pediatric bipolar disorder,[7] again strengthening the potential contribution of a P-GBI sleep scale as an endophenotypic marker. The K-SADS-PL interview[8] includes probes for sleep disturbance as well, and it will be important to attempt to discover the degree of concordance between the 2 measures. That being said, it is readily apparent that the P-GBI but not the K-SADS-PL will be likely to have application for routine clinical use.

Future Directions

The present findings have important implications for the assessment of pediatric bipolar disorder. Not all children presenting with the bipolar syndrome will have aroused concern in their parents regarding their sleep habits, but the majority demonstrate clinically marked disturbances of sleep. Two dimensions of this finding need to be explored further. First, more rigorous sleep measurement methodologies, as alluded to in the Limitations section above, need to be applied to this research question in order to determine if the findings change when the scope of the measurement is increased (wider symptom sampling and longitudinal, even daily, data collection). Secondly, the subgroup of children with pediatric bipolar disorder for whom sleep is a particular concern deserves closer scrutiny. This group may tend to highlight the nature of sleep as an endophenotype for bipolar disorder, marking them, as a subgroup, as closer to the defined narrow phenotype.[16] An advantage of a sleep scale extracted from the GBI is that GBI data have been gathered as a part of multiple projects, making it possible to evaluate the clinical correlates of this endophenotype across multiple data sets.

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