# Web Survey of Sleep Problems Associated with Early-onset Bipolar Spectrum Disorders

Nicholas Lofthouse,[1] PhD, Mary Fristad,[2] PhD, Mark Splaingard,[3] MD, Kelly Kelleher,[3] MD, John Hayes,[3] PhD, and Susan Resko,[4] MM

[1]*Department of Psychiatry, The Ohio State University, [2]Department of Psychiatry and Department of Psychology, The Ohio State University, [3]Department of Pediatrics, The Ohio State University and Columbus Children's Hospital, and [4]Child and Adolescent Bipolar Foundation*

**Objective**   As research on sleep difficulties associated with Early-Onset Bipolar Spectrum Disorders (EBSD) is limited, a web-based survey was developed to further explore these problems.   **Methods**   494 parents of 4-to-12 year-olds, identified by parents as being diagnosed with EBSD, completed a web survey about past and current EBSD-related sleep problems. The survey included Children's Sleep Habits Questionnaire (CSHQ) items and sleep problems from the International Classification of Sleep Disorders 2nd edition. **Results**   Nearly all parents reported some type of past or current EBSD-sleep problem. Most occurred during a worst mood period, particularly with mixed manic-depressive symptoms. Symptoms caused impairments at home, school, or with peers in 96.9% of the sample and across all three contexts in 64.0% of children. Sleep problems were also noted after three-day weekends and Spring and Fall Daylight Savings time changes.   **Conclusions**   Findings, study limitations, and implications for treatment and etiology are discussed.

**Key words**   bipolar disorder; childhood; sleep problems; web survey.

Reduced need for sleep is a symptom of mania, while insomnia and hypersomnia are symptoms of depression (Diagnostic and Statistical Manual of Mental Disorders, 4th Edition [DSM-IV], American Psychiatric Association [APA], 1994). Geller et al. (2002) identified a reduced need for sleep as a key symptom of early-onset bipolar spectrum disorders (EBSD). In their sample, this symptom differentiated children with EBSD from those with attention-deficit hyperactivity disorder (ADHD) and community controls (rates of 39.8, 6.2 and 1.1%, respectively).

Despite this, research on the presence, onset, course, and effects of sleep complaints in children with EBSD is scarce (Harvey, Mullin, & Hinshaw, 2006). To our knowledge, only three published studies (Lofthouse, Fristad, Splaingard & Kelleher, 2007a; Mehl et al., 2006; Rao et al., 2002) have focused on sleep problems associated with EBSD. In another study, a meta-analysis of EBSD clinical characteristics (Kowatch, Youngstrom, Danielyan, & Findling, 2005), reviewed six studies

(Ballenger, Reus, & Post, 1982; Bhangoo et al., 2003; Faedda, Baldessarini, Glovinksy, & Austin, 2004; Findling, Gracious, & McNamara, 2001; Geller, Tillman, Craney, & Bolhofner, 2004; Lewinsohn, Klein, & Seeley, 1995), and found a weighted average of 72% reporting decreased need for sleep.

In chronological order, Ballenger et al. (1982) first examined EBSD sleep problems by reviewing inpatient records of nine youth under 21 years of age presenting with Research Diagnostic Criteria (RDC: Spitzer, Endicott & Robins, 1978) for bipolar-type I (BP-I). They reported that 67% experienced a reduced need for sleep. Thirteen years later, in Lewinsohn et al.'s (1995) community-based prospective study of  14–18 year-olds, 61% (11 out of 18 adolescents) with Diagnostic and Statistical Manual of Mental Disorders, 3rd Edition, Revised (DSM-III-R) diagnoses of BP-I, BP-II, and Cyclothymia, reported decreased need for sleep. Similarly, Findling, et al. (2001) examined 90 5- to 17-year-old outpatients with DSM-IV BP-I and

found rates of 72.2% with sleep impairment. The first EEG study of EBSD-sleep problems was conducted by Rao et al. (2002) who studied 21 adolescents with unipolar depression, five adolescents initially diagnosed with unipolar depression who later switched to EBSD and 33 normal controls. The investigators found the EBSD group had a relatively normal REM (Rapid Eye Movement) sleep profile; however, they had more stage 1 sleep than the unipolar group and less stage 4 sleep than both the unipolar and control groups. In 2003, Bhangoo et al. interviewed parents of 34 6- to 17-year-old outpatients with DSM-IV BP-I and BP-II (2003). Most (76%) reported sleep problems with their children when in a manic state. Faedda et al. (2004) reported the highest rate for decreased need for sleep (95.1%) in their investigation of 82 3- to 17-year-old outpatients with DSM-IV BP-I, BP-II, or Cyclothymia. In contrast, Geller and colleagues (2004) reported only 43% of their community-based sample of 93 7- to 16-year-olds with BP-I had sleep disturbance during their Year 4 follow-up.

In 2006, Mehl et al. compared the results of polysomnography (PSG) evaluations to parent-reported sleep questionnaires completed on 13 6- to 7-year-olds with a ''pediatric bipolar disorder profile'' derived from the Child Behavior Checklist (i.e., not clinically diagnosed with EBSD) and matched controls. They found children with this profile demonstrated more PSG assessed sleep-continuity difficulties including poorer sleep efficiency, more awakenings, less REM sleep, and longer periods of slow-wave sleep. Parents of children with the ''pediatric bipolar disorder profile'' also reported significantly more problems than parents of controls with their children's sleep initiation, restless sleep, nightmares, and morning headaches. Although the first PSG study of its kind, Mehl and colleagues' findings are compromised by the lack of verified diagnoses in the sample and the use of the Child Behavior Checklist, which has been shown to produce more false-positives than measures containing hypomanic and manic items (Youngstrom et al., 2004).

Our group recently described and compared parent and child reports of sleep problems associated with manic, depressive, and comorbid symptoms in 133 8- to 11-year-olds diagnosed with EBSD (Lofthouse et al., 2007a). All participants were taking part in two separate studies assessing the efficacy of psychosocial treatments for children with mood disorders (Fristad, Gavazzi, & Mackinaw-Koons, 2003; Fristad, 2006). Children were assessed with parent and child versions of the Children's Interview for Psychiatric Syndromes-Child and Parent Forms (ChIPS, P-ChIPS; Weller, Weller, Rooney, & Fristad, 1999a; Weller,

Weller, Rooney, & Fristad, 1999b), Children's Depression Rating Scale-Revised (CDRS-R; Poznanski, Freeman, & Mokros, 1985) and Young Mania Rating Scale (YMRS; Young, Biggs, Ziegler, & Meyer, 1978). Dimensional and categorical measures indicated low agreement and high discrepancy between parent and child reports of EBSD-related sleep problems, emphasizing the need to obtain data from both sources. Subsequent combination of parent–child data revealed that the majority (96.2%) of children suffered from moderate-to-severe sleep problems related to manic, depressive, or comorbid symptoms, either currently or during their worst mood period. As would be expected, most sleep difficulties were found during a worst mood period, with 82% of children having depressive-related sleep problems of moderate severity and 58% having manic-related sleep problems, also of moderate severity. Initial insomnia was the most pervasive problem, followed by middle insomnia then terminal insomnia. Nearly two-thirds (64%) of the sample had sleep problems associated with current comorbidity, particularly separation anxiety disorder (i.e., difficulty sleeping away from home or without being near a major attachment figure), followed by specific phobia (i.e., a fear of the dark impairs the child's sleep routine), nocturnal enuresis (i.e., wetting the bed at night), and generalized anxiety disorder (i.e., worry associated with sleep disturbance).

This study was the first to report sleep problems associated with current and past manic and depressive symptoms as well as with comorbid diagnoses in a large sample of children diagnosed with EBSD. However, it had two main limitations. First, given its focus on a narrow age range of children (8–11 years at baseline), findings cannot be generalized to children of other ages. Second, as it was not designed to focus on sleep problems, measures were limited and did not adhere to standard sleep taxonomy.

Despite the promising results of these early studies, many residual questions remain including: how frequently specific sleep problems occur, including in mood episodes other than current and worst; the extent of sleep-related impairment at home, in school and with peers; factors associated with worsening sleep; pharmacological and nonpharmacological treatment strategies that have been tried; the efficacy, or lack thereof, of these interventions; whether mood-related sleep problems occurred solely during manic, depressive or mixed (manic and depressive) episodes; and whether sleep problems endorsed would correspond to those outlined in a standard sleep taxonomy (e.g., the International Classification of Sleep Disorders—2nd edition, ICSD-2, American Academy of Sleep Medicine, 2005).

## Goals of Study

Considering these limitations and the dearth of scientific information on EBSD-related sleep difficulties, a web-based parent survey was developed to further explore EBSD sleep problems. This survey was created to examine specific sleep problems via a psychometrically rigorous sleep questionnaire based on a standard sleep taxonomy for school-aged children; document the occurrence of sleep problems during manic, depressive, and mixed mood periods and during current, worst and other mood periods; determine EBSD sleep-related impairments at home, in school, and with peers; and identify some factors associated with the worsening of sleep problems within 4- to 12-year-olds.

## Methods
### Participants

Participants were 494 parent-members of the Child and Adolescent Bipolar Foundation (CABF, www.bpkids.org) who responded to a recruitment e-mail. CABF is a web-based national organization, established in 1999 by parent consumers and with input from a professional advisory board. Parents self-identified their child as having been previously diagnosed with BP-NOS (59.7%), BP-I (25.9%), BP-II (7.5%), Cyclothymia (2.0%), or ''BP but don't know exact diagnosis'' (4.9%). Although diagnoses were not independently confirmed, Cluss et al. (1999) reported a 93% agreement between adults' self-report of bipolar diagnosis and structured clinical interview results when using a voluntary bipolar disorder case registry, suggesting the sample is of clinical importance. Further lending credence to the diagnosis, most participants in this study also reported a positive family history for bipolar disorder (59.5%), depressive disorder (48.4%), and substance disorders (38.3%); rates similar to those reported in family studies of bipolar disorder (Craddock & Jones, 1999; Todd, Geller, Neuman, Fox, & Hickok, 1996).

Children were 4- to 12-years old, mostly White (85%), males (67%), and from intact families containing two biological parents (48.2%), with a family income ranging from <$20K–>$100K (<$20K = 9.1%, $20K–$39K = 16.6%, $40K–$59K = 19.2%, $60K–$79K = 15.2%, $80K–$99K = 12.6%, >$100K = 22.3%, don't know/didn't answer = 5.0%). The overall sample was well educated, with 55% of respondents having a college education and/or an advanced degree. Respondents were self-defined as the child's primary caregiver.

Most children had several parent-identified comorbid diagnoses including: ADHD (60.7%); one or more anxiety disorders (39.1%); oppositional defiant disorder (29.4%); a pervasive developmental disorder (12.6%); conduct disorder (5.1%); a psychotic disorder (2.8%); substance abuse/dependence (0.2%); or another disorder (8.7%). Few parents reported their children had been given an ICSD-2 diagnosis. Those reported include: sleep terror disorder (9.9%); primary insomnia (8.3%); nightmare disorder (4.3%); sleepwalking disorder (2.8%); breathing-related sleep disorder (2.6%); circadian rhythm disorder (2.2%); primary hypersomnia (1.0%); parasomnia-NOS (1.0%); dyssomnia-NOS (0.4%); and narcolepsy (0.2%).

### Procedure

Institutional Review Board approval and informed consent from all participants were received prior to data collection. CABF members were contacted via an e-mail distribution list by the CABF Executive Director. This e-mail included an explanation of the study, its benefits and risks, an offer to participate, and a web link for interested and eligible members. The web link transferred the member to a website containing an introductory web page and explanation of voluntary consent. After reading the consent, interested members chose an option that signified their consent and delivered them to the survey web page. Members not interested in participating were provided an option to exit the website.

The survey was developed using software from NetWellness, an online consumer health information website (www.netwellness.org).[1] On the survey web page, participants were given instructions to complete the survey. When done, they were given instructions about previewing, revising, and/or printing their results prior to exiting the website. Following a participant's exit from the website, their data set was assigned an ID number and was downloaded into a database. No personally identifying information about the participant or the participant's child was obtained. Downloaded data were transferred to Excel spreadsheets and imported into SPSS data files for data analysis.

### Survey

Questions were included to clarify whether the child experienced any EBSD-sleep difficulties associated with a mood episode currently and, if so, whether the disturbance occurred during a manic, depressive, or mixed episode; these questions were repeated for the child's worst episode and any other episode the parent chose to report.

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[1]NetWellness was created and is maintained by faculty at the University of Cincinnati, The Ohio State University and Case Western University.

To obtain information about the frequency of specific ICSD-2 sleep problems, the survey contained questions from the Children's Sleep Habits Questionnaire (CSHQ, Owens, Spirito, & McGuinn, 2000). The CSHQ is a 33-item parent-rated questionnaire with demonstrated reliability and validity (Owens, Maxim, Nobile, McGuinn & Msall, 2000, Owens et al., 2000). It inquires about typical sleep problems experienced by 4- to 12-year-old children. Each item is rated on a three-point scale: 1 = rarely (0–1 time/week); 2 = sometimes (2–4 times/week); 3 = usually (5–7 times/week). These 33 items comprise the following eight ICSD-2-based subscales: Bedtime Resistance, Sleep Onset Delay, Sleep Duration, Sleep Anxiety, Night Wakings, Parasomnia, Sleep Disordered Breathing and Daytime Sleepiness. Two items are included in both the Bedtime Resistance and Sleep Anxiety subscales. Some items are reverse scored (i.e., higher scores indicate more frequent difficulty with sleep; see Table II for a full list of items and subscales). As mood problems wax and wane, parents were asked to endorse CSHQ items in relation to their child's worst mood period and whether that period involved manic, depressive, or mixed symptoms. In the current sample, CSHQ individual items were examined categorically according to their frequency.

The web survey also contained multiple-choice questions about the degree of impairment (1 = None, 2 = Mild, 3 = Moderate, 4 = Severe) sleep problems caused at home, in school, and with peers during the child's worst mood period. Additional multiple-choice questions inquired about the child's psychiatric and sleep diagnoses; psychiatric disorders of the child's biological relatives (i.e., sibling, parents, and grandparents); and basic demographics (see Participants section). As clinical observations suggest sleep disruption is exacerbated following daylight savings time changes and 3-day weekends, the effect of spring and fall time changes and 3-day weekends on sleep were explored (1 = No Problems, 2 = Mild, 3 = Moderate, 4 = Severe).

The web survey also included questions about the type of health professionals parents saw regarding their child's sleep problems, which medications/supplements parents observed as being helpful for alleviating sleep problems, which medications/supplements made sleep problems worse, which nonpharmacological interventions were observed as being helpful and which nonpharmacological interventions made sleep problems worse. These treatment data and additional analyses have been presented and are being published elsewhere (Lofthouse et al., 2007b).

**Table I.** Percent of Children Experiencing Sleep Disturbance in the Context of Manic, Depressive, or Mixed Mood Symptoms During Their Current, Worst and Other Mood Episodes

| Mood State | Mood episode | | | |
| --- | --- | --- | --- | --- |
| | Current | Worst | Other[a] | Any |
| Manic | 16.6 | 15.6 | 43.9 | 55.9 |
| Depressive | 9.3 | 1.6 | 25.7 | 31.0 |
| Mixed | 43.7 | 80.2 | 53.8 | 89.3 |

[a]95.5% reported presence of other mood episodes.

## Results

Nearly all parents reported some type of mood-related sleep problem during their child's current, other or worst mood periods (Table I). Sleep difficulties were most commonly reported in children experiencing mixed states followed by those in manic states and finally, those in depressive states.

Table II summarizes the frequency with which parents report CSHQ sleep problems [i.e., endorsed Sometimes (2–4 times/week) or Usually (5–7 times/week)] during their child's worst mood episode. Subscale endorsement was very high. With the exception of sleep-disordered breathing, which only half the parents endorsed, all other subscales had one or more items endorsed by 85.6–98.4% of parents. In summary, 99.6% of parents reported one or more CSHQ sleep problems two to seven times per week. Impairment at home, in school, and with peers as a result of sleep problems during the child's worst mood episode is summarized in Table III. Impairment was the norm, as 96.6% of parents reported mood-related sleep impairments in one or more settings. Nearly two-thirds (64.0%) reported impairment in all three settings.

Finally, in response to questions about changes in routine, a majority of parents reported mild-to-severe sleep problems after 3-day weekends (70.2%) and daylight savings time shifts in the Spring (66.4%) and Fall (61.5%).

## Discussion

Despite sleep problems being part of the DSM-IV (APA, 1994), diagnostic criteria for manic and depressive episodes, research on EBSD-related sleep difficulties is sparse. Existing studies tend to focus on sleep difficulties related to current manic episodes, examine adolescent-only or mixed child–adolescent samples, and utilize small samples. Unlike previous research, the current study examines the occurrence of sleep problems associated with past and current manic, depressive, and mixed mood symptoms in a large (N = 494) child-only sample.

**Table II.** Percentage of Frequently Occurring[a] CHSQ Sleep Problems During Worst Mood Period

| Subscale | Item | % |
|---|---|---|
| Bedtime Resistance | *One or more subscale items endorsed* | *94.3* |
| | Struggles at bedtime | 79.8 |
| | Afraid of sleeping alone | 68.4 |
| | Does not fall asleep in own bed | 65.8 |
| | Needs parent in room to sleep | 56.7 |
| | Does not go to bed at same time | 51.8 |
| | Falls asleep in other's bed | 51.3 |
| Sleep Onset Delay | *Does not fall asleep in 20 minutes* | *86.6* |
| Sleep Duration | *One or more subscale items endorsed* | *89.5* |
| | Does not sleep right amount | 86.0 |
| | Sleeps too little | 81.2 |
| | Does not sleep same amount each day | 73.9 |
| Sleep Anxiety | *One or more subscale items endorsed* | *91.1* |
| | Afraid of sleeping in dark | 72.1 |
| | Afraid of sleeping alone | 68.4 |
| | Trouble sleeping away from home | 57.7 |
| | Needs parent in room to sleep | 56.7 |
| Nightwakings | *One or more subscale items endorsed* | *95.6* |
| | Awakes once during night | 70.1 |
| | Awakes more than once during night | 60.9 |
| | Moves to other's bed in night | 53.9 |
| Parasomnias | *One or more subscale items endorsed* | *96.8* |
| | Restless and moves a lot | 85.1 |
| | Talks during sleep | 63.7 |
| | Alarmed by scary dream | 62.2 |
| | Grinds teeth during sleep | 46.6 |
| | Wets the bed at night | 45.3 |
| | Awakens screaming, sweating | 35.8 |
| | Sleepwalks | 24.7 |
| Sleep Disordered Breathing | *One or more subscale items endorsed* | *46.8* |
| | Snores loudly | 43.0 |
| | Stops breathing during sleep | 12.3 |
| | Snorted gasped during sleep | 18.8 |
| Daytime Sleepiness | *One or more subscale items endorsed* | *98.4* |
| | Wakes up in negative mood | 91.5 |
| | Hard time getting out of bed | 90.0 |
| | Seems tired during day | 83.0 |
| | Others wake child | 74.7 |
| | Wakes by self | 70.9 |
| | Falls asleep riding in car | 61.5 |
| | Falls asleep watching TV | 52.0 |

[a]Parents report problem occurring "Sometimes" (2–4 times/week) or "Usually" (5–7 times/week).

In addition, this study is the first to use a web-based survey, containing a psychometrically rigorous sleep questionnaire (the CSHQ) developed with reference to standard sleep taxonomy for school-aged children (ISCD-2). It is also the first to examine the occurrence

**Table III.** Percent Sleep-related Impairment at Home, School, and With Peers During Worst Mood Episodes

| | None | Mild | Moderate | Severe | Any impairment |
|---|---|---|---|---|---|
| At home | 6.5 | 9.9 | 31.6 | 52.0 | 93.5 |
| In school | 14.0 | 21.1 | 33.0 | 32.0 | 86.0 |
| With peers | 30.4 | 21.9 | 28.1 | 19.6 | 69.6 |

of sleep problems associated with manic, depressive, and mixed mood symptoms, during current, worst, and other mood periods and EBSD sleep-related impairments at home, in school and with peers.

Nearly all (98.6%) parents reported some type of mood-related sleep problem during the course of their child's life. This is similar to our previous finding in another sample (Lofthouse et al., 2007a), in which 96.2% of 133 children with EBSD suffered from moderate-to-severe sleep problems related to manic, depressive, or comorbid symptoms, either currently or during their worst mood period. Our current findings indicate parents identify the most sleep difficulties during their child's worst mood period (97.4%), compared to other (90.5%) and current (69.6%) mood periods. This also corresponds to our previous findings, in which 94% of parents or children reported some sleep disruption during the worst mood period, while 69.2% reported current sleep problems. Sleep difficulties were most commonly reported during mixed manic–depressive states (89.3%), followed by manic states (55.9%) and finally, depressive states (31.0%).

Unlike previous studies that did not use an ICSD-2 based and psychometrically rigorous sleep questionnaire, nearly all (99.6%) the parents reported some type of CSHQ sleep problem two to seven times per week. All but one CSHQ subscale was endorsed by 85% or more of parents. These rates are much higher than the 23–43% reported by previous studies of sleep difficulties in healthy school-aged children (Kahn et al., 1989; Owens et al., 2000). However, it must be noted that the current data may have been affected by a self-selection bias. Participating parents may have been more motivated than nonparticipating parents to complete the study because their children had more EBSD-related sleep problems, thereby inflating endorsements in this sample.

Another finding, not reported by previous studies of EBSD-sleep problems, indicates the aforementioned sleep problems are associated with frequent impairments at home, in school or with peers during the worst mood episode. Nearly all children (96.9%) had impairment endorsed by their parents and nearly two-thirds (64.0%) had problems across all three spheres of

functioning. These findings are similar to previous studies of psychosocial impairment caused by sleep problems in children without EBSD (see review by Fallone, Owens, & Deane, 2002). Finally, the current study documented that phase shifts are associated with sleep difficulties for children with EBSD. The majority of parents reported mild-to-severe sleep problems after 3-day weekends (70.2%) and with daylight savings time shifts in the Spring (66.4%) and Fall (61.5%). These latter figures are comparable to those noted in the adult literature on daylight savings time changes (Coren, 1996) and disruptions in circadian and social rhythm (see review by Harvey et al., 2006).

### Study Limitations and Future Directions

Despite the exploration of several variables not examined by previous studies and support for previous findings, the present study has notable limitations. The primary one is the sample consisted of nonrandom, self-selected and web-savvy parents who identified their children as being diagnosed with EBSD. However, Cluss et al. (1999) found 93% agreement between adults' self-report of bipolar diagnosis and structured clinical interview using a voluntary bipolar disorder case registry. In addition, parents in the current sample reported having several biological relatives with rates of mood and substance problems similar to family studies of bipolar disorders (Craddock & Jones, 1999; Todd et al., 1996). Nonetheless, current findings should be replicated in a clinic study of children diagnosed with EBSD. Second, as previously discussed, CABF parents had the option to complete the survey or not. It is entirely possible that those parents whose children were experiencing more sleep-related problems were also more motivated to complete this study, thereby inflating reports of sleep problems in this sample.

Furthermore, because we used a web survey method, we do not know how many parents accessed but did not respond to the survey. Therefore, we cannot report response rate or the characteristics of nonresponders and any threats to validity. Third, due to practical and human subjects' concerns regarding children participating in web-based surveys, this study relied on parent data alone, despite recommendations from previous studies to incorporate information from both parents and children when assessing EBSD (Lofthouse et al., 2007a; Tillman et al., 2004).

Fourth, to minimize the web survey's length and complexity, sleep problems related to comorbidity were not explored. Previous findings (Lofthouse et al., 2007a) indicate the need to examine sleep-problems associated with non-mood psychiatric disorders throughout the child's life. Fifth, by focusing on ICSD-2 sleep problems, the DSM-IV (APA, 1994) manic–depressive sleep symptoms of reduced need for sleep, insomnia, and hypersomnia were not explored. Sixth, as only 4- to 12-year-olds were investigated, study findings cannot be generalized to sleep problems in adolescents diagnosed with EBSD. Finally, as sleep problems were explored via "snap-shots" in time—during the child's current, worst and other mood periods—longitudinal designs are required to understand the triggers, onset, course, and effect of such difficulties on children's and adolescents' functioning at home, in school, and with peers.

### Implications

Although exploratory and despite these limitations, current results suggest that EBSD is associated with numerous ICSD-2 sleep difficulties, related to current and past mood periods, causing functional impairment across several life domains. Given the additional potential for sleep disturbance triggering future manic and depressive symptoms by causing increased psychosocial stress at home, in school, and with peers and disrupting daily routines, current findings strongly suggest the need for effective pharmacological and nonpharmacological interventions.

Unfortunately, despite a significant increase in attention to EBSD from both the scientific community and the general public (Lofthouse & Fristad, 2004), there have been few controlled studies of pharmacological treatment for children and adolescents with EBSD (DelBello & Kowatch, 2006). Of the eight published controlled studies of pharmacological interventions for EBSD reviewed by Delbello and Kowatch, only one reported treatment data on sleep problems. Over an 8-week course, Biederman et al. (2005) treated 31 4- to 6-year-olds with EBSD with either olanzipine or risperidone and used the YMRS (Young et al., 1978) to measure treatment response. Overall, each medication significantly reduced YMRS total and sleep disturbance scores.

Currently, only two studies for EBSD have reported using a sleep hygiene module in their intervention, although both indicate positive results (Pavuluri et al., 2004; and Fristad, 2006). Pavuluri and colleagues examined their child- and family-focused cognitive-behavioral therapy (CFF-CBT) program plus medication in a specialty clinic with 34 children and adolescents with EBSD. Treatment as a whole led to significant reductions in sleep disturbance, mania, depression, psychosis, aggression and ADHD, and significant increases in

global functioning. Fristad examined her adjunct individual family psychoeducation (IFP) intervention in 20 children with EBSD who were on several medications with varying degrees of effectiveness. Improvements in mood and family climate and possible improvements in treatment utilization begin to occur immediately after treatment but were most pronounced at the 12-month follow-up period. Although neither study examined the specific effects of the sleep hygiene component, both suggest the potential for psychological interventions for EBSD sleep problems. In light of the frequent, durable and impairing problems we have reported on EBSD-related sleep problems and the lack of controlled research on pharmacological and nonpharmacological treatments for these problems, the development and testing of biological and psychological interventions is sorely needed.

A final implication of our results is that the widespread presence of sleep problems in EBSD may reflect underlying biological mechanisms. As previously noted, Rao et al.'s (2002) EEG study revealed more stage 1 sleep and diminished stage 4 sleep in adolescents who later switched to EBSD than in those with unipolar depression, and Mehl et al.'s (2006) PSG study of children with a "pediatric bipolar disorder profile" suggested poorer sleep efficiency, more awakenings, less REM sleep, and longer periods of slow-wave sleep. In adults with bipolar disorder, sleep difficulties have been connected to the medial prefrontal cortex (Wu et al., 1999) and urinary dopamine levels (Joyce et al., 1995), while CSF homovanillic levels of dopamine appear to increase just before a switch into mania (Wehr and Goodwin, 1981). Therefore, future studies of EBSD using functional imaging, EEG, PSG, and urinary and blood measures of dopamine may further elucidate the origins of associated sleep problems.

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