

# Sleep in Children and Adolescents with Obsessive-Compulsive Disorder



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## KEYWORDS

- Obsessive-compulsive disorder • Anxiety disorder • Children • Adolescents • Sleep-onset latency
- Total sleep time • Presleep arousal • Bedtime resistance

## KEY POINTS

- Sleep problems are not a core feature of obsessive-compulsive disorder (OCD), but emerging empirical data indicate some form of sleep disruption to be highly common.
- Available research in both adult and child patients is limited in several important ways, including the use of subjective reports (particularly in children), high rates of comorbid depression, and concurrent use of psychotropic medication.
- The presence of sleep disruption in OCD patients may compound severity and impairment of the disorder.
- More research is needed to fully understand the nature and consequences of sleep-wake disruption in children with OCD.

## INTRODUCTION

OCD is a common and often disabling disorder with lifetime prevalence rates ranging from 2% to 3%.<sup>1,2</sup> It is the fourth most common psychiatric disorder in the population, diagnosed nearly as often as asthma.<sup>3</sup> OCD is characterized by the presence of recurrent intrusive thoughts or images (ie, obsessions) that seem excessive and/or irrational to an individual as well as behavioral rituals (ie, compulsions) directed at reducing associated anxiety. Collectively, these symptoms can cause marked distress, are unreasonably time consuming, and may significantly impair functioning in any or all aspects of life, including personal relationships, education, employment, finances, and health.<sup>4,5</sup>

Although OCD has been moved from the anxiety disorders section in the *Diagnostic and Statistical Manual for Mental Disorders* (Fourth Edition, Text Revision)<sup>6</sup> to the OCD and related disorders section in the *Diagnostic and Statistical Manual for Mental Disorders* (Fifth Edition) (**Box 1**), OCD patients nevertheless experience significant anxiety related to their disorder.<sup>4,6</sup>

Although not always able to understand or communicate their symptoms, children are just as likely as adults to suffer from OCD.<sup>7,8</sup> The disorder is sometimes seen in children as young as 4 and 5 years of age,<sup>9</sup> although most patients report an onset of symptoms during the school-age or early teenage years.<sup>10</sup> Like their adult counterparts, children with OCD commonly experience both

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**Box 1****Abbreviated *Diagnostic and Statistical Manual for Mental Disorders (Fifth Edition)* diagnostic criteria for obsessive-compulsive disorder****A. Presence of obsessions, compulsions, or both:**

Obsessions are defined by (1) and (2):

1. Recurrent and persistent thoughts, urges, or images that are experienced, at some time during the disturbance, as intrusive and unwanted, and that in most individuals cause marked anxiety or distress
2. An individual attempting to ignore or suppress such thoughts, urges, or images or to neutralize them with some other thought or action

Compulsions are defined by (1) and (2):

1. Repetitive behaviors that an individual feels driven to perform in response to an obsession or according to rules that must be applied rigidly
2. The behaviors or mental acts are aimed at preventing or reducing anxiety or distress or preventing some dreaded event or situation; however, these behaviors or mental acts are not connected in a realistic way with what they are designed to neutralize or prevent, or are clearly excessive. Note: young children may not be able to articulate the aims of these behaviors or mental acts.

**B. The obsessions or compulsions are time consuming (eg, >1 h/d) or cause clinically significant distress or impairment in social, occupational, or other important areas of functioning.****C. The obsessive-compulsive symptoms are not attributable to the physiologic effects of a substance (eg, a drug of abuse or a medication) or another medical condition.****D. The disturbance is not better explained by the symptoms of another mental disorder.**

obsessions and compulsions. Children are more likely to present with compulsions/ritualized behaviors in the absence of specific obsessions.<sup>11</sup> The content of these behaviors varies considerably but frequently includes excessive hand washing or bathing; repeating certain numbers, words, or phrases; ordering items or doing something until it is “just right”; and checking behaviors.<sup>11</sup>

Despite that compulsions/rituals may consume up to several hours per day, children are sometimes able perform these behaviors in secret, hiding them from parents for extended periods.<sup>11</sup> As a result, parental reports of child obsessions and compulsions may underestimate both the severity and associated impairments of these symptoms.<sup>12</sup> In children, as in adults, interference across numerous areas of daily functioning may be present, such as in the ability to complete assigned tasks (ie, chores, homework, and schoolwork), in familial and social relationships (ie, getting along with parents, siblings, and friends), and in routines over the day and into the evening (ie, leaving for school, eating meals, and getting ready for bed). Functional impairments may also relate to problems with sleep, which are common<sup>13,14</sup> but poorly understood.

Sleep problems are not a core syndromal manifestation or prominent feature of OCD, yet

empirical studies in children indicate some form of disruption to the sleep-wake cycle as highly common.<sup>13,14</sup> In the authors' child anxiety clinic, for example, children with OCD (or their parents) sometimes report a need to engage in time-consuming rituals before bed, which must be performed to their satisfaction prior to initiating sleep. Some children are unable to sleep in their own bed due to contamination fears, which results in a lack of a consistent sleep environment and routine. The sleep problems of children with OCD resemble those typically associated with other forms of childhood anxiety, including general nighttime fears, a need to cosleep, or lengthy sleep-onset latencies. The goal of this article is to provide a summary of available research examining the sleep patterns and problems associated with OCD. Because the existing body of literature focused on children specifically is limited, the discussion begins with a review of studies conducted among adult patients with OCD.

### **SLEEP IN ADULTS WITH OBSESSIVE-COMPULSIVE DISORDER**

Although studies are limited compared with other psychiatric conditions, such as depression, examination of objective sleep patterns in OCD

has produced inconsistent results. In an initial examination by Insel and colleagues,<sup>15</sup> 14 patients with OCD, 14 age-matched patients with depression, and 14 age- and gender-matched controls were compared on objective measures of sleep. Significantly reduced total sleep time (TST), more awakenings, reduced stage 4 sleep, and shortened latency to rapid eye movement (LREM) sleep were observed in OCD patients compared with controls. Although fewer significant differences emerged between the clinical groups, OCD patients exhibited significantly greater amounts of stages 1 and 3 sleep than depressed patients. A major limitation of this study, however, is that at least half of OCD patients had a secondary depressive disorder, and research based on subjective reports suggests that the sleep problems of OCD patients may actually derive from co-occurring depression.<sup>16</sup> For example, Bobdey and colleagues<sup>16</sup> examined 12 OCD patients without comorbid depression, 12 OCD patients with comorbid depression, 57 healthy control patients, and 13 patients with primary depression. Patients in both groups with a depressive diagnosis reported worse sleep than the 2 nondepressed groups, suggesting that depression rather than OCD adversely affects sleep.

Bobdey and colleagues<sup>16</sup> also examined sleep phase delay in their sample, with more mixed results. Specifically, among those subjects with bedtimes in the 90th percentile (ie, the latest bedtimes) were 2 patients with OCD without depression, 1 patient with OCD and depression, and 3 patients with depression only, pointing toward a higher incidence of sleep phase delay in all 3 clinical groups compared with controls. Similarly, Mukhopadhyay and colleagues<sup>17</sup> examined sleep circadian rhythms in OCD patients by sampling consecutive OCD-based inpatient admissions over a 10-year period. Of 187 eligible patients, 33 (17.6%) fulfilled criteria for delayed sleep phase syndrome (DSPS). All 33 patients had a significantly earlier age of OCD onset than OCD patients without DSPS. An additional 31% ( $n = 58$ ) of patients reported sleep disturbances other than DSPS. Levels of comorbid depressive symptoms did not differ among OCD patients with and without any form of sleep disturbance. It is unclear how well results of this inpatient study generalize to nonhospitalized patients.

Hohagan and colleagues<sup>18</sup> examined 22 nonmedicated patients with OCD and 22 age-matched controls in terms of sleep, OCD severity (using the Yale-Brown Obsessive Compulsive Scale [Y-BOCS]),<sup>19</sup> and depression. Poorer sleep efficiency (SE) and an increased wake time during the sleep period were found in the OCD group. No

group differences were found for total rapid eye movement (REM) sleep, although the duration and density of the first REM period were nonsignificantly increased among OCD patients. Seven (32%) patients suffered from secondary depression and were, therefore, compared with nondepressed OCD patients on sleep variables. No differences were found. These findings are in line with those from previous studies (eg, including reduced SE and greater wake time) and suggest sleep disturbances to be related to a diagnosis of OCD.<sup>15,20</sup> Although Hohagan and colleagues<sup>18</sup> used a 7-day medication wash-out period,<sup>21,22</sup> other researchers have found increased REM density among OCD patients who have taken psychotropic medications previously compared with patients without a history of pharmacologic intervention.<sup>23</sup> As reported by Voderholzer and colleagues,<sup>23</sup> this difference could not be attributed to OCD severity or to comorbid depressive symptoms. The long-term effects of psychotropic medications on sleep are not yet understood.

The study by Voderholzer and colleagues<sup>23</sup> examined the sleep patterns of 62 nonmedicated patients with OCD and 62 matched healthy controls. The investigators noted that "many patients" in the OCD group had mild to moderate depressive symptoms secondary to OCD and only 29 of the patients had never been treated with psychotropic medication. Groups were compared on sleep continuity variables (ie, SE, sleep-onset latency, and number of awakenings) and sleep architecture (ie, LREM, duration of first REM period, and total REM density). Significant differences were seen on sleep variables between the groups, including shorter sleep duration, lower SE, and more time spent awake in the OCD group. Significant increases in REM density during the first REM period were also found among OCD subjects.

In a sample of 13 nonmedicated outpatients with OCD (who had each taken psychotropic medications previously) and a sample of matched controls, Robinson and colleagues<sup>24</sup> compared the sleep EEG of the 2 groups based on 2 nights of recording. No significant between-group differences were found for sleep measures. Within the OCD group, however, Y-BOCS scores were negatively correlated with TST, SE, and duration of sleep stages 1 and 2. Importantly, all patients in this sample were free of comorbid depressive diagnoses as well as significant depressive symptoms.

Kluge and colleagues<sup>25</sup> compared 10 inpatients with OCD (without comorbid depression) with 10 matched healthy controls using polysomnography (PSG). Sleep did not differ between the groups with the exception of reduced stage 4 sleep in

OCD patients, similar to results reported by Insel and colleagues.<sup>15</sup> In addition, LREM of less than 10 minutes was found among 3 individuals with OCD who had significantly more severe forms of the disorder compared with the other inpatients (as measured by the Y-BOCS). Although inpatients in this study did not have comorbid depression and were not taking medication at the time of participation, 3 subjects had previously been treated for a major depressive episode and all 10 inpatients had been on psychotropics at one time. The duration of drug-free intervals ranged from 9 days to several years.

### SUMMARY OF ADULT-BASED STUDIES

For the most part, adult findings are largely limited by the potential influence of co-occurring depression, the unclear impact of psychotropic medications on sleep architecture, and the collection of objective sleep data under laboratory (ie, artificial) conditions. As a result, conclusions that can be drawn from these studies remain tenuous. These studies suggest similarities in the sleep of patients with OCD and patient with depressive symptoms, not necessarily accounted for by high rates of comorbidity.<sup>15,18,23,25</sup> Similarities include poor SE, reduced slow wave sleep, increased wake after sleep onset (WASO), and a phase delay in the timing of sleep.

Despite similarities in presentation, sleep disturbances may hold different implications for these clinical groups. Whereas sleep deprivation (SD) produces (transient) improvements in mood in up to 70% of depressed patients,<sup>26,27</sup> the effects of SD on OCD symptoms seem more variable. In the only published study to use SD in a sample of 16 patients with OCD, findings included no change in OCD symptoms in 8 patients, improvement in 5 patients, and a worsening of symptoms in 3 patients.<sup>28</sup> Although the impact of co-occurring depression on SD outcomes is unclear, collectively, available data reveal a complex relationship between OCD symptoms and SD worthy of further investigation. Readers searching for more information about the relationship between OCD and sleep in adults are referred to a recent systematic review by Patterson and colleagues.<sup>29</sup>

### SLEEP IN CHILDREN WITH OBSESSIVE-COMPULSIVE DISORDER

Sleep findings among adult OCD patients are equivocal; studies using objective sleep measures in children with OCD are relatively nonexistent. Most available studies have investigated the

presence of sleep-related problems based on subjective child or parent reports. For example, Alfano and colleagues<sup>13</sup> found that 54% of children with primary OCD (ages 7 to 14 years) reported trouble sleeping and 64% reported difficulty waking in the morning. Among a larger sample, Storch and colleagues<sup>14</sup> found that, based on parent report, 90% of children and adolescents with OCD (ages 8 to 17 years) experienced some type of sleep-related problem including, most commonly, trouble sleeping and daytime tiredness. Sleep problems were more common in girls and younger children and were associated with more severe forms of OCD. In line with findings from Alfano and colleagues,<sup>13</sup> 44% of the sample experienced trouble sleeping, based on child reports. A limitation of the study by Storch and colleagues, however, includes that a majority of youth were taking psychotropic medications at the time of assessment.

Ivarsson and Larsson<sup>30</sup> conducted the largest study of sleep in youth with OCD to date, although also based on subjective reports. Three groups of Swedish children and adolescents were included: 185 inpatients with OCD (mean age = 12.9 y), 177 outpatients from a child and adolescent psychiatry clinic, and 317 controls from a normative school sample. Similar to methods used by Storch and colleagues,<sup>14</sup> sleep was assessed using items from the Child Behavior Checklist<sup>31</sup> based on parent report. As expected, significantly higher rates of sleep problems were found for the OCD and outpatient groups compared with controls. Approximately one-third of youth with OCD and one-fifth of the outpatient group were reported to have a sleep-related problem, although this difference was nonsignificant. Ivarsson and Larsson's<sup>30</sup> study had a large sample size and included a normal comparison group, which extends this research literature. Investigations of sleep using objective measures in children with OCD remain, however, largely unavailable.

In the only published study to use laboratory-based PSG in youth, Rapoport and colleagues<sup>32</sup> compared the sleep of 9 adolescents with OCD (ages 13–17 years) to a group of matched healthy controls. Three subjects with OCD met diagnostic criteria for major depressive disorder at the time of assessment, all patients had a history of depression, and 5 of the 9 patients had been treated with psychotropic medication in the past. Findings included significantly reduced SE and increased SOL within the OCD group; these adolescents required twice as long as controls to initiate sleep onset. Additionally, OCD patients had an average TST of 363 minutes (standard deviation = 58) compared with 421 minutes (standard deviation = 40) among controls.

A pilot study by Alfano and Kim<sup>33</sup> compared the sleep of a small group of nonmedicated, nondepressed children with OCD ( $n = 6$ ) to a group of matched healthy control children, all aged 7 to 11 years. All children wore wrist actigraphs at home for 7 consecutive days. Actigraphy results indicated significantly reduced TST and increased WASO among youth with OCD. More specifically, the OCD group averaged 389 (standard deviation = 32) minutes of TST per night across the 1-week period compared with an average of 480 (standard deviation = 21.5) minutes for controls. Although the 2 groups did not differ in terms of total number of nighttime awakenings, duration of arousals was twice as long in the clinical group. Comparable with adult-based findings reported by Robinson and colleagues,<sup>24</sup> a significant negative association was found between TST and severity of compulsions as measured by the Children's Y-BOCS.<sup>34</sup> These data suggest that sleep problems may emerge early in the development of OCD and are not attributable to the effects of medication or secondary depression. Based on the study's small sample size, however, replication of these findings is necessary.

Finally, in an attempt to understand potential processes involved in the interplay between OCD and sleep, Alfano and colleagues<sup>13</sup> measured both cognitive and somatic presleep arousal in 52 anxious children and adolescents (7–14 y), including 13 patients with OCD. Although cognitive presleep arousal was found significantly higher than somatic arousal in the anxious sample as a whole, surprisingly both forms of presleep arousal were not significantly related to either bedtime resistance or sleep latency. Instead, presleep cognitive arousal showed a significantly moderate relationship with TST, such that the higher the arousal the less TST was reported. Previous objective evidence has shown higher perisleep-onset cortisol levels in anxious children compared with healthy controls,<sup>35</sup> thus supporting Alfano and colleagues'<sup>13</sup> subjective reports of arousal prior to sleep. As much as the link between presleep arousal and lengthened sleep latency sounds plausible, however, evidence is needed in pediatric samples to support this link.

## SUMMARY ON PEDIATRIC FINDINGS

Sleep plays a critical role in early development.<sup>36</sup> For youth with OCD, sleep problems during this period may compound the severity and burden of their illness. Unfortunately, the majority of available sleep research has been conducted in adult OCD patients, rendering unclear implications for children based on salient development differences

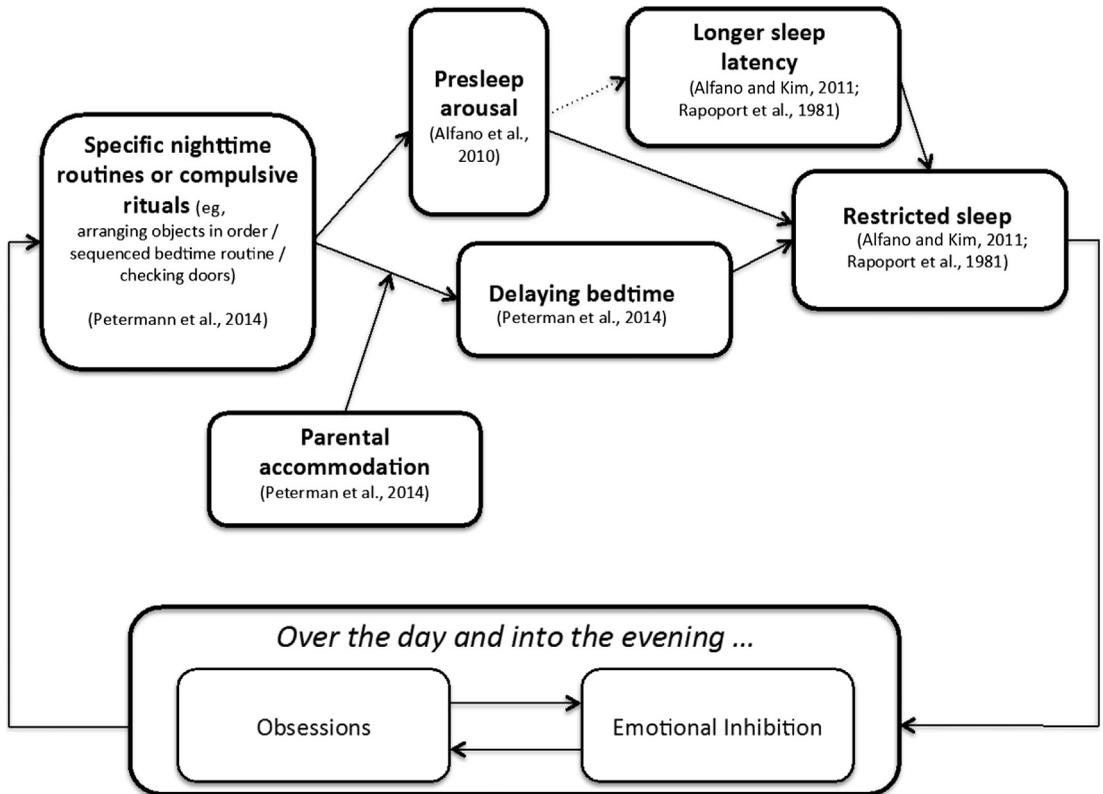
in both OCD and sleep patterns during this period. Adult-based studies are also limited by high rates of comorbidity. Yet, because adult patients are more likely to meet criteria for a comorbid depressive disorder,<sup>37</sup> childhood may afford an important window for better understanding the unique linkages between OCD psychopathology and sleep.

Of the few studies that have focused on children with OCD, subjectively reported sleep problems are prevalent.<sup>13,14</sup> Two published studies have used objective sleep methods and provide evidence of reduced TST in youth despite the use of different measurement techniques and age ranges.<sup>32,33</sup> Other objective sleep findings include reduced SE, increased SOL, and increased WASO. Research aimed at replicating these findings is a necessary next step, including investigations that compare subjective sleep reports with objective outcomes. The potential role of comorbidity and the effects of psychotropic medications on sleep also require empirical attention.

From a clinical standpoint, evidence for a link between sleep problems and a more severe form of OCD in children<sup>14,33</sup> may have important implications for intervention. Despite descriptive data that provide insight into the ways in which obsessions and compulsions each relate to difficulties during the presleep and sleep periods, more and better data are needed. Neurobiological mechanisms underlying this association also remain speculative at present. As a possible foci for future research in this area, Alfano and Kim<sup>33</sup> have hypothesized that because insufficient sleep, particularly during childhood, most profoundly affects executive functions of the prefrontal cortex,<sup>38</sup> including behavioral and emotional inhibition, obsessions and compulsions may become more difficult to resist (ie, inhibit) when sleep is inadequate. Experimental designs that seek to directly test this possibility may provide guidance for researchers and clinicians alike. **Fig. 1** presents a model synthesizing evidenced-based associations and hypothesizes links between factors that may help explain a vicious cycle occurring during comorbid OCD and sleep disturbance in children. More research is needed to confirm these associations.

## TREATMENT OF SLEEP PROBLEMS COMORBID WITH PEDIATRIC OBSESSIVE-COMPULSIVE DISORDER

The gold-standard nonpharmacologic treatment of OCD in adults and children is cognitive behavior therapy (CBT).<sup>39,40</sup> CBT has also been found to augment treatment outcomes for pediatric OCD where medical management (ie, selective serotonin reuptake inhibitors) is used.<sup>41</sup> Unfortunately,



**Fig. 1.** A maintenance model for the comorbid relationship between OCD and sleep disturbance in children and adolescents.

data on whether CBT improves comorbid sleep problems in children and adolescents are lacking. There is recent recognition of a need for “empirical evaluation of underlying mechanisms and shared treatment effects for anxiety and sleep in youth.”<sup>42</sup> In adults, the empirical evidence for shared treatment effects between sleep and OCD is small but nevertheless emerging. Using a nonpharmacologic sleep intervention, Abe and colleagues<sup>43</sup> treated the acute insomnia of a 25-year-old man with OCD using a combination of sleep hygiene (ie, moderating alcohol and caffeine consumption and regularizing habits across weekdays and weekends) and sleep perception training (ie, comparing actigraphic records of sleep with subjective reports). Abe and colleagues<sup>43</sup> report that the man’s “anxiety and fear of insomnia diminished,” although standardized changes in these outcomes do not seem to have been formally assessed.

In children, the evidence for shared treatment effects is slightly better than that in adult samples. Compared with a waitlist control group, Paine and Gradisar<sup>44</sup> found that OCD symptoms significantly decreased in school-aged children (7–12 y) diagnosed with behavioral insomnia in response to a

6-session CBT. These reductions in OCD occurred despite the focus of therapy on separation anxiety issues experienced by the sample, many of whom often needed parental presence to fall asleep. CBT consisted of treatment components seen in CBT for anxiety disorders (ie, cognitive restructuring, exposure therapy, and relaxation training). It also incorporated, however, treatment components extrapolated from CBT for adult insomnia (eg, sleep hygiene and bedtime fading [restriction therapy]). This randomized controlled trial provides some evidence of shared treatment reductions in OCD and sleep in children. Due to the multicomponent nature of the CBT used, however, the unique effect of sleep or anxiety treatment techniques on OCD is not known nor are the underlying mechanisms.<sup>42</sup>

Storch and colleagues<sup>14</sup> examined the effect of family-based CBT (ie, at least 1 parent attended all the sessions with the patient) for pediatric OCD on sleep-related problems. A total of 41 youth received weekly treatment over 14 weeks. Each session was 90 minutes in length, and core treatment components included psychoeducation, cognitive training, and exposure with response prevention.<sup>14</sup> Although sleep was not addressed directly, children demonstrated a significant

**Box 2****Interventions for comorbid pediatric obsessive-compulsive disorder and sleep problems**

- Sleep hygiene—caffeine consumption can be reduced (eg, perform a caffeine diary that includes chocolate, soda, and tea); arousing pre-bedtime activities (eg, surfing the Internet) are replaced by relaxing techniques (eg, reading). Bedtimes and wake-up bedtimes are regularized across the school week and weekend, allowing for a predictable build-up of sleep pressure.
- Bedtime fading—for children with a long sleep latency, bedtime may be gradually delayed until sleep latency is reduced to an acceptable level. Wake-up time needs to be consistent during the bedtime fading technique.
- Stimulus control—if sleep latency is extended over 15–20 min, the child can sit up and read in bed or in a chair next to the bed for 10–15 min and then reattempt sleep. Repeat this process. This technique is best begun on a weekend night (eg, Friday).
- Sleep restriction—in extreme circumstances, sleep restriction may be indicated. The child is recommended to spend time in bed 30 min less than the estimated TST. This should reduce wakefulness in bed, and sleepiness in the evening may reduce presleep arousal. This technique is best trialed during school holidays.

reduction in the total number of sleep-related problems post-treatment. Additionally, specific (parent-reported) problems of nightmares, sleeping less than most kids, being overtired, sleeping more than most kids, trouble sleeping, and sleeping next to someone else in the family all showed significant decreases from pre- to post-treatment. Thus, family-based CBT may be effective in reducing not only OCD symptoms<sup>45</sup> but also sleep-related problems in this population of youth.<sup>14</sup>

Across the aforementioned studies, sleep hygiene seems the most common treatment component applied.<sup>43,45</sup> Sleep hygiene has been suggested as a potential countermeasure to the theorized poor sleep hygiene that may be present in youth experiencing sleep problems comorbid with anxiety disorders.<sup>42</sup> There is a consensus by the American Academy of Sleep Medicine that sleep hygiene is not a recommended sole treatment of adults experiencing insomnia, yet it is simultaneously acknowledged that sleep hygiene is often an adjunct to other evidence-based techniques (eg, CBT for insomnia).<sup>46</sup> The authors extend the suggestion to use sleep hygiene in the treatment of childhood OCD and sleep problems to include additional behavioral sleep medicine treatment components. **Box 2** outlines each of these and how they align with the maintaining factors in **Fig. 1**.

Recent evidence suggests impairments in executive function are related to pediatric OCD,<sup>42,47</sup> and specifically that children low in emotional control receive the poorest treatment outcomes.<sup>47</sup> Therefore, any implementation of a sleep intervention for pediatric OCD comorbid with sleep problems should be mindful of factors moderating treatment outcome.

**SUMMARY**

Subjective and objective measurement of sleep in children and adolescents experiencing OCD demonstrates a longer time taken to fall asleep (sleep-onset latency) and restricted total sleep duration that may also include frequent night awakenings. Presleep arousal may be implicated in such sleep disturbances, yet more research is needed to confirm this link. Although models have been presented to understand the relationship between sleep problems and anxiety in school-aged children,<sup>42</sup> the authors present a framework for understanding the maintenance of pediatric OCD and sleep disturbance. The published literature is lacking directions for clinicians to treat both sleep problems and OCD using behavioral sleep medicine techniques. The authors present suggestions in this article (see **Box 2**) for clinicians to trial. These techniques also require, however, scientific validation, so that an evidence base may be established to help children and their families deal with the daily and nightly interference of OCD on their lives.

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