



Sleep Disruptions and Disorders in Children and Adolescents: A Review of the Impact of Parents and Family on Sleeping Behaviors

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Abstract

While it is recognized that ensuring adequate sleep is vital in childhood development, typical activities, such as television and other electronic media, early school start times, and extracurricular activities, can intrude on sleep time. Parents are faced with the responsibility of either limiting distractions and activities which interfere with sleep, or dealing with the complications of a child who does not receive adequate sleep. Some parents are not equipped with the knowledge of the amount of sleep children require. Certain parents also do not have discipline abilities to effectively manage their child's behavior to encourage sleep. Effective treatments are available for sleep disturbances in children, but often depend on a parent's ability to manage sleep behavior in their children. The following paper provides an overview of the significant literature published on sleep disturbances in children (early childhood through adolescence), along with the interrelationship between sleep and the family.

Introduction

The typical human being spends a full one-third of their lifetime asleep [1]. For something so critical to everyday existence, sleep research has yet to uncover the exact function of sleep [2-6]. Even determining what should be universal components of high quality sleep is difficult because sleep is so individualized [7]. Recommendations for young adults and middle-aged adults is between 7 to 9 hours has a normal distribution with a mean of 7.5 hours with a standard deviation of about 1.25 hours. Thus, statistically, 7 to 8 hours of sleep for older adults [7]. Nightly average sleep duration for adults indicate that about two-thirds of the adult population sleeps between 6.25 and 8.75 hours nightly [8]. Individual sleep requirements are determined by genetic and physiological factors, influenced by age and sex, and affected by complex psychological, developmental, environmental, and social aspects of life. What is clear is that sleep is important for performing daily activities as well as an overall high quality of life [1,9-11].

Sleep problems are a growing epidemic with more than 69 percent of adults in the United States getting less sleep than is needed for their bodies [12]. In order to achieve all the benefits of sleeping, adequate quantity and quality of sleep are required. Many American adults, approximately 65 percent, believe sleep is a contributing factor to their level of effectiveness on the following day [10]. During all stages of sleep the body is remarkably active, using this time for muscle

repair, memory consolidation, and the release of hormones that regulate processes such as growth and appetite. Sleep is structured as a series of repeated stages over the course of approximately eight to nine hours. About every 90 minutes, the body cycles through alternating stages of rapid eye-movement (REM) and non-rapid eye-movement (NREM) sleep [13]. REM is the period of sleep during which dreams occur, the eyes dart back and forth under closed lids, and the body becomes immobile and relaxed. This REM period of sleep first occurs 90 minutes after sleep has been initiated, lasts longer each cycle throughout the night [14,15], and is particularly important to performance the following day [10]. If these cycles are cut short by some type of restriction in overall time allotted for sleep or fragmentation/disruption of the expected sleep period, an individual wakes up less prepared to function and usually perceives a sense of sleepiness, a lower quality of mood, and an overall reduced ability to complete important

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tasks at home, school or work [1,9-11].

Commonly, several adverse concerns have been identified from sleep disturbances, specifically including challenging emotional responsiveness and emotion control or management [16]. Poor sleep quality resulting from sleep disturbances has been associated with several negative emotional consequences [16,17]. Poor sleep quality is also associated with heightened emotional reactivity and difficulties with emotion modulation, likely through alterations in cognitive processes that may impact reappraisal [16,18]. A form of the most common sleep disruption, insomnia, is thought to affect approximately 30% of the U.S. population over a given year, with about 15% of adults reporting chronic insomnia, which is defined as symptoms of insomnia which last longer than one month [19]. Other researchers estimate that insomnia may affect 33 to 50% of adults each year [20]. Insomnia can be a diagnosable disorder in and of itself, or indicative of some other underlying disease or emotional problem. The relationships between insomnia and other disorders can be complicated. Buysse, et al. [21] reported longitudinal analyses of insomnia and insomnia comorbid with depression. The results indicated that patients are at high risk for future episodes of the same diagnosis as well as future episodes of the other diagnosis [21]. Cognitive behavioral therapy [22] and pharmacological medications [23] are effective methods of coping with this very common sleep disturbance. In 2005, the United States National Institutes of Health state-of-the-science conference identified that only two treatment modalities, CBT and psychotropic medications, have adequate evidence to support their use in the management of chronic insomnia. Specifically, benzodiazepine-receptor agonists were named as the best psychopharmacological option for treating chronic insomnia [24].

Ensuring high quality and quantity sleep in a technological age is not a problem exclusive to adults. High quality sleep is also important for children and adolescents, with the issues of physical, emotional and psychological development added to the mix for the younger population. Studying sleep in children requires a broad base of disciplines to adequately address the myriad effects sleep has on behavior in children, particularly when researchers have reported sleep problems in children and adolescents at anywhere from 20-70% [4,10,11,25-29]. Parents of preschoolers have reported sleep problems estimated to range from 25-50%, and in samples of children aged 4-10 years of age, parents reported sleep problems around 37% [30]. More than 29% of adolescents ranging from aged 12-14 years old and 56% of those aged 15-17 years reported significant sleep complaints [31].

Recent reviews of the literature have concluded children and adolescents consistently do not get enough sleep, in part due to television and other electronic media influencing sleep at younger and younger ages. Also, as children age there are increasing academic demands and earlier school schedules affecting sleep patterns and practices. Childhood and adolescent sleep problems--regardless of etiology--have serious negative effects on children and their families [9,28,29,31-33]. For example, for children and adolescents sleep has been linked to learning, attention and other cognitive func-

tions important for their development [31,34,35]. Complicating matters of sleep research in children is that sleep behavior changes dramatically during the first few years of life depending on a wide variety of factors such as the culture of the family of origin and parental attitudes toward television watching and computer use [9,12,27,28,36-38]. Researchers also identified cellular phones as being significantly related to shorter sleep duration, more sleep disturbance, and excessive daytime sleepiness [39,40].

Healthy Sleep Patterns in Children

Healthy sleep in children looks much like healthy sleep in adults. Preschoolers, children aged between three and five years, typically need 10-13 hours of sleep per night [41]. Generally, daytime naps cease after about five years of age. For this population, difficulty falling asleep and waking up during the night are common. This is generally attributed to the growing imaginations of this age group; larger and more complex imaginations create more powerful and disturbing nightmares. Correspondingly, this is the age when sleep walking and night terrors peak until about age 7 [41-43]. The American Medical Association and the Sleep Foundation of America both recommend regular and consistent sleep schedules for preschoolers. This includes a relaxing bedtime routine, sleeping in the same cool, dark and quiet environment every night, and not placing a television in the child's [11,28,30,44-46].

For school-aged children, those aged between six and thirteen years, the recommended amount of sleep is between 9-11 hours per night [47]. Children within this age are just beginning to see increasing demands on their time. Larger quantities of homework [48-52], increased demands of school schedules [49,51,53,54] and extracurricular sports and other activities [48,55], all begin to place demands on the time of the school-age child and have the potential to interfere with sleep duration and quality. Also at this age television, computer games, and use of media, including the Internet, are factors of note regarding sleep [9,12,28,56]. Additionally, as children grow and gain independence parents become further removed from directly controlling the bedtime [48,51,54].

Sleep Deficit Causation

Childhood sleep problems, regardless of etiology, have serious negative effects on children and their families [9,28,29,33,57,58]. For example, for children and adolescents sleep has been linked to learning, attention, and other cognitive functions important for their development [34,35,59]. The self-perpetuating nature of a child's sleep disturbance, leading to family stress and dysfunctional parenting that then may in turn lead to increased bedtime resistance of the sleep disturbed child, is a problem of significant importance. Sleep is vital to overall well-being, particularly in children as they grow and develop. Parents often are unaware of how to manage sleep disturbances, and even when they seek help may still lack skills to manage the behavior. Parents' own discipline style may even be affecting the perpetuation of the sleep disturbance. However, these issues are not impermeable to change and adaptation.

Of particular importance to addressing quantity and quality of sleep in children is the parents' discipline style. This particular variable is important because it is both affected negatively by sleep disturbance in children and can be effectively modified to create behavioral change in the child [60-63]. Ineffective parenting has been linked to both internalizing problems, such as depression and anxiety, and externalizing problems, such as "acting out", or oppositional-type behaviors which are similar to the bedtime resistance that many parents experience [57,64,65]. At older ages, externalizing behaviors are associated with drug and alcohol abuse, family violence, crime, and psychopathology [65,66]. Either type of behavior can increase the parenting burden and the level of family stress, which in turn affects the ability of a parent to maintain adequate levels of functional discipline. Poor parenting can undermine a child's ability to manage emotions, particularly negative emotions, which can then disrupt relationships with parents, teachers, and peers [67].

Sleep Disorders in Children

The DSM-5 [68] categorizes sleep disorders into ten distinct disorders or disorder groups under the classification of sleep-wake disorders. Some authors argue that other classification systems are more appropriate for work with children. According to the DSM-5 [68] individuals who are diagnosed with one of these ten disorders usually have "sleep-wake complaints of dissatisfaction regarding the quality, timing, and amount of sleep" (p. 361). Other diagnostic systems focus on dyssomnias, or sleep disorders characterized by insufficient, excessive or inefficient sleep [69]. The DSM-5 does not categorically classify dyssomnia as a current disorder. However, the manual does describe that individuals having one of the sleep-wake disorders often "present with sleep-wake complaints of dissatisfaction regarding the quality, timing, and amount of sleep" (p. 361). Further, the fundamental attribute of all of the sleep-wake disorders is the individual experiences resulting daytime impairment, damage, and/or personal impairment [68].

The International Classification of Sleep Disorders: Diagnostic and Coding Manual, published in 1990, differentiated dyssomnias based on the characteristics of the disorder that contributed to its continuation and was a good fit for discussing childhood sleep problems [42]. The most recent edition (3rd) of the International Classification of Sleep Disorders (ICDS-3) acknowledges that are unknown areas when discussing sleep disorders [70]. The intrinsic dyssomnias stem from causes within the body, the extrinsic dyssomnias are dependent on external factors to produce and maintain the disorder, and circadian dyssomnias are based on the inappropriate timing of sleep in a 24-day [71,72].

The extrinsic or behavioral sleep disorders (BSD) are sleep onset association disorder, limit-setting disorder and adjustment sleep disorder, and represent the most common behavioral problems facing most parents [4,73]. For children, sleep onset association disorder is typically related to those factors that she cannot control, such as falling asleep in a car seat or being rocked to sleep. In other words, the young child cannot ask to be left to fall asleep on her own and cannot help

falling asleep when the body demands it, even if the location is less than ideal. Bedtime resistance or limit-setting disorder [74] refers to the child who often discovers many immediate needs just after the lights have been turned out and the parent has left the room. Necessities such as a drink of water, needing to use the bathroom, being too cold or too warm, or remembering something important to share with a parent, are all ways that children can resist bedtime. An important distinction between this behavioral resistance and an actual inability to fall asleep needs to be made. For example, a child who is suffering from a sleep phase delay (a circadian dyssomnia) is truly not sleepy at a standard age appropriate bedtime [75]. These children may present with the same behavioral resistance as a child without a phase delay (an extrinsic dyssomnia), but in fact cannot fall asleep at the time set for bed [75]. This emphasizes the need for clinical assessment and diagnosis of sleep disorders.

The American Psychiatric Association identifies Circadian Rhythm Sleep-Wake Disorders as "a persistent or recurrent pattern of sleep disruption that is primarily due to an alteration of the circadian system or to a misalignment between the endogenous circadian rhythm and the sleep-wake schedule required by an individual's physical environment or social or professional schedule" [68]. In addition, Owens, Ovipari, Nobile, & Spirito [76] wrote, "children with behaviorally-based sleep disorders also often have significant sleep disturbance, with irregular sleep-wake schedules, and/or fragmented or insufficient sleep. Thus, they may present with daytime behavioral problems related to daytime sleepiness that are similar to those described in children with obstructive sleep apnea syndrome" [76]. The differential diagnosis process for sleep disorders is a complex system that needs to be navigated carefully by any clinician. If the child or adolescent is participating in a late and long sleep schedule (staying up late on school nights and sleeping in long on weekends) and feels well-rested after the extended weekend sleep, it is possible that they are suffering from delayed sleep phase syndrome and intervention will be different than the sleep hygiene and limit-setting parents can initially use to address the behavioral issues [75,77]. As mentioned earlier, even when a child does not feel she is suffering any symptoms of a sleep disorder, the parents or caregivers may be suffering exponentially more in having to cope with the nighttime behaviors of the child.

Some sleep problems in children are considered to be medical in nature and can have solutions that require medical intervention. For example, in children and adolescents, sleep onset or initiation can be disrupted by restless leg syndrome [78]. Children often have difficulty describing the physical sensation other than to say they cannot get comfortable in bed or have an itchy or achy feeling in their legs [77,78]. Sleep maintenance issues in children and adolescents of a medical or organic nature need to be distinguished from behavioral issues.

More specific than the general term dyssomnias, parasomnias are sleep disorders that are characterized by behaviors intruding upon ongoing sleep [42,70]. The parasomnias are separated into three distinct groups, the non-rapid eye movement (NREM) related, rapid eye movement (REM) re-

lated, and others [70,79]. The most common are disorders of arousal, the disruptive nighttime behaviors that are classified in include the following categories: sleep terrors, confusion-al arousals, sleepwalking and sleep-related eating disorder [42,70,80,81]. These can be very disturbing to the parent or caregiver because the child is usually not aware of what is going on and can be very difficult to comfort. These three disorders share similar timing in the sleep cycle and important clinical features such as duration of the episode, presence of family history, amnesia for the episode, and degree of arousal [42,77].

Parasomnias can occur during any sleep stage, and are characterized as anything that disrupts the depth and duration of sleep can exacerbate the problem in those children predisposed to arousal disorders [79,82]. Maintaining a safe environment for the sleeping child and educating parents and caregivers about the nature of the arousal disorder is important, though often the best advice for parents is to not intervene at all other than to keep the child from hurting herself or others [82]. Extending sleep duration for as little as 30 minutes or addressing clear specific stressors can also help. In addition, older children and adolescents may experience arousal disorders as a response to emotional distress. Some type of psychological intervention may be appropriate in these situations. Similarly, nightmares can awaken a child at night but in these situations the child can be comforted and returned to bed with little difficulty [80,83]. As a last resort, medications can be used as a short-term treatment when the child appears to be at significant risk for self-harm during episodes [70,80,82].

Sleep disordered breathing (SDB) is another common problem in both childhood and adulthood. The symptoms can appear at any age and range from snoring to life-threatening apneas [83,84] or even cognitive and behavioral deficits [85]. Often this occurs in association with obstructive sleep apnea, a disruption of air flow preventing the body from receiving enough oxygen and causing the brain to reduce sleep depth and semi-awaken throughout the night [84-86]. In any of the three types of identified sleep apneas (obstructive, central, and mixed) these “microarousals” to restore the ventilation and oxygenation of the blood may occur over 200 times per night. This causes a serious fragmentation of sleep and sleep deprivation [42]. In some cases, other types of irregular breathing, including snoring and mouth breathing during sleep, can cause problems [87]. Guilleminault, Eldridge, Simmons, and Dement [88] described the first report of obstructive sleep apnea in children and concluded that excessive daytime sleepiness, decreases in school performance, abnormal daytime behavior, enuresis, headache, abnormal weight, and development of hypertension were all suggestive of a sleep apnea syndrome. Since then, testing of irregular breathers has indicated that even though still within the normal range, overall cognitive abilities, some language functions, and some visual-spatial functions are significantly lower in children that snore compared to controls [84,85]. In obstructive sleep apnea patients, sleepiness-sensitive tasks such as attention, tracking, memory and learning are primary areas of deficit [85,89] Often sleep disordered breathing has a surgical solution that is beneficial in reducing the problem [42,77,90].

Owens, et al. [76] discovered an interesting compensation effect in children with obstructive sleep apnea syndrome (OSAS). The authors write that the average sleep duration of children diagnosed with a behavioral sleep disorder (BSD) was significantly shorter than the sleep duration for children in the OSAS group, suggesting the presence of a compensatory mechanism in the OSAS group. They note that both groups suffered from an increased frequency of bedtime struggles that would presumably reduce sleep duration in both groups. However, the OSAS group slept on average 2.1 hours longer per night than the BSD group. The authors speculate that it may be this compensatory mechanism develops in response to the sleep fragmentation in OSAS, essentially by increasing the overall sleep duration to mitigate the microarousals that occur during OSAS, and may also play a role in the mitigation of the daytime neurobehavioral consequences of OSAS [76].

Childhood Psychopathology Associated with Sleep Disturbances

Children suffering from fragmented, disturbed or restricted sleep often present with attentional difficulties and irritability, and less often with subjective feelings of tiredness [84,91]. In extreme cases children may present with a syndrome similar to failure to thrive, which is likely related to insufficient release of growth hormones during sleep [42]. Sleep problems are also associated with affective disorders, anxiety disorders and symptoms consistent with PTSD in school-age children [92-94]. Sleep problems and manifestations of poor impulse control, behavior problems, and psychopathology have been linked to children in clinical and non-clinical populations. Dahl [4] wrote that children and adolescents with psychiatric, behavioral, or emotional problems had a significantly elevated rate of sleep related symptoms and problems; also, children with sleep problems showed a significant elevation in rates of psychiatric diagnoses and behavioral/emotional symptoms [4,91]. Children that are diagnosed with PDD, autism or other autism-spectrum disorders tended to have a higher prevalence of disorganized sleep when compared to controls [34,94,95].

The qualities of sustained attention and behavioral inhibition are frequently used to understand developmental psychopathology, and are also affected by sleep fragmentation and deprivation [35,96]. When adults are sleep deprived they often experience a subjective sense of sleepiness, but children and adolescents with excessive daytime sleepiness may present as being easily frustrated, agitated, irritable, aggressive, moody, emotionally labile, impulsive--all of which can lead to school and learning problems [77,97,98]. Collectively this pattern of symptoms is referred to as *eds*, or excessive disruptive symptoms. In assessing the *eds* of a particular child, the similarity between them and symptoms of attention deficit disorders should be noted [77,84]. The conclusion is for parents and professionals to be very well-educated on the consequences of poor quality or reduced duration of sleep in children, particularly when the child is being evaluated for some type of psychopathology [84,92,93]. It can be beneficial to treat sleep disturbances at a younger age because studies have reported that sleep problems in early childhood predict-

ed behavioral/emotional problems during the middle adolescent years [99,100].

Studies have indicated 26% of children designated as having mild symptoms of ADHD also suffered from obstructive sleep apnea. It has been suggested that there exists a high prevalence of snoring among the children exhibiting mild symptoms of Attention Deficit Hyperactivity Disorder (ADHD) [101,102]. The similarity between the daytime symptoms of children with sleep-disordered breathing and the symptoms of children with attention disorders has led to research attempting to find a link between ADHD and sleep disturbance [103].

Past research reported that stimulant medication used to control the daytime behaviors in children diagnosed with ADHD led to changes in those children's sleep. Particularly sleep latency was prolonged and there was an increased length of onset to first REM cycle [104]. However, there is some recent disagreement among experts regarding the effects of stimulant medication on the sleep habits of children and adolescents with ADHD [105]. Some researchers argue that psychostimulants are detrimental to child sleep, and they cite evidence of sleep deficit in sleep quality and quantity from the use of sleep assessment measures and parental reports of child insomnia [106,107]. Stimulants are known to increase and maintain alertness, which has been argued could be detrimental to sleep latency, which is the amount of time it takes to fall asleep [107]. Stimulants also have been identified as reducing both total sleep time and sleep efficiency [107], which may be particularly problematic when extended release doses are taken or if medication is taken later in the day (i.e., closer to bedtime) because extended release medication could still be active in the child's body when readying for bedtime [107]. Arguments for medication include some researchers disagreeing and stating that stimulants may actually improve a child's sleep [108] and stating noting that psychostimulants are typically well endured and are successful in diminishing the primary symptoms of ADHD. Sleep issues are typical for adolescents having ADHD, even when the child is not taking medications [109] and some clinicians claim that children with ADHD sleep better when taking medications [105,110].

Typically, children experience a biological push toward eveningness at the onset of puberty, which is consistent across cultures [111-113]. Gau, et al. [114] reported in their study of 1332 students aged 12-13 years that eveningness might be an indicator of psychopathology. After correcting for confounding factors, children in the group with the strongest eveningness ratings experienced more anxiety and depression than students with weaker eveningness ratings, as well as experiencing other emotional-behavioral problems including inattention, aggressive and delinquent behaviors, thought problems and social problems. Even the group with the strongest morningness ratings was at risk for depression although not for aggressive or delinquent behaviors. The authors also reported a link between eveningness and suicidality [114]. Insomnia in adolescents has been identified as severely impacting future health and functioning [115], and was also found to precipitate and maintain anxiety and depression [116]. Gang-

wisch, et al. [117] also reported an association between short sleep duration and suicidal ideation [117].

Depression and anxiety are the most common outcomes associated with sleep problems, but sleep problems are linked to a variety of psychiatric disorders [99,115,118] and sleep problems and depression co-occur during adolescence [4,119-123]. In older adolescents, data from survey research indicates that the late and long weekend recovery schedule employed by adolescents to compensate for daytime sleepiness is associated with poor academic performance, depressed mood, and an increase in risk-taking behaviors [50,57,124].

When examining links between sleep and personality characteristics such as introversion or extroversion and level of ambition, past studies showed inconsistent findings [124]. More recent studies have identified that personality traits, behavioral and social interactions, and physiology impact on sleep quality, stress, mental health, and even academic performance [125]. Two classic studies on the relationship between sleep and personality in a clinical adolescent population concluded that poor sleepers present with more neurotic traits and good sleepers present with more sociopathic and externalized traits [126]. Vincent, Cox, and Clara found correlational data that suggests that short sleep is associated with neuroticism [127], while a different study identified adults having a Type D personality style was a significant predictor of sleeping problems [128]. Researchers have theorized that the Type D personality, or the *distressed* personality, is identified by having the tendency to combine both negative emotions and inhibition of self-expression during social interactions [129]. Further, the Type D personality is characterized by having two inclusive personality traits, which are social inhibition and negative affect [130]. Recent research has identified adolescents with Type D personality have an increased risk for sleep disturbances, specifically four times more risk than their peers not having a Type D personality style [131]. Further, those adolescents having a Type D personality style were also acknowledged as sleeping fewer hours each night than their peers [131].

In nonclinical samples, Gau [124] reported that high ratings on neuroticism corresponded with feelings of sleep insufficiency, tiredness, moodiness, and difficulty waking up in the morning. The high neuroticism group had a higher risk of early and middle insomnia, nightmares, sleep talking, and a stronger eveningness preference. The high neuroticism subjects were more likely to fall asleep during class, doing homework, taking an exam and studying than those in the low neuroticism group. In addition, the teachers of the students in the high neuroticism group rated them as performing less well academically than their actual ability would indicate [124]. Dagan, Stein, Steinbock, Yovel, and Hallis [132] report similar results. Using a clinical population, the authors described an interrelationship between personality disorders characterized by emotional lability and delayed sleep phase syndrome [132]. Giannotti, et al. [36] reported higher rates of emotionality among evening types, which was related to a greater incidence of emotional problems. A recent study on adolescents having delayed sleep phase ascertained that

those students reported significantly later sleep timing, less total sleep time, greater daytime sleepiness, and greater impairment when compared to adolescents having good sleep [133].

Neurobehavioral Functioning (NBF) Alterations Associated with Sleep Disturbance

There is ample evidence that inadequate sleep quantity and quality are linked to significant problems in several domains of adolescents' lives [50,53,57,133,134,135]. According to Jones and Harrison [89] the distinction between the different brain functions that appears to be affected by sleep loss remains without a "unifying explanation at the level of cognitive mechanisms" (p.465). The authors argued that poorly defined concepts of attention, executive function, and memory are being measured using task challenges that are designed for more severe levels of impairment and as such this process inhibits the research in this area [89]. Even with overlap between studies attempting to measure psychopathology as it relates to sleep deprivation or fragmentation and studies attempting to measure deficits in neurobehavioral functioning as a result of inadequate sleep, the clinical and observational data tend toward a picture of inadequate sleep quality and/or quantity being linked to tiredness/daytime sleepiness, difficulty with focused attention, irritability, ease of frustration, and impulse control problems [31,100,118,136].

One of the most salient aspects of sleep disturbance in children and adolescence is the potential impact on the primary activity of this population: school. Sleepiness may be a widespread problem in the school setting, where reduced sleep quantity and poor sleep quality are associated with reduced academic performance, including problems with attention and an increased number of absences [31,57,137]. In older adolescents, data from survey research indicates that the late and long weekend recovery schedule employed by adolescents to compensate for daytime sleepiness is associated with poor academic performance, as well as depressed mood and other behavioral problems [50,57,124].

The Epworth Sleepiness Scale (ESS) has been used with adolescents [138]; however, it is not an ideal measure for the adolescent population as it was created for adults [139]. A need for an instrument that would consistently measure sleepiness in adolescents and children was recognized due to the nature of problems surrounding poor sleep on academic performance, mental health and physical well-being [138,140]. In response to this need, the author of the ESS created the Epworth Sleepiness Scale for Children and Adolescents [141] as the official modified version of the ESS for children and teens.

Before the introduction of the ESS-CHAD, Gibson, et al. [134] report 70% of Canadian high school students surveyed described bedtime habits (consistent routine, staying up late) that were significantly associated with high scores on the ESS. The students who scored highest on the ESS were more likely to feel their grades had dropped because of sleepiness and were the students most likely to be late for school and feel extremely sleepy in the early school hours [134]. One possible explanation for this is that students who got more sleep

were able to obtain better grades because of their ability to be more alert during class time, and to be able to pay greater attention during class and while completing homework [50,58,142].

Randazzo, Muehlback, Schweitzer, and Walsh [143] report that students aged 10 to 14 years were significantly impaired on the WCST and portions of the Torrance Test of Creative Thinking after being placed on a one night's sleep episode restricted to five hours. These tests were used to measure impairment in higher cognitive functions such as verbal creativity and abstract thinking. Overall or routine levels of performance were the same when compared to the group assigned an 11-hour overnight sleep episode. The authors concluded that abstract thinking and verbal creativity--the higher cognitive functions--were more sensitive to sleep restriction in children [143]. Other researchers utilizing experimental conditions where children were subject to reduced overall sleep duration or significantly fragmented sleep have suggested that there may be a compensatory mechanism at work. Carskadon, et al. [50] report that sleep restriction may not lead to the same degree of dysfunction in NBF that total sleep deprivation does. Consistent with the Carskadon, et al. study [53], Sadeh, et al. [34,35] suggested the adverse effects in NBF from sleep fragmentation stem from the increase in less-restorative sleep and the relative decrease in deeper and more restorative stages of sleep [34,35,53]. A study using high school adolescents also identified that cognitive function and learning are significantly linked to sleep amounts in children and adolescents, specifically that having sleep deficit contributes to impairment in cognition, alertness, and neurobehavioral domains [59].

In order to determine if the deficits in neurobehavioral functioning measured in previous studies had significant effects on academic performance in the classroom, Fallone, Acebo, Seifer, and Carskadon [144] placed school-age students on a one-week sleep restriction (to as little as six and a half hours per night) and then measured the effects *in vivo* through teacher ratings. They reported that children in the sleep-restricted condition were slower to process new information, were more forgetful, were more likely to be rated by the teacher as experiencing academic difficulty in the classroom, and presented with a hypo-active demeanor [144]. The previously mentioned study by Lo, et al. [143] also created conditions for partial sleep deprivation in adolescents. Even after 2 recovery nights to "catch up" on sleep, the baseline levels for the participants did not return and continued to demonstrate subjective sleepiness and sustained attention levels [143].

Evaluating Sleep Behavior of Children

It is important to recognize that the actual sleeping behavior of a child can be technically considered normal, though occurring at times and in patterns that the parents or caregivers find problematic [137,145]. Sometimes, parental expectations do not match appropriate developmental sleep patterns or behaviors [146]. Complete and detailed sleep, general medical, and social histories are necessary. Psychological and developmental screenings along with a physical examination

are also important to determine the age-appropriateness of certain sleep behaviors [38,42,136,147]. Some important disruptive but usually age-limited disturbances are colic in early infancy, separation anxiety from about nine to fifteen months, and fears surrounding adjusting to a new pre-school at about three years [148,149]. It is important to know what is “normal sleep” at each stage so parents can be reassured as appropriate or referred as necessary [77,150]. Knowledge of the current or most recent sleep pattern and presenting complaint are important details that need to be evaluated in light of the fact that there are different routes to the same symptomology [136,147]. Education may also be an important component of assessment for possible sleep [151].

It is very important that sleep assessments of children evaluate information from multiple sources. Parents and their children may differ on their opinions regarding the sleep patterns of the children. The differences in perception of the sleep disturbance problem between parent and an older child can be addressed by discussing the nature, seriousness, and specific details of the problem with the child (if possible) and adding to that any confirmation by the parents [42]. When both parents are present, important information can be learned about the dynamics in the family and the functions of certain behaviors the child may have acquired secondarily to the initial sleep disturbance. When parents significantly overestimate the amount of time the child spends awake when she should be sleeping or how much time the parents spend addressing the sleeping problems, it is important to consider this as an indication of the amount of distress the parents are experiencing. It is of clinical significance to consider the parents may be experiencing other problems in their spousal or partner relationship or with their work life that are difficult to discuss, so the parent displaces their concern onto the child. This is where comparing the child’s nighttime sleep to their napping sleep or the differences in sleeping behaviors that may occur in different settings with different people present can be beneficial to identifying the presence of a true sleep disorder versus a challenging behavioral problem. When possible, clinical assessment with polysomnography may add much-needed information. Devices that are commercially and financially available to the public for sleep assessment, such as accelerometers and actigraph recorders may provide some useful information about sleep times, but should not be considered clinically reliable for child populations [152].

Sleep and the Family

Sleep problems that are behavioral, interactive and schedule-related and may require parental management are common [9,27-29,77,153,154]. Pediatric sleep disorders have been identified as a significant behavioral problem facing many parents [136,155]. A common problem that parents of young children have is the management of bedtime behaviors and other issues related to sleep, such as night waking [63]. The behaviorally-based insomnia often present as displaying resistance to going to bed, lengthy sleep onset, or night wakings. These problems can coexist, with children often exhibiting both prolonged night wakings that require parental intervention and bedtime resistance postponement [156]. Behavioral insomnia occurs most frequently in young children aged

zero to five years, but it can persist into middle childhood and beyond. The principal origins are usually having poor sleep-onset relationships, parents who have difficulty with setting limits, or both [156]. Situations vary greatly: parents may want to set limits for the child and do not know how, parents may also not really want to set limits at all as the child being up at night provides some gain for them (i.e. enjoyment of spending time with the child, or avoiding being seen as demanding). Issues with individual parents, such as depression, illness, or marital problems may interfere with the desire to set appropriate limits. Treatment recommendations include educating the family on appropriate sleep behaviors, keeping in mind the nature of the limit-setting problem in order not to exacerbate problems of neglect if the case is so extreme [74]. When a family with a young child presents for treatment for a sleep problem to their pediatrician or other clinical professional it is often the caregiver that has the concern, but not the child. In this sense, the parental perception of the problem needs to be assessed because sometimes a problem in sleeping does not necessarily indicate a true sleep disorder [29,155].

It is also important to consider factors that may be distinctive to the specific parents or caregivers, such as the possible presence of certain mental health issues or unrealistic parenting priorities. Parents or caretakers may be poor limit-setters or poor enforcers of rules in general [28,155]. As Zuckerman, et al. [29] wrote, “persistent sleep problems are part of more pervasive behavioral difficulties between parent and child involving limits and boundaries” (p. 689). In fact, there has been a demonstrated association between general daytime behavior problems and problems with sleeping [29,157,158]. It may be helpful for a clinician to view the family as a complex interactive system based in the genetic similarities between (biological) parents and their children, but with the temperament and character of the child eliciting behavior from the parents towards the children in a cyclical fashion [159,160].

A systems orientation, according to Conger [161] is based on three factors: the elements within a bounded unit of some type are interdependent, the activities of any one of these elements has a direct and/or indirect influence on the other elements of the system, and the elements are related through some type of feedback loop such that the actions of one element in the system eventually have an effect on itself [161-163] These types of systems can be evaluated on three different levels: the individual family member, the family system, and the community. Taking a step away from focusing on the “problem child” and exploring the cultural forces at work is integral to understanding the parenting style potentially at the root of the presenting problem.

Western culture emphasizes independence in child rearing, with a focus on the individual [27]. However, the “psychosocial and cultural contexts in which young children’s sleep patterns and bedtime routines develop influence how sleep problems are defined” wrote Gianotti, et al. [36]. Determining the cultural influences on a particular family system is important given that research has demonstrated parental involvement at the time of falling asleep was significantly as-

sociated with longer sleep latency, higher incidence of night waking, and - as a consequence - shorter nighttime sleep duration for both the parent and the child [36,164]. Parents from non-Western cultures may be resistant for cultural reasons to putting their child to sleep alone in her room, but the end result of a difficult bedtime and frequent night waking and reduced sleep duration for all is not culturally limited [27,28,36,165].

A child not sleeping well typically means at least one parent is not sleeping well, and often the whole family is affected. This can directly affect the quality and quantity of parental sleep and result in fatigue and mood disturbances and lead to a decrease in effective parenting [28,166-168]. A parent's "parenting style" is one such aspect of parenting that is involved in this feedback loop between parent and child regarding bedtime resistance. Baumrind [169] defined parenting style as the consistent patterns with which parents interact with their children along two dimensions: demandingness and responsiveness. Demandingness refers to the effort parents make to integrate the child into the family through expectation of behavior and disciplinary practices. Responsiveness is parental action that is supportive and consistent with the needs and demands of the child [169].

The Interaction between Parenting Styles and Sleep Patterns

The influence of electronic media on the sleep behavior of children as well as the gradual removal of the parent from controlling bedtime is most accurate for parents from Western cultures because of the cultural emphasis on the development of individualism [27,170]. Even when just evaluating American culture, parenting researchers understand the malleability of the parental view of the child. As Diana Baumrind [171] wrote in her seminal article on models of parental control, "the practices favored by American parents to influence the actions and character of their offspring have varied from time to time, with the predominant view of the child as a refractory savage, a small adult, or an angelic bundle from heaven" [171]. She argued that many ideas about children, parents, and parenting come less from scientific research than religious values, a fact that she sought to change with her classification of parental authority into three models [171-173].

Baumrind [169,171,173] used these dimensions to define three parenting styles: authoritative, authoritarian, and permissive. Authoritative parenting combines a high demand for maturity with a high degree of emotional responsiveness and warmth toward the child with a deep valuing of both autonomy and conformity; authoritarian parents have high demand for mature behavior with low levels of responsiveness toward the child with a corresponding valuing of strict obedience; and permissive parents have few demands regarding maturity but have high levels of responsiveness while attempting to be nonpunitive in any way [171]. When parenting styles transform into specific discipline practices, especially at bedtime, an interaction of serious consequence can occur.

One of the most pervasive problems of sleep disruption in children is the effect on the parents and the overall

functioning of the family unit [174]. Zuckerman, et al. [29] wrote, "persistent sleep problems are part of more pervasive pattern of behavioral difficulties between a parent and child involving limits and boundaries" (Zuckerman, et al., 1987, p. 669) [29]. Parenting style and discipline practices have been linked to increased resistance and general noncompliance at bedtime, and otherwise competent parents may be poor limit-setters at bedtime because of fatigue or conflicting priorities [28,29,61,156]. For example, when a child displays bedtime resistance or limit-setting disorder, situations may vary from parents who may not really want to set limits at all because the child being up at night provides company or entertainment for them, which is a sign of dysfunctional permissive discipline, to yelling and threats or actual physical punishments to achieve compliance, which is a sign of dysfunctional authoritarian discipline [28,61,156].

The interaction between bedtime resistance on the part of the child and limit-setting difficulties on the part of the parent(s) has led sleep researchers to describe a cyclical effect to childhood sleep problems and the corresponding sleep deficit in the parents or caregivers. When parents are suffering from sleep deprivation and/or fragmentation, they are at risk for mood imbalances and the subsequent poor parenting that may follow [28,61,166-168]. Even when a child does not feel she is suffering any symptoms of a sleep disorder the parents or caregivers may be expending energy in having to cope with the nighttime behaviors of the child [166].

The Impact of Parenting on Neurobehavioral Functioning

Research examining the relationship between parenting style and outcomes has consistently linked parenting style and child well-being in a variety of domains, including those related to social competence, academic performance, and general psychosocial development and resistant or problem behaviors. In particular, authoritative parenting increased child and adolescent competence and adjustment in areas of academic achievement, mental health, and psychosocial competence with a reduced rate of resistant or problem behaviors [175-177]. Generally, authoritative parenting has been found to be conducive to children's growth, development and psychological health [175-176,178]. This parenting influence may continue to have an effect even when children and adolescents are no longer in daily contact with their parents [179,180]. In general, parental responsiveness predicts social competence and psychosocial functioning [181], while parental demandingness is associated with academic competence and behavioral control [182,183]. Authoritative parenting has consistently been associated with both instrumental and social competence [181] and lower levels of problem behavior in both males and females at all developmental stages [184,185]. Children and adolescents from authoritarian families tend to perform moderately well in school and be less involved in problem behavior, yet they have poorer social skills, lower self-esteem, and higher levels of depression [186]. Conversely, children and adolescents from permissive families are more likely to be involved in problem behavior

and perform less well in school [187], but were found to have higher self-esteem, better social skills, and lower levels of depression in past research [188]. More recent research by Barton and Kirtley [189] identified permissive parenting as an indicator for higher levels of college student negative mood and affect.

Any particular family system is dealing with challenges idiosyncratic to their specific child, a fact that limits generalizability. However, a child that is excessively emotional or possesses a temperament that is principally active tends to experience higher levels of distress and a lower level of "soothability" [61,190]. The feedback loop in a systems perspective with a child identified as the level of analysis may resemble a situation where a child with a general difficulty in modulating her own arousal leads parents or caregivers to not be stern at bedtime for fear of angering the child, which also leads to a quick response to the child during night wakings, creating a pattern of learned behavior on the part of the child and the parents. Nighttime wakings and late bedtimes may be reinforced by the contact parents provide at these times. This creates a cyclical situation that can be both initially created in part by a poor fit between parenting style and child temperament, or contribute to its continuation and exacerbation. In addition, this pattern can eventually interfere with the development of a normal diurnal sleep pattern and keep the child dependent on what is essentially a series of naps [191]. This loop must be evaluated with the understanding that parents who are chronically sleep deprived may be more likely to perceive the behavior of their child in a negative light [61,192].

Media and Sleep Deficit

One of the challenges of the modern family is achieving the difficult balance between high quality sleep in the children and all of the choices they have of what to watch, listen to or play. Electronics have been identified as a significant problem having the potential to disturb sleep because of the light and the noise [12,41,193]. One example of an area in which parental control can be necessary to ensuring children's sleep habits is in limiting the access the child has to television and electronic media [194,195]. Because electronics, including televisions, videogames, laptops and computers, and tablet-type computers, are now fixtures in the modern-day American family bedrooms, sleep disturbances in quality and duration of sleep are common [12,194,195,196]. Electronic devices in American bedrooms are pervasive; with 72 percent of children in the United States having at least one electronic device located in their bedroom [193]. On average, children in the U.S. aged 2 to 5 years of age watch greater than 32 hours of television per week [197]. Similarly, while children aged 6 to 8 years of age watch approximately 28 hours of television per week [197]. For young children, 75% of parents report television viewing as a usual part of their child's routine, with 90% of these parents believing that this television watching did not have a significant effect on the sleep of their child [28,198]. However, research has demonstrated television can affect the lifestyles of children and adolescents in a variety of ways [199]. Some of these have more behavioral consequences than others, but all can have an effect on the

sleep patterns that are required for children to be healthy [28,200]. For instance, television watching, and more recent access to other types of media (computers, cell phones), have been linked with obesity, poor eating habits, and poor sleep [201-204] decreased physical activity and fitness [205-207], and poor school performance [43,208,209]. In many cases the link between obesity and television watching can be at the home environment level. Research has indicated a significant relationship between the numbers of meals spent watching television and total time watching television, which is linked with the development of obesity [204,210]. Studies also indicate that limiting early television and electronic viewing may help to prevent obesity [211] and that the more television subjects watched, the higher Body Mass Index they accrued [204,207,212].

Electronic media use has repeatedly been shown to be related to difficulty getting to sleep and staying asleep [39]. This can partly be blamed on the bright light interfering with the body's typical release of sleep hormones [194,213-215]. Tazawa and Okada [216] reported excessive light exposure from television-game playing contributes to general exhaustion and exhaustion of the muscles around the eyes. They also report excessive television-game players have increased rates of muscle stiffness in the head, neck, and shoulders [216]. Increased muscle stiffness and discomfort may exacerbate sleep difficulties. Many studies have identified that electronic media is detrimental to sleep for children and adolescents [12,39,41,170,193-195,213,217] indicating that more interventions are necessary to ensure that sleep quality and duration is optimal for children and adolescents.

Treatment and Intervention

Deciding on appropriate treatment for childhood sleep disorders requires a multifaceted approach and treatment for several symptoms. In the past, the National Sleep Foundation [218] recommended that adolescents avoid the extremes of the late and long weekend recovery schedule as much as possible. The Foundation suggested delaying bedtimes on weekends by no more than one hour, and suggests to adolescents that they wake-up on weekends within two hours of their normal weekday rise time. To cope with daytime sleepiness, the Foundation also suggests an early afternoon nap [218].

For adolescents, late bedtimes in combination with early waking on school days typically reduces the overall quantity of hours spent sleeping particularly when the sleep loss occurring from over the school week is not compensated for during the weekends [219]. Unfortunately, for adolescents trying to catch-up on their sleep over the weekend, it may not be enough for a full recovery from sleep deprivation [220]. Carskadon [221] reports that while many adolescents typically obtain 1 to 2 more hours of sleep on their weekends than on weekdays, having a fluctuating sleep schedule may increase the danger of emerging sleeping problems or development of chronic sleep deprivation. Crowley and Carskadon [136] in testing similar interventions, determined that healthy adolescents did not keep the circadian system balanced between weekday and weekend. The authors suggested alternative approaches need to be tested [136].

Parents and professionals should be cognizant of the potential benefits of even a modest extension in sleep duration, which can be easily achieved by increasing the parental monitoring of bedtime [222]. With younger children, having a consistent nightly bedtime routine has been identified as improving sleep [223] which can sometimes be achieved by making children go to bed earlier [35]. It can be beneficial to treat sleep disturbances at a younger age [99,224], as that sleep problems at age four years has been shown to predict behavioral/emotional problems during the middle adolescent years. This result was achieved after accounting for the sex of the child, adoptive status, and the stability of the behavioral/emotional problems [99]. Researchers have identified an important developmental change that occurs in the overlap between sleep problems and behavioral/emotional problems that may exacerbate symptoms of both [99,224].

The nature of the modern family's busy lifestyle often precludes getting support or treatment for sleep disturbances. Additionally, the problem itself can lead to a dynamic which makes treatment appear more difficult. Aside from the relationship of poor parenting and sleep deprivation of parents or caregivers, poor or negative parenting (e.g. inconsistent discipline, harsh discipline, poor monitoring and poor supervision) is linked to both internalizing behaviors like depression and anxiety, and externalizing behaviors such as conduct problems and delinquency [57,64,66]. Additionally, families suffering with a sleep-disturbed child or adolescent are not functioning at their best, and are likely coping with the busy schedule of the modern family as well. Fortunately, there are interventions designed to change parental behaviors that have been linked to improvements in sleep in children [61,225].

Behavioral and cognitive interventions are effective but time-consuming and dependent on intense therapist support, so an alternative is written information that a parent can refer to many times over in their own home, even with their child [63,169,225-227]. In contrast to treatments for adults, medication for children to assist with sleep is generally without empirical support, and most sleep disturbances in children can be managed with success through the implementation of behavioral therapy alone [156]. Unfortunately, while the use of medication is not always recommended for children, it is often the practice of parents to use either prescription or over-the-counter medications to induce sleep [228].

Interventions for sleep problems have taken the form of support groups for parents and caregivers [229], visits to a clinic to see an individual therapist or sleep medicine behavioral specialist [156,230], individual therapists visiting the home for sleep studies) [231,232], and written information [63,225,226]. However, many parents do not achieve attendance at the full number of planned therapy sessions regarding their children, and between 20% and 80% terminate prematurely. This can be a significant disadvantage for family-based therapy or intervention programs, including behavioral parenting programs [233-236]. To avoid the added responsibility of attending therapy session, some researchers have used educational pamphlets, brochures and guides to train parents. Self-help guides, written to assist parents with

a wide range of common problems other than sleep, have been proven to be effective [225-227]. Eckerberg [168,237] hypothesized that written information given to parents of children with sleep disturbances would be more beneficial when combined with a telephone intervention. However, Eckerberg reported that in most cases the written information was enough [168].

Many sleep researchers have suggested that simple education regarding sleep related issues is an important possible intervention that can be undertaken by a variety of professionals who work with families such as teachers, school counselors, or pediatricians. Information regarding the sleep needs of children and adolescents as well as how television, computers, and extracurricular activities can affect the amount and quality of sleep is often recommended [35,53,137,238,239]. Many authors have suggested providing parents, teachers, and even older children with information about the sleep process and how to ensure high quality sleep [9,239-241], with some authors suggesting sleep education be worked into the academic curriculum of elementary and middle school students [241,242]. Eckerberg [168,237] hypothesized that written information given to parents of children with sleep disturbances would be beneficial, and the author reported that in most cases the written information was enough to affect significant change in the sleep patterns of the child and resulted in satisfaction for the parents.

Treatment: Sleep Hygiene

The only activities that should be undertaken the last 90 minutes before bedtime are those that prepare the brain and body for sleep, specifically parents should be removing devices from children near that time [243]. Additionally, many children and adolescents have a bedtime routine that includes bathing or showering [244]. However, some young children find a bath and associated play in the tub exciting or stimulating. For these children, it would be best to bathe earlier in the evening or in the morning [77]. Sleep hygiene involves learned behaviors which can typically be modified [245]. However, parents and health care specialists often miss the occasion to discuss and educate about healthful sleep exercises and sleep hygiene [245]. Mindell JA, Sedmak R, Boyle JT, Butler R, Williamson AA [245]. Sleep well!: A pilot study of an education campaign to improve sleep of socioeconomically disadvantaged children. *Journal of Clinical Sleep Medicine*, 12: 1593-1599.

When looking at the various ranges of parental education levels, socioeconomic statuses, and racial/ethnic backgrounds, it becomes apparent that not all parents understand overall rudimentary or basic sleep hygiene standards [12], and they do not establish positive sleep habits for their children [246].

In a comparison between Italian and American adolescents, LeBourgeois, et al. [136] reported, "cross-cultural differences in sleep quality...were due to differences in sleep hygiene practices. Sleep hygiene is an important predictor of sleep quality in Italian and American adolescents, thus supporting the implementation and evaluation of educational

programs on good sleep-hygiene practices” [135]. Parents and professionals should also be aware of the potential benefits of even a modest extension in sleep duration, which can be easily achieved by increasing the parental monitoring of bedtime and (for younger children) simply going to bed earlier [35,45,224]. Unfortunately, this type of knowledge is not always the case, even among pediatricians [134]. It can be beneficial to treat sleep disturbances at a younger age, researchers [99,224] have concluded that sleep problems at approximately age four years old can be predictors for later behavioral/emotional problems during the middle adolescent years. The authors concluded there is an important developmental change that occurs in the overlap between sleep problems and behavioral/emotional problems that may exacerbate symptoms of both [99,224].

Conclusion

Even with sleep difficulties possibly affecting over half of all children in the United States [247], there are significant gaps in knowledge for what parents and pediatricians believe is healthy sleep for children and adolescents [28,156]. Therefore, it seems that significant education about sleep hygiene, appropriate sleep quantity, and how to achieve high quality sleep is needed. Education for parents regarding a wide variety of sleep related issues is an important intervention described by many leading authors of research on sleep with children and adolescents [35,53,137,151,225,226,239]. Other commonly suggested interventions are reducing computer, TV and video game playing activity before bed, and increasing morning activity outdoors [239,243]. However, research is still ongoing into how well these interventions work in practice. Even so, with sleep hygiene an affordable and easy to teach solution, attempts should be made to incorporate these concepts into available educational outlets for both parents and children as frequently as possible. Clinicians providing sleep hygiene education to parents may also need to be aware of the importance of family and parenting dynamics to the sleep environment. Sleep interventions may need to be adapted to the different parenting styles, and parents may need additional training in behaviorally managing their children in order to optimize success of interventions.

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