

Disrupted Sleep and Attention Deficit/Hyperactivity Disorder:

A Tool for the Advanced Registered Nurse Practitioner

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Abstract

Chair: Dr. Linda Eddy

The purpose of this paper is to review the literature for effective interventions to improve sleep in children and adolescents with attention deficit/hyperactivity disorder (ADHD). The advanced registered nurse practitioner can use these findings as a tool to improve treatment outcomes. The findings reveal a thorough assessment should both rule out sleep disorders and identify psychosocial factors that may disrupt sleep in children and adolescents. Pharmacological and non-pharmacological interventions to treat disrupted sleep are also discussed. These findings are then applied to a case study and the theoretical framework of the paper. The case study provides an example of a nine-year-old boy with ADHD suffering disrupted sleep. The theoretical framework for this paper comes from the Theory of Planned Behavior. This is a theory of social psychology that helps explain why children and adolescents with ADHD suffer disrupted sleep.

Keywords: sleep problems, sleep disorders, nursing, interventions, children and adolescents, mental illness, ADHD

This paper summarizes a review of the literature regarding effective interventions to treat disrupted sleep in children and adolescents with attention deficit/ hyperactivity disorder (ADHD). The advanced registered nurse practitioner (ARNP) can use these findings as a tool to improve treatment outcomes. Consider the following statistics and literature review findings. In 2010, The Centers for Disease Control (CDC) surveyed youth in the United States and found that only 31% of students had an average of 8 or more hours of sleep on any given school night. The finding from this survey suggested that children and adolescents function at their best when they are able to obtain 10-11 hours of sleep per night (CDC, 2010). The Diagnostic and Statistical Manual of Mental Disorders Fourth Edition Text Revision (DSM-IV-TR) indicated that 4% of children and adolescents meet criteria for a sleep disorder (APA, 2000). These findings indicated that children and adolescents are not getting enough sleep and many of them do not have diagnosable sleep disorders. There is a large population of children and adolescents who suffer disrupted sleep and need effective treatments to avoid a lifetime of poor sleep.

Literature reviewed indicated children and adolescents with mental health problems, specifically ADHD do not get enough sleep (Alfano & Gamble, 2009; Gau & Chiang, 2009; Owens, 2005). Owens (2005, 2009) provided research findings that showed children and adolescents with ADHD have both reduced quality and quantity of sleep at a rate 1/3 greater than the general population. Taylor (2009) estimated that the incidence of disrupted sleep in this population might be as high as 50%. The DSM had at one time listed disrupted sleep as criteria for diagnosing ADHD (Owens, 2005; Taylor, 2009). Alfano and Gamble (2009) found that children and adolescents with mental health problems have disrupted sleep, which is greatly exacerbated by symptomology of ADHD. The authors emphasized the importance of assessing

for early signs of disrupted sleep and sleep disorders in children and adolescents and recommend careful assessment when children and adolescents present with complaints of disrupted sleep.

Sleep is a vital human function. A person spends 1/3 of his or her lifetime sleeping or a total of 25 years if he or she lives until age 75 (Dew et al., 2003). Children and adolescents are not getting enough sleep, an issue that may be exacerbated by mental health problems such as ADHD. The ARNP is in the position to improve disrupted sleep in children and adolescents with ADHD. The question of significance to the practice of nursing is: “What are the effective interventions to improve disrupted sleep in children and adolescents with ADHD?” The purpose of this paper is to review the literature for effective interventions to improve sleep in children and adolescents with ADHD and present these findings as a tool for use by the ARNP.

Background

Attention Deficit/Hyperactivity Disorder

The American Psychological Association’s Diagnostic and Statistical Manual of Mental Disorders IV-TR (2000) defined Attention Deficit/Hyperactivity Disorder (ADHD) as a disorder characterized by symptoms of hyperactivity, impulsivity, and/or inattention that interferes with functioning across multiple settings (APA, 2000). The American Psychological Association’s DSM-IV-TR (2000) reported that 3-7% of children and adolescents have ADHD and the worldwide prevalence rate of ADHD is 5.29% (APA, 2000). The disorder is diagnosed as one of three subtypes; hyperactive-impulsive, inattentive, or combined-type. Generally symptoms of ADHD must occur before age seven, be across at least two settings, and impair functioning. The most frequently diagnosed type of ADHD is combined type. Males are more likely to be diagnosed with ADHD compared to females (APA, 2000). Females are more likely to be diagnosed with the inattentive type of ADHD (APA, 2000). Symptoms of hyperactivity include

idgeting, constantly moving, or feeling as if driven by a “motor.” Symptoms of impulsivity include difficulty waiting, blurting out answers, acting without thinking, and interrupting.

Symptoms of inattentive include difficulty following conversation, difficulty paying attention, difficulty completing tasks, and often losing things. ADHD is caused by changes in areas of the brain that result in poor response inhibition and lack of control over executive functions.

Executive functions are processes that include, regulating emotion, working memory, planning, self-monitoring, verbal regulation, motor control and maintaining and changing mental sets (Weiss & Salpekar, 2010). Areas of the brain implicated in the cause of ADHD include the frontal lobe, basal ganglia, caudate nucleus, and cerebellum (Weiss & Salpekar, 2010). To adequately diagnose ADHD it is recommended that a mental health professional or licensed medical provider perform an assessment. Learning disabilities, other psychological disorders, behavioral disorders, and medical conditions must be rule out.

Sleep Disorders

Distinguishing sleep disorders from disrupted sleep or other comorbid conditions is an important assessment and diagnostic step for the ARNP. Sleep disorders in children and adolescents can include insomnia; parasomnias; narcolepsy; sleep-disordered breathing; sleep apnea; asthma; anatomical/structural abnormalities; periodic limb movement (PLM); and restless leg syndrome (RLS).

The importance of ruling out sleep apnea, both obstructive and hypopnea (Goldin, 2012) is critical. Sleep apnea can be described as a partial or full obstruction to the upper airway that disrupts normal ventilation during sleep. Diagnosis of sleep apnea is made when 10 seconds or greater of reduced or obstructed ventilation occurs during sleep. Generally a PSG and

electromyography are the most reliable diagnostic tools and if diagnosed, commonly results in an adenotonsillectomy. Sleep apnea has a childhood incidence rate of 2%, peaking between ages 3-6 years. This peak in sleep apnea may be due to anatomical factors that occur during these ages (Goldin, 2012).

Periodic limb movement disorder (PLM) can be described as repetitive flexion of extremities or parts of extremities during sleep that occur four or more times at varying lengths and intervals throughout the night. Polysomnography (PSG) or electromyography are used to diagnosis this condition. Restless leg syndrome can be described as a desire to move lower extremities, usually due to paraesthesia or dyesthesia that cause marked motor restlessness during the day, as well as during the night and often leads to insomnia.

Sleep disorders in children and adolescents with ADHD are reported at an increased frequency when compared to the general population (Owens, 2009; Weiss & Salpekar, 2010). Sleep disordered breathing (SDB), sleep apnea, upper airway resistance syndrome, and asthma can contribute to or cause symptoms of ADHD. Medications used to treat childhood asthma and upper airway resistance syndrome can cause side effects similar to the symptoms of ADHD. Sleep apnea is believed to actually precipitate ADHD (Goldin, 2012). Diagnosis and treatment can significantly improve symptoms associated with ADHD such as hyperactivity, inattention, mood liability, irritability, difficulty concentrating, and impulsiveness (Goldin, 2012). It is important to note that children with ADHD often display motor restlessness during the day that may be attributed to symptoms of ADHD rather than a sleep disorder. This is also the case with narcolepsy, often misdiagnosed as ADHD or another psychiatric disorder.

The Sleep-Wake Cycle

The ARNP needs to understand how the sleep-wake cycle influences sleep, which is often disrupted in children and adolescents with ADHD. Disrupted sleep that might influence the sleep-wake cycle includes complaints of sleep disturbances as well as diagnosable sleep disorders. The term “disrupted sleep” encompasses all of the following terms: daytime sleepiness, nighttime awakenings, enuresis or bedwetting, disrupted sleep, early morning waking, multiple nighttime awakenings, difficulty falling asleep and staying asleep, difficulty waking up or getting out of bed, nightmares, night terrors, sleep walking, and sleep talking. The sleep-wake cycle represents phases of sleep, further defined by physiological changes in brain activity (Kidd, 2011). Dreams occur during the Rapid Eye Movement (REM) phase of sleep. Non-REM (NREM) sleep is the most restful or restorative phase of sleep and occurs in four stages. The first two stages are considered “light sleep.” An individual may experience muscle twitching and many can still hear during this phase (Kidd, 2011). Stages 3 and 4 are considered slow wave or the deepest sleep. Consolidation of memory and cognitive development also occur during stages 3 and 4 (Kidd, 2011).

Circadian Rhythm

The circadian rhythm is another important biological variable for the ARNP to consider when assessing disrupted sleep. The circadian rhythm is a neurobiological process that is based on a set of genes known as “clock genes” located in the suprachiasmatic nucleus of the hypothalamus (Dueck, Thome, & Haessler, 2012). These “clock genes” are primarily affected by external factors such as light and environmental changes. These exogenous factors are also known as zeitgebers. The “clock genes” primarily regulate the release of hormones such as

melatonin and cortisol. This process is self-sustaining, endogenous, and oscillating over a 24-hour period. Dueck et al. (2011) indicated that children and adolescents in general suffer disrupted sleep due to circadian rhythm abnormalities. Delayed sleep onset or sleep onset latency are symptoms of disrupted sleep common in children and adolescents with ADHD. Melatonin has been shown to effectively treat these symptoms and is frequently used in children and adolescents with ADHD. Further discussion of this topic will occur later in this paper.

Theoretical Framework

The theoretical framework for this paper comes from social psychology, specifically the Theory of Planned Behavior (Appendix A). This theory is useful for the practice of nursing and allows the nurse to plan interventions specific to their patient populations and bring attention to health problems such as sleeplessness in children and adolescents with ADHD (McEwen & Wills, 2002). The Theory of Planned Behavior is used frequently in nursing research to explain attitudes and behaviors that influence health (McEwen & Wills, 2002). This theory was used to evaluate the available research, its implications and applications to the field of advanced nursing. Application of this theory to the research question in this paper will be based on the concept that getting adequate sleep is considered a positive normative belief, due to its positive benefits on health and well-being. This belief and the behaviors that result are influenced by psychosocial factors. Although children and adolescents may intend to sleep, they may perceive that they lack control over their sleep behaviors. This perceived lack of control might be further exacerbated by factors such as an inadequate environment to promote sleep, use of stimulating medications, and physiological factors such as gastrointestinal distress. ARNPs can identify factors contributing to a lack of perceived behavioral control over sleep and improve children and adolescents' attitudes towards sleep through the use of well-selected and effective interventions.

Consider the following study by Noland, Price, Drake, and Telljohann (2009) who randomly selected 384 ninth to twelfth graders to complete a self-administered questionnaire about sleep. The authors found that 95% of respondents reported receiving less than 9 hours of sleep on school nights. The adolescents in their study reported when they did not get enough sleep, they were more tired during the day and had difficulty paying attention. As a result their school performance declined, resulting in lower grades and increased stress levels. The adolescents also reported they had more difficulty getting along with others when they did not get enough sleep. The authors found many adolescents were using sleeping pills, smoking cigarettes and drinking alcohol to help them sleep. The respondents of their surveys were also found to have numerous misperceptions regarding sleep. These findings support the use of the Theory of Planned Behavior. Adolescents can be educated about the deleterious effects of using substances to help them sleep and more effective means to improve sleep. ARNPs can use the Theory of Planned Behavior to guide the selection of nursing interventions to influence the misperceptions students have regarding sleep and help them to change their behavior.

Search Strategies

An Internet search was performed using the Washington State University Library link at EBSCOhost: advanced search databases, CINAHL, PsychInfo, and PubMed Central. The Internet was also searched for statistical data from the Center for Disease Control and National Institute for Mental Health. The search terms used alone and/or in combination to focus the database search included; “sleep problems,” “sleep disorders,” “nursing,” “interventions,” “children and adolescents,” “mental illness,” and “ADHD.” The population of interest was children, aged 5-11 and adolescents, aged 12-18. This is generally considered the school-aged population and many research studies are performed in school settings with this age group. An

initial 75 articles were found containing the search terms. Of these 75 articles, 23 were referenced in this paper. The exclusion criteria used to further reduce these 75 articles included those that primarily discussed other psychiatric and developmental disorders in children, and those not in English. The inclusion criteria for these 23 articles included discussion of the target population, discussion of effective interventions to improve sleep, and discussion of the effect of ADHD symptomology on sleep. This further reduced the number of articles to 11. Out of these 11 articles 3 were referenced in the “Assessing Disrupted Sleep” section, 6 were referenced in the “Pharmacological Interventions” section, and 5 were referenced in the “Non-pharmacological” section. The other 12 articles referenced include those that discussed the background topics: sleep disorders, the sleep-wake cycle, the circadian rhythm, and diagnosing ADHD, as well as referenced texts.

Literature Review

Assessing Disrupted Sleep

Assessing sleep in children and adolescents with ADHD can be challenging. Gathering objective sleep data should be a priority for the ARNP. Objective assessments of sleep can include: polysomnography (PSG), video PSG, actigraphy, multiple sleep latency testing (MSLT), overnight sleep studies in a laboratory, and/or questionnaires (sleep diaries and sleep logs).

During an overnight sleep study physiological processes are recorded and monitored in a laboratory. A polysomnogram (PSG) records a combination of body functions during the sleep study. Brain activities are monitored with an electroencephalography (EEG), eye movements with an electrooculogram, skeletal muscle activation with an electromyogram, heart rhythm with an electrocardiogram (ECG) and respiratory function with measurements of nasal and/or oral airflow combined with pulse oximetry (Weiss & Salpekar, 2010). Sleep studies are expensive

and cumbersome for the patient. These tests should only be ordered if the level at which the disrupted sleep is affecting the child or adolescents' functioning, particularly in school is severe and persistent.

A more affordable and easy to use option to study sleep is actigraphy. Actigraphy is the measurement of body movements during sleep using a small device called an actiwatch. This can be a helpful tool to use for diagnosis and assessment of disrupted sleep in both adults and children (Weiss & Salpekar, 2010). The actiwatch is becoming more popular, often combined with other biometric measurements such as a pedometer that records foot steps.

The B.E.A.R.S. sleep assessment (Appendix B) is an example of a questionnaire that is useful for assessing the etiology of disrupted sleep and ruling out sleep disorders in children and adolescents (Weiss & Salpekar, 2010). B.E.A.R.S. is an acronym meaning; bedtime problems, excessive daytime sleepiness, awakenings, regularity and duration of sleep, and snoring. This specific sleep questionnaire is referenced numerous times in the literature (Tsai and Huang, 2007; Weiss & Salpekar, 2010). The B.E.A.R.S. sleep assessment should be used during the initial psychiatric evaluation of a child or adolescent. Millman (2005) promoted the use of the B.E.A.R.S. sleep assessment. Millman (2005) claims there are no established clinical guidelines for diagnosing and treating sleep disorders in children and adolescents and the B.E.A.R.S. sleep assessment is a reliable and evidenced-based tool. The questionnaire screens for most sleep disorders and asks developmentally appropriate questions (Millman, 2005; Weiss & Salpekar, 2010). Understanding the developmental stage of the child or adolescent is an important component of assessing disrupted sleep (Weiss & Salpekar, 2010). The B.E.A.R.S. sleep assessment provide specific questions to ask at three developmental stages; toddler/preschool, school-aged, and adolescent.

Collecting subjective data from the child or adolescent is necessary due to the fact parents often over report disrupted sleep in children and adolescents, especially those with ADHD (Weiss & Salpekar, 2010). Researchers recommend if there is discrepancy between the parent and the child reports, consider additional testing such as a sleep study (Taylor, 2009).

Sleep diaries, also known as sleep logs can be collected from the child or adolescent and their parents. Sleep diaries can be a useful clinical assessment tools for adequately determining the etiology of disrupted sleep (Weiss & Salpekar, 2010). Sleep diaries can then serve as an educational tool for the child or adolescent and parent. Sleep diaries are also useful tools to use throughout someone's life and can help individuals maintain good sleep hygiene (Weiss & Salpekar, 2010). Disrupted sleep in children and adolescents can significantly impact the family. This needs to be considered when developing a treatment plan. An important step of a thorough sleep assessment is to gather sleep related reports from every family member (Weiss & Salpekar, 2010). This step may also reveal family dysfunction or other conflicts that may need to become the focus of treatment (Owens, 2009).

Daytime sleepiness is often misdiagnosed as ADHD (Tsai & Huang, 2010). Children with daytime sleepiness may be misinterpreted as being hyperactive or impulsive due to their attempt to compensate for their daytime sleepiness (Tsai & Huang, 2010). This compensatory behavior may also account for disparaging perspectives between parents and teachers (Tsai & Huang, 2010). Attention, arousal, and sleep pathways are similar and interact to affect behavior in unknown ways. Noradrenergic and dopaminergic pathways similar in both sleep and arousal/attention may be contributing to disrupted sleep and the cause of daytime drowsiness (Tsai & Huang, 2010).

Social factors including low socioeconomic status, low parental education levels, and

urban versus rural living have been shown to cause disrupted sleep. These factors should be included in any thorough psychiatric assessment. They may represent barriers to wellness and improvement in sleep (Owens, 2009; Taylor, 2009).

Sleep efficiency is another important assessment variable. Sleep efficiency is the ratio or comparison of the duration of sleep versus the actual time spent in bed (Weiss & Salpekar, 2010). Individuals may report they spend 10 hours in bed, but only six of these hours are actually spent sleeping. Sleep efficiency may be reduced when parents send their children to bed too early and the child is not able to fall asleep. This may also explain why parents are not aware of their child's disrupted sleep.

Comorbid psychiatric disorders such as mood disorders, developmental disorders, movement related disorders, oppositional defiant disorder, learning disabilities and Tics/Tourette's are common in children and adolescents with ADHD. These conditions may also contribute to disrupted sleep and should be ruled-out during the initial assessment. Tsai and Huang (2010) reported numerous psychiatric disorders commonly associated with ADHD and disrupted sleep. They reported that insomnia and nightmares are common when psychiatric comorbidities exist and should be thoroughly assessed (Tsai & Huang, 2010). When these comorbid psychiatric disorders are effectively treated, sleep may improve and negate the need for additional treatment.

Pharmacological Interventions

Primary care providers, psychiatrists, psychiatric ARNPs and others treating disrupted sleep in children and adolescents have reported using a variety of pharmacological interventions. The Food and Drug Administration (FDA) does not currently approve any medications for the treatment of sleep disorders in children and adolescents (Owens, 2005; Owens, 2009; Helwig,

2011). Despite this fact, pharmacological interventions are those most commonly used to treat disrupted sleep in children and adolescents with ADHD (Owens, 2005). These pharmacological interventions include, sedative-hypnotics, antihistamines, anti-hypertensives, wake promoting medications, atypical anti-psychotics, and beta-blockers. Prazosin (Minipress), Trazodone (Desyrel), Mirtazapine (Remeron), Quetiapine (Seroquel), and modafanil are some of the medications used to treat disrupted sleep in children and adolescents (Owens, 2005).

Antihistamines, such as diphenhydramine and anti-hypertensives, such as clonidine are used for their sedating side effects and believed to cause fewer adverse effects when compared to other sleep inducing medications (Taylor, 2009).

Other pharmacological strategies to consider when treating disrupted sleep include changing the class, dose, timing, and formulation of medications. Stimulant medications often contribute to disrupted sleep (Owens, 2005). Switching to Strattera (atomoxetine), a non-stimulant medication used to treat ADHD is an effective strategy. The risks and benefits of using stimulant medications should be considered and discussed with patients.

Medications used for other chronic conditions may also be contributing to disrupted sleep and/or interacting with stimulant medications. Bronchodilators and steroidal asthma treatments are particularly stimulating and should be avoided at least two hours prior to bed (Owen, 2005; Weiss & Salpekar, 2010). Medications that cause side effects such as gastrointestinal distress, headaches, and agitation could be given in the morning rather than prior to bedtime (Owens, 2005, Weiss & Salpekar, 2010). Decongestants and other cold remedies are notoriously stimulating and should be avoided as well (Owens, 2005; Weiss & Salpekar, 2010). In general, the provider should perform a drug interaction check and assess for interactions that may be disrupting sleep.

Melatonin is the most commonly used pharmacological intervention to treat disrupted sleep in children and adolescents with ADHD. Melatonin is an alternative to prescription pharmacotherapies. Besides being a naturally occurring hormone, it is also shown to have a benign side effect profile and is safe to use in children (Hoebert, van der Heijden, van Geijlswijk, & Smits, 2009; Weiss & Salpekar 2010). Studies showed children with ADHD have a relative phase delay release of melatonin (Weiss & Salpekar, 2010). Weiss and Salpekar (2010) reported that melatonin reduces sleep onset latency and increases total sleep time, in both medicated and non-medicated children. Melatonin has been shown to be an effective short-term and long-term treatment for insomnia and other sleep problems in children and adolescents. Hoebert, van der Heijden, van Geijlswijk, and Smits (2009) report nearly 90% of parents reported improved sleep onset problems in their children after using melatonin. Weiss & Salpekar (2010) reported that sleep latency might be reduced as much as one hour, representing a significant improvement in sleep efficacy. They also reported that Melatonin is a safe treatment, with no adverse events or treatment related co-morbidities (Hoebert et al., 2009; Weiss & Salpekar, 2010). Melatonin can be dosed between 1 to 5 mg depending on age, with a maximum dose 10 mg daily. Melatonin should be given by mouth, 30 minutes before bed (Hoebert et al., 2009).

Non-pharmacological Interventions

There is a growing body of evidence that supports the use of non-pharmacological interventions to treat disrupted sleep in children and adolescents. Owens (2005) reported evidence that suggested clinicians frequently treat symptoms of disrupted sleep with pharmacologic regimens that, at best have little empirical basis and may be potentially harmful. Hylkema and Vlaskemp (2009), in a case study of 41 participants with developmental disabilities living in residential setting, found that disrupted sleep could be improved using non-

pharmacological and multi-disciplinary interventions. The limitations of this study were its small sample size and specific patient population. Behavioral therapies are effective interventions to treat disrupted sleep. Relaxation therapy, stimulus control therapy, sleep restriction and cognitive therapies are those reported in the literature to be the most effective. Sleep hygiene training is a form of cognitive behavioral therapy that involves changing the events that occur prior to sleep and contribute to increased sleep latency (Taylor, 2009). Specific suggestions are provided to improve sleep hygiene. These included behaviors such as going to bed and getting out of bed at the same times daily, eliminating exercise before bed, reducing caffeine use, eliminating snacking before bed (unless indicated for psychological or physiological reasons), and limiting media use prior to bed. Consideration should also be given to daytime activity levels, exposure to natural light, stress levels, environmental and artificial temperatures, use of a night light, and other ambient light from clocks and electronics. Activities in bed should be avoided; the bed should only be associated with sleeping. Implementation of relaxing or cool-down type exercises and avoiding daytime naps are other aspects of good sleep hygiene. Psychosocial events that occur prior to bed may also contribute to disrupted sleep. Emphasis should be placed on routine and consistency at bedtime. It is also advised not to change bedtime routines on weekends or holidays. White noise is another effective, yet overlooked intervention that has been shown to significantly impact sleep latency. Forquer and Johnson (2007) found a decrease in sleep latency and night waking among young adults who used a white noise generator set at between 60 and 75 decibels for 1 month. Often the television is used to create white noise, but this is discouraged due to the light the television emits.

Weighted blankets or ball blankets are frequently used on inpatient hospital units and in other psychiatric settings for children with pervasive developmental disorders and may be useful

for disrupted sleep in children and adolescents with ADHD. These are blankets filled with plastic balls, beans, or other small round objects. Hvolby and Bilenberg (2011) explained that the theory of sensory integration was used to assist in the design of these blankets. It is believed the weight of the blanket or balls inside the blanket provide points of increased external stimuli, giving a child or adolescent a sense of their bodies' boundaries (Hvolby & Bilenberg, 2011). This stimulus may distract the child from other internal stimuli that may be interfering with sleep and help them to relax enough to fall sleep.

Adjusting environmental factors such as the room's temperature, opening or closing the door, ensuring the room is clean, free of clutter, and noxious odors may also promote sleep. Consider stimulus that affects all five senses including visual, auditory, olfactory and tactile when making these adjustments. Transitional objects are objects that can be used to represent to the child that is bedtime and time to sleep. This attends to the tactile stimulus as well as psychosocial needs of the child. Transitional objects can include the child's favorite belonging such as a teddy bear or other stuffed toy animal. In some cases it is recommended to provide the child with a piece of a caregiver's clothing. Both the smell of the object and familiarity of the object can provide comfort to the child and promote their sleep.

Discussion

Implications for Clinical Practice

Clinical practice recommendations have been developed from a systematic review of the literature. First and foremost, screen children at routine visits for disrupted sleep, especially if presenting with increased behavioral problems. Rule out sleep disorders, co-morbid psychiatric conditions, and medication-related effects. Use the DSM-IV-TR (2000) criteria to diagnose

ADHD and sleep disorders. Refer the child or adolescent to a Primary Care Provider (PCP) if a sleep disorder is suspected. Subjective evaluation of signs and symptoms of disrupted sleep should occur across multiple settings, like school and home. Have the family keep sleep diaries, establish a sleep schedule, and improve other sleep hygiene practices. Consider the bidirectional relationship of sleep and symptoms of ADHD. Consider alternative and complementary interventions to improve disrupted sleep. Include Ferritin and iron levels when performing laboratory testing (Weiss & Salpekar, 2010). Ferritin levels have been shown to have a contributory effect, leading to worsening ADHD symptoms and should be tested at baseline.

The provider and the family must weigh the risks and benefits of continuing use of stimulant medications and medications used to improve sleep. If symptoms of disrupted sleep are resistant, consider referral to a sleep specialist. A sleep specialist better treats some sleep disorders and this referral should be made if necessary. In many communities a sleep specialist may not be available. In this case the most prudent thing is to order a sleep study. The lack of community awareness and specialized providers is another reason to ensure ARNPs are educated about how to accurately assess disrupted sleep in children and adolescents with ADHD (Helwig, 2011). Treatment decisions must be made on an individual basis. It is considered best practice to screen all children and adolescents with ADHD for disrupted sleep.

Case Study

A nine-year-old white, non-Hispanic, Caucasian male with ADHD (combined type) presents reporting increasingly disrupted sleep. He has been having nightmares and waking up multiple times during the night. He reports this occurs three to four times per week. He also has difficulty falling asleep on school nights. He does report remaining awake three to four hours

later on the weekends. He shares a room with his 11-year-old brother. He reports they have a T.V. and PlayStation 3 in their room. His mother is present during the interview. She has noticed he is drowsy during the day and his teacher has reported he is impulsive and inattentive during class. He has been taking Methylphenidate ED 20 mg once daily in the morning and 10 mg once daily at 2 pm for one and a half years and had been titrated up to this dose after being diagnosed with ADHD. He has had the most improvement in his symptoms since receiving treatment, approximately two years ago. In addition to ADHD (combined type), he has a history of nocturnal enuresis, asthma, seasonal allergies, and ear infections. He is otherwise healthy, gets along well with peers at school, has numerous friends, and is well liked by most family and friends. His mother reported he gets irritable with her, experiences poor sleep, hyperactivity, and impulsivity, is argumentative but is very rarely sad. In the past, diphenhydramine has been effective to improve his sleep, but this is no longer the case. Other psychosocial factors in this case include his mother being a single parent and the children lacking regular and consistent contact with his father. His maternal grandparents provide childcare at times and are identified as supports for the family. He enjoys playing sports and is good at soccer. As an ARNP, what would be the most appropriate interventions to treat this child's disrupted sleep?

Application of Case Study to Practice

In the case of this nine-year-old with ADHD (combined type) reporting increasingly disrupted sleep there are numerous interventions that could be implemented. First, a thorough assessment should be performed and rule out a sleep disorder. The most prudent step is to ensure a physical exam is performed and a sleep study completed prior to implementing any interventions. Further assessment of subjective data should include collecting sleep diaries from all family members. Include the B.E.A.R.S. sleep assessment during the psychiatric interview.

An actiwatch could be used to collect objective data. Address any environmental or physical factors affecting his sleep. He may have problems with nocturnal enuresis that contributes to his disrupted sleep. His respiratory care plan should be reviewed. If asthma medications are recommended, ensure they do not interfere with his sleep schedule and are given at least two hours before bed. Cardiac or gastrointestinal symptoms should be explored. Since he reports nightmares, assessment of his mood is critical. Mood symptoms such as anxiety can cause nightmares and contribute to disrupted sleep.

Sleep hygiene training should occur immediately. He needs to go to bed and wake up at the same time every day, including weekends. Recommend removing the television and PlayStation 3 from his room and limit any media use 2 hours prior to bed. Recommend changing his stimulant medication to Strattera or adding a central alpha-agonist such as guanfacine (Tenex) or clonidine (Catapres). If these pharmacological changes are not acceptable, then treatment could include melatonin, 30 minutes prior to his bedtime. Non-pharmacological treatments should also be recommended. These could include using a sensory stimulus like white noise, a weighted blanket, a ball blanket, or a nightlight.

Follow-up should occur at every interaction and include review of sleep diaries, sleep hygiene practices, and results of the physical exam including lab testing. If the interventions are not effective others should be trialed. If his sleep disruption persists, referral to a sleep specialist and further medical evaluation would be necessary if not already done.

Application of the Theoretical Framework

Research from the past 20 years has sought to prove the hypothesis that children and adolescents with ADHD have neurophysiological changes that disrupt their sleep and these children are in some way “different” when compared to children without ADHD (Owens, 2005). There is insufficient evidence to support this hypothesis.

After reviewing the literature, the Theory of Planned Behavior can be used to explain why such a large population of children and adolescents with ADHD suffer disrupted sleep. The bidirectional relationship of ADHD and sleep is clear. Multiple factors are likely the cause of disrupted sleep in this population. A parent’s perception of their child’s sleep affect the child’s perception about their ability to perform behaviors related to sleep. Children and adolescents develop attitudes about sleep, lack perceived behavioral control over their sleep related behaviors, and despite their intentions to get good sleep, experience disrupted sleep. The impact of their sleep related behaviors on their overall health well-being cannot be underestimated.

Take for example the Nolan et al. (2009) study where 9th -12th graders report smoking a cigarette prior to bedtime, believing it helps them relax and get to sleep. Interventions should target the beliefs of these teens, educate them about the ruinous effects of smoking, and increase their knowledge of sleep hygiene. This may influence their intentions and motivate them to change their sleep related behaviors.

Conclusion

This paper summarizes a review of the literature regarding effective interventions to treat disrupted sleep in children and adolescents with ADHD. The ARNP can use these findings as a tool to improve treatment outcomes. The findings reveal the necessity of an adequate assessment

to rule out sleep disorders and a model for identifying any psychosocial and behavioral factors that may impact sleep. Pharmacological and non-pharmacological interventions shown to be effective in the patient population were also discussed. According to the literature reviewed children and adolescents who have ADHD and suffer sleep disturbances are at risk for poor academic performance, delayed social skills, and mood disturbances. Effectively treating disrupted sleep in child and adolescents with ADHD is critical to their physical and psychological well-being. Effective treatment is the responsibility of the ARNP in partnership with the family.

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Appendix A

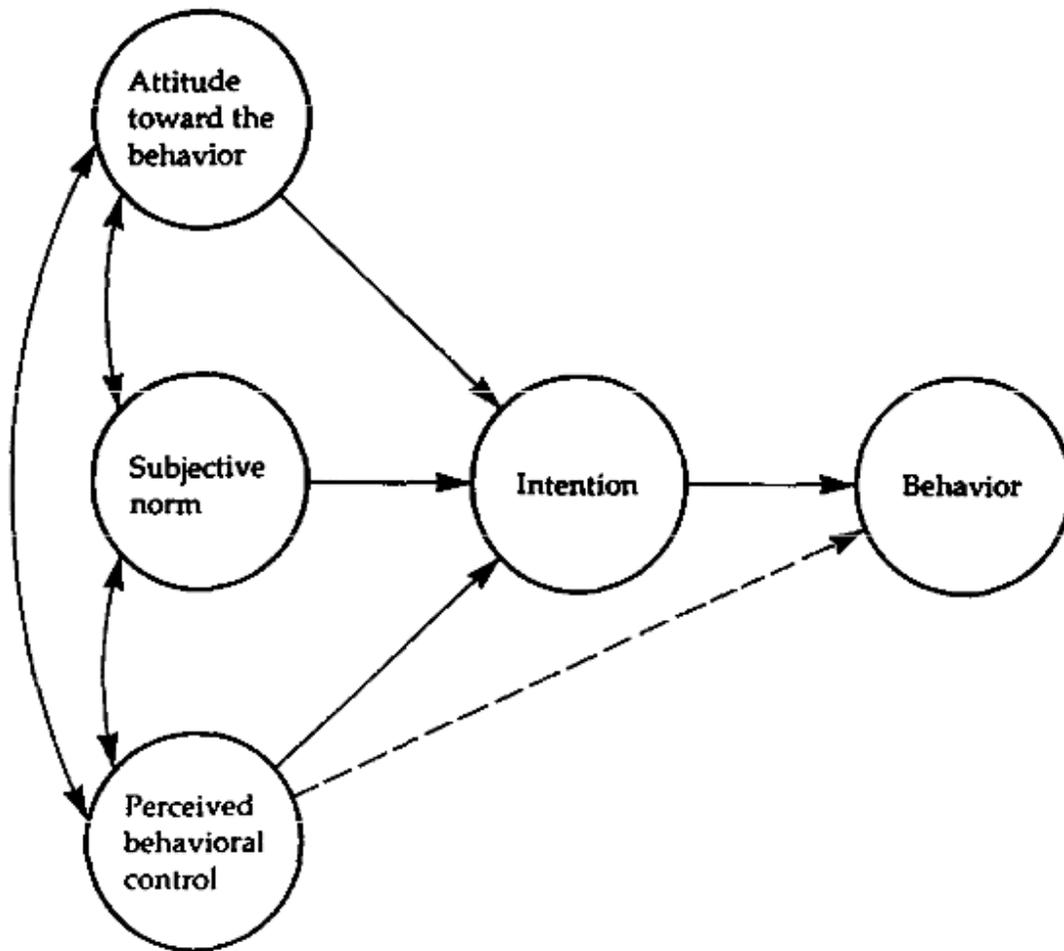


Figure 1: The Theory of Planned Behavior

Ajzen, I. (1991). The Theory of Planned Behavior. *Organizational Behavior and the Human Decision Processes*, 50, 179-211.

Appendix B

	THE BEARS SLEEP SCREENING ASSESSMENT			
Trigger Questions	Toddler/Preschool (2 - 5 years)	School-aged (6 - 12 years)	Adolescent (13 - 18 years)	
Bedtime problems	Does your child have any problems going to bed and/or falling asleep?	Does your child have any problems at bedtime?	Do you have any problems falling asleep at bedtime?	
Excessive daytime sleepiness	Does your child take naps or seem over-tired or sleepy a lot during the day?	Does your child have difficulty waking in the morning, feel sleepy during the day, or take naps?	Do you feel sleepy a lot during the day? In school? While driving?	
Awakenings	Does your child wake up a lot at night?	Does your child wake up a lot at night and/or have trouble getting back to sleep? Any sleepwalking or nightmares?	Do you wake up a lot at night/or have trouble getting back to sleep?	
Regularity and duration of sleep	Does your child have a regular bedtime and wake time? What are they?	What time does your child go to bed and get up on schooldays? Weekends? Do you think this is enough sleep?	What time do you usually go to bed on school nights? Weekends? How much sleep do you usually get?	
Snoring	Does your child snore a lot or have difficulty breathing at night?	Does your child have loud or nightly snoring or any breathing difficulties at night?	Does your teenager snore loudly or nightly? (Question for Parent)	



Source: J Pediatric Health Care © 2003 Mosby, Inc.

Figure 2: The B.E.A.R.S. Sleep Assessment

Merit Sleep (2013). The B.E.A.R.S. Sleep Assessment. Retrieved from

http://www.meritsleep.com/Web_Data/bears on March 26, 2013.