

The Interplay of Sleep Disturbance, Anxiety, and Depression in Children

Daniel B. Chorney,¹ MS, Michael F. Detweiler,² PhD, Tracy L. Morris,¹ PhD, and Brett R. Kuhn,³ PhD

¹West Virginia University, ²David Grant Medical Center, US Air Force, and ³University of Nebraska Medical Center

Objective To review and critically evaluate the association between sleep, anxiety, and depression in children and provide recommendations for future research. **Methods** A literature search was conducted using MEDLINE and PsychINFO computerized databases and bibliographies of relevant articles. **Results** A surprisingly small but growing research base exists on the relation between sleep disturbance, anxiety, and depression in pediatric populations. Existing research indicates a significant symptom overlap between anxiety, depression, and sleep. This overlap may complicate proper assessment and treatment of children with these disorders. **Conclusions** Future research should ensure adequate assessment for symptoms of anxiety and depression when examining sleep disturbance in children. Likewise, research on anxiety and depression should include assessment for symptoms of disturbed sleep. Bridging the gap between these literatures should provide further insights into the etiologies of these disorders, increase symptom detection, and improve the clinical care of children and their families.

Key words anxiety; children; depression; sleep disorder.

The clinical literature includes substantial discussion of the negative impact of sleep disruption on daytime functioning. Cognitive functioning and development, mood regulation, academic and social performance, attention and behavior, health and the immune system, and overall quality of life have all been shown to be negatively affected by disturbances in the quality or quantity of sleep (Dahl, 1996a; Everson, 1997; Fallone, Owens, & Deane, 2002; Lavigne et al., 1999; Owens, Fernando, & McGuinn, 2005; Sadeh, Gruber, & Raviv, 2002). While significant attention has been paid to the relation between sleep and anxiety or depression in adults (see Riemann & Voderholzer, 2003 for a review), there is a paucity of child and adolescent research examining the overlap and interplay of these disorders. Given that children presenting to pediatric and psychiatric clinics display an unusually high degree of sleep disturbances (Dahl, 1998a; Ivanenko, Crabtree, O'Brien, & Gozal, 2006; Simonds & Parraga, 1984), and disturbed sleep is one of the most common concerns presenting at pediatric clinics (Keren, Feldman, &

Tyano, 2001) this area merits further attention from both clinical and research perspectives. The purpose of the current article is to provide a brief review of research on the relation between pediatric sleep disorders, anxiety, and depression in children and adolescents. Some specific practice recommendations are included to guide clinicians and researchers in better understanding how these disorders may overlap and present within clinic or research settings. It is important to note that this article is not meant to be a systematic review of the literature, but rather a concise presentation of the literature examining the complex relationship between sleep, anxiety, and depression in pediatric populations.

A literature review was conducted by using computerized PsycINFO and MEDLINE with combinations of the search term sleep disorders with the terms pediatric, children, adolescent, anxiety, and depression. In addition, reviews of the reference sections of relevant articles were conducted to identify additional studies, which may not have appeared using the computerized search.

All correspondence concerning this article should be addressed to Tracy L. Morris, PhD, West Virginia University Department of Psychology, 1124 Life Sciences Bldg, Morgantown, WV 26506-6040, USA.
E-mail: tracy.morris@mail.wvu.edu

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Prevalence of Sleep Disorders in Children

Sleep disorders are now more widely recognized as warranting specific clinical attention. Prevalence rates of sleep disturbances in childhood vary depending on the age group surveyed and the criteria used for inclusion. Estimates from primary care settings indicate that 10–30% of children experience significant sleep disturbances (Lozoff, Wolf, & Davis, 1985; Stein, Mendelsohn, Obermeyer, Amromin, & Benca, 2001), while community studies note prevalence rates of up to 37% (Owens, Spirito, McGuinn, & Nobile, 2000). A community survey (Blader, Koplewicz, Abikoff, & Foley, 1997) of 987 parents of elementary school-aged children reported the following problems related to children's sleep behaviors: Bedtime resistance (27%), difficulty with morning wakening (17%), complaints of fatigue (17%), delayed sleep onset (11%), and nighttime awakenings (7%). Rates are even higher in studies examining clinical child populations, with restless sleep (43%) and night wakings (47%) affecting a substantial number of children (Simonds & Parraga, 1984). Despite the relatively high prevalence rates and potentially negative outcomes of disturbed sleep, adequate assessment of sleep problems is rarely conducted in primary care settings (Owens, 2001).

Comorbidity

Sleep disturbances have been found to co-occur with a number of psychiatric disorders, including anxiety and depression (Mellman & Uhde, 1989; Roy-Byrne, Uhde, & Post, 1986; Ryan et al., 1987), attention-deficit/hyperactivity disorder (Trommer, Hoeppner, Rosenberg, Armstrong, & Rothstein, 1988), autism (Allik, Larsson, & Smedje, 2006; Honomichl, Goodlin-Jones, Burnham, Gaylor, & Anders, 2002; Richdale, 1999), and mental retardation (Stores, 1992). For some children, sleep problems may result purely from poor habits and sleep hygiene; for others the sleep disturbance may represent a precursor or prodromal expression of a more serious emotional disorder (Ivanenko, Crabtree, & Gozal, 2004) or underlying neurobiological condition (Dahl, 1996b). Whether disturbances in sleep are the cause or consequence of a child's emotional difficulties may be difficult to ascertain upon initial presentation (Dollinger, Horn, & Boarnin, 1988; King, Ollendick, & Tonge, 1997). The role of basic processes, such as sleep, may be particularly important to consider when evaluating clients for anxiety and depression and formulating subsequent treatment plans. Clinical lore suggests that disturbed sleep is a secondary and direct consequence of primary

psychiatric disorders such as anxiety or depression (Lichstein, 2006). Unfortunately, this conceptualization often leads to the faulty conclusion that sleep will automatically improve during the course of treating the primary internalizing disorder. Recent research on adults with insomnia suggests that this often is not the case (Stepanski & Rybarczyk, 2005); therefore, practitioners should consider incorporating interventions to specifically target comorbid sleep problems when constructing treatment plans for children with anxiety or depression.

Sleep and Anxiety

Anxiety disorders are among the most common psychiatric diagnoses in children and adolescents (Verhulst, van der Ende, Ferdinand, & Kasius, 1997) with approximate prevalence rates of 17% among children and adolescents across community and primary care settings (Chavira, Stein, Bailey, & Stein, 2005; Kashani & Orvaschel, 1988, 1990). A recent study (Alfano, Ginsburg, & Kingery, 2007) examining sleep in 128 children and adolescents with anxiety disorders found that 88% had at least one sleep-related problem, and over half had three or more sleep disturbances (most commonly insomnia, nightmares, and reluctance/refusal to sleep alone).

Clinicians have long noted associations between sleep disruption and anxiety symptoms (Bourdet & Goldenberg, 1994; Reynolds & Kupfer, 1987). A longitudinal study of 943 children found that symptoms of sleep disturbance in early childhood were associated with the presence of anxiety disorders over 20 years later (Gregory et al., 2005). Another study found that fearful children took nearly an hour longer than nonfearful children to fall asleep (Mooney, 1985). Nighttime fears are very common in preschool and school-age children (Gordon, King, Gullone, Muris, & Ollendick, 2007). These fears are heterogeneous and may be related to personal safety, separation, worry about the loss of loved ones, fear of imaginary creatures, fear of frightening dreams, fear of the dark, or concerns about mounting academic and social pressures. Over the course of an intervention, children may alternate emphasis between sleep disruption and/or anxiety as the primary symptom complaint, with worries over sleep sometimes furthering the sleep disturbance itself.

As clinical presentation, associated features, and etiological factors vary to some extent across anxiety disorders (Morris & March, 2004), the following sections review the research on sleep and anxiety within specific diagnostic classifications.

Posttraumatic Stress Disorder

A substantial area of research on sleep and anxiety in children relates to the effects of abuse or exposure to trauma upon sleep. Stress is known to be a cause of transient insomnia, with some believing it to be the most common cause (Partinen, 1994). The International Classification of Sleep Disorders (ICSD-2) includes a diagnosis specifically for instances of sleep disruption caused by an identifiable environmental stressor (e.g., hospitalization), termed "Adjustment Insomnia." (AASM, 2005). When associated symptoms are particularly severe or persistent, a diagnosis of posttraumatic stress disorder (PTSD) is warranted. Symptoms of PTSD include the re-experiencing of a traumatic event through intrusive and distressing thoughts, nightmares (and associated disturbances in sleep), intense physiological arousal, and avoidance behavior (APA, 1994). In a review of the literature on children's reactions to stress and trauma, Sadeh (1996) concluded that "the sleep/wake system is the most prominent, nonspecific vulnerable system to succumb to a significant stressor" (p. 694). Common sleep disruptions for children with PTSD include difficulty falling asleep, difficulty maintaining sleep, and parasomnias such as nightmares and bed-wetting. In a recent study (Noll, Trickett, Susman, & Putnam, 2006), childhood sexual abuse remained associated with significant sleep disturbances 10 years after disclosure. Children who have been abused also show prolonged sleep latency, decreased sleep efficiency, and higher levels of nocturnal activity compared to both depressed and nonabused children (Glod, Teicher, Hartman, & Harakal, 1997).

Generalized Anxiety Disorder

Insomnia is a primary symptom frequently endorsed by children presenting with generalized anxiety disorder (Alfano et al., 2007). Generalized anxiety disorder (GAD) is a condition marked by excessive anxiety and worry that is difficult to control and causes clinically significant distress or impairment in daily functioning (APA, 1994). While individuals with other anxiety disorders such as social phobia or obsessive-compulsive disorder often complain of sleep difficulties, difficulty sleeping is not considered a key symptom of those disorders. A diagnosis of GAD in children requires chronic worry, difficulty controlling the worry, and the presence of at least one of six additional symptoms. One of these involves sleep disturbance, including difficulty falling asleep, staying asleep, or restless and unsatisfying sleep

(APA, 1994). The symptom overlap between GAD and disturbed sleep is especially noteworthy.

To date, research examining the relation between GAD and sleep disturbances is limited by inconsistent labels and vague definitions of sleep problems in both children and adolescents. Despite studies showing rates of "sleep disturbances" and "trouble sleeping," ranging from 42% to 66% among children and adolescents with GAD (Kendall & Pimentel, 2003; Masi et al., 2004; Pina, Silverman, Alfano, & Saavedra, 2002), the specific nature of the sleep problems was rarely delineated. A recent study by Alfano et al. (2007) addressed this gap, noting not only that sleep-related problems are more prevalent among youth with GAD than with other anxiety disorders, but that the most common specific sleep disturbance is insomnia followed by a reluctance or refusal to sleep alone.

Panic Disorder

Few studies have examined the relation between sleep and panic disorder in children. Panic disorder is characterized by sudden and recurrent unexpected panic attacks that result in an individual developing a fear of future attacks and/or significantly changing their behavior as a result of having these attacks (APA, 1994). Sleep disruption in children with panic disorder may be due to nervous apprehension and/or fear of separating from caregivers at bedtime (Garland, 1995). Nocturnal panic (NP) involves an abrupt awakening from sleep in a state of panic without an obvious trigger, and is a common presentation among adults with panic disorder. Notably, NP occurs more often in those with a history of an anxiety disorder during childhood (Labbate, Pollack, Otto, Langenauer, & Rosenbaum, 1994), highlighting the need to identify how these symptoms may affect future sleep patterns later in development. Careful assessment can distinguish NP from sleep terrors, nightmares, sleep apnea, and seizures (Craske, 2005). Future research with children is needed to determine whether panic attacks during sleep lead to conditioned arousal at bedtime, fear of falling asleep, or avoidance of going to bed. If so, similar to psychophysiological insomnia in adults, sleep onset may be delayed and the child's subsequent total sleep time reduced.

Social Anxiety

Social anxiety disorder is characterized by a marked or persistent fear of negative evaluation in social or performance situations (APA, 1994). Though studies examining the effects of social anxiety on sleep disruption

in children are lacking, some information from adult samples is available. Subjective reports of sleep disturbance in adults with social anxiety indicate significantly poorer sleep quality, increased sleep latency, more frequent sleep disturbance, and greater daytime dysfunction compared to healthy controls (Stein, Kroft, & Walker, 1993). Interestingly, these results are inconsistent with studies employing more objective measures of sleep disturbance (Brown, Black, & Uhde, 1994). Future studies investigating sleep disturbances and social anxiety in children may benefit from considering whether fears and apprehension result in disturbed sleep prior to or after an anxiety-provoking event. Children with social anxiety may lose sleep over an upcoming presentation, important social interaction, or simply attending school—all situations which tend to produce anticipatory anxiety (Beidel, Morris, & Turner, 2004). Likewise, it may be of importance to investigate whether sleep onset is delayed if a child is ruminating over the past day's events, mentally rehearsing situations where they may have felt embarrassed or negatively evaluated by peers.

Obsessive-compulsive Disorder

Obsessive-compulsive disorder (OCD) is defined by frequent and intrusive obsessions, which cause considerable anxiety and distress and by compulsions that take up more than an hour a day and cause marked distress or impairment (APA, 1994). Few studies have been conducted examining the effect of OCD on sleep patterns in children. The only study of adolescents with OCD included few participants, and found that six of the nine patients exhibited significantly less total sleep time, less stage two sleep, and decreased rapid eye movement (REM) latency in comparison with control participants (Rapoport et al., 1981), although these findings may have been confounded by the presence of comorbid depression. Studies with adults have shown that OCD patients have essentially normal sleep architecture (Robinson, Walsleben, Pollack, & Lerner, 1998). Although, yet to be investigated, the unwanted and intrusive thoughts which are part of OCD may delay sleep onset in children, as may any accompanying compulsions.

Separation Anxiety Disorder

Separation anxiety disorder (SAD) involves developmentally inappropriate and excessive anxiety upon separation or anticipated separation from major attachment figures (APA, 1994). As bedtime typically involves separation from familiar people, objects, and activities, going to bed

can induce considerable anxiety in predisposed children. In fact, refusal to sleep alone has been mentioned as the top reason for referral in specialty clinics for SAD (Eisen & Schaefer, 2005). Two of the eight primary symptoms for SAD specifically mention sleep, citing a persistent reluctance or refusal to sleep alone as well as repeated nightmares involving the theme of separation (APA, 1994).

Sleep and Depression

Depression in childhood and adolescence is a serious and growing concern, with prevalence rates of 1–3% in community samples of school-age children and rising to 5–6% in adolescents (Garber & Horowitz, 2002; Lewinsohn & Essau, 2002). These rates more than double in clinical samples, with estimated ranges upwards of 8–15% in children and over 50% in adolescents (Schwartz, Gladstone, & Kaslow, 1998).

Recent evidence suggests the association between sleep and depression in children may be stronger than that of childhood anxiety and sleep disturbances (Gregory, Rijdsdijk, Dahl, McGuffin, & Eley, 2006), although this is not consistent with longitudinal data examining this issue (Gregory et al., 2005). Reports of robust associations among depression and sleep disruption are common among adult populations (Billiard, Dolenc, Aldaz, Ondze, & Besset, 1994; Ford & Kamerow, 1989; Reynolds & Kupfer, 1987). In contrast, the picture is less clear for children and adolescents, with only a few studies noting delayed sleep onset, increased awake time, and shortened REM latency (Dahl & Puig-Antich, 1990). Such mixed findings may be due to limitations in the assessment and measurement of sleep or to maturational factors which may obscure results. What appears relatively consistent is the finding that the association between sleep disorders and depression becomes stronger as children mature into adolescence and adulthood (Gregory & O'Connor, 2002; Knowles & MacLean, 1990; Roberts, Roberts, & Chen, 2002).

Children with depressive disorders typically present with somatic complaints, apathy, loss of interest in activities that are usually pleasurable, decreased motivation and impaired performance at school, social withdrawal, and changes in both sleep patterns and appetite (Dahl & Lewin, 2001). In a study of 187 children and adolescents with major depression, 74% reported significant insomnia (Ryan et al., 1987). Aside from depressed mood, sleep disturbances are among the

most prevalent symptoms of depression in adolescents (Roberts, Lewinsohn, & Seeley, 1995). Adolescents who present with depression display high rates of sleep disturbance (Liu et al., 2007) and those who present with complaints of poor sleep display high rates of depression (Dahl et al., 1990, 1991; Price, Coates, Thoreson, & Grinstead, 1978; Ryan et al., 1987). This is not surprising given the persistent rumination and negative thoughts that characterize depression and can lead to heightened levels of physiological arousal, potentially delaying sleep onset. This may create a perpetual cycle, where lack of sleep leads to feelings of fatigue and apathy at school, impaired academic and social functioning, reduced levels of motivation, and impaired ability to regulate mood and emotional responses (Dahl & Lewin, 2001). Early studies of children with depression noted subjective reports of problems with sleep-onset, being unable to return to sleep after waking prematurely, and hypersomnia (Puig-Antich et al., 1982). This relation has come into question and the possibility of biased perception raised in that subjective reports of depressed adolescents indicate more disturbance and less quantity of sleep than that actually experienced based on objective (EEG) measurement (Armitage, Emslie, Hoffman, Rintelmann, & Rush, 2001; Bertocci et al., 2005; Dahl et al., 1990, 1991).

The strong correlation between depression and sleep disturbance has led some researchers to conceptualize sleep disruptions as prodromal symptoms of depression (Perlis, Giles, Buysse, Tu, & Kupfer, 1997), an idea which also has been applied to the development of some anxiety disorders (Gregory et al., 2005). Breslau, Roth, Rosenthal, and Andreski (1996) examined a large sample of young adults across a 3.5-year period and found that the presence of a sleep disorder almost doubled the risk of developing depression. Johnson, Chilcoat, and Breslau (2000) sought to examine the association between sleep disturbances and internalizing disorders both cross-sectionally and prospectively in a large sample of children. The study found that children who experienced sleep disturbances (as reported by mothers) were at significantly increased risk for developing a subsequent anxious/depressed condition. This association increased with age and was stronger than that with other mental disorders. These results are corroborated by Liu and colleagues (2007), with 73% of depressed children presenting with either insomnia or hypersomnia. Sleep disturbed children also showed higher levels of depression and were more likely to have

a comorbid anxiety disorder compared to children without sleep disturbances. These studies highlight the complex and bi-directional relation between sleep and affective disorders.

Interplay of Anxiety, Depression, and Sleep Disorders

A growing literature base supports the availability of evidence-based treatments for anxiety, depression, and sleep disorders in children (Compton et al., 2004; Mindell, Kuhn, Lewin, Meltzer, & Sadeh, 2006). Clinicians and researchers have long recognized the interplay among these disorders, and the impact they may have on family functioning. Dahl (1995; 1996b,c; 1998b) has written extensively on the reciprocal effects and interaction of sleep and psychiatric disorders, detailing how emotional difficulties can lead to sleep problems, which in turn may intensify the existing emotional or behavioral disturbance creating a perpetual negative cycle. With the possible exception of nighttime fears (Gordon et al., 2007), research has produced little empirical data to reveal how interventions targeting one disorder may impact other disorders, if at all, and the rate of recovery. For example, could effective treatment of a preschool child's separation anxiety during the day impact bedtime struggles, nighttime awakenings, and reactive co-sleeping? Or, how might a toddler's sleep, anxiety, and symptoms of depression respond to interventions targeting functionally related variables such as daily exercise or parent management skills (e.g., differential attention, limit-setting)? Reciprocal interactions between sleep disturbed children and their parents clearly warrant more research and clinical attention. The bi-directional effects of sleep, anxiety, or depression can be seen in many different hypothetical scenarios. Children with sleep disorders or those who exhibit bedtime refusal behaviors may become highly distressed or wake repeatedly throughout the night, which inevitably will impact the quality and/or quantity of their parent's sleep. Parents may then suffer from heightened irritability, greater daytime sleepiness, and impairments in daily functioning due to their own mounting sleep debt (Boergers, Hart, Owens, Streisand, & Spirito, 2007; Meltzer & Mindell, 2007). Strained cognitive and emotional resources on the part of the parent can negatively affect the parent-child relationship, potentially augmenting symptoms of anxiety, depression, or any sleep disorder a child is experiencing (Goodlin-Jones & Anders, 2001). A recent study examining this possibility

(Warren, Howe, Simmens, & Dahl, 2006) found that greater maternal depressive symptoms were predictive of longer durations of child awakenings among infants, yet child awakenings were not shown to contribute to maternal depressive symptoms. Data from this study support the importance of treating parental symptoms of psychopathology in effort to reduce mental health risk and improve the quality of life of children raised in the home.

Summary

Much of the existing research on the interplay between sleep, anxiety, and depression has been relegated to using measures of sleep that are not validated, or adopting a few sleep-related items from parental-report questionnaires. Differences in cut-off scores and the aggregation of subjects via group means results in the assumption of homogeneity in cases where heterogeneity may be inherent. Compared to the adult insomnia literature that has adopted insomnia research diagnostic criteria and uses a core set of outcome variables, the pediatric sleep literature is less mature. Vague and varied terminology (e.g., insomnia, sleep problem, disorder, disruption, or disturbance), inclusion criteria, diagnostic criteria, and lack of operationally defined outcome variables have made comparisons between pediatric studies extremely difficult (Kuhn & Elliott, 2003). Future research may benefit from ensuring that the assessment of sleep and psychological symptoms is as detailed and specific as possible to allow for greater external validity and clinical utility (Lee & Ward, 2005; Owens & Dalzell, 2001). Substantial progress has been made recently in addressing issues of subjectivity in reporting of sleep disturbances in childhood depression, yet little empirical data exists examining this topic with child anxiety disorders. We also know very little about sleep disturbances and how they relate to anxiety or depression in very young children, as methodological difficulties and limitations have prevented substantial progress in this area.

Though the importance of sleep and its association with anxiety and depression in children is gaining attention, much remains to be learned. We must not assume direct transfer of findings from the adult literature on clinic populations. To more fully elucidate the interplay of sleep and the expression of psychological symptoms, cross-sectional and longitudinal research is needed with children from community populations, in addition to medical and psychological clinic settings.

As our empirical base expands, we should seek to disseminate the knowledge gained in effort to arm parents and frontline practitioners with tools to screen for potential problems and strategies to optimize sleep. Such efforts may go a long way toward minimizing long term dysfunction and improving the quality of lives of countless children and their families.

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