Introduction

It has been said that there are two certainties in life: death and taxes. For every adult, there may also be a third: the experience of unsatisfactory sleep. Sleep is so intrinsic to the human experience that it is mentioned in the Bible, has been pondered by Hippocrates, and written about by Shakespeare and Homer. Despite this common thread that ties us together, its purpose and impact on health have not always been well-understood. Though we were aware of sleep medicine principles for centuries—in the 1600s Sir Thomas Willis described restless legs syndrome symptoms, and in the 1800s Charles Dickens wrote of a character with profound daytime sleepiness—it was not until the seminal *Sleep and Wakefulness* was published in 1939 (Kleitman, 1963) that significant research efforts began to focus on sleep.

Improving the base of knowledge related to sleep is important in a world that appears to not be getting enough of it. It is estimated that 34.8% of Americans sleep less than the minimum seven hours recommended by the American Academy of Sleep Medicine (Liu, 2016; Watson et al., 2014). Sleep is often considered as the bellwether of health and has been implicated in the development and/or exacerbation of health conditions such as cardiovascular disease, cancer, diabetes, obesity, and psychiatric disorders (Benca, Obermeyer, Thisted, & Gillin, 1992; Cappuccio et al., 2008; Gupta & Arnedt, 2012; Schernhammer, Kroenke, Laden, & Hankinson, 2006; Yaggi, Araujo, & McKinlay, 2006), and is associated with all-cause mortality in both the general and chronic illness populations (Cappuccio, D’Elia, Strazzullo, & Miller, 2010; Trudel-Fitzgerald et al., 2017).

The inclusion of a chapter on sleep in a health psychology handbook is reflective of the public and professional community’s escalating concern over the bidirectional effects of sleep on health outcomes, and the desire to learn how to treat sleep disorders effectively. By the end of this chapter, we hope that readers will agree that good sleep should be considered an essential element of health, and prioritized as a clinical and research focus for health psychologists.

What Is Sleep?

At its core, the purpose of sleep is clear: it is life-sustaining. There is compelling evidence linking consistent short sleep duration with mortality in humans (Grandner, Hale, Moore, & Patel, 2010). The exact mechanisms by which restricted sleep adversely affects health have not been clearly elucidated;
however, it is understood that insufficient or poor quality sleep is associated with compromised cardiovascular, neuroendocrine, and immune system function (Cappuccio, Cooper, D’Elia, Strazzullo, & Miller, 2011; Covassin & Singh, 2016; Faraut, Boudjeltia, Vanhamme, & Kerkhofs, 2012). Chronic sleep disturbances can result in harmful effects that persist, even after normal sleep is restored.

The two-process model of sleep regulation was proposed in the early 1980s and remains the most commonly cited conceptual model today (Borbely, Daan, Wirz-Justice, & Deboer, 2016). It suggests that sleep is regulated by the interaction of Process C (the body’s internal circadian rhythm) with Process S (sleep-wake balance, which is driven by increasing sleep debt). Humans have a ‘master clock’ located in the hypothalamus (specifically, the suprachiasmatic nucleus) controlling our circadian rhythms. It is responsible for regulating patterns for sleep, eating, body temperature, hormone production, and many other biological activities. Circadian rhythms alone are not sufficient to direct a person’s sleep/wake pattern; in addition, sleep debt, accumulated by being awake, interacts with the circadian rhythm to promote sleep.

Sleep Disorders

The International Classification of Sleep Disorders (ICSD–3) classifies all sleep disorders (American Academy of Sleep Medicine, 2014). Sleep disorders in the ICSD–3 are grouped into seven sections (see Table 36.1). We will briefly discuss some of the more common sleep disorders, recognizing that there are many others that warrant the attention of health psychologists.

Insomnia

Chronic insomnia disorder is defined by a patient’s self-reported difficulty with sleep initiation or maintenance at least three times per week for at least three months, despite adequate opportunity and circumstances for sleep, and the presence of daytime consequences. About one in ten adults in the general population meet diagnostic criteria for insomnia disorder, with prevalence rates about

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1.4 times higher in women, and in those who are older, and/or with more medical and psychiatric comorbidities (Ohayon, 2002).

**Sleep-Related Breathing Disorders**

Sleep-disordered breathing (SDB) comprises obstructive sleep apnea (OSA), central sleep apnea syndromes (CSA), sleep-related hypoventilation disorders, and sleep-related hypoxemia disorder, with OSA and CSA being the most common. In both conditions, an individual experiences cessations or reductions in breathing during sleep. OSA results from a physical blockage of the upper airway during sleep, while CSA is characterized by reduced ventilatory drive. The prevalence of moderate to severe OSA has been recently estimated at 6–13% of US adults, with men two to three times more likely than women to suffer from OSA (Peppard et al., 2013).

**Circadian Rhythm Sleep-Wake Disorders**

The behavioral outcome of an individual’s underlying circadian rhythms is referred to as their chronotype, ranging from ‘larks’ (morning tendencies), to ‘owls’ (evening tendencies). Chronotype is modulated by genetics, age, and environment. Research involving circadian disruptions most commonly focuses on adults who are employed in shift work, but there has been recent interest in ‘social jetlag,’ which describes the misalignment between an individual’s chronotype and their work/social schedule (Wittmann, Dinich, Merrow, & Roenneberg, 2006).

**Central Disorders of Hypersomnolence (Narcolepsy)**

Narcolepsy is clinically characterized by the subjective complaint of excessive daytime sleepiness (EDS), and occurs in approximately one out of every 2,000 people (Longstreth Jr, Koepsell, & Ton, 2007). As the most outwardly visible symptoms of narcolepsy disorder, such as EDS or cataplexy (loss of muscle control), can resemble other health issues, narcolepsy disorder is commonly misdiagnosed as insomnia, depression, seizure disorder, and even laziness.

**Health Consequences of Poor Sleep**

**Psychological Consequences**

Sleep-related disturbances are a part of the diagnostic criteria for many psychological disorders, including major depressive disorder, bipolar disorder, generalized anxiety disorder, and post-traumatic stress disorder. The complex relationship between sleep and psychological disorder is widely considered to be bidirectional in nature (Franzen & Buysse, 2017). High rates of comorbidity are evident, with estimates suggesting that roughly one in four adults with insomnia disorder also has a psychological disorder (Ohayon & Roth, 2003).

**Depression**

As disrupted sleep is a diagnostic criterion for major depressive disorder (MDD), it is not surprising that insomnia is often comorbid. Among patients diagnosed with MDD, there are significant differences in both subjective reports of sleep quality and polysomnographic findings, compared with non-MDD controls (Alvaro, Roberts, & Harris, 2013). Similar findings have been reported by researchers evaluating patients with bipolar disorder (Harvey, 2008). The relevance of disturbed sleep in the context of depressive disorders is highlighted in research that suggests that insomnia is
predictive of future depression: Non-depressed people with insomnia are twice as likely as those without sleep difficulties to develop depression (Baglioni et al., 2011).

**Anxiety**

Less research has been conducted examining sleep in the context of anxiety disorders; however, cognitive hyperarousal likely plays a critical role in insomnia (Riemann et al., 2010). About one in four individuals who experience difficulty initiating or maintaining sleep also has an anxiety disorder (Ohayon & Roth, 2003). Having a history of sleep problems substantially increases the risk for developing an anxiety disorder (Breslau, Roth, Rosenthal, & Andreski, 1996).

**Physical Health Consequences**

**Pain**

There exists a clear bidirectional relationship between sleep disruption and pain: Many adults experiencing chronic pain believe it to exacerbate their sleep problems, while sleep problems are known to increase perceptions of pain (Moldofsky, 2001). Clinical interventions targeting insomnia among patients with chronic pain demonstrate that sleep improves and pain decreases (Jungquist et al., 2010).

**Fatigue**

Insomnia is often comorbid with fatigue and depression, particularly among chronic illness populations such as cancer patients (Savard & Morin, 2001). If a patient receives effective insomnia treatment, they are likely to experience clinically meaningful improvements to their fatigue (Smith, Huang, & Manber, 2005).

**Cardiovascular and Metabolic Health**

OSA has been associated with hypertension, coronary artery disease, stroke, and heart failure, even after adjusting for confounders (Gottlieb et al., 2013). A recent review reported that the effect size of the association between OSA and type 2 diabetes was larger than the effect size between being physically inactive and type 2 diabetes (Reutrakul & Mokhlesi, 2017).

**Cancer**

Circadian disruption was first implicated in the development of cancer in the 1990s through epidemiological research that demonstrated increased cancer incidence in shift workers. Findings from cohort studies have linked shift work with increased risk of developing breast, colorectal, endometrial, and prostate cancer (Costa, Haus, & Stevens, 2010). Consequently, the World Health Organization has classified “shiftwork that involves circadian disruption [as] probably carcinogenic to humans” (Straif et al., 2007).

**Public Health Consequences**

The effects of sleep extend beyond individual health outcomes. Those who do not sleep enough and/or have untreated sleep disorders cost society billions of dollars annually due to factors including higher rates of health care utilization, increased work absenteeism, and increased accident risk (Altevogt & Colten, 2006).
Sleep Disparities

The vast majority of sleep research in the US has been conducted among non-Hispanic whites, with fewer studies in African Americans, and even less in Hispanic/Latino and Asian populations. Despite the limited data, growing evidence suggests racial/ethnic disparities in sleep. For example, racial/ethnic minorities in the US have a greater prevalence of insufficient sleep and more severe sleep disorders (Chen et al., 2015). Studies among African Americans and Hispanic/Latino populations have found that psychosocial stressors and environmental/neighborhood characteristics were associated with short sleep duration and poor sleep quality (Johnson et al., 2016). Asian populations have a higher prevalence of SDB compared to non-Hispanic whites; this is likely attributable to craniofacial structure as well as evidence that demonstrates an increased susceptibility to the adverse effects of obesity on SDB (Chen et al., 2016).

Beyond these racial/ethnic disparities, insufficient sleep is a global problem, with socioeconomic factors hypothesized to play a key role (Stranges, Tigbe, Gómez-Olivé, Thorogood, & Kandala, 2012). Lower income and educational attainment have been associated with more sleep complaints, poorer sleep quality, and insufficient or too much sleep (Grandner, Patel, et al., 2010; Krueger & Friedman, 2009; Stranges et al., 2012). Similar to the determinants of poor sleep among racial/ethnic minorities, individuals of lower socioeconomic status are also disproportionately exposed to environmental hazards such as noise, crowding, high temperatures, and psychosocial distress that can contribute to insufficient sleep (Stranges et al., 2008).

Sleep Interventions

Insomnia

Cognitive-behavioral therapy for insomnia (CBT-I), mindfulness-based treatments (Ong & Smith, 2017), and yoga (Khalsa, 2007) have been shown to improve insomnia. Because CBT-I is recommended by the American College of Physicians as the first-line therapeutic approach (Qaseem, Kansagara, Forcic, Cooke, & Denberg, 2016) we will focus on it here.

Core CBT-I treatment components include sleep restriction (to increase homeostatic drive for sleep by limiting the patient’s sleep window for several weeks); stimulus control (using the bed only for sleep to retrain the patient’s mind and body to associate sleep with their bedroom environment); cognitive restructuring targeting dysfunctional sleep-related beliefs/attitudes; sleep hygiene (optimizing behaviors that promote sleep, such as avoiding caffeine close to bedtime); and relaxation training to reduce cognitive and/or physical hyperarousal that can disrupt sleep.

Standard CBT-I protocols call for six to eight sessions. Recent trials have suggested that fewer sessions or individual CBT-I components may be sufficient for some insomnia patients (Harvey et al., 2014). CBT-I has been shown to be effective at treating insomnia in general and chronic physical and psychiatric illness populations, with efforts to adapt intervention content for patients commonly seen by health psychologists (Zhou, Suh, Youn, & Chung, 2017).

As CBT-I teaches patients cognitive/behavioral skills that can be implemented during future episodes of poor sleep, its effects persist, unlike pharmacotherapy where constant dosing is required (Smith et al., 2002). However, CBT-I requires significant patient effort, and so more patients and providers opt for medications to treat their insomnia (Bertisch, Herzig, Winkelman, & Buettner, 2014). Older, female, non-Hispanic white, lower income, and patients with poorer health were more likely to have reported insomnia medication use (Bertisch et al., 2014). Clinical practice guidelines suggest that there are a number of prescription medications that may be efficacious at improving sleep onset and/or sleep maintenance in patients with insomnia (Sateia, Buysse, Krystal, Neubauer, & Heald, 2017). However, there is insufficient high-quality research on the effectiveness of many drugs that
have FDA-approval for the treatment of insomnia. Furthermore, commonly used over-the-counter medications to assist with insomnia (e.g., diphenhydramine, melatonin, L-tryptophan, valerian) were not recommended due to limited research and/or small improvements following treatment (Sateia et al., 2017).

**Sleep Apnea**

The first-line OSA treatment is continuous positive airway pressure (CPAP). CPAP is a bedside device that delivers positive pressure to the airway via a mask worn during sleep, allowing for normal breathing. Although CPAP helps to improve many patient symptoms (e.g., daytime sleepiness, neurocognitive function), recent randomized controlled trials have not supported the efficacy of CPAP in reducing cardiovascular morbidity and mortality (McEvoy et al., 2016). Patients who consistently use CPAP (≥4 hours/night) may experience greater benefits, and health psychologists can play an important role in promoting adherence (Bakker et al., 2016).

**Conclusion**

Despite the remarkable amount of excellent sleep research that has been produced in a relatively short period of time, formal medical training programs have been slow to incorporate training on sleep and sleep disorders into their curricula (Mindell et al., 2011). This has resulted in critical gaps in sleep knowledge and clinical practice in the community setting (Owens, 2001). As patient demand for improved diagnosis and treatment of sleep disorders grows, we are likely to see increased clinical and research interest in exploring sleep. This will only serve to improve the quality of medical care that patients will receive for not only their sleep disorder, but the many related health epidemics (e.g., obesity, cardiovascular disease) that are affected by sleep health.

Health psychologists play a critical role in treating sleep disorders (e.g., CBT-I) and in ensuring adherence with medical therapies (e.g., CPAP). There are few trained CBT-I providers in the US. As many CBT-I providers are clinical psychologists, this presents an intriguing opportunity for those with an interest in health psychology. We are excited to see what the future holds for those with an interest in understanding the intersection between sleep and health.

**Disclosure**

Dr. Jessie P. Bakker is a full-time employee of Philips Respironics and has a part-time appointment at Brigham and Women’s Hospital. Dr. Bakker’s interests were reviewed and are managed by Brigham and Women’s Hospital and Partners HealthCare in accordance with their conflict of interest policies.

**References**


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