Occupational Sleep Medicine

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KEYWORDS

• Sleep • Sleepiness • Circadian rhythms • Work • Sleep disorders

KEY POINTS

- Occupational functioning can be affected by sleep loss, disordered sleep, and disruptions to circadian rhythms.
- Medical illnesses and medications can also affect sleep and sleepiness, resulting in added impairments to occupational functioning.
- The occupational consequences to disturbed sleep and sleepiness are numerous, although patients may lack insight into the ensuing consequences.

INTRODUCTION

The focus of occupational sleep medicine is predominantly organized around workplace productivity, safety, and health as influenced by sleep, circadian rhythms, and the assessment and treatment of sleep disorders. Sleepiness and sleep disturbance are common problems in the workplace and are associated with an array of adverse consequences, such as decreased productivity, increased risk for errors and accidents, and decrements in health and functioning. Depending on the occupational context, these consequences can be disastrous, as exemplified by historic accidents such as Chernobyl, Three Mile Island, and the Challenger explosion.

According to a national poll on adult sleep habits conducted by the National Sleep Foundation, sleep disturbance and sleepiness have become a significant problem in the working population.[1] Results from the poll found that more than one-third of the US workforce report daytime sleepiness, which amounts to approximately 5.7 million individuals, or roughly the entire population of Denmark. Similarly, 37% of working adults report symptoms that indicate risk for any sleep disorder.[2]

Although there are a multitude of causes for sleepiness and sleep disturbance, culprits can generally be organized into 5 overarching categories consisting of sleep deprivation, disordered sleep, disruptions in circadian rhythms, medical disorders, and medications. In addition to sleep duration, timing of sleep is also important to consider as sleep and alertness oscillate across 24 hours based on an internal biological clock. As such, sleepiness may also result when individuals are engaged in task performance at times when their biological clock is no longer actively promoting wakefulness, as occurs in the context of night shift work. Alternatively, sleepiness can also be a symptom of medical disorders involving dysregulations in the central nervous system, such as Parkinson's disease or narcolepsy, or may be a consequence of medications that influence central nervous system functioning, such as opiates or other sedating medications. We recommend that patients in occupational sleep medicine clinics are assessed on all 5 categories to achieve a comprehensive clinical landscape.

SLEEP AND WAKEFULNESS AS BIOLOGICAL PROCESSES

Sleep and wakefulness are governed by 2 biological processes that work in tandem.[3,4] The first process is often referred to as the *sleep-dependent process* (process S) and builds pressure for

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sleep with each hour of extended wakefulness and dissipates during sleep (Fig. 1). As such, sleepiness may be consequential to the buildup of sleep pressure from prolonged wakefulness.

The second process is referred to as the *sleep-independent circadian process* (process C), which is reflected by a rhythmic variation of increased sleep propensity and enhanced alertness that is governed by a circadian oscillator.[4] This separate process explains why individuals undergoing total sleep deprivation often report a period of restored energy the following morning (because of the onset of a circadian alerting signal) despite a total lack of sleep. Importantly, this circadian process is calibrated/synchronized by a series of environmental cues, the most important of which is natural sunlight or bright artificial light.

SLEEP DEPRIVATION

Chronic Sleep Loss

The Sleep Research Society, American Academy of Sleep Medicine,[5] and the National Sleep Foundation[6] recently published recommendations for sleep duration for adults based on extensive review of sleep research and consensus among the leading experts in sleep medicine. The recommended amount of sleep for adults is between 7 and 9 hours of sleep. Based on this recommendation, a remarkably large number of individuals in the United States are chronically sleep deprived (regularly getting <7 hours of sleep a night). In fact, the 2002 Sleep in America poll found that 39% of adults in the United States report getting less than 7 hours of sleep during weeknights, and 22% continuing with less than 7 hours of sleep on weekends. Moreover, there is evidence that this number has been increasing since 1984.[7]

Assessment of sleepiness

Inadequate sleep satiation most commonly leads to sleepiness, which can be measured both subjectively and objectively. Increased subjective feelings of sleepiness can reflect an increased propensity for sleep (ie, sleep pressure). Measures of sleep propensity form the basis of assessments that index sleepiness using objective methods. Well-validated objective and subjective measures of sleepiness have been used successfully for decades, and are valuable tools for use in broad-based clinical practice settings (self-report, eg, Epworth Sleepiness Scale) and sleep medicine (electroencephalogram-based measures).

Importantly, individuals habituate to the feeling of sleepiness over time despite the buildup of performance deficits with accumulating sleep debt.[8] While subjective sleepiness is easily identified after acute sleep deprivation, habituation occurs following chronic sleep restriction, which can lead to inaccurate perception and self-report of sleepiness. For example, an early study indicated that sleep-deprived train operators were not able to accurately identify imminent dozing,[9] thereby reducing accurate self-assessment of accident risk (eg, falling asleep at the wheel).

Subjective measures of sleepiness Self-report measures of sleepiness can be completed via clinical interview, or using a range of validated sleepiness questionnaires. Because accidental dozing is a natural consequence of sleepiness, assessments can also capture reported likelihood of dozing across various situations, which can help reduce the subjectivity involved with clinical impression and provide normative data for comparison. The Epworth Sleepiness Scale[10] (ESS) is one such instrument that is standardized and validated. The ESS is commonly used to index sleepiness based on likelihood of dozing in situations such as "sitting and reading" or "in a car, while stopped for a few minutes in traffic." The ESS indexes sleepiness via estimated sleep propensity rather than perceived feelings of sleepiness, and is intended to capture a

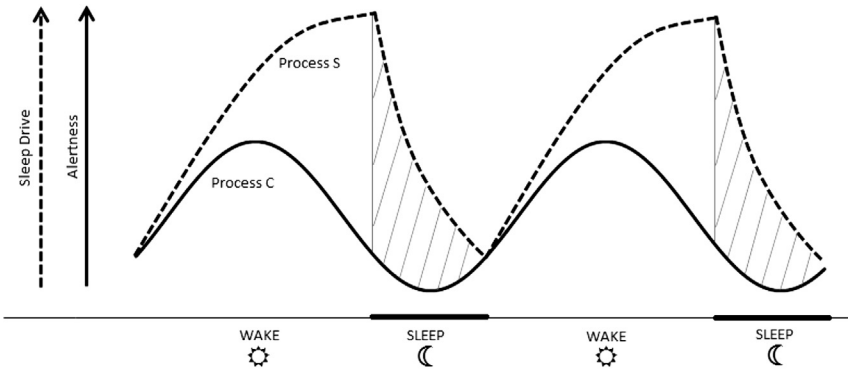

Fig. 1. Two-process model of sleep. Sleep drive (process S) increases with wakefulness and dissipates with sleep. The circadian signal (process C) oscillates rhythmically across day and night.