

# Behind Sleepy Eyes: Implications of Sleep Loss for Organizations and Employees

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Sleep loss and daytime sleepiness are common experiences for employees across many occupations. Although researchers commonly focus on the detrimental effects of sleep issues for attention and vigilance during task performance, we review research that examines how sleep issues influence interpretations of, and interactions in, the work environment. This review begins by differentiating between sleep loss and sleepiness. We then highlight how sleep issues can negatively bias the interpretation of environmental information and result in aggressive responding. We also examine how sleep issues impair self-regulatory ability and contribute to workplace deviance. After each section, we discuss the implications of these findings for the work environment. A closer examination of sleep's influence on workplace interactions can spur a beneficial discussion for researchers across a variety of disciplines and employees across all organizational levels.

*Keywords:* bias, organization, sleep, sleep deprivation, work

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Many employees sleep six or fewer hours daily (Luckhaupt, Tak, & Calvert, 2010) and are less alert, vigilant, and attentive as a result of sleepiness (Banks & Dinges, 2007; Doran, Van Dongen, & Dinges, 2001; Van Dongen, Maislin, Mullington, & Dinges, 2003). Consequently, sleepiness detrimentally affects organizations through increased accidents (Åkerstedt, Fredlund, Gillberg, & Jansson, 2002) and absences (Godet-Cayré et al., 2006).

Yet, sleepiness' effect on the workplace through employees' biases when interpreting information is underappreciated. We focus on how sleep alters cognition and behavior beyond typical attention and vigilance research. We de-

fine sleep loss, sleepiness, and their association. Then, we highlight how sleepiness biases interpretations to foster aggressive reactions, which leads to a discussion of sleep, executive functioning, and workplace deviance.

## Sleep Loss and Sleepiness

Sleep loss and sleepiness are distinct concepts. Sleep loss refers to shortened sleep duration relative to that needed for optimal functioning. Sleep scientists note that sleep needs differ by individual, but often range from six to nine hours (Ferrara & De Gannaro, 2001). Across disciplines, however, studies show cognitive and performance decrements for most people sleeping less than seven hours (Belenky et al., 2003; Van Dongen, Rogers, & Dinges, 2003). Alternatively, sleepiness is the subjective state of feeling a need to sleep, which can arise from sleep behaviors (e.g., sleep loss, sleep quality), but can also be influenced by sleep-wake cycle factors (i.e., time of day; Wehr, Aeschbach, & Duncan, 2001) and substance use (i.e., caffeine; Roehrs & Roth, 2008). Note that both sleep loss (i.e., reduced sleep) and sleep deprivation (i.e., no sleep) refer to *sleep behaviors* (e.g., sleep length, quality, and efficiency), whereas the ex-

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periential *state* of sleepiness follows those behaviors. For instance, adults sleeping five hours for seven nights reported increased sleepiness after each night (Carskadon & Dement, 1981).

### Sleep, the Interpretation of Information, and Social Behavior

We integrate research from neuroscience, sleep science, and evolutionary, social, organizational health, management, personnel, and industrial-organizational psychology to suggest that sleepiness induces a vulnerable state that biases interpretations of information (see Appendix A in the online supplemental materials for a summarized list of research discussed in this review). Because individuals must feel safe to sleep, sleepy individuals should be vigilant for safety/threat cues (Haselton & Buss, 2000), which is adaptive to ensure a safe environment. Vigilance for a safe environment should influence the interpretation of information in that environment.

Social psychologists report that sleepy individuals interpret threat-ambiguous sentences as especially threatening and respond faster to threat-consistent words following those sentences (Ree & Harvey, 2006). This threat response is similar to that observed in chronically poor sleepers. Those authors speculated that individuals draw conclusions about their environment based on their current psychological states (Ree & Harvey, 2006). Moving beyond that initial interpretation, we propose that sleepy individuals are in a vulnerable state that heightens threat vigilance as a result of increased self-protection motivation; that is, the desire to protect the self from potential harm (Neuberg, Kenrick, & Schaller, 2011).

Sleep science research supports our assertion regarding sleepiness and vulnerability. For example, individuals who are sleep deprived are less likely to trust others in social interactions and show increased sensitivity to unfairness (Anderson & Dickinson, 2010). Sleep loss also alters evaluations of pictures with a neutral valence, as ratings were significantly more negative among those who did not sleep for one night compared to those who did (Tempesta et al., 2010). Interestingly, individuals did not alter their assessments when information suggested a clear judgment regarding positively or

negatively valenced pictures. This is consistent with what evolutionary psychologists propose regarding individuals who are in a vulnerable state (e.g., Haselton & Buss, 2000); they tend to err toward caution when interpreting potential environmental threat, especially in situations concerning ambiguous information.

Sleepy individuals also respond more aggressively and blame others when encountering frustrating situations. One neuroscience research team reported that, compared with their presleep deprived scores, sleepy individuals increasingly directed blame and aggression toward another person or object in the environment. They also refused to accept blame for the situation and rejected resolutions based on restitution or amends (Kahn-Greene, Lipizzi, Conrad, Kamimori, & Killgore, 2006). Because of consistency with other findings (cf., James & Gregg, 2004), those authors conclude that sleep deprivation reduces inhibition (Kahn-Greene et al., 2006).

Sleep scientists also report sleep loss' disinhibiting effects regarding negative emotional stimuli (i.e., words on a Go/No Go task; Anderson & Platten, 2011). Good sleepers not suffering complaints of daytime sleepiness experienced one night of no sleep or one night of normal sleep. Sleepy participants instructed to inhibit responses to negative stimuli failed. Not only did they fail, they actually responded faster to those stimuli than to the target stimuli, an effect absent for normal sleepers (Anderson & Platten, 2011). Consistent with self-protection motivations, sleepiness heightened vigilance for potentially threatening—or negative—information. Upon encountering that information, sleepy individuals exhibited a behavioral readiness (i.e., responded faster) to react to that stimuli, even when specifically instructed to inhibit such reactions (Anderson & Platten, 2011).

Together these findings suggest that ambiguity is a central feature of the negative interpretive bias. Sleepy individuals confronted with an ambiguous social situation search for that situation's meaning. Given their vulnerable state, they have a greater probability of interpreting that ambiguous social interaction in a negative manner. This negative interpretation will then inform and influence the sleepy individual's response to that situation. Therefore, organizations likely will benefit from unambiguous

communications and environmental cues. Policies should receive greater acceptance and adherence with clear and unambiguous support from management.

*Application 1:* To limit negative work environment interpretations, organizations should ensure communications (e.g., policies, standards) are clear, direct, and unambiguous.

### **Sleep, Employee Stress, Employee Health, and Productivity**

Sleepy employees interpret the workplace more negatively and might be more likely to interpret incivility—low intensity deviant behaviors that are ambiguous concerning harmful intent (Andersson & Pearson, 1999)—because of that ambiguity. This increases the likelihood of sleepy employees interpreting customer, coworker, or manager actions as uncivil. Such experiences could foster unfair workplace judgments, which likely are stressful. Consequently, workplace stressors can induce strain reactions detrimental to employee health (Nixon, Mazzola, Bauer, Krueger, & Spector, 2011; Robbins, Ford, & Tetrick, 2012; Spector & Jex, 1998).

Many models purport to explain the stressor-strain relationship (e.g., Frese & Zapf, 1988; Spector & Jex, 1998), but they seem to agree that work stressors (i.e., interpersonal conflict, role conflict, role ambiguity, workload, work hours, and locus of control; Nixon et al., 2011) induce strain (i.e., physical, psychological, behavioral; Nixon et al., 2011). For example, a meta-analysis examined the relationships between job stressors and physiological health symptoms, which included gastrointestinal problems, sleep disturbances, backache, headache, and fatigue. Stressors associated more strongly with gastrointestinal issues and sleep disturbances than any other symptoms (Nixon et al., 2011).

Consequently, the stressor-strain relationship harms employee health and sleepiness likely moderates that relationship. Sleepy individuals should exhibit a stronger stressor-strain relationship than do rested individuals. Even though most individuals report similar numbers of minor daily stressors, sleep scientists report that those experiences especially distress poor sleep-

ers (Morin, Rodrigue, & Ivers, 2003). Importantly, minor daily stressors, and their negative appraisal, disrupt sleep that evening (Morin et al., 2003). Sleepiness negatively influences work environment interpretations, which likely increases work-related stress. As this stress contributes to subsequent sleep issues, a reciprocal relationship emerges. Sleepiness fosters negative interpretations of social information, which induces stress that then disrupts subsequent sleep. Over time, such a process will harm employee health and well-being (see figure located in Appendix B of the online supplemental materials).

Not only is stress harmful to employees, it is also detrimental to productivity. Personnel researchers found that job stressors, especially role ambiguity, demonstrated a significantly negative relationship with performance (Gilboa, Shirom, Fried, & Cooper, 2008). Increased workplace stress results in decreased job performance, a relationship exacerbated by sleepiness. In fact, extant research shows that sleepy individuals' are less attentive (Killgore, 2010; Lim & Dinges, 2008; Van Dongen et al., 2003), respond slower, and make more errors of commission—responding at inappropriate times—and omission—missing responses—during tasks (Doran et al., 2001). Limited attention, increased errors, and slowed reactions all decrease productivity (Lim & Dinges, 2008, 2010). Although both stress and sleepiness individually reduce performance, the greatest reductions should be when employees are both stressed and sleepy.

Training employees to cope with stress will benefit organizations. Mindful awareness practices (mindfulness based stress reduction; mindfulness based cognitive therapy, yoga; Siegel, 2007; de Vibe et al., 2013) reduce stress and could reduce sleepiness' negative effects. Mindful awareness practices tend to improve emotional regulation, reduce emotional dysfunction, improve cognitive patterns, reduce negative mindsets, and improve stress reactivity (Siegel, 2007). Across occupations and organizational levels, employee health and productivity should benefit from improved stress management, thereby also improving organizational outcomes.

*Application 2:* Organizations should train all employees in stress management tech-

niques to improve employee well-being and productivity.

### Sleep, Self-Control, and Deviant Workplace Behaviors

Clearly, employees should inhibit negative interpretations or impulsiveness to be effective on the job. Customer service representatives must control reactions to difficult customers. Heavy machinery operators (e.g., truck drivers, airline pilots) require high degrees of focus. Those behaviors each require self-control, but self-control resources are limited (Muraven & Baumeister, 2000; for a counterargument see, Inzlicht, Schmeichel, & Macrae, 2014). After individuals exhaust their self-control resources, they are in a state of ego depletion. Ego depletion occurs when insufficient self-control resources remain for future effortful tasks (Muraven & Baumeister, 2000). Importantly, ego depleted individuals act impulsively and have difficulty inhibiting aggression (DeWall, Baumeister, Sillman, & Gaillot, 2007; Tangney, Baumeister, & Boone, 2004), which might explain ego depletion's contribution to deviant behaviors (e.g., theft, incivility, tardiness; Robinson & Bennett, 1995). It is problematic that sleep loss impairs self-control (i.e., causes ego depletion), as self-control and deviance correlate negatively (Bordia, Restubog, & Tang, 2008; Marcus & Schuler, 2004).

In one sleep science study, participants had no sleep or normal sleep for one night. Sleepiness resulted in poorer self-control. Sleepy individuals were also worse at multitasking, responding to new situations, planning, and organizing (Nilsson et al., 2005). Recent industrial–organizational psychology research reports that sleep loss and poor sleep quality are associated with organizational (i.e., theft) and interpersonal (i.e., rude behavior) deviance through increased ego depletion and state hostility (Christian & Ellis, 2011). Sleepiness also contributed to unethical behaviors across many employment positions with both sleep quantity and quality influencing those behaviors (Barnes, Schaubroeck, Huth, & Ghumman, 2011; Study 3). In another study, sleep loss predicted cognitive fatigue—a proxy for self-control resources—and cognitive fatigue predicted unethical behavior (Barnes et al., 2011; Study 4).

Neuroscience further supports the ego depletion interpretation discussed in the aforementioned studies, as global glucose metabolism in the brain slows after sleep deprivation (Short & Banks, 2014). Given ego depletion's association with glucose depletion (Gailliot et al., 2007), sleepiness seems to affect the same neurological processes. Research suggests that sleep deprived individuals exhibit approximately 60% greater amygdala activation (Yoo, Gujar, Hu, Jolesz, & Walker, 2007). The amygdala activates when processing emotional information, especially negative or aversive information (Phelps & LeDoux, 2005). Yoo and colleagues (2007) assert that sleep loss may amplify the neurobiological response to aversive stimuli, as it weakened the functional connectivity between the medial prefrontal cortex and the amygdala. Together this research shows that sleepy individuals who interpret more work environment threat will have difficulty inhibiting emotion-based responses.

Sleepiness affects employees across all organizational levels, and sleepy employees have difficulty resisting temptation (Muraven & Baumeister, 2000), even the temptation to engage in unethical or risky behaviors. All employees should benefit from withholding any possibly risky, unethical, or counterproductive decisions or actions until after obtaining sufficient sleep, regardless of occupation, job role, or organizational level. However, ego depleted employees will have greater difficulty inhibiting impulsive reactions. Consequently, social psychology research finds that short-breaks (e.g., 10 minutes) between tasks replenishes self-control to some extent (Tyler & Burns, 2008), and even though future research should determine whether this applies to other executive functions (strategic planning, judgment) it is still clear that short breaks following ego depleting tasks will benefit employees self-control, especially when sleepy. If feasible, instituting flexible schedules that let employees take breaks when feeling particularly fatigued or depleted should maximize employees' self-control during the workday.

*Application 3:* Employees should take short breaks after ego depleting tasks to increase self-control, especially when sleepy.

### Sleep, Executive Functioning, and Organizational Policy

Self-control is just one of many executive functions that sleepiness detrimentally affects. Executive functions drive one toward future goal states through both self-control and self-coordination. They include processes related to attention, memory, impulse control, planning, judgment, and behavior inhibition (Killgore, 2010). It is especially noteworthy that executive functions span a highly complex set of cortical and subcortical networks, although the prefrontal cortex seems heavily involved with the most complex cognitive processes (e.g., self-regulation, strategic planning; Killgore, 2010). Importantly, those systems are sensitive to sleep loss (Short & Banks, 2014). For example, the dorsolateral prefrontal cortex seems to support working memory (Chee & Chuah, 2008), but uses less metabolic energy following sleep deprivation (Thomas et al., 2000), which could result in working memory deficits (Killgore, 2010). Consequently, Lim and Dinges (2010) note moderate effects sizes for the negative effect of sleep deprivation on individuals' accuracy and response time on working memory tasks. Considering that working memory maintains and stores information for short periods (Baddeley, 2003), sleepiness might disrupt information acquisition, retention, or recall.

All employees (e.g., managers, shipping/receiving specialists) across all industries should be aware that sleep loss also contributes to inflexible thought processes, less creative problem solving, and poorer judgment (Harrison & Horne, 2000). For example, one sleep science study compared well-rested individuals' performance on a marketing strategy game to their post sleep deprivation performance. Sleepy individuals thought more rigidly, retained unproductive plans, failed to update plans to reflect new information, and failed to develop and implement innovative resolutions (Harrison & Horne, 1999). Additionally, sleep loss increases risk-taking behaviors (Killgore, 2010). Inflexible thought processes combined with greater risk taking surely affects outputs, such as marketing or election campaigns and design projects (e.g., engineering designs).

Teaching employees effective sleep hygiene practices will likely provide the most benefit for the least cost. Simple sleep hygiene practices

include maintaining a consistent sleep schedule and avoiding bright lights, exercise, and caffeine within three hours of sleeping (see Appendix C in the online supplemental materials). Organizational health psychologists report that consistently receiving sufficient sleep improves self-regulation and decreases stress in only one week (Barber & Munz, 2011). Both behavioral (e.g., physical activity or eating before sleeping) and cognitive (e.g., worrying or planning before sleeping) factors, along with inconsistent sleep (i.e., not maintaining a consistent sleep schedule) and substance use (e.g., nicotine, caffeine, or alcohol intake before sleeping), can disrupt sleep and next-day energy needed for work engagement (Barber, Grawitch, & Munz, 2013). Importantly, just knowing about effective sleep hygiene practices can improve sleep (Brown, Buboltz, & Soper, 2002). A sleep hygiene intervention (e.g., a presentation with handouts) is low cost, but high return. For example, college students who received a short sleep hygiene presentation (i.e., 30 minutes) had improved sleep up to 6 weeks after that intervention (Brown, Buboltz, & Soper, 2006). It is reasonable to suggest that any employee sleep improvements that result from organizational sleep hygiene training will result in productivity increases and deviance decreases. Therefore, effective sleep hygiene will improve employee health and productivity, as well as potentially decrease deviance.

*Application 4:* Employees should be trained in effective sleep hygiene practices to improve employee health and productivity, as well as potentially decrease deviance.

### Conclusion

This review looked “behind sleepy eyes” and found that employees and organizations alike should take steps to limit sleepiness' detrimental effects. Sleepy employees interpret situations more negatively, respond impulsively to threat-ambiguous situations, and demonstrate lower self-regulatory ability. Moreover, sleepy employees are less creative, make poorer decisions, and take unnecessary risks. Sleep loss also compounds stress and places employees at greater risk for sleep issues on subsequent evenings, which over time harms employee health

and increases absenteeism. Promoting effective sleep hygiene and coping strategies will help decrease employee stress and workplace deviance to improve organizational outcomes. Stress and deviance cumulatively and negatively harm employees and affect an organization's bottom line. Thus, ongoing research exploring these effects—and their reduction—is critical for improving the workplace.

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