

Sleep, Work, and Well-Being

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Introduction

Well-being is of the utmost importance to individuals, deeply affecting the quality of all aspects of their lives. Indeed, the effects of well-being go further than individuals themselves, and organizations should care about the well-being of their employees because of the negative consequences that poor health and well-being have on organizational functioning (e.g., Danna and Griffin, 1999).

If well-being is so important, it behooves us to understand not just its consequences, but its causes as well. Two essential determinants of individuals' well-being are sleep and work (e.g., Kuoppala, Lamminpää, and Husman, 2008; Strine and Chapman, 2005), and not by chance, these are also the two activities that together absorb most of adults' lives (Basner et al., 2007; Barnes, Wagner, and Ghumman, 2012). Despite their importance to well-being, sleep and work are incompatible, as time spent working takes away from the time available for sleep, and vice versa. For example, for full-time employees, as the time spent working has increased over the past 30 years, the amount of time spent sleeping has decreased (Knutson, Van Cauter, Rathouz, DeLeire, and Lauderdale, 2010). Barnes et al. (2012) go further, showing in two separate samples that this relationship is nonlinear: the effects on sleep loss occur disproportionately for those who work the longest hours. This is of the utmost importance, because as time spent working increases and time spent sleeping decreases, well-being and health are negatively impacted (e.g., Shields, 1999), highlighting the need to understand the interrelationship between sleep and work, and how their separate and combined effects influence employee well-being.

The remainder of this chapter focuses on how the two most time-consuming activities in adult life (sleep and work) affect well-being. We begin by establishing the direct effects of both work and sleep on well-being. We then move to consider how work impacts sleep and well-being, with special attention to shift work and work stress, and this is followed by an examination of how sleep impacts work and well-being. Finally, we will consider implications

for organizations, and how individuals and organizations can improve the health and well-being of workers.

We acknowledge that there are many definitions and proposed dimensions of well-being. It is not our intention, however, to engage in this conceptual debate. Instead, our goal in this chapter is to understand how sleep and work together impact well-being, and we pay special attention to individuals' psychological and physical functioning.

Work Stress and Well-Being

Research on work stress and its impact on health has a long history (e.g., Ganster and Schaubroeck, 1991; Kornhauser, 1965). Work stress has been linked consistently with a variety of employee outcomes, including negative physical and psychological well-being (e.g., Beehr, 1995; Beehr and Glazer, 2005; Jex and Crossley, 2005). Specific physical health effects of excess work stress include increased incidence of cardiovascular disease (Johnson and Hall, 1988), type 2 diabetes and pre-diabetic metabolic syndrome (Agardh et al., 2003; Chandola, Brunner, and Marmot, 2006), and musculoskeletal disorders (Houtman, Bongers, Smulders, and Kompier, 1994). Fried et al.'s (2013) recent study is indicative of the specificity with which both work stress and well-being are examined: Using longitudinal data and a large sample, inadequate levels of job enrichment (too low or too high) contributed to abdominal obesity.

The psychological consequences of work stress include burnout (Maslach, Schaufeli, and Leiter, 2001), anxiety, depression, and job and life dissatisfaction (Van der Doef and Maes, 1999). Research also demonstrates how low control at work predicts depression and psychiatric symptoms (Mausner-Dorsch and Eaton, 2000) and neurotic disorders (Cropley, Steptoe, and Joeekes, 1999). The debate as to whether work stress affects well-being is long over.

Sleep and Well-Being

Medical research has clearly established that sleep impacts health. People who consistently fail to get enough sleep are at an increased risk of chronic disease (e.g., Hublin, Partinen, Koskenvuo, and Kaprio, 2007). For example, being at risk for or having a sleep disorder (e.g., sleep apnea, insomnia) predicts an increased risk for cardiovascular disease (e.g., hypertension, myocardial infarction, arrhythmia, heart failure) and type 2 diabetes (Newman et al., 2000; Public Health Agency of Canada, 2009). In addition, poor sleep quality predicts less severe health issues such as muscle pain, headaches, and gastrointestinal problems (Kuppermann et al., 1995; Schwartz et al., 1999), and obesity and metabolic disturbance (Spiegel, Leproult, and Van Cauter, 1999; Wolk and Somers, 2007).

In terms of the psychological outcomes, poor sleep leads to hostility and frustration (Kahn-Greene, Lipizzi, Conrad, Kamimori, and Killgore, 2006), anxiety and paranoia (Kahn-Greene, Killgore, Kamimori, Balkin, and Killgore, 2007) and depression (Riemann, Berger, and Voderholzer, 2001). Although these all involved subclinical symptoms, research from the field of sleep medicine also shows a high comorbidity between sleep disorders and psychiatric illnesses, especially mood and anxiety disorders (Ohayon, 2002). Similarly, insomnia is a risk factor for mental illness in epidemiologic studies over the past two decades (e.g., Breslau, Roth, Rosenthal, and Andreski, 1996; Ford and Kamerow, 1989). More recently, baseline insomnia was a significant risk factor for incident depression and anxiety 12 months later in a sample of

2,000 United Kingdom residents (Morphy, Dunn, Lewis, Boardman, and Croft, 2007). Taken together, these studies show that different aspects of sleep problems affect well-being.

Work Affecting Sleep

Having established that sleep and work influence well-being, we turn our attention to how sleep and work are interrelated, and how they together affect well-being, and focus on two of the most frequently studied ways in which work impacts sleep, namely shift work and work stress.

Shift Work

There has been a wealth of research on shift work impacts on sleep (e.g., Folkard and Monk, 1985). This should not be surprising given that shift work is ubiquitous. In contrast, sleep is a new research focus in organizational psychology (e.g. Barnes, 2012; Mullins, Cortina, Drake, and Dalal, 2014). Shift work reflects any work schedule that deviates from the traditional day-shift (typically starting between 7 a.m. and 10 a.m.), such as night, early morning, and late afternoon/evening shifts, or rotating shifts. Large deviations from the traditional work schedule, such as working during the dark hours of night, require shift workers to work when they are programmed to sleep, and to try to sleep during times that are biologically more appropriate for wakefulness (Cheng and Drake, 2016). This disrupts the normal sleep/wake cycles.

Sleep/wake cycles include two physiological systems that regulate sleep, sleep/wake homeostasis and the circadian biological clock (National Sleep Foundation, 2015). The sleep/wake homeostasis clock reflects the drive to sleep, leaving individuals more tired as the day progresses, and ensuring that by night time, they are ready to sleep. The circadian biological clock regulates the timing of periods of sleepiness and wakefulness throughout the day and night (National Sleep Foundation, 2015) so that the drive to sleep is the strongest in the middle of the night (e.g., between 2 and 4 a.m.) and in the early afternoon (e.g. between 1 and 3 p.m.). Any reversal of typical sleep and wake schedules due to shift work is at odds with normal sleep/wake cycles and while some individuals are able to adapt, many shift workers experience functional impairments (Drake et al., 2015). This condition is termed *shift work disorder* and has major consequences on sleep and performance, and importantly on health and well-being at work.

Consequences of shift work for sleep and well-being

The most common complaint of shift workers is lack of sleep (e.g., Parkes, 1999). Shift workers sleep an average of 30 to 60 minutes less per day than day workers (e.g., Park, Matsumoto, Seo, Cho, and Noh, 2000; Pilcher, Lambert, and Huffcutt, 2000). In addition, they experience other difficulties such as in falling and staying asleep. Thus, shift work may trigger sleep difficulties, or exacerbate preexisting insomnia symptoms (Cheng and Drake, 2016). For example, in a large epidemiological study, 18.5 percent of shift workers reported clinically significant sleep difficulties, twice the rate of day workers (Drake, Roehrs, Richardson, Walsh, and Roth, 2004).

Shift work is also associated with poor health. Based on a large-scale long-term study, shift work increased the risk of being diagnosed with chronic conditions, including cardiovascular disease and gastrointestinal disorders (Shields, 2002). In a review of 17 studies, 13 of which

were longitudinal, Bøggild and Knutsson (1999) concluded that shift workers had a 40 percent increased risk for cardiovascular disease compared with day workers. Shift work has been associated with reproductive health problems and breast cancer among female employees (Shields, 2002). In addition, Figà-Talamanca's (2006) review of 14 studies examining irregular work hours found that shiftwork was associated with a slight increase in the risk of spontaneous abortion and reduced fertility.

The bulk of research on shift work and well-being has focused on physical outcomes. While mental health outcomes have received less research attention, shiftwork is associated with greater psychological distress, depression, anxiety, and burnout (e.g., Bohle and Tilley, 1989; Healy, Minors, and Waterhouse, 1993; Jamal, 2004).

Consequences of shift work for work-related well-being

In general most outcomes of shift work are a function of the excessive sleepiness caused by insufficient and disrupted sleep (Cheng and Drake, 2016). Thus, one major outcome of sleepiness at work is involuntary sleeping on the job, which can have significant negative effects on work-related well-being (e.g., safety) and the quality of job performance.

One study found that a third of nurses working different shifts reported unintentionally falling asleep (Gold et al., 1992). Aside from preventing any work being done, this increases the risk for injuries, especially when driving. Not surprisingly, night and morning shift workers are at increased risk for motor vehicle accidents (Cheng and Drake, 2016). In one study using a driving simulator, workers driving after a night shift experienced substantially increased sleepiness and decreased driving performance (Åkerstedt, Peters, Anund, and Kecklund, 2005). This effect may be most pronounced for drivers involved in heavy-duty transportation, who have a disproportionately higher number of fatigue-related collisions (Clarke, Ward, Bartle, and Truman, 2009). Indeed, transportation remains one of the deadliest sectors per capita across different counties (e.g., WSIB, 2014), with approximately 40 percent of transportation incidents involving someone driving a commercial vehicle while sleepy or sleeping (TUC, 2013). Acknowledging the consequences for the public at large, who are inadvertently put at risk, gives greater meaning to the effects of shift work.

Even when shift workers do remain awake, but sleepy, reduced cognitive functioning can put the public at risk in other ways. Research in medical settings shows that interns engaged in shift work are more likely to make serious diagnostic and medication errors (e.g., in ordering or administering medication, intravenous fluids, or blood products), even resulting in increased rates of patient death (Barger et al., 2006; Landrigan et al., 2004). Similarly, nurses involved in rotating shifts were twice as prone to work-related accidents or errors, and 2.5 times more likely to experience a near-miss (Gold et al., 1992). One reason for this is that shift work disorder affects psychomotor control, which can impact any work requiring manual dexterity or complex psychomotor tasks, such as surgery or driving (Cheng and Drake, 2016). Thus, medical interns are also at higher risk of self-injury from used needles during the night shifts (Ayas et al., 2006).

In conclusion, shift work increases sleepiness through sleep loss, thereby increasing risk for injuries and accidents at work. In addition, shift work reduces sleep and is linked to both physical and mental disorders. Having examined shift work (which is ubiquitous but visible) and sleep, we now consider a more insidious or invisible work-related factor that impacts both sleep and well-being, namely work stress.

Work Stress

Work stress is an all too prevalent outcome of work, experienced at one time or another by most employees, and it can affect both sleep and well-being. Broadly speaking, work stress is a concept that reflects reactions to objective conditions in the job environment (i.e., job stressors), the subjective experience of the conditions and the cognitive, affective, and physiological reactions to the subjective experiences (i.e., strain; Kahn and Byosiére, 1992; Pratt and Barling, 1988). Different work conditions can constitute stressors (e.g., task-related stressors, role stressors, social stressors, and physical stressors; Sonnentag and Frese, 2012), all of which can be experienced chronically (i.e., enduring across time), as acute stressors, or as short-term events (Pratt and Barling, 1988).¹

Within this perspective, work stress is a process, and this explains why most employees would experience work stressors, but not all would be negatively affected. Some individuals will experience (objective) work stressors negatively, but others might not. Those who do not would not experience any strain. Of the people who do experience subjective work stress, some might be affected negatively (e.g., poor health), but others might not, thereby not suffering any strain. Sleep problems are a frequent manifestation of strain (e.g., Nixon, Mazzola, Bauer, Krueger, and Spector, 2011) and work-related stress is one the most frequently reported causes of sleep problems (Ertel, Koenen, and Berkman, 2008).

Consequences of work stress for sleep and work-related well-being

The sheer volume of research on this topic enables us to discuss studies separately, depending on whether the data were cross-sectional, longitudinal, or daily.

Cross-sectional studies Most the research in this area has been cross-sectional, and has examined a wide array of work-related stressors (e.g., task-related stressors, role stressors, social stressors). In general, work stress (e.g., task-related stressors, workload, time pressure) is consistently associated with sleep problems (e.g., Berset, Elfering, Lüthy, Lüthi, and Semmer, 2011; Stenfors, Magnusson Hanson, Oxenstierna, Theorell, and Nilsson, 2013; Winwood and Lushington, 2006). As one example, Barber and Santuzzi (2015) examined telepressure (i.e., preoccupation with and perceived necessity to respond immediately to electronic messages), and found that telepressure predicted poor sleep quality. Social stressors (e.g., interpersonal conflicts; Winwood and Lushington, 2006) and the experience of injustice (Hietapakka et al., 2013) are also associated with poor sleep. Meta-analytical evidence suggests that interpersonal stress has a larger effect on sleep than task-related, role, and time related stressors (see Nixon et al., 2011).

Longitudinal studies Studies using longitudinal designs are important because they begin to enable causal inferences about the role of work stress. In a review of 16 longitudinal studies on work stress and sleep, Van Laethem, Beckers, Kompier, Dijksterhuis, and Geurts (2013) reported that job demands consistently predicted sleep quality over time. As well, Linton et al.'s (2015) review of 24 studies showed again that high job demands predicted future sleep disturbances.

Along with job demands, social stressors also affect sleep. For example, breach of the psychological contract, or the unwritten set of expectations of the employment relationship as distinct from the formal, codified employment contract, predicted insomnia across time; and

in some cases, participants' insomnia symptoms were present eight months later (Ng and Feldman, 2013).

Extending this, researchers examined the longitudinal effects of subjective stress symptoms that result from work stressors on sleep problems. Armon, Shirom, Shapira, and Melamed (2008) showed, after controlling for baseline insomnia, baseline depression, and other relevant variables in a sample of healthy employees, that burnout at baseline predicted insomnia 18 months later.

Daily studies Researchers have also investigated the same-day effects of work stress on sleep. Studies such as this are important, as they enable an understanding of experiences as they unfold (Iida, Shrout, Laurenceau, and Bolger, 2012). This research has shown that stressful days are followed by impaired sleep (Dahlgren, Kecklund, and Åkerstedt, 2005; Jones and Fletcher, 1996). As one example, sleep was more fragmented (i.e., a higher number of awakenings) the same night that employees experienced social exclusion (Pereira, Meier, and Elfering, 2013). In a separate study, Pereira, Semmer and Elfering (2014) showed that tasks that employees perceive as unreasonable or unnecessary predicted increased sleep fragmentation and problems falling asleep the same night.

Researchers have also shown that during weeks in which employees experienced a high level of stress at work, total sleep time decreased (Dahlgren et al., 2005). Similarly, Syrek and Antoni (2014) showed that over a period of five weeks, the stress associated with unfinished tasks predicted self-reported sleep disturbances over the weekend. Finally, employed students reported poor sleep quality during weeks in which they experienced high levels of work-school conflict (Park and Sprung, 2014).

Taken together, across cross-sectional, longitudinal and daily/weekly studies, work stressors and work stress influence sleep. In the next section, we examine research investigating whether sleep affects work and well-being, and examine potential reciprocal relationships between work stress and sleep. First we will review the impact of sleep on performance, job related attitudes, affect, and behaviors.

Sleep Affecting Work

So we have seen that shift work and work stress affect sleep, but might sleep affect the experience of work? Research on the effects of sleep physiology on human functioning is by no means new (see Harrison and Horne, 2000; Lim and Dinges, 2010). Although more limited, research within organizational psychology now shows that sleep also affects several work-related outcomes. For example, sleep deprivation predicts poor task performance (Kessler et al., 2011; Pilcher and Huffcutt, 1996) and decreased organizational citizenship behavior (Barnes, Ghumman, and Scott, 2013). As well, low sleep quantity predicts decreased job satisfaction (Scott and Judge, 2006). Poor sleep also leads to a host of negative organizational outcomes, including workplace deviance (Christian and Ellis, 2011), cyberloafing (Wagner, Barnes, Lim, and Ferris, 2012), and unethical behavior (Barnes, Schaubroeck, Huth, and Ghumman, 2011).

Self-regulation has emerged as the dominant theoretical framework for understanding the effects of sleep at work (Christian and Ellis, 2011). Baumeister, Heatherton, and Tice (1994) first suggested that self-control depended on a limited energy resource. They proposed an energy theory of self-control, in which self-control is a limited resource that becomes depleted

through use (e.g., Baumeister et al., 1994; Baumeister, Bratslavsky, Muraven, and Tice, 1998; Muraven and Baumeister, 2000). Specifically, all acts of self-control draw from a common resource that controls thoughts, emotions and behaviors (Baumeister et al., 1998). The depletion of self-regulatory resources involves a temporary reduction in the capacity to engage in volitional action (Baumeister, Muraven, and Tice, 2000; Christian and Ellis, 2011). In the face of this depletion, at least two courses of action are possible. Replenishment can take place, and sleep is one essential activity through which this can occur (Baumeister et al., 2000). However, if replenishment does not take place, depletion can spiral downwards, negatively affecting several work-related outcomes (Barnes, 2012). Along with the negative effects of sleep on organizational outcomes, sleep is also related to employees' well-being at work. Some of these affective outcomes are examined below.

Affect

Research has long shown that sleep influences affect and emotions (e.g., Pilcher and Huffcutt, 1996). Importantly, sleep interferes with specific aspects of affect that might have important consequences in the workplace. For example, sleep deficits increase negative affect (e.g., hostility) and decrease positive affect (e.g., cheerfulness or joviality; Scott and Judge, 2006; Sonnentag, Binnewies, and Mojza, 2008). Sleep disturbances also interfere with the ability to regulate emotions, particularly negatively valenced emotions (Yoo, Gujar, Hu, Jolesz, and Walker, 2007). In the same vein, sleep loss amplifies the negative emotional consequences of disruptive daytime experiences, and inhibits positive benefit associated with rewarding or goal-enhancing activities (Zohar, Tzischinsky, Epstein, and Lavie, 2005). The effects of sleep deprivation go further, by selectively impairing accurate judgment of facial emotions, especially threat relevant (anger) and reward relevant (happy) categories (Van der Helm, Gujar, and Walker, 2010). Not surprisingly, sleep deprivation is associated with lower emotional intelligence and intrapersonal functioning (Killgore et al., 2008), and individuals who were at risk for a sleep disorder were more likely to report mood impairments, boredom and avoiding interactions with coworkers (Swanson et al., 2011), all of which can negatively influence work-related well-being.

Perceptions of Work

Intriguingly, sleep does not only affect our work per se, it also affects how we perceive our work, and our work stress, because insufficient or poor quality sleep affects how employees evaluate information (Barber and Budnick, 2015), causing them to perceive their work environment as more negative (de Lange, Taris, Kompier, Houtman, and Bongers, 2005). For example, sleep-deprived individuals are more reactive to negative or aversive events than those who are not (Anderson and Platten, 2011; Franzen, Buysse, Dahl, Thompson, and Siegle, 2009). This phenomenon is echoed in research showing that poor sleepers perceive workplace events as more distressing than better sleepers, even when the amount of daily stressors is the same (Morin, Rodrigue, and Ivers, 2003; Zohar et al., 2005). Barber and Budnick (2015) showed across three studies that this phenomenon may be especially likely in the presence of social threats, such as an unfair workplace. These results are important, as they suggest that sleep impacts individuals' perceptions of work and work stress, as a result of which there is a reciprocal relationship between work stress and sleep.

However, findings from studies examining whether this reciprocal relationship exists have been mixed. First, de Lange et al. (2009) replicated the predicted effects from stress to sleep, specifically, that high-strain work environments (characterized by high job demands and low job control) predicted sleep-related complaints (sleep quality, fatigue); however sleep did not influence work stress across their four year, four-wave study. When Magnusson Hanson et al. (2011) extended de Lange et al.'s (2009) study by including lack of social support as a potential job stressor, there was a reciprocal relationship between social support and sleep. However more research is needed to understand sleep's influence on perceptions of work stress.

Workplace Injuries and Accidents

Moving beyond the potential psychological outcomes of sleep to physical well-being, we turn our attention to work-related injuries and accidents, a critical outcome of sleep problems. Importantly, people do not need to fall asleep on the job for an accident to occur. Merely being sleepy at work is associated with increases in risk-taking behavior (Roehrs, Greenwald, and Roth, 2004), because sleep is related to reduced alertness, concentration, vigilance, and attentiveness (e.g., Banks and Dinges, 2007; Drake et al., 2001; Mullins et al., 2014), explaining why there is an increased risk of safety incidents, errors and injuries when people are sleep-deprived at work (e.g., Dinges, 1995).

In an intriguing study, Barnes and Wagner (2009) used Daylight Saving Time to examine the effects of sleep loss on injuries. Their analyses showed that one hour of lost sleep predicted a significant increase in workplace injuries, and in injuries of greater severity. More importantly, they also showed in a follow-up study that 40 minutes of lost sleep was sufficient to result in an increase in injuries. The effects of sleep loss on workplace safety has been documented in different countries, such as Canada (Kling, McLeod, and Koehoorn, 2010) and Finland (Salminen et al., 2010). Additionally, self-reported disturbed sleep, which contributes to daytime sleepiness, predicts accidental death at work (Åkerstedt, Fredlund, Gillberg, and Jansson, 2002). These negative effects that lost sleep has on work-related injuries and accidents really demonstrates the critical importance of sleep to an individual's health and well-being.

Health and Work Withdrawal

Sleep problems also influence work indirectly, through their effects on health. As previously noted, there is a well-established relationship between sleep and health (e.g., Spiegel et al., 1999; Wolk and Somers, 2007); in turn, poor health affects work, and work withdrawal behaviors specifically. Both sleep and health problems result in absenteeism. One study showed that daytime sleepiness predicted taking more days off work for health reasons (Philip, Taillard, Niedhammer, Guilleminault, and Bioulac, 2001). Similarly, disturbed sleep and sleepiness both predicted long-term sickness absence in a national sample in Sweden (Åkerstedt, Kecklund, Alfredsson, and Selen, 2007).

Further evidence for indirect effects of sleep on work withdrawal comes from research showing that poor sleep quality among Japanese white-collar employees predicted poor physical and psychological health, and sickness absence (Minowa and Tango, 2003). Importantly from the organization's perspective, disturbed sleep predicts long-term (90 days or more) and intermediate length (14–89 days) sickness leave (Åkerstedt et al., 2007), as well as medically certified sickness absence from work (Westerlund et al., 2008). Similarly, mediocre or poor sleep

predicted long-term work disability (Eriksen, Natvig, and Bruusgaard, 2001). Last, more evidence for indirect effects of sleep on work withdrawal derives from research showing that sleep apnea combined with daytime sleepiness was strongly associated with sick leave (Sivertsen, Björnsdóttir, Øverland, Bjorvatn, and Salo, 2013).

As this review suggests, not only does work affects sleep, but sleep also has important effects on both psychological and physical well-being at work. In the next section we will examine some potential avenues for further research on this important topic, and then review the practical implications of these findings.

Moving Forward

One of the delights in writing a chapter of this nature is the opportunity to read and think deeply about the topic. In doing so, the need for further research investigating how work and sleep influence each other, and in turn influence well-being, becomes even more apparent. What follows are three different areas for investigation that we think would further our understanding of sleep, work and well-being.

First, as already suggested, more research is needed examining the reciprocal relationship between work stress and sleep, and how sleep problems may influence the way in which people perceive work stressors. Some support for the plausibility of this idea emerges from research showing a robust reciprocal relationship between mental health and work stress (e.g. Akashiba et al., 2002; Ford and Kamerow, 1989; de Lange, Taris, Kompier, Houtman, and Bongers, 2004). To explain the reciprocal relationship between mental health and work stress, de Lange et al. suggest that mental health influences work stress by changing the way in which people evaluate their work environment, such that employees experiencing mental health issues might perceive their work environment more negatively. Similar arguments prevail for the effects of sleep problems. Previous research demonstrates that sleep deprivation changes individuals' perceptions of work-related phenomena (Barber and Budnick, 2015). Zapf, Dormann, and Frese (1996) labeled this effect as the "true strain-stressor process", because in this case, stressors (i.e., job stressors) may sometimes be affected by strain (i.e., sleep problems). Although work is beginning in this area (e.g., Barber and Budnick, 2015), more research is needed.

Second, sleep does not only affect physical withdrawal from the workplace (i.e., absenteeism); it also potentially affects psychological and cognitive withdrawal while at work. This can be understood by examining cognitive distraction. For example, sleepiness decreases attentional capacity through hyper-reaction to novel stimuli (Gumenyuk et al., 2010) or through lapses in attention (Drake et al., 2001; Lim and Dinges, 2010). In terms of hyper-reaction to stimuli, Anderson and Horne (2006) demonstrated that sleepiness enhanced participant distraction during the completion of a monotonous cognitive task. In terms of lapses in attention, a meta-analysis conducted by Lim and Dinges (2010) examined the effects of short-term sleep deprivation on cognitive variables, including simple and complex attention, processing speed, working memory, short-term memory, and reasoning and crystalized intelligence. They found that sleep deprivation produced significant differences in most cognitive domains; however, the largest effects were seen in tests of simple, sustained attention. Decreased attentional capabilities resulting from sleepiness therefore likely lead to cognitive distraction at work. Therefore, researchers should examine the impact that sleep has on withdrawal both at work and from work.

Third, one salient feature of the research on the interdependence of sleep and work is that, with a few exceptions (e.g., Guglielmi, Jurado-Gómez, Gude, and Buéla-Casal, 2014; Sivertsen et al., 2013; Sjösten et al., 2009; Ulfberg, Carter, and Edling, 2000), it has been based almost exclusively on nonclinical populations, or healthy individuals who do not manifest clinically diagnosed sleep problems. This might be a significant omission: The *International Classification of Sleep Disorders* (American Sleep Disorders Association, 2001) distinguishes more than 80 different sleep disorders and problems, with falling asleep or daytime sleepiness affecting 35–40 percent of the US adult population (Hossain and Shapiro, 2002). Not only might the clinical sleep problems interfere directly with work, but because they have a powerful influence on health (e.g., hypertension, heart disease, irregular heartbeat, heart failure, cerebrovascular disease, depression, and type 2 diabetes; Public Health Agency of Canada, 2009), there is the possibility of indirect effects on work, magnifying the importance of sleep for work.

Thus, it becomes important to understand how individuals with diagnosed sleep disorders cope with their work. Research suggests that obstructive sleep apnea impacts a number of work-related outcomes, including increased stress and burnout (Guglielmi et al., 2014), workplace accidents (Ulfberg et al., 2000), absenteeism (Sivertsen et al., 2008; 2013) and reduced productivity and performance (Mulgrew et al., 2007; Ulfberg, Carter, Talback, and Edling, 1996), and even subsequent sick leave and permanent work disability (Sivertsen et al., 2008; Sivertsen et al., 2013). Future research could also contrast the work-related outcomes of different sleep disorders such as sleep apnea, insomnia and narcolepsy. Last, by nature diagnosed sleep disorders are likely to be ongoing and chronic and therefore might result in unique work outcomes, making it important to contrast the effects of clinically diagnosed vs. everyday sleep problems.

Practical Implications

Our review suggests that two different types of interventions might be available to organizations. First, organizations may directly address job stressors (i.e., job demands and social relationships at work), and the scheduling of shift work (i.e., ensuring that rotating shifts are stable, rotate forward and are longer term) to improve sleep, and thereby health-related outcomes. Organizations could also examine how work-related cultural beliefs about sleep influence employees' sleep and well-being. For example, organizations could help to ensure that employees can recover from demanding work by not expecting emails to be answered at night or on the weekends (e.g. Barber and Santuzzi, 2015).

Another way in which organizations might be able to intervene is suggested by research on nurses' experience with what is referred to as "underpayment inequity" (Greenberg, 2006). A change in pay policy led to a reduction in pay for nurses in two hospitals but no pay reduction in two other hospitals. Not surprisingly, nurses who had experienced pay reductions not only reported feelings of pay unfairness, they also experienced greater insomnia. Supervisors of these nurses then received four hours of leadership training that focused on interactional justice; and this significantly reduced both the nurses' insomnia and feelings of being treated unfairly. These findings are of considerable significance from a practical perspective: The fact that both insomnia and feelings of injustice were reduced by only four hours of training, conducted in group sessions, means that organizations have a relatively inexpensive opportunity to enhance employees' sleep and well-being, and reduce their work stress.

Conclusion

We have shown how sleep and work are reciprocally related, and how both influence employees' psychological and physical well-being. In one way, this knowledge provides a unique challenge to organizations: These findings remind us how work affects well-being outside of the workplace, but they also show that a major cause of work stress and lack of work-related well-being lies outside of the organization. While organizations have traditionally been reluctant to engage in any interventions that might be seen as "meddling" in their employees' non-work, or private lives, minimal organizational interventions exist that can reduce work stress, and enhance employees' sleep and well-being (Greenberg, 2006; Kelloway and Barling, 2010). Given the stakes involved both for employees and their organizations, this is an opportunity not to be missed.

Note

1. For the purpose of this discussion, we consider work stressors together; more finite considerations about the effects of different forms of types of work stressors appear elsewhere (e.g., Barling, Kelloway, and Frone, 2005; Jex and Yankelevich, 2008).

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