Sleep and Social Behavior in Organizations: Implications for Job Performance

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Employee behavior varies within organizations and job roles. Organizational behavior scientists have devoted significant effort toward understanding predictors of this variability—especially concerning job performance. Past research identified environmental (e.g., job characteristics, work conditions) and individual differences (e.g., employee knowledge, skills, abilities, and other characteristics) that facilitate or hinder performance, but recent research seeks to understand *within-person* performance fluctuations (e.g., Beal, Weiss, Barros, & MacDermid, 2005; Dalal, Lam, Weiss, Welch, & Hulin, 2009). One research avenue resulting from this shift is the influence of sleep on employee behavior and organizational functioning.

Recent research on sleep and workplace behavior treats sleep as an outcome variable by studying how work characteristics (e.g., work overload, shift work) harm sleep (e.g., Åkerstedt, 2003; Linton, Kecklund, Franklin, et al., 2015). Although decades of extant research examines sleep's influence on various cognitive tasks (e.g., Lim & Dinges, 2010; Harrison & Horne, 1999, 2000), organizational behavior scientists have only recently started investigating sleep's influence on performance within organizations. As poor sleep negatively influences cognitive (Harrison & Horne, 1999, 2000; Lim & Dinges, 2010), emotional (Kahn, Sheppes, & Sadeh, 2013), and social functioning (Beattie, Kyle, Espie, & Biello, 2015; Gordon,

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Mendes, & Prather, 2017) outside the work context, poor sleep should also affect behavior at work.

We focus on how sleep (i.e., quantity, quality, consistency, and sleepiness[1]) and social behavior intersect within organizations to influence job performance. Job performance encompasses multiple workplace behaviors. Therefore, we first define job performance and discuss how sleep relates to various job performance components. Then we highlight variables that could explain sleep and job performance relationships (i.e., mediators) while considering under what conditions (i.e., moderators) sleep is more (or less) likely to influence job performance. Last, we analyze current research methodologies, provide suggestions for improving future research designs, and identify novel research directions. Even though organizational sleep research is in nascent stages, we draw from the larger body of scientific research (i.e., occupational health psychology, clinical psychology, social psychology, biopsychology, management, neuroscience, sleep medicine) to inform critical inquiry into this topic. We hope this chapter sparks future interdisciplinary research on sleep and social behavior in organizations.

Job Performance: Definition and Relationship with Sleep

Job performance includes all workplace behaviors influencing organizational functioning and goal obtainment that are evaluated (positive or negative; Campbell, 1990; Motowidlo, Borman, & Schmidt, 1997; Viswesvaran & Ones, 2000). Consistent with past work, we conceptualize job performance as having three dimensions: task performance, organizational citizenship behaviors, and counterproductive work behaviors (Motowidlo et al., 1997). Task performance reflects the job role's core required behaviors (e.g., duties included in a job description) and thus operationalizations differ by role.

Organizational citizenship behaviors are voluntary behaviors that improve the organizational environment either socially or psychologically (e.g., helping a coworker with job-related tasks, teamwork; Organ, 1997). Organizational citizenship behaviors typically are not rewarded via formal compensation mechanisms but require employees to go above and beyond core duties (Organ, Podsakoff, & MacKenzie, 2006). Researchers generally propose two dimensions comprising organizational citizenship behavior: 1) helping individuals (Williams & Anderson, 1991) or helping behaviors (e.g., assisting others after absences; Smith, Organ, & Near, 1983; Organ et al., 2006), and 2) compliance (e.g., punctuality, regular

[1] Sleep is a multidimensional construct, so we often need to specify which type of sleep measurement was used for each study in our review. Quantity refers to the amount of sleep (usually measured in minutes or hours), whereas quality refers to whether someone feels restored after a sleep period. Sleep consistency refers to having regular bed and wake times. Sleep quality, quantity, and consistency are all potential precursors to the concept of sleepiness, which has a physiological basis in terms of the drive to want to fall asleep. For a thorough review of these distinctions related to work behavior, see Mullins et al. (2014).

attendance; Smith et al., 1983; Organ et al., 2006) or contributions to the broader organization (e.g., protecting organizational assets; Williams & Anderson, 1991).

Counterproductive work behaviors are behaviors that harm organizations and/or employees. Counterproductive work behaviors also are multidimensional with some suggesting five dimensions (i.e., abuse, production, sabotage, theft, and withdrawal; Spector et al., 2006), and others proposing a two-dimension model (i.e., interpersonal and organizational deviance; Sackett & DeVore, 2001). Interpersonal deviance refers to behaviors directed toward organizational *members* (e.g., gossiping or insults). Organizational deviance focuses on behaviors directed at the organization and include property deviance (e.g., theft or property damage) or production deviance (absences, tardiness, or intentional poor performance). Across models, counterproductive work behaviors are purposeful (i.e., volitional) and cause the organization or organizational stakeholders harm (Spector et al., 2006). Consistent with the three-dimension view of job performance, we next focus on how sleep influences task performance followed by a discussion of sleep's relationship with organizational citizenship and counterproductive work behaviors.

Task Performance and Sleep

Core job tasks, and thus task performance, differ by job type. Because our focus is on *social* behavior within organizations, we limit our discussion of task performance to two areas of social task performance relevant to various jobs: leadership and emotion performance. Although we focus on these, we acknowledge that they are not a complete "task performance" definition,[2] which also must account for non-social organizational objectives (e.g., individual productivity, safety). For example, sleep deficits increase task completion errors (Kribbs & Dinges, 1994; Van Dongen & Dinges, 2005) and workplace accidents (Barnes & Wagner, 2009). Still, leadership and emotion performance involve common workplace interpersonal interactions (e.g., leader-follower and employee-customer/client interactions), contribute to individual and organizational objectives, and therefore are important to overall employee and organizational functioning.

Leadership and Sleep Numerous conceptualizations of leadership make examining sleep and leadership complex. To date, organizational research has examined sleep in the context of three leadership theories: Transactional, Transformational-Charismatic, and Leader-Member Exchange theory. Transactional leaders use rewards and corrective feedback to motivate performance (Bass, 1985), whereas transformational leaders inspire and motivate followers through a strong vision,

[2] The organizational science literature does not typically classify emotion performance as a type of task performance. However, emotion performance often involves required behaviors that are central to one's job in service positions (e.g., displaying positive emotions toward customers, even when feeling negatively) and are rewarded via formal compensation mechanisms (e.g., exceptional customer service bonuses), consistent with the definition of task performance.

integrity, charisma, and communal follower-leader relationships (House, 1977; Weber, 1947). Alternatively, Leader-Member Exchange theory holds that leaders interact with followers differently based on in-group and out-group membership. In-group followers hold unique, high quality relationships with the leader, characterized by trust, respect, obligation, and mutual benefit; out-group followers often have low quality leader relationships (Dienesch & Liden, 1986; Graen & Scandura, 1987; Graen & Uhl-Bien, 1995).

Sleep loss hinders adaptive leadership performance including both decreased transactional and transformational leadership (Barnes, Guarana, Nauman, & Kong, 2016; Olsen, Pallesen, Torsheim, & Espevik, 2016). Additionally, inconsistent sleep (i.e., longer sleep durations on weekends compared to weeknights) has been associated with lower peer-rated leadership performance (Gaultney, 2014). Sleep issues also seem to influence leader-follower relationship quality. When lacking sleep, both leaders and followers report lower leader-follower relationship quality (Guarana & Barnes, 2017). Overall, the dearth of research in this area and the breadth of literature suggesting that leadership influences follower job performance (e.g., Martin, Guillaume, Thomas, Lee, & Epitropaki, 2016; Wang, Oh, Courtright, & Colbert, 2011) justifies more research examining sleep's relationship to different leadership components.

Emotion Performance and Sleep As a core job duty, customer service employees are often required to display positive emotions and hide negative emotions to achieve organizational objectives (i.e., 'service with a smile'; Hochschild, 1983; Grandey, 2000). Emotion performance reflects the extent that employees' expressed emotions align with rules dictating acceptable workplace emotional expression (emotional display rules; Grandey & Gabriel, 2015). Such emotion performance predicts customer satisfaction, loyalty, referrals, and service quality perceptions (Groth, Hennig-Thurau, & Walsh, 2009; Hennig-Thurau, Groth, Paul, & Gremler, 2006; Pugh, 2001).

Research has focused on two "emotional labor" strategies employees may use to achieve emotion performance: (1) surface acting – faking emotions by modifying displayed expressions, and (2) deep acting – using emotion regulation strategies to change *both* felt and expressed emotions. Deep acting involves the display of authentic emotions via methods such as cognitive reframing or attentional shifting, whereas an example of surface acting includes smiling while still feeling frustrated. Deep acting generally predicts more positive performance outcomes and fewer negative outcomes compared to surface acting (Groth et al., 2009; Hülsheger & Schewe, 2011; Totterdell & Holman, 2003). This strategy distinction is important because the *perceived authenticity* of emotional displays predicts positive customer service outcomes (Hennig-Thurau, Groth, & Gremler, 2006; Wang et al., 2017). As sleep loss and poor sleep quality are detrimental to adaptive emotion regulation (for reviews see Budnick & Barber, 2015; Kahn et al., 2013; Palmer & Alfano, 2017), sleep should influence employees' abilities to effectively deep act at work, in turn, influencing emotion performance and customer service. In fact, in one study, sleep deprivation predicted decreased deep acting for leaders; however, sleep loss did not predict surface acting (Barnes, Guarana, et al., 2016).

Moreover, emerging evidence indicates that sleep loss alters individuals' workplace social information interpretations, which could affect one's ability to evaluate—or re-evaluate-the situations. Sleepy individuals interpret ambiguous information more negatively than non-sleepy individuals (Barber & Budnick, 2015; Ree & Harvey, 2006), and poor sleep is associated with reduced cognitive reappraisal abilities (an emotional regulation strategy; Mauss, Troy, & LeBourgeois, 2013). Thus, sleep might alter how employees interpret interactions and their ability to adaptively respond. Yet, sleep and emotion performance outcomes are relatively unexamined even though many countries have predominantly service-based economies.

Organizational Citizenship Behaviors and Counterproductive Work Behaviors

We are aware of only one study to date that has directly examined sleep and Organizational Citizenship Behaviors—behaviors such as assisting others in the organization and showing enthusiasm in one's work and organizational goals. One night of objectively measured sleep quantity (via polysomnography) was associated with greater next-day organizational citizenship behaviors directed toward the organization, but not those directed toward *individuals* in the organization (Study 1; Barnes, Ghumman, & Scott, 2013). Self-reported sleep quantity across five workdays also positively predicted *both* organizational citizenship behaviors directed toward the organization and toward individual organizational members (Study 2).

Counterproductive work behaviors cover a range of negative workplace behaviors typically categorized as interpersonal or organizational deviance. Supervisors with poor self-reported sleep quality across 10 days displayed increased abusive supervisory behaviors (e.g., yelling or being rude to a subordinate) indirectly through lower self-reported self-regulation ability (i.e., ego depletion; Barnes, Lucianetti, Bhave, & Christian, 2015). Sleep issues also correlate with unethical counterproductive work behaviors (for a review see Barber & Budnick, 2016). For instance, in one study, higher objective sleep quantity and self-reported sleep quality predicted fewer unethical workplace behaviors like cheating and taking credit for another's work (Barnes, Schaubroeck, Huth, & Ghumman, 2011).

Intentionally withholding effort (work withdrawal) is another type of counterproductive work behavior. Employees can physically (e.g., lateness, absenteeism) or psychologically withdraw (e.g., presenteeism, cyberloafing; LeBlanc, Barling, & Turner, 2014; for a review on sleep and work withdrawal see Carleton & Barling, 2016). Concerning physical withdrawal, state sleepiness predicts partial (e.g., arriving late, leaving early; Swanson et al., 2011) and full absenteeism (Åkerstedt, Kecklund, Alfredsson, & Selen, 2007; Philip, Taillard, Niedhammer, Guilleminault, & Bioulac, 2001). Sleep deprivation also predicts psychological withdrawal, such as concentration and attention problems (Anderson & Horne, 2006; Chuah et al., 2010; Lim & Dinges, 2010; Swanson et al., 2011). Poor sleep additionally facilitates

psychological withdrawal expressed as reduced work effort. For example, cyberloafing – internet use at work for non-work purposes – is associated with poor objective sleep (Wagner, Barnes, Lim, & Ferris, 2012). On the Monday directly following Daylight Savings Time (a sleep loss proxy) employees increased cyberloafing relative to the week prior and two weeks after (Wagner et al., 2012). In sum, poor sleep quality and quantity generally predict less counterproductive work behaviors (e.g., Christian & Ellis, 2011; Mullins, Cortina, Drake, & Dalal, 2014) and sleep quantity predicted more organizational citizenship behaviors (Barnes et al., 2013), but less is understood about the causes or boundaries around those relationships. Therefore, we next discuss potential mediators and moderators of the sleep-performance relationship.

From Sleep to Performance: Mediators and Moderators

The reviewed literature demonstrates a link between better sleep and more desirable social behaviors in organizations. Yet our understanding of those relationships' causal explanations and boundary conditions remains limited. Integrating empirical evidence across disciplines (e.g., organizational behavior, social psychology, neuroscience, sleep medicine) suggests that three mediator "classes" help explain sleep and social behavior relationships: (1) social cognitive processes, (2) affective states, and (3) self-regulatory processes. Indeed, multiple related and interacting mechanisms likely explain the sleep-performance link (see Fig. 1). Although the mechanisms we propose certainly influence each other, in any situation, the most salient mechanism(s) may depend on both the focal performance component and context. For example, the mechanism explaining sleep's relationship to organizational citizenship behaviors might differ from that explaining sleep's relationship to counterproductive work behaviors, and whether those relationships even exist might be partially determined by the organizational context. Below, we discuss each separate—but highly interrelated—mediator class that might explain why sleep influences job performance, with the caveat that considerable work remains to confirm these proposed mechanisms.

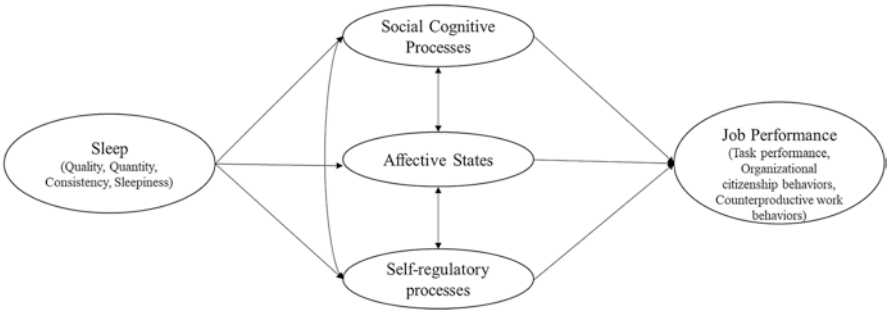

Fig. 1 Mediators of relations among sleep and job performance

Mediator Class 1: Social Cognitive Processes

A large body of research suggests sleep can influence various cognitive processes including attention, perception, memory, and decision-making (Alhola & Polo-Kantola, 2007; Harrison & Horne, 2000; Killgore, 2010). Growing evidence also suggests sleep influences *social* cognitive processes (Beattie et al., 2015; Gordon et al., 2017). Because organizational scientists already apply social cognitive principles to understanding leadership (e.g., leader-follower relations; Thomas, Martin, Epitropaki, Guillaume, & Lee, 2013; Implicit Leadership Theories; see Epitropaki, Sy, Martin, Tram-Quon, & Topakas, 2013; Lord & Maher, 1991), customer service interactions (e.g., Van Kleef, Homan, & Cheshin, 2012), and unethical work behaviors (Barber & Budnick, 2016), we suggest a similar approach to understanding relations among sleep and social-organizational behavior. We propose three social cognitive processes to help explain relations among sleep and social-organizational behavior: (1) attentional biases, (2) person perception, and (3) social judgment and decision-making processes.

Attentional and Memory Biases Sleepiness affects vigilance, in that important situation-relevant information can be overlooked (Budnick & Barber, 2015; Durmer & Dinges, 2005). This *attentional bias* can result in a failure to recognize the ethical implications of one's own or another's actions (Barber & Budnick, 2016). In fact, sleep loss is related to moral awareness (Barnes, Gunia, & Wagner, 2015); individuals are less likely to recognize that a situation holds moral implications when sleepy. Relatedly, poor sleep quality fosters a memory bias for negative information (Gobin, Banks, Fins, & Tartar, 2015). Employees could feel that aggressive responses toward the organization or others in the organization are justified when influenced by a sleepiness-induced negative attentional bias (i.e., only attending to and remembering supervisor, coworker, or customer negative behaviors). In other words, moral awareness might mediate a relationship between poor sleep and abusive supervision, as well as poor sleep and counterproductive work behaviors.

Person Perception Sleep also influences person perception (i.e., one's perception and impression of others; Gordon et al., 2017). For instance, sleep may influence emotion recognition which involves processing emotional stimuli, including identifying and interpreting others' emotions (Beattie et al., 2015; Killgore, Balkin, Yarnell, & Capaldi, 2017). Sleep deprivation decreases the speed and accuracy of facial expression recognition (positive, negative, or neutral) and ambiguous (neutral) expressions are especially subject to those deficits (Beattie et al., 2015; Maccari et al., 2014; van der Helm, Gujar, & Walker, 2010).[3] Outside of the organizational

[3] In a recent study, Holding et al. (2017) found no effect of self-reported sleep quality, quantity or manipulated sleep deprivation on emotion recognition accuracy using both video and audio-based stimuli. These authors suggest lack of replication may be due to use static stimuli and morphed images in prior research (versus multimodal stimuli) or publication bias. However, they also speculate sleep may influence recognition of emotion *intensity* (versus identification of the displayed emotion) which was not measured in their research.

literature, worse sleep in one partner predicted less empathic accuracy (i.e., identification of others' emotions) during conflict for *both* partners in the romantic relationship (Gordon & Chen, 2014). Additionally, one night of sleep deprivation led to decreased accuracy of identifying happiness and sadness, but not surprise, fear, disgust, or anger (Killgore et al., 2017). Killgore et al., concluded sleep deprivation may be less likely to influence reactions to urgent or threatening situations, but rather may impair social-affiliative processes and less urgent relationship processes—such as work-related social interactions.

From the Emotions as Social Information perspective (EASI; Van Kleef, 2009), affective displays influence perceivers' behaviors and social judgments by providing information about others' intentions and goals or by influencing perceiver affect via emotional contagion and/or increased interpersonal attraction (Van Kleef, 2009). For example, employees in service settings can use customers' positive or negative emotional displays as information indicating they should maintain or adjust behavior, respectively, in order to increase customer satisfaction (Mattila & Enz, 2002). Additionally, accurate emotion recognition appears critical for transformational leadership. Correctly identifying followers' emotions helps to effectively communicate and inspire, as well as develop high quality leader-follower relationships (Caruso, Mayer, & Salovey, 2002; Rubin, Munz, & Bommer, 2005). Further, follower sleep deprivation decreases perceptions of leader charisma (Barnes, Guarana, et al., 2016), which could reduce perceptions of leader effectiveness.

Social Judgment and Decision-making Sleep not only influences what social information individuals attend to and how they perceive this information, but also how they interpret/judge and make decisions regarding social information (see Harrison & Horne, 2000). The term "social decision-making" refers to decisions affecting both ourselves as well as others (Lee & Harris, 2013; Rilling & Sanfey, 2011). Such decisions involve both "non-social" processes (e.g., risk/reward processing) as well as social processes (e.g., inferring others' psychological states; Lee & Harris, 2013). Social processes also include decisions related to trusting others, helping others, following social norms, and fairness (Rilling & Sanfey, 2011), all of which are relevant to job performance.

For instance, poor sleepers use more heuristics or mental shortcuts, such as stereotyping, which can in turn lead to prejudice (Ghumman & Barnes, 2013). Sleepiness also fosters a negative interpretive bias; that is, when faced with ambiguous (or clearly) negative social information sleepy individuals provide especially negative interpretations relative to rested individuals (Barber, Barnes, & Carlson, 2013; Barber & Budnick, 2015; Ree & Harvey, 2006; Tempesta et al., 2010). Within the organizational context, increased sleepiness predicts heightened unfairness interpretations when exposed to ambiguous or clearly unfair workplace information (Barber & Budnick, 2015). Those findings align with research showing sleep deprivation leads to decreased trust and heightened unfairness sensitivity when interacting socially (Anderson & Dickinson, 2010). Further, sleep deprived individuals are more likely to place blame on others during frustrating situations and less likely to offer solutions or attempt to make amends with others

(Kahn-Greene, Lipizzi, Conrad, Kamimori, & Killgore, 2006). Finally, sleep deprivation can lead to deficits in moral decision-making (Olsen, Pallesen, & Eid, 2010; Tempesta, Couyoumdjian, Moroni, et al., 2011). As sleepier individuals tend to interpret ambiguous information as especially negative, those interpretations should influence their social behavior in organizational settings (Budnick & Barber, 2015). For instance, interpretive biases may be particularly relevant in mediating relations among sleep and non-task performance behaviors (Barber & Budnick, 2016) because perceptions of workplace fairness have been positively linked to organizational citizenship behaviors and negatively linked to counterproductive work behaviors (Colquitt et al., 2013; Dalal, 2005). However, there is currently no direct evidence empirically supporting the link between sleep, fairness perceptions, and job performance outcomes.

Finally, given attention, perception, judgment, and decision-making are interrelated, sleep may simultaneously influence these processes. For example, attentional biases might contribute to faulty decision-making (e.g., as neutral/negative information is more heavily weighted) and negative judgments toward others (e.g., subordinate perceptions of leaders). In the workplace, sleepy leaders that engage in more abusive supervisory behaviors (Barnes, Gunia, et al., 2015) might do so because they attend to, remember, and more heavily weight followers' actions that are negative or are ambiguously negative (Barber & Budnick, 2015; Budnick & Barber, 2015).

Mediator Class 2: Affective States

Social Task Performance Much research examines affective states' and related processes' (e.g., display of affect; see discussion on self-regulatory processes below) influence on work behaviors (e.g., Beal et al., 2005; Dalal et al., 2009; Weiss & Cropanzano, 1996), in particular, social performance behaviors (Barsade & Gibson, 2007; Van Knippenberg, Van Knippenberg, Van Kleef, & Damen, 2008). Sleep's importance for mood/emotional states is well-documented (e.g., Beattie et al., 2015; Fairholme & Manber, 2015; Kahn et al., 2013; Pilcher & Huffcutt, 1996). When individuals sleep poorly they experience more negative (Dinges et al., 1997; Drake et al., 2001; Križan & Hisler, 2019) and less positive affect (Bower, Bylsma, Morris, & Rottenberg, 2010; Talbot, McGlinchey, Kaplan, Dahl, & Harvey, 2010).

Direct evidence links sleep to leadership via negative affective states. Specifically, rested leaders display less hostility which improves leader-follower relationship quality (Guarana & Barnes, 2017). Sleep deprivation decreases follower positive affect and perceptions of charismatic leadership (Barnes, Guarana, et al., 2016). Regarding customer service performance, poor sleep that increases employees' negative affect could disrupt attempts to bridge gaps between experienced and displayed emotions (Gish & Wagner, 2016). Sleepy employees might have difficulty meeting social performance expectations (e.g., to express friendliness toward customers), because of increased negative affect combined with more emotion regulation difficulties.

Organizational Citizenship Behaviors Research suggests job satisfaction mediates the sleep to organizational citizenship behavior relationship (Barnes et al., 2013). Job satisfaction is an attitudinal construct comprised of both affective (i.e., positive mood) and cognitive components (Judge & Kammeyer-Mueller, 2012). Evidence suggesting positive affect is associated with organizational citizenship behaviors (Dalal et al., 2009; Fisher, 2002; Miles, Borman, Spector & Fox, 2002) might indicate that positive affective states also mediate relations between sleep and organizational citizenship behaviors. Still another plausible mediator of relations among sleep and organizational citizenship behaviors is work engagement, which is a positive affective-motivational state characterized by vigor, dedication, and absorption (Schaufeli, Salanova, Gonzalez-Romá, & Bakker, 2002). Work engagement increases organizational citizenship behaviors (Rich, LePine, & Crawford, 2010), but sleep problems predict decreased work engagement (Hallberg & Schaufeli, 2006) and better sleep hygiene and sleep quality predict more work engagement (Barber, Grawitch, & Munz, 2013; Kühnel, Zacher, de Bloom, & Bledow, 2017). Furthermore, *supervisor* sleep quality correlates with decreased *employee* work unit engagement (Barnes, Lucianetti, et al., 2015) suggesting supervisor sleep may also influence employee organizational citizenship behaviors, although this is not yet empirically confirmed.

Counterproductive Work Behaviors Regarding counterproductive work behaviors, empirical evidence suggests hostility mediates the relationship between sleep and counterproductive work behaviors (Christian & Ellis, 2011). Another potential negative affective state that may mediate relations among sleep and counterproductive work behaviors includes anxiety, which correlates with both sleep problems (Swanson et al., 2011) and counterproductive work behaviors (Fox, Spector, & Miles, 2001). However, an empirical test of this has yet to emerge. A different alternative mechanism might relate to affective functioning; when sleepy, individuals might have greater difficulty interpreting the cause of their own affective states—for example, they might attribute negative emotions to an aspect of the organizational environment instead of to poor sleep (Barnes, Guarana, et al., 2016). If sleepiness is the cause of negative affect, but employees misattribute it to the organizational environment, sleepy individuals might engage in counterproductive work behaviors.

Mediator Class 3: Self-Regulatory Processes

Self-regulation Definition and Relationship to Job Performance Self-regulation is a broad construct referring to effortful goal-focused control over cognition, affect, and/or behaviors. Sleep has a well-established influence on higher-order executive self-regulatory functions (e.g., working memory, attention, inhibition; Chuah, Venkatraman, Dinges, & Chee, 2006; Killgore, 2010; Lim & Dinges, 2010). Although listed separately, self-regulatory processes are intertwined tightly with the affective and social cognitive processes discussed previously. We discuss

self-regulatory processes separately because they are integral to job performance (Beal et al., 2005; Porath & Bateman, 2006) and are commonly discussed as a potential mediator of sleep and workplace outcomes (e.g., Barnes, 2012).

Effective behaviors in each component of job performance involve self-regulation as they require motivating goal-directed and inhibiting non-goal-directed behaviors. For example, social task performance (e.g., leadership and emotion performance) necessitates emotion regulation – controlling emotional experiences and displays. Effective emotion regulation should also predict high emotion performance. Given customer and leader perceptions of employees are critical to successful social task performance, much research examines the association between affective *displays* (as opposed to affective experiences) and leadership (e.g., Trichas, Schyns, Lord, & Hall, 2017). Effective social task performance also involves other aspects of self-regulation such as goal-monitoring and inhibitory control. For example, emotion performance requires monitoring the discrepancy between affective experiences and display rules (i.e., goal monitoring). If a discrepancy occurs, emotion regulation strategies (e.g., deep or surface acting) are key to inhibiting maladaptive responses (e.g., yelling at a customer/employee). Thus, sleep issues can interfere with multiple self-regulatory aspects key to social task performance including goal monitoring, emotion regulation, and inhibitory control (e.g., Križan & Hisler, 2016).

Self-regulation Theories Although multiple self-regulatory theories exist, two seem to be relevant contenders; the self-regulatory depletion model (i.e., strength model) and shifting priorities models (Križan & Hisler, 2016; Pilcher, Morris, Donnelly, & Feigl, 2015). The depletion model proposes that individuals' self-regulatory *ability* or energy is limited; adequate sleep replenishes self-regulatory resources (e.g., Barnes, 2012). When employees "deplete" resources via effortful work activities, they must sleep to restore resources required for subsequent self-regulation. The proposition that employees cannot self-regulate for effective job performance without sleep is characteristic of a self-regulation depletion approach (e.g., Baumeister, Vohs, & Tice, 2007). To date, most organizational behavior research has adopted the self-regulatory depletion model by suggesting performance results from employees' self-regulatory *ability*. For instance, counterproductive work behaviors result from self-regulatory failure due to depletion (e.g., Barnes, Gunia, et al., 2015; Christian & Ellis, 2011).

Yet, rather than being *unable* to self-regulate, employees might just be *unwilling*. The shifting priorities model of self-regulation proposes that employees can adaptively self-regulate but choose not to. Evidence contradictory to the strength model suggests that incentives override ego depletion (Vohs, Baumeister, & Schmeichel, 2012) and sleep-related vigilance deficits (Horne & Pettitt, 1985). Moreover, ego depletion *perceptions* influence performance, regardless of actual depletion (Clarkson, Hirt, Jia, & Alexander, 2010; Draganich & Erdal, 2014). Because organizational behavior research typically collects self-reports of ego depletion, some performance results might be attributed to sleep-related motivation variations. When experiencing sleepiness, employees might think that they are unable to

self-regulate and that could provide a "self-license" for negative behavior (e.g., counterproductive work behaviors, violating display rules; e.g., Križan & Hisler, 2016). Finally, researchers also have been unable to provide evidence for what "resource" is being depleted (see Inzlicht & Berkman, 2015), especially given central claims of an energy mechanism have been undermined by later research (i.e., glucose; Dang, 2016). Other studies even question the robustness of the central depletion behavioral effect observed in past research (Carter, Kofler, Forster, & McCullough, 2015; Carter & McCullough, 2014; Hagger et al., 2016).

Alternatively, sleepy employees might reprioritize focal goals and recruit compensatory mechanisms to motivate goal pursuit, an assertion consistent with work showing fewer performance decrements on complex compared to simple tasks when sleepy (Harrison & Horne, 2000; Hockey, 2013; Križan & Hisler, 2016). Stated differently, sleepy employees might identify and focus efforts on achieving the most critical goals and withhold citizenship effort for sustained task performance despite sleep problems (Križan & Hisler, 2016). This discussion presents at least two potential self-regulatory mediators between sleep and job performance. Sleepiness might predict increased task performance (but decreased organizational citizenship behaviors) indirectly via self-regulatory beliefs (i.e., limited or not) and/or ego-depletion perceptions.

Moderators of the Sleep-Job Performance Relationship

Caffeine Intake Caffeine mitigates attention and vigilance deficits after poor sleep (Lorist, Snel, Kok, & Mulder, 1994; Patat et al., 2000; Reyner & Horne, 1997; Van Dongen et al., 2001; Wright, Badia, Myers, & Plenzler, 1997) and could buffer job performance against sleep loss—at least on some tasks. Although caffeine seems to consistently provide benefits for simple attention and vigilance tasks, caffeine's relationship with sleep and social behavior appears more nuanced. In social contexts, caffeine may enhance sleep deprived participants' differentiation of complex emotional expressions' subtleties (Huck, McBride, Kendall, Grugle, & Killgore, 2008). Caffeine also improves mood following sleep loss (e.g., reduced fatigue and irritability; Grant et al., 2018; Lieberman, Tharion, Shukitt-Hale, Speckman, & Tulley, 2002; Penetar, McCann, & Thorne, 1993) and reduces depletion to influence social performance (e.g., counterproductive work behaviors such as deception; Welsh, Ellis, Mai, & Christian, 2014). Further, caffeine use leads to less risky-decision making and impulsivity following sleep deprivation (Killgore, Kamimori, & Balkin, 2011). However, some studies find no effect of caffeine on some executive functions (Killgore, Kahn-Greene, Grugle, Killgore, & Balkin, 2009), or moral decision-making speed (Killgore et al., 2007) following sleep deprivation. Further, others report that caffeine increases anxiety and social threat sensitivity (Smith, Lawrence, Diukova, Wise, & Rogers, 2012). Those results hold implications for different dimensions of job performance as caffeine could attenuate sleep-related deficits at work, or potentially even enhance negative attentional or interpretive

biases by increasing anxiety and threat sensitivity. Importantly, both the dose of caffeine as well as the amount of sleep loss may also influence whether and how caffeine affects performance (e.g., Bonnet et al., 2005; Roehrs & Roth, 2008). Thus, various factors (e.g., task type, caffeine dose, amount of sleep loss) may interact with caffeine use to influence social-organizational behavior.

Task Type and Job Position Sleep research emphasizes the differential effects of poor sleep on various cognitive and emotional functions (e.g., Harrison & Horne, 2000; Killgore, 2010; Lim & Dinges, 2010; Nilsson et al., 2005; Pilcher & Huffcutt, 1996; Tucker, Whitney, Belenky, Hinson, & Van Dongen, 2010). Given different cognitive functions underlie different tasks, sleep and job performance relationships should differ by task type (e.g., Mullins et al., 2014; Pilcher & Huffcutt, 1996). For example, poor sleep heavily influences creative thinking and problem-solving tasks via reduced prefrontal cortex functioning (Barnes & Hollenbeck, 2009; Durmer & Dinges, 2005). That influence is even greater for novel or difficult tasks relative to well-learned, routine tasks (Bonnet, 2011; Mullins et al., 2014).

In team contexts, task interdependency might alter the relationship between sleep and team performance. Interdependent tasks require unique contributions from team members toward a superordinate goal. By contrast, independent or additive team tasks are ones in which each member contributes to an overall team output and no member's contribution is identifiable. Preliminary research suggests that interdependent tasks mitigate the influence of poor sleep on task performance. When identifiable and responsible for a unique contribution, individuals appear to increase performance motivation since low effort is easily noticed by others (Baranski et al., 2007). Alternatively, if a sleepy employee is under-performing, non-sleepy team members might increase effort to compensate and safeguard performance levels (Barnes & Hollenbeck, 2009). However, in an independent team task context (i.e., all employees complete identical tasks), poor sleep increases social loafing (i.e., lower effort when working in a group versus alone; Hoeksema-van Orden, Gaillard, & Buunk, 1998). Because individual contributions are unidentifiable for independent team tasks, individuals can reduce efforts without fear of potential social consequences. In fact, providing individual performance feedback mitigates poor sleep's negative influence on both task and team performance (Hoeksema-van Orden et al., 1998).

Perhaps particularly socially relevant, sleep deprivation's negative mood induction seems even stronger than its detrimental influence on cognitive and motor performance (Pilcher & Huffcutt, 1996). Therefore, poor sleep may be more strongly related to job performance for employees working in jobs characterized by high levels of emotional labor (e.g., customer service and client-facing employees). Additionally, effective leadership also heavily relies on adaptive emotional functioning (e.g., inspiring and motivating), which poor sleep might influence more heavily than non-social job performance components (e.g., individual productivity).

Chronotype Misalignment Individuals typically self-identify as a morning or night person, which is one chronotype indicator. Chronotype refers to a biologically-based (circadian) rhythm toward morning/evening alertness. A mismatch between

one's chronotype and work schedule should exacerbate sleep loss' negative effects on social cognitive, affective, and self-regulatory processes. Research suggests circadian processes (which determine chronotype) influence affect (Boivin, 2000; Murray et al., 2009), alertness (Dijk, Duffy, & Czeisler, 1992) and cognitive performance (Dijk et al., 1992). Regarding social behavior, the *morning morality effect* (Kouchaki & Smith, 2014) suggests ethical behavior is more likely in the morning than evening; however, one's chronotype qualifies that effect. Although morning types exhibit the morning morality effect, evening types are most ethical in the evening (Gunia, Barnes, & Sah, 2014). Thus chronotype-schedule fit might moderate relationships between sleep and unethical (Barber & Budnick, 2016) or counterproductive work behaviors (see also Randler, chapter "Chronotype and Social Behavior", this volume).

Closely related to the above, many employees' work schedules disrupt their normal circadian rhythm resulting in lost sleep on work days (i.e., sleep debt), which is recuperated by sleeping longer on non-work days. The degree to which one's work schedule is chronically misaligned with one's circadian rhythm is called *social jetlag*, and is commonly observed in evening types (Wittmann, Dinich, Merrow, & Roenneberg, 2006) and/or shift workers (Juda, Vetter, & Roenneberg, 2013). For instance, emerging work suggests circadian misalignment in shift workers is associated with increased procrastination (Kühnel, Sonnentag, Bledow, & Melchers, 2018). Further, social jetlag moderates a sleep quality and procrastination relationship; poor sleep quality predicts procrastination for socially jetlagged employees (Kühnel, Bledow, & Feuerhahn, 2016). Research has yet to examine if sleep quality (or quantity) and social jetlag interact to predict social performance behaviors like leadership effectiveness, emotion performance, or citizenship behaviors.

Personality In addition to external influences, stable individual differences (e.g., personality) likely render individuals more or less vulnerable to poor sleep's negative outcomes. For instance, sleep deprivation harms extraverts' cognitive and psychomotor functioning on vigilance tasks relative to introverts (Killgore et al., 2007; Taylor & McFatter, 2003). However, that effect is only observed during daytime social interactions; when socially isolated, no differences emerged between introverts and extraverts on vigilance performance (Rupp, Killgore, & Balkin, 2010). In team settings (or highly socially interactive jobs) extraverts might actually be at a greater performance disadvantage following sleep loss than introverts, at least concerning vigilance tasks (e.g., TSA agents scanning airport luggage together). Alternatively, sleep-deprived extraverts in socially-enriched environments might perform worse on vigilance tasks but better on social interaction tasks (e.g., customer service, sales performance) than introverts. As extraverts may be energized by social interaction (Cunningham, 1988), interacting when sleepy might exhibit similar effects on social tasks as those observed for caffeine on vigilance tasks. Given that some individual differences (e.g., trait negative/positive affectivity, self-control) directly influence organizational citizenship behaviors and counterproductive work behaviors (Kaplan, Bradley, Luchman, & Haynes, 2009), examination of personality's influence on the sleep and social performance relationship is warranted.

Dyad Tenure For some employees, high performance means developing high-quality relationships with relevant colleagues and stakeholders (e.g., followers in leader-follower relationships, customers, clients). As Leader-Member Exchange theory suggests, the dyadic relationship among a leader and follower develops over-time and eventually stabilizes once individuals learn more about each other. In the beginning of the relationship, however, individuals may rely heavily on social and environmental cues (e.g., emotional expressions; Guarana & Barnes, 2017) in understanding the other person and the quality of their relationship. Further, in forming impressions, individuals tend to attribute others' behaviors to personality or stable characteristics instead of situational factors (i.e., the fundamental attribution error). Because of this, sleep may be more likely to influence relationship quality early in the relationship versus once the relationship is stabilized (e.g., attributing a leader's negative expressions to internal characteristics versus poor sleep). Testing this specific question, Guarana and Barnes (2017) found dyad tenure moderated the relationship between *follower* sleep quantity and leader perceptions of relationship quality, such that there was a positive relationship *only* for newer dyads. However, tenure did not influence the positive relationship between *leader* sleep quantity and follower perceptions of relationship quality. Whether such findings may extend to the customer service context is a relevant question not yet empirically examined.

Organizational Norms Organizations, leaders, and/or jobs requiring or rewarding long working hours and constant connectivity (e.g., via e-mail or messaging platforms) contribute to employees' poor sleep (Barber & Jenkins, 2014; Barnes, Jiang, & Lepak, 2016; Lanaj, Johnson, & Barnes, 2014; van der Hulst, 2003). Under those conditions, employees might expend compensatory effort to perform for *short-term* productivity (e.g., vigilance tasks; Doran, Van Dongen, & Dinges, 2001) at the expense of long-term sustainable performance. In fact, immediate productivity *increases* may result when employees restrict sleep to work more (Barnes, Jiang, et al., 2016). Yet a point exists at which such behavior becomes unsustainable and compensatory efforts fail to buffer poor sleep's influence on performance (Doran et al., 2001; Meijman, 1997). Thus, employees adhering strictly to norms for long work hours and constant connectivity paradoxically facilitate further performance decrements as poor sleep's negative effects accumulate and worsen with time (Hursh et al., 2004). Moreover, as sleep debt increases recovery time to return to baseline performance also increases (Barnes, Jiang, et al., 2016; Rupp, Wesensten, & Balkin, 2010) likely leading to decreasing performance across workdays.

Perhaps even more concerning, chronically sleepy employees have greater negative health risks, such as burnout (Armon, Shirom, Shapira, & Melamed, 2008; Söderström, Jeding, Ekstedt, Perski, & Åkerstedt, 2012), further costing the organization through absenteeism and/or turnover (e.g., Swider & Zimmerman, 2010). Even though organizational norms prioritizing work over sleep initially buffer sleep loss' negative performance influence, over time those norms exacerbate the relationship between poor sleep and performance decrements (Barnes, Jiang, et al., 2016).

Future Directions: Understudied Topics and Methodologies

The above discussions on mediators and moderators suggest several gaps in the literature and questions for future research. Below we review five broad areas in need of further investigation in terms of both understudied topics and methodological approaches. Although there are many possible avenues for research in this area, we believe these five will most critically advance the literature on sleep and social behavior in organizations.

Multilevel Approaches Beyond the Individual

The topic of sleep and social behavior in organizations is inherently multilevel as it involves biological and psychological processes nested within individuals, who may be nested within dyads (i.e., supervisor-employees), which are also nested within both teams and organizations. Although our review highlighted some multilevel research designs addressing sleep and organizational behavior questions, they tend to be limited to within-person approaches using daily diary or experience sampling designs (e.g. Barnes, Gunia, et al., 2015; Barnes, Lucianetti, et al., 2015; Kühnel et al., 2016) or dyadic designs (e.g., lead-follower relations, employee-customer relations; for a review and examples of approaches applied to organizationally-relevant dyads see Krasikova & LeBreton, 2012). Following others' suggestions (Faber, Häusser, & Kerr, 2017; Gordon et al., 2017), depending on one's research question, research examining sleep in the context of teams and organizations would benefit from social network methodology (for a review see Brass, Galaskiewicz, Greve, & Tsai, 2004) and/or the use of data analytic techniques such as multilevel modeling that make maximal use of group level data. Though multilevel research is difficult and time-consuming to conduct (for resources see Kerr & Tindale, 2004; Kozlowski & Klein, 2000), such designs are crucial given the importance of both team and organizational factors on behavior. We highlight a few examples of each of these below.

Team Performance Team-based work is ubiquitous in organizations; yet, there is little empirical research to date on the effects of poor sleep on team performance (for theoretical reviews on sleep and team performance see Barnes & Hollenbeck, 2009 and Faber et al., 2017). A key takeaway from the small body of literature is that the impact of poor sleep on team performance will differ depending on various aspects of the team and aspects of the task. For example, Barnes and Hollenbeck (2009) propose the link between sleep deprivation and team performance will depend on the number of rested vs. sleep deprived team members, the task type (e.g., decision-making versus problem solving), the team composition and structure (e.g., diversity of the members in terms of areas of expertise or level), and social characteristics (e.g., trust among team members). Analogous to the effects on individual performance, a single team member's poor sleep can contribute to decreased

individual productivity, increased errors, poor communication of important information, or increased interpersonal conflict. However, non-sleepy team members could compensate for the poor performance of sleepy team members, mitigating the effects of poor sleep on team performance. In other cases, non-sleepy team members may purposefully withhold effort so as not to encourage free-riding and be taken advantage of by a sleepy member (i.e., the *sucker effect*; Barnes, 2011; Faber et al., 2017; Kerr, 1983), thereby exacerbating the effects of poor sleep on team performance. Furthermore, if that sleepy team member happens to be the team leader, the influence of their errors or poor decision-making may be much greater than if that team member is more peripheral (i.e., less impactful) to the group. Clearly this topic is complex, and research is needed to test these and other propositions on the topic of sleep and team performance (see Barnes & Hollenbeck, 2009).

Organizational-Level Factors Ironically, the body of empirical research on relations among sleep and social behavior in organizations is largely missing examinations of how organizational-level variables influence these relations. Features unique to organizational settings are likely to have a direct influence on sleep, such as work-family balance policies (e.g., Crain, Brossoit, & Fisher, 2018) and policies regarding payment reductions (e.g., Greenberg, 2006). Organizational factors may also buffer or exacerbate relations among sleep and social behavior. As discussed previously, it is possible aspects of the organizational environment may motivate employees to exert extra effort to perform well despite poor sleep, temporarily reducing negative relationships between sleep and social-organizational behavior (e.g., organizational norms prioritizing work over sleep; Barnes, Jiang, et al., 2016). One example not previously considered is workplace formality. For instance, the influence of poor sleep on social behavior may be more pronounced in organizations that have an "informality climate" as individuals feel less pressure to conform to strict behavioral rules and thus, are less motivated to act in an appropriate way when sleepy (for an analogous hypothesis see Andersson and Pearson (1999) on the incivility spiral). In formal workplaces, sleepy employees may exert extra effort to display acceptable behaviors, in turn mitigating the effects of sleep on social behavior—at least in the case of minor sleep deficiency. In the case of severe sleep deficiency, it is possible deviation from organizational norms will be most relevant in formal workplace climates, and in turn, *more* disruptive to performance.

Experimental Designs Focused on Interventions

As demonstrated throughout our review, research to date on sleep and social-organizational behavior generally converges on the finding that poor sleep is associated with fewer positive outcomes and more negative outcomes. Much of this work relies on cross-sectional data or longitudinal designs not assessing directional relationships, as experimentally manipulating sleep deprivation (i.e., negative sleep interventions) in organizations is fraught with ethical considerations (Barber, 2017).

We suggest experiments can be used in several other ways to advance the literature on sleep and social-organizational behavior. First, as manipulation of work-related variables (e.g., culture, policies, job characteristics) in an organizational setting is often unfeasible and/or unethical, experimental designs using laboratory simulations can be used to examine the interactive effect of organizational-level factors on relations among sleep and social-organizational behavior. This research can aid in the identification of variables that can mitigate the negative impact of sleep. Second, increased use of experiments will help identify mechanisms explaining relations among sleep and social-organizational behavior (i.e., mediators). The majority of research in this area measures mediators via self-report questionnaires (e.g., self-reported depletion, self-reported affect). Using an experimental procedure to manipulate a proposed mechanism provides a stronger test of the mediating process (similar to the *moderation-of-process* design; see Spencer, Zanna, & Fong, 2005). Such designs can aid in theory-building by clarifying *why* sleep contributes to certain social-organizational outcomes. Finally, whereas research has successfully identified a multitude of negative outcomes associated with poor sleep, research on positive sleep interventions (i.e., interventions aiming to improve sleep; Barber, 2017) is lacking. However, authors have identified several promising intervention targets via research on antecedents of poor sleep (e.g., organizational norms, late-night technology use, emotional labor; Barnes, 2011; Lanaj et al., 2014; Wagner, Barnes, & Scott, 2014).

Although few studies have actually tested the effectiveness of sleep interventions in organizational settings, sleep interventions have been examined in populations outside the workplace (e.g., students, Barber & Cucalon, 2017; Brown, Buboltz, & Soper, 2006; individuals with insomnia; Seyffert et al., 2016; van Straten et al., 2018; adults without sleep disorders; Murawski, Wade, Plotnikoff, Lubans, & Duncan, 2018). As such, this area is particularly suitable for cross-discipline collaboration. Below we discuss the limited intervention research that exists in the organizational behavior literature organizing our discussion into two sections (per Barber, 2017): interventions that directly target sleep processes and interventions indirectly targeting sleep.

Interventions Directly Targeting Sleep In some instances, sleep interventions developed for clinical populations outside of the workplace may be feasibly and effectively implemented in organizational settings. For instance, Barnes, Miller, and Bostock (2017) examined the effects of the internet-based version of cognitive-behavioral therapy for insomnia (CBT-I) which has been successfully employed in clinical populations (Ritterband, Thorndike, Ingersoll, et al., 2017; Seyffert et al., 2016; van Straten et al., 2018). CBT-I involves reframing maladaptive thoughts regarding sleep as well as changing unhealthy sleep-related behaviors. In an employee sample, the ten-week intervention increased organizational citizenship behaviors and job satisfaction and decreased interpersonal deviance via decreased insomnia and increased self-control (Barnes et al., 2017). Burton et al. (2016) tested a five-month web-based sleep hygiene education intervention (called *Healthy Sleep for Healthy Living*) in a sample of employees and found improved

self-reported sleep quality and quantity and fewer self-reported workplace limitations (i.e., time management difficulties, mental/interpersonal limitations, productivity limitations) due to emotional or physical problems. Similar sleep hygiene education interventions that researchers may consider adapting and testing in organizational settings include the Sleep Treatment and Education Program for Students (STEPS; Brown et al., 2006) and the modified STEPS intervention (STEPS-TECH; Barber & Cucalon, 2017) which includes a component addressing sleep-disruptive technology use.

Interventions Indirectly Targeting Sleep Other research has tested interventions indirectly targeting sleep through other work- and health-related factors. One way to intervene on employee sleep is through supervisor behavior. Greenberg (2006) tested the effects of an interactional justice training (IJT; i.e., training in the fair interpersonal treatment of employees) in nurses' supervisors on insomnia in underpaid nurses. Nurses whose supervisors received the training reported fewer insomnia symptoms compared to nurses whose supervisors did not receive the training. As IJT has also been associated with social behavior in organizations (i.e., increased organizational citizenship behaviors; Skarlicki & Jones, 2002; decreased counterproductive work behaviors; Greenberg, 1990), such interventions may be dually effective in improving both sleep and performance.

A second intervention indirectly targeting sleep through both employees and their managers includes the STAR (Support, Transform, Achieve, Results) intervention which is aimed at improving workplace culture by increasing employees' control over their time and family supportive supervisor behaviors (i.e., behaviors supporting the effective management of employees' family and home lives). The STAR intervention improved actigraphy-assessed sleep quantity and self-reported perceptions of sleep insufficiency (but not actigraphy-assessed sleep quality or insomnia symptoms) in a sample of IT employees (Olson et al., 2015). However, there were no effects of the STAR intervention on sleep outcomes in a sample of extended-care, home nursing employees (Marino et al., 2016). Future research might consider examining an intervention directly targeting organizational norms surrounding sleep or supervisor support of healthy sleep practices (termed "sleep leadership"; Gunia, Sipos, LoPresti, & Adler, 2015), and how these influence employee sleep and in turn, social behavior. Indeed, one study found sleep leadership is associated with improved sleep among deployed soldiers and in turn, improved unit climate (i.e., unit morale and cohesion; Gunia et al., 2015).

Outside the organizational behavior literature, interventions targeting other health behaviors such as exercise and nutrition have been shown to improve sleep (e.g., Banno et al., 2018; Peuhkuri, Sihvola, & Korpela, 2012). Such interventions could also be feasibly integrated into workplace wellness programs or implemented on their own to improve employee sleep in a workplace setting (for an example see de Vries, van Hooff, Geurts, & Kompier, 2017). Another example is workplace mindfulness training (WMT). Mindfulness interventions have gained popularity in the organizational behavior literature over the past decade given mindfulness is associated with a host of positive outcomes including improved job performance

(Dane & Brummel, 2013), self-regulation (Howell, Digdon, & Buro, 2010), and improved sleep (Allen & Kiburz, 2012; Hülsheger et al., 2014). In a sample of employees from various industries self-reported sleep quality and quantity increased as a result of daily mindfulness practice over a ten-day period (Hülsheger, Feinholdt, & Nübold, 2015). Furthermore, a randomized waitlist-controlled trial examining an 8-week WMT in a sample of teachers found that the WMT improved self-reported sleep quantity, insomnia symptoms and sleepiness at post-intervention, and self-reported sleep quality and quantity at a three-month follow up (Crain, Schonert-Reichl, & Roeser, 2017). Future research is needed to examine whether WMTs can influence social behavior in organizations via improved sleep.

Multimethod Approaches to Sleep Measurement

Multimethod Approaches To date, research typically centers on examining sleep quality (i.e., how well one slept), sleep quantity (i.e., how long one slept), sleep consistency (i.e., consistency of bed and wake times), or state sleepiness (i.e., the experienced drive to seek sleep). Each of these constructs might exhibit unique effects on performance and require unique intervention components to address. For instance, one intervention might promote sleep consistency but not sleep quality which can be influenced by a host of factors (e.g., prescribed medication, drug/alcohol consumption prior to sleeping); however, increasing sleep consistency might simultaneously increase sleep quality. Therefore, the careful and precise specification (e.g., quality, quantity, consistency) of sleep remains critical.

Throughout our literature review, we specified whether sleep quality and quantity were measured objectively (e.g., actigraphy, polysomnography) or subjectively (i.e., self-report measures). This is in part because research has generally shown differential effects of sleep depending on the measurement method (see Litwiller, Snyder, Taylor, & Steele, 2017 for meta-analytic findings). Currently, the dominant approach to measuring sleep constructs in the organizational behavior literature is via self-report; however, more and more organizational behavior research is assessing sleep quality and quantity via actigraphy. Consistent with other authors (e.g., Crain et al., 2018), we suggest a multimethod approach given each method has unique limitations, and confidence in an effect is higher with corroboration of findings across multiple methods.

Ability/Motivational Mechanisms Researchers have also considered that differential findings across measurement approaches may be due to different constructs being assessed. For instance, our discussion on mediators highlighted how sleep can influence self-regulation (and in turn, social behavior in organizations), through both ability and motivational mechanisms. Barber, Taylor, Burton, and Bailey (2017) found that only *subjective* sleep quality was associated with failure in self-regulation, whereas actigraphy-assessed sleep was not. These authors speculated that self-reported sleep quality may relate to self-regulation *motivation*, whereas objective sleep quality may better predict self-regulatory *ability*.

An important question may concern the conditions under which sleep makes an individual *unable* to perform well (i.e., declines in ability) versus *unwilling* to perform well (i.e., declines in motivation). For example, much of the literature on sleep and counterproductive work behaviors is approached from the perspective of the limited resource or ego-depletion model of self-regulation (Muraven & Baumeister, 2000), which suggests self-regulation is a limited resource which must be replenished via sleep or an individual will be *unable* to self-regulate. Recent work has challenged the limited resource model on the basis of several conceptual and methodological arguments (see Carter et al., 2015; Inzlicht & Berkman, 2015; Schimmack, 2012; Vadillo, Gold, & Osman, 2016). Some arguments point to research demonstrating that motivational incentives can reverse depletion effects (Masicampo, Martin, & Anderson, 2014), similar to the buffering effects of monetary incentives or feedback on performance following sleep deprivation (Steyvers & Gaillard, 1993). Other research challenging the limited resource model has shown how *perceptions* of being less depleted or less fatigued can improve performance (Clarkson et al., 2010; Draganich & Erdal, 2014).

We agree with other authors (e.g., Kühnel et al., 2018) who point out it is likely not the case sleep influences self-regulation through *either* ability *or* motivational mechanisms. However, when considering social behavior in organizations, it still may be the case that motivation is the dominant mechanism under certain conditions whereas changes in ability explain these relations under other conditions. Such notions raise important questions such as: Up to what point (e.g., for what degree of sleep loss), can motivational aspects of the workplace setting (e.g., performance evaluations, potential consequences of good and poor performance) offset negative effects of poor sleep by motivating employees to exert compensatory effort to sustain performance? In what situations does poor sleep lead to declines in ability that cannot be compensated for by exertion of extra effort?

Underlying Physiological Processes Employee performance and organizational outcomes also might be influenced by two separate physiological processes related to regulating the sleep-wake cycle, which might explain some inconsistent findings. Sleep researchers propose that the two-process model of sleep-wake regulation influences daytime sleepiness levels via both the: (1) homeostatic sleep drive (Process S), and (2) circadian cycle/pacemaker (Process C; discussed in the Chronotype Misalignment section; Schmidt, Collette, Cajochen, & Peigneux, 2007). The homeostatic sleep drive (Process S) accumulates linearly with time awake and reflects the proximal state of sleep need or pressure. Adequate quality sleep resets the sleep drive, whereas sleep issues result in a failure to return to baseline levels upon awakening. Alternatively, the circadian cycle influences individuals through non-linear daily patterns related to alertness, attention, and cognitive functioning. The circadian cycle fluctuates throughout the day, resulting in multiple highs and lows in alertness (Schmidt et al., 2007; Tutek et al., chapter "Daily Rhythmicity in Social Activity", this volume). A better understanding of which measures better capture homeostatic sleep drive-related variables versus circadian process-related variables would be a valuable addition to the literature.

The Oura ring (https://ouraring.com/#unique-quidance) is a new product marketed as a wearable sleep-tracker designed to improve employee sleep. Advertisements for this product suggest it assesses sleep stages, heart rate, heart rate variability, and body temperature—key variables typically not assessable outside laboratory settings. Empirical tests confirming the accuracy of such products will likely prove highly valuable to future research. For example, body temperature (especially core body temperature) is a strong indicator of one's position in their circadian cycle (Khalsa, Jewett, Duffy, & Czeisler, 2000; Smith, Reilly, & Midkiff, 1989); however, it is difficult to collect multiple reliable daily body temperature assessments. Pending evidence of reliability and validity in an organizational setting, the Oura ring or similar technology might be able to overcome measurement challenges such as these.

Changes in Sleep-Performance Links Over Time

The above discussions highlight the importance of considering time and patterns of sleep behavior when examining the effects of sleep on social behavior in organizations (see also Barnes, Jiang, et al., 2016). Along these lines, researchers have typically measured within-person variability in performance via experience-sampling methodology, similar to the approach taken by researchers who study emotions in organizations (e.g., Beal et al., 2005; Beal & Weiss, 2003; Weiss & Cropanzano, 1996). In other words, daily variations in sleep quality and quantity are likely to influence daily variations in job performance (e.g., via variations in affect, self-regulation, and cognitive processes), which would not otherwise be captured by assessing "general" sleep quality or overall performance in the aggregate (for examples specific to sleep see Pilcher, Vander Wood, & O'Connell, 2011; Zohar, Tzischinsky, Epstein, & Lavie, 2005). Given there can be substantial within-person variation in both job performance and sleep (e.g., Knutson, Rathouz, Yan, Liu, & Lauderdale, 2007), and that sleep (in)consistency also influences performance-related outcomes (Barber & Munz, 2011), it will be important for future research to continue to use longitudinal, within-person approaches.

Chronic vs. Short-Term Sleep Deficiency Along these lines, research should consider whether accumulation of sleep dept overtime (i.e., chronic sleep deficiency) and shorter-term sleep deficiency differentially influences components of social behavior and whether these effects occur via different mediating mechanisms. For instance, it is possible short-term sleep deficiency is more likely to lead to decreases in job performance components such as organizational citizenship behaviors via a conscious process to withdraw effort from tasks that are not absolutely essential, whereas chronic sleep deficiency may influence all areas of performance (albeit through different mechanisms).

Circadian Processes Within-person approaches should also be used to look at performance episodes in shorter intervals (i.e., within a single day). As discussed

previously, employee performance might be influenced by two separate physiological processes (Process S and Process C; Schmidt et al., 2007). Depending on one's position in the circadian cycle (Process C), circadian peaks (i.e., daily periods of high cognitive alertness) might foster stable vigilance levels even when sleep drive is elevated thus masking actual sleep loss or poor sleep quality effects (i.e., Type II error). During circadian dips (i.e., daily periods of reduced cognitive alertness), the effects of heightened sleep drive resulting from sleep loss might be exacerbated, artificially inflating observed effects. A better understanding of how circadian alertness peaks influence performance following employee sleep loss would further our understanding of sleep's organizational influence and could help integrate empirical inconsistencies.

Bi-directional Relationships The focus of this chapter was on sleep as an antecedent of social performance outcomes. Research suggests relations are bi-directional—social behavior in organizations such as emotional labor (Wagner, Barnes, & Scott, 2014), leadership (Munir & Nielsen, 2009), and counterproductive work behaviors (Yuan, Barnes, & Li, 2018), including interpersonal stressors and workplace bullying (Niedhammer, David, Degioanni, Drummond, & Philip, 2009) can also undermine sleep quality and quantity. More longitudinal research is needed to understand the cyclical and bidirectional relationship between sleep and organizational behavior. For instance, interventions targeting potential mediators (e.g., emotion regulation at work, late-night smartphone use, ICT boundary crossing), may contribute to healthy sleep patterns, in turn contributing to effective social behavior and vice versa.

Technological Advances and Positive Social Performance Outcomes

Similar to a lack of sufficient research on positive sleep interventions, researchers have also tended to overlook positive social behavior outcomes in organizations. This disproportionate focus on negative performance outcomes, such as counterproductive work behaviors, has limited our understanding of how sleep might influence organizational citizenship behaviors and other positive experiences in the workplace. We suggest the field of positive psychology offers both relevant theory and methodology that can translate to and advance research on sleep and social-organizational behavior.

One exemplar methodological advancement is the sociometric badge. Sociometric badges appear as typical name badges or tags but contain instruments designed to assess face-to-face interaction and physical activities amongst others (Chancellor, Layous, & Lyubomirsky, 2015; Yano, Lyubomirsky, & Chancellor, 2012). Such instruments could be used, for example, in conjunction with subjective measures to examine associations between sleep and workplace relationships. Quality relationships at work (e.g., High Quality Connections; Stephens, Heaphy, & Dutton, 2011)

may have motivational properties (e.g., increased feelings of energy) that could potentially buffer relations among poor sleep and job performance. Relatedly, workplace humor—another positive psychology topic—has been shown to contribute to important outcomes, including task persistence (Cheng & Wang, 2015) and organizational citizenship behaviors (Cooper, Kong, & Crossley, 2018). From an intervention perspective, quality workplace relationships and/or humor may contribute to improved sleep, given positive affect and social support predict better sleep outcomes (Kent, Uchino, Cribbet, Bowen, & Smith, 2015; Steptoe, O'Donnell, Marmot, & Wardle, 2008; Wood, Joseph, Lloyd, & Atkins, 2009).

Along these lines, sleep, as it relates to social-organizational behavior, can be examined in the context of innate needs as proposed by Self-Determination Theory (needs for social relatedness, autonomy, and competence; Gagné & Deci, 2005; Ryan & Deci, 2000). For instance, the need for autonomy is the most influential of the three needs, and refers to an individual's freedom to direct their behavior in the manner they determine best (Gagné & Deci, 2005; Ryan & Deci, 2000). Employees in autonomy-supportive work environments report increased persistence, performance (especially on creative tasks), job satisfaction, work attitudes, organizational citizenship behaviors, and personal wellbeing (Gagné & Deci, 2005). Individuals with high levels of autonomy might be able to better negotiate their daily fluctuations in alertness due to circadian rhythms, as they have the freedom to take short breaks when needed. Having autonomy to arrange their work processes (e.g., via job crafting, schedule flexibility) is another method that might assist employees with combatting the effects of circadian rhythm on their performance. For example, an employee could choose to complete attention-demanding work tasks (e.g., reviewing documents for errors) early in the day when they are the most cognitively alert and save menial tasks (e.g., email) for the afternoon when alertness typically declines. Highly autonomous employees might even shift the start of their work day to later hours after sleeping poorly or to make up for missed sleep. Alternatively, workplace need fulfillment might predict better quality sleep that evening because need fulfillment reduces stress (Weinstein & Ryan, 2011)—a known sleep disruptor (Åkerstedt, Kecklund, & Axelsson, 2007; Hisler, Krizan, & DeHart, 2018). This interplay between need fulfillment and sleep on employee performance has yet to be examined.

Conclusion

Knowledge and understanding of the relationship between sleep and social behavior in organizations will grow as researchers approach questions from varied perspectives, draw from fields outside their own, and partner with diverse scholars. Advancing the science and practice surrounding sleep and social-organizational behavior will involve using methodologies that align with the multifaceted constructs we examine and the multilevel questions we ask. It is our hope we have both demonstrated the importance of sleep to social behavior in organizations and

recognized the nuances in this relationship. We further hope that while outlining the limitations and presenting current challenges, we have highlighted the vast and exciting opportunities in this research area. Finally, this topic is one of widespread applicability; the positive impact of this work can be maximally realized to the extent scientists and practitioners communicate and collaborate with the common goal of improving employee and organizational wellbeing.

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