

THESIS

THE RELATIONSHIP BETWEEN SLEEP IMPAIRMENT AND INTERPERSONAL  
ORGANIZATIONAL OUTCOMES

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## ABSTRACT

### THE RELATIONSHIP BETWEEN SLEEP IMPAIRMENT AND INTERPERSONAL ORGANIZATIONAL OUTCOMES

Sleep is essential for individuals, organizations, and societies. For instance, reduced sleep is a significant predictor of poor mood and mortality. Impaired sleep can also affect workers and organizations such as by increasing absenteeism and presenteeism, reducing productivity, and increasing accidents on the job. Although previous research on sleep in organizational contexts has examined the relationship between sleep and social support variables such as perceived supervisor support and perceived social support more broadly, it has not examined the association between worker's sleep and perceived social support in a multilevel model. Additionally, prior research has not examined the relationship between sleep and perceived organizational support. This cross-sectional study examined the relationship between 2213 workers' self-reported sleep (e.g., sleep quantity and sleep sufficiency) and three social support variables: perceived social, organizational, and supervisor support at both the individual and organizational level. Results indicated that sleep sufficiency was related to the three social support variables at both the individual and organizational levels in the model. However, sleep quantity was unrelated to the three social support variables at either level of the model. Implications from these findings are discussed in light of theoretical and applied contributions to the literature.

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## CHAPTER 1: INTRODUCTION

Sleep is essential for individuals, organizations, and societies. For example, sleep is positively associated with workers' job satisfaction, organizational citizenship behaviors (OCB) and followers' ratings of leaders' effectiveness (Barnes, Ghumman & Scott, 2013; Barnes, Guarana, Nauman & Kong, 2016). Conversely, impaired sleep is associated with numerous negative outcomes. For example, impaired sleep a significant predictor of increased hypertension, cardiovascular disease, diabetes mellitus, coronary heart disease, and overall mortality (Itani, Jike, Watanabe & Kaneita, 2017). Furthermore, experimental studies found that reduced sleep causes mood deficits (Covassin & Singh, 2016; Short & Louca, 2015). Impaired sleep can also affect organizations by increasing absenteeism and presenteeism, reducing productivity, and increasing accidents on the job (Barnes & Watson, 2019; Hillman et al., 2018).

In turn, these effects can have detrimental consequences on societies. For example, the effects of impaired sleep on absenteeism and presenteeism lead to about 1.23 million lost workdays each year in the U.S. (Hafner et al., 2017). Moreover, the overall economic costs of impaired sleep for the U.S. range from \$280 to \$411 billion annually (Hafner et al., 2017). Given the rapidly increasing findings on the negative influence of sleep impairment on known variables within society, it is crucial to understand how sleep may affect yet unknown variables. In fact, some of the lesser-studied variables affected by impaired sleep, such as issues related to interpersonal relationships, may be the most fundamental to human well-being (Baumeister & Leary, 1995).

There have been numerous findings regarding the association between impaired sleep and single-dyad interpersonal variables (e.g., perceptions of how supportive a single supervisor is).

For example, among subordinates, sleep impairment is associated with reduced perceptions of leader efficacy and trust in negotiations with supervisors (Barnes & Watson, 2019). Additionally, impaired sleep has been found to be associated with abusive leadership behaviors among supervisors and their respective subordinates (Barnes, Lucianetti, Bhawe & Christian, 2016).

These findings regarding the importance of sleep for individuals and organizations are plausibly explained by impaired sleep depleting individuals' abilities to control or regulate their own behavior (Barnes et al., 2016), which is required for ethical behavior and patience in relationships (Barnes, Schaubroeck, Huth & Ghumman, 2011; Meldrum, Barnes & Hay, 2015). Others have explained the relationship between sleep impairment and impaired social relationships as being at least partly caused by another effect of sleep impairment, which is the effect it has on affect. For example, there is evidence that impaired sleep leads to more negative emotion such as irritability, which in turn may influence individuals' behaviors toward others (Kent et al., 2015; Nordin, 2006).

Yet, though the relationship between sleep and single-dyad interpersonal variables such as perceived supervisor support among a supervisor and a subordinate have been investigated at the individual level (Buston et al., 2009), they have not been investigated at the multiple-dyad level, such as in a multilevel model. Finding organization-level relationships may have practical implications for organizational-level interventions, which are more effective than individual-level interventions (Burke, 1993; Cox, Taris, & Nielsen, 2010). Additionally, organization-level associations may have implications for motivating organizations to help protect workers' sleep to outcompete other organizations. Although findings regarding the relationship between impaired sleep and single-dyad interpersonal variables (e.g., perceived supervisor support) are important contributions, it is essential that sleep research not miss the forest for the trees. Research on the

relationship between sleep and multiple-dyad interpersonal variables such as perceived organizational support is scant, though. No research to date has investigated the relationship between employees' sleep and perceived organizational support, which is a commonly researched multiple-dyadic interpersonal variable. Multiple-dyad interpersonal variable refers to the overall combined perceived support from among several simultaneous dyadic relationships such as one's relationship with their supervisor, and a coworker, and yet another coworker. Additionally, though there is research investigating the relationship between sleep impairment and perceived social support (Costa, Ceolim & Neri, 2011), this relationship has not been investigated at the aggregate level between organizations. It is thus important that additional research examines the relationship between sleep impairment and multiple-dyad interpersonal variables, such as the relationship between employees' sleep impairment and perceived organizational support (Barnes & Watson, 2019). Finding evidence that this relationship, as well as the relationship between impaired sleep and perceived social support, exists will give organizations additional reason to protect their employees' sleep as they aim to achieve their mission.

Investigating the relationship between sleep and multiple-dyad type interpersonal variables such as perceived social support and perceived organizational support is also essential given that the need to belong within groups has been recognized as a fundamental human need and associated with numerous important outcomes (Baumeister & Leary, 1995). In fact, in a meta-analysis including over 300,000 participants, the magnitude of the effect of having adequate social relationships on health was comparable to that of quitting smoking (Holt-Lunstad, Smith & Bradley, 2010). It should not be surprising then that perceived social support facilitates positive affect and overall psychological well-being (Feeney & Collins, 2014; Haslam



et al., 2018). Multiple-dyad type interpersonal variables such as overall perceived social support and perceived organizational support are associated with numerous important outcomes and should thus not be understudied in the context of sleep research, especially given that prior literature has suggested the workplace is a common place where the need to belong is fulfilled (Baumeister & Leary, 1995). Consequently, the current study adds to the literature by examining the relationship between sleep and novel multiple-dyad type interpersonal variables such as perceived organizational support and perceived social support. Additionally, though the relationship between an individual's sleep and their own perceptions of social support have been examined, as has the relationship between an individual's sleep and the support they perceive from their supervisor, this has only been at the individual level. The current study will test for the relationship between these previously researched relationships at both the employee level and at the organizational level.

The purpose of the current study is to expand upon previous literature by investigating the relationship between workers' sleep (e.g., quantity and sufficiency) and work-related interpersonal variables (e.g., perceived social support, supervisor support, and organizational support) (Crain et al., 2018; Sianoa et al., 2019). Sleep sufficiency is a qualitative component of sleep measurement referring to the degree one feels rested. The aforementioned relationships will be tested at two levels in a multilevel model. First, these relationships will be tested at the individual level, predicting that individuals who are more well-rested will report greater social, supervisor, and organizational support. The current study will also test these same relationships at the organizational level, predicting that organizations that report greater sleep will also report greater scores for social, supervisor, and organizational support. There is significant theoretical

grounding for expecting relationships between sleep and the aforementioned interpersonal variables, which will be explained below.

## **Sleep**

Broadly, sleep is a temporary reduction in perception of one's environment (Carskadon & Dement, 2011). Rapid eye movement (REM) and non-REM (NREM) are the two main components of sleep and alternate in cycles throughout sleep, beginning with NREM (Carskadon & Dement, 2011). Watson et al. (2015) found that the majority of sleep scholars recommend seven hours of sleep per night for optimal health. This is consistent with the National Sleep Foundation's recommendations to sleep between seven to nine hours per night (National Sleep Foundation, 2020). However, the number of hours an individual sleeps per night is only one metric for measuring sleep.

Consistent with Crain, Brossoit & Fisher (2018) and Watson (2012), we will define sleep in two ways: sleep quantity and sleep quality. First, one may measure temporal duration of sleep, such as in hours. Time spent sleeping has been referred to as sleep quantity in prior literature (Crain et al., 2018; Watson, 2012). The other component of sleep and metric by which it can be measured is sleep quality. This refers to how well one sleeps, such as how quickly one falls asleep, how well sleep is maintained through the night, and the degree to which one feels rested after sleep (Crain et al., 2015; Olson et al., 2015; Watson, 2012). Moreover, the sleep quality subcomponent of sleep sufficiency refers to the degree to which one feels rested after sleep (Barber et al., 2010; Olson et al., 2015). Despite sleep insufficiency being a subcomponent of sleep quality, it by itself has nonetheless been found to be associated with negative health outcomes such as obesity, hypercholesterolemia, and hypertension (Altman, 2012).

## **The Strength Model of Self-Regulation**

To study the relation between sleep impairment such as sleep insufficiency and organizational outcomes, we seek to understand the relation between sleep impairment and antisocial behavior at work. There is considerable debate regarding the causes of antisocial behavior in the workplace, including whether some of its potential causes (e.g., ego depletion) exist (Evans, Boggero & Segerstrom, 2016; Vohs, Glass, Maddox & Markman, 2011; Friese, Loschelder, Gieseler, Frankenbach & Inzlicht, 2019). Evans et al., (2016) posited perhaps the most balanced view, arguing that lapses in self-regulation (e.g., anger outbursts) are due to multiple causes. These causes include a depleted limited resource, an idea that is commonly referred to as the ego-depletion model or strength model of self-regulation, as well as physiological (e.g., depleted energy resources) and psychological (e.g., motivation) causes. Taking a stance on which explanation of lapses in self-regulation (particularly during sleep impairment) is best is beyond the scope of this paper. Thus, I will only briefly summarize findings from the ego-depletion model of self-regulation related to sleep and antisocial behavior (Baumeister, Bratslavsky, Muraven & Tice, 1998).

The ego-depletion model posits that the majority of self-regulatory behaviors (e.g., regulating one's anger outbursts/aggression, resisting tempting foods) appear to share and draw upon a limited resource (Baumeister et al., 1998). This effect has generally been tested by having participants either participate in an experimental condition that requires regulatory behavior such as suppressing one's emotional responses to a sad movie, or a control condition that requires significantly less self-regulation, such as watching a sad movie without suppressing one's emotions. Following these tasks, both groups participate in a self-regulating task, such as resisting a tempting, unhealthy food. Many studies have found that the group in the experimental

condition that just exerted themselves will perform more poorly in self-regulating behaviors in the new, subsequent self-regulation task compared to those who were in the control group (Evans, Boggero & Segerstrom, 2016).

This is relevant because sleep researchers have suggested that antisocial behaviors following sleep impairment may be due to reduced self-regulation abilities (Guarana & Barnes, 2017), and in particular a reduction in self-regulation resources as the ego-depletion model would predict (Barnes et al., 2011). This is corroborated by many studies that have reported reductions in self-regulation following sleep impairment (Hagger, 2010). Such reductions would plausibly lead to increased antisocial behaviors such as abuse or aggression, as previous findings have found that impaired self-regulation does indeed lead to increased aggression (Stucke & Baumeister, 2006; DeWall, Finkel & Denson, 2011). Furthermore, as mentioned, conflict-related behaviors such as aggression are predicted to reduce feelings of belongingness according to the belongingness theory (Baumeister & Leary, 1995), which would reduce feelings of perceived social, organizational, and supervisor support.

### **Sleep and Perceived Social Support**

A plethora of studies have found perceived social support is associated with different sleep metrics. For instance, Rambod et al. (2013) found perceived social support was inversely related to sleep quality. Additionally, perceived social support was also found to be inversely associated with sleep disturbance (Liu et al., 2016; Nordin, 2006). Perceived social support also moderated the relationship between work stress and impaired sleep, such that the association between work stress and impaired sleep was attenuated for those reporting greater social support (Pow, King, Stephenson & DeLongis, 2017). Moreover, in a sample of older adults, it was found that social participation was associated with better sleep while using actigraphic measures of

sleep (Chen, Lauderdale & Waite, 2016). Actigraphs, often worn on the wrist, help measure sleepers' frequency and intensity of movement while they are asleep, which can be used to assess sleep quality and quantity (Chen et al., 2016). In another sample, 58.6% of workers reported that their impaired sleep affected their social relationships (Hege, Lemke, Apostolopoulos, Whitaker & Sönmez, 2019).

The exact explanation the relationship between sleep and perceived social support is unclear, though several explanations have been discussed in the extant literature. Perhaps the most plausible explanation is that the relationship between sleep and perceived social support is bidirectional rather than unidirectional. For example, Tavernier and Willoughby (2015) conducted a path analysis to test for a bi-directional relationship between sleep impairment and social ties over three years and found statistically significant results. Tavernier and Willoughby (2015) also found significant indirect effects. In particular, emotional regulation was found to mediate the relationship between sleep impairment and social ties in both directions. Thus, improved sleep led to increased emotional regulation, which in turn led to increased social ties, and vice versa (Tavernier & Willoughby, 2015).

Other studies support the notion that the association between sleep and social relationships is mediated by affect. For example, Nordin (2006) found that emotional support was negatively associated with disturbed sleep. Additionally, Kent et al. (2015) found the relationship between positive social ties and sleep quality was partially mediated by depression. However, it was also found that perceived partner responsiveness was negatively associated with self-reported sleep problems and positively associated with actigraph-measured sleep efficiency. This effect was found even after controlling for perceived emotional support from participants'

partners, suggesting multiple factors may play a role in the association between sleep and perceived social support (Selcuk, Stanton, Slatcher & Ong, 2017).

In the current study, perceived social support and related variables such as perceived organizational support are not synonymous. In prior literature, perceived social support in the workplace generally refers to support from multiple sources within the broader organization, including peers, supervisors and upper-management (Eisenberger, Singlehamber, Vandenberghe, Sucharski & Rhodes, 2002; Ford et al., 2007; Kossek, Pichler, Bodner & Hammer, 2011). By contrast, perceived organizational support refers to support from the organization, and in particular from upper management (Eisenberger et al., 1986). Perceived supervisor support refers to support from one's direct supervisor (House, 1981; Kossek et al., 2011). Yet, these variables may have sufficient overlap to predict that associations between sleep and perceived organizational support will be similar to associations between sleep and perceived social support.

For example, in their review of the literature on perceived organizational support, Krishnan and Mary (2012) noted that key components of perceived organizational support include an organization valuing its employees' contributions and wellbeing, as well as a resulting feeling of reciprocal obligation. Likewise, in a review of the literature on perceived social support, components of one definition of social support included an individual's perception of being valued and cared for, as well as mutual obligation (Kossek, Pichler, Bodner & Hammer, 2011). Moreover, workplace social support, a variable similar to the combination of perceived organizational support, perceived supervisor support and perceived social support was described as consisting of multiple sources including a workers' organization, supervisors, and coworkers (Kossek et al., 2011).

Similar to perceived organizational support, perceived supervisor support also has considerable overlap with perceived social support. As noted, perceived social support is likely influenced by affective components such as emotional support (Kent et al., 2015; Nordin, 2006). Similarly, general supervisor support consists of emotional support and tangible assistance (House, 1981; Kossek et al., 2011). Also, perceived supervisor support has been recognized as a facilitator of perceived organizational support, which as mentioned is closely related to perceived social support (Krishnan & Mary, 2012). More importantly, perceived supervisor support and perceived social support have considerable overlap given that both variables, as well as perceived organizational support, are at least partially based on social exchange theory (Emerson, 1976; Krishnan & Mary, 2012; Nahum-Shani & Bamberger, 2011). Social exchange theory posits that mutually contingent and rewarding behaviors between individuals are likely to be continually reinforced (Emerson, 1976). Likewise, perceived social, organizational, and supervisor support all partially consist of feelings of reciprocal obligation (Kossek et al., 2011; Krishnan & Mary, 2012).

Taken together, Hypotheses 1 and 2 are as follows:

**Hypothesis 1:** Workers' sleep quantity will be positively associated with perceived social support within organizations.

**Hypothesis 2:** Workers' sleep sufficiency will be positively associated with workers' perceived social support within organizations.

### **Sleep and Perceived Organizational Support**

Organizational support theory posits that perceived organizational support facilitates key social exchanges for organizations (Eisenberger, Huntington, Hutchison & Sowa, 1986). In particular, when followers perceive greater organizational support, such as a perceived care for

their wellbeing and appreciation of their efforts, they reciprocate with increased organizational commitment and performance (Eisenberger et al., 1986; Vardaman et al., 2016). A recent meta-analysis found perceived organizational support was associated with multiple performance variables, as would be predicted given Organizational Support Theory (Kurtessis et al., 2017). Moreover, in a recent meta-analysis, perceived organizational support was a predictor of organizational turnover (Rubenstein, Eberly, Lee & Mitchell, 2018). Thus, facilitating organizational support may facilitate highly efficacious outcomes for employers and organizations more broadly.

According to perceived organizational support theory, workers perceive support from members of their organization when they feel cared for and know their contributions are valued (Eisenberger et al., 1986). Therefore, if subordinates with impaired sleep are more likely to interpret social interactions more negatively, this would plausibly lead to reductions in perceived organizational support. Moreover, compared to well-rested participants, sleep deprived participants interpreted ambiguous faces as significantly more hostile (Ree & Harvey, 2006). Sleep impaired participants also had greater neural reactivity upon viewing subtly hostile faces compared to well-rested participants who viewed the same subtly hostile faces (Cote et al., 2014). Anderson and Dickinson (2010) also found that sleep deprivation undermined interpersonal trust. Consequently, it is likely that sleep impaired individuals would perceive less organizational support. Based on organizational support theory and previous research summarized above, Hypotheses 3 & 4 state that:

**Hypothesis 3:** Workers' sleep quantity will be positively associated with perceived organizational support within organizations.



**Hypothesis 4:** Workers' sleep sufficiency will be positively associated with workers' perceived organizational support within organizations.

### **Sleep and Perceived Supervisor Support**

Perceived supervisor support is conceptually similar to perceived organizational support but focuses on the degree followers feel appreciated and cared for by their immediate supervisors. In fact, past research has shown increases in perceived organizational support temporally followed increases in perceived supervisor support (Eisenberger, Stinglhamber, Vandenberghe, Sucharski & Rhoades, 2002). Given that supervisors are considered representatives of the organization, it is not surprising that perceived supervisor support and perceived organizational support are consistently positively associated with each other (Eisenberger et al., 2002; Kurtessis et al., 2017; Shanock & Eisenberger, 2006).

Moreover, similar to perceived organizational support, perceived supervisor support is negatively associated with turnover (Kalidass & Bahron, 2015) and positively associated with job performance (Shanock & Eisenberger, 2006). The unit-level variable of perceived supervisor support climate has also been found to predict unit-level job performance (Dysvik & Kuvaas, 2012). Thus, organizations may benefit significantly by attempting to facilitate perceived supervisor support.

In fact, prior research has also found that employees' perceptions of supervisors as supportive may have a significant influence on employees' sleep patterns as well, particularly through family supportive supervisor behaviors (FSSB) (Olson et al., 2015). In an intervention designed to test the influence of FSSB on employee outcomes, Olson et al. (2015) found that employees managed by supervisors who were trained in FSSB slept significantly longer and had

significantly less sleep insufficiency. Crain et al. (2014) also found that family-supportive supervisor behaviors were associated with subordinates' objective and self-reported measures of sleep quality and quantity. In a related study, Sianoja et al. (2019) found that FSSB were positively associated with employees' sleep hygiene and negatively associated with sleep impairment. However, surprisingly, Sianoja et al. (2019) also found FSSB was in one case negatively related to sleep quantity. Yet, sleep leadership, or the degree to which supervisors both model and communicate their concern for the sleep of their employees, has also been found to be related to less sleep-related impairment and sleep disturbance (Sianoja et al., 2019).

Other prior research has found numerous relationships between sleep impairment and interpersonal outcomes that may contribute to or detract from perceived social, organizational or supervisor support. Though the specific explanations for why impaired sleep is negatively associated with interpersonal outcomes may vary, there are two broad mechanisms that may explain this relationship. First, it is plausible that impaired sleep leads to poor interpersonal outcomes because those who have impaired sleep may behave in ways that reduce others' feelings of social connectedness. For example, individuals with impaired sleep tend to act more aggressively and others may recognize such increased behaviors. However, interpersonal outcomes may also be affected in another distinct way. In particular, individuals who are sleep deprived may simply perceive others' as being more aggressive when they are not actually more aggressive, and consequently feel less social, organizational, or supervisors support as a result of their skewed perceptions. The first explanation (e.g., impaired sleep leading to increased antisocial behaviors) will be examined first.

As an example, supervisors' self-reported sleep impairment was associated with subordinates' reports of abusive leader behaviors (Barnes et al., 2015). Given their antithetical

nature relative to social support, abusive leader behaviors would be expected to mitigate non-supervisors' perceptions of perceived social, organizational, or supervisor support. Moreover, supervisors with insufficient sleep were perceived as having less interpersonal effectiveness (e.g., emotional intelligence such as being able to recognize others' emotions) by direct reports and peers (Nowack, 2017). Moreover, emotional intelligence facilitates organizational support and leaders' emotional intelligence is hindered by insufficient sleep (Nowack, 2017; Mahon, Taylor, & Boyatzis, 2014).

Insufficient sleep is associated with increased interpersonal conflict and delinquency (Gordon & Chen, 2014; Meldrum, Barnes & Hay, 2015). Meldrum, Barnes & Hay (2015) suggested sleep impairment leads to reduced self-control and consequent delinquent behaviors, which may in turn cause interpersonal conflict. Such interpersonal conflicts would plausibly reduce perceived social, organizational, and supervisors' support. Belongingness theory (Baumeister & Leary, 1995) posits that following conflict, individuals feel anxiety toward the opposing individual as well as withdraw from interacting with them, leading to a reduction in feelings of belongingness.

As mentioned, a second explanation for the negative association between impaired sleep and reduced interpersonal outcomes may be explained by skewed perceptions as a result of impaired sleep, rather than any increase in antisocial behaviors. For instance, individuals who had insufficient sleep the night before interpreted ambiguous faces as significantly more hostile than those who had sufficient sleep (Ree & Harvey, 2006; Tempesta et al., 2010). Such distorted interpretations of others' emotions will thus plausibly lead to reduced perceived organizational support given that hostility is antithetical to perceived support. However, in addition to interpreting ambiguous stimuli as more negative rather than positive or neutral, sleep impaired

individuals also respond with greater reactivity to clearly negative stimuli (Anderson & Platten, 2011). Moreover, Anderson and Dickinson (2010) found those who were sleep deprived had greater difficulty trusting others, which may reduce feelings of connectedness within interpersonal bonds.

Thus, even in the absence of conflict, sleep impaired individuals may experience reduced perceived social, organizational, and supervisor support as a result of skewed perceptions, or reduced feelings of trust. Bucknick and Barber (2015) suggested that such threat vigilance experienced by sleep-impaired individuals may be due to an increased self-protection motivation in their vulnerable state. Potentially compounding the issue, Bucknick and Barber (2015) noted that such negative interpretations on behalf of those with impaired sleep would plausibly exacerbate reductions in interpersonal outcomes, as those individuals would be more likely to respond to the source of their perceived aggression with retaliatory aggression. These findings have significant implications for workers. Similar to how workers have a general perception regarding how much the organization cares for their wellbeing and values their contribution, workers also have perceptions of how much their supervisors care for them and value their contributions (Kottke & Sharafinski, 1988). Consequently, if workers have impaired sleep, they will be more likely to have more negative emotions and perceptions of their social interactions, including interactions with their supervisors (Anderson & Dickinson, 2010; Tempesta et al., 2010). Conversely, better-slept subordinates would be more likely to have more positive affect and a greater propensity for trust (Anderson & Dickinson, 2010; Sin et al., 2017), which would facilitate more positive perceptions of supervisors' care for them. Based on the research summarized above, Hypotheses 5 and 6 state that:

**Hypothesis 5:** Workers' sleep quantity will be positively associated with perceived supervisor support within organizations.

**Hypothesis 6:** Workers' sleep sufficiency will be positively associated with perceived supervisor support within organizations.

In addition to expecting that sleep is associated with perceived social support variables within businesses, it is plausible to expect that sleep is associated with perceived social support variables across businesses. This is because there are a number of variables that may affect sleep including work schedules and work- and non-work-related sources of stress. For instance, McMenamin (2007) noted that some businesses use shiftwork extensively and that others use it sparsely. Many businesses may operate during typical day-time business hours, yet other businesses, such as restaurants or bars, conduct most business during the evening hours and thus require employees to engage in substantially more shiftwork (McMenamin, 2007). Additionally, shiftwork is associated with impaired sleep (Conway, Campanini, Sartori, Dotti & Costa, 2008; Gerber, Hartmann, Brand, Holsboer-Trachsler & Pühse; 2010; Kecklund & Axelsson, 2016).

Although fluctuating schedules and late work hours likely interfere with sleep, Cannizzaro et al. (2020) also found that cortisol and blood pressure, which are physiological markers of stress, increased immediately before and after night-time shift-workers started their shifts. Additionally, self-reported perceived stress and physiological markers of stress such as cortisol are associated with impaired sleep (Akerstedt, 2006; Gerber et al., 2010; Linton et al., 2015). Thus, shiftwork may affect sleep through fluctuating or late work hours, as well as through stress (Cannizzaro et al., 2020). Given that different businesses utilize varying amounts of shiftwork (McMenamin, 2007) and that shiftwork is a predictor of impaired sleep, different

businesses are expected to differ in their aggregate level of sleep impairment and consequently differ in their perceived social support. Consequently, sleep impaired organizations would be expected to have more aggressive or unsupportive social interactions and consequently less perceived support. Organizations with more sleep impairment would also be expected to have more subjective negative perceptions of social interactions. Thus, based on the research above, Hypotheses 7 through 12 state that:

**Hypothesis 7:** Organizations reporting greater sleep quantity will report greater perceived social support.

**Hypothesis 8:** Organizations reporting greater sleep quantity will report greater perceived organizational support.

**Hypothesis 9:** Organizations reporting greater sleep quantity will report greater perceived supervisor support.

**Hypothesis 10:** Organizations reporting greater sleep sufficiency will report greater perceived social support.

**Hypothesis 11:** Organizations reporting greater sleep sufficiency will report greater perceived organizational support.

**Hypothesis 12:** Organizations reporting greater sleep sufficiency will report greater perceived supervisor support.

It is important to note that the stress process may explain the relationship between impaired sleep and reduced perceived social support. For example, perhaps stress reduces sleep quantity and/or sufficiency and perceptions of support in the workplace. In fact, previous literature has shown stress is consistently associated with impaired sleep quantity and quality,

which were measured via sleep length and undesired waking from sleep (Åkerstedt, 2006; Yang et al., 2018), and reduced perceptions of social support (Harandi, Taghinasab & Nayeri, 2017). Consequently, I originally intended to add stress as a covariate in my model and have included findings regarding the relationship between stress and other criterion variables such as perceived social support in my findings.

## CHAPTER 2: METHOD

### **Sample**

The sample consisted of 2,360 employees from 105 small businesses (each business having less than 500 employees) located in several regions in the state of Colorado. The sample was obtained from the Small, Safe, and Well (SSWell) Study conducted by the Center for Health, Work, and Environment in the Colorado School of Public Health. The employees in the study work in high, medium and low hazard industries. Workers' ages range from 18-80. There were no exclusion criteria on the basis of individual characteristics.

### **Procedure**

The SSWell Study is a multi-year research study intended to facilitate a deeper understanding of what characteristics of small businesses support the health and safety of their employees. The data analyzed in the present study are archival data from the SSWell study and all data collection occurred in April, 2017. Employees were recruited to participate through key partnering organizations (e.g., Colorado Small Business Administration, local chambers of commerce) that were recruited through member communications networking events, and direct outreach. Participants completed all measures online, including demographic measures at the start of the study. These measures were the only ones utilized in the study. Participants' data were stored in a secure location to maintain participants' confidentiality.

### **Measures**

All variables used during data collection were measured via self-report rather than objective or other sources. The predictor variables include sleep quantity and sleep sufficiency.. The criterion variables are perceived social support, organizational support, and supervisor support.



**Perceived social support.** Perceived social support was measured with five items using the Work Design Questionnaire (WDQ, Morgeson & Humphrey, 2006; see Appendix A). The component of the WDQ that measures perceived social support, and which was used in the current study, includes five items such as, “*people I work with are friendly.*” Participants responded to each item using a five-point Likert-type response scale (*1 = Strong disagree; 5 = Strongly agree*). Higher scores indicate greater perceived social support. The internal consistency reliability for this measure using Cronbach’s alpha is acceptable ( $\alpha = 0.82$ ; Morgeson & Humphrey, 2006).

**Perceived organizational support.** Perceived organizational support was measured using three items such as “*the organization shows a lot of concern for me* (Eisenberger, Huntington, Hutchison, & Sowa, 1986) (Appendix B), with a five-point response scale (*1 = Strong disagree; 5 = Strongly agree*). Higher scores indicate greater perceived organizational support. The internal consistency reliability for this measure using Cronbach’s alpha is acceptable ( $\alpha = 0.97$ ; Eisenberger et al. 1986). This scale had acceptable reliability

**Perceived supervisor support.** The single perceived supervisor support item (*I can count on my supervisor/manager for support when I need it*) (Appendix C) had a five-point response scale (*1 = Strong disagree; 5 = Strongly agree*). The test-retest reliability for this single item was acceptable (0.61) (Fisher, Matthews & Gibbons, 2016).

**Sleep quantity.** The sleep quantity item asked “*How many hours of sleep do you usually get daily?*” Possible response options included *<6 hours, 6-6.9 hours, 7-8 hours, and, >8 hours* (Newman, Stinson, Metcalf & Fang, 2015) (Appendix D).

**Sleep sufficiency.** For the sleep sufficiency item (“*I woke up feeling fresh and rested*”), responses options were *At no time*, *Some of the time*, *Less than half of the time*, *More than half of the time*, and *Most of the time* (Staehr & Johansen, 1998) (Appendix E).

## CHAPTER 3: RESULTS

### **Data Cleaning**

I used IBM SPSS 18 to clean and analyze the data. The first step was to review and clean the data. Data cleaning steps included computing descriptive statistics and frequency distributions for all variables to check for missing data and outliers, as well as to test assumptions regarding normality. A total of 99 small businesses were included in the analysis, with a total of 2,360 participants. Listwise deletion was used for missing cases on any variables mentioned in hypotheses 1-12 because missing cases were missing at random and a small proportion of responses (Tabachnik & Fidell, 2013). Descriptive statistics on the variables included in my hypotheses, which were sleep quantity and sufficiency, as well as perceived social support, perceived organizational support, and perceived supervisor support from the remaining sample obtained after using listwise deletion did not significantly differ from the full sample, leaving 2289 remaining participants.

Cases with a z-score of  $\pm 3.29$  or greater on any variable utilized in my hypotheses were considered univariate outliers (Field, Miles & Field, 2012). Using the chi-square distribution, cases with a Mahalanobis distance score with a probability less than 0.001 were considered multivariate outliers (Tabachnik & Fidell, 2013). Two participants were removed from the analysis due to being the sole remaining member of their organization left in the analysis, leaving 2213 participants from 99 small businesses for the analysis. This was done because my model tested relationships between variables at the organizational level, and organizations must have more than one individual in them to be considered an organization (Schein, 2010). On average, 23 employees from each business participated and were retained for analyses. Small business

sizes ranged from two organizational members to 89. The number of participants excluded from the analysis and the reason for exclusion are presented in Table 1.

Table 1

*Participants Excluded in Data Cleaning*

Reason for Exclusion	Number Excluded	Remaining sample
Listwise deletion for missing responses on essential variables	71	2289
Removal of univariate outliers	64	2225
Removal of multivariate outliers	10	2215
Removal of individuals being the lone remaining member of their organization	2	2213

Probability plots of cases from essential variables were created to examine whether the assumption of normality was met (Tabachnik & Fidell, 2013). All perceived social support variables had a substantial negative skew, as suggested by the normal probability plots (Tabachnik & Fidell, 2013). To reduce extreme skewness, all skewed variables were transformed using reflection and a square root conversion. Results of confirmatory factor analyses utilized to assess the validity of scales are reported in Table 2.

Table 2

*Confirmatory Factor Analyses on Scales Utilized*

Scale	CFI	TFL	RMSEA
Perceived Social Support (5 items)	0.93	0.87	0.18
Perceived Social Support (4 items)	0.94	0.82	0.24
Perceived Organizational Support	1.0	1.0	0.00
Stress	1.0	1.0	0.00

Though the RMSEA for the perceived social support scale exceeded the conventional threshold of .05 for good model fit, we retained this scale with all original items because the RMSEA increased from 0.18 to .24 after removing the item with the lowest loading on any factor and because the CFI value indicated acceptable model fit (Tabachnik & Fidell, 2013).

Additionally, though the RMSEA of 0.18 exceeded the conventional threshold of 0.05, the RMSEA estimate we obtained may not be accurate with excessively small or large ( $n > 800$ ) sample sizes (Chen, Curran, Bollen, Kirby & Paxton, 2008). Additionally, this scale has been used extensively in previous research and we opted to retain it based on established validity in previous studies (e.g., Borges-Andrade, Peixoto, Queiroga & Pérez-Nebra, 2019; Khandan et al., 2018; Morgeson & Humphrey, 2006). Descriptive statistics including the means, standard deviations, reliabilities, and intercorrelations between key variables in the current study are reported in Table 3. Descriptive statistics for second-level predictors are included in Table 4.

Sleep quantity was not included in Table 3 or Table 4 because it was measured categorically and does not have a meaningful mean and standard deviation.

Table 3

*Means, Standard Deviations, and Correlations Among Study Variables*

Variable	Items	Alpha	M	SD	1	2	3	4	5
Sleep Sufficiency	1	N/A	3.19	0.99					
Perceived Social Support	5	0.85	4.06	0.64	0.32*				
Perceived Org. Support	3	0.95	3.70	1.01	0.37*	0.63*			
Perceived Sup. Support	1	N/A	4.70	0.96	0.33*	0.61*	0.59*		
Stress	3	0.51	3.02	0.66	-0.43*	-0.18*	-0.64*	-0.01	
Shift work	1	N/A	1.85	0.36	0.03	0.04	0.03	0.53*	-.12

*Note.* \* $p < .05$ . Variables measured on a scale of 1-5 except shift work, in which 1 = yes, 2 = no.

The most-commonly-reported sleep quantity was 7-8 hours (44% of sample), followed by 6-6.9 hours (39% of sample), less than 6 hours (12.6% of sample), and more than 8 hours (4.2% of sample). Bivariate correlations between predictor variables for the hypotheses were examined for multicollinearity and all correlation values were less than 0.9 (Tabachnik & Fidell, 2013).

Table 4

*Means, Standard Deviations, and Correlations Among Study Variables at the Organization Level*

Variable	Items	Alpha	M	SD	1	2	3	4	5
Sleep Sufficiency	1	N/A	3.20	0.27					
Perceived Social Support	5	N/A	4.05	0.22	0.30*				
Perceived Org. Support	3	N/A	3.69	0.40	0.48*	0.82*			
Perceived Sup. Support	1	N/A	4.05	0.27	0.48	0.63*	0.64*		
Stress	3	N/A	3.02	0.19	-0.57*	-0.01*	-0.21*	-0.31*	
Shift work	1	N/A	1.85	0.19	-0.14	-0.8*	-0.09	0.19*	0.02

*Note.* \* $p < .05$ . Variables measured on a scale of 1-5 except shift work, in which 1 = yes, 2 = no

### Hypothesis Testing

A two-level multilevel model was utilized to analyze the relationship between sleep (sufficiency and quantity) and each criterion variable. It was predicted that each sleep variable would be positively associated with each social support variable. First-level units in the model

were individual workers working within small businesses. Second-level units were the small businesses that individual workers worked within. Multilevel modeling was implemented through IBM SPSS, Version 26.

In the model utilized in the present study, a random effects model was used for both predictors at the first and second level of the multilevel model, allowing intercepts and slopes to vary. To justify testing a multilevel model, I first tested for nesting of the criterion variables within organizations. Specifically, I tested the degree to which variability in employees' social support scores was explained by organizational membership across small businesses in an intercepts-only model. This model had no predictors and only tested for differences in the social support variables across businesses. The intraclass correlation coefficients for perceived social support (0.08), perceived organizational support (0.14), and perceive supervisor support (0.03) were all statistically significant ( $p < .001$ ), suggesting that data were non-independent and that the use of a multilevel model was justified. All model fit statistics are reported in Tables 5-7. Fit statistics represent whether each successive model with additional predictors has a better fit than the previous, simpler model when predicting the criterion variable (Tabachnik & Fidell, 2013). A  $\chi^2$  likelihood-ratio test was used to test improvement in each model and each model in the current study had a better fit than the previous model (Tabachnik & Fidell, 2013).

The full multilevel model as a whole was significantly better than the intercepts-only model for perceived support,  $\chi^2 (4, N = 2289) = 4387 - 4130 = 257, p < .05$ , perceived organizational support,  $\chi^2 (4, N = 2289) = 6392 - 6048 = 344, p < .05$ , and perceived supervisor support,  $\chi^2 (4, N = 2289) = 6316 - 6060 = 256, p < .05$  (Tabachnik & Fidell, 2013).



Table 5

*Model Fit Predicting Perceived Social Support*

Fit statistic	Intercept- only model	Level 1 predictors added	Level 2 predictors added
-2 Log Likelihood	4387	4142	4130
AICC	4393	4153	4145
CAIC	4413	4186	4192
BIC	4410	4181	4184

Table 6

*Model Fit Predicting Perceived Organizational Support*

Fit statistic	Intercept- only model	Level 1 predictors added	Level 2 predictors added
-2 Log Likelihood	6392	6073	6048
AICC	6398	6084	6061
CAIC	6418	6117	6109
BIC	6415	6112	6102

## Model 7

### *Model Fit Predicting Perceived Supervisor Support*

Fit statistic	Intercept- only model	Level 1 predictors added	Level 2 predictors added
-2 Log likelihood	6316	6087	6060
AICC	6322	6097	6074
CAIC	6342	6131	6121
BIC	6339	6126	6114

In the second step of the same model, level-one predictors, which were individuals' sleep sufficiency and sleep quantity, were added to predict each perceived social support variable. Level-one predictors were also group mean centered to make estimates more interpretable (e.g., effect sizes) (Lorah, 2018). However, the covariate of stress was not included in the multilevel model, as adding predictors to the model would increase the error variance of the effect size measures (Tabachnick & Fidell, 2013). Sleep sufficiency was a statistically significant predictor of each perceived social support variable, showing that sleep sufficiency and perceived social support variables were positively correlated among workers within small businesses. Sleep quantity at the individual level was, by contrast, not a statistically significant predictor of the three perceived social support variables. In the third and final step of the model, level-two-predictors were added to the model to test whether workers at businesses with overall greater sleep scores also reported greater perceived social support. The level-two predictor of sleep

sufficiency was a statistically significant predictor of all three social support variables. However, the level-two predictor of sleep quantity was not a statistically significant predictor of the three social support variables.

Each of the three dependent variables, perceived social support, perceived organizational support, and perceive supervisor support, was predicted in a separate multilevel model (Tabachnick & Fidell, 2013). Though each multilevel model had its own exclusive criterion variable, each multilevel model had the same four predictor variables, which were the two level one predictors of individuals' sleep quantity and sleep sufficiency, and the two level two predictors of aggregated sleep quantity and sleep sufficiency scores for each small business. Though the level one and level two predictors were included in each of the three multilevel models, the results for the level one and level two predictors were separated into two tables for organizational purposes. Therefore, the results from the level one predictors are shown in Table 8 and the results of the level two predictors are shown in Table 9.

The coefficients labeled as gamma ( $\gamma$ ) refer to the parameter estimate for each predictor. For example, the coefficient for sleep sufficiency as a level-one predictor is 0.19, which refers to the average slope for sleep sufficiency across all businesses when all other predictors are taken into account (Tabachnick & Fidell, 2013). Put another way, for each one-unit increase in individual sleep sufficiency, there is a .19 increase in perceived social support.

Table 8

*Level-One Relationships*

Predictor	Criterion	$\gamma_{10}$	Std. Error	<i>df</i>	<i>t</i>	95% CI Lower Bound	95% CI Upper Bound
Sleep Sufficiency	Perceived Social Support	0.19*	0.01	7	15.88	0.16	0.22
	Perceived Organizational Support	0.35*	0.02	7	18.42	0.31	0.39
	Perceived Supervisor Support	0.23*	0.02	7	15.18	0.16	0.30
Sleep Quantity	Perceived Social Support	-0.02	0.02	7	-1.78	-0.06	0.10
	Perceived Organizational Support	-0.08*	0.2	7	-3.21	-0.13	-0.03
	Perceived Supervisor Support	-0.02	0.2	7	-0.90	-0.07	0.03

Note. \* $p < .001$ .

Table 9

*Level-Two Relationships*

Predictor	Criterion	$\gamma_{01}$	Std. Error	<i>Df</i>	<i>t</i>	95% CI Lower Bound	95% CI Upper Bound
Sleep Sufficiency	Perceived Social Support	0.23*	0.7	7	3.39	0.09	0.36
	Perceived Organizational Support	0.60*	0.12	7	5.22	0.37	0.83
	Perceived Supervisor Support	0.39*	0.08	7	5.46	0.24	0.55
Sleep Quantity	Perceived Social Support	-0.02	0.09	7	0.69	-0.13	0.23
	Perceived Organizational Support	0.12	0.15	7	0.97	0.19	0.43
	Perceived Supervisor Support	-0.04	0.10	7	0.26	-0.25	0.16

Note. \* $p < .001$ .

## CHAPTER 4: DISCUSSION

This study examined workers' sleep quantity and sufficiency as possible predictors of perceived social support, perceived organizational support and perceived supervisor support both within and across small businesses. We predicted that each sleep variable, sleep quantity and sufficiency, would be positively associated with each social support variable both within and between small businesses. These hypotheses were based on prior findings that have demonstrated that sleep impairment is associated with more negative affect, greater irritability with others, and more negative perceptions of others' behaviors (e.g., interpreting ambiguous facial expressions in others as threatening), all of which would lead sleep impaired workers to perceive reduced social support from others (Kent et al., 2015; Ree & Harvey, 2006; Schwarz et al., 2018). Similar research has found the same relationship between sleep impairment and emotional support in particular (Nordin, 2006). For example, Selcuk et al. (2017) found emotional support from one's partner was associated with reduced sleep duration.

My organizational-level hypotheses were based on these findings as well, but also on ego-depletion theory and organizational support theory (Baumeister, 1998; Eisenberger et al., 1986). More specifically, Hypotheses 7-12 were based on the expectation that sleep impaired workers would both perceive interactions with others as less supportive and also experience objectively less-supportive behaviors. We predicted employees in more sleep impaired organizations would experience objectively less supportive behaviors based on the ego-depletion model, which posits that the majority of self-regulatory behaviors (e.g., regulating one's anger outbursts/aggression, maintaining patience with others) appear to share and draw upon a limited resource (Baumeister et al., 1998), which is depleted due to sleep impairment (Barnes, 2016; Barnes et al., 2011; Guarana & Barnes et al., 2017).

The hypotheses were partially supported such that sleep sufficiency was positively associated with the three social support variables at both level one and level two of the model. Specifically, within organizations, employees who reported greater sleep sufficiency also reported more social support (e.g., perceived social support, organizational support, and supervisor support), and small businesses that had higher ratings in sleep sufficiency also had higher ratings on the same three social support variables. Conversely, my hypotheses that sleep quantity and social support variables would be positively correlated was unsupported at both the individual level and the organization level. Though there was one statistically significant finding regarding sleep quantity being negatively associated with perceived organizational support, this finding may be the result of Type 1 error, as the estimate was small (-0.08) and sleep quantity was unrelated to any other social support variable.

The statistically significant results for the relationship between sleep sufficiency and all three perceived support variables is congruent with prior findings. It is plausible that within organizations, workers with poorer sleep are more likely to perceive less social support as a result of their own impaired sleep. For instance, impaired sleep is associated with experiencing negative affect and perceiving ambiguous stimuli as more threatening (Ree & Harvey, 2006; Schwarz et al., 2018). This internalized explanation may also help explain why participants in small businesses with lower sleep scores report reduced perceived support. All effect sizes for statistically significant predictors at the individual level were considered small according to accepted standardized measures of effects (Lorah, 2018). The effect size of the surprising statistically significant finding showing sleep quantity to be inversely related to perceived organizational support did not reach the threshold for being considered small (0.1), further suggesting the relationship was due to type one error.

The organizational level finding that workers in more sleep-impaired organizations report reduced perceived support may also be explained by external influences as well. In addition to workers themselves being more sleep deprived and thus subjectively interpreting interactions with others more negatively, it may be that their interactions with sleep-impaired coworkers or supervisors actually were objectively worse. For instance, past research has found that sleep impairment among supervisors is associated with abusive leadership behaviors (Barnes et al., 2016). If workers in more sleep impaired organizations experience more objectively negative interactions with supervisors or peers, it follows logically that they would perceive less social support in their workplace. All effect sizes at level two of the model were also small ( $< 0.1$ ) according to accepted standardized measures of effects, except for the relationship between organization's sleep sufficiency and perceived organizational support, which was a medium effect size (Lorah, 2018).

Our non-significant results regarding the relationship between sleep quantity and social support variables may be explained in several ways. First, according to prior literature, sleep quality is a better predictor than sleep quantity when trying to predict sleep outcomes. This alone may explain why sleep sufficiency, which is a subcomponent of sleep quality, was a significant predictor of social support variables and why sleep quantity was not. Compounding this issue, the single sleep quantity item utilized in the current study was categorical, with some responses including an interval of 5 hours (e.g., sleeping 5 or less hours) and other responses including an interval of approximately one hour (e.g., sleeping between 6 and 6.9 hours) or more (e.g., 8 or more hours). This may have produced some range restriction and lack of measurement precision regarding sleep quantity. In other words, with responses on this item constrained to the



aforementioned intervals, much of the variability in participants' sleep quantity would not be captured by this measure.

Moreover, Barnes et al., (2015) have found similar results and suggested that it may be that individuals are more aware of their sleep quantity deficits than their sleep sufficiency deficits, and consequently more likely to monitor their own behavior when they do not get enough hours of sleep. If this is the case, the relationship between sleep quantity and perceived social support variables at the organization level would be attenuated. This is because individuals may be more aware of their lack of sleep time and therefore self-monitor their behavior more, resulting in reduced aggression or irritability. The relationship between sleep quantity and perceived social support variables at the individual level of the model may be attenuated as well. If individuals realize they slept fewer hours the night before, they may self-monitor their own affect, and its influence on their perceptions, and thus be less likely to perceive others' behaviors as aggressive or unsupportive.

However, my measure of sleep sufficiency was not ideal. First, there was only one item used to assess sleep sufficiency. It is possible that this measure was criterion deficient because it only measured a single subcomponent of sleep quality, namely sleep sufficiency. Also, according to prior literature, more direct, objective, measures of sleep, such as polysomnography, are the most accurate measures of sleep quality and quantity (Littner et al., 2003). Self-report measures, by contrast, have been long considered relatively weak measures of sleep quality given that participants may not accurately recall when or how often they woke through the night (Frankel, Coursey, Buchbinder & Snyder, 1976). Both measures of sleep quantity and sleep sufficiency in the current study were self-report measures.

The results of the current study contribute to the literature on sleep and the workplace in several ways. Using past literature regarding outcomes associated with sleep impairment, such as interpreting social interactions more negatively or having increased negative affect (Anderson & Dickinson, 2010; Nordin, 2006) we hypothesized that impaired sleep would be associated with reduced perceived organizational support. This was because, according to organizational support theory, workers' perceived support from coworkers depends on feeling cared for and knowing their contributions are valued (Eisenberger et al., 1986). Additionally, by utilizing the ego-depletion model (Baumeister, 1998), which predicts that impaired sleep would lead to depleted resources needed to maintain continuous supportive behaviors (Barnes, 2016), we predicted that more sleep impaired organizations would perceive less social support. This is the first study we are aware of that has shown evidence of a relationship between workers' sleep and perceived organizational support at either the employee or organizational level. This is important because it demonstrates that there may be a spillover effect between the home and work domains, as individuals who have impaired sleep at home are more likely to be perceived as unsupportive at work (Barnes et al., 2015). The results of the current study may also corroborate the perspective that experiences at work, such as experiencing unsupportive behaviors from supervisors or peers, may have a negative spillover effect of work into the home. This is because the relationship between impaired sleep and reduced perceived social support may be explained bidirectionally in that those who perceived the workplace as less supportive may have poorer sleep as a result.

Moreover, as mentioned, previous research has examined the relationship between sleep and perceived social support, as well as perceived supervisor support, at an individual level. Yet, the current study is the first we are aware of to examine these relationships in a multilevel model, particularly by testing these relationships at the organization level. By drawing on prior research

that has provided evidence of these relationships (e.g., between sleep and perceived social support) at an individual level, as well as research indicating organizations may differ in overall sleep due to their utilization of shiftwork, we hypothesized the multilevel model presented in the current study.

Additionally, by finding a relationship between sleep sufficiency and perceived social support variables at the organizational level of the multilevel model, this research opens new avenues for alternative explanations based upon potential mediating mechanisms. For example, at the second (organizational) level of the model, the relationship between organizational sleep impairment and individual workers' perceived social support may be mediated by numerous factors. For instance, similar to on the individual level of the model, the relationship between organizational sleep impairment and a worker's reduced perceived support may be partially explained by workers' perceptions of ambiguous social stimuli as negative if their sleep is impaired. However, the relationship between an organization's overall sleep impairment and individual workers' reduced perceived support may also be at least partly explained by experiencing objectively unsupportive behaviors. Examples include abusive leadership behaviors from sleep impaired supervisors (Barnes, 2019), or increased interpersonal conflict or delinquency with peers (Gordon & Chen, 2014; Meldrum, Barnes & Hay, 2015) within their own sleep-impaired organization. Consequently, different levels of the relationships found in the current study may have different potential explanations, which opens future research directions to discover what those explanations are at each level.

### **Theoretical Implications**

Feelings of belonging are essential to human well-being and can be acquired through one's workplace (Baumeister & Leary, 1995). Organizational support theory states that workers

feel supported within the workplace when they know they are cared for and that their contributions are valued by the organization (Eisenberger et al., 1986). However, research has demonstrated that when individuals have impaired sleep, they are more likely to have negative affect and consequently perceive others as being the opposite of supportive (Anderson & Dickinson, 2010; Kent et al., 2015). Not surprisingly, Rambod et al. (2013) found perceived social support was inversely related to sleep quality and perceived social support was also found to be inversely associated with sleep disturbance (Liu et al., 2016; Nordin, 2006). The results of the current study corroborate these findings by demonstrating that individuals with impaired sleep sufficiency are less likely to perceive support overall, and from their supervisor(s) and organizations, specifically. These findings also help further extend organizational support theory, which would predict that employees who experience more negative perceptions of coworkers' behaviors toward them would perceive their organization as less supportive (Eisenberger et al., 1986).

Moreover, the ego-depletion model posits that the majority of self-regulatory behaviors (e.g., regulating one's anger outbursts/aggression, being patient with others) appear to share and draw upon a limited resource (Baumeister et al., 1998). Sleep researchers have suggested that antisocial behaviors following sleep impairment may be due to depleted self-regulation following sleep (Barnes et al., 2011; Guarana & Barnes, 2017). This is corroborated by many studies that have reported reductions in self-regulation following sleep impairment (Hagger, 2010). Considering these findings, one would predict that more sleep impaired organizations would have reduced perceived social support at the aggregate level. The results of the current study have found this relationship, specifically between sleep sufficiency and supervisor, organizational, and perceived support more broadly.

## **Practical Implications**

The results of this study indicate that sleep sufficiency is positively associated with workers' perceived social support in the work environment. Thus, the clearest practical implications suggest workers may benefit from improving their sleep sufficiency. To this end, Barnes (2011) suggested preventative measures that organizations may take to protect employees' sleep. In the current study, the main reason we predicted differences in organizations' sleep levels was because some organizations utilize shiftwork more than others (McMenamin, 2007), and shiftwork has been shown to be associated with impaired sleep (Conway et al., 2008; Gerber et al., 2010; Keklund & Axelsson, 2016). Indeed, Barnes (2011) recommended that employers reduce or eliminate shift work or extended work shifts that may interfere with employees' sleep schedules. If this isn't possible (e.g., healthcare which requires 24-hour care), then training employees about healthy habits that improve sleep sufficiency may be beneficial. For example, the sleep literature suggests many things workers can do to obtain healthy sleep, such as creating a consistent bedtime routine, avoiding the use of screens in bed, as well as sleeping in a dark, cool, and comfortable environment (Irish, Kline, Gunn, Buysse & Hall, 2015).

Additionally, the finding that organizations may differ in their sleep in the current study may also give employers an impetus to communicate the importance of sleep to employees as a means of competing with other organizations within their own niche. Though substantial differences in organization-level sleep scores will likely be rare, the extremely low cost of educating employees on how to improve sleep hygiene and communicating the value of sleep will still likely be worthwhile (Barnes, 2011). This is especially likely given that sleep impairment is associated with a plethora of negative outcomes for organizations including

absenteeism, presenteeism, reduced productivity, and increasing accidents on the job (Barnes & Watson, 2019). Thus, employers have little to lose while improving the quality of life of their employees and potentially gaining a small but real advantage against organizations in their own niche that may have lower sleep sufficiency. Leaders in organizations should be good role models for healthy sleep and aim to support a positive health culture in terms of sleep (Barnes, Awtrey, Lucianetti & Spreitzer, 2020).

### **Limitations**

There were several limitations in the current study. Though results are congruent with past literature citing plausible causes for the observed relationships between sleep impairment and social support variables, causal inferences cannot be made. The observed relationships between sleep sufficiency and perceived social support variables may be explained by confounding variables. Stress, for example, may cause both sleep impairment in workers as well as reduced perceptions of social support from coworkers or upper management. In fact, past research has found stress is consistently associated with impaired sleep (Åkerstedt, 2006; Yang et al., 2018) and reduced perceptions of social support (Harandi, Taghinasab & Nayeri, 2017).

Depression is also associated with both impaired sleep and reduced perceived social support (Steiger & Pawlowski, 2019; Wang, Mann, Lloyd-Evans, Ma & Johnson, 2018). It may be that those who have more depressive symptoms are more likely to experience disturbed sleep and reduced perceptions of social support without sleep impairment influencing perceived social support. Similarly, neuroticism, a big five personality trait, may be another confounding variable. Neuroticism is associated with impaired sleep and reduced perceived social support (Slavish et al., 2018; Swickert, Hittner & Foster, 2010). It may therefore be that neuroticism is causing both

impaired sleep and perceptions of lower social support, without impaired sleep influencing perceived social support variables.

There may also be an interaction between shift work and social support. Employees participating in shift work may be more likely to work overnight and thus experience less face-to-face interaction or support with supervisors, upper-management, or coworkers. Not surprisingly, shiftwork is associated with impaired sleep (Gerber et al., 2010; Kecklund & Axelsson, 2016). Therefore, it may be that shift work causes both impaired sleep and reduced perceptions of social support, instead of impaired sleep influencing perceived social support.

The self-report nature of our measures also suggests our results should be interpreted with caution. More specifically, relationships between variables may be inflated due to common-method bias (Podsakoff, MacKenzie & Lee, 2003). Self-report measures are also considered less accurate compared to more objective measures of sleep (Littner et al., 2003). Future studies may benefit from utilizing better measures of sleep. Specifically, researchers may find more accurate results by employing EEG measurements, sleep tracking measurements worn by the participant, or by using a more comprehensive measure of sleep quality, rather than only using its subcomponent, sleep sufficiency. In the present study, sleep quantity was also measured via a categorical item. Future research may benefit from using a continuous item for sleep quantity to achieve more precise measurement of variability in sleep quantity among participants or organizations.

Moreover, though the current study allowed for examination of the relationship between sleep impairment and perceived social support at both the employee and organizational levels, our research was limited due to fact that we could not match subordinates with their supervisors. If there were data that could be used to match subordinates with their respective supervisors,

additional analyses could be conducted. For instance, in addition to predicting workers' perceived social support via their own sleep and their organization's mean level of sleep, matched data would have allowed for us to test whether supervisors' impaired sleep predicts their respective subordinates' perceived social support. Matched data would have also allowed for us to test whether subordinates' sleep impairment predicted their respective supervisors' perceived social and organizational support. Without being able to match supervisors and subordinates in the dataset, it is especially difficult to explain why the second-level predictor of organizations' sleep sufficiency in our model predicted workers' perceived social support variables.

### **Future research**

Future research should attempt to examine potential causes for the relationships found in the current study. Though experimental research may not be feasible, mediation analyses investigating the potential paths through which sleep impairment could inhibit perceived social support (or vice versa) could shed light on plausible causal explanations. Additionally, given that the current study was cross-sectional, future longitudinal research may investigate if changes in one variable (e.g., sleep sufficiency) are followed by subsequent changes in another variable (e.g., perceived supervisor support). Such temporally ordered changes may provide evidence for the direction of causality. Though we have summarized prior research to support the prediction that impaired sleep will lead to lower perceptions of social support (Barnes, 2016; Nordin, 2006), other authors have suggested that the direction of causality may be reversed (Kent de Grey, Uchino, Trettevik, Cronan & Hogan, 2018). It may also be that the relationship between sleep and perceived social support is bidirectional. Thus, future longitudinal research may help in



discerning whether the relationship the direction(s) of causality within the relationship of sleep and perceived social support.

Future research should also attempt to extend or qualify findings from the current study. Investigating whether there is a third, confounding variable associated with both sleep sufficiency and perceived social support is one example. Previous research has found that depression is associated with both impaired sleep and reduced perceived social support (Steiger & Pawlowski, 2019; Wang et al., 2018). Thus, it may be that depression may explain the relationship between impaired sleep and perceived social support. The big five personality trait known as neuroticism may be another confounding variable, as it is associated with both impaired sleep and reduced perceived social support (Slavish et al., 2018; Swickert, Hittner & Foster, 2010). The archival dataset used in the current study did not measure depression or neuroticism.

Additionally, it may be that more introverted workers prefer shiftwork that includes overnight shifts, as these shifts would be expected to have less social interaction. If night shift workers are less social, this could impact perceptions of social support. In the current study, though, neither personality traits nor what type of shift work (e.g., overnight, weekends, cycles) participants engaged in. Future research may benefit by measuring and including these variables in the analysis to search for confounding variables.

Future research may also conduct moderation analyses to examine potential contexts in which the relationship between sleep impairment and social support variables may be stronger or weaker. If employees frequently telework or have very little contact with their supervisor(s), the relationship between sleep impairment and supervisor support may be mitigated since employees may not be able to directly observe unsupportive supervisor behaviors in sleep-impaired

supervisors. The relationship between workers' sleep sufficiency and perceived supervisor support may also be moderated by individual difference variables. For instance, Schwarz et al. (2018) found that the relationship between sleep impairment and negative affect is weaker among older adults. Thus, if the relationship between workers' sleep impairment and perceived social support is mediated by workers' own negative affect, the relationship between sleep impairment and perceived social support may be weaker among older adults.

It may also be that contextual factors play a role in moderating the relationship between sleep sufficiency and perceived social support variables. Future research may want to investigate whether the relationship between sleep sufficiency and perceived social support is stronger in larger organizations. If workers in larger organizations have more social interaction and thus a greater chance of negative social experiences with others, this may mean sleep impaired employees in larger organizations would be especially likely to report reduced social support. This is because previous research has shown that people tend to experience disproportionately negative affect due to negative events compared to the positive affect they experience due to positive events of the same magnitude (Norris, 2019; Rozin & Royzman, 2001).

In addition to extending or qualifying the findings of the current study, future research should also investigate the direct relationship between supervisors' sleep impairment and their respective subordinates' perceived supervisor support. In the current study, the archival dataset that was used had no identifying information that could be utilized to match subordinates with their respective supervisors. For example, Barnes et al. (2016) matched supervisors' and their respective subordinates' to examine the association between supervisors' self-reported sleep impairment and their subordinates' observations of abusive leadership behaviors done by their supervisor. Future research should thus match supervisors' self-reported sleep sufficiency and

their respective subordinates' self-reported perceived supervisor support as a means of testing whether the relationship between supervisors' sleep impairment and subordinates' perceived supervisors support is best explained by objective sleep impairment in supervisors or subjective perceptions of subordinates.

### **Summary and Conclusions**

Previous research and the current study have utilized the ego-depletion model and organizational support theory to test hypotheses regarding the relationship between sleep and perceived social support. Though causality and its direction in this relationship is still being investigated, there is nonetheless evidence that sleep is associated with perceived social support at both the individual level and organizational level for small businesses. This finding is relevant for scientists and practitioners, as it demonstrates a possible spillover effect between nonwork (e.g., sleep sufficiency) and work (e.g., perceived organizational support), which has important theoretical and practical implications.

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## APPENDIX

### **Perceived Social Support Measure**

Instructions: Please indicate how much you agree or disagree with the following statements.

1 = Strongly Disagree; 2 = Disagree; 3 = Neither Agree nor Disagree; 4 = Agree;

5 = Strongly Agree

1. I have the opportunity to develop close friendships in my job.
2. I have the chance in my job to get to know other people.
3. My supervisor is concerned about the welfare of the people that work for him/her
4. People I work with take a personal interest in me.
5. People I work with are friendly.

### **Perceived Organizational Support Measure**

Instructions: Please indicate how much you agree or disagree with the following statements about your organization.

1 = Strongly Disagree; 2 = Disagree; 3 = Neither Agree nor Disagree; 4 = Agree;

5 = Strongly Agree

1. The organization really cares about my well-being.
2. The organization cares about my general satisfaction at work.
3. The organization shows a lot of concern for me.



### **Perceived Supervisor Support Measure**

Instructions: Please indicate how much you agree or disagree with the following statements about your organization.

1 = Strongly Disagree; 2 = Disagree; 3 = Neither Agree nor Disagree; 4 = Agree;

5 = Strongly Agree

1. I can count on my supervisor for support when I need it.

### **Sleep Quantity Measure**

How many hours of sleep do you usually get daily?

<6 hours; 6-6.9 hours; 7-8 hours; >8 hours

### **Sleep Sufficiency Measure**

Please indicate how you have been feeling over the past 2 weeks.

Over the past 2 weeks I woke up feeling fresh and rested...

1. At no time

2. Some of the time

3. Less than half of the time

4. More than half of the time

5. Most of the time