THE IMPACT OF DAILY OCCUPATIONAL STRESS ON SLEEP AMONG SHIFT WORKERS: SOCIAL SUPPORT AS A BUFFER

by

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B.Sc., The University of Calgary, 2008

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARTS

in

The Faculty of Graduate and Postdoctoral Studies

(Psychology)

THE UNIVERSITY OF BRITISH COLUMBIA

(Vancouver)

August 2015

ABSTRACT

Shift workers are a population at risk for experiencing poor sleep. Given the evidence linking health with shift work and sleep disturbance, it is important to identify factors that can exacerbate or mitigate sleep problems in this vulnerable population. We followed eighty-seven shift-working paramedics morning and evening over one week using an intensive longitudinal design. Multilevel modeling was used to examine whether the detrimental effects of daily occupational stress on sleep quality were buffered by perceived social support availability. Paramedics who reported more social support tended to report better quality sleep over the week. Additionally, social support buffered sleep from day-to-day fluctuations in occupational stress as well as from high average occupational stress over the week. Findings indicated that those with low levels of social support displayed poor sleep quality on days with high occupational stress; those high in support did not show significant effects of occupational stress on sleep. Those with low levels of social support tended to also display poor sleep on average across the week when they also tended to report high occupational stress on average across the week. Theoretical and practical implications are discussed.

PREFACE

I am the primary contributor and author of the work presented in this thesis. The results have been submitted for publication: Pow, J., King, D. B., Stephenson, E., & DeLongis, A. (in review). The impact of daily occupational stress on sleep among shift workers: Social support as a buffer.

I took the lead on identifying research questions, conducting data analysis, and composing the manuscript. Dr. King contributed to study design and data collection, provided guidance on data analysis, and assisted in manuscript revisions. Ms. Stephenson provided guidance on data analysis and assisted in manuscript revisions. Dr. DeLongis was the supervisory author on this project and contributed to study design and data collection, concept formation, provided guidance on data analysis, and assisted in manuscript revisions.

All research contained herein was approved by the UBC Behavioural Research Ethics Board (Project Title: "Stress and Coping across Occupational and Personal Environments (SCOPE) in Paramedics," BREB # H09-02994).

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ACKNOWLEDGEMENTS

First and foremost, I would like to thank my advisor, Dr. Anita DeLongis. The last fourteen months have been the most challenging that I have ever experienced, and Dr. DeLongis has given me the tools, encouragement, and steady support that I needed to thrive throughout the process. She allowed me to pursue answers to questions that *I* think are interesting, she trusted me to complete important and difficult tasks without questioning my ability to do so, and she had the patience to allow me to fix my own mistakes when I made them. I have gained so much knowledge and so many skills since first entering graduate school, and most of that growth occurred because of Dr. DeLongis' guidance.

I would also like to thank my committee members, Dr. Christiane Hoppmann and Dr. Frances Chen, for taking the time to learn about my research and for providing feedback on this project. I would like to specifically thank Dr. Hoppmann for her thoughtful instruction in research methods and I would also like to specifically thank Dr. Chen for participating in and providing constructive feedback after my practice oral defense.

The last year would definitely not have gone as smoothly without the incredible advice and emotional support from my colleagues: Ellen Stephenson, David King, Mark Lam, Jennifer Lay, and Victoria Michalowski. I feel very privileged to be able to know and work alongside such brilliant and unique individuals and I look so forward to continuing to collaborate with you for years to come.

I would like to thank the first "project manager" that I ever had, my mother, who worked with me through countless grade school assignments, projects, and science fairs. She was the person who taught me how to be creative, how to work hard, and most of all, how to think BIG.

The research presented in this thesis was supported by the Canadian Institutes for Health Research Masters Award, a Faculty of Arts Graduate Award from the University of British Columbia, a UBC Hampton Fund Research Grant, and research grants from the Social Sciences and Humanities Research Council to Dr. Anita DeLongis, all of which contributed to the success of this endeavor.

This manuscript is dedicated to Adam.

Introduction

Shift workers make up a substantial proportion of the working population around the world; with reported rates ranging from 15-17% for the European Union (Eurofound, 2010) to 28% of employed individuals in Canada (Williams, 2008). Shift work can disrupt circadian rhythms and is associated with a greater incidence of sleep disturbance, fatigue, and even involuntary sleep in the workplace (Åkerstedt, 2003). Both shift work and sleep problems have been linked to a variety of negative psychological and physical health outcomes. Shift work is a risk factor for cardiovascular disease, peptic ulcers, negative pregnancy outcomes, (Knutsson, 2003) and breast cancer (Wang, Armstrong, Cairns, Key, & Travis, 2011). Additionally, individuals with sleep disturbances are at risk for depression and other psychological disorders (Taylor, Lichstein, & Durrence, 2003), cardiovascular disease, diabetes, and early mortality (Åkerstedt, 2006). Given the evidence linking health with shift work and sleep disturbance, it is important to identify factors that can exacerbate or mitigate sleep problems in this vulnerable population.

Occupational stress may be a key factor in exacerbating sleep problems in shift workers. Stress can transfer across settings such that stress experienced at work may persist after the end of a workday, "spilling over" to the home (King & DeLongis, 2014). The cognitive and physiological arousal that accompanies stress may interfere with sleep (Garde, Albertsen, Persson, Hansen, & Rugulies, 2012; Hall et al., 2007; Sadeh, 1996; Steiger, 2007). Individuals who report high occupational stress tend to report poorer sleep quality relative to those who report less occupational stress (Geiger-Brown, Trinkoff, & Rogers, 2011). Additionally, individuals who report high occupational stress are at risk for future sleep disturbance (for a review, see Van Laethem, Beckers, Krompier, Dijksterhuis, & Geurts, 2012).

Regardless of a person's average levels of occupational stress, there may be meaningful variability across days in levels of occupational stress for most workers. Whether these daily fluctuations in occupational stress predict subsequent sleep quality beyond mean levels has implications for clinical interventions. A worker may be unprepared to move to a less stressful position or occupation, but if day-to-day shifts in occupational stress predict the night's sleep quality, then those in stressful occupations may benefit from learning to manage stress more effectively while engaging in what remains a relatively

high stress job. However, there has been limited work examining the daily association of occupational stress and sleep quality.

In a recent study using a sample of day-workers, Vahle-Hinz, Bamberg, Dettmers, Friedrich, and Keller (2014) measured self-reported occupational stress and subsequent sleep quality over two consecutive workdays and found that more stressful workdays tended to be followed by poorer sleep relative to less stressful workdays. However, trait- and state-level components of the variables were not examined independently. Given this, it is not clear whether people who tend to experience high occupational stress also tend to experience poor sleep quality relative to those experiencing low occupational stress, or whether days on which individuals experience more occupational stress than they typically do are associated with poorer subsequent sleep, or whether both are true . In the current study, we used an intensive longitudinal design incorporating a larger number of time points and an analytical approach that allowed us to consider the effect of fluctuations around each person's mean in occupational stress on subsequent sleep quality (i.e., the within-person or state-level association) while also considering the association of each person's average reported occupational stress with their average reported sleep quality (i.e., the between-person or trait-level association; Bolger & Laurenceau, 2013).

One key factor that may mitigate the negative effects of shift work and its associated stress is the perception that social support would be available if it were to be needed. Perceived social support availability is beneficial for health and well-being both directly and in buffering against the negative effects of stress (Cohen & Wills, 1985; Taylor, 2011; Umberson & Montez, 2011; Viswesvaran, Sanchez, & Fisher, 1999). Studies testing the direct effects of social support on sleep have found higher levels of social support to be related to better sleep quality both cross-sectionally (Sinokki et al., 2010; Brummett et al., 2006; Nordin, Sundbom, & Knutsson, 2008) and prospectively (Nordin, Westerholm, Alfredsson, & Åkerstedt, 2012). Not only would we expect social support to have direct effects on sleep quality, but we would also expect social support to protect sleep from the detrimental effects of stress. However, to our knowledge, only one study has been conducted examining whether social support can protect sleep from the negative effects of a stressor (Crain et al., 2014). In this study, Crain and colleagues (2014)

examined the cross-sectional relations of work-family conflict, supervisor support, sleep duration, and sleep quality in a sample of information technology workers. In this study, supervisor support was not found to have significant direct or indirect relations with sleep outcomes. A possible explanation for these findings is that the measure of social support used in this study was limited to measuring supervisor support. It may be that a measure is needed that assesses support from the broader social network. In the current study, we assessed social support using the Interpersonal Support Evaluation List (ISEL; Cohen, Mermelstein, Kmack & Hoberman, 1985) which is a broad-based measure of social support that has been well-validated in diverse participant pools (Cohen & Hoberman, 1983; Cohen & Wills, 1985) and is widely used in health research (Fortmann & Gallo, 2014). Additionally, social support measured in this way has been found to have both direct and stress-buffering effects in other health domains (Taylor, 2011).

In order to meet the goals of this study, we followed paramedics across a period of one week. Paramedics are an ideal population to study in this context because they are a primarily shift working population known to be at especially high risk for experiencing both sleep disturbances (Pirrallo, Loomis, Levine, & Woodson, 2011) and high levels of occupational stress (Regehr, Goldberg, & Hughes, 2002). Because occupational stress and the associated physiological and cognitive arousal may spill over into the home setting and is thought to be sleep-disrupting:

> Hypothesis 1: Day-to-day fluctuations in occupational stress around each person's mean were expected to be associated with subsequent sleep quality. After days of higher occupational stress, participants were expected to report poorer sleep relative to after days of lower occupational stress.
>
> Hypothesis 2: Each person's average occupational stress was expected to be associated with their average sleep quality across the week such that those reporting high occupational stress over the week would tend to report poorer sleep relative to those reporting lower occupational stress.

In support of both direct and stress buffering models (Cohen & Wills, 1985), we further expected that:

Hypothesis 3: Perceived social support would be associated with each person's average sleep quality over the week such that more support would be related to better sleep quality;

Hypothesis 4: Perceived social support would mitigate the effect of fluctuations in occupational stress around each person's mean on subsequent sleep quality and the effect of each person's average occupational stress on their average sleep quality across the week. We expected that those reporting high social support would have sleep that is unrelated to occupational stress, whereas those reporting low social support would have poorer sleep as a function of greater occupational stress.

Methods

Participants

Data are from an ongoing longitudinal study of 87 paramedics examining the impact of occupational stress on wellbeing (for additional information about demographics, eligibility criteria, and recruitment procedures, see King & DeLongis, 2014). Paramedics were licensed by the Canadian Medical Association and had been on the job for an average of 15.2 years (*SD* = 7.7). Participants were aged 27-62 years (mean 42.1 years, *SD* = 8.3) and most (*n* = 71) identified as male. Eighty-two paramedics identified as Caucasian, four as Asian, and one as Hispanic. Participants' mean years of post-secondary education was 2.36 (*SD* = 1.85) and mean household income was $117, 500 CDN (*SD* = 40, 000 CDN).

Procedure

Paramedics were recruited using online media as well as flyer and brochure advertisements at local Emergency Medical Service stations. The advertisements directed interested paramedics to an online website where they were asked to complete an eligibility questionnaire. This questionnaire asked basic information about employments status, relationship status, and schedule information. Eligibility criteria included being employed full-time or working full-time equivalent hours. Additionally, participants had to be scheduled to work four consecutive shifts during the study in order to maintain homogeneity in work schedules.

If participants met the eligibility criteria for the study, they were directed to an online questionnaire on a secure server at the University of British Columbia where they were asked to provide informed consent and basic demographic information. Following this, participants were contacted by phone to schedule the diary phase of the study. Once a time was scheduled, participants received an email link to the online diary questionnaires. Participants were asked to complete structured diaries for a seven day period during which days 2-5 were scheduled work days. Because of changing schedules associated with shift work as well as the sensitive nature of the job, we chose to utilize an event-contingent design whereby paramedics were asked to complete diaries within one hour of waking, at the end of the workday, and within one hour of going to bed. For the purposes of the current study, we only examined

diaries that were completed upon waking (i.e., assessing sleep quality) and after work (i.e., assessing work stress). Even though days 2-5 were scheduled work days at study onset, sometimes work schedules changed during the study, with some paramedics working fewer than four shifts and some working more than four shifts. We did not exclude participants if the participants' schedules changed during the study. Of the 609 days that were assessed across all participants, there were 291 reported workdays and with a mean for each person of 3.32 days (*SD* = 1.31, range = 0-6). Following the diary phase of the study, participants were asked to complete a final online questionnaire battery. After the online questionnaire battery, participants were thanked and debriefed. All participants received a $40 gift card for their participation. This study was approved by the affiliated institution's Behavioural Research Ethics Board.

Measures

During the diary phase of the study, paramedics were asked to complete an 11-item checklist for problems or events experienced "while at work" at the end of each workday. Checklist items were chosen based on cited job responsibilities by major services in Canada and reviewed by a paramedic consultant on the project. These events and their frequencies are listed in Table 1. The most common problems that paramedics experienced were high call volume and illegitimate calls. One of the 11 checklist items was "other problem" and participants were given the opportunity to give a brief description of this problem if they endorsed this item. These open-ended responses were most often in regard to issues associated with patient care (32%; e.g., "pulseless patient with return of pulse", "road rage incident directed at elderly disabled person", "cardiac arrest") and with coworkers (25%; e.g., "my partner drives like Stevie Wonder", "my partner was incompetent", "working de-paired"). The number of stressors was summed for each workday to create an index of occupational stress. The number of stressors that were reported each day ranged from zero to five. Participants completed the occupational stressors checklist on 290 of the 291 reported workdays.

Sleep quality was assessed during the seven-day daily diary phase of the study with a key item that makes up the score for the first component of the Pittsburgh Sleep Quality Index (Buysse, Reynolds, Monk, Berman, & Kupfer, 1988). Reworded for diary format, this item has been used in previous

intensive longitudinal research to measure subjective sleep quality (Rutledge et al., 2009). Paramedics were asked to respond to the following question within one hour of waking: "How would you rate your overall sleep quality last night?" Responses included "very good (= 4)", "fairly good (= 3)", "fairly bad (= 2)", and "very bad (= 1)". Across the 609 person-days of daily diaries, participants completed the sleep quality rating for 420 days in total, so each person completed the sleep quality rating on 6.21 days on average (*SD* = 1.26, range = 0-7). One participant did not complete the sleep quality item throughout the entire week period, and was therefore excluded from analyses.

Participants completed the Interpersonal Support Evaluation List (ISEL; Cohen, Mermelstein, Kmack & Hoberman, 1985) during the final online questionnaire battery (completed within two weeks of completing the daily diary component of the study). The ISEL is a 40-item measure of social support and asks respondents to report whether a series of statements are "definitely true", "probably true", "probably false" or "definitely false". Cronbach's alpha for the scale was .94. On the ISEL, there was a 99.6% completion rate and linear interpolation was utilized to impute missing data.

Statistical analysis

Due to the multilevel structure of the data, hypotheses with regard to the relation of occupational stress, perceived support, and sleep quality were tested using hierarchical linear modelling (HLM) software (v6.0; Raudenbush, Bryk, Cheong, & Congdon, 2004). Daily measures were nested within individuals. Therefore, daily within-person measures were modelled at level 1 and between-person measures were modelled at level 2. Additionally, random intercepts and slopes were utilized. Following Woltman, Feldstain, MacKay, and Rocchi's (2012) recommendations, we tested two unconditional means models to calculate the intra-class correlations (ICCs) for sleep quality and occupational stress. The ICCs for both indicated that there was a significant proportion of their variance at the within-person level (level 1) and at the between-person level (level 2), and a multilevel analytic approach was necessary to capture both sources of variation (see Table 2).

Model 1 tested our first two hypotheses, which were that daily fluctuations in occupational stress would be negatively associated with the next day's sleep quality and that each person's mean on

occupational stress would be negatively associated with their mean on sleep quality. In this model, daily occupational stress was centered around each person's mean and modeled at level one and each person's average occupational stress was centered around the grand mean and included at level two. Model 2 tested our third hypothesis, which was that greater perceived support would predict better average sleep over the entire week (across both workdays and weekends). In this model, perceived support was grand-mean centered and entered into the model at level 2. Finally, Model 3 tested our fourth hypothesis, which was that social support would buffer sleep from occupational stress. In this model, daily fluctuations around each person's mean occupational stress levels were entered at level 1. Each person's average occupational stress across the week, social support and their interaction were entered at level 2. Additionally, we entered a cross-level interaction for daily fluctuations in occupational stress with each person's social support. List-wise deletion was used to handle missing data.

Results of significance testing of simple slopes are presented following recommendations by Preacher, Bauer and Curran (2004). This method provides information regarding the specific boundaries of the moderator at which the association between the focal variable and the outcome variable become significant. In the current study, we present the specific values of perceived support at which the association between occupational stress and sleep quality were significant.

We controlled for gender, age, type of shift (i.e., dayshift or nightshift), and day of the study in preliminary analyses. Additionally, when examining the main effect of social support on sleep quality across the entire week, we controlled for type of day (i.e., workday or weekend) in preliminary analyses. However, none of these variables were significantly related to sleep quality nor did they change the associations of occupational stress and perceived support with sleep quality. Therefore, these control variables were dropped from the final analyses presented here. We controlled for the previous day's sleep quality in all analyses in order to reduce the possibility for reverse causation. It is important to note, however, that excluding the previous day's sleep quality in analyses did not substantively change results as they are presented here.

Results

Means, standard deviations, ICCs, and within- and between- person bivariate correlations of sleep quality, occupational stress, and perceived support are displayed in Table 2. Each person's average sleep quality was associated with their average reported occupational stress as well as with perceived support. However, the within-person correlation between occupational stress and sleep quality was not significant. Social support and each person's average occupational stress across the week were not significantly correlated. When tested alone in a multilevel model, there was a significant negative effect of each night's sleep quality on the subsequent night's sleep quality (b = -.09, SE = .04, t (85) = -2.20, p = .030).

Hypothesis testing

Tests of our hypotheses are shown in Table 3[1]. Model 1 shows that fluctuations around each person's mean on occupational stress were marginally negatively related to subsequent sleep quality. Therefore, hypothesis 1 was partially supported. Model 1 also shows that people who reported more occupational stress over the week also tended to report poorer sleep quality relative to those reporting less occupational stress. Therefore, hypothesis 2 was supported. Next, Model 2 indicated that those who reported more social support were likely to report better quality sleep over the week relative to those reporting less social support. Therefore, hypothesis 3 was supported.

Model 3 shows that the interaction of social support with fluctuations in occupational stress to predict sleep quality was significant. Decomposition of simple slopes indicated that fluctuations in occupational stress were related to subsequent sleep quality for paramedics reporting social support that was lower than .51 SD below the mean (ISEL score < 76.11). For paramedics reporting low social support, days of higher occupational stress (relative to their own typical levels) were related to worse subsequent sleep quality. This interaction is displayed graphically in Figure 1. Model 3 also shows that the interaction of social support with each person's average occupational stress to predict average sleep quality was significant. Decomposition of simple slopes indicated that each person's average levels of occupational stress were related to their average sleep quality for paramedics reporting social support that

was lower than .36 SD above the mean (ISEL score < 92.15). This interaction is displayed graphically in Figure 2. Therefore, hypothesis 4 was supported.

Discussion

This study provides initial evidence that social support buffers the effect of occupational stress on sleep quality and adds to the general body of research documenting the direct and buffering effects of social support on health outcomes. Over a one-week period, more stressful workdays tended to be followed by poorer sleep for those reporting low social support. Conversely, those reporting high social support tended to have sleep that was unrelated to their reports of occupational stress from the previous day. When we examined the effect of each person's average occupational stress on his or her average sleep quality, a similar pattern emerged. Findings from this study suggest that social support buffers sleep from especially stressful workdays as well as from occupational stress that is consistently high across one week of measurement.

This study also yielded insights about the stressors that paramedics tend to experience and provides an understanding of the extent to which these stressors may impede sleep quality. Paramedics are among the most at-risk for developing post-traumatic stress disorder (PTSD; McFarlane, Williamson, & Barton, 2009), which could be a result of their frequent exposure to highly traumatic stressors. Sleep is thought to be crucial for recovery from daytime demands, and is a predictor for future onset of PTSD (Germaine, 2013). If experiencing an increasing number of occupational stressors impairs sleep for some paramedics, then providing paramedics with more recovery time following especially stressful workdays may help to prevent future onset of PTSD. Along with past research suggesting that those who are socially integrated or feel socially supported may be more resilient following traumatic stressors relative to less socially integrated or less socially supported individuals (Kaniasty, 2012; Schwarzer, Bowler, & Cone, 2014), this research suggests that increasing paramedics' social resources may prevent PTSD and other negative health outcomes linked to sleep disturbances.

Although not hypothesized, another finding of note was that one night of high quality sleep was generally associated with a subsequent night of poorer quality sleep and vice versa, supporting the idea that homeostatic mechanisms might be involved in regulating sleep quality (Perlis, McCall, Jungquist, Pigeon, & Matteson, 2005) in shift-workers. A night of poor sleep might be followed by a night of

recovery sleep because of a build-up of "sleep pressure" (Perlis et al., 2005). This is consistent with research indicating that some individuals with insomnia tend to have quite predictable sleep quality in that they have an increasing probability of reporting good quality sleep 1-3 days after a night of poor quality sleep (Vallières, Ivers, Bastien, Beaulieu-Bonneau, & Morin, 2005). Future research could examine the potential for the build-up of sleep pressure in shift-working populations.

Limitations and Future Directions

Previous long-term prospective research indicates some bidirectionality in the relations of individual differences in sleep with individual differences in social support and occupational stress (e.g., Hanson et al., 2011; Nordin et al., 2012). Given this, a plausible alternative hypothesis here is that poor quality sleep leads to increased occupational stress. However, we found support for our hypothesis that occupational stress predicted subsequent sleep quality, even while holding the sleep quality of the previous sleeping session constant.

Past research suggests that that those who feel socially supported tend to use both more adaptive and a wider variety of coping strategies relative to those who feel less socially supported (DeLongis & Holzman, 2005; Holzman, Newth, & DeLongis, 2004; Manne & Zautra, 1989). For example, those who report low levels of social support tend to be more inclined to engage in ruminative coping relative to those reporting greater social support (DeLongis, Holtzman, Puterman, & Lam, 2010; Holzman & DeLongis, 2007) and social support has been found to attenuate state rumination in those who have a tendency to ruminate (Puterman, DeLongis, & Pomaki, 2010). It is possible that social support provides paramedics with coping resources that allow them to effectively process and recover from daily occupational stress, decreasing bedtime rumination, emotional arousal, and other factors linked to poor sleep. Future research should examine whether the effect of social support on sleep occurs through eliciting coping strategies that are more adaptive. This may require intensive longitudinal designs assessing support and coping processes multiple times between the end of a workday and going to sleep.

In addition, it is possible that personality traits that have been shown to be related to sleep, stress, or social support, such as trait rumination or neuroticism, act as third variables causing both stress and

sleep disturbance (Guastella & Moulds, 2006). However, by considering fluctuations in occupational stress around each person's mean level of stress we have greater confidence that relationships between stress and sleep found here are not due to these potential confounds. It is possible that individual differences in factors such as rumination and neuroticism may moderate the relationships between stress and sleep found here and should be the subject of future research.

Conclusion

This study indicates that occupational stress may play a key role in predicting sleep quality. It further provides evidence for a social support buffering model in which the effects of everyday occupational stress on sleep quality is moderated by social support, adding to the general body of literature documenting the main and buffering effects of social support on health and wellbeing. Findings suggest the importance of social relationships for protecting workers' sleep and health, particularly those in high stress jobs such as emergency medical personnel. Stress management interventions may benefit from a focus on helping workers to understand the value of their social relationships in managing their stress and facilitating sleep.

Table 1. Frequencies of stressors over one week

	Frequency (out of 290 workdays)	% of workdays with completed checklist
A lot of work demands/high call volume	90	31.03
Illegitimate call	81	27.93
Family or relationship demands (while at work)	67	23.10
Significant off-load delay[a]	55	18.97
Violence/ threat to crew safety	46	15.86
Suicide call	23	7.93
Pediatric call	22	7.59
Personal health problem (while at work)	19	6.55
Death of patient while under care	16	5.52
Multiple casualty incident	9	3.10
Other (open ended)	59	20.34
Any stressor	233	80.34
One stressor	87	30.00
Two stressors	74	25.52
Three stressors	45	15.52
Four stressors	18	6.21
Five stressors	9	3.10

Note. [a]An off-load delay occurs when a paramedic spends too much time (typically greater than 30 minutes) at the emergency department of a hospital with a patient.

Table 2. Means, standard deviations, ICCs and bivariate correlations for variables of interest

	Grand Mean[a] (SD)	Person Mean[b] (SD)	ICC	1	2	3
1. Stress	1.68 (1.29)	1.73 (.98)	.38	-	-.33**	-.04
2. Sleep quality	2.96 (.73)	2.93 (.48)	.16	-.09	-	.45**
3. Social Support		85.51 (18.44)				-

Note. Between-person correlations are presented above the diagonal and within-person correlations are presented below the diagonal for variables that were repeatedly measured.

[a]Means are across all person-days.

[b]Means are for aggregated scores across the week for each participant for variables measured repeatedly

$^{+}p < .10$, $*p < .05$, $**p < .01$, $*** p < .001$.

Table 3. Predicting sleep quality from occupational stress and perceived social support

	Model 1		Model 2		Model 3	
Fixed effects	Estimate (*SE*)	*t*	Estimate (*SE*)	*t*	Estimate (*SE*)	*t*
Intercept	2.93 (.06)	49.90***	2.92 (.05)	61.42***	2.93 (.05)	55.79***
Prior sleep quality	-.11 (.05)	-2.10*	-.09 (.04)	-2.27*	-.10 (.05)	-2.03*
Support			.01 (.003)	3.65**	.01 (.003)	4.85***
Daily stress	-.10 (.06)	-1.73^{+}			-.09 (.05)	-1.65
Daily stress X support					.01 (.002)	2.88**
Average stress	-.17 (.06)	-2.59*			-.17 (.06)	-2.79**
Average stress X support					.01 (.004)	2.05*
Random effects	Standard Deviation	χ^2	Standard Deviation	χ^2	Standard Deviation	χ^2
Intercept	.37	75.53***	.29	137.57***	.32	74.02***
Prior sleep quality	.08	36.82	.06	31.63	.08	37.56
Stress (within)[b]	.23	80.15***			.19	72.06**
Level 1	.62		.66		.62	

Note. Model 1: n = 74 individuals, 238 days; Model 2: n = 86 individuals, 420 days; Model 3: n = 74 individuals, 240 days; *df* for *t* values ranged from 70-85. *df* for χ^2 values ranged from 35-65.

$^{+}p < .10$, $*p < .05$, $**p < .01$, $***p < .001$.

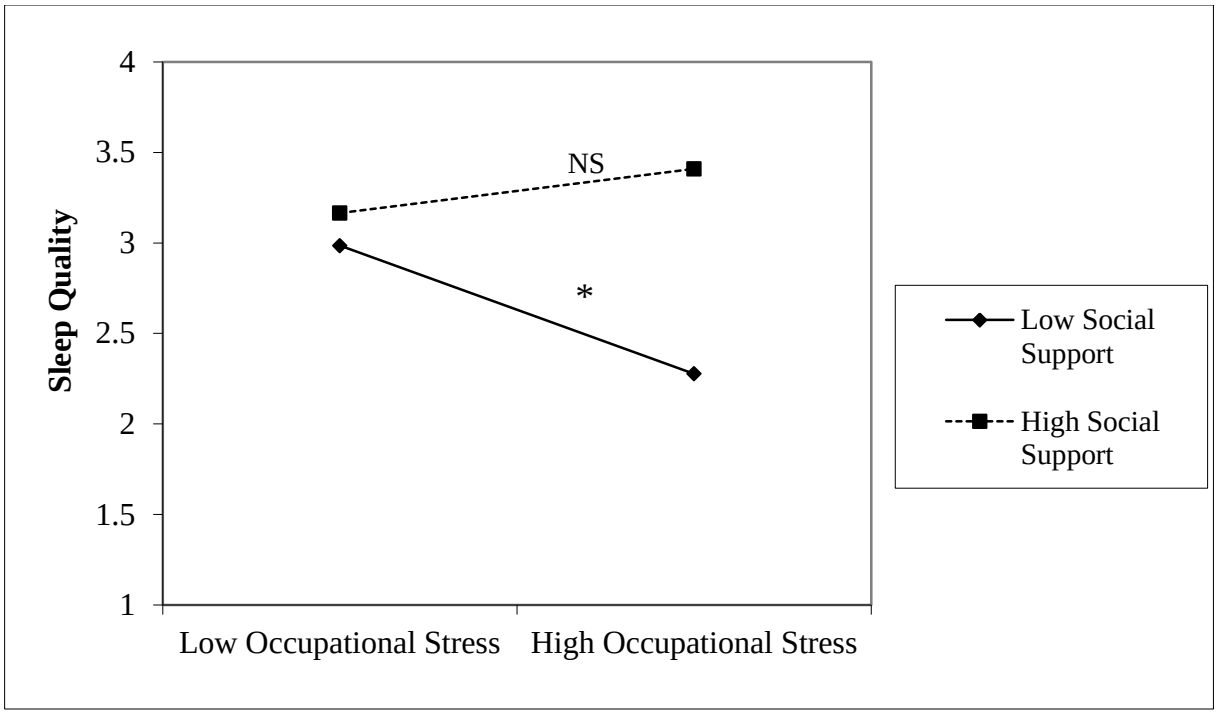

Figure 1. Daily sleep quality as a function of the deviation of occupational stress from each person's mean from the previous day for those reporting low (1 *SD* below the mean) and high (1 *SD* above the mean) social support (Model 3).

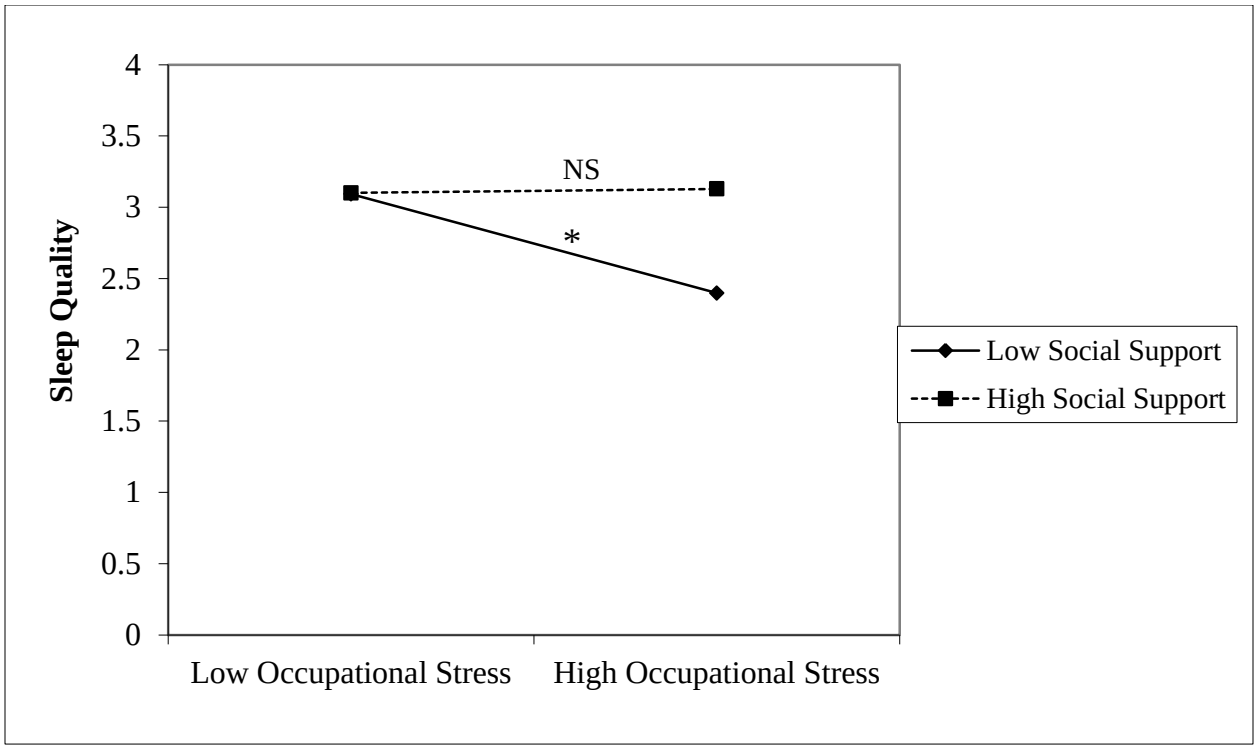

Figure 2. Average sleep quality as a function of average occupational stress across the week for those reporting low (1 *SD* below the mean) and high (1 *SD* above the mean) social support (Model 3).

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