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Association Between Police-Specific Stressors and Sleep Quality: Influence of Coping and Depressive Symptoms

Tara A. Hartley,
Biostatistics and Epidemiology Branch, Health Effects Laboratory Division, National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention, Morgantown, WV, USA

John M. Violanti,
Department of Social and Preventive Medicine, School of Public Health and Health Professions, University at Buffalo, Buffalo, NY, USA

Khachatur Sarkisian,
Biostatistics and Epidemiology Branch, Health Effects Laboratory Division, National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention, Morgantown, WV, USA

Desta Fekedulegn,
Biostatistics and Epidemiology Branch, Health Effects Laboratory Division, National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention, Morgantown, WV, USA

Anna Mnatsakanova,
Biostatistics and Epidemiology Branch, Health Effects Laboratory Division, National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention, Morgantown, WV, USA

Michael E. Andrew, and
Biostatistics and Epidemiology Branch, Health Effects Laboratory Division, National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention, Morgantown, WV, USA

Cecil M. Burchfiel
Biostatistics and Epidemiology Branch, Health Effects Laboratory Division, National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention, Morgantown, WV, USA

Abstract

Police officers work in an environment of chronic psychological stress which may be associated with sleep quality. Variation in sleep quality may be a result of how well officers cope with stress. The purpose of this study was to examine associations between police-specific stresses and sleep quality, and factors which may modify these associations. Participants were 356 police officers

Correspondence to: Tara A. Hartley.

(256 men, 100 women) from the Buffalo Cardio-metabolic Occupational Police Stress (BCOPS) Study examined between 2004 and 2009. Stress in the past year, including organizational, physical and psychological danger and lack of support, was measured using the Spielberger Police Stress Survey. Sleep quality was measured using the Pittsburgh Sleep Quality Index. Analysis of covariance was used to examine multivariable-adjusted sleep quality across police stress tertiles; p-values were obtained from linear regression. Adjustments were made for age, gender, race, education, marital and smoking status. Analyses were stratified by coping and depressive symptoms, potential moderators of the association of interest. Multivariable-adjusted global sleep and sleep disturbance scores increased significantly with increasing tertiles of police stress scores for the total and subscale scores ($p<0.005$). The association with global sleep was significant for those who used more passive coping strategies ($p<0.007$). The association with sleep disturbances was significant for those with higher levels of depressive symptoms ($p<0.003$) and passive coping ($p<0.001$). These findings demonstrate that different types of police stress may adversely affect sleep quality, and those who use passive coping strategies, such as self-blame or denial, and those with higher depressive symptoms may be more adversely affected by police stress.

Introduction

Police officers are routinely exposed to high levels of stress ranging from organizational pressures, public demands and expectations, and lack of support at work and at home, to inherent life-threatening events such as high speed chases, and arresting suspects alone. High stress exposures have been associated with a host of unfavorable physical and psychological outcomes. We have previously reported that police officers have adverse levels of traditional cardiovascular disease (CVD) risk factors, elevated prevalence of the metabolic syndrome, and sleep less than the general population (Hartley, Burchfiel, Fekedulegn, Andrew & Violanti, 2011). Poor sleep quality may mediate the relationship between work-related stress and unfavorable health outcomes (Neylan et al. 2002). Short and long sleep duration has been associated with increased workplace injuries (Nakata, 2011), adverse metabolic and cardiovascular consequences, and increased mortality (Grandner, Sands-Lincoln, Pak & Garland, 2013).

The association between workplace stress and sleep quality has been previously examined. Park, Nakata, Swanson and Chun (2013) recently reported a significant association between poor psychological working conditions and sleep problems in Korean workers. Nomura and colleagues (2009) found a significant association between increased job strain and decreased job control and insomnia among male Japanese workers. Sinokki and colleagues (2010) found that low supervisor and coworker support was associated with more sleep problems in the Finnish Health 2000 Study. Specifically for police officers, Neylan et al. (2002) found a significant association between routine work stressors and poor sleep quality but only a weak association between traumatic event exposure and poor sleep quality.

Several factors may modify or influence the association between work stress and poor sleep quality. Caregivers, a known high stress group, with high levels of depressive symptoms had significantly more sleep problems than non-depressed non-caregivers (Kochar, Fredman, Stone & Cauley, 2007). An earlier study by Etzion (1984) reported that social support

moderated the association between work stress and burnout: those with high levels of social support were better able to cope with work stress than those with lower levels of social support. A more recent study of Chinese nurses found that coping moderated the association between work stress and quality of life (Wu, Li, Yang, Zhu & Wang, 2012).

In the current study, we examined the association between three types of police-specific stressors and overall sleep quality. We extend previous research by examining associations with different sleep parameters including sleep duration, sleep latency and sleep disturbances. We hypothesized that increased police stress would be inversely associated with sleep quality and duration, and positively associated with sleep latency and disturbances. The effect of coping strategies and depressive symptoms on the association between police stress and sleep quality was also examined.

We hypothesized that among officers with more passive coping strategies (i.e. venting, self-blame, and behavioral disengagement) and more depressive symptoms, the association between police stress and sleep quality would be stronger than among those with more positive coping strategies and fewer depressive symptoms.

Methods

Study Participants

Participants were police officers from the Buffalo Cardio-metabolic Occupational Police Stress (BCOPS) Study, a cross-sectional study of the association between workplace stress and subclinical cardiovascular disease (CVD) conducted between 2004 and 2009. Inclusion criteria were being a sworn police officer at the time of the study; women officers pregnant at the time of examination were excluded (n=2). A total of 710 active duty officers from the Buffalo, New York Police Department were invited to participate, 431 of which completed the clinical examination (60.7%). Participants with missing values for police stress and sleep quality was excluded; complete data were available for 356 officers (256 men, 100 women). All participants provided informed consent, and the study was approved by the University at Buffalo Institutional Review Board and the National Institute for Occupational Safety and Health Human Subjects Review Board.

Study Measures

Police stress was measured with the 60-item Spielberger Police Stress Survey (Spielberger, Westberry, Grier & Greenfield, 1981). For each item, the officer rated the stressfulness of the event on a scale from 0-100 (0 = not stressful, 100 = extremely stressful) and how frequently the event occurred in the past month and past year. The mean stress indices, the product of the stress rating, and event frequency were calculated for the total score and three subscales: administrative and organizational pressure (23 items including satisfaction with the judicial system and departmental policies and procedures), physical and psychological threats (24 items including experience with high speed chases and making arrests while alone), and lack of support (13 items including political pressure and support from coworkers and supervisors). The subscales have good internal consistency (Cronbach's alpha > 0.90) (Spielberger, Westberry, Grier & Greenfield, 1981).

Sleep quality was measured using the 19-item Pittsburgh Sleep Quality Index (PSQI) (Buysse, Reynolds, Monk, Berman & Kupfer, 1989). The PSQI measures sleep quality during the past month. Seven subscales can be derived: subjective sleep quality, sleep latency (i.e. time to fall asleep), sleep duration (i.e. actual time asleep), habitual sleep efficiency (i.e. time spent in bed), sleep disturbances, use of sleeping medication, and daytime dysfunction (i.e. trouble staying awake during the day). Subscale scores range from 0 (better) to 3 (worse) with higher scores indicating poorer sleep quality. The global score is derived from the seven subscales and ranges from 0-21 with higher scores indicating poorer sleep quality. In the current study, we used the continuous measures for global sleep quality, sleep latency (in minutes), sleep duration (in hours) and sleep disturbances (score with range of 0 ‘no disturbances’ to 27 ‘three or more times per week’).

Coping strategies were measured using the 28-item Brief COPE scale, a shortened version of the COPE that has been shown to have acceptable internal reliability (Carver, Scheier & Weintraub, 1989; Carver, 1997). The scale measures dispositional coping and consists of 14 coping aspects (2 questions each): planning, positive re-framing, acceptance, active coping, instrumental support, emotional support, self-distraction, venting, self-blame, denial, behavioral disengagement, substance use, humor and religion. Responses were provided on a 4-point scale ranging from 0 (I have not done this at all) to 3 (I have done this a lot) when coping with stressful situations. The mean for each coping style is calculated with higher scores indicating greater use of the coping style. These coping aspects cluster in three categories: passive which includes self-distraction, venting, denial, and behavioral disengagement; active which includes planning, positive reframing, acceptance and active coping; and support which includes instrumental and emotional support. For stratified analyses, the median for each of the three categories were used.

Depressive symptoms were measured using the Center for Epidemiologic Studies – Depression (CES-D) Scale (Radloff, 1977). The CES-D is a 20-item scale designed to assess depressive symptoms in the general population. For each item, officers indicated how often each symptom occurred in the past seven days: ‘0 - rarely or none of the time, less than 1 day’, to ‘3 = most or all of the time, 5-7 days’. The CES-D correlates well with other depression measures and across various populations. Scores of 16 and greater have been reported as an indicator of clinical depression (McDowell, 2006). For the current study, the median CES-D score was used for stratified analyses.

Statistical Analysis

Descriptive statistics were used to characterize the study population. Prevalence (or proportions) and means (standard deviations, SD) for various demographic and lifestyle characteristics, police stress indices, and sleep parameters were estimated for the whole study sample as well as for men and women. Analysis of variance and covariance were used to examine the global sleep score, sleep duration, sleep latency and sleep disturbances by tertiles of police stress. Tests for trend were obtained from linear regression. Multivariable models adjusted for age, gender, race, education, marital status and smoking status. The associations were stratified by median scores of coping and depressive symptoms. For all tests, statistical significance was assessed at the 5% level, except for interaction terms

between the potential moderators and police stress (15%). All analyses were conducted using the SAS software, Version 9.3 (SAS Institute, Cary NC).

Results

The study population was mostly male (72%), Caucasian or Hispanic (80%), married (74%) and had attended college (89%) (Table 1). The mean age was 41.3 (SD=6.7) years. Regarding police-specific characteristics, the majority was patrol officers (72%), worked the afternoon or night shift (60%), and nearly half had 15 or more years of police service (49%). Less than two percent reported using sleep medication. The stress indices for the past year and past month were highest for administrative and organizational pressures, depressive symptoms were relatively low (7.9), and mean active and support coping scores were higher than mean scores for passive coping.

The mean PSQI global score was 6.5 (3.4) and was slightly higher for female compared to male officers. Over 50% of officers were classified as having poor sleep quality with 28.7% having global PSQI scores of 9 or greater. Officers reported receiving slightly over six hours of sleep in a 24-hour period and it took approximately 23 minutes (SD=17.2) for them to fall asleep. The mean sleep disturbance score was 7.4 per month. The highest rated subscales were subjective sleep quality and sleep disturbances; the lowest were use of sleep medications and habitual sleep efficiency. The mean PSQI global score was 6.5 (3.4) and was slightly higher for female compared to male officers. Over 50% of officers were classified as having poor sleep quality with 28.7% having global PSQI scores of 9 or greater. Officers reported receiving slightly over six hours of sleep in a 24-hour period and it took approximately 23 minutes (SD=17.2) for them to fall asleep. The mean sleep disturbance score was 7.4 per month. The highest rated subscales were subjective sleep quality and sleep disturbances; the lowest were use of sleep medications and habitual sleep efficiency.

The PSQI global score increased significantly across increasing tertiles of the total stress index for the past year [Low: 5.8 (3.2), Middle: 6.4 (3.4), High: 7.4 (3.3); $p<0.001$] (Table 3). Similar associations were found for the three subscales (all $p<0.005$). The associations remained significant after adjustment for age, gender, race, education, marital status, and smoking status [Total Stress Index: Low: 5.7 (0.3), Middle: 6.4 (0.3), High: 7.3 (0.3); $p<0.001$]. Anti-depressant medication use was also considered in the multivariable model, but since its inclusion did not alter the results appreciably it was removed from the final model (data not shown). Officers who reported taking sleep medications were also removed from the model to account for its potential influence, because results were essentially unchanged these officers were retained (data not shown). No association was found between the stress index for the past year and sleep duration ($p>0.05$). Sleep latency was significantly associated with the total ($p=0.043$) and lack of support indices; as lack of support increased officers reported longer sleep latency [Low: 19.6 (1.6), Middle: 25.3 (1.6), High: 24.5 (1.6); $p=0.005$] after full adjustment. Sleep disturbances were significantly and positively associated with the total stress index and the three subscales ($p<0.002$), the strongest gradient being evident with lack of support [Low: 5.5 (0.4), Middle: 7.6 (0.4), High: 9.0 (0.4); $p<0.001$]. All results were similar when using the stress index for the past month (data not shown).

Stratified analyses were conducted to test for effect modification by coping strategies and depressive symptoms. For global sleep score, the tests for interaction involving the total stress index during the past year were 0.076 and 0.140 for passive coping and depressive symptoms, respectively. Among officers with high use of passive coping strategies, there was a significant, positive and independent association between the PSQI global score and all types of police stressors [Total Stress Index: Low: 6.3 (0.5), Middle: 6.0 (0.4), High: 7.9 (0.4); p=0.001; Table 4]. The association was not significant among those with low use of passive coping strategies. A similar association was found for sleep disturbances (all p<0.001); no differences were found for sleep duration or sleep latency (data not shown). Among officers with higher levels of depressive symptoms, there was a significant association between the PSQI global scores and total [Low: 6.6 (0.5), Middle: 7.5 (0.5), High: 8.2 (0.4); p=0.037] and lack of support stressors [Low: 5.9 (0.5), Middle: 8.3 (0.4), High: 7.9 (0.4); p=0.018]; no association was found among those with low levels of depressive symptoms.

Discussion

In this study of police officers, we found a significant, independent and inverse association between police-specific stresses in the past year and sleep quality. This overall finding is consistent with prior studies examining workplace stress, defined numerous ways, and sleep quality (Park, Nakata, Swanson & Chun, 2013; Nomura, Nakao, Takeuchi & Yano, 2009; Sinokki et al, 2010). Interestingly, the association with sleep quality was significant for all types of police stressors measured, including organizational stress, lack of support stress, and physical and psychological danger, indicating that officers' sleep may be adversely affected by many types of workplace stress. This finding is somewhat similar to that found by Neylan and colleagues (2002) who reported a strong association between routine work stressors and sleep quality but a weak association between critical incidents and sleep quality in a cohort of police officers. In our study, the largest difference in sleep quality among the three types of stress was for lack of support stress with the highest lack of support tertile having a sleep quality score that was 1.9 units worse than the lowest tertile. This may indicate the importance of having a strong support system for police officers.

Over 54% of officers in our study had poor sleep quality, defined as a PSQI global score greater than 5 (Buysse, Reynolds, Monk, Berman & Kupfer, 1989). Officers slept an average of 6.1 hours during a 24-hour period, which is below the National Sleep Foundation recommended amount of 7-9 hours for adults (http://www.sleep-foundation.org/article/how-sleep-works/how-much-sleep-do-we-really-need). Mean minutes of sleep latency (i.e. how long it takes to fall asleep) was approximately 23 minutes for officers. This value is higher than that reported by Silva and colleagues (2007) using data from the Sleep Heart Health Study (17.0 minutes). Sleep disturbances, including waking up during sleep, having bad dreams, and snoring or coughing loudly, occurred about once per week with a mean score of 7.4 on a scale of 0 – no disturbances to 27 – three or more disturbances per week.

When we explored the association between police-specific stress and these types of sleep problems interesting differences were found. No significant associations were found for sleep duration with the three types of stress. However, for organizational stress and threats of

danger, a significant association was found for increased sleep disturbances only. For lack of support, the associations were significant for both increased sleep latency and increased sleep disturbances. Not only were officers who did not receive support from coworkers and supervisors experiencing significantly more sleep disturbances, they also had significantly more trouble falling asleep. The difference between the lowest and highest tertiles was nearly five minutes. These findings may be important given that a small percentage of officers reported use of either sleep medications (1.7%) or anti-depressants (7.6%). Prior studies have found that untreated sleep disorders increases the risk of motor vehicle accidents and injuries (Tregear, Reston, Schoelles & Phillips, 2009) and increased cognitive impairment (Yaffe et al., 2011).

Passive coping strategies include denial, self-blame, venting and behavioral disengagement. These strategies have previously been shown to be associated with psychological distress (Silver, Holman, McIntosh, Poulin, & Gil-Rivas, 2002). Among officers who used passive coping strategies, there was a significant association between police-specific stress and sleep quality. This association was significant for all three types of police-stress with the strongest difference for lack of support stress; the difference in sleep quality scores was 2.1 between the lowest and highest lack of support tertile. No associations were found among those officers who reported low use of passive coping. We also found a similar yet stronger association with sleep disturbances. For those officers with higher levels of passive coping, a significant association was found between all three types of stress and sleep disturbances. Again, the largest difference in sleep disturbances was between the lowest and highest tertile of lack of support. Thus, the combination of low support from coworkers, supervisors, friends and family and use of passive coping (i.e. self-blame, denial and behavioral disengagement) appears to have the strongest association with sleep quality for these officers.

Among officers with high levels of depressive symptoms, a significant association was found between lack of support stress and sleep quality. The association was not significant for organizational stress or physical/psychological danger and no associations were found among those officers with low levels of depressive symptoms. All three types of stress were significantly associated with sleep disturbances, but only among those officers with higher levels of depressive symptoms. Prior studies have found a significant association between depressive symptoms and sleep problems (Kaneita et al., 2006; Swinkels, Ulmer, Beckham, Buse & Calhoun, 2013). The combination of workplace stress and increased depressive symptoms may have the strongest association with sleep quality, particularly the frequency of sleep disturbances they experience.

This current study has several limitations. The study design is cross-sectional and, therefore, we are not able to determine the temporal pattern between exposure and outcome. However, police-specific stress was assessed as events occurring during the past year and past month, while sleep quality was assessed as symptoms over the past month. Both police-specific stress and sleep quality, as well as coping strategies and depressive symptoms, were measured from self-report questionnaires. Recall bias may be expected with such assessment but would likely be non-differential. Strengths of this study include the use of a validated measure of sleep quality, the Pittsburgh Sleep Quality Index (PSQI) and the ability to look at

different types of sleep problems, including sleep duration, sleep latency, and sleep disturbances. This distinction was important given that sleep disturbances were repeatedly associated with police stress and sleep duration was not. We also used a police-specific questionnaire to capture exposures unique to this occupation. This questionnaire allowed for comparisons between inherent stressors, those involving dangerous and life-threatening events, and organizational stressors in relation to sleep quality. We were able to account for the potential effects of sleep and anti-depressant medication use, as officers reported the use of these medications during the clinical examination.

In summary, findings from this study showed that police-specific stress was significantly associated with sleep quality, particularly sleep disturbances. This association was strongest for lack of support stress. Associations were also stronger for officers who utilized more negative ways of coping (i.e. passive coping) or had higher levels of depressive symptoms. Sleep problems have been associated with numerous poor health outcomes, including cardiovascular disease and increased mortality. It is important to develop interventions to reduce the level of work-related stress that officers experience, which may lead to improvements in their overall sleep quality. Future studies utilizing a prospective study design and other study populations are necessary and desirable to reaffirm and expand the findings in our study.

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Table 1

Demographic, life style, and physiological characteristics in officers stratified by gender

Characteristics[a, b]	Total (N=356)		Males (N=256)		Females (N=100)	
	N	% or Mean (SD)	N	% or Mean (SD)	N	% or Mean (SD)
Marital status[a]						
Single	43	12.1	20	7.8	23	23.0
Married	263	73.9	205	80.1	58	58.0
Divorced	50	14.0	31	12.1	19	19.0
Education						
High school/GED	38	10.7	34	13.3	4	4.0
College < 4 years	200	56.3	140	54.9	60	60.0
College 4+ years	117	33.0	81	31.8	36	36.0
Smoking status						
Current	61	17.2	35	13.7	26	26.5
Former	82	23.2	53	20.7	29	29.6
Never	211	59.6	168	65.6	43	43.9
Years in Service						
0 – 9 years	96	27.0	62	24.2	34	34.0
10 – 14 years	85	23.8	65	25.4	20	20.0
15 – 19 years	79	22.2	57	22.3	22	22.0
20+ years	96	27.0	72	28.1	24	24.0
Rank						
Police officer	253	71.9	175	69.4	78	78.0
Sergeant/Lieutenant	56	15.9	43	17.1	13	13.0
Captain/Detective	43	12.2	34	13.5	9	9.0
Race						
Caucasian & Hispanics	279	79.5	207	86.3	72	72.0
African American	72	20.5	35	13.7	28	28.0
Shift work						
Day	142	40.1	74	29.0	68	68.7

Characteristics[a, b]	Total (N=356)		Males (N=256)		Females (N=100)	
	N	% or Mean (SD)	N	% or Mean (SD)	N	% or Mean (SD)
Afternoon	127	35.9	109	42.8	18	18.2
Midnight	85	24.0	72	28.2	13	13.1
Military experience	76	21.4	63	24.6	13	13.0
Anti-depression medication use	27	7.6	15	5.9	12	12.0
Sleep medication use	6	1.7	3	1.2	3	3.0
Age, years[b]	356	41.3 (6.7)	256	41.4 (7.0)	100	41.1 (5.8)
Alcohol, drinks/week	352	5.6 (9.4)	254	6.2 (10.2)	98	3.9 (6.3)
Body Mass Index, kg/m2	355	29.2 (4.7)	256	30.3 (4.1)	99	26.2 (4.8)
Spielberger Indices for Past Year	356		256		100	
Total		309.8 (244.6)		306.3 (243.4)		318.9 (248.7)
Administrative		338.1 (289.9)		339.3 (292.0)		335.0 (286.0)
Danger		300.9 (241.7)		294.5 (239.2)		317.2 (248.5)
Lack of Support		275.9 (272.7)		269.4 (272.7)		292.4 (273.3)
Spielberger Indices for Past Month	356		256		100	
Total		78.5 (67.4)		76.8 (65.5)		82.8 (72.3)
Administrative		86.0 (81.4)		86.6 (80.8)		84.4 (83.3)
Danger		73.5 (67.2)		71.0 (65.2)		79.8 (72.2)
Lack of Support		74.5 (82.2)		70.3 (78.2)		85.3 (91.2)
Depression score	356	7.9 (7.1)	256	7.4 (6.4)	100	9.0 (8.4)
Active coping	325	3.9 (0.9)	232	3.9 (0.9)	93	4.0 (0.9)
Passive coping	323	1.5 (0.8)	230	1.5 (0.8)	93	1.6 (0.7)
Support coping	326	3.4 (1.3)	233	3.3 (1.3)	93	3.8 (1.3)

[a] For categorical variables, the values are numbers and percentages.

[b] For continuous variables the values are means and standard deviations.

Table 2

Sleep quality and quantity by sex

	Total		Men		Women	
PSQI Components	**Mean (SD)**	**N(%)**	**Mean (SD)**	**N(%)**	**Mean (SD)**	**N(%)**
Global Score	6.5 (3.4)		6.3 (3.2)		7.0(3.7)	
Good (≤ 5)		163 (45.8)		120 (46.9)		43 (43.0)
Poor (> 5)		193 (54.2)		136 (53.1)		57 (57.0)
6 – 8		92 (25.6)		71 (27.7)		20 (20.0)
≥ 9		102 (28.7)		65 (25.4)		37 (37.0)
Sleep duration, hours	6.1 (1.2)		6.1 (1.2)		6.1 (1.2)	
Sleep latency, minutes	23.2 (17.2)		23.5 (17.0)		22.5 (17.8)	
Sleep disturbances, count	7.4 (4.7)		7.1 (4.7)		8.2 (4.6)	
Subscales *						
Subjective sleep quality	1.4 (0.7)		1.4 (0.7)		1.4 (0.9)	
Sleep latency	1.1 (1.0)		1.1 (1.0)		1.2 (1.1)	
Sleep duration	1.1 (1.0)		1.1 (0.9)		1.0 (1.0)	
Habitual sleep efficiency	0.4 (0.8)		0.4 (0.8)		0.6 (0.9)	
Sleep disturbances	1.3 (0.6)		1.3 (0.6)		1.4 (0.6)	
Use of medication	0.3 (0.8)		0.3 (0.8)		0.4 (0.8)	
Daytime dysfunction	0.9 (0.8)		0.8 (0.7)		1.0 (0.8)	

* Scores range from 0 (better) to 3 (worse).

Table 3

Unadjusted and adjusted mean PSQI overall and subscale scores by tertiles of Spielberger stress components

		Global PSQI		Sleep Duration		Sleep Latency		Sleep Disturbances	
	N	Unadjusted Mean (SD)	MV-Adjusted* Mean (SE)	Unadjusted Mean (SE)	MV-Adjusted* Mean (SE)	Stress Index In Past Year (Tertiles)	MV-Adjusted* Mean (SE)	Unadjusted Mean (SD)	MV-Adjusted* Mean (SE)
Total									
Low	118	5.8 (3.2)	5.7 (0.3)	6.2 (1.2)	6.3 (0.1)	21.6 (17.5)	21.5 (1.7)	6.2 (4.2)	6.1 (0.4)
Middle	119	6.4 (3.4)	6.4 (0.3)	6.2 (1.3)	6.1 (0.1)	22.3 (15.8)	22.2 (1.6)	7.5 (4.8)	7.4 (0.4)
High	119	7.4 (3.3)	7.3 (0.3)	6.0 (1.1)	6.0 (0.1)	25.7 (18.1)	25.6 (1.6)	8.6 (4.8)	8.6 (0.4)
p-value**		*<0.001*	*<0.001*	*0.26*	*0.11*	*0.034*	*0.043*	*<0.001*	*<0.001*
Admin/Org Pressure									
Low	118	5.9 (3.4)	5.9 (0.3)	6.2 (1.2)	6.2 (0.1)	22.9 (19.0)	23.0 (1.7)	6.4 (4.2)	6.3 (0.4)
Middle	119	6.4 (3.3)	6.4 (0.3)	6.2 (1.2)	6.1 (0.1)	20.8 (13.8)	20.7 (1.6)	7.3 (4.9)	7.2 (0.4)
High	119	7.2 (3.3)	7.2 (0.3)	6.1 (1.1)	6.0 (0.1)	26.0 (18.2)	25.6 (1.6)	8.5 (4.7)	8.6 (0.4)
p-value**		*0.003*	*0.004*	*0.63*	*0.37*	*0.05*	*0.09*	*<0.001*	*<0.001*
Phys/Psych Danger									
Low	118	6.2 (3.3)	6.1 (0.3)	6.2 (1.3)	6.3 (0.1)	22.9 (17.5)	22.6 (1.6)	6.8 (4.5)	6.7 (0.4)
Middle	119	6.2 (3.4)	6.2 (0.3)	6.2 (1.1)	6.1 (0.1)	21.3 (15.7)	21.6 (1.6)	7.0 (4.4)	6.9 (0.4)
High	119	7.2 (3.3)	7.1 (0.3)	6.0 (1.2)	6.0 (0.1)	25.4 (18.3)	25.2 (1.6)	8.5 (5.0)	8.5 (0.4)
p-value**		*0.003*	*0.004*	*0.15*	*0.05*	*0.13*	*0.16*	*0.002*	*0.001*
Lack of Support									
Low	118	5.4 (2.9)	5.3 (0.3)	6.3 (1.2)	6.3 (0.1)	20.2 (16.1)	19.6 (1.6)	5.6 (3.9)	5.5 (0.4)
Middle	119	6.9 (3.5)	6.9 (0.3)	6.0 (1.2)	5.9 (0.1)	25.2 (19.1)	25.3 (1.6)	7.6 (4.6)	7.6 (0.4)
High	119	7.2 (3.3)	7.2 (0.3)	6.1 (1.2)	6.1 (0.1)	24.2 (16.1)	24.5 (1.6)	9.1 (4.9)	9.0 (0.4)
p-value**		*<0.001*	*<0.001*	*0.15*	*0.11*	*0.007*	*0.005*	*<0.001*	*<0.001*

Note: PSQI = Pittsburgh Sleep Quality Index; Admin/Org Pressure=administrative/organizational pressure; Phys/Psych Danger= physical/psychological danger

*Models adjusted for age, gender, race, education, marital status, and smoking status. Those taking sleep medication were included.

**p-values are from linear regression.

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Table 4

Multivariable-adjusted* mean global PSQI scores by tertiles of Spielberger stress components stratified by types of coping and depression

	PSQI Global								Sleep Disturbances							
	Passive Coping				Depression (CES-D)				Passive Coping				Depression (CES-D)			
	< Median		≥ Median		< Median		≥ Median		< Median		≥ Median		< Median		≥ Median	
	N	Mean (SE)	N	Mean (SE)	N	Mean (SE)	N	Mean (SE)	N	Mean (SE)	N	Mean (SE)	N	Mean (SE)	N	Mean (SE)
Total	140		182		162		194		140		182		162		194	
Low	62	5.5 (0.44)	43	6.3 (0.54)	66	5.0 (0.36)	52	6.6 (0.51)	62	5.5 (0.6)	43	6.0 (0.8)	66	5.5 (0.5)	52	6.8 (0.7)
Middle	46	6.7 (0.51)	59	6.0 (0.44)	60	5.3 (0.38)	59	7.5 (0.45)	46	7.4 (0.7)	59	7.2 (0.6)	60	5.5 (0.5)	59	9.3 (0.6)
High	32	5.9 (0.61)	80	7.9 (0.37)	35	5.4 (0.49)	83	8.2 (0.37)	32	6.8 (0.8)	80	9.3 (0.5)	36	6.1 (0.7)	83	9.8 (0.5)
p-value**		0.91		0.001		0.76		0.037		0.25		<0.001		0.55		0.003
Interaction			0.076				0.140				0.141				0.745	
Admin/Org Pressure																
Low	60	6.1 (0.46)	48	6.1 (0.53)	63	5.0 (0.37)	55	7.0 (0.51)	60	6.1 (0.6)	48	6.1 (0.7)	63	5.6 (0.5)	55	6.9 (0.7)
Middle	45	5.7 (0.52)	59	6.4 (0.45)	64	5.4 (0.37)	55	7.5 (0.47)	45	6.4 (0.7)	59	7.2 (0.6)	64	5.4 (0.5)	55	9.3 (0.6)
High	35	6.0 (0.59)	75	7.8 (0.39)	35	5.2 (0.49)	84	8.1 (0.38)	35	7.0 (0.8)	75	9.5 (0.5)	35	5.9 (0.7)	84	9.8 (0.5)
p-value**		0.90		0.006		0.74		0.08		0.24		<0.001		0.44		0.005
Interaction			0.157				0.120				0.254				0.876	
Phys/Psych Danger																
Low	54	6.2 (0.47)	49	6.1 (0.50)	60	5.4 (0.38)	58	6.9 (0.48)	54	6.2 (0.6)	49	6.1 (0.7)	60	5.6 (0.5)	58	7.8 (0.7)
Middle	53	5.6 (0.47)	54	6.6 (0.47)	70	5.2 (0.37)	56	7.3 (0.47)	53	5.8 (0.6)	54	7.6 (0.7)	63	5.5 (0.5)	56	8.5 (0.6)
High	33	6.2 (0.61)	79	7.6 (0.38)	39	4.9 (0.48)	80	8.3 (0.38)	33	7.8 (0.8)	79	9.0 (0.5)	39	5.8 (0.7)	80	9.9 (0.5)
p-value**		0.88		0.004		0.74		0.08		0.41		<0.001		0.70		0.031
Interaction			0.143				0.226				0.183				0.960	
Lack of Support																
Low	67	5.3 (0.41)	44	5.5 (0.52)	70	4.8 (0.35)	48	5.9 (0.52)	67	5.3 (0.5)	44	5.2 (0.7)	70	5.1 (0.5)	48	5.9 (0.7)
Middle	42	7.3 (0.52)	62	7.1 (0.43)	60	5.6 (0.38)	59	8.3 (0.44)	42	7.8 (0.7)	62	7.6 (0.6)	60	5.9 (0.5)	59	9.5 (0.6)
High	31	5.6 (0.59)	76	7.6 (0.38)	32	5.3 (0.51)	87	7.9 (0.36)	31	7.0 (0.8)	76	9.5 (0.5)	32	6.1 (0.7)	87	10.0 (0.5)
p-value**		0.98		<0.001		0.93		0.018		0.17		<0.001		0.69		<0.001
Interaction			0.052				0.168				0.221				0.252	

Note: PSQI = Pittsburgh Sleep Quality Index; Admin/Org Pressure=administrative/organizational pressure; Phys/Psych Danger= physical/psychological danger

*Models adjusted for age, gender, education, marital status, smoking status and race. Those taking sleep medication were included.

**p-values are from linear regression.