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Sleep Leadership in High-Risk Occupations: An Investigation of Soldiers on Peacekeeping and Combat Missions

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Individuals in high-risk occupations (e.g., military service) often report physical, psychological, and organizational problems. Although leaders can partially buffer their subordinates against these problems, the impact of established leadership skills appears limited, especially in high-risk occupations. Thus, building on recent theories of domain-specific leadership, we examined whether leadership focused on the specific domain of sleep might be negatively associated with some specific problems facing individuals in high-risk occupations, beyond their relationship with general leadership. Studying military personnel on peacekeeping and combat deployments, we predicted that "sleep leadership" would be negatively associated with sleep problems (physical), depressive symptoms (psychological), and negative climate (organizational), and that sleep would mediate the relationship between sleep leadership and the psychological and organizational problems. Results were generally supportive, contributing to theories of domain-specific leadership by showing that sleep-focused leader behaviors may go beyond general leadership behaviors, relating directly to the problems facing individuals in high-risk occupations.

Keywords: combat, leadership, peacekeeping, sleep, unit climate

Many occupations are high-risk: they present the possibility of substantial and unpredictable danger. As a result, individuals working in these occupations often report a variety of physical, psychological, and organizational problems (Benedek, Fullerton, & Ursano, 2007; Johnson et al., 2005; Milczarek, 2011).

In the high-risk occupation of military service, deployed service members report physical health concerns like sleep problems (e.g., Dohrenwend et al., 2006; Engelhard et al., 2007; Fear et al., 2010; Seelig et al., 2010). In addition, service members report a variety of mental health problems (e.g., Adler, Litz, & Bartone, 2003; Hoge et al., 2004) like depression (Adler et al., 2009; Bartone, Adler, & Vaitkus, 1998) and posttraumatic stress disorder (PTSD; Hoge et al., 2004; Litz et al., 1997). Finally, service members report organizational problems associated with morale (e.g., Bartone et al., 1998; Britt et al., 2013) and workplace climate (e.g., MacDonald et al., 1998; Kelly et al., 2013).

Because sleep problems are interlinked with mental health and organizational performance (Seelig et al., 2010; Wesenten, Belenky, &

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Balkin, 2006), sleep is a potentially efficient target for military leaders to address. Building from recent theories of domain-specific leadership, the current research explores whether leadership focused on the specific behavior of sleep might be negatively associated with psychological and organizational problems, over and above their relationship with established leadership skills.

General Leadership

Research has suggested that military leaders, like other leaders, can help to buffer their subordinates against physical, psychological, and organizational problems using an established set of general leadership skills. General leadership skills refer to best-practice leadership behaviors that are not specific to, or focused on, a particular domain. Rather, they are characteristic of strong leaders across many domains, and are relevant in many situations (Bliese & Britt, 2001), spanning behaviors classified as both transactional and transformational (Bass, 1990). Yet, general leadership is not a "catch-all" category; it attempts to capture a wide range of leadership behaviors that have been empirically linked to each other and to well-established organizational effectiveness measures across many situations.

In addition to predicting organizational effectiveness, general leadership skills are inversely correlated with mental health symptoms and linked to improvements in mental health outcomes during both peacekeeping (e.g., Bliese & Halverson, 1998) and combat deployments (e.g., Jones et al., 2012). Based on these types of results, the military health literature predicts that general leadership skills can partially buffer subordinates against the negative mental health consequences of deployment (Adler & Castro, 2013; Bliese & Castro, 2003). Because general leadership skills do not target specific outcomes in subordinates, however, general leadership is a relatively "blunt instrument" for addressing the specific challenges facing subordinates in high-risk occupations (e.g., sleep problems). Additionally, theories of contingent leadership (e.g., Hersey & Blanchard, 1969) suggest that leadership behaviors targeted directly at the desired outcome (e.g., sleep improvement) might be more likely to bring about that outcome. Finally, from a practical point of view, general leadership's very breadth can make it difficult to learn (e.g., Barker, 1997). Thus, we looked beyond general leadership toward more specific leadership behaviors that could help to solve specific problems arising in high-risk settings, following recent research that has begun to focus on tactical forms of leadership in specific domains.

Domain-Specific Leadership

Unlike general leadership, domain-specific leadership skills target specific, desired outcomes and apply in particular situations. The proposed effectiveness of domain-specific leadership is grounded in theories of social support, which suggest that people can better overcome stressful events when they have the support of others (e.g., Cohen & Wills, 1985)—especially important others like supervisors (e.g., Thomas & Ganster, 1995). Thus, when supervisors offer support in a stress-inducing domain (e.g., work-family conflict, safety hazards), subordinates may feel better equipped to handle that domain.

Both social support theory and contingency theories of leadership suggest that domain-specific leadership should mitigate specific occupational problems over and above their relationships with general leadership. Focusing primarily on the restaurant industry, for example, Barling, Loughlin, and Kelloway (2002) studied leadership in the organizational safety domain, finding that safety-specific leadership was particularly predictive of workplace injuries and the surrounding safety climate. Subsequent studies of safety-specific leadership have echoed these findings (e.g., Kelloway, Mullen, & Francis, 2006; Newnam, Griffin, & Mason, 2008; Mullen & Kelloway, 2009) and also applied the domain-specific leadership framework to health-specific leadership: "the leader's explicit consideration of and engagement in employee health" (Gurt, Schwennen, & Elke, 2011, p. 108). Of particular note, Gurt and colleagues studied government administrators, showing that health-specific leadership behaviors were associated with a better health-related climate across the organization. Most recently, Hammer and colleagues developed the concept of family supportive supervisor behaviors (FSSB), proposing that leaders can help employees deal with competing work-family demands by demonstrating four sets of behaviors:

emotional support, role modeling behaviors, instrumental support, and creative work-family management (Hammer et al., 2009, 2011). In a longitudinal study of grocery store employees, for example, FSSB improved the physical health, job satisfaction, and turnover intentions of employees experiencing high work-family conflict (i.e., those who most needed support). Collectively, these studies suggest that domain-specific leadership can have unique and important effects on employee welfare, particularly in the targeted domain.

Though intriguing and important, these studies have not (to our knowledge) extended domain-specific leadership into high-risk occupations like military service. Because high-risk environments like military deployments impose unique strains on employees, testing domain-specific leadership in a high-risk setting presents important theoretical and practical opportunities. Theoretically, these settings impose much more stress on military personnel, allowing us to test whether targeted domain-specific leadership could relate to such severe strains as sleep impairment and depression. Practically, these settings offer opportunities to create real and immediate improvements in individuals' health by mitigating sometimes severe physical, psychological, and organizational problems. Thus, our research extended domain-specific leadership into a particular high-risk occupation: military service.

Sleep Leadership

Because military service can acutely threaten service member sleep (e.g., Adler et al., 2009; Gallagher & McGilloway, 2007; Neylan et al., 1998; Neylan et al., 2002; Su et al., 2007), and sleep problems are interlinked with psychological and organizational problems (Seelig et al., 2010; Wesenten, Belenky, & Balkin, 2006), we targeted the domain of sleep. Deployment conditions are not typically conducive to sleep, but rather involve prolonged stress, shift work, and environmental exposure (Peterson et al., 2008). For example, in a 2010 adjusted sample of U.S. soldiers deployed to Afghanistan, 32.7% reported not getting enough sleep compared with 28.7% in 2009 (Joint Mental Health Advisory Team 7 (J-MHAT 7), 2011). In the 2010 sample, soldiers indicated that numerous factors interfered with sleep, including a poor sleep environment (33.1%), night fire (29.5%), and high operations tempo (17.1%). Other deployed samples have also reported concerns about sleep. For example, 74% of U.S. Air Force airmen sampled during deployment reported less sleep quality relative to predeployment, and 40% showed poor sleep efficiency (Peterson et al., 2008). Additionally, deployed U.S. Navy personnel reported 5.9 hours of average sleep (Taylor et al., 2014), resulting in 56% classified as sleep deficient. Since deployed military personnel "require 7 to 8 hours of good quality sleep every 24-hr period," (Army Combat and Operational Stress Control Manual for Leaders and Soldiers, 2009; Field Manual 6–22.5, p. 67), these findings suggest that the deployed environment creates acute challenges for sleep quality and quantity—two distinct but related ways of operationalizing sleep.

Sleep problems, in turn, are associated with numerous mental health problems, particularly over the course of a protracted assignment (e.g., a military deployment; Seelig et al., 2010; Wright et al., 2011a; Wright et al., 2011b). Short sleep duration, for example, accounted for variance in redeployed Army soldiers' depression, PTSD, and panic disorder (among other comorbidities; Luxton et al., 2011). Similarly, deployed U.S. Navy personnel who got less than six hours of sleep showed an elevated risk of depressive disorder, PTSD, and generalized anxiety disorder (Taylor et al., 2014). Sleep problems have also been shown to precipitate psychological problems in soldiers returning from a combat deployment (Wright et al., 2011b).

Poor sleep has also been linked to variables that would likely threaten an organization's effectiveness and climate. Sleep deprivation, for example, hampers cognitive performance (Durmer & Dinges, 2005; Goel et al., 2009; Poe, Walsh, & Bjorness, 2010), motivation (Odle-Dusseau, Bradley, & Pilcher, 2010), and the performance of physical tasks (Belenky et al., 2003). Additionally, sleep-deprived individuals show decrements in mood, along with heightened stress and tension (Dinges et al., 1997). These issues may contribute to the range of organizational problems that have been linked to poor sleep, from reduced organizational citizenship behaviors (Barnes, Ghumman, & Scott, 2013), to impaired job performance (Wesenten, Belenky, & Balkin, 2006), and

moral obliviousness (Barnes, Gunia, & Wagner, 2015).

Given the links between sleep, mental health, and organizational effectiveness, leadership behaviors that target sleep might be associated with improved health and unit climate, beyond their relationships with general leadership. Thus, we investigated leadership in the domain of sleep (which we term "sleep leadership"). Our conceptualization of sleep leadership was guided by FSSB as well as a model of military leadership proposed by Britt and colleagues (2004), who suggested that military leaders can exert the strongest influence on subordinate wellbeing by clarifying the means that subordinates can use to accomplish a given goal (path-goal clarifying behaviors) and showing concern for subordinates' welfare, particularly under distressing or arduous circumstances (supportive behaviors; Bliese & Castro, 2003; House, 1996).

In keeping with the leadership model proposed by Britt and colleagues (2004), we conceptualized sleep leadership as a set of behaviors that could broadly fulfill both path-goal clarifying and supportive functions to improve subordinate sleep. Specifically, sleep leadership was defined as a set of leader behaviors that collectively aid subordinates in obtaining more and/or better sleep (path-goal clarifying) and express concern for the quantity and/or quality of subordinates' sleep (supportive). The former behaviors in the sleep domain, for example, might involve instructing subordinates to adjust the sleep environment (temperature, noise etc.; Wesenten et al., 2006) or get extra sleep before an arduous task (Rupp et al., 2009). The latter might involve asking subordinates about their sleep habits or encouraging them to sleep. Thus, sleep leadership might not only target the specific kinds of problems created by high-risk settings; it might also meet Britt and colleagues' (2004) criteria for improving employee wellbeing in a high-risk occupation like military service.

Based on the research cited above, we predicted that sleep leadership would have a variety of salutary relationships with the physical, psychological, and organizational strains facing subordinates in high-risk settings, over and above their relationships with general leadership. In addition, we predicted that greater amounts of sleep would be associated with lower amounts of the psychological and organizational strains. Our analysis focused on both sleep quality and sleep quantity, which are distinct, yet complementary indicators of a person's sleep profile (Luxton et al., 2011). In particular, quantity and quality were conceptualized as analogous to the concepts of reliability and validity: both necessary but neither sufficient for healthy sleep.[1]

Consistent with domain-specific leadership influencing the specific domain being targeted (Barling et al., 2002; Hammer et al., 2011), we predicted that sleep leadership would be associated with more and/or better subordinate sleep:

> *Hypothesis 1:* Higher levels of sleep leadership will be associated with better subordinate sleep quality and quantity, over and above their associations with general leadership.

Additionally, given the above-noted links between sleep (itself) and mental health (e.g., Seelig et al., 2010), we also expected that sleep leadership would be associated with better mental health, operationalized as symptoms of depression, and that sleep quantity or quality might help to explain these relationships:

> *Hypothesis 2:* Higher levels of sleep leadership will be associated with fewer depressive symptoms among subordinates, over and above its association with general leadership; sleep quantity and/or quality will mediate this relationship.

Finally, we focused on the link between sleep leadership and organizational strains. Among the many organizational problems that might benefit from sleep leadership, we focused on one—organizational climate—that past research has linked to domain-specific leadership. As noted, both Barling et al. (2002) and Gurt et al. (2011) demonstrated a marked effect of domain-specific leadership on organizational climate; focusing leadership attention on an important domain improved the surrounding organizational climate. Similarly, studies with military units have directly linked leadership behaviors to unit climate measures like cohe-

[1] We thank the action editor for this astute analogy.

sion (Bliese & Castro, 2003; Britt et al., 2004), and insufficient sleep has been linked to a variety of behaviors that could readily harm organizational climate (e.g., mood, stress, and tension; Dinges et al., 1997). These considerations led us to predict that sleep leadership would be associated with improved climate in military units, with the direct link between sleep and organization-relevant behaviors suggesting that sleep quantity or quality might help to mediate these relationships:

> *Hypothesis 3:* Higher levels of sleep leadership will be associated with better unit climate, over and above its relationship with general leadership; sleep quantity and/or quality will mediate this relationship.

In sum, we expected sleep leadership to be negatively related to many of the physical, psychological, and organizational problems facing military service members, over and above their association with general leadership.

We examined sleep leadership in two separate settings: a peacekeeping and a combat deployment. Study 1 tested the relationship between an initial measure of sleep leadership and a variety of positive outcomes, in a physically and psychologically demanding peacekeeping deployment, but one that involved relatively less exposure to potentially traumatic events than a combat deployment. Study 2 investigated sleep leadership in a dangerous and highly stressful combat deployment to Afghanistan. These settings differed in terms of relative risk, allowing us to test for generalizability. Nevertheless, both were high-risk compared with most occupations, and both represented ideal settings to study the relationships between sleep leadership and strain since both potentially compromised sleep via the challenging conditions noted above (e.g., noise, crowding, physical discomfort, temperature, work schedules).

Method: Study 1

This study was approved by the institutional review board (IRB) at the Walter Reed Army Institute of Research (WRAIR).

Participants and Procedure

Participants were drawn from a group of 623 soldiers deployed on a peacekeeping mission in the Horn of Africa. Soldiers were deployed for a year and were primarily tasked with providing security for a U.S. base. The survey was administered in small group settings on the base; soldiers had been deployed for an average of 292 days ($SD = 100$). After being briefed on the study, 81.1% of potential participants provided their informed consent and participated in the study, leaving a final sample of 505. The sample was 89.9% male and 9.7% female. In terms of rank, the sample was 51.1% junior-enlisted (private to specialist/corporal), 37.8% noncommissioned officers (sergeant to sergeant major), and 10.9% officers/warrant officers.

Measures

Covariate. Given the well-documented influence of rank on a range of health-related outcomes in the military (e.g., Adler et al., 2009), all analyses included rank as a covariate.

General leadership. General leadership was assessed using a 7-item scale developed and validated by the Walter Reed Army Institute of Research as a measure of global, supervisory leadership skills within the military (Bliese, 2006; MHAT 9, 2013). Soldiers were asked to rate how often their immediate supervisor "tells service members when they have done a good job," "exhibits clear thinking and reasonable action under stress," "shows concern about the safety of service members," "ensures that service members do not assume unnecessary risks when conducting missions," "embarrasses service members in front of other service members (R)," "tries to look good to higher-ups by assigning extra missions or details to service members (R)," and "shows favoritism to certain members in the unit (R)." These questions were rated on a 5-point scale (1 = *very low*, 5 = *very high*) and compiled into a general leadership scale ($\alpha = .83$). The referent was "immediate supervisors" because the survey was used across a diversity of units with a wide range of supervisory structures (and differed from the typical maneuver unit in which noncommissioned officers [NCOs] provide direct supervision).

Sleep leadership. In light of the above-noted sleep challenges associated with the mission, sleep leadership was operationalized as a set of behaviors that could help service members cope with those challenges by obtaining more and/or better sleep. To develop an initial measure of sleep leadership behaviors, we consulted the US Army's Combat and Operational Stress Control Manual for Leaders and Soldiers (Field Manual 6–22.5; http://armypubs.army.mil/), which details the Army's doctrine for leaders concerning the management of combat stressors. Based on the sleep deprivation section (Ch. 4), we developed three new items; soldiers were asked: "Thinking about your unit/shop, rate how often your leaders . . .": "ask service members about their sleep habits," "encourage service members to get adequate sleep," and "work to ensure service members have a good sleep environment (quiet, dark, not too hot or cold)." These questions were rated on a 5-point scale (1 = *never*, 5 = *always*) and compiled into a sleep leadership scale (α = .90).

Sleep. Sleep quality and quantity were conceptualized as unique, yet complementary indicators of service members' overall sleep profiles. Because insomnia and its effects on daily functioning are indicators of poor sleep quality (Luxton et al., 2011), sleep quality was measured by asking a question from the Insomnia Severity Index, described by Morin, Vallieres, and Ivers (2007): "To what extent do you consider your sleep problem to INTERFERE with your daily functioning (e.g., daytime fatigue, ability to function at work/daily chores, concentration, memory, mood etc.)?" (*not at all/no sleep problem*, *a little*, *somewhat*, *much*, *very much*). This variable was reverse-coded such that higher numbers indicated higher sleep quality. Sleep quantity was measured by asking: "On average, how many hours of sleep do you get per day?" (3 or fewer, 4, 5, 6, 7, 8 or more). Although we recognize the limitations of single-item measures and would have ideally preferred to administer the entire index (quality) as well as additional questions on quantity, survey length considerations limited us to these questions.

Depressive symptoms. Depressive symptoms were assessed using the nine-item Patient Health Questionnaire for Depression (PHQ-9; Spitzer, Kroenke, & Williams, 1999). The PHQ-9 is a frequently used and previously validated instrument that has been included as an assessment measure in population-based studies of soldiers postcombat (Hoge et al., 2004). Participants indicated whether they had "experienced in the last month" a set of depression-relevant indicators, each measured on a 4-point scale ranging from 1 (*not at all*) to 4 (*nearly every day*).[2] Answers were summed to form a depressive symptoms scale (α = .92).

Unit climate. Unit climate was measured with two sets of questions. Two questions asked about morale (1 = *very low*, 5 = *very high*; Britt & Dickenson, 2006). They stated: "Please rate the following . . ." and then "your personal morale" and "morale in your unit/shop." They were compiled into a morale scale (α = .78). Three questions, adapted from Podsakoff and MacKenzie (1994) and used in studies with military samples (Britt et al., 2007), asked about unit cohesion on a 5-point scale (1 = *strongly disagree*, 5 = *strongly agree*). The questions stated: "The members of my unit/shop are cooperative with each other," "The members of my unit/shop know they can depend on each other," and "The members of my unit/shop stand up for each other." They were compiled into a unit cohesion scale (α = .93).

Analyses

All analyses were conducted using SPSS for Windows Version 21. The unique features of this sample prevented us from analyzing the data using a multilevel approach, as this particular deployment survey did not identify group or unit membership, and information that would identify small groups was not available. To determine the relationships between sleep leadership and the dependent variables, over and above general leadership, analyses were hierarchical regressions, with general leadership entered in step 1 and sleep leadership entered in step 2. Separate hierarchical regressions were conducted for each dependent variable.

[2] In keeping with past research using the PHQ-9, these questions referred to a specific time period: "the last month." None of the other variables included in these studies referred to a specific time period.

Results: Study 1

Table 1 lists the primary correlations. Notably, the correlation between general and sleep leadership was $r = .46$ ($p < .001$).

Sleep

A hierarchical regression on sleep quality, controlling for rank, yielded a positive coefficient on general leadership ($\beta = .21$, $p < .001$). When sleep leadership was added, both general leadership ($\beta = .16$, $p = .002$) and sleep leadership ($\beta = .10$, $p = .05$) still positively accounted for variance in sleep quality. A hierarchical regression on sleep quantity, controlling for rank, yielded a positive coefficient on general leadership ($\beta = .18$, $p < .001$). When sleep leadership was added, general leadership ($\beta = .15$, $p = .005$) continued to positively account for variance in sleep quantity, but sleep leadership had a coefficient that only marginally differed from zero ($\beta = .07$, $p = .16$). Thus, in this peacekeeping environment, sleep leadership was only significantly associated with sleep quality, over and above its association with general leadership, offering qualified support for Hypothesis 1.

Depressive Symptoms

A hierarchical regression on the depressive symptoms scale, controlling for rank, yielded a negative coefficient on general leadership ($\beta = -.21$, $p < .001$). When sleep leadership was added, general leadership ($\beta = -.21$, $p < .001$) continued to positively account for variance in depressive symptoms, but the coefficient on sleep leadership did not differ from zero ($\beta = .02$, $p = .76$). Thus, sleep leadership did not appear to relate to depressive symptoms over and above general leadership, and the first part of Hypothesis 2 was not supported.

Because sleep leadership was associated with sleep quality, and sleep quality is known to influence mental health variables like depression (Seelig et al., 2010), however, we conducted a series of analyses to determine whether sleep leadership might have an indirect association with depressive symptoms through sleep quality (Preacher & Hayes, 2004), as predicted by Hypothesis 2. (Parallel analyses were not conducted with sleep quantity since the relationship between sleep leadership and that variable was not significant.) As noted, sleep leadership was associated with sleep quality ($\beta = .10$, $p = .05$), but not depressive symptoms ($\beta = .02$, $p = .76$). A regression indicated that sleep quality did, however, account for 28% of the variance in depressive symptoms ($\beta = -.51$, $p < .001$). When both sleep quality and sleep leadership (in addition to general leadership) were included in the model, the coefficient on sleep quality remained significant ($\beta = -.52$, $p < .001$), and sleep leadership became marginal ($\beta = .07$, $p = .15$). A bootstrap test with 5000 iterations (Preacher & Hayes, 2004) produced a confidence interval that did not include zero (−.87 to −.27), supporting an indirect relationship between sleep leadership and depressive symptoms through sleep quality. In short, sleep leadership seemed to relate to depressive symptoms indirectly, through sleep quality. This supports the second part of Hypothesis 2.

Unit Climate

A hierarchical regression on the morale scale, controlling for rank, yielded a positive coefficient on general leadership ($\beta = .34$, $p < .001$).

Table 1
Correlations Among Variables (Study 1)

Correlations	*M*	*SD*	Gen. Lead.	Sleep Lead.	Morale	Cohesion	Slp. Quant.	Slp. Qual.	Depression
General leadership	3.36	.91	—						
Sleep leadership	2.12	1.08	.46***	—					
Morale	2.63	1.01	.36***	.35***	—				
Cohesion	3.33	1.04	.47***	.39***	.45***	—			
Sleep quantity	3.51	1.41	.20***	.15**	.27***	.23***	—		
Sleep quality	2.20	1.16	.23***	.18***	.30***	.21***	.45***	—	
Depression	14.21	6.29	−.22***	−.08+	−.26***	−.19***	−.39***	−.53***	—

+ $p < .10$. ** $p < .01$. *** $p < .001$.

When sleep leadership was added, both general leadership ($\beta = .23$, $p < .001$) and sleep leadership ($\beta = .23$, $p < .001$) still positively accounted for variance in morale. Similarly, a hierarchical regression on the cohesion scale yielded positive coefficients for both general leadership (step 1 $\beta = .45$, $p < .001$; step 2 $\beta = .35$, $p < .001$) and sleep leadership ($\beta = .22$, $p < .001$). Thus, sleep leadership appeared to have a unique, positive relationship with both unit climate variables, supporting the first part of Hypothesis 3.

Analyses parallel to the above were conducted to test whether sleep quality would mediate these relationships. Sleep quality accounted for 9.1% of the variance in morale. When both sleep quality and sleep leadership (in addition to general leadership) were included in a model predicting the morale scale, the coefficients on both sleep quality ($\beta = .20$, $p < .001$) and sleep leadership remained significant ($\beta = .21$, $p < .001$). A bootstrap test with 5,000 iterations produced a confidence interval that did not include zero (.02 to .07), suggesting that sleep quality mediated the association between sleep leadership and morale. Similarly, sleep quality accounted for 4.2% of the variance in cohesion. When both sleep quality and sleep leadership (in addition to general leadership) were included in a model predicting the cohesion scale, the coefficient on sleep quality was nearly significant ($\beta = .08$, $p = .055$), and the coefficient on sleep leadership was significant, ($\beta = .21$, $p < .001$). A bootstrap test with 5,000 iterations produced a confidence interval that did not include zero (.007 to .05), suggesting that sleep quality mediated the relationship between sleep leadership and morale.

To summarize, sleep leadership was associated with key variables, even when controlling for the association of general leadership. Specifically, it was directly associated with sleep quality and unit climate, and sleep quality also mediated its relationship with unit climate. Although sleep leadership was not directly associated with depressive symptoms, it was indirectly associated with depressive symptoms through sleep quality.

Discussion: Study 1

This initial study showed that sleep leadership is directly associated with several important physical and organizational variables, over and above their relationships with general leadership. Furthermore, it suggested that sleep leadership has an indirect relationship with depressive symptoms as a result of its relationship with sleep quality. These results begin to suggest that sleep leadership has important and unique relationships with the problems facing subordinates in a high-risk environment.

One limitation, however, was that the question referent differed between the general leadership measure (immediate supervisor) and the sleep leadership measure (leaders). Additionally, the weak relationship between sleep leadership and sleep quantity (though not quality) was surprising. Given the direct focus of sleep leadership on sleep itself, we would have expected a significant effect. However, we suspected that this relationship might emerge in a higher-risk combat setting, where sleep was presumably more threatened. With these considerations in mind, Study 2 sought to use a consistent and specific referent for leader and to test the hypotheses in a high-risk combat deployment.

Method: Study 2

This study was approved by the WRAIR IRB.

Participants and Procedure

Participants were drawn from a group of 619 U.S. soldiers deployed to Afghanistan for 9 to 12 months. Soldiers were from maneuver units and were primarily tasked with combat-related duties. Surveys were administered to a randomized sample of units using procedures outlined by Bliese et al. (2011). Participants had been deployed for an average of 132 days ($SD = 77$).

Data were collected in 2012 as part of the Joint Mental Health Advisory Team 8 (J-MHAT 8, 2013). Participation was voluntary; after being briefed on the study, 89.0% of potential participants provided their informed consent and participated, leaving a final sample of 551. The sample was 64.4% junior-enlisted, 31.2% noncommissioned officers, and 4.0% officers/warrant officers. These maneuver units consisted of men only, so the sample was limited to men.

Measures

Covariates. As in Study 1, rank was included as a covariate. Given the combat context of the current study and the well-established link between combat experiences and health-related outcomes (e.g., Adler et al., 2009; Hoge et al., 2004), combat experiences were also included as a covariate. Combat experience was measured with a 30-item scale based on the original Hoge et al. (2004) measure and further developed by WRAIR. The scale assessed how often respondents had experienced a variety of combat events (never, one time, two to four times, five to nine times, 10 or more times). Sample items include "being attacked or ambushed" and "receiving small arms fire." A total score was generated by summing the number of items for which a respondent had any experience, regardless of frequency.

General leadership. General leadership was measured using the same scale as in Study 1, altered only to refer to the noncommissioned officer (NCO) supervising the units. The items were compiled into a general leadership scale ($\alpha = .84$). The referent was NCO because this sample consisted of traditional maneuver units, all of which had an NCO providing supervision.

Sleep leadership. As part of our continued effort to develop a reliable and valid sleep leadership scale, within the constraints of a field setting that did not allow us to carry out a complete scale validation exercise, the Study 1 sleep leadership scale was expanded to encompass additional elements of the Army's Combat and Operational Stress Control Manual for Leaders and Soldiers (see Appendix). The items were compiled into a 9-item sleep leadership scale ($\alpha = .93$). The scale referent was NCOs.

Sleep. Sleep quantity was measured as in Study 1. Measures of sleep quality were not included in the J-MHAT 8 data collection and thus could not be included in this study.

Depressive symptoms. Depressive symptoms were measured and summed to create a depression scale ($\alpha = .88$) in the same fashion as in Study 1.

Unit climate. Scales were comparable with Study 1, but the referents were changed to units because that was the appropriate unit label for an Army-only combat deployment. Both morale ($\alpha = .79$) and cohesion ($\alpha = .89$) were measured as in Study 1.

Analyses

All analyses were conducted using SPSS 21. Because this was a traditional, platoon-based sample with group identification data available, the most appropriate analyses for all dependent variables were multilevel, with platoon as the grouping variable. Individual-level analyses were performed, using random-intercepts models to control for variance at the platoon level; there were 46 platoons. Values on Akaike's Information Criterion (AIC) were examined to assess whether the addition of sleep leadership to general leadership led to better-fitting models. All models had lower AIC values when they contained sleep leadership, indicating that sleep leadership uniformly improved model fit. Thus, separate multilevel models were conducted for each dependent variable, with general leadership, sleep leadership, and the covariates included as fixed effects in each model.

Results: Study 2

Table 2 lists the primary correlations. General and sleep leadership were correlated at $r = .55$ ($p < .001$).

Table 2
Correlations Among Variables (Study 2)

Correlations	*M*	*SD*	Gen. Lead.	Sleep Lead.	Morale	Cohesion	Slp. Quant.	Depression
General leadership	3.43	.81	—					
Sleep leadership	2.35	.95	.55***	—				
Morale	2.43	1.02	.40***	.33***	—			
Cohesion	3.84	.80	.51***	.36***	.24***	—		
Sleep quantity	3.42	1.23	.20***	.21***	.23***	.09+	—	
Depression	13.43	5.01	−.22***	−.09+	−.35***	−.16***	−.29***	—

+ $p < .10$. *** $p < .001$.

Sleep

A multilevel regression on sleep quantity, controlling for rank and combat experience, yielded positive fixed effects for both general leadership, $t(496.03) = 2.00$, $p = .05$, and sleep leadership, $t(489.13) = 2.67$, $p = .008$. Thus, sleep leadership was positively related to sleep quantity, supporting Hypothesis 1.

Depressive Symptoms

A multilevel regression on the depressive symptoms scale, controlling for rank and combat experience, yielded a negative fixed effect of general leadership, $t(508.60) = -4.87$, $p < .001$, but no direct effect of sleep leadership, $t(499.92) = .64$, $p = .52$. Thus, sleep leadership did not have a direct relationship with depressive symptoms, and the first part of Hypothesis 2 was not supported.

We conducted the same set of analyses as in Study 1, however, to determine whether sleep leadership might have an indirect relationship with depressive symptoms, operating through sleep quantity. A multilevel regression indicated that sleep quantity accounted for 8.4% of the variance in depressive symptoms, $t(457.33) = -5.36$, $p < .001$. When both sleep quantity and sleep leadership (in addition to general leadership) were included in the model, the coefficient on sleep quantity remained significant, $t(469.01) = -4.80$, $p < .001$, and sleep leadership became marginal, $t(498.99) = 1.43$, $p = .15$. A bootstrap test with 5000 iterations (which did not account for the multilevel structure of the data; Preacher & Hayes, 2004) produced a confidence interval that did not include zero ($-.51$ to $-.17$), supporting an indirect relationship between sleep leadership and depressive symptoms through sleep quantity. In short, sleep leadership seemed to have an indirect relationship with depressive symptoms through sleep quantity, consistent with the second part of Hypothesis 2.

Unit Climate

A multilevel regression on the morale scale, controlling for rank and combat experience, yielded positive fixed effects for both general leadership, $t(498.40) = 6.23$, $p < .001$, and sleep leadership, $t(486.06) = 3.65$, $p < .001$. Similar regressions on the cohesion scale yielded a positive fixed effect of general leadership, $t(506.95) = 9.38$, $p < .001$, and a marginal fixed effect of sleep leadership, $t(498.13) = 1.84$, $p = .066$. Thus, sleep leadership had a positive relationship with unit climate, offering some support for Hypothesis 3.

Analyses parallel to the above were conducted to test whether sleep quantity would mediate the relationship between sleep leadership and morale. (Parallel analyses were not conducted for the cohesion scale since the relationship between sleep leadership and that variable was marginal.) Sleep quantity accounted for 5.1% of the variance in morale. When both sleep quantity and sleep leadership (in addition to general leadership) were included in a model predicting the morale scale, the coefficients on both sleep quantity, $t(503.82) = 3.47$, $p = .001$, and sleep leadership, $t(484.82) = 3.20$, $p = .001$, remained significant. A bootstrap test with 5000 iterations (which did not account for the multilevel structure of the data; Preacher & Hayes, 2004) produced a confidence interval that did not include zero (.02 to .07), suggesting that sleep quantity mediated the relationship between sleep leadership and morale.

To summarize, sleep leadership was associated with sleep quantity, morale, and cohesion (marginally), beyond their relationships with general leadership. Additionally, as in Study 1, sleep leadership was indirectly associated with depressive symptoms through sleep quantity.

Discussion: Study 2

In a study conducted among soldiers on a combat deployment, sleep leadership continued to explain variance in sleep and organizational strains, over and above their relationships with general leadership. Sleep also continued to help explain the relationship between sleep leadership and morale, as well as sleep leadership and depressive symptoms. Although caution is warranted when generalizing from this all-male sample, these results are conceptually similar to those of Study 1, which included women and took place in a relatively lower-risk environment. The current results collectively suggest that, even in this high-risk environment, sleep leadership may directly or indirectly account for variance in the physical, psychological, and organizational strains facing subordinates.

General Discussion

Two studies examined the relationships between sleep leadership and the physical, psychological, and organizational strains facing deployed service members. Across both studies, sleep leadership accounted for variance in measures of sleep and unit climate, over and above their relationships with general leadership. Additionally, sleep measures mediated the relationships between sleep leadership and the climate measures, and also created an indirect path between sleep leadership and depressive symptoms. Collectively, these results suggest that sleep leadership is directly or indirectly associated with a wide array of physical, psychological, and organizational strains, accounting for variance in the wellbeing of individuals in high-risk settings.

We believe that these findings have practical relevance, as they suggest that sleep leadership may deserve attention as a potential addition to the leadership toolkit. Indeed, given the arduous medical and behavioral treatments commonly used to treat sleep impairments (Peterson et al., 2008), sleep leadership deserves further examination. In addition, we believe that these findings have noteworthy theoretical implications. First, they suggest that leadership behaviors relate to subordinate wellbeing when they "fit" the behavior targeted for change. The fact that sleep leadership was associated with subordinate sleep over and above sleep's association with general leadership suggests that sleep leadership fit the targeted behavior. Sleep leadership had a direct and unique relationship with sleep that more general leadership behaviors on their own did not. Though consistent with theories of contingent leadership (e.g., Hersey & Blanchard, 1969), the findings extend these theories by suggesting that the most effective leadership may need to fit not only the situation, but the targeted subordinate behavior.

Second, the findings shed new light on theories of social support. By suggesting that a supervisor's support is related to potentially severe strains, the findings suggest that social support may deserve additional research attention in a variety of organizational settings. If supervisors' behavior is associated with subordinate sleep, what other extrawork behaviors might relate to supervisors' behavior? Tracing the full implications and ethical dimensions of these issues would seem to offer interesting research avenues, and our physical, psychological, and organizational framework may provide theoretical guidance.

These studies have several limitations that future research may seek to remedy. First, the studies relied on self-report measures and thus may be subject to self-presentational concerns. Previous studies, however, suggest that self-reported measures can be valid for several of the variables studied here—especially combat experience (Dohrenwend et al., 2006), mental health (Warner et al., 2007), and sleep (Castro, Adler, & Huffman, 2001). Second, the data were cross-sectional, so neither directionality of effect nor patterns of mediation can be definitively established. Future studies might employ longitudinal or experimental designs and could also examine the potential for bidirectional relationships between leader behaviors and subordinate wellbeing, as reported by Van Dierendonck et al. (2004). Third, the sleep environment may have been so difficult in these environments that leaders may have had minimal opportunity to impact sleep conditions. For example, many of our participants may have had a hard time sleeping because of flight noise or cramped conditions, which may be outside the control of immediate supervisors. It is interesting to observe that despite these potential environmental factors and differences, which make our tests inherently conservative, sleep leadership still showed a variety of relationships with sleep, climate, and depression, suggesting that sleep leadership may operate in spite of objective barriers to sleep.

Finally, it is important to note that our findings emerged across two different deployed settings, a peacekeeping and a combat deployment. On one hand, the fact that similar results emerged across both settings lends generalizability to the findings. On the other hand, the differences that did arise across settings should be highlighted. For example, sleep leadership had a significant relationship with sleep quality but not sleep quantity in Study 1. Although a similar comparison was impossible in Study 2 because no quality measure was available, a significant relationship between sleep leadership and sleep quantity emerged in that study. Notwithstanding the similarity in results across the two studies, then, digging deeper into the source of these cross-study differences may rep-

resent interesting research avenues. For example, future research could examine the degree to which sleep leadership is related to sleep quantity as a function of risk level in the environment. The mechanism behind such a relationship might also be examined. Future research could also examine the impact of sleep leadership training programs, investigating whether such programs prompt leaders to devote more attention to sleep, and subordinates to actually obtain more sleep. Such efforts could be evaluated in terms of both perceptions and behaviors, from both leaders and subordinates. Indeed, given the Army Surgeon General's recent emphasis on sleep in an operational environment (Army Performance Triad http://armymedicine.mil/Pages/performance-triad.aspx), the time seems right for organizations to integrate sleep into their priorities.

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Appendix

Study 2 Sleep Leadership Items

In your platoon, my NCOs (1 = *never*, 2 = *seldom*, 3 = *sometimes*, 4 = *often*, 5 = *always*; $\alpha = .93$):

- Ask Service Members about their sleeping habits.
- Encourage Service Members to get adequate sleep.
- Consider sleep as an important planning factor.
- Encourage Service Members to nap when possible.
- Encourage Service Members to get extra sleep before missions that require long hours.
- Work to ensure Service Members have a good sleep environment (quiet, dark, not too hot or cold).
- Support the appropriate use of prescription sleep medications (like Ambien) when Service Members need help with sleeping.
- Discourage the use of caffeine or nicotine use within several hours before trying to go to sleep.
- Encourage Service Members to try to go to sleep on time.

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