Prevalence and Consequences of Sleep Problems in Military Wives

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Abstract

Study Objectives: Despite the prevalence of sleep problems among service members, few prior studies have examined the rate of sleep problems among military spouses, who also face the stresses of deployment and military life. This is the first study of spouses of U.S. service members to examine the prevalence of sleep disturbances, effect of service member deployment, and associated physical and psychosocial outcomes.

Design: Cross-sectional analysis of RAND Deployment Life Study data.

Setting: Self-report measures administered via telephone and web-based surveys in Fall 2012.

Participants: Female military spouses (n= 1,805) aged 19-65 years (M = 33.5 [8.3]), married to service members across branches and components (73% previously, 11% currently, and 16% never deployed).

Measurements: Spouses self-reported sleep duration, sleep quality, daytime fatigue, and daytime impairment. Outcomes included self-rated health, marital satisfaction, and depressive symptoms.

Results: Eighteen percent of spouses reported extreme short sleep duration, which is higher than rates reported in the general population. Spouses indicated worse sleep when the servicemember was currently or previously deployed, although deployment status was not associated with sleep duration or daytime impairment. Greater sleep disturbances were significantly associated with all three outcomes, with the strongest association observed with greater depressive symptoms.

Conclusions: This is the first report to document high rates of short sleep duration and poor sleep quality among spouses of service members. Furthermore, sleep problems were independent correlates of poor mental and physical health. Findings highlight the importance of addressing sleep issues in military families as well as service members.

Keywords: military family, sleep, insomnia, marriage, couples, fatigue

Introduction

Nearly three million service members have deployed to support operations in Iraq and Afghanistan since 2001. Deployment affects not only service members, but also their spouses and families.(1) With the advances in our understanding of post-deployment health and psychosocial functioning of deploying service members, there has been a concomitant interest in the impact of deployment on the health and mental health of military family members.(2)

Sleep problems are extremely prevalent among military members. Troxel and colleagues found that approximately 63% of surveyed service members did not obtain the recommended seven or more hours of sleep, and nearly 32% averaged five hours or less of sleep per night.(3) Sleep problems are particularly common during and post-deployment,(4) and one survey of OEF/OIF service members and veterans found that 89% had clinically significant sleep disturbances.(5) However, some evidence suggests that sleep problems may be more endemic to military culture, rather than being due to deployment specifically.(3)

Spouses of service members (henceforth referred to as “military spouses”) are exposed to the stressors of military life (e.g., frequent relocations, long duty hours(6)), and deployments can significantly impact military spouses’ mental health,(7, 8) and increase use of mental health services and medications by the spouse during the deployment period.(9, 10) In fact, Eaton and colleagues found that rates of depression and generalized anxiety disorder among military spouses were similar to those of soldiers returning from combat deployment.(11) The presence of mood and anxiety disorders is particularly salient given that sleep problems are a core feature of several mental health disorders.(12) Moreover, Mansfield and colleagues found that sleep disorders were among the most common mental health-related diagnoses in treatment-seeking Army wives, particularly when their service member spouse was deployed.(10) However, there is scant research examining sleep problems and their associated consequences within spouses.

It is critically important to understand the prevalence and associated consequences of sleep problems in military spouses. Sleep disturbances are associated with a host of physical and mental health problems, and may be a key factor underlying health in military spouses as well as their families. For example, sleep problems increase the risk of developing depression; anxiety disorders, including obsessive compulsive disorder and panic disorder; and substance use disorders.(13-15) Poor sleep also increases the likelihood of several physical health issues, including diabetes,(16) weight gain,(17) hypertension,(18) and coronary heart disease.(19) There is also evidence that sleep problems impact marital quality (as reviewed in Troxel, 2010).(20) Strawbridge and colleagues found that sleep problems in one partner can affect the relationship happiness of both spouses,(21) and Hasler and Troxel found that males with poorer sleep efficiency rated more negative interactions with their partners the next day.(22) In addition, the link between sleep problems and marital quality has implications for military spouses, but also for the military family unit, as factors such as the physical and psychological wellbeing of family members are linked to the resilience of the family unit. (23) Therefore, an understanding of the ways that military factors can impact the health of military spouses – including the consequences of sleep disturbances in military spouses – has the potential to inform novel prevention and intervention efforts to support military family health and resilience, particularly in the post-deployment period.

Despite the fact that military spouses are at high-risk for the development of stress-related sleep disturbances, and as such, at risk for experiencing health and relationship difficulties, no prior study has examined the prevalence of sleep problems, associated consequences and whether the prevalence of sleep problems among military spouses varies depending on the service member's deployment history. This study is designed to address these knowledge gaps using a large sample of military spouses¹ across military service branches to identify at-risk characteristics that can be targeted in future intervention efforts to improve resilience in military spouses. We hypothesized that shorter sleep duration, poorer sleep quality, greater daytime impairment related to sleep problems, and greater fatigue levels would be

¹ We have previously published a report concerning the prevalence and consequences of sleep problems among service members in this cohort. (3)

associated with greater depressive symptoms, poorer physical health, and lower marital satisfaction. Given the lack of prior data to inform hypotheses concerning spousal deployment history, we did not make a priori hypotheses concerning the prevalence of sleep problems according to service member deployment history or differences in the relationship between sleep problems and psychosocial or physical health outcomes based on deployment history.

Participants and Methods

This study uses data from the RAND Deployment Life Study, a large-scale, multi-wave study of married, deployable service members across service branches and components. The sample for the Deployment Life Study included service members eligible for deployment, their spouses, and children under 18 (if available). For more detail regarding the study population and design, see Tanielian et al.(1) Rolling recruitment and administration of the baseline assessment began in March 2011 for the Army, Air Force, and Marine Corps sample and in November 2012 for the Navy sample. The sleep survey was added to the Navy baseline survey; for the remainder of the services, the sleep survey was added to the ongoing waves of data collection in December 2012.(3) Thus, the current results represent cross-sectional data drawn from the Navy baseline assessment and the follow-up wave occurring most contiguous to Navy baseline for the remainder of the services. All study methods were approved by the RAND Human Subjects Protection Committee (HSPC), and all participants provided informed consent for their involvement. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments.

Participants

A total of 2,724 service members and spouses were recruited for the Deployment Life Study. Among all spouses recruited, 2,257 responded to the survey. Because we wished to explore the relationship between military spouses' sleep quality and service member's deployment status, we excluded cases where deployment status could not be established at the time when sleep data were

collected (n=50). Dual military couples (n=356) and male spouses (n=35) were also excluded, due to the relatively small sample sizes for these groups and to avoid confounding of gender with military status in the analysis, as were couples who were no longer married to each other at the time of the current assessment (n=11). Thus, the current analyses included 1,805 female military spouses (888 Army, 688 Navy, 158 Air Force, 71 Marine Corps) included in the Deployment Life Study.

Measures

Self-report measures were administered to assess sleep problems; three main study outcomes; relevant sociodemographic characteristics; and military/deployment characteristics of the service member spouse.

Sleep measures.

Pittsburgh Sleep Quality Index (PSQI).(24) The PSQI is a widely used and well-validated self-report measure, that provides a global measure of sleep quality, and also provides subscales that assess several sleep-related domains. For the current analyses, we utilized the global PSQI score (as an indicator of sleep quality) as well as the measure of sleep duration, as short sleep duration has been consistently shown to predict a host of adverse mental and physical health consequences.(16, 25, 26) In the current analyses, we utilize the continuous global PSQI score to assess sleep quality. Based on the distribution of the sleep duration subscale, we used a categorical measure of sleep duration, with those sleeping seven hours or more as the referent group, as compared to those sleeping six hours, or five hours or less.

Daytime impairment. Interference of sleep problems with work or daily tasks was assessed with an item adapted from Insomnia Severity Index (ISI).(27) Participants were asked to describe the extent to which sleep problems interfere with daytime functioning on a 5-point scale, with response options ranging from “not at all interfering” to “very much interfering.” Based on the distribution of this measure, responses were recoded into three categories: “somewhat to very much;” “a little;” and “not at all.”

Fatigue. An item modified from the Berlin Questionnaire(28) assessed how often the participant feels “tired, fatigued, or not up to par,” on a 5-point scale, with response options ranging from “never or nearly never” to “nearly every day.” Based on the distribution of this measure, responses were recoded

into three categories: “nearly every day or 3-4 times a week;” “1-2 times a week;” and “1-2 times a month or never or nearly never.”

Psychosocial and physical health outcomes.

Depressive symptoms. Depressive symptoms were measured using six items from the Patient Health Questionnaire (PHQ-8), a measure based on the DSM-IV criteria for depressive disorders (alpha = 0.82 for spouses).(29) Consistent with previous research,(3) the two items that ask about sleep were omitted to avoid redundancy with sleep measures.

Self-rated health. Physical health was assessed with a single item asking, “In general, how would you rate your physical health?”(30) Responses are made on a 5-point scale, with options ranging from “poor” to “excellent,” and higher scores reflecting better self-reported health. This is a widely used single-item assessment of self-reported health, and has been validated against other self-reported instruments as well as physician diagnoses.(30, 31)

Marital satisfaction. Military spouses completed a nine-item measure of marital satisfaction that was adapted from a set of items used previously in the Florida Formation Survey.(32) These items measure different aspects of relationship quality including satisfaction with time spent together, communication, trust, and overall satisfaction with the relationship. Items were averaged to form a marital satisfaction score ranging from one to five, with higher scores reflecting greater satisfaction (alpha =.80).

Sociodemographic characteristics. The female military spouse reported her age, race/ethnicity, highest level of education, number of children under the age of 18 living in the household, and employment outside of the house (yes/no).

Deployment characteristics. To describe the impact of deployment status on sleep and the psychosocial/physical health outcomes, we examined history of deployment to OEF, OIF, or OND (currently deployed, previously deployed, never deployed). The servicemember’s military/deployment characteristics were reported by the military spouse including: officer (i.e., commissioned and Warrant Officers) or enlisted (coded 1 and 0, respectively); service (Army, Navy, Air Force, Marines); and component (active vs. reserve or guard, coded 1 and 0, respectively).

Statistical Analysis

Initial descriptive statistics were calculated to describe the sample with respect to military spouse demographic characteristics; characteristics of service members' military experiences; and the prevalence of sleep disturbances and associated outcomes among military spouses.

Second, we examined the prevalence of military spouse sleep problems overall, and according to the service member's deployment history. Adjusted means accounting for demographic characteristics were calculated using the recycled prediction method.⁽³³⁾ For service members in the Army, Air Force, and Marines, there were three possible deployment categories: never deployed, currently deployed, and previously deployed. By study design, there were no Navy service members that were currently deployed at the time of the baseline survey. Therefore, because data for the Navy sample were taken from a baseline assessment (before a pending deployment), there were two possible deployment categories for this subsample: never deployed or previously deployed. Thus, for these analyses and subsequent regression models, separate analyses were conducted for (a) the combined subsample of spouses of Army, Air Force, and Marine service members, looking across the three deployment categories and adjusting for military branch; and (b) the spouses of Navy service members, examining across the two deployment categories.

Third, separate linear regression models were used to test the association between sleep measures and physical and psychosocial outcomes – self-rated health, marital satisfaction, and depression – after adjusting for covariates (note that depressive symptoms were included as a covariate for the models examining self-rated health and marital satisfaction). Outcome measures and the PSQI were standardized before modeling by dividing by the sample standard deviation; thus, model coefficients can be interpreted as effect sizes. As cited in the literature, effect sizes of less than 0.20 are considered small, effects of 0.20–0.50 are considered moderate, and effects greater than 0.50 are considered large.⁽³⁴⁾ Finally, to test if the association between sleep measures and physical and mental health outcomes differed by service member's deployment history, we also ran models including the interaction terms between sleep predictors and deployment history.

Results

The mean age of military spouses was 34 years, and the majority was non-Hispanic White (76%). Overall, 54% of the sample rated their health as “very good” or “excellent.” Military spouses reported, on average, high levels of marital satisfaction and low levels of depressive symptoms. Regarding characteristics of the service member spouses, most were in the Navy (38%) or Army (49%). Seventy-three percent had at least one prior deployment but were not currently deployed, and 10% were currently deployed. For complete demographic data, see Table 1.

Table 2 summarizes the prevalence of sleep problems among military spouses in the total sample and according to deployment history. Overall, 44% of military spouses reported sleeping six hours or less per night. Mean self-report sleep quality suggested poor sleep quality. About half the spouses reported at least “a little” daytime impairment due to sleep problems. Daytime fatigue was common, with one-third of spouses experiencing fatigue at least 3-4 times a week.

We also examined the association between service member deployment status and spouse sleep problems. Among the subsample of Army, Air Force, and Marine Corps couples, there was evidence that spouse’s sleep quality (based on the PSQI) varied by service members’ deployment status (joint test $p < 0.05$), with spouses of service members who were currently deployed having a higher PSQI, indicating poorer sleep quality (adjusted mean=7.1) than spouses of either never or previously deployed service members. Among the Navy couples, there was a difference in daytime fatigue by deployment history, such that spouses of service members who had previously deployed were more likely to be fatigued more often ($p < .05$). All other comparisons were non-significant.

Table 3 summarizes the adjusted regression models examining the association between sleep and self-rated health, depressive symptoms, and marital satisfaction. In both of our samples (the combined Army, Air Force, and Marines subsample and the Navy subsample), short sleep duration was an independent correlate of poor self-rated health and greater depressive symptoms. Also, across both subsamples, poorer sleep quality was associated with lower self-rated health, lower marital satisfaction,

and more depressive symptoms. Both greater daytime impairment and more frequent daytime fatigue were associated with lower self-rated physical health, lower marital satisfaction, and more depressive symptoms in both subsamples. The only non-significant finding was that sleep duration and marital satisfaction were not significantly associated in the Army, Air Force, and Marine sample; however, in the Navy sample, those sleeping five hours or less reported significantly lower marital satisfaction.

To test if associations between sleep and physical and mental health outcomes in spouses differed according to the service members' deployment history, we included the interaction between each sleep variable and deployment history in the regression models. Only two significant interaction terms were evident and both were in the combined Army, Air Force, and Marine sample. Specifically, lower sleep quality and more frequent daytime fatigue were each associated with lower marital satisfaction in spouses of service members who had previously or never deployed, but not among spouses of currently deployed service members ($p's < .01$; analyses not shown). Importantly, these results should be interpreted with caution given the relatively small sample of spouses of currently deployed service members.

Discussion

Research has established that service members are at high-risk for sleep disturbances.(3-5) However, until now, the sleep of military spouses has been largely overlooked. The stressors of military culture, the impact of deployment on other aspects of physical and mental health, and the potential contribution of sleep disturbances in military service members to that of military spouses may put military spouses at greater risk for developing sleep problems than their civilian counterparts.

This study found a high prevalence of sleep problems in military spouses. Whereas an estimated 29-35% of women in the general population obtain less than seven hours of sleep per night,(35, 36) 44% of women in this study reported short sleep duration. In addition, a relatively high proportion of women in the current sample (18%) reported extreme short sleep duration (i.e., five hours or less per night), which is higher than that reported in the general population.(35) Although direct comparisons between these groups should be made cautiously, as they are not matched on a number of key characteristics (e.g., age,

sex, socioeconomic status), the findings reported here suggest that military spouses may be a high-risk group for sleep problems.

Regarding the association between military spouse sleep and service member deployment history, spouses of currently deployed service members rated their overall sleep quality as poorer than spouses of previously or never deployed service members, which may reflect the influence of stressors associated with the service member being away from home (e.g., worries about the safety of the service member, burden of taking on additional household roles). Among the Navy spouses, we found higher fatigue levels among those whose spouse had previously deployed as compared to those who had not experienced a prior deployment. Overall, however, there were few significant differences in sleep according to service member deployment history. This is consistent with our prior work on sleep among service members, which found few significant differences in sleep according to deployment history, and further suggests that other factors of military life may contribute to high rates of sleep disturbances and daytime fatigue. For instance, there is evidence that factors such as days spent in training exercises, perceived work overload, predictability of duty hours, and nights away from home can contribute to work-family conflict,(37, 38) and in turn impact family outcomes, including mental health and the marital relationship.(37) Therefore, even when a service member is not deployed, there are many ways in which the military experience may impact spouse sleep.

These results extend previous research demonstrating that sleep disorders are among the most common mental health diagnosis among military wives.(10) However, this previous work was limited to individuals who had received outpatient treatment services through TRICARE, the military health care program (including care at military treatment facilities and purchased care received from civilian providers).(10) By focusing on broader indicators of sleep health and sleep disruption in a sample of military wives who were not necessarily seeking treatment, the present study may provide more insight into the degree of sleep disturbances experienced by this more generalizable population. Moreover, these findings have important implications for screening and intervention. First, among military spouses who do seek treatment, many first present to military primary care providers, and a sizeable proportion

continue to receive specialty mental health care services from their primary care providers.(11) Therefore, administering standardized screening measures as part of an intake assessment may be one way to identify spouses experiencing sleep problems. However, some at-risk spouses may not receive care within the military system for a number of reasons, including concerns regarding stigma (11) and preferences for purchased care versus military treatment facilities (9). Therefore, as the military and other public and private organizations seek to implement public health campaigns to promote military family resilience, it may be important to develop messages about the importance of sleep.

Consistent with prior research on the widespread impact of sleep on a variety of indicators of physical and mental health, we found that sleep problems, including short sleep duration, poor sleep quality, daytime impairment, and fatigue, were independent correlates of depression, self-rated health, and marital quality. After adjusting for both military spouse and service member characteristics and depressive symptoms, the associations between each sleep measure and both self-rated health and marital satisfaction were moderate in size. The associations between sleep and depressive symptoms were moderate to large. Although inferences regarding the temporal relationship among these factors cannot be drawn from the present study, these findings further highlight the importance of screening for sleep problems among military spouses, as they are closely tied to factors that contribute to resilience, especially depressive symptoms, which had the largest effect sizes.

Regarding the moderating effect of deployment history, only two interactions reached significance. Interestingly, both of these interactions suggest that there is a less adverse impact of sleep problems (including sleep quality and daytime fatigue) on marital satisfaction when the service member spouse is currently deployed. This is particularly interesting given the finding that spouses of currently deployed service members reported lower sleep quality. However, it may be that sleep problems and their daytime sequelae have a greater impact on the marital relationship when both partners are present in the household – a finding that comports with evidence that poor sleep is associated with negative partner interactions the next day.(22) In contrast, when the service member spouse is deployed, sleep problems

seem to more consistently affect the military spouses' physical and mental health than the health of the marital relationship.

This study has several limitations that should be taken into consideration when interpreting the findings. As previously described, the sleep survey module was administered at a different phase of the Deployment Life Study for the Navy service members/families. As a result, no Navy service members were currently deployed at the time of the study. However, administering the sleep survey module in this way ensured that all surveys were completed close together in time, thus ensuring that historical variables were as consistent as possible across branches and components. A related limitation is that there were relatively few service members who were currently deployed (among the Army, Air Force, and Marines), which may have limited statistical power to detect differences in the prevalence of sleep problems or the moderating impact of deployment history on sleep and mental and physical health outcomes. Although research has established that poor sleep is a risk factor for mental and physical health outcomes, the current cross-sectional analyses cannot rule-out the possibility of reverse causality (poor mental or physical health leading to sleep problems), which is particularly relevant given known bidirectional associations between sleep and health.(39)

Related to sleep measurement, only self-report measures of sleep were administered, and it will be important for future studies to include objective measures of sleep quality as well, such as actigraphy or polysomnography. We also did not include data on whether the couple was currently sleeping together since it would not be relevant for the subgroup that is currently deployed. Therefore, we cannot conclude that differences in sleep during deployment were due to the loss of the physical presence of the bedpartner, the stresses of deployment, or some other factor(s). In addition, although the present analyses provide important insights into the way that deployment may impact spouse sleep, there are several other aspects of military life may impact the health of the military family unit, including frequent relocations, long duty hours and periodic separations, and economic strain (6, 40, 41). It will be important for future research to determine what impact these factors may have on military spouse sleep. Finally, based on the small number of male non-military spouses in the sample, we restricted our analyses to female military

spouses. Thus, it will be essential for future research to explore sleep among male spouses as well as dual service member couples, who may be uniquely impacted by factors such as deployment.

Despite these limitations, this study is an important first step toward better understanding sleep problems and their impact on well-being among military spouses. These findings have important implications for the health of military spouses. As mentioned previously, these findings highlight the importance of screening for sleep problems in this population. Detecting the presence of sleep problems among military spouses is an important first step to connecting them with evidence-based treatments (e.g., cognitive behavioral therapy for insomnia). In addition, for military spouses receiving treatment focused on depression or marital health, it may be important for providers to consider the ways that sleep may be contributing to or affected by these symptoms, and incorporate this into the treatment plan as appropriate. Moreover, to the extent that spouse sleep problems may impact the marital relationship and health of the family unit, these findings also have important implications for promoting resilience in the military family. Promoting family resilience is a top priority for the military, and there are a number of DoD-funded and community-based programs designed to promote resilience in service members and families.(23, 42) Mental and physical health are common targets of these programs, and the results of this study support the inclusion of sleep as a critical domain to address.

Together with extensive prior research on the high prevalence of sleep problems among service members,(3-5) these findings highlight the fact that both service members and spouses are at risk for sleep problems. Given the limited research related to sleep problems and their consequences in military spouses, as well as the ways that deployment may impact these relationships, this study presents an essential first step toward understand the scope of the problem. With this foundation in place, an important next step will be to explore the ways that sleep problems in one partner affect the sleep of the other partner, and how such a dynamic may contribute to the health of the relationship. Furthermore, couple-level approaches to intervening on sleep problems may also have benefits for the couples' marital functioning.(20) Examining the longitudinal causes and consequences of sleep problems will also help to guide programs and policies to support the health and resilience of military spouses and families.

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Table 1. Sample characteristics (n=1,805)

	% (n) or Mean (SD) [range]
Demographics	
Age	33.5 (8.3) [19 to 65]
Highest level of education	
High school or less	18.1% (326)
Some college, no degree	24.3% (437)
Associates or vocational degree	17.3% (311)
4-year college degree	29.1% (525)
Master's, doctoral, or professional school degree	11.3% (203)
Number of children living in household	1.5 (1.2) [0 to 9]
Race/Ethnicity	
White	76.3% (1,377)
Black	4.6% (83)
Hispanic	10.2% (185)
Asian	3.4% (62)
Other	5.4% (98)
Employed outside the home	41.0% (740)
Service Characteristics of Service Member	
Service Branch	
Army	49.2% (888)
Navy	38.1% (688)
Air Force	8.8% (158)
Marine Corps	3.9% (71)

Officer Status		
Enlisted		70.7% (1,274)
Officer		29.3% (529)
Component		
Active		74.4% (1,343)
Reserve or Guard		25.6% (462)
Deployment History		
Never		16.2% (292)
Current		10.4% (188)
Prior		73.4% (1,325)
Outcomes		
Self-rated health		3.5 (0.9) [1 to 5]
Marital satisfaction		3.7 (0.7) [1 to 4.6]
Depressive symptoms		1.9 (2.9) [0 to 10]

Table 2. Prevalence of Sleep Problems by Deployment History.

		Combined Army, Air Force, and Marine Sample ^{a,b}			Navy Sample ^a	
	Total Sample ^c	Never deployed	Currently deployed	Previously deployed	Never deployed	Previously deployed
Total N	1,805	73	188	856	219	469
Sleep duration						
5 hours or less	18.3%	14.5%	22.9%	18.1%	19.8%	16.9%
6 hours	25.6%	24.2%	29.4%	27.0%	24.1%	22.4%
7 hours or more	56.1%	61.3%	47.7%	54.9%	56.1%	60.7%
Sleep quality (PSQI)	6.1 (3.8)	5.9 (0.9)	7.1 (0.9)	6.2 (0.9)	6.3 (0.7)	5.7 (0.7)
Daytime impairment						
Somewhat to very much	20.0%	19.3%	23.6%	20.8%	15.9%	18.9%
A little	33.9%	33.8%	35.7%	34.6%	31.3%	33.5%
Not at all	46.1%	46.9%	40.6%	44.6%	52.8%	47.6%
Daytime fatigue						
Nearly every day <i>or</i> 3-4 times a week	33.0%	36.7%	39.0%	32.0%	27.3%	34.3%
1-2 times a week	29.4%	27.0%	26.9%	26.8%	33.2%	33.7%

1-2 times a month <i>or</i> Never or nearly never	37.6%	36.3%	34.1%	41.2%	39.4%	32.0%
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Bold indicates differences in adjusted sleep measure by deployment status ($p < .05$)

^aAdjusted for spouses' age, education, number of children living at home, race/ethnicity, and employment outside the home

^bAdjusted for military branch

^cUnadjusted distributions

Table 3. Summary of linear regression models^a of outcomes on sleep measures among spouses (n=1,805).

	Combined Army, Air Force, and Marine Sample ^b (n=1,117)			Navy Sample (n=688)		
	Self-rated health ^c	Marital satisfaction ^c	Depressive symptoms	Self-rated health ^c	Marital satisfaction ^c	Depressive symptoms
	Standardized β	Standardized β	Standardized β	Standardized β	Standardized β	Standardized β
	[95% CI]	[95% CI]	[95% CI]	[95% CI]	[95% CI]	[95% CI]
Sleep duration						
5 hours or less	-0.33 [-0.48,-0.18]***	-0.15 [-0.31,0.02]	0.90 [0.73,1.07]***	-0.21 [-0.42,-0.01]*	-0.19 [-0.33,-0.05]**	0.46 [0.31,0.60]***
6 hours	-0.12 [-0.25,0.01]	-0.12 [-0.26,0.02]	0.14 [-0.01,0.29]	-0.19 [-0.37,-0.01]*	-0.09 [-0.22,0.03]	0.24 [0.11,0.38]***
7 hours or more [ref]	0.00	0.00	0.00	0.00	0.00	0.00
Sleep Quality (PSQI)	-0.24 [-0.30,-0.17]***	-0.11 [-0.18,-0.04]**	0.55 [0.49,0.61]***	-0.22 [-0.31,-0.13]***	-0.11 [-0.17,-0.05]***	0.33 [0.28,0.39]***
Daytime impairment						
Somewhat to very much	-0.63 [-0.80,-0.47]***	-0.26 [-0.44,-0.09]**	1.48 [1.33,1.64]***	-0.38 [-0.59,-0.16]***	-0.18 [-0.33,-0.04]*	0.81 [0.67,0.95]***
A little	-0.28 [-0.40,-0.15]***	-0.27 [-0.40,-0.14]***	0.34 [0.21,0.47]***	-0.02 [-0.19,0.14]	-0.20 [-0.31,-0.09]***	0.30 [0.19,0.42]***
Not at all [ref]	0.00	0.00	0.00	0.00	0.00	0.00
Daytime fatigue						
“Nearly every day” or “3-4 times a week”	-0.32 [-0.46,-0.17]***	-0.21 [-0.37,-0.06]**	1.23 [1.09,1.36]***	-0.43 [-0.62,-0.23]***	-0.27 [-0.41,-0.14]***	0.73 [0.60,0.86]***

1-2 times a week	-0.10 [-0.24,0.03]	-0.18 [-0.33,-0.04]*	0.30 [0.16,0.45]***	-0.14 [-0.31,0.04]	-0.12 [-0.24,-0.00]*	0.28 [0.15,0.41]***
“1-2 times a month”						
or “Never or nearly never” [ref]	0.00	0.00	0.00	0.00	0.00	0.00

*p<0.05; **p<0.01; ***p<0.001. Asterisks represent specific significance tests for contrasts with the referent group.

^aAll models are adjusted for military spouses’ demographics (age, education, number of children living at home, race/ethnicity, employed outside the home) and service members’ military and deployment characteristics (officer/enlisted status, active duty status, and history of deployment)

^bModels in the combined Army, Air Force, and Marine Sample additionally control for service branch.

^cModels of self-rated health and marital satisfaction additionally control for depressive symptoms.