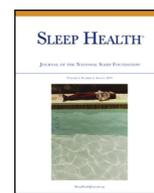




Contents lists available at ScienceDirect

Sleep Health

Journal of the National Sleep Foundation

journal homepage: sleephealthjournal.org

Sleep knowledge, goals, and habits in soldiers[☆]

Jennifer L. McDonald, PhD^{a,*}, Michelle L. Ganulin, MS^a, Matthew L. LoPresti, PhD^a, Amy B. Adler, PhD^b^a United States Army Medical Research Directorate-West, Joint Base Lewis-McChord, Washington, USA^b Walter Reed Army Institute of Research, Silver Spring, MD, USA

ARTICLE INFO

Article history:

Received 6 November 2018

Received in revised form 18 April 2019

Accepted 22 April 2019

Keywords:

Sleep

Military

Knowledge

Goals

Habits

Intervention

ABSTRACT

Objectives: The present study examines the link between these individual sleep knowledge, goals, and habits and self-reported sleep quantity in a military setting.

Methods: Survey data from active duty US soldiers were analyzed using a modified Poisson regression to provide relative risk ratios.

Results: Soldiers who had better sleep knowledge and endorsed healthy sleep goals and habits were more likely to report adequate sleep (7 or more hours of sleep per 24 hours) than those who did not. Specifically, soldiers who endorsed a goal of trying to get at least 7 hours of sleep per night had a 2.8 fold increase in the probability of reporting adequate sleep relative to short sleep (≤ 6 hours of sleep per 24 hours).

Conclusions: These findings identify areas of focus for sleep education programs designed to target soldiers at-risk for insufficient sleep.

© 2019 National Sleep Foundation. Published by Elsevier Inc.

Most US soldiers sleep less than 6 hours per 24 hour period,¹ at least 1 hour below the recommended amount of sleep for healthy adults.² Insufficient sleep is linked to numerous adverse outcomes, including missed work days, decreased military readiness, and early departure from military service.^{1,3–5} Given the detrimental impact of sleep restriction, it is important to understand the drivers of sleep-related behaviors in order to target behavior change.

Numerous factors account for sleep restriction in the military context, such as poor sleep environments, high operational tempo, shift work, and culture.^{1,5–7} Individuals may also feel compelled to sleep less because of mission requirements and leadership encouragement.⁸

Besides organizational factors, knowledge about sleep may influence the degree to which individuals prioritize sleeping. Previous research suggests substantial knowledge gaps regarding the importance of sleep. For example, soldiers express relatively low levels of concern about obtaining insufficient sleep⁵ and incorrectly

believe they need less sleep than their civilian counterparts.⁹ However, to the best of our knowledge, there have been no systematic assessments regarding soldier sleep knowledge or how it may be linked to actual sleep behavior.

Knowledge may influence sleep given that previous work has found a link between health-related knowledge and healthy behavior,¹⁰ although some studies demonstrate conflicting results in certain occupational contexts.^{11–13} Besides knowledge, an individual's goals and habits may also influence sleep behavior given that previous research has found that goal setting^{14,15} and personal habits are linked to health-related choices.^{16,17}

Thus, sleep-related knowledge, goals, and habits represent potential targets for sleep health education. The present study examined these potential targets. We first characterized soldier sleep problems, sleep quantity, and perceived sleep need. We then examined the relationship between knowledge, goals, and habits to self-reported sleep. Given that sleep restriction impedes soldier health and performance, identifying potential targets for improving sleep patterns in military personnel is critically important.

Method

Participants and design

The data in the present study come from a larger study of the mental health of active duty US Soldiers in a Brigade Combat Team

[☆] Disclosure Statement: Material has been reviewed by the Walter Reed Army Institute of Research. There is no objection to its presentation and/or publication. The opinions or assertions contained herein are the private views of the author, and are not to be construed as official, or as reflecting true views of the Department of the Army or the Department of Defense. The investigators have adhered to the policies for protection of human subjects as prescribed in AR 70-25.

* Corresponding author at: Clinical Research Psychologist, US Army Medical Research Directorate-West, Joint Base Lewis-McChord, Washington, USA. Tel.: +1 2539684878; fax: +1 253 968 4192.

E-mail address: jennifer.l.mcdonald68.civ@mail.mil. (J.L. McDonald).

stationed in Germany during spring 2014.^{18,19} The total response rate was 83% of 3035 available Soldiers (n = 2528). This study was conducted under a protocol approved by the Institutional Review Board at the Walter Reed Army Institute of Research.

Demographic characteristics

Demographic characteristics included gender (male; female), age (18-24; 25-29; 30-39; 40 or older), highest level of civilian education (high school diploma/GED or less; some college/associate's degree; bachelor's degree or more), and rank (junior enlisted [E1-E4]; noncommissioned officers [NCOs; E5-E9]; officer or warrant officer).

Measures

Sleep problems were measured using four items from the Insomnia Severity Index²⁰ (ISI). These items asked participants to rate severity of any difficulties with falling or staying asleep on a 5-point Likert scale (1 = None to 5 = Very Severe), how satisfied they are with their current sleep pattern (1 = Very satisfied to 5 = Very dissatisfied), and to what extent they considered any sleep problem to interfere with their daily functioning (1 = Not at All/No sleep problem to 5 = Very much). Total score responses on the ISI items were dichotomized such that a positive score represented the presence of a sleep problem using established cut-offs reported in previous studies with soldiers.^{21,22}

Sleep quantity and perceived sleep need were assessed using a single item each, adapted from the Pittsburgh Sleep Quality Index.²³ Specifically, sleep quantity was assessed by asking the question, "On average, how many hours of sleep do you get PER DAY (24 hours)?" and perceived sleep need was assessed by asking the question, "On average, how many hours of sleep do you need PER DAY (24 hours) to feel rested?" Response options for both questions were hours endorsed (3 or fewer, 4, 5, 6, 7, and 8 or more).⁵ Responses for both were dichotomized into short or restricted sleepers (6 hours or fewer) and adequate sleepers (7 hours or more).

Two items measured sleep goals and five items developed for this study measured sleep knowledge (see Table 1 for specific items asked). Participants rated their agreement on a 5-point scale (1 = Strongly Disagree to 5 = Strongly Agree). Responses were categorized

such that a score of 4 or 5 was rated as agreement. Five items developed for this study assessed sleep habits. Participants rated frequency of engagement with sleep habits in the past month, using a 5-point scale (1 = Not at All to 5 = Most of the Time). Responses were categorized such that a score of 4 or 5 was rated as endorsement of engaging in that habit. Table 1 displays all items for sleep knowledge, sleep goals, and sleep habits.

Analytic strategy

Relative risk ratios were calculated using a modified Poisson regression approach,²⁴ with higher ratios indicating better likelihood of being an adequate sleeper. These resulting benefit ratios should be interpreted as increased (or decreased) likelihood of being an adequate sleeper based on the response to the survey item. Covariates of age, gender, and education level were selected based on their association with knowledge and sleep quantity.¹ Sleep problems were also selected as a covariate in order to control for the effect of insomnia on number of sleep hours. Significance was set at P ≤ .05 for all analyses. All analyses were carried out in Stata 14/SE.

Results

Approximately 94.7% (n = 2379) of the sample was male; 5.3% (n = 133) were female. By rank, junior enlisted were 58.7% of the sample (n = 1477); non-commissioned officers were 32.8% of the sample (n = 825); and officers comprised 8.6% of the sample (n = 216). The age category breakdown was as follows¹: 18-24 (52.2%, n = 1317)²; 25-29 (25.7%, n = 648); 30-39 (18.3%, n = 461); and 40 or older (3.8%, n = 95). A majority of participants reported having received a high school diploma or GED (47.1%, n = 1186) as their highest level of education, with some college or an associate's degree (39.2%, n = 986) as the next highest level of education endorsed.

More than one in five soldiers (23.1%, n = 582) scored above the cut-off for sleep problems as assessed by use of the ISI²⁰. Overall, 77.2% (n = 1925) were categorized as short sleepers and 59.4% (n = 1484) reported needing at least seven or more hours of sleep per night.

As shown in Table 1, agreement with sleep knowledge and sleep goals items was endorsed by a higher proportion of adequate sleepers

Table 1
Sleep knowledge, goals, and habits by sleep length

Sleep knowledge	% Short sleepers (agree/strongly agree)	% Adequate sleepers (agree/strongly agree)	Relative benefit	95% Confidence interval
I am aware of how my sleep impacts my mental effectiveness/performance	80.7%	83.7%	1.29*	[1.06, 1.58]
It is normal for people to wake up a few times a night	33.4%	41.4%	1.26*	[1.09, 1.45]
Getting enough sleep impacts my ability to make good decisions	57.3%	65.9%	1.41*	[1.22, 1.65]
Being sleep deprived is like having an elevated blood alcohol level	55.2%	59.3%	1.24*	[1.07, 1.43]
When I am not getting enough sleep, I am more likely to have an accident or make a mistake	52.2%	59.8%	1.39*	[1.20, 1.60]
Sleep Goals	% Short sleepers in agreement	% Adequate sleepers in agreement	Relative benefit	95% Confidence interval
I am trying to keep a regular sleep schedule	67.0%	80.3%	1.77*	[1.47, 2.13]
I am trying to get at least 7 hours of sleep each night	56.2%	85.5%	3.77*	[3.03, 4.68]
Sleep habits	% Short sleepers in agreement	% Adequate sleepers in agreement	Relative benefit	95% Confidence interval
I made sure my alcohol intake didn't interfere with my sleep	52.8%	57.2%	1.11	[0.97, 1.29]
I avoided caffeine 6 hours before bed	52.5%	58.3%	1.31*	[1.13, 1.52]
I made sure my sleep environment was comfortable	60.5%	69.2%	1.36*	[1.17, 1.60]
I made sure that light and sound were blocked	58.9%	65.9%	1.28*	[1.10, 1.49]
I napped to catch up on my sleep	30.5%	30.4%	1.03	[0.88, 1.21]
On my days off, I stayed awake all night and slept during the day.	14.2%	11.4%	0.82	[0.65, 1.04]

Note: N sizes may differ due to missing data. Total sample N = 2528. Higher relative benefit ratio indicates better likelihood of being an adequate sleeper (obtaining ≥ 7 hours of sleep per 24 hours) if in agreement with the listed items. Analyses controlled for gender (male/female), age (18-24; 25-29; 30-39; 40 or older), education (high school diploma/GED or less; some college/associate's degree; bachelor's degree or more), and sleep problems.

* Indicates P < .05.

than short sleepers. Likewise, agreement with positive sleep habits on all but two items were endorsed by a higher proportion of adequate sleepers than short sleepers.

Relative benefit ratios are shown in Table 1. The highest increased benefit came for individuals endorsing agreement with the goal of trying to get at least 7 hours of sleep each night. Agreement with this goal is associated with a 2.8 fold increase in the chance of being an adequate sleeper, relative to short sleepers.

Discussion

Most soldiers reported being sleep restricted, despite over half recognizing that they need seven or more hours of sleep. Similarly, nearly half of soldiers reported good knowledge, goals, and habits related to healthy sleep. While these results are encouraging, they also indicate that almost half of those surveyed did not report good sleep knowledge, goals, or habits. Given that these variables were associated with reporting adequate levels of sleep, even after controlling for sleep problems, results from the present study provide insight into potential targets for sleep health education.

Specifically, soldiers with better sleep knowledge, who endorsed keeping regular schedules, and tried to get at least 7 hours of sleep per night were more likely to be adequate sleepers. Additionally, those who endorsed trying to make their sleep environment comfortable, dark, and quiet and avoiding caffeine prior to bed were more likely to obtain adequate sleep than those who did not.

Although military occupational context drives soldier sleep patterns, these results provide potential, practical directions for targeting specific sleep-promoting behaviors. For example, focusing on goal-setting behaviors may help shift soldiers into healthier sleep patterns. Furthermore, targeting negative sleep habits, such as staying up all night, may also be useful in promoting healthier sleep. Notably, there were no differences as a function of alcohol intake modification or napping, despite no restrictions on either alcohol intake or napping while off-duty, suggesting that insufficient sleep may be independent of these habits. Thus, these habits may be influenced by larger cultural and/or occupational factors.

Although the present study uses a robust sample, with detailed questions that provide insight into soldier understanding of sleep health, it is limited by the use of self-report and the correlational design. The questions regarding sleep knowledge and goals have not yet been validated, nor were individual differences in sleep need examined. Furthermore, there were no measures of sleep quality or any measure of how improving sleep quantity may or may not influence sleep quality. Future efforts should build on these findings. First, studies should examine whether sleep education for soldiers, their supervisors, and organizational leaders is effective in influencing soldier behaviors and improving sleep patterns. Second, educational initiatives, including formal training, tailored feedback about the performance implications of restricted sleep,¹⁸ and public health campaigns should be used to target improved sleep throughout the military. Finally, mental health providers and other healthcare personnel should be trained to address specific sleep health topics with soldiers. By highlighting topics indicative of poor sleep patterns, these healthcare personnel can provide key information during routine patient consultations. Given the importance of sleep for

individual health and performance, as well as organizational effectiveness, identifying mechanisms for improving sleep habits should be a priority.

Acknowledgment

This study was funded as part of the US Army's Military Operational Medicine Research Program.

References

- Seelig AD, Jacobson IG, Donoho CJ, et al. Sleep and health resilience metrics in a large military cohort. *Sleep*. 2016;39:1111–1120.
- Watson NF, Badr MS, Belenky G, et al. Recommended amount of sleep for a healthy adult: a joint consensus statement of the American Academy of sleep medicine and Sleep Research Society. *J Clin Sleep Med*. 2015;11:591–592.
- Belenky G, Wesensten NJ, Thorne DR, et al. Patterns of performance degradation and restoration during sleep restriction and subsequent recovery: a sleep dose-response study. *J Sleep Res*. 2003;12:1–12.
- Folkard S, Tucker P. Shift work, safety and productivity. *Occup Med*. 2003;53:95–101.
- LoPresti ML, Anderson JA, Saboe KN, et al. The impact of insufficient sleep on combat mission performance. *Mil Behav Health*. 2016;4:356–363.
- Foster SN, Hansen SL, Capener DC, et al. Gender differences in sleep disorders in the U.S. military. *Sleep Health*. 2017;3:336–341.
- Troxel WM, Shih RA, Pedersen E, et al. Sleep in the Military: Promoting Healthy Sleep among U.S. Service members. Santa Monica, CA: RAND Corporation; 2015 https://www.rand.org/pubs/research_reports/RR739.html, Accessed date: 13 July 2018.
- Gunia BC, Sipes ML, LoPresti ML, et al. Sleep leadership in high-risk occupations: an investigation of soldiers on peacekeeping and combat missions. *Mil Psychol*. 2015;27:197–211.
- Harrison E, Glickman GL, Beckerley S, et al. Self-reported sleep during US navy operations and impact of deployment-related factors. *Mil Med*. 2017;182:189–194.
- Tawalbeh LI, Ahmand MM. The effect of cardiac education on knowledge and adherence to healthy lifestyle. *Clin Nurs Res*. 2014;23:245–258.
- Alaunyte I, Perry JL, Aubrey T. Nutritional knowledge and eating habits of professional rugby league players: does knowledge translate into practice? *J Int Soc Sports Nutr*. 2015;12:18.
- Ahmed N, Sadat M, Cukor D. Sleep knowledge and behaviors in medical students: results of a single center survey. *Acad Psychiatry*. 2017;41:674–678.
- Ross A, Bevans M, Brooks AT, et al. Nurses and health-promoting behaviors: knowledge may not translate into self-care. *AORN J*. 2017;105:267–275.
- Rodrigues AL, Ball J, Ski C, et al. A systematic review and meta-analysis of primary prevention programmes to improve cardio-metabolic risk in non-urban communities. *Prev Med*. 2016;87:22–34.
- Poirier J, Bennet WL, Jerome GJ, et al. Effectiveness of an activity tracker and internet based adaptive walking program for adults: a randomized controlled trial. *J Med Internet Res*. 2016;18(2).
- Kelly MP, Barker M. Why is changing health-related behaviour so difficult? *Public Health*. 2016;136:109–116.
- Galizzi MM. Label, nudge, or tax? A review of health policies for risk behaviours. *J Public Health Res*. 2012;1(1):14.
- Adrian AL, Adler AB, Thomas JL, et al. Integrating new soldiers: the role of leaders and unit members. *Mil Psychol*. 2012;30(2):131–141.
- Start AR, Allard Y, Adler A, et al. Predicting suicide ideation in the military: the independent role of aggression. *Suicide Life Threat Behav*. 2018:1–11.
- Bastien CH, Vallieres A, Morin CM. Validation of the insomnia severity index as an outcome measure for insomnia research. *Sleep Med*. 2001;2:297–307.
- Adler AB, Brossart DF, Toblin RL. Can anger be helpful? Soldier perceptions of the utility of anger. *J Nerv Ment Dis*. 2017;205:692–698.
- Adler AB, Gunia BC, Bliss PD, et al. Using actigraphy feedback to improve sleep in soldiers: an exploratory trial. *Sleep Health*. 2017;3:126–131.
- Buyse DJ, Reynolds CF, Monk TH, et al. The Pittsburgh sleep quality index: a new instrument for psychiatric practice and research. *Psychiatry Res*. 1989;28:193–213.
- Hirshkowitz M, Whiton K, Albert SM, et al. National sleep foundation's sleep time duration recommendations: methodology and results summary. *Sleep Health*. 2015:40–43.
- Zou G. A modified poisson regression approach to prospective studies with binary data. *Am J Epidemiol*. 2004;159:702–706.