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Effects of a *Total Worker Health*® Leadership Intervention on Employee Well-Being and Functional Impairment

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Although evidence has been mounting that supervisor support training interventions promote employee job, health, and well-being outcomes, there is little understanding of the mechanisms by which such interventions operate (e.g., Hammer et al., 2022; Inceoglu et al., 2018), nor about the integration of such organizational-level interventions with individual-level interventions (e.g., Lamontagne et al., 2007). Thus, the present study attempts to unpack the mechanisms through which supervisor support training interventions operate. In addition, the present study examines an integrated Total Worker Health® intervention that combines *health protection* in the form of supervisor support training (i.e., family supportive supervisor behaviors and supervisor support for sleep health) with a *health promotion* approach in the form of feedback to improve sleep health behaviors. Using a cluster randomized controlled trial drawing on a sample of 704 full-time employees, results demonstrate that the Total Worker Health intervention improves employee job well-being (i.e., increased job satisfaction and reduced turnover intentions), personal well-being (i.e., reduced stress before bedtime), and reduces personal and social functional impairment at 9 months postbaseline through employee reports of supervisors' support for sleep at 4 months postbaseline, but not through family supportive supervisor behaviors. Effects were not found for general stress or occupational functional impairment outcomes. Implications are discussed, including theoretical mechanisms by which leadership interventions affect employees, supervisor training, as well as the role of integrated organizational and individual-level interventions.

Keywords: leadership, stress, well-being, interventions

Occupational stress has a significant impact on employee job and personal well-being as well as on functional impairment, or ability to fulfill day-to-day obligations (e.g., Ganster & Rosen, 2013; Herrell et al., 2014), with costs of occupational stress estimated up to $190 billion annually (Goh et al., 2015). Ganster and Rosen's (2013) review of work stress and health documented consistent evidence of the relationship between job stressors and health indicators of cardiovascular disease, depression, type 2 diabetes, and higher employee health care costs. Furthermore, long work hours, and associated occupational stress, have been identified as significantly contributing to disease, injury, and death (Pachito et al., 2021; Pega et al., 2021). Employee well-being and functional impairment are also critical for employee performance and broader organizational outcomes (e.g., Boushey & Glynn, 2012; Harter et al., 2002). One way to combat the negative effects of occupational stress is by training supervisors to provide support to employees (e.g., Hammer et al., 2020). Drawing on organizational support theory (e.g., Baran et al., 2012), we suggest that leadership support training will positively impact employee job and personal well-being and reduce functional impairment, thereby reducing occupational burdens and risks for employees.

The focus on employee well-being has never been so important, as reports reveal extreme levels of psychological distress among the general population in relation to the coronavirus disease (COVID-19) pandemic (e.g., American Psychological Association (APA), 2020). Managers and supervisors may be in the best position to mitigate such distress through their supportive actions (e.g., Kniffin et al., 2021; Sinclair et al., 2020). We argue here that employee well-being should be a primary focus in mainstream management scholarship and practice, consistent with the World Health Organization's identification of work as a social determinant of health.

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The contributions of this study are threefold. *First*, we go beyond previous supervisor support training frameworks by utilizing a Total Worker Health® (TWH) approach that includes supervisor support training (i.e., health protection) while also incorporating personalized feedback to improve health behaviors (i.e., health promotion). *Second*, although previous research suggests that supervisor support trainings can have positive effects on employee perceptions of stressors, job well-being, and personal well-being (e.g., Hammer et al., 2011), little research has elucidated the processes by which such interventions can impact these outcomes. The present study increases our understanding of such mechanisms by investigating the effects of the intervention on improved employee perceptions of family supportive supervisory behaviors (FSSB) and supervisor support for sleep, and in turn, on employee well-being and functional impairment outcomes. *Third*, we use a rigorous cluster randomized controlled trial (RCT) design, lacking in much of the prior leadership intervention research (see Hammer et al., 2022), and yet suggested by Eden (2020) as being best suited to lead to causal conclusions that provide practitioners with useful tools to move leadership science to practice.

Job and Personal Well-Being

Well-being is defined in many ways, but in general is a combination of physical, mental, and social health (Warr, 2011). More recently, Chari et al. (2018) defined worker well-being as "an integrated concept that characterizes quality of life with respect to an individual's health and work-related environmental, organizational, and psychosocial factors" (p. 590). Furthermore, we draw on Kaluza et al. (2020) conceptualization of well-being characterized by high levels of positive constructs, such as job satisfaction (i.e., job well-being), or low levels of negative constructs, such as stress (i.e., personal well-being). Here, we operationalize *job well-being* as high job satisfaction and low turnover intentions. Although also in the nomological net of job attitudes, each can be viewed as indicators of job well-being. For instance, employees who have high job satisfaction are also more likely to experience high life satisfaction and happiness (Bowling et al., 2010). On the other hand, considering quitting one's job and looking for employment at a different organization is related to job dissatisfaction and can be a time-consuming and stressful experience for workers. Another component of well-being is *personal well-being*, which is operationalized here as the degree of stress an individual experiences. We conceptualize stress in two ways—general stress (e.g., feeling unable to control important aspects of one's life) and stress before bed (e.g., feeling angry, upset, or nervous at bedtime).

Functional Impairment

Functional impairment has been defined by Herrell et al. (2014) as the ability to fulfill obligations, thereby impacting performance in occupational, personal, and social domains. Regarding occupational functional impairment, employees who have difficulty in their job performance or struggle to complete their work in an accurate and high-quality manner, may be burned out or unable to feel engaged in their job (e.g., Bakker et al., 2014; Maslach et al., 2001). Outside of the work domain, personal functional impairment (i.e., the inability to handle day-to-day responsibilities, like paying bills) and social functional impairment (i.e., inability to get along with others), are also associated with poor physical and psychological health outcomes (Herrell et al., 2014).

Leader Influence on Employee Well-Being and Functional Impairment

Organizational leaders (i.e., leaders, managers, supervisors) are in an excellent position to help improve well-being and functional impairment of employees by controlling workplace psychosocial hazards such as decreasing excessive demands and increasing control over work (e.g., Harms et al., 2017; Offermann & Hellmann, 1996; Spector, 2002). Likewise, there is growing evidence that transformational leadership behavior, which can operate through leader social support (Liaw et al., 2010), is significantly related to employee well-being outcomes (e.g., Arnold, 2017). Furthermore, leader support has been identified as a central mechanism to improve employee health, safety, and well-being (e.g., Kelloway & Barling, 2010). Only recently, however, has serious attention been given to the concept of well-being in the leadership literature (Inceoglu et al., 2018; Kaluza et al., 2020). Furthermore, leadership development in the form of training is emerging as an important intervention strategy for improving well-being and reducing functional impairments for employees (e.g., Hammer et al., 2022) and couples (Brady et al., 2021) over time, and at the daily level (Mohr et al., 2021).

The Case for Integrated Interventions: Total Worker Health®

One framework that has encompassed both leadership and well-being is TWH. TWH is defined as policies, programs, and practices that integrate *protection* from work-related safety and health hazards with *promotion* of injury and illness prevention efforts to advance worker well-being (Schill & Chosewood, 2013; Tamers et al., 2019). Based on the concept that work is a social determinant of health, the TWH approach suggests that individuals' experiences, exposures, health, and well-being all affect, and are affected by, their work (Feltner et al., 2016). Integrated interventions have been identified in at least two separate reviews of occupational health intervention research as the most effective type of occupational health interventions; however, only a handful of studies have adopted such a rigorous approach (see reviews; Anger et al., 2015; Lamontagne et al., 2007). Using a rigorous RCT design, we evaluated the effectiveness of an integrated TWH intervention that combines *health protection* in the form of supervisor support training (i.e., FSSB and supervisor support for sleep health), with a *health promotion* approach in the form of employee personalized sleep feedback.

Theoretical Framing: Organizational Support Theory

Organizational support theory (OST) outlines elements of the employer–employee relationship and the process by which antecedents in the workplace lead to employees developing perceptions of supportiveness of their organization, which in turn has implications for important employee outcomes (Baran et al., 2012; Eisenberger et al., 1986; Rhoades & Eisenberger, 2002). More specifically, OST draws on social exchange theory (e.g., Blau, 1964) and proposes that workers trade effort and dedication to their

organizations for tangible benefits (e.g., pay) and socioemotional need fulfillment/benefits (e.g., social support). Organizations that offer more and higher quality benefits consequently have employees who reciprocate and are more committed, higher performing, and healthier (e.g., Baran et al., 2012). In the present study, we draw on OST propositions, aimed to target socioemotional benefits for employees through leader social support that would result in employees having higher job well-being, personal well-being, and reduced functional impairment.

Theoretical and empirical reviews suggest that there are four categories of antecedents that lead to increased perceptions of perceived organizational support, including (a) fairness, (b) organizational rewards and job conditions, (c) supervisor support, and (d) supportive work-life practices (Baran et al., 2012; Cohen & Wills, 1985; Rhoades & Eisenberger, 2002). In the present study, we integrate OST with a TWH framework and focus on the latter two of the four proposed OST antecedents. We implemented a health protection initiative designed to increase supervisor support where supervisors were trained to better support employees' nonwork life and sleep, in combination with a health promotion initiative that represented a supportive work-life practice wherein employees received personalized sleep feedback. In line with OST, the aim of these intervention efforts was to increase employee perceptions of support, and more specifically, employee reports of supervisor support for nonwork/family life and supervisor support for sleep.

OST also proposes that a number of employee work and well-being outcomes will manifest once employees perceive higher levels of support from their organization (e.g., Baran et al., 2012; Rhoades & Eisenberger, 2002). These include affect toward one's organization, less withdrawal behavior, and less strain (Baran et al., 2012). In this study, we also considered a novel outcome category of functional impairment, which is related to ability to fulfill obligations and performance outcomes. OST specifies that perceptions of organizational support result in one underlying process whereby employees have a sense of felt obligation toward their organization as a result of the reciprocity norm (i.e., the organization provides benefits to the employee that should be reciprocated by the employee; Rhoades & Eisenberger, 2002). Additionally, another underlying process can take place where employees who perceive more organizational support have their socioemotional needs for approval, esteem, and affiliation with others met, where they experience less strain and are better able to perform adaptive behaviors (Rhoades & Eisenberger, 2002). Thus, we suggest that by increasing perceptions of supervisor support for family and sleep, employees will feel a greater sense of obligation to their organization and experience their socioemotional needs being met, manifesting as (a) increased job well-being in the form of job satisfaction (i.e., job related affective affinity) and reduced turnover intentions (i.e., withdrawal behavior), (b) increased personal well-being in the form of decreased general stress and stress before bed (i.e., strain), and (c) less functional impairment (i.e., in the form of occupational, personal, and social ability to fulfill obligations). In the following section, we provide more rationale for the specific supervisor support constructs related to sleep and FSSB as important mechanisms.

Intervention Mechanisms: Perceptions of Supervisor Support for Sleep and FSSB

The supervisor training aspect of the leadership intervention was designed to build upon traditional supportive supervisor frameworks, while also incorporating supervisor support for sleep and FSSB. The intervention draws on prior social support training interventions, whereby training supervisors in certain behavioral health leadership domains (Adler et al., 2015), such as support for family (FSSB; Kossek et al., 2011, 2019), support for safety (Hammer et al., 2019), and support for sleep (Gunia et al., 2015), is an effective strategy for improving employee job and personal well-being outcomes (e.g., Brady et al., 2021; Gunia et al., 2015).

The concept of behavioral health leadership, based in social support theory, was introduced by Adler et al. (2015) and refers to leadership behaviors that are focused on specific domains (e.g., safety, health, family, mental health), and are expected to have a positive impact on employee health and well-being. Adler et al. (2015) identified sleep leadership as leadership behaviors that promote healthy sleep patterns and sleep conditions of employees. We also draw on the work–nonwork–sleep framework (Crain et al., 2018) that highlights the interconnection between sleep, work, nonwork, and well-being. Indeed, sleep and sleep-related variables have been associated with a number of job and personal well-being outcomes (e.g., job satisfaction, turnover intentions, work–family conflict, positive mood, psychological health; Britt & Dawson, 2005; Litwiller et al., 2017; Scott & Judge, 2006; Sonnentag et al., 2008). Furthermore, employees with supervisors who exhibit sleep leadership behaviors report fewer depressive symptoms (Gunia et al., 2015). Another example of domain-specific leadership is FSSB (Hammer et al., 2011), which is a multidimensional construct consisting of emotional support and instrumental support concerning family demands, in addition to role modeling behavior and creative work–family management (Hammer et al., 2009). Employees with family-supportive supervisors also experience favorable job and personal well-being outcomes like job satisfaction, low turnover intentions, reduced work–family conflict, and low perceived stress (Hammer et al., 2009, 2011). Moreover, a recently published paper indicated that employee perceptions of both leader support for sleep and FSSB are influential in employee sleep health (Sianoja et al., 2020).

In addition to training supervisors on sleep leadership and FSSB, employees received individualized reports depicting their sleep patterns and were encouraged to set goals for improving their sleep. Direct personal sleep feedback that is supported at the worksite level represents a supportive organizational health promotion program, which is also expected to result in increased perceptions of health-supportive culture and leadership (e.g., Sorensen et al., 2013).

> *Hypothesis 1:* The TWH intervention will improve employee reports of perceived supervisor support for sleep and FSSB 4 months postbaseline.

Given propositions from OST (e.g., Baran et al., 2012; Rhoades & Eisenberger, 2002) and general social support theory (Cohen & Wills, 1985), increased perceptions of organizational support, in the form of supervisor support for sleep and FSSB, should in turn result in increased job well-being outcomes (i.e., increased job satisfaction and decreased turnover intentions). Additionally, these employees are likely to feel a sense of obligation and dedication to their supervisors and the larger organization, resulting in decreased intentions to turnover.

Hypothesis 2: The TWH intervention will improve employee job well-being as indicated by greater job satisfaction and lower turnover intentions at 9 months postbaseline indirectly, through its effect on improvements in perceived supervisor support for sleep and FSSB at 4 months postbaseline.

In addition, personal well-being should also be increased as a result of increased perceptions of supervisor support for sleep and FSSB. OST suggests that employees who experience these types of support are being cared for and esteemed by supervisors who are acknowledging and attending to their sleep and nonwork-related needs. OST suggests that decreased strain results when service members perceive more support, and while we measure stress generally, we also extend this idea to the nonwork domain and hypothesize that stress before bed will also be decreased.

Hypothesis 3: The TWH intervention will improve employee personal well-being as indicated by decreased general stress and stress before bed at 9 months postbaseline indirectly, through its effect on improvements in perceived supervisor support for sleep and FSSB at 4 months postbaseline.

Finally, we propose that increased perceptions of supervisor support for sleep and FSSB should result in an increased ability to complete day-to-day tasks at work, in one's own personal life, and socially. OST suggests that when socioemotional needs are being met, individuals are more likely to perform necessary daily responsibilities.

Hypothesis 4: The TWH intervention will improve employee occupational, personal, and social functional impairment at 9 months postbaseline indirectly, through its effect on improvements in perceived supervisor support for sleep and FSSB at 4 months postbaseline.

Taken together, we posit that supervisor support for sleep and FSSB training, along with personalized feedback to improve sleep behaviors, will jointly have beneficial effects on employee job and personal well-being and reduced functional impairment, through employee reports of improved supervisor support for sleep and FSSB. Specifically, employees who were randomized to the intervention group and receive greater support for their sleep and lives outside of work should be more satisfied in their job, less likely to quit, and experience fewer difficulties in their work performance compared to employees who were randomized to the control group.

Method

Study Design and Overview

Using a cluster RCT design with a waitlist control group, data were collected at baseline, and 4 months and 9 months postbaseline. All participants were full-time members and employees in the Army and Air National Guard (NG) in one U.S. state of the Pacific Northwest. Positions primarily included personnel providing support for the day-to-day functioning of the NG (e.g., human resources, maintenance). The study ran from 2017 through 2020. The Institutional Review Board of the first author's institution approved all study protocols. Figure 1 provides an overview of the study design and timing of each study component. Intervention activities for both supervisors and service members occurred approximately 1–2 months after baseline data collection. The time lag between the end of the intervention period and the two subsequent data collections was approximately 1 and 6 months, respectively. A study (Sianoja et al., 2020) was previously published drawing on the overall larger study's baseline data to examine correlates of sleep. The theoretical framework, purpose, contributions, research questions, and managerial implications of this prior study all diverge from the purpose of the present study, and therefore meets current guidance on best practices of multiuse datasets (Kirkman & Chen, 2011).

Procedure

Recruitment and Data Collection

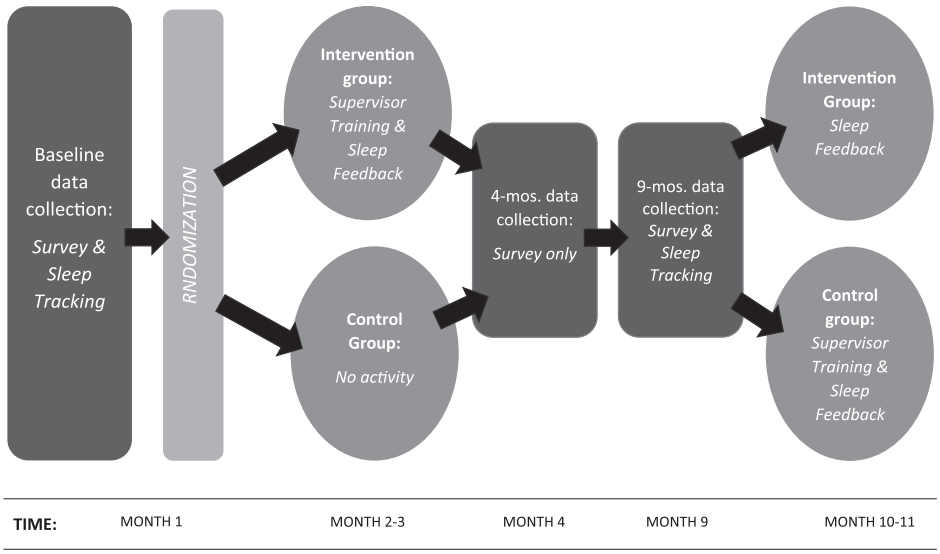
We developed a detailed timeline to recruit military units on a rolling basis over 2 years. After receiving support from the state's Adjutant General of the NG, and briefing top leadership, our team briefed the individual unit leaders 1 month prior to the commencement of recruitment activities. We provided unit leaders an email template to send to all of their full-time unit staff that included information about the study and a link for them to sign-up online. Service members provided contact information, were screened for eligibility (i.e., worked 32 or more hours a week for the NG), and were provided pertinent information about the study. Participation occurred during off-duty time and therefore, participants were offered a $25 gift card for each of the *three* survey data collections ($75), and for participation in the *two* sleep tracking data collections that involved wearing an actigraphy wrist device for 3 weeks ($50). Thus, they were eligible to receive up to $125 total.

Researchers emailed participants an electronic questionnaire via the REDCap (Research Electronic Data Capture) survey data platform. The baseline survey was open for approximately 1 month, during which time we continued to recruit more service members from the current group. The 4-month and 9-month postbaseline surveys were emailed to participants, with email and/or phone reminders if not completed within 2 weeks. Informed consent was obtained electronically and/or in person (i.e., when a participant signed up during a research team visit instead of online).

Randomization

We used the existing organizational structure of the NG and grouped approximately 60 military units into 20 groups, based on geographical location, size, job type, and branch. We then paired groups by size and/or functionality (i.e., job types) and randomized groups within each pair to treatment or control. Each pair went through the study in tandem, with a new pair beginning every 1–2 months. For logistical reasons, all Army units completed study activities first, followed by Air units. Randomization occurred after baseline recruitment and survey data collection (see Figure 1), so the study was double blind at randomization. Because of the nature of the intervention, blinding was not possible after treatment, but those in the control group were not explicitly told which group they were in. Many units were geographically distant or physically separated (e.g., separate buildings) from others, reducing the potential social contagion of treatment effects.

Figure 1
Study Design Elements and Timing



Participants

The population of all full-time employees of the NG for this state was approximately 1,770. Of these, 975 signed up to participate (55.1%), and 919 returned their baseline survey (51.9% of the population). After removing supervisors (n = 215) whose survey data were not the focus on this paper, a total of 704 employees participated from intervention units (n = 358) or control units (n = 346) at baseline. Retention rates were similar across condition with about 82%–84% retained at 4 months (intervention: n = 295, control: n = 289), and about 77%–79% of baseline retained at 9 months (intervention: n = 275, control: n = 274). See CONSORT diagram in Figure 2.

Of the 704 service members who were randomized, 74.7% were male, 25.1% female, and 0.1% other.[1] They were on average 36.2 years old (SD = 9.08, range = 19–69). The most common race/ethnic background was White (80.7%), with 8.9% identifying as Latinx or Hispanic. Most participants were married (65.5%) or living with a partner (11.6%), and had been in that relationship for an average of 10.4 years (SD = 8.4, range = 0–47). The majority had children (69.1%), and most (60.3%) had children still living at home at least 3 days per week. Most participants (88.5%) completed some education beyond a high school degree.

Regarding military characteristics, slightly more Air NG (56.5%) than Army NG (43.5%) participated, which was representative of the overall makeup of the NG in this state. The vast majority were enlisted (i.e., rank of E-1–E-9; 88.9%). As expected, most service members worked dual-status (82.5%), meaning that they are required to maintain military status (e.g., drill one weekend a month) as a condition of their full-time position. Service members reported working on average 42.0 hr per week (SD = 5.0), having been in the National Guard for an average of 10.9 years (SD = 7.4), and in their current position for 4.7 years (SD = 5.5). Most worked a regular daytime shift (82.5%).

Description of Intervention

The integrated TWH intervention was comprised of two primary activities: (a) a *health protection* computer-based training for *supervisors* focused on FSSB and supervisor support for sleep, and (b) a *health promotion* component for all employees (both *service members* and *supervisors*) consisting of personalized feedback based on actigraphic sleep reports. Although participation in the actigraphy data collection was voluntary, making the sleep feedback dependent on who actually participated, completion of the supervisor training was "mandatory" and sanctioned by the NG. Thus, individuals who were identified as supervisors in the intervention groups were directed to complete the training on work time, regardless of whether they participated in the rest of the study. Approximately 1 month after baseline data collection, intervention activities commenced.

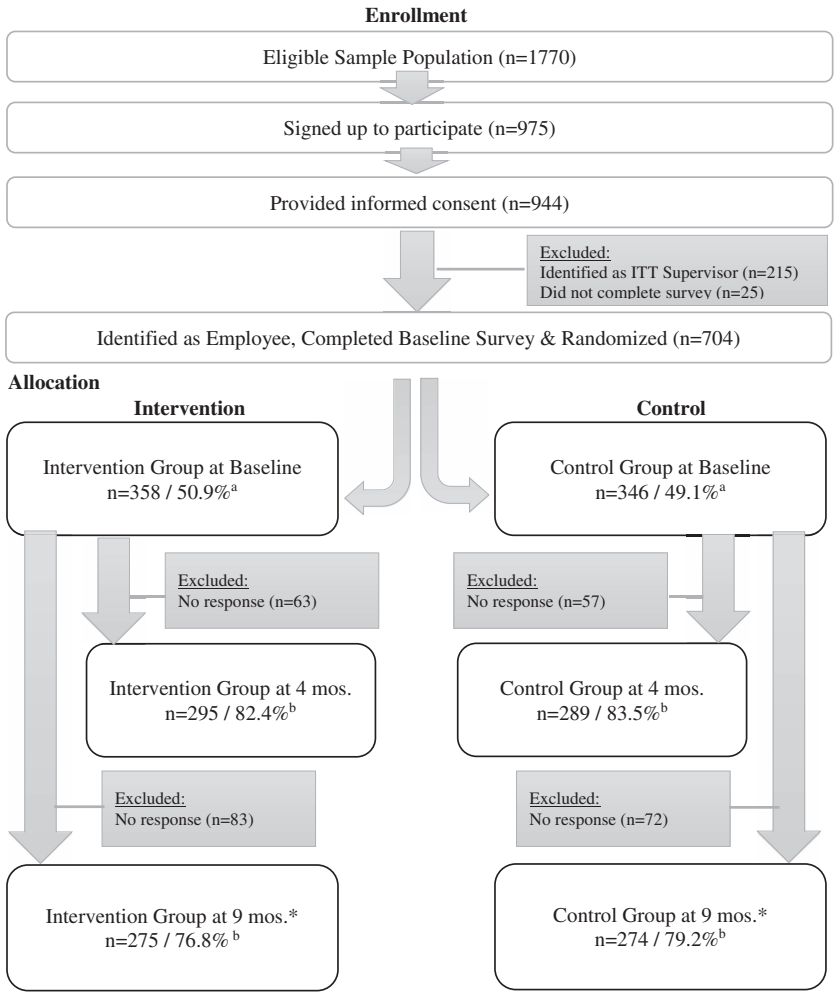
Health Protection Supervisor Training

The supervisor training was a computer-based training, which took approximately 1 hr to complete, was self-paced, and interactive. Supervisors in the intervention groups received an explanation of why they were receiving the training, general information about the study, and were informed that the training was mandatory regardless of whether they ultimately consented to have their data included in the study or participated in other study activities. Supervisors were provided with a personalized link to the training and provided informed consent that allowed us to use the data related to the training (i.e., learning and reaction data embedded in the training). A total of 210 supervisors in the treatment group were identified by the employees who participated in the survey as their supervisors and in turn were sent the training link, with 157 (74.7%) actually completing the

[1] All descriptive participant information is based on the participants who responded to the survey question, rather than the total number of participants.

Figure 2

Consort Diagram for Oregon Military Employee Sleep and Health Study: Employee Survey Sample



Note. [a] Entire sample at baseline; [b] condition at baseline; * 9-month surveys sent regardless of 4 months participation status.

training. Seven supervisors (4.5%) did not consent and their training data were deleted.

The training content drew on the evidence-based FSSB training (Hammer et al., 2011), along with the incorporation of supervisor support for sleep principles related to the concept of behavioral health leadership (Adler et al., 2015) and sleep leadership specifically (i.e., Gunia et al., 2015). Figure 3 includes a summary of the training content. We incorporated current military training components (e.g., Performance Triad) where applicable to ensure we were complementing existing messaging and described the consequences of poor sleep and work–family balance within a military framework.

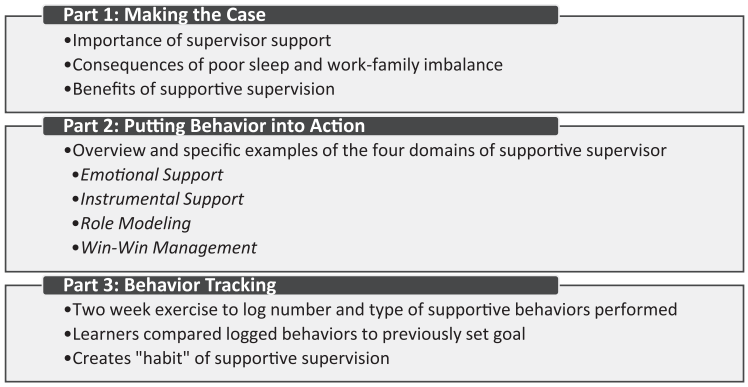
Throughout the training, we had several "learning checks" to assess knowledge and understanding, and to increase motivation to pay attention as supervisors had to successfully complete the knowledge checks before moving onto the next module. Supervisors who did not pass a learning check were able to review the pertinent information and retake the quiz. Finally, we included a pre and posttest so supervisors could see their knowledge had improved and for our team to assess learning.

Health Promotion Personalized Sleep Feedback

The other intervention component was the personalized sleep feedback. After participants wore an actigraphic device for 3 weeks at baseline, we used an algorithm developed in conjunction with The Sleep Research Center at Walter Reed Army Institute of Research (WRAIR) to create an individual sleep report. The personalized report included a graphical representation of sleep and activity data over the 3-week period, a mental acuity graph describing level of cognitive functioning based on individual sleep patterns, and comparative summary information on metrics such as sleep duration, efficiency, and time to fall sleep.

Prior to delivering feedback, trained research assistants reviewed each participant's graphs for specific aspects of sleep: *duration*,

Figure 3
Supportive Supervisor Training Content Overview



fragmentation, and *consistency*. Staff created a summary sheet so anyone on the research team delivering the feedback could quickly glance at the summary and provide a thorough, informed, and consistent feedback session, using a rehearsed and practiced script. Figure 4 provides an overview of the content covered in the feedback session. Feedback sessions lasted approximately 10–15 min. At the end of the feedback session, we asked participants to set two specific behavior-based goals to improve their sleep. Researchers contacted participants 2 weeks later to inquire about their goal progress and if they thought their goals helped improve their sleep. Sleep resources were also provided to participants (e.g., *National Sleep Foundation*).

Of the 358 baseline intervention group participants who completed the survey (see Figure 2 for CONSORT diagram), we were able to provide sleep feedback to 337 of them (94.1%); 243 (67.9%) were in-person and another 47 (13.1%) by phone. If we were not successful in reaching someone, we emailed the report to their personal address, along with instructions for interpretation (n = 47, 13.1%).

Measures

Supervisor Support for Sleep

Supervisor support for sleep was assessed using a modified Sleep Leadership Scale (Gunia et al., 2015). Service members rated the frequency their supervisors exhibited sleep leadership behaviors with eight items on a 5-point scale (1 = *never*; 5 = *always*) at baseline and 4 months. Example items include: "Your supervisor . . . asks subordinates about their sleeping habits," ". . . encourages subordinates to get adequate sleep," and ". . . works to encourage subordinates to have a good sleep environment (quiet, dark, not too hot or cold)." One item from the original scale was dropped ("Your supervisor supports the use of prescription sleep medications (like Ambien) when subordinates need help with sleeping") as we did not expect that supervisors would be aware of their employees' prescribed medications in this context. Reliability estimates for this and the following measures appear in Table 1.

Figure 4
Sleep Feedback Content Overview

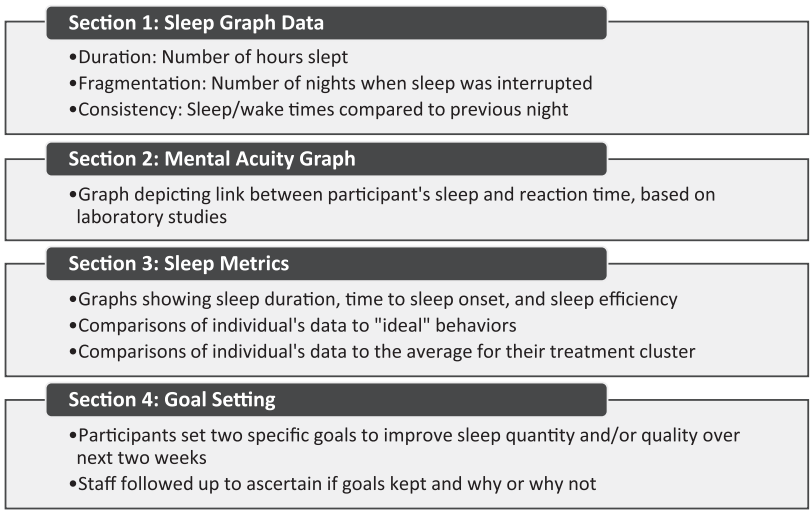


Table 1
Descriptives and Correlations Among Study Variables

Variable	*M* (*SD*)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. Condition	0.51 (0.50)	—	—																	
2. SS (*B*)	2.23 (0.98)	.05	.92	—																
3. SS (4m)	2.43 (1.00)	.11**	.59**	.94	—															
4. FSSB (*B*)	4.07 (0.97)	.04	.37**	.32**	.95	—														
5. FSSB (4m)	4.05 (0.92)	.08	.28**	.47**	.46**	.96	—													
6. Job Sat (*B*)	3.94 (0.85)	.05	.25**	.29**	.35**	.30**	.89	—												
7. Job Sat (9m)	3.83 (0.89)	.04	.22**	.34**	.28**	.36**	.60**	.89	—											
8. Turn Intent (*B*)	2.13 (1.19)	−.08*	−.22**	−.22**	−.32**	−.28**	−.66**	−.48**	.91	—										
9. Turn Intent (9m)	2.29 (1.23)	−.03	−.19**	−.24**	−.23**	−.33**	−.43**	−.66**	.55**	.93	—									
10. OFI (*B*)	1.81 (0.78)	.03	−.03	−.07	−.12**	−.15**	−.16**	−.18**	.13**	.09*	.91	—								
11. OFI (9m)	1.76 (0.77)	.04	−.04	−.05	−.03	−.09	−.16**	−.25**	.05	.18**	.35**	.92	—							
12. PFI (*B*)	1.61 (0.75)	−.02	−.01	.00	−.09*	−.10*	−.08*	−.09*	.15**	.10*	.35**	.16**	.67	—						
13.PFI (9m)	1.55 (0.69)	.01	−.05	−.12*	−.07	−.18**	−.17**	−.27**	.19**	.27**	.18**	.38**	.49**	.65	—					
14. SFI (*B*)	1.68 (0.66)	−.01	−.11**	−.13**	−.22**	−.20**	−.21**	−.23**	.23**	.20**	.38**	.14**	.51**	.33**	.67	—				
15. SFI (9m)	1.67 (0.68)	−.01	−.10*	−.17**	−.06	−.15**	−.18**	−.29**	.16**	.26**	.21**	.39**	.30**	.59**	.53**	.72	—			
16. Stress (*B*)	1.37 (0.70)	−.00	−.08*	−.17**	−.18**	−.20**	−.35**	−.35**	.30**	.26**	.25**	.26**	.46**	.41**	.47**	.39**	.73	—		
17. Stress (9m)	1.36 (0.69)	−.02	−.11*	−.16**	−.11*	−.17**	−.26**	−.32**	.22**	.28**	.18**	.29**	.35**	.48**	.39**	.48**	.61**	.64	—	
18. Bed stress (*B*)	2.41 (0.88)	−.02	−.12**	−.10*	−.12**	−.14**	−.23**	−.20**	.21**	.16**	.13**	.09*	.24**	.23**	.29**	.27**	.42**	.34**	.71	—
19. Bed stress (9m)	2.29 (0.87)	−.01	−.11*	−.17**	−.15**	−.13**	−.17**	−.20**	.14**	.15**	.12**	.23**	.20**	.35**	.24**	.35**	.38**	.42**	.61**	.71

Note. The clustering of the participants within units is not accounted for in this table. Condition: 0 = control group, 1 = treatment group; B = baseline; 4m = 4-month follow-up; 9m = 9-month follow-up; SS = supervisor support for sleep; FSSB = family-supportive supervisor behaviors; Job Sat = job satisfaction; Turn Intent = turnover intentions; OFI = occupational functional impairment; PFI = personal functional *impairment*; SFI = social functional impairment; Stress = general stress; Bed Stress = stress before bed. α reliability coefficients are provided on the diagonals. *N*s range = 503–704.
* $p < .05$. ** $p < .01$.

Family Supportive Supervisor Behavior

Similar to supervisor support for sleep, service members rated the extent to which they agreed their supervisor was supportive of their work and nonwork integration, on a 5-point scale (1 = *strongly disagree*; 5 = *strongly agree*), at baseline and 4 months (Hammer et al., 2013). The measure included four items with sample items of: "Your supervisor . . . makes you feel comfortable talking to him/her about your conflicts between work and nonwork" and ". . . demonstrates effective behaviors in how to juggle work and nonwork issues."

Job Satisfaction

Service member job satisfaction was assessed with three items on a 5-point scale (1 = *strongly disagree*; 5 = *strongly agree*) at baseline and 9 months (Cammann et al., 1983). Items included: "All in all I am satisfied with my job," "In general, I don't like my job," (reversed), and "In general, I like working here."

Turnover Intentions

Turnover intentions were assessed with two items on a 5-point scale (1 = *strongly disagree*; 5 = *strongly agree*) at baseline and 9 months (Boroff & Lewin, 1997). Items included: "I am seriously considering quitting this full-time job at the National Guard for an alternate employer" and "During the next year, I will probably look for a new full-time job outside the National Guard."

General Stress

Service members' general stress was assessed with the perceived stress scale, which includes four items on a 5-point scale (0 = *never*; 4 = *very often*; Cohen & Williamson, 1988). Example items include: "How often have you felt that you were unable to control the important things in your life?" and "How often have you felt difficulties were piling up so high that you could not overcome them?"

Stress Before Bed

To assess service members' stress before bed, the following two items from Mastin et al. (2006) measure of sleep hygiene were used: "I go to bed feeling stressed, angry, upset, or nervous" and "I think, plan, or worry when I am in bed." Response options were on a on a 5-point scale (1 = *never*, 5 = *always*).

Occupational Functional Impairment (OFI)

The OFI subscale of the overall functional impairment scale (Herrell et al., 2014) was assessed with six items on a 5-point scale (1 = *no difficulty at all*; 5 = *extreme difficulty*). Service members were asked to reflect on their full-time National Guard position and rate their difficulty with items including: "Your overall work performance" and "The quality of your work."

Personal Functional Impairment (PFI)

The PFI subscale of the overall functional impairment scale (Herrell et al., 2014) was assessed with two items on a 5-point scale (1 = *no difficulty at all*; 5 = *extreme difficulty*). Service members were asked to rate their difficulty with the following two items "your ability to handle personal responsibilities (e.g., maintaining the car, keeping appointments, running errands)" and "your ability to get your bills paid on time."

Social Functional Impairment (SFI)

The SFI subscale of the overall functional impairment scale (Herrell et al., 2014) was assessed using four items on a 5-point scale (1 = *no difficulty at all*; 5 = *extreme difficulty*). Service members were asked to rate their difficulty with items including: "your ability to get along with friends" and "Your ability to have a close relationship (e.g., spouse/partner, girlfriend/boyfriend)."

Analytic Approach

We used a linear mixed modeling approach in Mplus (V7; Muthén & Muthén, 1998–2012), accounting for the multilevel structure of the data (i.e., employees clustered within randomized units; Murray, 1998). To evaluate direct and indirect intervention effects, we used an analysis of covariance approach, which controls for grand mean centered baseline values of both the mediator and outcome variables and is the preferred approach for assessing intervention effects in cluster-randomized designs because it maximizes statistical precision (see Appendix B of Bodner & Bliese, 2018). To assess the hypothesized indirect effects of the intervention, 95% confidence intervals were estimated with 5,000 bias-corrected bootstrapped samples (see Preacher & Hayes, 2008). In the indirect effect models, each mediator was evaluated separately.[2] See Appendices A and B for Mplus code for the direct and indirect intervention analyses. Lastly, we used a conservative intent-to-treat approach, which reduces bias (e.g., sampling error) that would undermine the cluster RCT and maintains generalizability (McCoy, 2017; Shadish & Cook, 2009).

The core analyses in our paper are path models in which observed scale scores rather than latent variables are modeled. The complexity of our intervention analyses (i.e., multilevel structure of data, inclusion of baseline control variables, tests of mediation), increase the number of parameters that require statistical estimates, and increase the sample size needed to perform latent variable analyses (Kline, 2015). Moreover, modeling scale scores rather than latent variables is a commonly used approach, particularly in intervention papers with similar levels of complexity (e.g., Brady et al., 2021; Crain et al., 2019; Falon et al., 2021; Leger et al., 2021). Rather than integrating structural and measurement models, we performed confirmatory factor analyses to verify the model fit and distinguishability of the constructs (see Appendix C). Overall, our path analysis approach with observed scale scores is the most parsimonious way to answer our research questions about the effects of the intervention on employee well-being.

[2] Although not hypothesized, based on reviewer comments, we also tested mediation models in which both supervisor support for sleep and FSSB were included as mediators in the same model. Most of the significant indirect effects were retained, with the exception of the indirect effects of the intervention on reduced turnover intentions and reduced PFI through supervisor support for sleep. We believe that the significant positive correlations (.23–.24) between supervisor support for sleep and FSSB in these models is why these effects were no longer significant when both mediators were included in the same model.

Results

Intervention Effectiveness

We used Kirkpatrick's model for evaluating training effectiveness (Kirkpatrick, 1994). First, a pre and posttest intervention assessment was given to evaluate supervisors' overall learning from the training. The pretest mean percentage correct was 71.05 while the posttest mean percentage correct was 86.19, with a Cohen's *d* of .83, indicating a large effect size and representing learning by the supervisors who were trained. Next, supervisor reaction to the training was very favorable. Of the 150 supervisors who completed the training and consented to use their data, 89% ($n = 134$) rated the training as "Excellent" or "Good". Most supervisors felt the training would be useful (95%; $n = 142$) or relevant to their work (96%, $n = 144$). Finally, 88% ($n = 132$) of supervisors would recommend the training to other co-workers.

Descriptive Analyses and Correlations

Means, standard deviations, and correlations of study variables are presented in Table 1. Intraclass correlation coefficients (ICCs) were explored as a preliminary step to understand the extent to which employee responses to supervisor support and well-being outcomes were related to working in the same cluster. ICCs for the mediator and outcome variables ranged from .001 to .025, with an average ICC value of .01. Although there was little variation in the mediators and outcomes were due to group membership, we report the results of models that account for the clustering of service members within units.

Hypothesis Tests[3]

Hypothesis 1 was partially supported. There was a significant main effect of the intervention on service member reports of greater supervisor support for sleep at 4 months ($b = .18$, $SE = .07$, $p < .01$, pseudo $\Delta R^2 = .01$; $\beta = .92$, $d = .22$). There was not a significant main effect of the intervention on service member reports of FSSB at 4 months ($b = .10$, $SE = .06$, $p = .12$, pseudo $\Delta R^2 = .003$; $\beta = .85$, $d = .12$). See Table 2 for all direct effects.

Hypothesis 2 was partially supported. There were significant indirect effects of the intervention on greater job satisfaction, $ab = .03$, $SE = .01$, 95% confidence interval (CI) = [.01–.06]; $\alpha\beta = .02$, and reduced turnover intentions, $ab = -.02$, $SE = .01$, 95% CI = [−.05 to −.003]; $\alpha\beta = -.01$, at 9 months via greater supervisor support for sleep. However, FSSB did not mediate the intervention effects on the job well-being outcomes. See Table 3.

Hypothesis 3 was partially supported. There was a significant indirect effect of the intervention on reduced stress before bed, $ab = -.02$, $SE = .01$, 95% CI = [−.05 to −.001]; $\alpha\beta = -.01$, via greater supervisor support for sleep, but no significant indirect effects of the intervention on general stress. FSSB did not mediate the intervention effects on any of the personal well-being outcomes. See Table 3.

Hypothesis 4 was partially supported. There were significant indirect effects of the intervention on reduced personal functional impairment, $ab = -.01$, $SE = .01$, 95% CI = [−.04 to −.001]; $\alpha\beta = -.01$, and reduced social functional impairment, $ab = -.01$, $SE = .01$, 95% CI = [−.03 to −.003]; $\alpha\beta = -.01$, at 9 months via greater supervisor support for sleep, but no significant indirect effects on occupational functional impairment. FSSB did not mediate the intervention effects on the functional impairment outcomes. See Table 3.

Discussion

This study demonstrates that a TWH leadership intervention geared toward supporting employee health and well-being improves employee perceptions of supervisor support for sleep which in turn, improves their job satisfaction and reduces their turnover intentions, stress before bed, personal functional impairment, and social functional impairment. Additionally, supervisors showed significant training learning effects and had positive reactions to the training. However, the intervention did not impact perceptions of FSSB, general stress, or occupational functional impairment. This work has practical implications related to leadership interventions and theoretical implications related to understanding the mechanisms by which supervisor support training interventions operate. The findings of this TWH leadership intervention study contribute to the literature in three primary ways.

First, we implemented and evaluated a TWH intervention that integrated health protection in the form of leadership social support training (FSSB and supervisor support for sleep) and health promotion in the form of individualized sleep feedback. Prior supervisor support interventions tended to focus completely on health protection, providing leadership training to support employees, a type of organizational approach for reducing psychosocial hazards at work (e.g., Hammer et al., 2020). More recently it has been suggested that the most effective workplace interventions are those that integrate health protection and health promotion, namely TWH integrated intervention approaches (e.g., Sorensen et al., 2013). Few interventions have taken this approach and among those that have, dissemination and translation of such interventions is almost nonexistent (Anger et al., 2015). Consistent with the TWH perspective (e. g., Tamers et al., 2019), we argue that leadership social support training is a primary prevention *health protection* intervention, given the extensive evidence that points to the critical role of leaders in affecting employee well-being (e.g., Arnold, 2017; Inceoglu et al., 2018; Kelloway & Barling, 2010). Integrating this approach with an individual *health promotion* approach led to beneficial effects on perceptions of leadership support for sleep, and in turn, job and personal well-being, as well as decreased personal and social functional impairment for employees.

A second important contribution of this study is the examination of employee perceived social support as a mediating mechanism by which the TWH intervention impacted key employee well-being and functional impairment outcomes. Although the supervisor support training was based on both FSSB and supervisor support for sleep principles, which are each related to employee sleep health (Sianoja et al., 2020), when tested, only employee perceptions of supervisor support for sleep was a significant mediator linking the intervention to improved well-being and reduced personal and social functional impairment. It is possible that supervisor support

[3] In testing the hypothesized models, we controlled for hours worked per week, whether service members were in the Army or Air National Guard, and a COVID-19 flag variable, which represented the declaration of a State of Emergency (on March 8, 2020) in the state where the study was conducted. These control variables did not substantively affect the interpretation of the intervention effects, and therefore our final models exclude these variables for simplicity.

Table 2
Unstandardized Mixed Model Results for Direct Intervention Effects on Mediators and Well-Being Outcomes

Predictor	Mediators		Outcomes						
	SS (4m) Est. (*SE*)	FSSB (4m) Est. (*SE*)	Job Sat (9m) Est. (*SE*)	Turnover Intent (9m) Est. (*SE*)	OFI (9m) Est. (*SE*)	PFI (9m) Est. (*SE*)	SFI (9m) Est. (*SE*)	Stress (9m) Est. (*SE*)	Bed stress (9m) Est. (*SE*)
Intercept	2.33 (0.03)***	4.00 (0.05)***	3.82 (0.05)***	2.28 (0.09)***	1.74 (0.06)***	1.55 (0.03)***	1.69 (0.03)***	1.40 (0.03)***	2.30 (0.04)***
Outcome (*B*)	0.59 (0.05)***	0.45 (0.05)***	0.49 (0.05)***	0.58 (0.05)***	0.35 (0.05)***	0.47 (0.06)***	0.56 (0.06)***	0.60 (0.03)***	0.60 (0.04)***
Intervention	0.18 (0.07)**	0.10 (0.06)	0.05 (0.08)	0.02 (0.12)	0.04 (0.08)	−0.02 (0.07)	−0.04 (0.05)	−0.08 (0.07)	−0.02 (0.07)
Res. Var. within	0.65 (0.05)***	0.67 (0.06)***	0.49 (0.05)***	1.04 (0.06)***	0.56 (0.04)***	0.35 (0.05)***	0.33 (0.04)***	0.29 (0.02)***	0.48 (0.08)***
Res. Var. between	0.02 (0.01)	0.10 (0.06)	0.01 (0.01)	0.02 (0.02)	0.01 (0.01)	0.01 (0.01)	0.00 (0.01)	0.01 (0.01)	0.00 (0.01)
Pseudo R^2	0.35	0.22	0.36	0.30	0.12	0.24	0.28	0.37	0.37

Note. All models account for clustering within randomized units. The control group was coded as 0 and the treatment group was coded as 1. SS = supervisor support for sleep; FSSB = family-supportive supervisor behaviors; Job Sat = job satisfaction; Turn Intent = turnover intentions; OFI = occupational functional impairment; PFI = personal functional impairment; SFI = social functional impairment; Stress = general stress; Bed Stress = stress before bed; Outcome (*B*) = baseline control variable of the mediator (e.g., FSSB) or outcome (e.g., Job Sat); Res. Var. = residual variance.
* $p < .05$. ** $p < .01$. *** $p < .001$.

for sleep had more room for improvement as the baseline mean was 2.23, while the baseline mean for FSSB was 4.07 (both on a 5-point scale). Thus, a ceiling effect likely occurred with the NG supervisors already being proficient at supporting their service members' family lives before the study began. Additionally, supervisor support for sleep was aligned with the individual-level employee sleep feedback and may have been more salient when employees responded at the 4-month follow-up survey when compared to their perceptions of supervisor support for family. Numerous studies have demonstrated the beneficial effects of FSSB training on employee outcomes (e.g., Kossek et al., 2019), and have extended to spouses and couples' relationships (e. g., Brady et al., 2021), so the effects of FSSB may operate through more generalized perceptions of support or other more diffuse mechanisms (i.e., Bolger et al., 2000). Regardless, we do not want to lose sight of the fact that supervisor support for sleep was a significant mediator, thus providing insight on the mechanisms through which an integrated TWH intervention operates.

The third important contribution of this study is the rigor of the cluster RCT design. This allowed for causal conclusions to be made, which strengthens the confidence that scientists and practitioners can have in the theoretical and practical implications of the study. For example, organizational practitioners can be confident that implementing supervisor support training programs can improve workplace and employee outcomes. Scholars have noted that a primary limitation of most workplace interventions is a weak experimental design leading to inability to draw causal conclusions (e.g., Beehr, 2019). Similarly, Arnold (2017) and Inceoglu et al. (2018) suggested that much of the scholarship on the relationship between leader behavior and employee occupational stress and well-being relies on cross-sectional research designs and there is a need for rigorous studies to investigate this relationship using RCTs. In response to these criticisms, this study offers a rigorous evaluation of a TWH intervention.

A final contribution of this study is its multidimensional conceptualization of well-being as consisting of separate job, personal, and functional impairment factors. This expanded view of well-being is consistent with prior conceptualizations, and suggests that researchers should strive to include as much of the nomological net of the well-being construct as possible. Consistent with this conceptualization, but not available when this study was conducted, is the recently developed National Institute for Occupational Safety and Health (NIOSH) Well-Being Questionnaire (WellBQ; NIOSH, 2021). The WellBQ is another example of such expansive conceptualizations as it includes dimensions of work, nonwork, and physical and mental health status, similar to the present study. The expanded focus of occupational safety and health to include well-being (Chari et al., 2018), is also consistent with the NIOSH TWH approach, which further suggests that interventions to improve well-being should integrate both organizational level and individual level strategies, as was done in the present study. Additionally, a unique aspect of this intervention is that it includes both the leader and the follower, suggesting a possible synergistic effect on well-being with stronger effects over time, that should be examined in future research.

Limitations and Future Research

A limitation of the present study is that we do not know the relative contribution of the leadership supervisor support training (health

Table 3
Unstandardized Mediated Intervention Effects

	Direct effects			Indirect effects		
					95% CI	
Mediator	*a* path Est. (*SE*)	*b* path Est. (*SE*)	*c* path Est. (*SE*)	*ab* Est. (*SE*)	Lower	Upper
Job satisfaction						
SS	.17 (.08)*	.15 (.05)**	.01 (.08)	.03 (.01)	0.01	0.06
FSSB	.08 (.08)	.18 (.05)**	.03 (.08)	.02 (.02)	−0.01	0.05
Turnover intentions						
SS	.16 (.08)*	−.13 (.06)*	.05 (.12)	−.02 (.01)	−0.05	−0.003
FSSB	.07 (.08)	−.26 (.07)**	.04 (.12)	−.02 (.02)	−0.06	0.03
Occupational functional impairment						
SS	.18 (.07)*	−.01 (.05)	.05 (.08)	−.002 (.01)	−0.03	0.01
FSSB	.10 (.07)	−.05 (.05)	.05 (.08)	−.01(.01)	−0.03	0.003
Personal functional impairment						
SS	.18 (.07)*	−.07 (.04)	.01 (.07)	−.01 (.01)	−0.04	−0.001
FSSB	.08 (.07)	−.11 (.04)**	.001 (.07)	−.01 (.01)	−0.04	0.01
Social functional impairment						
SS	.18 (.07)*	−.07 (.03)*	−.02 (.04)	−.01 (.01)	−0.03	−0.003
FSSB	.10 (.07)	−.07 (.03)*	−.04 (.05)	−0.01 (.01)	−0.03	0.001
General stress						
SS	.18 (.07)*	−.01 (.02)	−.07 (.07)	−.002 (.01)	−0.01	0.01
FSSB	.10 (.07)	−.05 (.03)	−.07 (.07)	−.01 (.01)	−0.02	0.002
Stress before bed						
SS	.18 (.07)*	−.10 (.05)*	−.001 (.06)	−.02 (.01)	−0.05	−0.001
FSSB	.11 (.08)	−.01 (.04)	−.02 (.06)	−.001 (.01)	−0.02	0.01

Note. All models account for clustering within randomized units and control for baseline levels of the mediator and outcome variables. The control group was coded as 0 and the treatment group was coded as 1. *a* path = intervention predicting 4-month mediator; *b* path = 4-month mediator predicting 9-month outcome; *c* path = intervention predicting 9-month outcome; *ab* = indirect effect of intervention on 9-month outcome via 4-month mediator; Lower = 95% bias-corrected bootstrapped lower confidence interval; Upper = 95% bias-corrected bootstrapped upper confidence interval; SS = supervisor support for sleep; FSSB = family supportive supervisor behaviors. *N*s range = 597–618. Confidence intervals (CIs) that do not contain zero indicate significant indirect effects.
* $p < .05$. ** $p < .01$.

protection) compared to the individual employee actigraphic sleep feedback (health promotion). Given our interest in TWH and our emphasis on integrated, simultaneous interventions (e.g., Feltner et al., 2016), individual components are not theoretically or practically relevant to the present study. Our intervention components were designed to be integrated. The supervisor training and employee feedback components had a coordinated delivery within intervention groups, and each component referred to the other in provided materials, so there was no way to evaluate these two components individually, nor would we advocate for such an evaluation within the context of TWH intervention approaches. Furthermore, it is likely that their interactive synergistic effects may exceed those of the individual components, as has been suggested by the TWH approach.

Another limitation of the study relates to generalizability. The present study was conducted in a military setting with the NG. Thus, these findings cannot be generalized beyond the military sample at this time. Additionally, the sample consisted of primarily men and it is not clear how these results would generalize to a sample of predominantly of women. It is possible that men may have been more responsive to supervisors' support for sleep, compared to FSSB, than would women. Perhaps family support would be more salient for women and thus, could potentially have stronger impacts on job and personal well-being for women as compared to men. Given the small number of women in the sample we were not able to test for gender differences, however, and suggest that future research examine the impact of different types of supervisor support across gender.

Further, these findings may be more likely to generalize to other high-risk occupations. While supervisor support for sleep and family is important in most occupations, they may be particularly so for populations that may be at risk for adverse sleep and work–family stress outcomes (e.g., those who work long hours or who are required to spend long hours awake), such as the military. Thus, extending this research to other nonmilitary occupations (e.g., health care workers) is suggested. Similarly, we suggest that future research focus on studying the dissemination and implementation of the intervention that was developed and tested in the present study. It is important to note that previous research has demonstrated that less robust interventions that have focused on health protection aspects (e.g., supportive supervisor trainings) have demonstrated effectiveness in nonmilitary populations (e.g., Hammer et al., 2011). Still, extending this TWH line of research to additional populations is becoming more important as the need to understand ways of closing the scientist-practitioner gap is critical for improving the lives of workers.

In the recent meta-analysis by Estevez Cores et al. (2021), interventions aimed at the individual level, primarily stress management interventions, not surprisingly, had significant effects on stress, with the largest effects on the Perceived Stress Scale. These interventions focused only on changing the individual and have been criticized as "blaming the worker." It is just this type of intervention that occupational health psychology and TWH approaches are attempting to move away from, by taking a more holistic approach to well-being and targeting both the organization

and the individual. The recognition that workplace psychosocial stress hazards are frequently under the control of the organization/leadership, has led to such innovative TWH interventions as examined in the present study. Although stress management individual-level interventions may have a stronger direct effect on individual reports of stress as an outcome as demonstrated by Estevez Cores et al. (2021), they do not tend to show beneficial effects on longer-term outcomes such as burnout or absenteeism. Thus, we suggest that individual-level interventions are limited to their focused effects on individual stress and anxiety and that more comprehensive interventions such as the present TWH intervention are more effective at addressing the expanded, multidimensional well-being outcomes including job, personal, and functional impairment.

Finally, we note that the significant effects were small. This may be due to the conservative intent-to-treat analyses, the sample being predominantly male, or the chosen time points. Future research should investigate intervention effects with a more heterogeneous sample, representing gender and occupational diversity to increase the generalizability of the findings and perhaps even increasing the size of the intervention effects. Additionally, it is possible that stronger effects may have been established if they were assessed closer in time to perceptions of improvements in FSSB and supervisor support for sleep. The literature demonstrates that the temporal occurrence of well-being outcomes may vary, with some studies examining effects 1 month following interventions (e.g., Hammer et al., 2011) and others demonstrating that it can take longer for well-being to be impacted, such as at 9 months following baseline assessments as opposed to three (Brady et al., 2021). Future work should therefore focus on untangling the temporal nature of interventions and well-being outcomes.

Conclusion

The present study demonstrates the effectiveness of a leadership training intervention that improves employee job and personal well-being and reduces functional impairment, which can be applied to many situations including the current pandemic. Now more than ever it is important that leaders understand how to provide support and empathy to employees who may be suffering in many ways ranging from spousal job loss, to loss of a loved one, to fear about one's own safety and health and that of one's family. Furthermore, such training coupled with individual-level health promotion instruction on sleep health and sleep tracking can be relatively easy to implement given the host of publicly available resources on supervisor support training, and health tracking apps that exist on most smart phones. Thus, organizations have the tools at their fingertips to support their employees' health and well-being.

Understanding ways of alleviating occupational stress and improving employee well-being is critical and the leader's role has been shown to have a significant impact on well-being and functional impairment. We suggest that our online supervisor support training is ideal, as it is scalable and designed to be delivered virtually, and thus can reach many levels of leadership and has the potential of changing the organization to be more supportive of employees. Further, this TWH intervention led to increased organizational support via improved perceptions of leader support. A recent meta-analysis suggests that managerial interventions that have the power to make organizational-level modifications can create both manager-level and organizational-level supports to improve employee well-being (Lesener et al., 2020). Thus, we argue that leaders are key to influencing employee stress and well-being and are an important element of interventions designed to reduce such stress.

In addition, individual-level personalized sleep feedback has shown to be positively associated with improved sleep (Adler et al., 2017). Such individual feedback combined with leader social support training represents a rare, but effective TWH intervention with elements of *health protection* and *health promotion*. In the Lamontagne et al. (2007) extensive review of job stress interventions it was determined that such "integrated" or "high system" interventions are the most effective at reducing employee occupational stress. In fact, occupational health psychology has always had, as its tenants, the importance of organizational strategies as well as individual strategies for reducing occupational stress with primary prevention being the cornerstone (Hurrell & Murphy, 1996). While TWH emphasizes primary prevention through organizational-level health protection strategies, most of the research has not evaluated intervention effectiveness (Anger et al., 2015). Thus, this study, in documenting the effectiveness of a TWH intervention, contributes to the growing field suggesting that an effective way to reduce occupational stressors and improve employee well-being is through such integrated intervention approaches.

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Appendix A

Mplus Code for Direct Intervention Effect Analyses

```
USEVARIABLES CLUSTER COND DV1 DV2;
MISSING = all (−9999);
CLUSTER = CLUSTER;
WITHIN = DV1;
BETWEEN = COND;
DEFINE: CENTER DV1 (GRANDMEAN);
ANALYSIS: TYPE IS twolevel;
MODEL:
  %within%
  DV2 on DV1;
  %between%
  DV2 on COND;
OUTPUT = stdyx;
```

Key: CLUSTER = clustering variable; COND = condition clusters randomized to; DV1 = dependent variable at baseline. DV2 = dependent variable at follow-up time-point of interest (e.g., at 4-month or 9-month data collection).

Appendix B

Mplus Code for Indirect Intervention Effect Analyses

```
USEVARIABLES CLUSTER COND MED1 MED2 DV1 DV3 w;
WEIGHT = w;
MISSING = all (-9999);
CLUSTER = CLUSTER;
DEFINE: w = 1;
CENTER MED1 (grandmean);
CENTER DV1 (grandmean);
ANALYSIS: TYPE IS complex;
MATRIX = covariance;
REPSE = bootstrap;
BOOTSTRAP = 5000;
MODEL:
MED2 DV3 on MED1 DV1;
MED2 on COND;
DV3 on MED2;
DV3 on COND;
Model indirect: DV3 ind COND;
OUTPUT: cinterval(bcbootstrap) stand;
```

Key: CLUSTER = clustering variable; COND = condition clusters randomized to; MED1 = mediator variable at baseline; MED2 = mediator variable at follow-up time-point of interest (e.g., at 4-month data collection); DV1 = dependent variable at baseline; DV3 = dependent variable at follow-up time-point of interest (e.g., at 9-month data collection).

(*Appendices continue*)

Appendix C

Confirmatory Factor Analyses

Using baseline data, nested confirmatory factor analysis models (i.e., single-factor models nested within multiple factor models; Tabachnick & Fidell, 2013) were used to test whether the measured constructs within each of the three outcome categories (i.e., job well-being, personal well-being, and functional impairment) were empirically distinguishable. Model fit was determined using Hu and Bentler's (1999) and Yu's (2002) recommendations. A correlated two-factor model of the two job well-being measures had excellent model fit, $\chi^2(4) = 7.51$, $p > .05$, CFI = .99, TLI = .99, RMSEA = .04, SRMR = .01, with a factor correlation between job satisfaction and turnover intentions in the two-factor model of $r = -.73$ and fit the data better than a single-factor model ($\Delta\chi^2 = 451.71$, $p < .001$). A correlated two-factor model of the two personal well-being measures had adequate model fit, $\chi^2(8) = 68.74$, $p < .05$, CFI = .94, TLI = .90, RMSEA = .11, SRMR = .04, with a factor correlation between general stress and stress before bed in the two-factor model of $r = .59$ and fit the data better than a single-factor model ($\Delta\chi^2 = 144.35$, $p < .001$). A correlated three-factor model of the three functional impairment measures had adequate model fit, $\chi^2(51) = 402.72$, $p < .05$, CFI = .91, TLI = .89, RMSEA = .10, SRMR = .07, with factor correlations among occupational, personal, and social functional impairment in the three-factor model ranging from .39 to .70 (average $r = .50$) and fit the data better than a single-factor model ($\Delta\chi^2 = 602.57$, $p < .001$). Thus, the individual constructs within each of the three outcome categories were treated as distinct outcomes.

In addition, nested confirmatory factor analysis models using baseline data were used to test whether each of the seven outcome variables were empirically distinct. A correlated seven-factor model had adequate model fit, $\chi^2(209) = 748.71$, $p < .05$, CFI = .93, TLI = .92, RMSEA = .06, SRMR = .05, and fit the data better than a single-factor model ($\Delta\chi^2 = 4{,}210.15$, $p < .001$). Of note is that in the seven-factor model, the average factor correlation *within* a well-being category is $r = .60$. In particular, the factor correlation for the two job well-being factors is −.72, the factor correlation for the two personal well-being factors is .58, and the average factor correlation for the three functional impairment factors is .51 (range: .40–.72). On the other hand, the factor correlations *between* each of the well-being categories ranged from .09 to .65, with an overall average of $r = .31$.[4] More specifically, the average correlation between the job well-being factors and the personal well-being factors is $r = .35$ (range: .28–.43), the average correlation between the job well-being factors and the functional impairment factors is $r = .18$ (range: .09–.29), and the average correlation between the personal well-being factors and the functional impairment factors is $r = .41$ (range: .13–.65). Thus, the average factor correlation *within* a well-being category is markedly larger than *between* the categories, suggesting that job well-being, personal well-being, and functional impairment are distinct well-being categories.

[4] Although job satisfaction is negatively correlated with the other constructs, the absolute values of correlations are reported because we are primarily interested in the magnitude of the correlations.

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