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SLEEP HEALTH



A workplace intervention improves sleep: results from the randomized controlled Work, Family, and Health Study

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ABSTRACT

Study objectives: The Work, Family, and Health Network Study tested the hypothesis that a workplace intervention designed to increase family-supportive supervision and employee control over work time improves actigraphic measures of sleep quantity and quality.

Design: Cluster-randomized trial.

Setting: A global information technology firm.

Participants: US employees at an information technology firm.

Interventions: Randomly selected clusters of managers and employees participated in a 3-month, social, and organizational change process intended to reduce work-family conflict. The intervention included interactive sessions with facilitated discussions, role playing, and games. Managers completed training in family-supportive supervision.

Measurements and results: Primary outcomes of total sleep time (sleep duration) and wake after sleep onset (sleep quality) were collected from week-long actigraphy recordings at baseline and 12 months. Secondary outcomes included self-reported sleep insufficiency and insomnia symptoms. Twelve-month interviews were completed by 701 (93% retention), of whom 595 (85%) completed actigraphy. Restricting analyses to participants with ≥ 3 valid days of actigraphy yielded a sample of 473–474 for intervention effectiveness analyses. Actigraphy-measured sleep duration was 8 min/d greater among intervention employees relative to controls ($P < .05$). Sleep insufficiency was reduced among intervention employees ($P = .002$). Wake after sleep onset and insomnia symptoms were not different between groups. Path models indicated that increased control over work hours and subsequent reductions in work-family conflict mediated the improvement in sleep sufficiency.

Conclusions: The workplace intervention did not overtly address sleep, yet intervention employees slept 8 min/d more and reported greater sleep sufficiency. Interventions should address environmental and psychosocial causes of sleep deficiency, including workplace factors.

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Introduction

Sleep deficiency^{1,2} has been linked to increased risk of chronic disease^{3,4} and early mortality.^{5,6} Prospective studies yield evidence that short sleep duration and/or poor sleep quality is causally related to chronic disease risks of obesity^{7,8} and diabetes.^{4,9} The recent Institute

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of Medicine report “Sleep disorders and sleep deprivation: an unmet public health problem” highlighted improving sleep health in the United States as a critical public health need.¹⁰ For these reasons and others, increasing the proportion of US adults and adolescents obtaining adequate sleep has become a new federal priority in *Healthy People 2020*¹¹ and a primary goal for the field of sleep.¹² Clinical sleep medicine focuses primarily on treatment of individual patients' sleep disorders; however, individual-level treatments are limited in reach for meeting this challenge.

The role of workplace factors in sleep loss has been studied for decades.^{1,13–15} Most studies focus on the individual level and use stress-based models. Extreme work hours have negative impacts on sleep duration that can be alleviated to some degree by changes in work schedules.¹⁶ Demands of the global recession coupled with mobile technologies have extended work hours and blurred the boundaries between work and nonwork, especially within information technology (IT) industries.^{17–19} Time use studies suggest that US employees make the tradeoff of about 2 hours less of sleep for every 1 additional hour of work.²⁰ Therefore, it is important to understand the impact on sleep of particular workplace factors.^{21–23} Most workplace stress interventions focus on individual coping behavior, such as yoga²⁴ or mindfulness practices.^{25,26} Few workplace studies have attempted to reduce employee stress and improve sleep by changing the structure of work.^{27,28}

“Impoverished” environments, such as workplaces where employees lack social support and/or have limited control over their time, are associated with a range of negative health outcomes.^{29,30} Employees in low support/control work environments are particularly vulnerable to work-family conflict, which occurs when the demands of work are incompatible with the nonwork demands of family and personal life.^{31,32} Work-family demands have increased for a growing number of dual-earner families, single mothers, and “sandwich” families who must simultaneously provide care for young and old.^{33–38} High work-family conflict increases insomnia and reduces self-reported sleep time and quality.^{39–42} In an extended care (nursing home) workplace setting, employees whose managers were less supportive of work-family integration averaged about 30 minutes less daily sleep (measured with actigraphy) than employees with supportive managers.⁴³ Given the extensive negative health effects of work-family conflict,^{27,44} the work-family interface has become a public health priority,⁴⁵ including the evaluation of interventions to reduce this occupational health hazard and associated negative impacts on sleep.^{27,46,47}

Limited work-family intervention research has shown that improving supervisor support and employee control over work time benefits worker health and/or sleep. A randomized field experiment with grocery workers evaluated the effects of training supervisors on family supportive behaviors. For workers experiencing high work-family conflict, the intervention improved self-reported health and job satisfaction and reduced turnover intentions.²⁷ A longitudinal study of white-collar employees at the headquarters of a Fortune 500 retail organization found that an intervention promoting greater employee control over time increased self-reported sleep on nights before work by almost an hour²⁸ and improved perceptions of adequate time for sleep.⁴⁸ However, structural workplace interventions to reduce work-family conflict remain scarce, and no prior work-family intervention has measured impacts on objective sleep outcomes within a randomized controlled trial.

The present study evaluated the effects of a theoretically informed workplace intervention on objectively measured employee sleep with a randomized controlled design. The study was implemented at an IT company, and measurements were collected at baseline, 6 months, and 12 months. Our primary hypotheses were that the intervention would improve actigraphically measured total sleep time

and wake after sleep onset (WASO; a marker of insomnia symptoms), as well as self-reported measures of sleep insufficiency and insomnia symptoms at the 12-month time point relative to the usual practice (control) condition. Our secondary hypothesis was that intervention effects on sleep at the 12-month time point would be at least partially mediated by increased control over work hours and subsequently reduced work-family conflict at the 6-month time point.

Methods

Study methods were approved by appropriate institutional review boards. Primary study outcomes were actigraphy-based measures of total sleep time per day and WASO (in minutes) and self-reported measures of sleep insufficiency and insomnia symptoms measured at baseline and 12 months. Of interest was the change in these outcomes over the study year in the intervention and usual practice (control) arms of the study.

Design and data collection

The study used a cluster-randomized design with 3 measurement time points reported here (baseline, 6 months, and 12 months). Recruitment spanned from September 2009 to September 2010, and 12-month follow-up was completed on September 2011. Fifty-six “study groups” or clusters of managers and employees were identified with company representatives as eligible for randomization. Adaptive randomization occurred after baseline data collection for each study group, as previously described.⁴⁹ All employees within these groups were eligible to participate. Some study groups involved large teams under 1 leader, whereas other study groups involved multiple teams who worked closely together or reported to the same senior leader. We refer to randomization units as study groups to denote that they are aggregations of existing functional work groups that operated in the organization. Baseline demographic descriptive statistics for the sample are provided in Table 1.

Recruitment materials emphasized the value of the research for employees and the organization as well as for scientific knowledge. Trained study site managers introduced the study to employees at

Table 1
Percentage or mean \pm SD for demographic characteristics by condition (n = 474).

	Usual practice (n = 240)	Intervention (n = 234)
Female	37.9%	42.7%
Age	46.6 \pm 8.4	46.8 \pm 8.8
Race/ethnicity		
White, non-Hispanic	72.1%	70.5%
Black or African American, non-Hispanic	1.3%	1.7%
Asian Indian	13.8%	12.4%
Other Asian	4.2%	5.1%
Other Pacific Islander	0.8%	1.3%
Hispanic	6.7%	8.1%
More than 1 race	1.3%	0.9%
Married or living with partner	79.2%	81.2%
No. of children	1.0 \pm 1.2	1.0 \pm 1.0
Elder care	25.8%	24.4%
Education		
High school graduate	2.5%	3.0%
Some college or technical school	17.9%	22.7%
College graduate	79.6%	74.4%
Hours worked per week	45.5 \pm 6.0	45.6 \pm 5.5
Shift		
Variable schedule	21.3%	20.9%
Regular daytime	77.9%	78.2%
Rotating	0.4%	0.9%
Split shift	0.4%	0.0%

Note: Descriptives shown for all individuals included in analyses (n = 474).

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