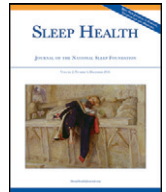




Contents lists available at ScienceDirect

# Sleep Health

Journal of the National Sleep Foundation

journal homepage: [sleephealthjournal.org](http://sleephealthjournal.org)

## The effects of a cluster randomized controlled workplace intervention on sleep and work–family conflict outcomes in an extended care setting



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### ARTICLE INFO

#### Article history:

Received 4 May 2016

Received in revised form 21 August 2016

Accepted 7 September 2016

### ABSTRACT

**Objectives:** To evaluate the effects of a workplace-based intervention on actigraphic and self-reported sleep outcomes in an extended-care setting.

**Design:** Cluster randomized trial.

**Setting:** Extended-care (nursing) facilities.

**Participants:** US employees and managers at nursing homes. Nursing homes were randomly selected to intervention or control settings.

**Intervention:** The Work, Family, and Health Study developed an intervention aimed at reducing work–family conflict within a 4-month work–family organizational change process. Employees participated in interactive sessions with facilitated discussions, role-playing, and games designed to increase control over work processes and work time. Managers completed training in family-supportive supervision.

**Measurements:** Primary actigraphic outcomes included total sleep duration, wake after sleep onset, nighttime sleep, variation in nighttime sleep, nap duration, and number of naps. Secondary survey outcomes included work-to-family conflict, sleep insufficiency, insomnia symptoms, and sleep quality. Measures were obtained at baseline, 6 months, and 12 months postintervention.

**Results:** A total of 1522 employees and 184 managers provided survey data at baseline. Managers and employees in the intervention arm showed no significant difference in sleep outcomes over time compared with control participants. Sleep outcomes were not moderated by work-to-family conflict or presence of children in the household for managers or employees. Age significantly moderated an intervention effect on nighttime sleep among employees ( $P = .040$ ), where younger employees benefited more from the intervention.

**Conclusion:** In the context of an extended-care nursing home workplace, the intervention did not significantly alter sleep outcomes in either managers or employees. Moderating effects of age were identified where younger employees' sleep outcomes benefited more from the intervention.

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## Introduction

Sleep critically affects physical and mental health.<sup>1</sup> This line of inquiry is important given the rise of 24–7 economies that push more workers into long and nonstandard work hours that can interfere with sleep quantity and quality. Indeed, 30% of US workers today have insufficient sleep—less than 6 hours per night<sup>2</sup>—which may be linked to poor general health and increased disease risk relative to obtaining 7–8 hours of sleep.<sup>3</sup> Moreover, the trend of sleep insufficiency is likely to vary markedly across workforce age cohorts and occupational categories.<sup>4</sup>

Cross-sectional studies show that longer work hours are consistently related to poorer sleep quality and reduced sleep quantity.<sup>5,6</sup> There are also longitudinal links between work time and sleep, such that having less control over work time increases the risk of sleep disturbances (symptoms 5–7 nights per week) among employees.<sup>6</sup> Sleep typically occurs at home, making it important to understand how work and family interactions shape employee sleep. Because time is a limited resource, sleep time often competes with time allocated to work and family demands. For example, employees are more likely to have shorter sleep duration when they spend longer hours at work and even more so when they also are committed to spending time with family.<sup>7</sup> Thus, a growing body of evidence is suggesting that incompatible work to family role demands, or work-family conflict (WFC),<sup>8</sup> may spill over to employees' personal life and influence their sleep. Specifically, work role expectations and stressors can carry over to the family domain to interfere with family/personal activities. Work-family conflict is an important psychological stressor for employees that increases need for recovery from work and fatigue.<sup>9</sup> Prior studies have shown that WFC is negatively associated with employees' sleep quantity and quality.<sup>10,11</sup> Most of these studies are cross-sectional and lack the capacity to determine the causal direction between WFC and sleep. However, a few promising studies have also provided longitudinal evidence that WFC increases sleep problems.<sup>12,13</sup> Moreover, the causal link has been found in a number of countries, including the UK, Finland, and Japan.<sup>12</sup> These studies suggest that WFCs, mostly time-based conflicts between work and family roles, are detrimental to employee sleep across times and settings.

Workplace interventions may reduce tensions between work and family life and thereby improve employee sleep. In our prior study with Information Technology (IT) workers, we found that employees whose managers were less supportive of work and family issues slept less.<sup>14–16</sup> Thus far, our prior study has demonstrated a positive effect of a workplace intervention for reducing WFC<sup>17</sup> on objective sleep outcomes within a randomized controlled trial. In a randomized experiment in an IT firm, the workplace intervention that addressed reducing WFC through an organizational change process significantly increased employees' actigraphically assessed total sleep duration and perceived sleep sufficiency.<sup>18</sup> This research points to the possible benefits of interventions aimed at increasing workplace and manager support as well as increasing employee's control over work time to improve employee sleep, and the need to investigate intervention effects in other settings such as health care. Limited research on workplace intervention effects on sleep has focused on individual-level employees' coping behaviors, such as mindfulness practices,<sup>17,19</sup> rather than organizational changes in work practices. A few studies, however, have suggested that it is critical to reduce WFC at the workplace level to enhance employee well-being, including sleep.<sup>20–22</sup> To extend these findings, we test whether a workplace intervention previously proven effective can improve sleep quantity and quality when implemented in a markedly different industry with lower-wage hourly workers in extended-care (nursing) facilities. Examining workers in the extended-care setting was of our interest because their work context may be associated with high job strain, less

control over work time, and high WFC, which may have implications for poor sleep.<sup>23</sup>

This study therefore evaluated the effects of a randomized workplace intervention designed to increase family-supportive supervision and employee control over work time<sup>24</sup> on objectively measured actigraphic and self-reported measures of sleep in employees in the extended-care setting. Our primary hypotheses were that the intervention would improve sleep outcomes in both managers and employees in an extended-care setting at the 12-month time point relative to the usual-practice condition. We tested secondary hypotheses that the effect of the intervention on sleep outcomes would be moderated by life-course factors, such as age, baseline work-to-family conflict, or presence of children in the household. Age-related vulnerabilities in sleep physiology<sup>25</sup> and age-related differences in work conditions could modify intervention effects. The baseline level of work-to-family conflict could also interact with intervention effects such that workers who had higher work-to-family conflict at baseline may benefit more from the intervention than those with lower work-to-family conflict.<sup>21</sup> In a similar vein, the intervention could bring more benefits to parents than nonparents because the former are in greater need for workplace support/flexibility.<sup>21</sup>

## Participant and methods

### Study participants

This study is part of the Work, Family, and Health Network Study.<sup>24</sup> Study participants were recruited from an extended-care (nursing home) industry partner.<sup>26</sup> The study cohort consisted of a low-wage, primarily hourly workforce from 30 distinct worksites located in the northeastern United States. Eligible employees were involved in direct patient care, typically worked at least 22 h/wk, and did not do regular night work. Overall, of the 1783 eligible employees with direct patient care responsibilities, 1524 were recruited (85% participation rate), and among the 211 eligible managers, 184 were recruited (87% participation rate). Study worksites were then adaptively randomized to either receive the intervention or continue with usual practice, as previously described.<sup>26</sup> Both actigraphic and self-reported measurements were collected at baseline (prior to the intervention) and at 6 and 12 months post-baseline. [Figure 1](#) depicts study enrollment and follow-up. Appropriate institutional review boards approved the study. All procedures were conducted in accordance with the Declaration of Helsinki.

### Primary outcomes: actigraphic sleep measures

Primary actigraphic sleep measures were collected via a wrist-worn sleep monitor (Actiwatch Spectrum; Philips-Respironics, Murrysville, PA) they were instructed to wear for 1 week. Employees received up to \$60 for completing all worksite data collection components at each time point. Actigraphy data were analyzed for subjects with at least 3 days of valid recordings and scored using the Actiware Sleep Scoring Program (Version 5.71, Philips-Respironics, 2012). A recently validated standard algorithm was used by at least 2 members of the scoring team to determine the validity of each day of recording and then manually insert visually identified periods (main sleep intervals and naps). Scorers identified decreased activity levels within the context of the overall activity profile for the subject. Sudden, decreased light levels were confirmatory but not required. Actigraphy scorers determined a recording to be invalid if there was either constant false activity (ie, device battery failure signal) on the recording, if the data were unable to be retrieved, or if there was participant noncompliance (ie, >4 hours of off-wrist time in a day, or an off-wrist period of more than 60 minutes within 10 minutes

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