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Effects of a Workplace Intervention on Sleep in Employees' Children

Susan M. McHale, Ph.D.[a], **Katie M. Lawson, Ph.D.**[a], **Kelly D. Davis, Ph.D.**[a], **Lynne Casper, Ph.D.**[b], **Erin L. Kelly, Ph.D.**[c], and **Orfeu Buxton, Ph.D.**[d]

[a]Department of Human Development and Family Studies, The Pennsylvania State University

[b]Department of Sociology, University of Southern California

[c]Department of Sociology, University of Minnesota

[d]Division of Sleep Medicine, Department of Medicine, 221 Longwood Ave, Brigham and Women's Hospital, Boston, MA 02115

Adolescence is a period of dramatic physical, cognitive and socio-emotional developmental changes, including in youth sleep patterns. Both psychosocial factors such as youth's increasing involvement in the world beyond home, and biological factors such as circadian time, for example, underlie changes in adolescents' preferences for going to bed and getting up at later times[1]. Nonetheless, sleep remains critical for adolescents' health and development.[1] Indeed, accumulating evidence documents the significance of sleep patterns for adolescents' well-being in domains ranging from psychological and social adjustment and health risk behaviors to school performance and obesity.[2,3,4,5,6,7,8,9] U.S. adolescents, however, experience greater sleep deprivation than either children or adults[10]-- almost two hours less than the recommended average of nine hours per night.[11] And, national data suggest that sleep deprivation increases across adolescence.[12]

Although research has examined the characteristics and health implications of youth sleep, there remain gaps in the literature about the social contextual determinants of healthful sleep.[13] Prior work highlights demographic factors (e.g., ethnicity, SES), but a focus on such status variables does not provide insights about malleable processes and conditions to target

Corresponding Author: Susan M. McHale, 114 Henderson, Penn State University, University Park, PA 16802; mchale@psu.edu, PHONE: 814-865-2663, FAX: 814-865-.

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for intervention. Some work also shows that family processes such as parental warmth are linked to youth sleep.[13,14] Correlational research designs, however, limit conclusions about the causal links between the social ecology and youth sleep, because unmeasured third variables may explain patterns of association.

We grounded our work in an ecological model, which holds that youth are embedded within a system of nested contexts ranging from more proximal (e.g., family) to distal (e.g., societal institutions) influences.[15] Using a randomized controlled field trial design, we tested whether an experimental intervention, aimed at reducing employees' work family conflict, improved sleep in employee-parents' adolescent-aged offspring. Sleep was assessed in terms of the duration, night-to-night variability in duration, latency, and quality of youth's sleep.

From an ecological perspective, youth health is influenced by the microsystems of everyday life, such as family and school, but in addition, by contexts in which youth do not directly participate. Such exosystem influences include, for example, their teachers' family lives and their parents' workplace conditions.[15] Consistent with ecological tenets, the Work-Home Resources model[16] posits that parents' work experiences can cross over to negatively affect their children's health by depleting parents' personal resources, such as positive mood and time needed for monitoring and promoting children's healthful daily routines. Parents' work experiences can also enhance family role performance and foster children's well-being when those experiences provide parents with personal resources, such as control over their work schedules that allow time for parental responsibilities.

As noted, research on social contextual correlates of youth sleep focuses on demographic characteristics, such as family SES and parents' marital status. Reviewing this literature, Hale et al.[13] concluded that these status characteristics may mark social/psychological stressors such as financial hardship and family conflict, which serve as the mechanisms linking demographic factors and youth sleep patterns. Research on family dynamics is consistent with this conclusion, showing links between both marital and parent-child conflict and youth sleep.[17,18] By contrast, positive parental involvement, including parent-child shared time, monitoring, and appropriate limit-setting, may promote healthful sleep.[13,17,19]

Prior research also documents associations between parents' work experiences and the same kinds of parenting behaviors that have been linked to youth sleep patterns. For example, parents' job demands have related to less parent-child shared time and warmth but more conflict,[20,21,22] and a negative social climate at work was correlated with negative parent-child interactions.[23] In contrast, employees' schedule flexibility was related to more parent-child shared time and, in turn, greater warmth[22], and employees' positive interactions with supervisors were associated with greater parental warmth[14]. In the US, limited public policy means that employers are left to develop programs and practices that support working families.[25, 26] Although past decades have seen new family friendly workplace policies, there are few systematic data on the effectiveness of those policies for improving employee health, and we know almost nothing about whether and how family-oriented work policies benefit the physical health of employees' children[27].

This study used data from a field test of the STAR (Support, Transform, Achieve Results™) workplace intervention program to examine the role of parents' work experiences in their adolescent-aged offspring's sleep patterns. STAR was designed to reduce employees' work-family conflict by promoting job resources in two domains: supervisor support for employees' personal and family lives and employees' perceived control over their work schedules. Importantly for the purposes of this study, the intervention did not target parenting practices, though prior findings on the links between supervisor support and parental warmth and schedule control and parental involvement suggested that STAR effects might spillover to affect the same parenting behaviors that have been implicated in youth sleep.

STAR was implemented in the Information Technology (IT) division of a US Fortune 500 company over a three-month period and included training sessions for managers to learn about the intervention and strategies to support employees' personal and family lives while maintaining high levels of work performance. The supervisor support training also included a self-paced, computer-based training followed by real-time self-monitoring of managers' supportive behaviors via an iPod Touch™ with an alarm reminder to log support behaviors. In addition, STAR involved eight hours of work group participatory training sessions (four sessions) for managers and employees. Highly scripted sessions focused on targeted areas for change (e.g., attitudes that more hours spent at the office reflected greater commitment or productivity). The sessions were highly interactive and aimed at identifying new work practices that would focus employees' time and attention on key work results rather than face time. The intervention is described in detail, and program materials are available online[27].

The first analyses of the effects of STAR established that, at the six-month follow-up, the intervention had predicted, positive effects: Employees who were randomly assigned to the intervention reported more schedule control and supervisor support for family and personal life and less conflict between work and family responsibilities than did those in the Usual Practice (UP) condition. Additional analyses indicated that STAR employees almost doubled their hours of work at home and were more likely to describe their schedules as "variable" at follow-up; they also exhibited more time adequacy for activities with family members and time spent with their children.[28] Their greater availability may mean that parents are more knowledgeable about their children's activities and are better able to orchestrate family routines that promote healthful sleep patterns in youth.

The current analyses build on this initial evaluation of the intervention to test its effects on the sleep patterns of the adolescent-aged offspring of employee-parents. We measured four domains of youth sleep that have been linked in prior research to youth physical, psychological and behavioral health: sleep duration (hours of sleep per night), night-to-night variation in sleep duration (to mark consistent sleep routines), sleep onset latency, (reflecting difficulty falling asleep), and perceived sleep quality[1,2,10,17]. Based on the tenets of the Work-Home Resources model[16] and our prior research[29], we hypothesized that, by the 12-month follow up, youth whose parents had participated in STAR would exhibit more positive sleep patterns than youth whose parents were randomly assigned to the Usual Practice (UP). Findings that healthful sleep may decline across adolescence as youth become

more autonomous and involved in activities beyond the home[8] led us to expect that intervention effects might manifest in the form of buffering age-related declines in healthful sleep patterns.

Method

The data came from the baseline and 12-month follow-up waves of a group-randomized field experiment designed to test the effects of a workplace intervention on the health and well-being of employees, their families, and their work organization. The research team partnered with a Fortune 500 company, pseudonym TOMO, to recruit study participants from its information technology (IT) division. Following the baseline data collection, teams of employees who worked together and/or reported to the same supervisors (N = 56 teams) were assigned to the intervention or usual practice (UP) condition. Given the differing sizes and functions of the work teams, we used a modified biased-coin randomization approach for group randomization[28, 29] to yield a balance across the intervention and UP conditions in job function, team size, and executive (vice president) leader. Importantly for our purposes here, employee work groups, not the youth who were the focus of these analyses, were the unit of group assignment.

STAR was introduced by the organization's IT executives as a company-sponsored pilot program. Our research team and outside consultants jointly developed the intervention, customizing the materials for the targeted IT work force. Four group facilitators delivered the STAR intervention to supervisors and employees. The evaluation study was introduced separately and not directly linked to STAR, and a separate group of research staff, blind to participants' group assignments, was responsible for data collection.

Participants

The sample of parent-youth dyads was drawn from the larger sample of employees who participated in workplace interviews. Of the 823 employees who completed workplace interviews, 222 (26.97%) were a parent of a child aged 9–17 who lived at home for at least four days a week and thus eligible for the family component of our study. Of the 147 parent-youth dyads that completed the baseline home interview, 93 completed at least three of the 8 daily telephone diary interviews at both baseline and the 12-month follow-up and are the focus of the present analyses. Tests for differential attrition (t- and chi-squared tests) revealed no differences between those who remained versus left the study at 12 months as a function of demographic or work characteristics (i.e., age, gender, income, ethnicity, marital status, number of children in the household, job tenure) or the target intervention variables (i.e., schedule control, family-supportive supervisor behaviors, work-to-family conflict). Eligible (N=222) and participating (N=147) families differed only in income, ethnicity, and youth age (participants had lower salaries, were less likely to be minorities, and youth were older).

At baseline, average annual income of participating families fell in the range of $80,000-$90,000, and most parents (80.80%) had a bachelor's degree or more education. In addition, 83.2% of youth had married parents. Most (67.00%) were White, non-Hispanic, with smaller percentages of Asian/Pacific Islander (20.00%), Hispanic (9.60%), Black, non-Hispanic

(1.60%), and multi-racial (1.60%) youth. Parents (47.00% female) averaged 45.05 years of age (*SD* = 6.03), 12.73 years employed by the company (*SD* = 6.45), and 46.45 hours of work per week (*SD* = 5.94), though all worked daytime shifts. Youth participants (52.78% female) averaged 13.34 years of age (*SD* = 2.30). There were no differences on any of these measures for youth whose parents were assigned to the STAR (*n*= 57) versus the UP (*n* = 36) conditions, and no differential attrition across groups (Table 1).

Procedures

Trained interviewers conducted interviews with employees at the worksite and with employees and their children at their homes at baseline and the12 month follow-up. During the latter, parents provided consent and youth assented to participation. Following the home interviews, in eight, consecutive, nightly phone calls averaging 15 minutes, youth reported on their experiences during the 24 hours prior to the call. The data collection centers' Institutional Review Boards approved the procedures. Families received $150 for participation at baseline and $200 for participation at the 12-month follow-up telephone diary assessment.

Measures

We adapted items from the Pittsburg Sleep Quality Index[30] for the diary interviews. During each nightly interview, youth were asked four questions about the prior night: "What time did you go to bed?" "What time did you wake up this morning?" "How long did it take you to fall asleep?" and "How well did you sleep last night?" Bedtime and wakeup time were recorded in military time and the interval between them calculated to index *sleep duration* (hours/day). *Night-to-night sleep duration variability* was the within-person standard deviation of the duration scores across the diary days, with high scores signifying greater variation. [31] *Sleep latency* was coded on a 4-point ordinal scale (1= *about 15 minutes*; 2= *between 15 and 30 minutes*; 3= *30 to 60 minutes*, 4 = *more than an hour*). Youth rated their *sleep quality* on each call using a 4-point ordinal scale (1= *very badly*; 4 = *very well*). Over 90% of youth completed all 8 calls and all completed at least 6 calls.

Results

To account for the clustered design (occasions within persons), we conducted mixed effect, multilevel models using SAS Proc Mixed. To test intervention effects on the sleep duration, latency and quality dependent measures, the two waves of data (baseline and 12-months) were stacked (i.e., 16 rows per person, 8 days for each wave). The analysis of sleep variability required only one within-individual measure, wave. Wave (0 = *baseline*, 1 = *12-month follow-up*) and condition variables (0 = *UP*, 1 = *STAR*) were the primary predictors; the estimate obtained for their interaction indicated whether the change in youth sleep outcomes from baseline to 12-months differed for the UP versus STAR groups. Given the relatively small sample size, to limit the number of factors we first tested for links between potential covariates and between covariates and sleep measures, including parent income, ethnicity, and the workplace intervention targets. Given non-significant effects, these factors were excluded from the final models. The final models included youth age and gender (0 = female), day in study (0 = *Day 1*, 7 = *Day 8*), and the percentage of the eight diary days at

each wave that the youth attended school. The latter was an index of the timing of the 8-day diary.

Descriptive data are shown in Table 2 and results in Table 3. Analyses revealed no effects for sleep duration, but predicted effects of the intervention emerged for the other measures: (1) youth whose parents were assigned to the STAR intervention showed no change in sleep duration variability, but youth in the UP group increased in night-to-night variability in sleep duration from baseline to the 12-month follow-up, effect size = .23; (2) STAR youth exhibited decreases in latency of sleep onset, but youth in the UP group exhibited increases in the time it took them to fall asleep, effect size − .15; and (3) STAR youth exhibited no change in sleep quality, but youth in the UP group exhibited declines, effect size = .13.

Discussion

Our findings showed that a workplace intervention, designed to reduce employees' work-family conflict through increasing employees' schedule control and supervisor support for work and personal life, had corollary effects on the sleep of employees' adolescent-aged offspring. The results suggest that the intervention served to buffer youth from age-related declines in healthful sleep patterns. Prior research on social contextual factors in youth sleep suggested that markers of family stress are associated with less healthful sleep patterns.[9,13] Correlational designs, however, do not allow for strong inferences about the role of the social context in youth sleep, because unmeasured third variables can account for both social influences and youth health. Using a group-randomized experimental design, this study documented the significance of social contextual influences on youth sleep by demonstrating that experimentally-induced changes in the exosystem can lead to more healthful sleep in adolescence. Our workgroup random assignment meant that youth, themselves, were not randomly assigned to the intervention, limiting the causal inferences that can be drawn from this study. That group differences in changes over time in youth sleep were evident despite the fact that the workplace intervention targeted neither parenting nor parent-youth relationships, however, attests to the significance of parents' work experiences in youth health.

Taken together, our results have several implications for an understanding of youth sleep and adolescent health, more generally. First, the findings were consistent with the tenets of an ecological model, which holds that youth are embedded within a system of nested contexts and highlights the significance of forces beyond youth's immediate settings in their well-being and development.[15] Our findings document the power of exosystem influences—contexts outside of youth's own everyday experiences—to affect youth sleep, and they alert practitioners to take these more distal and sometimes malleable influences into account in efforts to promote youth health and health behaviors. Second, although impediments to healthful sleep may change across adolescence as youth become increasingly autonomous and involved in the world beyond home[13], in this study, exosystem influences emanating from parents' work conditions were evident into late adolescence. Our findings are thus consistent with a body of research on adolescent development that highlights the continued importance of parents and family life across this developmental period[32]. Finally, our results are congruent with a body of correlational research linking parents' work conditions and

youth well-being, but which to date, has not focused on youth sleep or health. As noted, the STAR program included no components focused on parenting practices and behaviors, underscoring the potentially powerful effects of parents' work experiences on their children. The significant effects of STAR should also be viewed in the light of mixed findings from tests of youth-oriented psychoeducational interventions for promoting healthful sleep: Although increases in youth knowledge have been documented, program effects on sleep behaviors have been limited.[33, 34]

An important direction for research on workplace effects is to test whether resources such as schedule control and supervisor support have effects on the sleep patterns of youth whose parents are employed in other kinds of industries. In particular, our findings are limited to employees with relatively high incomes and education and should be replicated in less advantaged samples. The small sample size precluded tests of moderating factors, including youth age, gender and seasonality differences in youth sleep, other directions for future research. In addition, our study is limited by its reliance on youth self-reports of their sleep duration and timing. The measure of sleep duration captured time in bed, or sleep opportunity, and thus may have overestimated actual sleep duration. Indeed, average sleep duration in this sample was longer than typically reported, which may also reflect our focus on a relatively advantaged sample of youth. Research on a more socio-economically diverse group of youth using objective measures such as wrist actigraphy would provide stronger evidence about social contextual effects on youth sleep. Of particular interest is whether interventions like STAR have stronger impacts on youth who are at higher risk for sleep problems.

Another step is to identify the proximal processes through which workplace policies and programs like STAR can affect youth sleep. As noted, our prior research showed that STAR increased two workplace resources, schedule control and supervisor support, and reduced employees' work-family conflict. Further, STAR positively impacted employees' reports of time adequacy and time spent with their children[29]. By providing employees with more control over their work schedules, STAR parents may have been able to align their time at home to fit their children's schedules and needs. Although we did not detect intervention effects on sleep duration, findings that youth whose parents participated in STAR did not show the same increase in night-to-night variation in sleep duration as youth with parents in the UP group are consistent with the idea that parental involvement, which provides opportunities for monitoring and developmentally-appropriate limit-setting, can promote regular sleep routines during a developmental period when school, work, and peer activities may otherwise promote their decline. Another mechanism through which STAR may have had its impact is through its documented effects on employees' work-family conflict. Prior research highlights the role of family stressors in youth sleep, including through its effects on youth's emotional security.[13,35] Our findings are consistent with the idea that reducing parents' work-related stress can have positive impacts on their children's sleep, including sleep quality and the time it takes them to fall asleep.

At the most general level, our findings speak to the importance of looking beyond the immediate settings of youth's daily lives for influences in the larger environment that have an impact on their health and health behaviors. As such, the results are consistent with an

ecological perspective, which highlights the embeddedness of youth in a larger, multi-layered system of interacting influences[15]. From this perspective, interventions that target only individual adolescents may not be effective if changes to behavior and health fail to take into account powerful and potentially competing influences in the larger ecology. An ecological perspective also opens up new opportunities to intervene at points in the system that are most malleable and that may have the broadest impact. Consistent with the Work-Home model[16], our findings suggest that providing parents with workplace resources that reduce their experiences of work-family conflict may alter the family system in ways that support and promote youth health. At the most general level, the significant effects of the STAR intervention on youth sleep attest to the power of parents' workplace conditions to affect the health of their children.

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List of Abbreviations

STAR	Support, Transform, Achieve Results
UP	Usual Practice

References

1. Carskadon, M.; Tarokh, L. Developmental changes in circadian timing and sleep: adolescence and emerging adulthood. In: Wolfson, A.; Montgomery-Downs, H., editors. The Oxford Handbook of Infant, Child, and Adolescent sleep and behavior. New York: Oxford; 2013. p. 70-77.
2. Fuligni A, Hardway C. Daily variations in adolescents' sleep, activities, and psychological well-being. J Res Adolesc. 2006; 16(3):353–378.10.1111/j.1532-7795.2006.00498.x
3. Lemola S, Raikkonen K, Scheier M, Matthews K, Pesnon A-K, Heinonen K, Lahti J, Komsi N, Paavonen J, Kajantie E. Sleep quantity, quality and optimism in children. Journal of Sleep Research. 2011; 20:12–20.10.1111/j.1365-2869.2010.00856.x [PubMed: 20561178]
4. Peach HD, Gaultney JF. Sleep, impulse control, and sensation-seeking predict delinquent behavior in adolescents, emerging adults, and adults. J Adolesc Health. 2013; 53(2):293–299.10.1016/j.jadohealth.2013.03.012 [PubMed: 23672770]
5. Institute of Medicine. Sleep Disorders and Sleep Deprivation: An Unmet Public Health Problem. Washington, DC: The National Academies Press; 2006.
6. Meijer AM, Habekothé RT, Van Den Wittenboer GLH. Time in bed, quality of sleep and school functioning of children. Journal of Sleep Research. 2000; 9:145–153.10.1046/j.1365-2869.2000.00198.x [PubMed: 10849241]

7. Tatone-Tokuda F, Dubois L, Ramsay T, Girard M, Touchette E, Petite D, Montplaisir J. Sex differences in the association between sleep duration, diet, and body mass index: a birth cohort study. Journal of Sleep Research. 2012; 21:448–460.10.1111/j.1365-2869.2011.00989.x [PubMed: 22151014]
8. Snell EK, Adam EK, Duncan G. Sleep and the body mass index and overweight status of children and adolescents. Child Dev. 2007; 78(1):309–323.10.1111/j.1467-8624.2007.00999.x [PubMed: 17328707]
9. Silva GE, Goodwin JL, Parthasarathy S, Sherrill DL, Vana KD, Drescher AA, Quan SF. Longitudinal association between short sleep, body weight, and emotional and learning problems in Hispanic and Caucasian children. SLEEP. 2011; 34(9):1197–1205. [PubMed: 21886357]
10. Wolfson AR, Carskadon MA. Understanding adolescents' sleep patterns and school performance: a critical appraisal. Sleep Med Rev. 2003; 7(6):491–506.10.1016/S1087-0792(03)90003-7 [PubMed: 15018092]
11. Knutson KL, Lauderdale DS. Sociodemographic and behavioral predictors of bed time and wake time among US adolescents aged 15 to 17 years. J Pediatr. 2009; 154(3):426–430.10.1016/j.jpeds.2008.08.035 [PubMed: 18849051]
12. Eaton DK, McKnight-Eily LR, Lowry R, Perry GS, Presley-Cantrell L, Croft JB. Prevalence of insufficient, borderline, and optimal hours of sleep among high school students- United States, 2007. J Adolesc Health. 2010; 46(4):399–401.10.1016/j.jadohealth.2009.10.011 [PubMed: 20307832]
13. Hale, L.; Parente, V.; Phillips, GK. Social determinants of children's sleep. In: Wolfson, AR.; Montgomery-Downs, HE., editors. The Oxford Handbook of Infant, Child, and Adolescent Sleep and Behavior. New York: Oxford; 2013. p. 99-112.
15. Bronfenbrenner, U.; Crouter, AC. Evolution of environmental models in developmental research. In: Kessen, W.; Mussen, PH., editors. Handbook of Child Psychology. New York: Wiley; 1983. p. 357-414.
16. ten Brummelhuis LL, Bakker AB. A resource perspective on the work-home interface: the work-home resource model. Am Psychol. 2012; 67(7):545–556.10.1037/a0027974 [PubMed: 22506688]
17. Adam EK, Snell EK, Pendry P. Sleep timing and quantity in ecological and family context: A nationally representative time-diary study. J Fam Psychol. 2007; 21(1):4–19.10.1037/0893-3200.21.1.4 [PubMed: 17371105]
18. El-Sheikh M, Buckhalt JA, Mize J, Acebo C. Marital conflict and disruption of children's sleep. Child Dev. 2006; 77(1):31–43.10.1111/j.1467-8624.2006.00854.x [PubMed: 16460523]
19. McHale SM, Kim J, Kan ML, Updegraff K. Sleep in Mexican American adolescents: social, ecological and well-being correlates. J Youth Adolesc. 2011; 40(6):666–679.10.1007/S10964-010-9574-x [PubMed: 20668925]
20. Milkie MA, Mattingly MJ, Nomaguchi KM, Bianchi SM, Robinson JP. The time squeeze: parental statuses and feelings about time with children. J Marriage Fam. 2004; 66(3):739–761.10.1111/j.0022-2445.2004.00050.x
21. Ransford CR, Crouter AC, McHale SM. Implications of work pressure and supervisor support for fathers', mothers' and adolescents' relationships and well-being in dual-earner families. Community Work Fam. 2008; 11(1):37–60.10.1080/13668800701785312
22. Roeters A, Van Der Lippe T, Kluwer ES. Work characteristics and parent-child relationship quality: the mediating role of temporal involvement. J Marriage Fam. 2010; 72(5):1317–1328.10.1111/j.1741-3737.2010.00767.x
23. Repetti RL. Short-term and long-term processes linking job stressors to father-child interaction. Soc Dev. 1994; 3(1):1–15.10.1111/j.1467-9507.1994.tb00020.x
24. Gassman-Pines A. Associations of low-income working mothers' daily interactions with supervisors and mother-child interactions. J Marriage Fam. 2011; 73(1):67–76.10.1111/j.1741-3737.2010.00789.x
25. Kelly, EL. Discrimination against caregivers? Gendered family responsibilities, employer practices, and work rewards. In: Nielsen, LB.; Nelson, RL., editors. The Handbook of Employment Discrimination Research. New York: Kluwer Academic Publishers; 2005. p. 341-362.

26. Waldfogel, J. Work and family research: a public policy perspective. In: Bianchi, SM.; Casper, LM.; King, RB., editors. Work, family, health, and well-being. Mahwah, NJ: Erlbaum; 2005. p. 227-238.
27. Kossek EE, Lewis S, Hammer LB. Work-life initiatives in organizational change: Overcoming mixed messages to move from the margin to the mainstream. Human Relations. 2010; 63:3–19.10.1177/0018726709352385 [PubMed: 22021934]
28. Bray, JW.; Kelly, EL.; Hammer, LB.; Almeida, DM.; Dearing, JW.; King, RB.; Buxton, OM. RTI Press publication no MR-0024-1303. Research Triangle Park, NC: RTI Press; 2013. An integrative, multilevel, and transdisciplinary research approach to challenges of work, family, and health. http://www.rti.org/publications/rtipress.cfm?pubid=20777
29. Kelly EL, Moen P, Oakes JM, et al. Changing work and work-family conflict: Evidence from the work, family, and health network. Amer Soc Rev;. 2014:1–32.10.1177/003122414531435
30. Buysse DJ, Reynolds CF, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh sleep quality index: A new instrument for psychiatric practice and research. Psychiatry Res. 1988; 28:19–213.
31. Ram N, Gerstorf D, Lindenberger U, Smith J. Developmental change and intraindividual variability: relating cognitive aging to cognitive plasticity, cardiovascular lability, and emotional diversity. Psychol Aging. 2011; 26(2):363–371.10.1037/a0021500 [PubMed: 21443355]
32. Collins, WA.; Laursen, B. Parent-adolescent relationships and influences. In: Damon, W.; Lerner, RL., editors. Handbook of Adolescent Psychology. Hoboken, NJ: Wiley; 2004. p. 331-362.
33. Cain N, Gradisar M, Moseley L. A motivational school-based intervention for adolescent sleep problems. Sleep Med. 2011; 12(3):246–251.10.1016/j.sleep.2010.06.008 [PubMed: 21292553]
34. Moseley L, Gradisar M. Evaluation of a school-based intervention for adolescent sleep problems. Sleep. 2009; 32(3):334–341. [PubMed: 19294953]
35. El-Sheikh M, Buckhalt JA, Cummings ME, Keller P. Sleep disruptions and emotional insecurity are pathways of risk for children. J Child Psychol Psychiatry. 2007; 48(1):88–96.10.1111/j.1469-7610.2006.01604.x [PubMed: 17244274]

Implications

Sleep is linked to youth health, but we know less about social-ecological influences on sleep patterns. A workplace intervention to reduce employees' work-family conflict had positive effects on regularity of adolescents' nighttime sleep duration, sleep quality, and time to fall asleep, but not sleep duration.

Table 1

Participant Demographic Information (n = 93), Mean (SD) or number (%)

	Intervention (*N* = 57)	**Usual Practice (*N* = 36)**
Employee Measures		
Age (Years)	45.58 (6.16)	43.56 (4.71)
Gender (% Female)	28 (49.12%)	14 (38.89%)
Education (% College Graduate)	46 (80.70%)	28 (77.78%)
Marital Status (% Married/Cohabiting)	49 (85.96%)	34 (94.44%)
Number of Children Living in Household	1.93 (.90)	2.25 (1.20)
Work Hours (Hours/Week)	46.84 (6.10)	45.78 (5.54)
Income (% More than 100,000/Year)	41 (77.36%)	22 (64.71%)
Tenure (Years)	13.64 (7.66)	12.32 (5.74)
Diary Days Completed	7.82 (.47)	7.78 (.48)
Youth Measures		
Age	12.93 (1.99)	13.31 (2.40)
Gender (% Female)	29 (50.88%)	17 (47.22%)
Diary Days Completed	7.86 (.40)	7.88 (.42)

Note. The results of independent samples *t*-tests and chi-squared tests revealed no significant differences between the intervention and UP groups on these measures.

Table 2

Means (SDs) and Pearson Correlations for Sleep Measures[1] at Baseline (above Diagonal) and 12-Months (below Diagonal); Stability Coefficients (bolded) on Diagonal

	Baseline Mean (*SD*)	12 Months Mean (*SD*)	Duration	Variability	Latency	Quality
Duration	8.99 (*1.55*)	8.94 (*1.74*)	**.72****	−.27**	.20*	.13
Variability	1.09 (*.49*)	1.34 (*.59*)	−.05	**.33****	.01	−.17
Latency	1.52 (*.83*)	1.50 (*.87*)	.28**	−.14	**.64****	−.25*
Quality	3.53 (*.62*)	3.51 (*.55*)	−.00	−.02	−.40**	**.53****

Note. Duration measured in hours, variability measured as the within-person standard deviation of the duration scores across days, latency rated on a 4-point scale (1= *about 15 minutes*; 4 = *more than 60 minutes*, and quality rated on a 4-point scale (1= *very badly*; 4 = *very well*).

* $p < .05$,

** $p < .01$.

Table 3

Mixed Model Results (Coefficients and Standard Errors) of Intervention Effects on Youth Sleep Duration, Variability, Latency, and Quality[1]

	Sleep Duration	Sleep Variability	Sleep Latency	Sleep Quality
Covariates				
Day in study	.01 (.02)	--	−.02 (.01)*	−.01 (.01)
Youth gender	.30 (.15)*	.05 (.08)	.13 (.13)	−.01 (.08)
Youth age	−.27 (.04)***	.07 (.02)**	−.05 (.03)	−.02 (.02)
Wave mean school days	−1.03 (.18)***	−.11 (.13)	.35 (.10)***	.07 (.07)
Intervention Effect				
Intercept	8.82 (.16)***	.96 (.09)***	1.48 (.13)***	3.69 (.08)***
Wave	−.07 (.12)	.41 (.10)***	.16 (.05)**	−.10 (.04)*
Condition	−.10 (.17)	.21 (.11)	−.01 (.14)	−.22 (.08)**
Wave*Condition	**−.07 (.15)**	**−.26 (.13)***	**−.27 (.06)*****	**.15 (.05)****

Note. Sleep duration measured in hours, variability measured as the within-person standard deviation of the duration scores across days, latency rated on a 4-point scale (1= *about 15 minutes;* 4 = *more than an hour*), and quality rated on a 4-point scale (1= *very badly*; 4 = *very well*). Intervention effects are bolded. Wave coded as baseline = 0, 12-month follow-up = 1. Condition coded as 0 = UP, 1 = STAR. Youth gender coded as 0 = female, 1 = male.

* $p < .05$;

** $p < .01$;

*** $p < .001$.