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Team-level flexibility, work–home spillover, and health behavior

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Abstract

Drawing on two waves of survey data conducted six months apart in 2006, this study examined the impacts of a team-level flexibility initiative (ROWE – Results Only Work Environment) on changes in the work-home spillover and health behavior of employees at the Midwest headquarters of a large US corporation. Using cluster analysis, we identified three distinct baseline spillover constellations: employees with *high negative* spillover, *high positive* spillover, and *low overall* spillover. Within-team spillover measures were highly intercorrelated, suggesting that work teams as well as individuals have identifiable patterns of spillover. Multilevel analyses showed ROWE reduced individual- and team-level negative work-home spillover but not positive work-home spillover or spillover from home-to-work. ROWE also promoted employees' health behaviors: increasing the odds of quitting smoking, decreasing smoking frequency, and promoting perceptions of adequate time for healthy meals. Trends suggest that ROWE also decreased the odds of excessive drinking and improved sleep adequacy and exercise frequency. Some health behavior effects were mediated via reduced individual-level negative work-home spillover (exercise frequency, adequate time for sleep) and reduced team-level negative work-home spillover (smoking frequency, exercise frequency, and adequate time for sleep). While we found no moderating effects of gender, ROWE especially improved the exercise frequency of singles and reduced the smoking frequency of employees with low overall spillover at baseline.

Keywords

Work-time flexibility; ROWE intervention; Health behaviors; Work-home spillover; Work-family; Home contexts; Multilevel modeling; U.S.A.

Introduction

This U.S. study examines the effects of a workplace flexibility initiative (ROWE, described below) on work-home spillover and health behaviors while taking account of baseline spillover and home contexts. Although linkages between workplace flexibility and work-related outcomes (such as job satisfaction, turnover intentions, etc.) have been studied extensively (see, for example, Carlson, Grzywacz, & Kacmar, 2010; Kossek, Lautsch, & Eaton, 2006; Moen, Kelly, & Hill, 2011; Roehling, Roehling, & Moen, 2001), scholars have only begun to investigate the relationship between workplace flexibility policies and various health behaviors. Moreover, empirical evidence to date is weak and inconsistent (Grzywacz, Carlson, & Shulkin, 2008). While policies have been associated with work-home spillover (Glass & Estes, 1997; Kelly, Moen, & Tranby, 2011), most studies are cross-sectional and do not examine possible changes in either flexibility or spillover, much less possible moderating effects of workers' home contexts.

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This study contributes to the existing literature first by adopting a more stringent study design: the evidence comes from a longitudinal natural experiment, thereby overcoming the inherent limitations of both observational and cross-sectional data. Second, we examined individual- and team-level changes simultaneously, using a multilevel model to disentangle individual from group effects. Third, this study is the first to our knowledge to integrate four types of spillover between work and home into identifiable baseline constellations in order to examine whether employees having various spillover profiles react differently (in terms of health behaviors) to a flexibility initiative. Doing so responds to calls (Frone, 2003; Grzywacz & Marks, 2000a) for scholars to investigate positive work-home experiences rather than focusing exclusively on negative spillover. Fourth, we propose a dynamic mediational model, with changes in individual- and team-level spillover operating as potential mediators between the introduction of a flexibility initiative and subsequent changes in health behavior. It thus opens up the work-family black box (Moen et al., 2008b) to promote understanding of how the introduction of flexible work arrangements might bring about health behavior changes, and whether this differs depending on employees' prior spillover constellations. Finally, we examined the potential moderating effects of home ecologies capturing home demands and home control, to see whether they shape the effects of ROWE on health behavior. We also assessed whether these processes operate similarly for women and men, finding no statistically significant gender differences, which is in line with findings by Grzywacz, Casey, and Jones (2007) and Grzywacz and Marks (2000b). Given space limitations we do not present these gender analyses.

Background and hypotheses

The ROWE initiative and spillover change

There is a growing body of scholarship calling for greater workplace flexibility as a way of improving the interface between work and family (Bianchi & Milkie, 2010; Christensen & Schneider, 2010; Voydanoff, 2004; Workplace Flexibility, 2010). Flexibility arrangements range from informal procedures implemented by managers for certain workers to formal interventions offering employees a high degree of control over their work time (Hill et al., 2008; Kelly & Moen, 2007). The Results Only Work Environment (ROWE) initiative was rolled out sequentially to various departments at the corporate headquarters (approximately 3500 employees) of a Fortune 500 retail company. Designed in-house by two people in its human resources department, it encourages employees, managers and teams to focus on results, not time spent on the job. While most flexible work arrangements (such as flex-time, telecommuting, compressed work weeks, reduced-hours schedules) allow a select few employees to deviate from standard work hours and routines with their supervisors' permission (Kelly & Kalev, 2006), ROWE aims to shift the organizational culture so that employee control over the time, timing, and location of their work becomes the norm for all employees, not the exception granted to a deserving few. The designers of ROWE defined the desired work environment as one in which employees and managers can "do whatever they want, whenever they want, as long as the work gets done" (Ressler & Thompson, 2008: p. 3). ROWE offers temporal flexibility on condition that deadlines and objectives are met. Employees can routinely change when and where they work based on their individual needs and job responsibilities (including a responsibility to coordinate work within the team as needed), without seeking permission from a manager or even notifying one. While there were initial concerns that the increased schedule flexibility would lead to increased work demands, previous research found that ROWE had no impact on work hours, which averaged about 48 hours a week (Moen, Kelly, Tranby, & Huang, 2011). (A more detailed description of ROWE is in the Methods section.)

Note that ROWE was not promoted as a "work-family" or "family-friendly" innovation; rather, the goal was to fashion a new way of working that did not use time as a measure of

either activity or productivity. Still, given the degree of autonomy granted over when and where workers can do their jobs, we expect that the ROWE initiative should produce desirable changes in the work– home interface by allowing employees to take care of tasks in both domains more fluidly. We adopt the classification scheme of Grzywacz and Marks (2000a), whose ecological perspective suggests that the work–family relation can best be described by four distinct dimensions: negative spillover from work to family, negative spillover from family to work, positive spillover from work to family, and positive spillover from family to work (see also Frone, 2003). We draw on these four spillover constructs to test whether the ROWE flexibility initiative affected spillover change and further extend their study by examining whether these changes predict changes in health-related behaviors.

First, we expected that participating in ROWE produces salutary changes in both work-to-home and home-to-work spillover. In a meta-analytic review, Byron (2005) observed that some work factors (such as job stress) have “simultaneously disruptive effects” within both spheres (p. 190, see also Beauregard, 2006). Grzywacz and Marks (2000a) found certain work factors (decision latitude) related to less negative work-to-family and more positive spillover (in both directions). Greater control over the time and timing of work are what Voydanoff (2005) refers to as “boundary spanning resources.” ROWE promotes a results-focused approach and encourages employees to develop schedules that fit their own needs. Arguably, this flexibility could ease temporal constraints and improve employees’ ability to meet work and home obligations, thereby enhancing positive work-to-home (PWHS) and home-to-work spillover (PHWS), and reducing negative work-to-home (NWHS) and home-to-work spillover (NHWS). In line with this argument, the schedule flexibility offered might well augment employees’ skills such as “organization, forward-thinking, and sound judgment” (Carlson et al., 2010: p. 335), with such skills useful at both work and home.

Second, creating a Results Only Work Environment is presented by the ROWE trainers as an ongoing, collective effort to change the organizational culture. Work groups are described as a ROWE team rather than labeling individuals as telecommuters or users of flextime. The focus on collective culture change suggests that the salutary effects on work-to-home or home-to-work spillover may also take place at the team level. ROWE teams aim to accommodate the non-work aspects of team members’ lives while also achieving expected results on the job; working in such an environment should serve as a protective factor promoting positive and reducing negative spillover from work-to-home and vice versa.

Previous analysis found ROWE reduced negative work-to-home spillover (Kelly et al., 2011), but did not test home-to-work spillover, team-level variations, or moderators. Hence, our first hypothesis:

> **H1.** The ROWE flexibility initiative is associated with an increase in positive and a decrease in negative work-to-home and home-to-work spillover, at both individual- and team-levels.

ROWE and health behavior change

According to the time availability perspective (Barnett, 1998; Nomaguchi & Bianchi, 2004) and the scarcity hypothesis (Goode, 1960), time is a limited resource that constrains activities, with health-related behavior often pushed aside in response to work and family obligations. Strains, specifically, job strain (Karasek, 1979) or time strain (Moen, Kelly, & Lam in press), have been empirically linked to deleterious consequences. By providing employees greater control over when and where they work, ROWE should facilitate employees’ opportunity to decrease harmful and increase positive health-related behaviors. Extant evidence on the relationship between flexibility and health behavior is inconsistent.

Based on a controlled intervention in a unit of a Finish airline company, Viitasalo, Kuosma, Latinen, Harma (2008) found no significant effects of a more flexible shift system on alcohol consumption or dietary habits among 84 male workers. However, Devine, Connors, Sobal, and Bisogni's (2003) qualitative interviews of 51 low-to-moderate income workers in upstate New York showed employees with inflexible jobs reported not having adequate time or energy for preparing meals. Some studies have found little or no association between workers' control of schedules and physical activity (Lucove, Huston, & Evenson, 2007; Viitasalo et al., 2008). But a flexibility intervention has been associated with decreasing daytime sleepiness (Viitasalo et al., 2008); flexibility has also been linked with higher quality sleep (Grzywacz et al., 2007) and employees with more flexible managers report sleeping almost half an hour more per night (Berkman, Buxton, Ertel, & Okechukwu, 2010).

Most of this literature is based on cross-sectional data, which partly explains the mixed findings and makes it difficult to assess causal relationships (Bianchi & Milkie, 2010). But in a study of US- based employees in a multinational pharmaceutical company, Grzywacz et al. (2007) found that changes in perceived flexibility (decline, stable, or improve over one year) were associated with changes in sleep hours, participation in health education seminars, and self-appraised lifestyle. A study of ROWE found that it increased sleep time on nights before work by almost an hour (Moen et al., 2011b). Other intervention studies of changes in flexibility policies can be problematic if participants self-select into the intervention, as was the case in Viitasalo et al. (2008).

In addition, the term flexibility is used loosely and inconsistently (Kelly & Moen, 2007). For example, studies find that some types of flexibility (having a temporary contract, being on call, continuous working hours, irregular working hours, and compressed work weeks)do not change frequency of sleep disturbances and may even undermine sleep quality(Martens,Nijhuis, van Bostel, & Knottnerus, 1999). In addition, most studies measure employee flexibility as perceived flexibility, which is a function of both provision of flexibility programs and personal characteristics (Grzywacz et al., 2008). We build on Grzywacz et al. (2008) by examining an actual policy initiative while controlling for home characteristics, as well as testing their possible moderating effects. We investigate whether, over a six-month study period, ROWE impacts health behavior in terms of smoking, alcohol consumption, and exercise, along with perceptions of adequate time for sleep and for healthy meals.

H2. The ROWE initiative is positively associated with a decrease in harmful and an increase in beneficial health behaviors. Specifically,

H2a. Participating in ROWE increases the odds of quitting smoking and exercise frequency, and reduces the odds of starting to smoke as well as smoking frequency and high levels of alcohol consumption.

H2b. Participating in ROWE increases employees' perceptions of adequate time for sleep and for preparing healthy meals.

Work–home spillover change as a mediator

We suggest that ROWE affects health behavior both directly by removing temporal constraints and increasing schedule control, and indirectly through reducing negative spillover and enhancing positive spillover for both individuals and for teams. Accordingly, we proposed changes in both individual and team-level spillover as possible mediators between ROWE and health behavior change. We have previously discussed why ROWE might lead to salutary spillover changes; in this section we describe studies linking spillover to health behavior.

The largest body of evidence is on the deleterious health effects of negative work-to-home spillover (similar to work-family conflict). According to Greenhaus and Beutell (1985), negative spillover can be both time-based and strain-based. For example, individuals juggling work and family obligations frequently mention the absence of time and energy as barriers to their engaging in physical exercise and making healthy food choices (Brown, Brown, Miller, & Hansen, 2001). Such stress can motivate people to initiate a variety of maladaptive coping responses, including unhealthy food choices, sedentary activities, alcohol consumption, and tobacco use (Taylor, Repetti, & Seeman, 1997) that bring short-term pleasure aimed at reducing stress. Food, for example, has been described by employees as an escape from work stress (Devine et al., 2003). Ng and Jeffery (2003) found greater perceived stress was associated with a higher fat diet, lower levels of physical activity, increased smoking and lower confidence in ability to quit smoking. Thomas and Ganster (1995) suggest work-family conflict has a mediating role in the relationship between flexible scheduling and various health outcomes such as somatic complaints and blood cholesterol. Quantitative studies also showed work-to-home conflict associated with alcohol use (Frone, Barnes, & Farrell, 1994; Grzywacz & Marks, 2000b; Lallukka et al., 2010), smoking (Frone et al., 1994; Lallukka et al., 2010), limited exercise and poor food choices (Grzywacz & Marks, 2000b; Nomaguchi & Bianchi, 2004). Therefore, ROWE may decrease unhealthy and promote health-related behavior and assessments of time for healthy eating and sleeping by lessening the strain of negative spillover, especially from work to home.

There is a dearth of research linking positive work-home experiences to health behavior. Yet positive spillover presumably contributes to increased resources, energy, self-esteem, and positive emotion (Carlson et al., 2010; Grzywacz, 2000). Accordingly, ROWE might also increase a sense of adequate time for and actual engagement in healthy activities by promoting positive spillover. For example, Grzywacz and Marks (2000b) found positive home-to-work spillover associated with lower odds of alcohol abuse among midlife (ages 35–65) women and men in the U.S.

We conceptualize team-level spillover as the collective perceptions of spillover by team members, thereby capturing shared experiences of the work–home interface among a group of co-workers. We suggest that a healthy work-team environment is one with high positive and low negative spillover that, in turn, fosters healthy behavior among workers. Such teams both acknowledge and support team members' lives outside of work, including enabling time and energy for health-related behaviors.When teams reportless negative spillover, co-workers may support and even facilitate team members' health behavior. When teams report more positive spillover, co-workers may experience higher collective efficacy that promotes health behavior. We knowof no study that simultaneously examines spillover at both individual-and team-levels as potential mediators of the relationship between flexibility and health behavior.

H3a. Participating in ROWE encourages health behavior through its positive effects on both individual-level and team-level work-home spillover.

H3b. The health behavior effects of ROWE will vary depending on employees' baseline work-home spillover constellations.

Home ecologies as moderators

We also hypothesize the importance of home ecologies (Bianchi & Milkie, 2010; Ertel, Koenen, & Berkman, 2008; Grzywacz et al., 2008; Moen et al., 2008a), proposing that benefits of ROWE would be more evident among workers with heavy family responsibilities, such as those caring for young children, children with a health condition, or infirm adult relatives.

Home ecologies reflect varying demands on employees at different life stages as well as their sense of control at home. Compared with unmarried individuals, for example, married people have less freedom in terms of how to use their time, given their commitments to a spouse and spouse's relatives. Similarly, studies show that the presence of a child in the household exacerbates the relationship between job strain and depressive symptoms (Ertel et al., 2008). Young children are predictive of higher levels of work-family conflict and time pressure (Greenhaus & Beutell,1985), and less leisure time, especially for women (Bianchi & Milkie, 2010; Bittman & Wajcman, 2000). In line with these findings, Nomaguchi and Bianchi (2004) showed that married people and parents of young children tend to spend less time exercising.

H4. ROWE will have different effects depending on participants' home ecologies, with more pronounced positive effects on health behavior of participants with heavy home demands.

Method

ROWE intervention

This study is based on a natural experiment examining the effects of the Results Only Work Environment (ROWE) initiative rolled out at the corporate headquarters (housing approximately 3500 professionals) of a Fortune 500 retail company in 2006. ROWE is a team-level intervention, implemented sequentially in teams throughout the headquarters. Individuals did not decide whether or not to participate; rather, senior executives signed their departments on to receive ROWE training based on their interest in the initiative and the facilitators' capacity to take on new teams at that time (Kelly et al., 2011). The assumption was that all departments would eventually adopt the ROWE way of working. ROWE training consisted of each team (employees and manager) attending four sessions, with an additional session for managers only, totaling six hours over a period of about three months. The first session oriented employees to the ROWE philosophy and the process of change in their teams (see Kelly, Ammons, Chermack, and Moen (2010)). This was followed by a session critically examining the current organizational culture and developing a vision of the desired culture. For example, employees role-play by sharing comments arising from the current culture (e.g., "Just getting in?") and practice responses that do not reinforce traditional time norms (e.g., "Is there something you need?"). In the third session, employees were prompted to clarify outcomes (results) for their tasks and identify low-value activities not contributing to team performance. Team members were encouraged to identify strategies for meeting business goals that simultaneously increased their control over time. For example, some teams began cross-training so they could rotate working off-site and know that customer questions could be handled by co-workers. A final session brings together employees and managers from multiple teams to brainstorm about problems and to publicize new practices that are working well. The ROWE participatory initiative was both highly scripted and highly interactive, having participants identify new work practices that are sensible from the perspective of their teams' job function.

Participants and design

We surveyed respondents both before and following the program roll-out, treating those who participated in ROWE as the intervention group and those who continued existing work practices (who would eventually move into the ROWE program) as the comparison group. Two waves of data were collected, six months apart. The initial sample included 1,026 individuals of which 825 responded to the survey (80% response rate). Of the 825 participants, 659 (80%) completed Wave 2. This longitudinal design controlled for time-unvarying unobserved heterogeneities among respondents. There were some observed

baseline differences between the ROWE and comparison groups (Appendix A) but these factors were controlled for in the multivariate analysis. This study received ethical approval from the Institutional Review Board (IRB) at University of Minnesota.

Outcome measures

Smoking was assessed by "During the past 4 weeks, how often did you smoke cigarettes?" Responses range from not at all (0) to every day (7). We also constructed dichotomous variables indicating whether respondents began (valued 0 at Wave 1 and 1–7 at Wave 2) or quit (valued 1–7 at Wave 1 and 0 at Wave 2) smoking between two waves.

Alcohol consumption was based on questions "During the past 4 weeks, how often did you have any type of alcoholic beverage?" and "During the past 4 weeks, how many drinks did you usually have on days that you drank?" Because moderate drinking is not harmful to health (Newbold, 2005), we created a dichotomous variable denoting whether respondents drank more heavily (12 plus drinks per week).

Physical activity was assessed with "During the past 4 weeks how often did you engage in moderate or strenuous exercise?" No explanation of "moderate or strenuous" was given. Responses range from not at all (0) to every day (7). Another study of ROWE (Moen et al., 2011b) examined exercise but used structural equation models without considering home or team-level mediators/moderators.

Two outcomes assessed whether respondents reported adequate time for sleep and healthy meals. Enough time for sleep was assessed with a 0–10 response "to what extent is there enough time for you to get enough sleep/rest?" Another study of ROWE (Moen et al., 2011b) examined hours of sleep per night, which did not capture whether or not respondents assess it as "enough." Enough time for healthy meals is based on "to what extent is there enough time for you to prepare or eat healthy meals?" (0–10).

Predictor measures

ROWE—Teams participating in the ROWE initiative were coded 1, with the comparison teams coded 0. Fourteen employees participated in ROWE sessions but then moved to a non-ROWE team; they are included in the comparison group. Counting them as ROWE members in an intent-to-treat-analysis did not change results.

Spillover between work and home—These are drawn from the Midlife in the United States Study (Grzywacz & Marks, 2000a). Responses range from 1 = never to 5 = all of the time. Correlations of the 4 types of spillover are shown in Appendix B.

Negative work-to-home spillover was assessed with four items (α = 0.82 at Wave 1, 0.79 at Wave 2). Sample question: How often has your job reduced the effort you can give to activities at home in the past year? Positive work-to-home spillover was captured with four items (α = 0.70 at both waves), for instance: How often have the things you do at work helped you deal with personal and practical issues at home in the past year? Negative home-to-work spillover was assessed with four items (α = 0.76 at Wave 1, 0.68 at Wave 2), including: How often have responsibilities at home reduced the effort you can devote to your job in the past year? Positive home-to-work spillover was gauged with four items (α = 0.56 at Wave 1,0.60 at Wave 2), such as: How often has talking with someone at home helped you deal with problems at work in the past year?

Baseline Spillover Constellations—We used two-step-cluster-analysis to assess whether the four measures of work-home spillover varied in patterned ways (Moen et al.,

2008a; Moen et al., 2008b), identifying three meaningful spillover groups at baseline: employees with *high negative* spillover (in both directions, $n = 206$), employees with *high positive* spillover (in both directions, $n = 201$), and employees with *low overall* (positive and negative) spillover (in both directions, $n = 124$).

Baseline home ecologies: We also detected patterned baseline home ecologies (Moen et al., 2008a), using a combination of home demands and home control. Home control items were inspired by Karasek's 1979 job-control scale: To what extent do you have the freedom to decide how to organize your household work? (1–5) and To what extent do you have control over what happens at home? (1–5). Home demands were captured with four dichotomous baseline variables: whether married/living with a partner, whether living with children younger than 6, whether taking care of any infirm adults, and whether living with a child with a chronic health condition. Cluster analysis identified five home ecologies: (1) singles, high home control ($n = 152$), (2) adult care providers, low home control ($n = 66$), (3) parents of child with chronic health condition, low home control ($n = 36$), (4) married, average home control ($n = 201$), and (5) parents of preschoolers, low home control ($n = 76$).

Covariates: Age, gender, and SES are among the most consistently observed characteristics associated with health behavior (Bird & Rieker, 2008; Mirowsky & Ross, 2003). In all analysis reported here, we controlled for gender (female = 1) and job level (manager =1 vs. employee = 0). We used job level instead of education for SES because this sample was highly educated (85.7% with college degrees). We did not control for age because the home ecologies were age-graded. We also controlled for life events between waves (number of events respondents experienced between surveys, such as birth/adoption of a child, divorce).

Analytical strategy—We tested a mediational model in which the relationship between ROWE and health behaviors was mediated by changes in spillover. We followed Baron and Kenny (1986) to test H1–H3a, controlling for gender, job level, life events between waves, and each lagged dependent variable. We then estimated interaction models to test for moderating effects of baseline spillover constellations (H3b) and home ecologies (H4).

Given the hierarchical structure of the data, individuals (level 1) nested within teams (level 2), we performed multilevel regression analysis (Raudenbush & Bryk, 2002). The interpretation of the coefficients is largely the same as in conventional OLS regressions, except that the standard error is adjusted to take into account that individuals are nested within teams. For example, the coefficient for the team-level variable, ROWE, represents the expected change for ROWE participants in the outcome, relative to persons continuing usual working arrangements and net of covariates and group clustering. Multilevel modeling permits the calculation of two variances: team variance and individual variance, as reported in the bottom of the table. Team variance captures the (adjusted) variability in the outcome between teams, while individual variance captures the (adjusted) variability in the outcome within teams. This permitted us to assess whether an individual-level (or team-level) variable was useful in explaining the outcome by looking at the extent to which the individual (or team) variance dropped after including that variable. We used BIC to evaluate models, with smaller values indicating better fit (Raftery,1995). Our analytic sample was composed of employees in teams with two or more respondents, with 531 respondents nested within 130 teams.

Findings

Sample description—Table 1 provides descriptive data on both respondents and teams. This was a young workforce; nearly half the sample was under age 30, followed by those in

their 30s (39%), with only 15% ages 40 to 59. Managers accounted for about a third of the sample .

While a majority of workers (83%) did not smoke at either wave, about 2% initiated smoking and 2% quit smoking in the six months between surveys. Workers who changed drinking status were equally split: 3% began to drink alcohol between survey waves, while another 3% stopped drinking. About 7% of the sample stopped exercising by Wave 2, while 5% began to exercise. During the six months between the surveys, respondents decreased smoking, increased drinking frequency, engaged in less exercise ($p < .001$), and reported having significantly more time for sleep and for healthy meals ($p < .05$).

We provide team-level means and standard deviations, and, for variables with a clearly defined range, we calculated interrater reliability to assess the degree of agreement among team members, thereby capturing the "groupness" of the variables (James, Demaree, & Wolf, 1984). Congruence within teams in both positive and negative spillover was high, with alpha coefficients between 0.68 and 0.75. This suggests that work-home spillover measures reflect team members' common exposure to a given work environment, not just individual differences in assessments of spillover.

Does ROWE predict individual- and team-level spillover change?—As a first test of the mediational model, we present in Table 2 multilevel estimates as to whether participating in ROWE changes respondents' positive/negative work-home spillover (in both directions). We found a larger reduction in negative work-to-home spillover by Wave 2 for ROWE respondents, on average 0.10 points (equivalent to 0.15 standard deviation of baseline NWHS) greater, a 3.4% additional reduction from baseline among ROWE respondents compared with those continuing to work as usual ($p < .05$). We then replicated the same analysis (Table 3) using teams as the unit of analysis, finding ROWE teams had 0.13 (equivalent to 0.20 standard deviation of baseline NWHS) lower negative work-to-home spillover by Wave 2. However, Hypothesis 1 is only partially supported; we found no significant ROWE effects on the other three forms of spillover. Nevertheless, these results show that ROWE reduces negative work-to-home spillover of both respondents and their teams, suggesting the potential value of studying spillover at the team as well as individual level.

Does ROWE predict health behavior change?—Using Pearson's residual to test whether ROWE participants were overrepresented in the quit-smoking category and under-represented in the begin-smoking category, we found among ROWE smokers at baseline, 23.08% stopped smoking between waves, while the cessation rate was only 7.5% for those in comparison teams ($p < .10$). We also found evidence that participants in ROWE teams were more likely to stop drinking alcohol between waves: 13 (5.42%) out of 240 ROWE employees who drank at Wave 1 stopped doing so, while only 5 (2.2%) out of 227 employees in the comparison group stopped drinking alcohol ($p < .10$).

Moving beyond simple two-way frequency tests to multilevel models, we found ROWE promoted desirable changes in health behavior (Table 4). Consistent with Hypothesis 2, ROWE participants had higher odds of quitting smoking (5.35, $p < .05$), and those who continued smoking decreased smoking at a rate of 25% ($p < .05$). ROWE participants also had almost half the odds of engaging in excessive drinking at Wave 2 (0.55, $p < .10$). ROWE participants tended to exercise more frequently by Wave 2 (1.12, $p < .10$), and were more apt to report having adequate time for sleep (0.30, $p < .10$, equivalent to 0.12 standard deviation of baseline values), with very small effect sizes. They reported having more time for preparing/eating healthy meals (0.73, $p < .001$, equivalent to 0.29 standard deviation of baseline values). After including ROWE, the team-level variance for adequate time for

healthy meals dropped from 0.013 to null, suggesting ROWE accounted for a large proportion of the outcome variance between teams, supporting our second hypothesis.

Do changes in individual- and team-level negative work–home spillover mediate the ROWE-health behavior relationship?—We next present a formal test of the mediation model, with Model 1 in Table 5 including change in individual-level NWHS, Model 2 including change in team-level NWHS, and Model 3 including both levels simultaneously. This permitted a test of whether negative work-to-home spillover change mediated the association between ROWE and specific health behaviors, and whether changes in spillover at the individual or team level were more consequential.

First, we found evidence that reduction in individual negative work-to-home spillover mediated ROWE effects on changes in both smoking and exercise frequency, as well as in perceptions of adequate time for sleep. For smoking frequency, the ROWE effects disappeared after we added team-level change in negative work-to-home spillover. For exercise and perceived adequacy of time for sleep outcomes, after including either individual or team mean change in negative work-to-home spillover, ROWE ceased to be significant, with its effect fully mediated by decreases in negative spillover. Increases in teams' negative work-to-home spillover between waves were significantly associated with more smoking, less exercise, and less perceived adequacy for sleep time, adding further evidence to our hypothesized mediation model.

Second, in terms of excessive drinking and perceptions of adequate time for healthy meals, ROWE continued to be statistically significant after including spillover change, although the magnitudes were somewhat reduced. This suggests ROWE effects were partially mediated by reductions in individual- and team-level negative work-to-home spillover.

Our third hypothesis was thus largely supported. Among the multiple outcomes, three (smoking frequency, exercise frequency, and perceived adequate time for sleep) are fully mediated and two (excessive drinking and perceived adequate time for healthy meals) are partially mediated by decreases in negative work-to-home spillover.

Do home ecologies and baseline spillover clusters moderate these processes?—We next turn to tests of Hypotheses 3b and 4. In terms of baseline spillover, ROWE effects were particularly salient for those in the low overall spillover cluster. Fig. 1 shows that, by Wave 2, the predicted smoking frequency for ROWE participants in this cluster was around 2 days/week less than comparison group, a gap significantly larger than other spillover clusters. In addition, ROWE participants characterized by low overall spillover had a greater increase in exercise (0.267, $p < .10$, compared with the high positive spillover cluster). As Fig. 2 shows, ROWE participants in the "singles, high control" home ecology reported significantly higher exercise frequency by Wave 2 (0.284, $p < .05$), compared with married employees with average home control.

Discussion

This study examined whether and under what conditions ROWE, a company-developed intervention offering workers considerable flexibility and control over the time and timing of their work, promoted changes in health behavior and in employees' perceptions of adequate time for healthy behavior. We posited work-home spillover as a key mediator between ROWE and health behavior. A first test was to examine the effects of ROWE on spillover (Hypothesis 1). We found that ROWE decreased negative work-to-home spillover at both individual and team-levels. Reduction in team-level negative work-to-home spillover is important, because it shows that ROWE changed the quality of the work environment at the team level as well as the spillover experienced by particular individuals. But note that

ROWE did not change positive spillover or negative home-to-work spillover at either level. This may be because the resources provided by and the skills acquired in ROWE are domain-specific, or because it takes time for workers to learn how to use the ROWE flexibility efficiently in ways that might enhance positive spillover. Nevertheless, this finding confirms the claim by Frone (2003) and Grzywacz and Marks (2000a) that positive and negative spillover represent separate constructs rather than being opposite ends of a single continuum. It also points to the need for future research to investigate the ways negative and positive spillover differ, and to devise interventions accordingly.

The ROWE program also improved health behaviors (Hypothesis 2) in the predicted direction. Compared with those continuing to work in traditional ways, ROWE participants were significantly more likely to stop smoking or reduce smoking levels by Wave 2; marginally less likely to engage in high levels of alcohol consumption, marginally more apt to exercise, and more apt to perceive adequate time for sleeping and for preparing healthy meals. Judging by effect size, ROWE seems to be particularly helpful in promoting self-perceived adequate time for preparing healthy meals, echoing previous studies showing lack of time is a barrier to doing so (Devine et al., 2003). These results are encouraging, given that ROWE was not designed to target health outcomes and yet appears to promote healthy lifestyles. Note that although previous findings (Moen et al., 2011b) showed that ROWE was associated with almost an extra hour of sleep on work nights, we observed only a marginal ROWE effect on perceived adequate time for sleep, pointing to the difference between perceptions and behaviors. One explanation is that even though ROWE employees' actual sleep time increased, they still did not feel they had enough time for adequate sleep.

Another important contribution is showing that changing negative work-to-home spillover was a key mechanism linking participation in ROWE with positive health-related changes (Hypothesis 3a). This supports the thesis that temporal constraints on the job and the associated stress experienced in the work-home interface impede workers' engaging in healthy behaviors; by having greater control over their time, ROWE participants – as individuals and as teams – were better able to schedule their lives in ways that reduced negative work-to-home spillover and, as a result, improved health-related behaviors. The finding (Table 5) that reductions in team-level spillover were associated with reduced smoking and greater exercise frequency – even net of individuals' own spillover – has important implications for future team-level interventions, rather than focusing exclusively on individual-level interventions.

We also tested and found moderation effects (Hypotheses 3b and 4) showing that ROWE was particularly beneficial for some subgroups. But, in contrast to our hypotheses, it was not those in the most demanding home ecologies or negative spillover constellations who benefited most from ROWE. In fact, ROWE participants in the singles, high home control cluster were more apt than married, average control respondents to exercise more frequently by Wave 2. ROWE participants in the low overall spillover cluster benefited more from ROWE in terms of decreased smoking. These two groups (singles and employees in low spillover cluster) had the lowest burden on the home front, and therefore might be better able to translate the flexibility ROWE offers into activities such as exercising.

This study has considerable limitations. It is a small, select, white-collar sample in the Midwestern U.S., limiting generalizability. Additional studies of workplaces where direct service provision (e.g., teaching, call centers) occurs are needed to fully investigate the benefits/limitations of ROWE and similar initiatives. Non-random allocation to ROWE vs. comparison teams is a concern. Although we were able to control for a set of potential confounders, other unobserved differences between ROWE and comparison employees may explain different outcomes. Multiple comparisons were not adjusted for, which might inflate

type-1 error and, given the relatively small sample, some of the estimates may be unstable. Another limitation: we were only able to follow respondents for a six-month period, so cannot speak to any long-term consequences of ROWE. We also faced the common problem of self-reported data, even though exposure to ROWE was measured with administrative data at the team level, and the key mediating variable, NWHS, had high reliability as assessed by Cronbach's alpha. Despite these shortcomings, the longitudinal, natural experiment design of this study provided a rare opportunity to examine the relationship between a workplace flexibility initiative and health behavior in both home and team contexts and over time. Future intervention studies in different work environments are essential to further identify policies and practices that can enhance workers' health behavior.

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Appendix A

Characteristics between ROWE and comparison groups at baseline.

	ROWE			Comparison		
	N	Mean/ Percent	S.D.	*N*	Mean/ Percent	S.D.
Smoking Frequency (#days/week): Wave 1	275	0.63	1.85	256	0.58	1.73
Drinking Frequency (#days/week): Wave 1	275	1.82	1.8	256	1.83	1.81
Exercise Frequency (#days/week): Wave 1	275	2.47	2.03	256	2.72	2.13
Perceived Enough Time for Sleep (0–10): Wave 1	275	5.06	2.51	256	5.7	2.61*
Perceived Enough Time for Healthy Meals (0–10): Wave 1	275	4.9	2.42	256	5.45	2.53*
Spillover between Work and Home (Wave 1)						
High Negative Spillover (*N* = 206)	275	46%	0.5	256	31%	0.46***
High Positive Spillover (*N* = 201)	275	34%	0.48	256	42%	0.49*
Low Overall Spillover (*N* = 124)	275	20%	0.4	256	27%	0.45*
Home Ecologies (Wave 1)						
Singles, High Home Control (*N* = 152)	275	26%	0.44	256	32%	0.47
Adult Care Providers, Low Home Control (*N* = 66)	275	15%	0.36	256	10%	0.3
Married, Ave. Home Control (*N* = 201)	275	33%	0.47	256	43%	0.5**
Parents, Preschooler, Low Home Control (*N* = 76)	275	19%	0.39	256	10%	0.3**
Parents, Child Chronic Health, Low Home Control (*N* = 36)	275	8%	0.27	256	6%	0.24
Negative Work-Home: Wave 1	275	3.01	0.68	256	2.81	0.62***
Positive Work-Home: Wave 1	275	2.98	0.67	256	3	0.6
Negative Home-Work: Wave 1	275	2.32	0.63	256	2.2	0.56*
Positive Home-Work: Wave 1	275	3.24	0.57	256	3.36	0.58**
Woman	275	48%	0.5	256	46%	0.5
Age						
20–29	275	35%	0.48	256	58%	0.49***

	ROWE			Comparison		
	N	Mean/ Percent	S.D.	*N*	Mean/ Percent	S.D.
30–39	275	47%	0.5	256	30%	0.46***
40–59	275	18%	0.38	256	12%	0.32
Holds a manager position	275	39%	0.49	256	27%	0.44**

Notes:
*** $p < 0.001$,
** $p < 0.01$,
* $p < 0.05$,
+ $p < 0.1$ (two-tailed *t*-test for difference between ROWE and comparison group members)

Appendix B

Correlation of the four types of spillover scales at Wave 1, and change (Wave 2–Wave 1)

	1	2	3	4	5	6
1. Neg. W-H (Wave 1)	1					
2. Pos. W-H (Wave 1)	0.02	1				
3. Neg. H–W (Wave 1)	0.48	0.14	1			
4. Pos. H–W (Wave 1)	−0.03	0.36	−0.10	1		
5. Neg. W-H (Change)	−0.42	0.03	−0.16	−0.04	1	
6. Pos. W-H (Change)	−0.07	−0.51	−0.08	−0.16	−0.11	1
7. Neg. H–W (Change)	−0.18	−0.05	−0.48	−0.03	0.28	0.11
8. Pos. H–W (Change)	−0.04	−0.04	0.07	−0.41	0.11	0.23

References

Baron RM, Kenny DA. The moderator-mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations. Journal of Personality and Social Psychology. 1986; 51:1173–1182. [PubMed: 3806354]

Barnett RC. Toward a review and reconceptualization of the work/family literature. Genetic, Social and General Psychology Monographs. 1998; 124:125–182.

Beauregard TA. Predicting interference between work and home: a comparison of dispositional and situational antecedents. Journal of Managerial Psychology. 2006; 21:244–264.

Berkman LF, Buxton O, Ertel K, Okechukwu C. Managers' practices related to work-family balance predict employee cardiovascular risk and sleep duration in extended care settings. Journal of Occupational Health Psychology. 2010; 15(3):316–329. [PubMed: 20604637]

Bianchi SM, Milkie MA. Work and family research in the first decade of the 21st century. Journal of Marriage and Family. 2010; 72:705–725.

Bird, CE.; Rieker, PP. Gender and health: The effects of constrained choices and social policies. New York: Cambridge University Press; 2008.

Bittman M, Wajcman J. The rush hour: The character of leisure time and gender equity. Social Forces. 2000; 79:165–189.

Brown PR, Brown WJ, Miller YD, Hansen V. Perceived constraints and social support for active leisure among mothers with young children. Leisure Science. 2001; 23:131–144.

Byron K. A meta-analytic review of work-family conflict and its antecedents. Journal of Vocational behavior. 2005; 67:169–198.

Carlson DS, Grzywacz JG, Kacmar KM. The relationship of schedule flexibility and outcomes via the work-family interface. Journal of Managerial Psychology. 2010; 25(4):330–355.

Christensen, K.; Schneider, B. Workplace flexibility: Realigning 20th-century jobs for a 21st-century workforce. Ithaca, NY: Cornell University Press; 2010.

Devine CM, Connors MM, Sobal J, Bisogni CA. Sandwiching it in: spillover of work onto food choices and family roles in low- and moderate-income urban households. Social Science & Medicine. 2003; 56:617–630. [PubMed: 12570978]

Ertel KA, Koenen KC, Berkman LF. Incorporating home demands into models of job strain: findings from the work, family, and health network. Journal of Occupational and Environmental Medicine. 2008; 50(11):1244–1252. [PubMed: 19001950]

Frone, MR. Work–family balance. In: Quick, JC.; Tetrick, LE., editors. Handbook of occupational health psychology. Washington, DC: American Psychological Association; 2003. p. 143-162.

Frone MR, Barnes GM, Farrell MP. Relationship of work-family conflict to substance use among employed mothers: the role of negative affect. Journal of Marriage and the Family. 1994; 56:1019–1030.

Glass JL, Estes SB. The family responsive workplace. Annual Review of Sociology. 1997; 23:289–313.

Goode WJ. A theory of role strain. American Sociological Review. 1960; 25(4):483–496.

Greenhaus JH, Beutell NJ. Sources of conflict between work and family roles. Academy of Management Review. 1985; 10:76–88.

Grzywacz JG. Work-family spillover and health during midlife: is managing conflict everything? American Journal of Health Promotion. 2000; 14:236–243. [PubMed: 10915535]

Grzywacz JG, Carlson DS, Shulkin S. Schedule flexibility and stress: linking formal flexible arrangements and perceived flexibility to employee health. Community, Work & Family. 2008; 11(2):199–214.

Grzywacz JG, Casey PR, Jones FA. The effects of workplace flexibility on health behaviors: a crosssectional and longitudinal analysis. Journal of Occupational and Environmental Medicine. 2007; 49(12):1302–1309. [PubMed: 18231077]

Grzywacz JG, Marks NF. Reconceptualizing the work-family interface: an ecological perspective on the correlates of positive and negative spillover between work and family. Journal of Occupational Health Psychology. 2000a; 5(1):111–126. [PubMed: 10658890]

Grzywacz JG, Marks NF. Family, work, work-family spillover and problem drinking during midlife. Journal of Marriage and Family. 2000b; 62(2):336–348.

Hill EJ, Grzywacz JG, Allen S, Blanchard VL, Matz-Costa C, Shulkin S, et al. Defining and conceptualizing workplace flexibility. Community, Work, and Family. 2008; 11:149–163.

James LR, Demaree RG, Wolf G. Estimating within-group interrater reliability with and without response bias. Journal of Applied Psychology. 1984; 69(1):85–98.

Karasek R. Job demands, job decision latitude, and mental strain: implications for job redesign. Administrative Science Quarterly. 1979; 24:285–308.

Kelly EL, Ammons SK, Chermack K, Moen P. Gendered challenge, gendered response confronting the ideal worker norm in a white-collar organization. Gender & Society. 2010; 24(3):281–303. [PubMed: 20625518]

Kelly EL, Kalev A. Managing flexible work arrangements in US organizations: formalized discretion or ‘a right to ask’. Socio-Economic Review. 2006; 4:379–416.

Kelly EL, Moen P. Rethinking the clockwork of work: why schedule control may pay off at work and at home. Advances in Developing Human Resources. 2007; 9(4):487–506.

Kelly EL, Moen P, Tranby E. Changing workplaces to reduce work-family conflict: schedule control in a white-collar organization. American Sociological Review. 2011; 76(2):1–26.

Kossek EE, Lautsch BA, Eaton SC. Telecommuting, control, and boundary management: correlates of policy use and practice, job control, and work-family effectiveness. Journal of Vocational Behavior. 2006; 68:247–267.

Lallukka T, Chandola T, Roos E, Cable N, Sekine M, Kagamimori S, et al. Work-family conflicts and health behaviors among British, Finnish, and Japanese employees. International Journal of Behavioral Medicine. 2010; 17(2):134–142. [PubMed: 19507039]

Lucove JC, Huston SL, Evenson KR. Workers' perceptions about worksite policies and environments and their association with leisure-time physical activity. American Journal of Health Promotion. 2007; 21:196–200. [PubMed: 17233238]

Martens MF, Nijhuis FJ, van Bostel MP, Knottnerus JA. Flexible work schedules and mental and physical health: a study of a working population with non-traditional working hours. kJournal of Organizational Behavior. 1999; 20:35–46.

Mirowsky, J.; Ross, CE. Education, social status, and health. New York: Aldine Transaction; 2003.

Moen P, Kelly EL, Hill R. Does enhancing work-time control and flexibility reduce turnover? A naturally occurring experiment. Social Problems. 2011; 58(1):69–98. [PubMed: 21532909]

Moen P, Kelly EL, Huang Q. Work, family and life-course fit: Does control over work time matter? Journal of Vocational behavior. 2008a; 73:414–425. [PubMed: 19430546]

Moen P, Kelly EL, Huang R. Fit inside the work-family black box: An ecology of the life-course, cycles of control reframing. Journal of Occupational and Organizational Psychology. 2008b; 81(3):411–433. [PubMed: 19809532]

Moen P, Kelly EL, Lam J. Healthy work revisited: do changes in time strain predict well-being? Journal of Occupational Health Psychology. in press

Moen P, Kelly EL, Tranby E, Huang Q. Changing work, changing health: can real work-time flexibility promote health behaviors and well-being? Journal of Health and Social behavior. 2011b; 52:404–429. [PubMed: 22144731]

Newbold B. Self-rated health within the Canadian immigrant population: risk and the healthy immigrant effect. Social Science & Medicine. 2005; 60:1359–1370. [PubMed: 15626530]

Ng DN, Jeffery RW. Relationships between perceived stress and health behaviors in a sample of working adults. Health Psychology. 2003; 22:638–642. [PubMed: 14640862]

Nomaguchi KM, Bianchi SM. Exercise time: Gender differences in the effects of marriage, parenthood, and employment. Journal of Marriage and Family. 2004; 66:413–430.

Raftery A. Bayesian model selection in social research. Sociological Methodology. 1995; 25:111–164.

Raudenbush, S.; Bryk, A. Hierarchical Linear Models: Applications and Data Analysis Methods. Thousands Oaks: Sage; 2002.

Ressler, C.; Thompson, J. Why work sucks and how to fix it: No schedules, no meetings, no joke—The simple change that can make your job terrific. New York: Penguin Group; 2008.

Roehling PV, Roehling MV, Moen P. The relationship between work-life policies and practices and employee loyalty: a life course perspective. Journal of Family and Economic Issues. 2001; 22:141–170.

Taylor S, Repetti R, Seeman T. Health psychology: what is an unhealthy environment and how does it get under the skin? Annual Review of Psychology. 1997; 48:411–447.

Thomas LT, Ganster DC. Impact of family-supportive work variables on work-family conflict and strain: a control perspective. Journal of Applied Psychology. 1995; 80:6–15.

Voydanoff P. The effects of work demands and resources on work-to-family conflict and facilitation. Journal of Marriage and Family. 2004; 66:398–412.

Voydanoff P. Consequences of boundary-spanning demands and resources for work-to-family conflict and perceived stress. Journal of Occupational Health Psychology. 2005; 10:491. [PubMed: 16248695]

Viitasalo K, Kuosma E, Latinen J, Harma M. Effects of shift rotation and the flexibility of a shift system on daytime alertness and cardiovascular risk factors. Scandinavian Journal of Work Environ & Health. 2008; 34(3):198–205.

Workplace Flexibility. Flexible work arrangements: A definition and examples. Retrieved 17.01.11. http://workplaceflexibility2010.org/images/uploads/general_information/fwa_definitionsexamples.pdf.

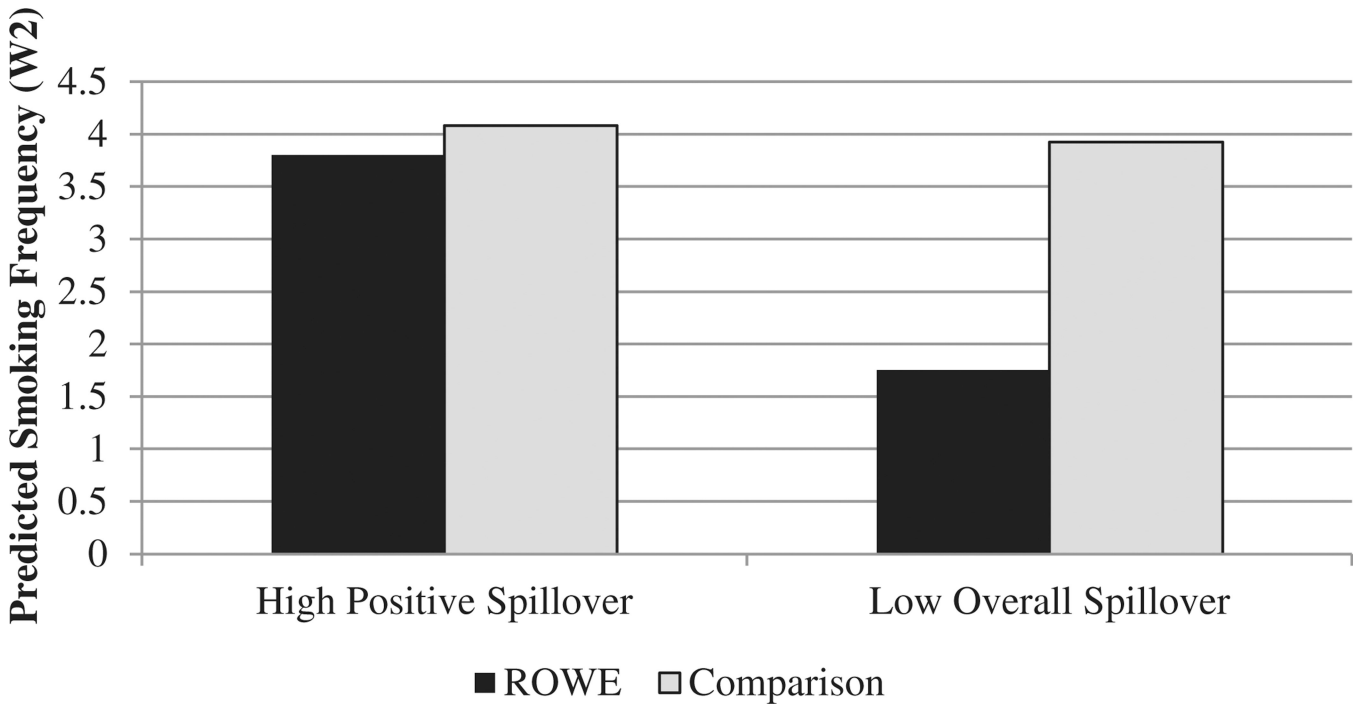

Fig. 1.
Smoking frequency at Wave 2: by ROWE and spillover clusters.

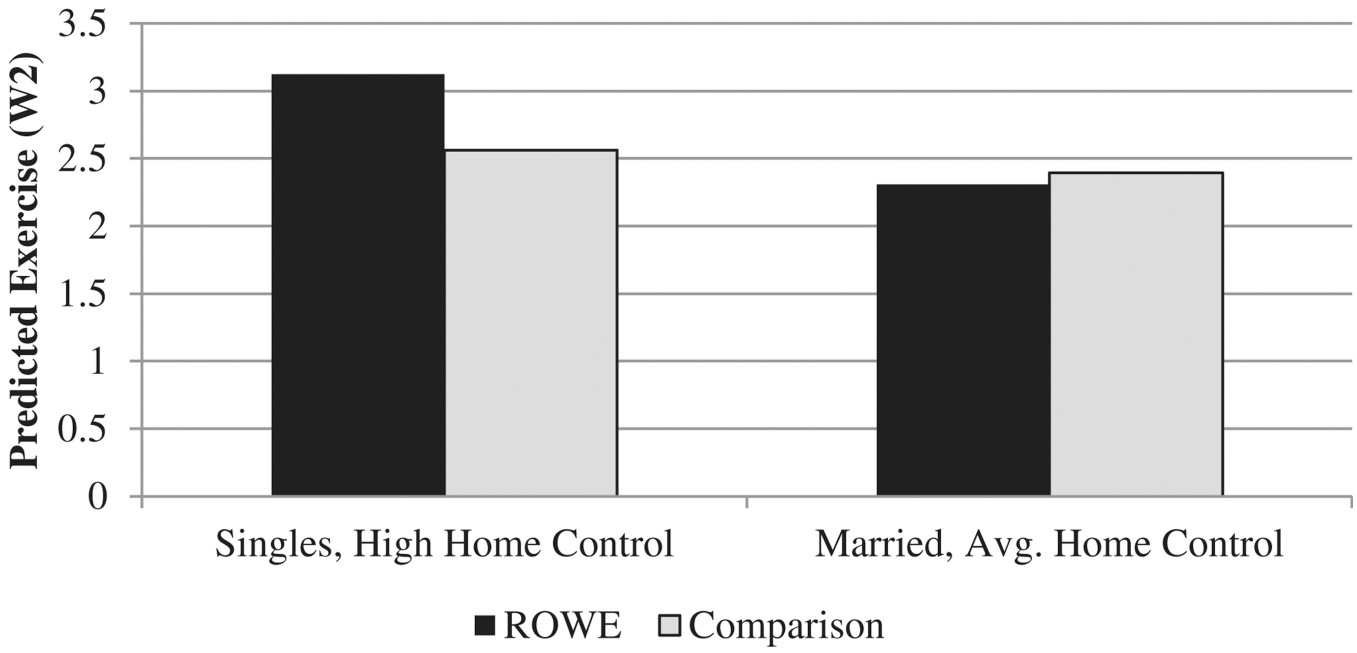

Fig. 2.
Exercise frequency at Wave 2: by ROWE and home ecologies.

Table 1

Descriptive statistics of individual- and team-level variables in Wave 1 and changes between Wave 1 and Wave 2.

Variable	Individual level (*N* = 531)		Team level (*N* = 130)		
	Mean/Percent	S.D.	Mean of Team Mean/Percent	Mean of Team S.D.	Mean of Team IRR
Dependent variables					
Smoking status					
Non-smoker at Wave 1, smoker at Wave 2	2%	0.15	22%	0.05	–
Smoker at Wave 1 and non-smoker at Wave 2	22%	0.15	32%	0.04	–
Non-smoker at Wave 1 and Wave 2	83%	0.38	82%	0.29	–
Smoker at Wave 1 and Wave 2	13%	0.33	13%	0.23	–
Smoking Frequency (#days/week): Wave 1	0.6	1.79	0.64	1.17	–
Smoking Frequency (#days/week): Wave 2 – Wave 1	−0.03	1.03	−0.05	0.59	–
Alcohol use					
Non-drinker at Wave 1, drinker at Wave 2	32%	0.18	32%	0.06	–
Drinker at Wave 1 and non-drinker at Wave 2	32%	0.18	32%	0.06	–
Non-drinker at Wave 1 and Wave 2	92%	0.28	82%	0.17	–
Drinker at Wave 1 and Wave 2	85%	0.36	86%	0.24	–
Drinking Frequency (#days/week): Wave 1	1.83	1.8	1.83	1.73	–
Drinking Frequency (#days/week): Wave 2 – Wave 1	0.02	1.29	0.01	0.94	–
Exercise status					
Not exercise at Wave 1, exercise at Wave 2	52%	0.21	42%	0.1	–
Exercise at Wave 1 and not exercise at Wave 2	72%	0.25	72%	0.14	–
Not exercise at Wave 1 and Wave 2	42%	0.19	42%	0.08	–
Exercise at Wave 1 and Wave 2	85%	0.36	85%	0.28	–
Exercise Frequency (#days/week): Wave 1	2.59	2.08	2.63	2.01	–
Exercise Frequency (#days/week): Wave 2 – Wave 1	−0.31	1.71	−0.41	1.45	–
Perceived Enough Time for Sleep (0–10): Wave 1	5.37	2.58	5.24	2.41	–
Perceived Enough Time for Sleep (0–10): Wave 2 – Wave 1	0.16	2.15	0.2	2.02	–
Perceived Enough Time for Healthy Meals (0–10): Wave 1	5.17	2.49	5.14	2.32	–
Perceived Enough Time for Healthy Meals (0–10): Wave 2 – Wave 1	0.16	2.22	0.16	1.97	–
Independent variables					

Variable	Individual level (*N* = 531)		Team level (*N* = 130)		
	Mean/Percent	S.D.	Mean of Team Mean/Percent	Mean of Team S.D.	Mean of Team IRR
ROWE	52%	0.5	55%	0	–
Spillover between work and home					
Negative Work-Home: Wave 1	2.91	0.66	2.92	0.6	0.71
Negative Work-Home Change: Wave 2 – Wave 1	−0.04	0.54	−0.06	0.49	0.95
Positive Work-Home: Wave 1	2.99	0.63	3	0.56	0.68
Positive Work-Home Change: Wave 2 – Wave 1	−0.05	0.6	−0.04	0.51	0.93
Negative Home-Work: Wave 1	2.26	0.6	2.27	0.55	0.74
Negative Home-Work Change: Wave 2 – Wave 1	0.01	0.58	0.01	0.53	0.94
Positive Home-Work: Wave 1	3.3	0.58	3.31	0.54	0.75
Positive Home-Work Change: Wave 2 – Wave 1	−0.06	0.55	−0.07	0.49	0.95
Baseline spillover clusters (Wave 1)					
High Negative Spillover (*N* = 206)	39%	0.49	39%	0.42	–
High Positive Spillover (*N* = 201)	38%	0.49	39%	0.41	–
Low Overall Spillover (*N* = 124)	23%	0.42	22%	0.33	–
Home ecologies (Wave 1)					
Singles, High Home Control (*N* = 152)	29%	0.45	26%	0.38	–
Adult Care Providers, Low Home Control (*N* = 66)	12%	0.33	13%	0.23	–
Married, Ave. Home Control (*N* = 201)	38%	0.49	37%	0.43	–
Parents, Preschooler, Low Home Control (*N* = 76)	14%	0.35	15%	0.25	–
Parents, Child Chronic Health, Low Home Control (*N* = 36)	72%	0.25	82%	0.14	–
Demographics (Wave 1)					
Woman	47%	0.5	47%	0.44	–
Age					
20–29	46%	0.5	40%	0.34	–
30–39	39%	0.49	44%	0.43	–
40–59	15%	0.36	17%	0.24	–
Holds a manager position	33%	0.47	37%	0.27	–
No. of Life Events between Wave 1 and Wave 2	0.85	1.09	0.83	0.87	–

Notes: 1. In our analytic sample, the team sizes range from 2 to 14, with an average of 5.5 and standard deviation of 3.1; 2. Mean of team standard deviations are calculated for teams with at least 3 respondents (there are 87 such teams); 3. IRR: interrater reliability, see text for explanation.

Table 2

Multilevel models predicting spillover change (Wave 2 – Wave 1) between work and home: main effect models.

	Positive Work-Home (Wave 2)	Negative Work-Home (Wave 2)	Positive Home-Work (Wave 2)	Negative Home-Work (Wave 2)
Level one: individual level				
Lagged Dependent Variable	0.51*** (0.04)	0.65*** (0.03)	0.59*** (0.04)	0.53*** (0.04)
Woman	−0.04 (0.05)	0.03 (0.04)	−0.00 (0.04)	−0.04 (0.04)
Holds a Manager Position	−0.04 (0.05)	0.12* (0.05)	0.05 (0.05)	−0.01 (0.05)
Home Ecologies (Wave 1, Ref. = Singles, High Home Control)				
Adult Care Providers, Low Home Control	0.06 (0.08)	−0.08 (0.07)	−0.03 (0.08)	0.02 (0.08)
Married, Avg. Home Control	0.05 (0.06)	−0.07 (0.05)	0.13* (0.06)	−0.00 (0.05)
Parents, Preschooler, Low Home Control	0.03 (0.07)	−0.13+ (0.07)	0.10 (0.07)	0.05 (0.07)
Parents, Child Chronic Health, Low Home Control	0.04 (0.10)	−0.08 (0.09)	0.02 (0.10)	0.01 (0.10)
No. of Life Events (btw Wave 1 and Wave 2)	−0.03 (0.02)	0.05** (0.02)	0.02 (0.02)	0.03 (0.02)
Level two: team level				
ROWE	0.04 (0.05)	−0.10* (0.04)	0.00 (0.04)	−0.02 (0.05)
Constant	1.42*** (0.12)	1.00*** (0.10)	1.21*** (0.13)	1.07*** (0.09)
Observations	531	531	531	531
Number of groups	130	130	130	130
Team variance (see Note 1)	0.0181	0	0	0.00429
Individual variance (see Note 2)	0.250	0.232	0.247	0.249
BIC	877.9	805.9	838.7	853.2

Notes: 1. Team variance is the variance in the outcome between teams, after adjusting for the covariates; 2. Individual variance is the variance in the outcome within teams, after adjusting for the covariates; 3. Standard errors in parentheses.

*** $p < 0.001$,

** $p < 0.01$,

* $p < 0.05$,

+ $p < 0.1$.

Table 3

OLS models predicting team-level spillover change (Wave 2 – Wave 1) between work and home.

	Team Mean of Positive Work-Home (Wave 2)	Team Mean of Negative Work-Home (Wave 2)	Team Mean of Positive Home-Work (Wave 2)	Team Mean of Negative Home-Work (Wave 2)
Lagged Dependent Variable	0.59*** (0.08)	0.54*** (0.07)	0.69*** (0.07)	0.58*** (0.07)
Team %Women (Wave 1)	−0.09 (0.09)	0.06 (0.08)	−0.02 (0.08)	−0.15* (0.08)
Team Home Ecologies (Wave 1)				
Team %Adult Care Providers	−0.24 (0.19)	0.03 (0.15)	−0.15 (0.17)	−0.08 (0.16)
Team %Married, Ave. Home Control	−0.17 (0.12)	0.02 (0.10)	−0.09 (0.11)	−0.04 (0.10)
Team %Parents of Preschoolers	−0.16 (0.12)	−0.14 (0.10)	−0.11 (0.11)	−0.15 (0.10)
Team %Parents of Child Chronic Health Conditions	−0.24 (0.22)	−0.30+ (0.18)	−0.06 (0.20)	−0.17 (0.19)
Team Mean Life Events (btw Wave 1 and Wave 2)	0.02 (0.05)	0.03 (0.04)	0.03 (0.04)	0.06 (0.04)
ROWE	0.07 (0.06)	−0.13* (0.05)	0.01 (0.06)	0.03 (0.05)
Constant	1.37*** (0.26)	1.36*** (0.21)	1.01*** (0.22)	1.02*** (0.18)
Observations	165	165	165	165
R-squared	0.28	0.33	0.43	0.35

Notes: Standard errors in parentheses.

*** $p < 0.001$,

** $p < 0.01$,

* $p < 0.05$,

+ $p < 0.1$.

Table 4

Multilevel models predicting health behavior change (Wave 2 – Wave 1).

	Multilevel Logistic Model (in odds)			Multilevel Poisson Model (in incident rates)		Multilevel Linear Model	
	Initiate Smoking (btw Wave 1 and Wave 2)	**Quit Smoking (btw Wave 1 and Wave 2)**	**Excessive Drinking (Wave 2)**	**Smoking Frequency (Wave 2)**	**Exercise Frequency (Wave 2)**	**Perceived Adequate Time for Sleep (Wave 2)**	**Perceived Adequate Time for Healthy Meals (Wave 2)**
Level One: Individual Level							
Lagged Dependent Variable			18.12***(5.96)	1.30***(0.04)	1.28***(0.02)	0.57***(0.03)	0.49***(0.03)
Woman	2.77 (1.73)	0.56 (0.43)	0.52*(0.17)	1.13 (0.16)	1.12^{+}(0.07)	0.29^{+}(0.16)	0.16 (0.16)
Holds a Manager Position	0.16^{+}(0.17)	1.92 (1.57)	1.27 (0.43)	1.01 (0.16)	0.93 (0.06)	−0.16 (0.18)	−0.33^{+}(0.18)
Home Ecologies (Wave 1, Ref. = Singles, High Home Control)							
Adult Care Providers, Low Home Control	2.21 (1.83)	0.00 (0.00)	1.34 (0.72)	1.02 (0.26)	1.05 (0.10)	−0.36 (0.28)	−0.41 (0.28)
Married, Ave. Home Control	0.79 (0.57)	0.44 (0.37)	2.32*(0.93)	1.49**(0.23)	0.96 (0.07)	0.22 (0.20)	0.22 (0.20)
Parents, Preschooler, Low Home Control	1.54 (1.45)	0.90 (0.96)	1.51 (0.84)	1.12 (0.30)	0.88 (0.10)	−0.07 (0.27)	−0.29 (0.27)
Parents, Child Chronic Health, Low Home Control	0.00 (0.00)	0.70 (0.92)	1.72 (1.27)	1.73*(0.37)	0.77^{+}(0.12)	0.17 (0.36)	−0.33 (0.35)
Baseline Spillover Clusters (Ref. = Low Overall Spillover)							
High Negative Spillover	1.11 (0.83)	0.45 (0.45)	1.19 (0.49)	0.93 (0.18)	0.93 (0.07)	−0.49*(0.23)	−0.98***(0.22)
High Positive Spillover	0.68 (0.54)	0.19 (0.21)	1.31 (0.53)	1.13 (0.19)	0.89 (0.07)	−0.24 (0.22)	−0.50*(0.22)
No. of Life Events (btw Wave 1 and Wave 2)	1.29 (0.28)	1.31 (0.44)	0.98 (0.14)	0.85*(0.07)	0.94*(0.03)	−0.09 (0.08)	−0.16*(0.08)
Level Two: Team Level							
ROWE	0.77 (0.46)	5.35*(4.54)	0.55^{+}(0.17)	0.75*(0.11)	1.12^{+}(0.07)	0.30^{+}(0.17)	0.73***(0.17)
Constant	0.02***(0.02)	0.20^{+}(0.17)	0.07***(0.03)	0.87 (0.20)	1.10 (0.11)	2.53***(0.34)	3.18***(0.33)
Observations	452	79	467	79	531	531	531
Number of groups	129	59	129	59	130	130	130
Team variance	–	–	–	–	–	0	0
Individual variance	–	–	–	–	–	3.441	3.359
BIC	135	77	326	327	1827	2251	2238

Notes: 1. The model for initiating smoking (column 1) is restricted to persons who did not smoke in Wave 1.The models for quitting smoking and smoking frequency at Wave 2 (columns 2 and 4) are restricted to persons who smoked in Wave 1. The model for excessive drinking at Wave 2 (column 3) is restricted to persons who drank in Wave 1; 2. Team variance is the variance in the outcome between teams, after adjusting for the covariates. Individual variance is the variance in the outcome within teams, after adjusting for the covariates. These two variances are only meaningful for continuous outcomes, so no corresponding figures are reported for categorical outcomes from initiating smoking to exercise frequency; 3. Standard errors in parentheses.

***$p < 0.001$,

**$p < 0.01$,

*$p < 0.05$,

+$p < 0.1$.

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Table 5

Multilevel models predicting health behavior change (Wave 2 – Wave 1) mediated by individual- and team-level negative work-to-home spillover change (Wave 2 – Wave 1).

	Multilevel logistic model (in odds)			Multilevel Poisson model (in incident rates)						Multilevel linear model					
	Excessive drinking (Wave 2)			Smoking frequency (wave 2)			Exercise frequency (Wave 2)			Perceived adequate time for sleep (Wave 2)			Perceived adequate time for healthy meals (Wave 2)		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Level one: individual level															
Lagged dependent variable	18.15***	18.36***	18.68***	1.29***	1.30***	1.29***	1.29***	1.28***	1.28***	0.57***	0.57***	0.57***	0.50***	0.49***	0.50***
	(5.98)	(6.08)	(6.23)	(0.04)	(0.04)	(0.04)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Woman	0.52*	0.51*	0.51*	1.15	1.11	1.15	1.12^{+}	1.13*	1.13*	0.28^{+}	0.31^{+}	0.28^{+}	0.14	0.18	0.15
	(0.17)	(0.17)	(0.17)	(0.16)	(0.15)	(0.16)	(0.07)	(0.07)	(0.07)	(0.16)	(0.16)	(0.16)	(0.16)	(0.16)	(0.16)
Holds a manager position	1.29	1.25	1.27	1.03	1.01	1.06	0.95	0.95	0.95	−0.09	−0.14	−0.09	−0.26	−0.31^{+}	−0.26
	(0.44)	(0.43)	(0.43)	(0.16)	(0.16)	(0.17)	(0.06)	(0.06)	(0.06)	(0.18)	(0.18)	(0.18)	(0.18)	(0.18)	(0.18)
Home ecologies (Wave 1, Ref. = Singles, high home control)															
Adult care providers, low home control	1.27	1.35	1.24	0.98	1.08	1.02	1.03	1.03	1.03	−0.47^{+}	−0.39	−0.47^{+}	−0.51^{+}	−0.43	−0.51^{+}
	(0.69)	(0.73)	(0.68)	(0.26)	(0.28)	(0.26)	(0.10)	(0.10)	(0.10)	(0.27)	(0.28)	(0.27)	(0.27)	(0.28)	(0.27)
Married, ave. home control	2.24*	2.32*	2.19^{+}	1.42*	1.57**	1.43*	0.95	0.97	0.96	0.13	0.24	0.15	0.13	0.24	0.15
	(0.90)	(0.93)	(0.88)	(0.24)	(0.25)	(0.24)	(0.07)	(0.07)	(0.07)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
Parents, preschooler, low home control	1.45	1.56	1.49	1.07	1.21	1.11	0.86	0.87	0.86	−0.21	−0.11	−0.21	−0.41	−0.33	−0.42
	(0.80)	(0.86)	(0.82)	(0.30)	(0.33)	(0.31)	(0.09)	(0.09)	(0.09)	(0.27)	(0.27)	(0.27)	(0.26)	(0.27)	(0.26)
Parents, child chronic health, low home control	1.64	1.77	1.69	1.70*	1.81**	1.78**	0.77^{+}	0.76^{+}	0.76^{+}	0.07	0.10	0.05	−0.42	−0.41	−0.44
	(1.21)	(1.31)	(1.26)	(0.37)	(0.39)	(0.39)	(0.12)	(0.12)	(0.12)	(0.35)	(0.36)	(0.35)	(0.35)	(0.35)	(0.35)
Baseline spillover clusters (Ref. = Low overall spillover)															
High negative spillover	1.10	1.24	1.15	0.91	0.96	0.90	0.89	0.90	0.88	−0.73**	−0.59**	−0.74***	−1.18***	−1.08***	−1.20***
	(0.47)	(0.53)	(0.50)	(0.18)	(0.19)	(0.18)	(0.07)	(0.07)	(0.07)	(0.22)	(0.23)	(0.22)	(0.22)	(0.22)	(0.22)
High positive spillover	1.24	1.34	1.25	1.11	1.11	1.06	0.87^{+}	0.88^{+}	0.87^{+}	−0.35^{+}	−0.26	−0.35^{+}	−0.59**	−0.52*	−0.59**
	(0.51)	(0.54)	(0.51)	(0.19)	(0.19)	(0.18)	(0.07)	(0.07)	(0.07)	(0.21)	(0.22)	(0.21)	(0.21)	(0.22)	(0.21)

	Multilevel logistic model (in odds)			Multilevel Poisson model (in incident rates)						Multilevel linear model					
	Excessive drinking (Wave 2)			Smoking frequency (wave 2)			Exercise frequency (Wave 2)			Perceived adequate time for sleep (Wave 2)			Perceived adequate time for healthy meals (Wave 2)		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
No. of life events	0.98	0.98	0.99	0.85*	0.86^{+}	0.85*	0.95^{+}	0.95*	0.95^{+}	−0.05	−0.09	−0.05	−0.12^{+}	−0.16*	−0.13^{+}
(btw Wave 1 and Wave 2)	(0.15)	(0.14)	(0.15)	(0.07)	(0.07)	(0.07)	(0.03)	(0.03)	(0.03)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
ΔNeg work-to-home spillover	0.79		0.68	0.90		0.76	0.88*		0.95	−0.88***		−0.82***	−0.81***		−0.73***
	(0.25)		(0.25)	(0.14)		(0.14)	(0.05)		(0.06)	(0.15)		(0.17)	(0.15)		(0.17)
Level two: team level															
ROWE	0.53*	0.57^{+}	0.57^{+}	0.74*	0.82	0.81	1.10	1.06	1.06	0.18	0.14	0.15	0.63***	0.56***	0.58***
	(0.17)	(0.19)	(0.19)	(0.11)	(0.12)	(0.12)	(0.07)	(0.07)	(0.07)	(0.16)	(0.17)	(0.17)	(0.16)	(0.17)	(0.17)
Team ΔMean of negative work-to-home spillover		1.34	1.83		1.53	1.96*		0.70**	0.74*		−1.04***	−0.28		−1.06***	−0.38
		(0.78)	(1.20)		(0.44)	(0.66)		(0.08)	(0.09)		(0.31)	(0.34)		(0.31)	(0.34)
Constant	0.07***	0.06***	0.07***	0.92	0.81	0.90	1.13	1.13	1.14	2.75***	2.62***	2.76***	3.30***	3.25***	3.31***
	(0.03)	(0.03)	(0.03)	(0.22)	(0.19)	(0.22)	(0.12)	(0.12)	(0.12)	(0.33)	(0.34)	(0.33)	(0.32)	(0.33)	(0.32)
Observations	467	467	467	79	79	79	531	531	531	531	531	531	531	531	531
Number of groups	129	129	129	59	59	59	130	130	130	130	130	130	130	130	130
Team variance	–	–	–	–	–	–	–	–	–	0	0	0	0	0	0
Individual variance	–	–	–	–	–	–	–	–	–	3.230	3.370	3.226	3.179	3.286	3.172
BIC	328	329	330	328	327	326	1824	1820	1821	2224	2246	2229	2215	2233	2220

Notes: 1. The models for excessive drinking at Wave 2 (columns 1–3) are restricted to persons who drank in Wave 1. The models for smoking frequency at Wave 2 (columns 4–6) are restricted to persons who smoked in Wave 1; 2. For each of the five outcomes, three multilevel models are estimated. The first model estimates the mediating effect of *individual-level* negative work-to-home spillover change on health behavior change. The second model estimates the mediating effect of *team-level* negative work-to-home spillover change on health behavior change. The third model estimates the simultaneous mediating effects of *individual- and team-level* negative work-to-home spillover change on health behavior change; 3. Team variance is the variance in the outcome between teams, after adjusting for the covariates. Individual variance is the variance in the outcome within teams, after adjusting for the covariates. These two variances are only meaningful for continuous outcomes, so no corresponding figures are reported for categorical outcomes of excessive drinking and smoking frequency; 4. Standard errors in parentheses.

*** $p < 0.001$,

** $p < 0.01$,

* $p < 0.05$,

$^{+}$ $p < 0.1$.

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