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A self-regulatory perspective of work-to-home undermining spillover/crossover: Examining the roles of sleep and exercise

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Abstract

Research demonstrating that employees who are undermined at work engage in similar behavior at home suggests this connection reflects displaced aggression. In contrast, the present study draws on self-regulation theory to examine the work-home undermining spillover/crossover process. We propose that poor sleep quality transmits the influence of workplace undermining to home undermining per self-regulatory impairment, and exercise moderates this indirect effect per self-regulatory improvement. Using matched data from 118 employees and a member of their household to test our model, results demonstrated that undermining experienced from supervisors increased subjective (i.e., self-reported) but not objective (i.e., actigraph-recorded) sleep difficulties, which in turn increased the frequency with which individuals engaged in undermining at home (as reported by cohabitants). Additionally, indirect effects occurred for employees with low but not high levels of physical exercise (as measured by self-reports, step counts, and energy expenditure). Our findings suggest sleep and exercise may serve as valuable intervention points to prevent the spread of harmful behavior across contexts. Implications for theory and practice are discussed.

Keywords: spillover/crossover, workplace mistreatment, home undermining, sleep, exercise

A self-regulatory perspective of work-to-home undermining spillover/crossover: Examining the roles of sleep and exercise

The work-related consequences of workplace mistreatment are well known. Individuals who are mistreated by their bosses experience lower job satisfaction, greater psychological distress, and exhibit poorer task performance (e.g., Duffy, Ganster, & Pagon, 2002). The effects of such mistreatment can also impact employees' home lives, resulting in work-family conflict and family dissatisfaction (Carlson, Ferguson, Hunter, & Whitten, 2012; Carlson, Ferguson, Perrewé, & Whitten, 2011). Perhaps one of the most problematic consequences of workplace mistreatment is that it can "spill" over to the home domain and "cross" over to affect the well-being of other household members. In such scenarios, employees mistreated at work display negative emotional reactions and behaviors toward members of their household (i.e., home undermining; cf. Hoobler & Brass, 2006), which can harm individuals and relationships at home.

The primary explanation offered for the transmission of such behaviors from the work domain to the home domain rests on the notion of displaced aggression (Marcus-Newhall, Pedersen, Carlson, & Miller, 2000). According to this perspective, employees who experience mistreatment at work (i.e., from supervisors) feel unable to respond in the work environment and therefore vent their frustrations toward less powerful individuals. Because members of one's household are "safer" targets and readily available, employees are likely to direct negative emotions and behaviors toward them (Hoobler & Brass, 2006). While perfectly reasonable, this explanation is unlikely to be the only one to illuminate this phenomenon. Existing research has not considered whether other theoretical perspectives could also explain this sort of work-home behavioral transmission.

An alternative explanation is that this transfer of harmful behaviors from work to home is governed by self-regulation processes (Baumeister, 1998). This perspective holds that experiences of workplace mistreatment foster self-regulation impairment by reducing the capacity and motivation needed to regulate behaviors at home (Baumeister & Vohs, 2007; Thau & Mitchell, 2010). Note that the displaced aggression and self-regulation accounts are not mutually exclusive (DeWall, Baumeister, Stillman, & Gailliot, 2007; Liu, Wang, Chang, Shi, Zhou, & Shao, 2015). Indeed, Baumeister and Tierney (2011, p. 36) remarked that "the old line about the frustrated worker going home and kicking the dog jibes with the ego-depletion experiments" commonly conducted in self-regulation research.

Given that the link between mistreatment at work and home could be understood through multiple theoretical lenses, the purpose of the present study is to test an alternative to the more popular displaced aggression perspective. More specifically, we rely on self-regulation theory to examine how experiences of undermining behaviors at work—those which display negative affect and criticism toward employees (Vinokur & van Ryn, 1993)—influence employees' undermining behavior at home. Guided by research that suggests poor sleep quality may facilitate self-regulatory impairment and physical exercise might mitigate it, we expect these physiological factors may help explain the spread of undermining behavior across domains. As shown in Figure 1, our model explains *when* and *why* work and home undermining are interrelated vis-à-vis two key mechanisms of self-regulation theory: impairment (i.e., depletion/fatigue factors; Baumeister, Gailliot, DeWall, & Oaten, 2006) and improvement (i.e., replenishing/energizing factors; Masicampo, Martin, & Anderson, 2014).

This study extends current theory and understanding of social undermining at work and home in two primary ways. First, we depart from the prevailing view (i.e., displaced aggression;

Hoobler & Brass, 2006) by suggesting that experiences of workplace undermining leave individuals with less capacity and motivation to appropriately self-regulate their behavior at home. Whereas prior spillover research has examined how employees displace their frustrations with abusive supervisors (Hoobler & Brass, 2006) or work-family conflicts (Liu et al., 2015), adopting a self-regulatory perspective advances extant work by allowing scholars to examine potential physiological mechanisms that may explain why undermining is transmitted across domains. Second, our investigation of sleep and exercise elucidates specific mechanisms and boundary conditions of the work-home undermining spillover/crossover process. Moreover, our use of subjective and objective measures of sleep and exercise answers calls to test predictions derived from self-regulation theory with measures other than those that are self-reported (Inzlicht & Schmeichel, 2012; Vohs, Glass, Maddox, & Markman, 2011), and it allows for multiple tests of our hypotheses. Our work also addresses calls to examine effects of self-regulation impairment on behaviors outside the work domain (Thau & Mitchell, 2010), boundary conditions of sleep effects (Barnes, 2012), and the joint roles of physiological and psychological variables in self-regulatory processes (Evans, Boggero, & Segerstrom, 2015).

Theoretical Background and Hypotheses

Work-Home Undermining: A Self-Regulatory Perspective

Social undermining refers to behaviors "that display (a) negative affect (anger or dislike), (b) negative evaluation of the person in terms of his or her attributes, actions, and efforts (criticism), and (c) behaviors that make difficult or hinder the attainment of instrumental goals" (Vinokur & van Ryn, 1993, p. 350). The concept originated from work exploring supportive and abusive patterns of interaction in close relationships, such as those between children and parents or between spouses (e.g., Coyne & DeLongis, 1986; Vinokur & Caplan, 1987). It is therefore

understandable that, in defining and examining the effects of social undermining in the workplace, Duffy et al. (2002) drew on this research concerning the work-home interface. Of interest to the present study, these authors observed interrelationships of undermining behaviors across social domains. Thus, social undermining is a broad construct that applies to interpersonal relationships across contexts, such that undermining behaviors can "spill over" from the work domain to the home domain (Hoobler & Brass, 2006). Understanding the spillover process is important because it can then "cross over" to affect the stress or strain felt by an employee's spouse or partner; in this way, an individual's experience of workplace undermining can influence members of his or her household through an indirect crossover process (e.g., Bakker, Demerouti, & Burke, 2009; Westman & Vinokur, 1998).

More formally, spillover occurs when emotions or behaviors transfer across domains (Edwards & Rothbard, 2000). In the case of undermining spillover, aversive experiences at work (e.g., being insulted, put down, or belittled by a supervisor) produce fatigue, tension, and frustration that interfere with relationships at home. Accordingly, the capacity to adjust one's thoughts, emotions, and behaviors across contexts—i.e., self-regulation—is critical for maintaining positive social interactions, at home or elsewhere (Zimmerman, 2000). Thus, from a self-regulatory perspective, home undermining may occur because individuals undermined at work fail to override negative emotional or behavioral tendencies produced by these destructive work experiences (Baumeister & Heatherton, 1996).

Several reasons have been put forth to explain why self-regulatory failure, or impairment, occurs. One perspective (i.e., the limited resource model, Muraven & Baumeister, 2000) holds that self-regulatory impairment is due to energy depletion. Supporting this view, organizational research shows that employees who experience mistreatment from supervisors or coworkers

report more self-regulatory fatigue (i.e., "ego-depletion") and more frequently mistreat others at work (Lee, Kim, Bhave, & Duffy, 2016; Thau & Mitchell, 2010). Other models (i.e., the process model, Inzlicht & Schmeichel, 2012; the opportunity cost model, Kurzban, Duckworth, Kable, & Myers, 2013) suggest self-regulatory impairment occurs not because individuals are unable to self-regulate their behavior but instead are less willing to do so. Support for these motivational accounts of self-regulation comes from research demonstrating that depletion effects can be eliminated or reversed with incentives (see Inzlicht & Berkman, 2015; Masicampo et al., 2014).

Although these models differ on the specific reason why work-home spillover/crossover effects would occur (i.e., energy depletion or reduced motivation), both perspectives suggest sleep and exercise can influence the spillover/crossover process. That is, regardless of whether individuals undermined at work lack the capacity to self-regulate or are less motivated to exert the effort required to maintain social relationships at home, sleep and exercise can affect spillover via physiological (e.g., neurobiological) and psychological mechanisms (Barnes, 2012; Evans et al., 2015). In what follows, we offer logic and evidence to suggest poor sleep quality transmits the work-home undermining spillover/crossover process due to self-regulatory impairment and physical exercise moderates impairment effects via self-regulatory improvement.

Self-Regulation Impairment: The Intervening Role of Sleep

Sleep is critical to self-regulation (Barnes, 2012). Indeed, there is ample evidence that poor sleep is a key indicator of self-regulation impairment (e.g., Barber & Munz, 2011; Christian & Ellis, 2011; Muraven & Baumeister, 2000; Wagner, Barnes, Lim, & Ferris, 2012). These studies suggest that self-regulation is cognitively or emotionally taxing and thus individuals require replenishment through rest. Accordingly, we expect that sleep difficulties arising from workplace mistreatment may affect employees' interactions at home because they are too tired to

regulate the resultant negative thoughts and emotions. In line with research suggesting spillover effects can be transmitted indirectly (Edwards & Rothbard, 2000), we anticipate that the work-home undermining spillover/crossover process is likely facilitated by poor sleep quality.

We posit that poor sleep quality would carry the influence of workplace undermining to home undermining for at least two reasons. First, sleep plays a vital role in helping individuals replenish energy needed to manage their thoughts, feelings, and behavior. Experiences of mistreatment from supervisors have been shown to be draining (e.g., Hershcovis & Barling, 2010) and contribute to sleep problems (Duffy, Ganster, Shaw, Johnson, & Pagon, 2006; Rafferty, Restubog, & Jimmieson, 2010). Such sleep difficulties disrupt the recovery processes that naturally occur during rest (Barnes, 2012). Accordingly, individuals who experience sleep difficulties are more likely than well-rested individuals to suffer self-regulation impairment, as evidenced by their increased tendencies to display deviant and unethical behavior (e.g., Barnes, Lucianetti, Bhave, & Christian, 2015; Christian & Ellis, 2011; Wagner et al., 2012).

A second reason why sleep quality is particularly important to the self-regulation process involved in work-home undermining spillover/crossover is that it fosters bodily restoration. In this connection, biological and neuroscience research indicates that fitful sleep impairs self-regulation via its impact on the brain and body. Neuroimaging studies, for instance, demonstrate that poor sleep quality is associated with lower activity in the prefrontal cortex, the primary brain region responsible for self-regulation (Barnes, 2012). Moreover, individuals who experience poor sleep exhibit decreased connectivity between the prefrontal cortex and amygdala and, hence, are likely to have difficulty regulating their emotions (Evans et al., 2015). We therefore predict that as individuals experience greater undermining at work (i.e., from supervisors), they

will be more likely to suffer self-regulatory impairment via sleep difficulties, which will in turn increase the frequency with which they engage in undermining at home.

> *Hypothesis 1: Workplace undermining has an indirect effect on home undermining through poor sleep quality. More frequent experiences of undermining from one's supervisor will be positively related to poor sleep quality, which in turn will be positively related to home undermining.*

Self-Regulation Improvement: The Moderating Role of Exercise

Although we argued that self-regulation impairment explains relations between work and home undermining via sleep difficulties, theory and research suggest such impairment can be counteracted or eliminated (e.g., Baumeister & Heatherton, 1996; Baumeister & Vohs, 2007; Inzlicht & Schmeichel, 2012; Masicampo et al., 2014). Whereas several activities have been shown to improve self-regulation in this regard (e.g., monitoring posture and food intake; Muraven, Baumeister, & Tice, 1999), an accumulating body of evidence suggests self-regulatory impairment can be mitigated by physical exercise (e.g., Baumeister et al., 2006; Nägel & Sonnentag, 2013; Oaten & Cheng, 2006). Given that self-regulation improvements affect multiple spheres of one's life (Baumeister et al., 2006), physical exercise may similarly influence the spillover/crossover of harmful behaviors from the work domain to the home domain. Below, we explain why differences in physical exercise levels are likely to moderate the indirect effect of workplace undermining on home undermining via poor sleep quality.

Self-regulation theory and research provide several motivational accounts to explain why the indirect effect of work undermining on home undermining (via sleep quality) could depend on physical exercise levels. For example, interventions that target individuals' perceptions of and responses to effort have been shown to mitigate self-regulation impairment by decreasing the

perceived effort of self-regulation and increasing motivation to engage in demanding tasks (Masicampo et al., 2014). Relatedly, individuals who frequently engage in physical exercise report higher self-efficacy for effortful behaviors (Loprinzi, Wolfe, & Walker, 2015) and cope better with stressful events (Gerber & Pühse, 2009; Salmon, 2001) than those who exercise less often. Likewise, the effects of self-regulation impairment can be overridden when self-control is regularly practiced (Baumeister et al., 2006; Muraven et al., 1999). Supporting this notion, Oaten and Cheng (2006) found that a two-month exercise program involving weightlifting, resistance training, and aerobics improved participants' self-regulation. Thus, when employees experience sleep difficulties precipitated by workplace undermining, we expect that the effects on their undermining behavior at home will be weaker among those who more frequently engage in physical exercise than among their more sedentary counterparts.

Biological and neurophysiological research likewise explains why, from a self-regulation perspective, physical exercise should moderate the effects of undermining spillover/crossover via poor sleep quality. Physical exercise has been shown to enhance performance on cognitive tasks known to rely on the prefrontal cortex (Brockett, LaMarca, & Gould, 2015), suggesting exercise enhances executive functioning required for self-regulation. In addition, physical exercise can enhance the cognitive functioning needed to resolve incompatible reactions to experienced mistreatment (Botvinick, Braver, Barch, Carter, & Cohen, 2001). This might occur when individuals undermined at work seek to balance conflicting desires to take negative emotions out on members of their household with desires to maintain established relationships. We therefore expect that individuals who regularly exercise should be less likely than physically inactive individuals to undermine household members due to sleep difficulties arising from workplace undermining. As such, we anticipate that the indirect effect of workplace undermining from

one's supervisor on home undermining (via poor sleep quality) would be weaker among individuals who more frequently exercise and stronger among those with lower exercise levels. As shown in Figure 1, our expectation corresponds to a form of moderated mediation (Edwards & Lambert, 2007) in which the second stage of the indirect effect—i.e., the relationship between sleep quality and home undermining—varies according to individual differences in physical exercise levels.

> *Hypothesis 2: Exercise moderates the indirect effect of supervisor undermining on home undermining through poor sleep quality, such that the second stage of the indirect effect (i.e., between sleep quality and home undermining) will be strong and positive among individuals who engage in low levels of physical exercise and weak or null among those who engage in high levels of exercise.*

Method

Participants and Procedures

This study was reviewed and approved under expedited procedures by the Institutional Review Board at Northern Illinois University (protocol #HS13-0296) and complies with APA ethical standards for the treatment of participants. We recruited 213 MBA students who worked full-time to participate in our study. Employees first completed a survey asking about their experiences of workplace undermining from their supervisor (i.e., at Time 1).[1] One week after completing the survey, participants were given a GT3X+ actigraph—an activity monitor that estimates sleep-wake cycles and physical movements—and were instructed to wear it on their non-dominant wrist for one week. Among healthy adult populations, actigraphy data has been widely used and has demonstrated acceptable reliability and validity (Sadeh, 2011). Moreover, the device used in the present study has been established as a reliable and valid measure of sleep

and physical activity (e.g., Cellini, Buman, McDevitt, Ricker, & Mednick, 2013; Robusto & Trost, 2012; Santos-Lozano et al., 2013; Trost, McIver, & Pate, 2005).

At the end of the week, employees returned the actigraphs and completed a second survey regarding their sleep and exercise behavior (i.e., at Time 2).[2] At Time 2 we also sent an email to a cohabitant of the 171 employees who provided their contact information in the initial survey. Thirty-three employees did not provide cohabitant information because they lived alone, five did not have contact information, and four did not wish to participate further. Of the cohabitants contacted, 118 (69%) responded to the survey. Cohabitants were primarily spouses (72.9%) but also included other relatives (6.7%), roommates (11.9%), and friends (3.4%).[3] Six participants (5.1%) chose not to answer this question.

The final employee sample (n = 118) was largely male (61%) and White (73%), with an average age of 32 years (SD = 7.01). Respondents reported working 42 (SD = 9.87) hours per week, on average, and had been in their current job for about 4 years (SD = 3.65). Common occupations reported were finance, accounting, marketing, sales, engineering, and general management positions.

Measures

The data used for this study were part of a broader data collection effort and this is the first publication from this work**.** The measures presented below were the focus of the current study's research questions and associated analyses.

Supervisor undermining. In the first survey, employees indicated the frequency (1 = *never;* 6 = *everyday*) with which they were undermined by their supervisor during the past six months using Duffy et al.'s (2002) 13-item measure. Sample items include "Your supervisor put

you down when you questioned work procedures" and "Your supervisor did not give as much help as promised."

Sleep quality. Employee sleep quality was measured with both subjective reports and objective actigraph data. The subjective measure consisted of four items from Jenkins, Stanton, Niemcryk, and Rose (1988) that describe symptoms of restless sleep (e.g., "woke up several times during the night") experienced during the past week. Responses were reported on a 5-point scale (1 = *to a very small extent*; 5 = *to a very large extent*), with higher scores indicating poorer *self-reported sleep quality*. To measure objective sleep quality, participants wore actigraph devices that same week (7 days) to gauge their sleep-wake patterns. Consistent with prior research (e.g., Barnes, Schaubroeck, Huth, & Ghumman, 2011; Wagner et al., 2012), sleep scores were calculated using the Sadeh algorithm (see Sadeh, Sharkey, & Carskadon, 1994) in ActiLife Version 5.10. *Sleep efficiency* refers to the ratio of time asleep to time in bed. *Time awake after sleep onset* refers to the number of minutes awake during the sleep period. *Number of awakenings* refers to the number of times the participant woke up during the sleep period. Daily values were averaged across the week for each person. Higher scores on time awake after sleep onset and number of awakenings, and lower scores on sleep efficiency, indicate poorer sleep quality.

Exercise. Employee exercise was likewise assessed with subjective and objective measures. Participant *self-reported exercise* was measured via the Leisure Time Exercise Questionnaire (Godin & Shepherd, 1985), which asks participants to indicate the number of times they engaged in (a) mild, (b) moderate, and (c) strenuous exercise (e.g., walking, jogging) for at least 15 minutes over the past week. Activity scores were determined with the following formula: (9 x strenuous activity) + (5 x moderate activity) + (3 x light activity), where a score of

24 units represents the minimum recommended amount of physical activity (Department of Health and Human Services, 2008; Godin, 2011). Using the Freedson algorithm (Freedson, Melanson, & Sirard, 1998), the actigraph devices recorded participants' objective exercise activity, which included the *number of daily steps* and *daily energy expenditure* (i.e., number of kilocalories expended). Daily values were averaged across the week for each person. Higher scores on all measures reflect higher physical exercise levels.

Home undermining. Using Hoobler and Brass's (2006) six-item measure, cohabitants reported the extent to which employee respondents took out their work frustrations on them at home over the past week (e.g., "He/she often takes negative work emotions out on me"). Response options were on a Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*).

Data Analyses

We tested our hypotheses with an SPSS macro developed by Hayes (2013). We used the macro to produce regression coefficients and bias-corrected and accelerated 95% confidence intervals from 10,000 bootstrap samples. To illustrate the conditional indirect effects, we plotted the effects at high (+1 standard deviation) and low (-1 standard deviation) levels of the hypothesized moderator variable and conducted simple slope analyses based on procedures described by Edwards and Lambert (2007). Because we assessed sleep with four and exercise with three measures, in all we estimated 12 total models. We report results from each model estimated independently given potential collinearity issues and because we were interested in testing the independent (rather than unique) effects of our sleep and exercise measures. In response to a comment from the review team, we also tested models that included all four sleep quality indicators simultaneously; results were unchanged.

Results

Descriptive statistics and bivariate associations among study variables are reported in Table 1.

Hypothesis 1 posited that poor sleep quality would transmit the effects of supervisor undermining on home undermining. As shown in Table 2, supervisor undermining was associated with poorer subjective sleep quality (b = .45, SE = .20, p < .05), which was in turn associated with greater home undermining (b = .26, SE = .08, p < .001). Supervisor undermining was not associated with objective sleep quality measures (*n.s.* results for efficiency, wake after sleep onset, awakenings), which were likewise unrelated to home undermining. Bootstrapping results further demonstrated that supervisor undermining indirectly influenced home undermining through self-reported sleep quality (ab = .12, CI_{95} = .02, .33) but not through objective sleep quality indicators (all CIs included zero). These findings provide some support for Hypothesis 1, as they revealed indirect effects with the subjective indicator of sleep quality.

Hypothesis 2 proposed that exercise would moderate the indirect effect of supervisor undermining on home undermining through poor sleep quality. As seen in Table 3, bootstrapping results revealed that the indirect effects of supervisor undermining on home undermining via subjective sleep quality were significantly different from zero at low levels of self-reported exercise (ab = .15, CI_{95} = .03, .41), daily steps (ab = .18, CI_{95} = .03, .44), and energy expenditure (ab = .17, CI_{95} = .04, .43), but not at high levels of subjective or objective exercise. Figure 2 further shows that the indirect effects were significant at mean levels of the moderator variables and, moreover, that they were mitigated around 57 units of self-reported exercise, 10,500 steps, and 2,100 kilocalories. As with Hypothesis 1, none of the models involving objective indicators of sleep quality demonstrated conditional indirect effects, thus failing to support our

expectations. These results provide some support for Hypothesis 2, as conditional indirect effects were observed when assessing sleep quality via self-reports.

Discussion

The current study was predicated on the idea that there may be more than one reason why individuals who are undermined at work might engage in similar behaviors at home. To date, this sort of work-home undermining spillover/crossover has only been explored from the perspective of displaced aggression (Hoobler & Brass, 2006). In testing an alternative to this line of reasoning, we drew on self-regulation theory to understand and explain how employees' sleep quality and exercise levels influence the association between work and home undermining. We proposed and tested our conceptual model in response to calls to better understand "when and why [self-regulatory impairment] occurs" (Masicampo et al., 2014, p. 638). We found that undermining experienced from supervisors was positively associated with poor subjective sleep quality, which in turn was positively associated with home undermining. Moreover, we found that employees who more frequently exercised were less likely to perpetuate undermining behavior at home. Overall, the results suggest self-regulation theory is another lens through which work-home undermining spillover/crossover can be understood.

We extend research on social undermining and the work-home interface by investigating self-regulation impairment and improvement mechanisms as potential explanations for work-home undermining spillover/crossover. Departing from the prevailing theoretical perspective to understand this transmission of behaviors across domains (i.e., displaced aggression), our results support the notion that individuals undermined at work (i.e., by their supervisor) engage in undermining at home because their ability or motivation to maintain functional, supportive relationships with household members is impaired by resulting sleep difficulties. Our findings

likewise demonstrate such impairments can be diminished when individuals maintain comparatively higher levels of exercise. These results substantiate research suggesting the work-home interface should be examined through a self-regulatory lens (e.g., Grawitch, Barber, & Justice, 2010; Rothbard, 2001) and are consistent with recent work exploring self-regulation in other work-home spillover processes (e.g., Courtright, Gardner, Smith, McCormick, & Colbert, 2015; Unger, Sonnentag, Niessen, & Kuonath, 2016). As research has only recently begun to conceptualize workplace undermining as an experience that reduces self-regulatory restraint (Lee et al., 2016), our findings further support the adoption of such a perspective for future investigations of social undermining.

The present study also contributes to the undermining and self-regulation literatures by highlighting the importance of sleep and exercise in the undermining spillover/crossover process. Indeed, little work has explored the role of sleep and exercise in relation to social undermining, despite assertions that physiological factors must be considered to fully understand self-regulatory impairment and improvement (Evans et al., 2015). In this respect, our results not only corroborate the limited research showing that workplace mistreatment is associated with sleep problems (Rafferty et al., 2010) and that exercise can mitigate the extent to which individuals mistreat other organization members in response to experienced work stress (Burton, Hoobler, & Scheuer, 2012), but they also extend this line of research by demonstrating that the process by which undermining victims become perpetrators can occur *across contexts*—namely, that victims of undermining at work are more likely to engage in undermining at home (cf. Lee et al., 2016).

Our use of subjective and objective measures of sleep and exercise also provides a few points worth noting. Our findings that self-reported but not objective indicators of sleep quality

transmitted the influence of undermining from work to home are consistent with research suggesting sleep benefits accrue as long as people *think* they got a good night's sleep (Akerstedt et al., 2002). Indeed, self-reported sleep quality may be a more useful indicator of self-regulation impairment because it directly assesses the degree to which individuals actually feel refreshed after the sleep period. Although speculative, self-reported sleep quality could better reflect employees' self-regulatory motivation, whereas objective sleep indicators might correspond more closely with their self-regulatory abilities. In light of recent debate about the specific mechanisms responsible for self-regulation (i.e., capacity versus motivation; e.g., Evans et al., 2015; Inzlicht & Berkman, 2015), we encourage future researchers to explore these possibilities. Moreover, evidence across both subjective and objective measures of exercise indicated that high levels of physical activity could reduce the likelihood that individuals undermined at work perpetuate this harmful behavior at home. Specifically, our results revealed that workplace undermining is associated with poorer (perceived) sleep quality and in turn greater home undermining, but only among individuals who reported exercising less, took comparatively fewer steps each day, and expended less energy. In this respect, the use of multiple measures of sleep and exercise allowed us to assess one aspect of our findings' generalizability.

Study Limitations and Future Research Directions

We acknowledge the present study's limitations, which may be viewed as providing opportunities for further research on work-home undermining spillover/crossover. First, the variance accounted for by our models is relatively small; thus, researchers interested in work-to-home undermining effects could benefit from considering other theoretical perspectives or methodological strategies. One suggestion is to design studies that simultaneously test self-regulatory, displaced aggression, or other perspectives to better understand the work-home

spillover/crossover process. Such a study might, for example, test multiple intervening variables that reflect different underlying theoretical mechanisms (cf. Wo, Ambrose, & Schminke, 2015) proposed to link work and home undermining.

Other opportunities for future research stem from the static nature of our study design. Whereas the present study focused on between-person relationships, recent research demonstrates that workplace mistreatment, sleep quality, and exercise levels can fluctuate over time (e.g., Barnes et al., 2015; Taylor, Bedeian, Cole, & Zhang, 2014). Accordingly, additional longitudinal studies—i.e., those that employ repeated measures designs—are necessary to explore dynamic relations among undermining behaviors, sleep, and exercise, and whether their effects change or accumulate over time. For example, physical exercise might have different effects on acute experiences of poor sleep quality compared to chronically poor sleep. We encourage future researchers to conduct studies employing an experience sampling methodology (ESM) to explore these possibilities.

In a related vein, future research might also investigate the timing and duration of self-regulatory processes and their effects, as these two temporal factors are poorly understood in organizational research (Mitchell & James, 2001; Pitariu & Ployhart, 2010). From previous research, one might expect that self-regulatory impairment from poor sleep would occur on a daily basis, whereas self-regulatory improvement from exercise might take longer (i.e., weeks) to be realized. Such differences might explain an important distinction between two kinds of self-regulatory strength observed in prior research: power and stamina (Baumeister & Tierney, 2011). Other scholars have likewise noted the utility of examining self-regulatory processes within-persons to assess the timing of effects (Masicampo et al., 2014) and how such effects unfold over time (Evans et al., 2015). As such, these temporal issues deserve attention in future research.

A final avenue for future research involves examining other spillover/crossover effects beyond the indirect crossover (i.e., home undermining) assessed in this study. Whereas spillover is an intra-individual transmission process (e.g., one's undermining experiences at work influence his or her undermining behavior at home), crossover is an inter-individual transmission process whereby one person's experience influences the feelings and behaviors of another person (Westman, 2001). Research has shown, for example, that experiences of workplace mistreatment can *directly* cross over to affect the employee's partner—specifically, the partner's marital satisfaction and family-work conflict (i.e., work-related stress interfering with family activities; Ferguson, 2012). Thus, scholars may wish to extend our model by exploring other outcomes of the indirect crossover process. Alternatively, future studies might investigate whether cohabitants' experiences of home undermining similarly impair self-regulation and subsequently lead them to engage in undermining or other behaviors (e.g., withdrawal, reduced citizenship) at their workplace. In other words, we suggest that more research examines undermining spillover/crossover in the opposite direction—i.e., from family to work (see Courtright et al., 2016).

Practical Implications

In light of reports from the Centers for Disease Control and Prevention (CDC, n.d., a, b) that inadequate sleep and physical activity affect tens of millions of American adults, our results provide important implications for managers and organizations. Advances in technology have made health tracking de rigueur in recent years, and our findings expand the utility of two such technologies. First, organizations could administer fitness trackers (similar to the actigraphy devices used in the present study) to help employees be mindful of their health and to encourage more physical activity. These devices can likewise be used to track and improve sleep patterns

(e.g., Bort, 2015). Initial reports indicate some organizations have seen social and financial improvements from tracking health activities (Weber & Silverman, 2014). Second, organizations might offer employees active workstations (i.e., "treadmill desks"), as individuals working at them report higher task satisfaction and less stress than those in seated or standing workstations (Sliter & Yuan, 2015). Perhaps the benefits of active workstations could "spill" or "cross" over to the home domain—namely, by reducing contributions of workplace mistreatment and poor sleep to home undermining.

Managers could also implement organization-level strategies aimed at promoting employee health (viz., sleep quality and physical activity) and reducing harmful workplace behaviors. To lessen the detrimental effects of self-regulation impairment (e.g., via poor sleep quality), organizations might implement sleep-friendly work schedules or programs that encourage employees to develop and maintain healthy sleep and exercise habits (e.g., as recommended by Caldwell, Caldwell, & Schmidt, 2008). Given that aggressive climates can contribute to employees' experiences of personal mistreatment (e.g., Yang, Caughlin, Gazica, Truxillo, & Spector, 2014), organizations would also do well to create work climates in which mistreatment is less likely. To do so, Chang, Eatough, Spector, and Kessler (2012) recommend training managers to establish clear policies, respond promptly to reported incidents of mistreatment, and prioritize employee safety. Our findings suggest such organizational efforts to reduce workplace mistreatment could improve relationships at both work and home.

Our results also offer guidance to managers seeking to realize the value of employee sleep and exercise. In the present study, employees who reported exercising more than two times the amount recommended by the Department of Health and Human Services (2008; i.e., 57 units compared to the suggested 24 units) were less likely to experience self-regulatory impairment

effects. Similarly, employees who recorded over 10,500 steps were more resistant to self-regulatory impairment effects than those recording fewer steps. This finding is particularly compelling given recommendations from the CDC (see Rettner, 2014) and the American Heart Association (2014) to walk between 8,000 and 10,000 steps per day. Our results likewise indicate that individuals who burned over 2,100 kilocalories each day were significantly less susceptible to the detrimental effects of workplace undermining and poor sleep quality than those who expended fewer kilocalories. By way of comparison, it takes approximately 3,500 kilocalories below caloric needs to lose a pound of body fat (Department of Health and Human Services, 2005). The present research also suggests that an increase in approximately 587 kilocalories expended, on average, can substantially reduce harmful effects of workplace undermining. For the average American male (195 lbs; wikipedia.org), such gains could be achieved with an hour of swimming (moderately-paced freestyle; www.active.com) or a 90-minute walk (3.5 mph; pedbikeinfo.org). By focusing on the influences of sleep and exercise, we hope our work informs future research and practice on reducing mistreatment at work and home.

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Footnotes

[1] Employee participants also reported coworker undermining. Results of hypothesis testing with coworker undermining are similar to those for supervisor undermining and available upon request.

[2] In anticipation of missing sleep and exercise data at Time 2, we also measured self-reported sleep quality and exercise on the first employee survey (i.e., at Time 1). Our intent behind this strategy was to treat Time 1 sleep and exercise scores as auxiliary variables, which can be employed in regression imputation to predict missing sleep and exercise values at Time 2 (see Graham, 2009). Indeed, four individuals were missing self-reported sleep and exercise data at Time 2. Objective exercise scores were also missing for participants who did not wear their actigraphs with enough consistency to register reliable step counts (n = 15 missing for steps). An additional 13 people did not report their weight, which is necessary to calculate energy expenditure (n = 28 missing for energy expenditure). Missing data for objective sleep quality (n = 12) could not be imputed because no variables measured in the first employee survey significantly correlated with actigraphy measures of sleep quality at Time 2.

[3] Although the composition of our cohabitant sample (79.6% family members) is similar to that reported in prior research on "family" undermining spillover (i.e., Hoobler & Brass, 2006, 75% family members), we performed some analyses to determine if our results were influenced by the cohabitant's relationship status. We first tested whether the relationship between work and home undermining was affected by rating source (i.e. family member vs. non-family member), either as a moderator or covariate. Results revealed that cohabitant source did not moderate the work-home undermining relationship, nor did it qualify as a relevant covariate (i.e., it was not associated with home undermining). We then tested our hypotheses on the subset of our sample (n = 94) comprised only of family members. Results were the same as those reported in the Results section. Results were likewise unchanged when we imputed home undermining scores for cases missing this data from cohabitants (n = 159).

Table 1

Correlations among Study Variables

Variable	*M*	*SD*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
1. Supervisor Undermining	1.28	0.52	**0.93**								
2. Subjective Sleep Quality	2.78	1.14	0.21*	**0.74**							
3. Subjective Exercise	28.58	28.72	-0.08	-0.12	--						
4. Home Undermining	2.00	0.94	0.09	0.32**	-0.14	**0.94**					
5. Objective Sleep Quality (Efficiency)	83.66	7.19	-0.07	0.01	-0.01	0.25*	--				
6. Objective Sleep Quality (Wake After Sleep Onset)	63.38	32.46	0.11	0.06	0.01	-0.21*	-0.90**	--			
7. Objective Sleep Quality (Awakenings)	18.51	6.04	0.09	0.18	-0.02	-0.04	-0.47*	0.61**	--		
8. Objective Exercise (Steps Taken)	8933.59	2023.96	0.06	-0.01	0.20*	-0.05	-0.07	0.03	-0.09	--	
9. Objective Exercise (Energy Expenditure)	1756.49	586.73	0.12	-0.13	0.04	-0.03	-0.12	0.04	-0.15	0.58*	--

Note. $N = 118$ for all variables except actigraph-recorded sleep quality (5-7; $N = 106$). Cronbach's alphas for multi-item measures are shown on the diagonal.

* $p < .05$, ** $p < .01$

Table 2

Indirect Effects of Supervisor Undermining on Home Undermining via Each Indicator of Sleep Quality

	Decomposed effects				Indirect effects				
Mediator (M)	*a*	*b*	*c*	*c´*	Boot *ab (SE)*	Lower	Upper	*F*	R^2
Subjective sleep quality	0.45 (0.20)*	0.26 (0.08)**	0.16 (0.17)	0.04 (0.16)	0.12 (0.07)	0.02	0.33	6.43**	0.10
Objective sleep quality (efficiency)	-0.92 (1.28)	0.03 (0.01)	0.14 (0.17)	0.17 (0.17)	-0.03 (0.07)	-0.19	0.08	3.81*	0.07
Objective sleep quality (wake after sleep onset)	6.71 (5.74)	-0.01 (0.01)	0.14 (0.17)	0.18 (0.17)	-0.05 (0.07)	-0.24	0.06	3.13*	0.06
Objective sleep quality (awakenings)	0.97 (1.07)	-0.01 (0.02)	0.14 (0.17)	0.14 (0.17)	-0.01 (0.02)	-0.11	0.01	0.46	0.01

Note. N = 118 for subjective sleep quality, N = 106 for objective sleep quality. *a* = first-stage effect of predictor X on mediator M; *b* = second-stage effect of M on Y, controlling for X; *c* = total effect of X on Y; *c´* = direct effect of X on Y. Unstandardized regression coefficients are reported, standard errors shown in parentheses. Boot *ab* = bootstrapped indirect effect. Lower and Upper values are bias-corrected and accelerated 95% confidence intervals. F and R^2 values are for the full model.

* $p < .05$, ** $p < .01$

Table 3

Conditional Indirect Effects for Moderated Mediation Analyses

Supervisor undermining effects on home undermining	Low Exercise		High Exercise	
	Boot *ab* (*SE*)	BCa CI_{95}	Boot *ab* (*SE*)	BCa CI_{95}
Supervisor undermining effects on home undermining				
via subjective sleep quality				
Subjective exercise*	0.15 (0.09)	0.03; 0.41	0.06 (0.06)	-0.02; 0.24
Objective exercise (steps)*	0.18 (0.10)	0.03; 0.44	0.03 (0.05)	-0.04; 0.18
Objective exercise (energy)*	0.17 (0.07)	0.04; 0.43	0.05 (0.07)	-0.05; 0.26
via objective sleep quality (efficiency)				
Subjective exercise	-0.05 (0.10)	-0.28; 0.14	-0.02 (0.05)	-0.18; 0.37
Objective exercise (steps)	-0.04 (0.09)	-0.27; 0.12	-0.02 (0.05)	-0.19; 0.05
Objective exercise (energy)	-0.03 (0.06)	-0.19; 0.07	-0.03 (0.08)	-0.26; 0.09
via objective sleep quality (wake after sleep onset)				
Subjective exercise	-0.05 (0.09)	-0.31; 0.08	-0.03 (0.07)	-0.27; 0.04
Objective exercise (steps)	-0.05 (0.09)	-0.32; 0.08	-0.03 (0.06)	-0.23; 0.03
Objective exercise (energy)	-0.03 (0.06)	-0.22; 0.04	-0.06 (0.11)	-0.37; 0.09
via objective sleep quality (awakenings)				
Subjective exercise	-0.01 (0.03)	-0.14; 0.31	-0.01 (0.03)	-0.12; 0.01
Objective exercise (steps)	-0.01 (0.03)	-0.16; 0.02	0.00 (0.03)	-0.10; 0.04
Objective exercise (energy)	0.00 (0.03)	-0.10; 0.04	-0.02 (0.04)	-0.20; 0.02

Note. $N = 118$ for self-reported data, $N = 106$ for actigraphy data. Boot *ab* = bootstrapped indirect effect. Unstandardized regression coefficients reported, based on bias-corrected and accelerated confidence intervals (BCa CIs). Confidence intervals that do not include zero are marked with an asterisk (*) and indicate support for indirect effects.

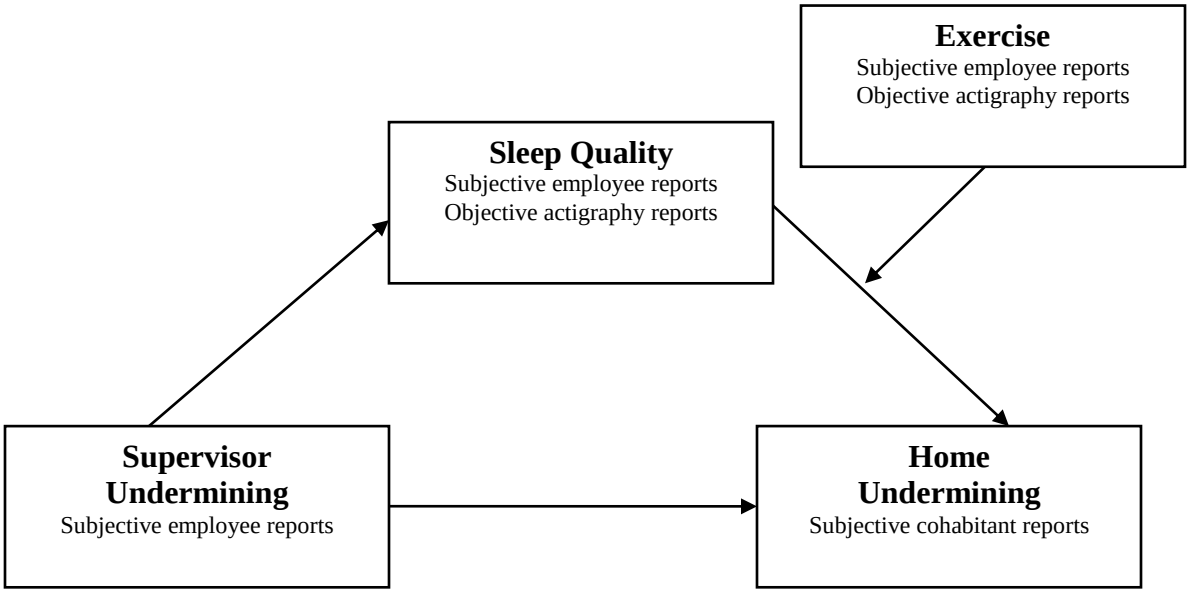

Figure 1: Hypothesized model and source of measurements.

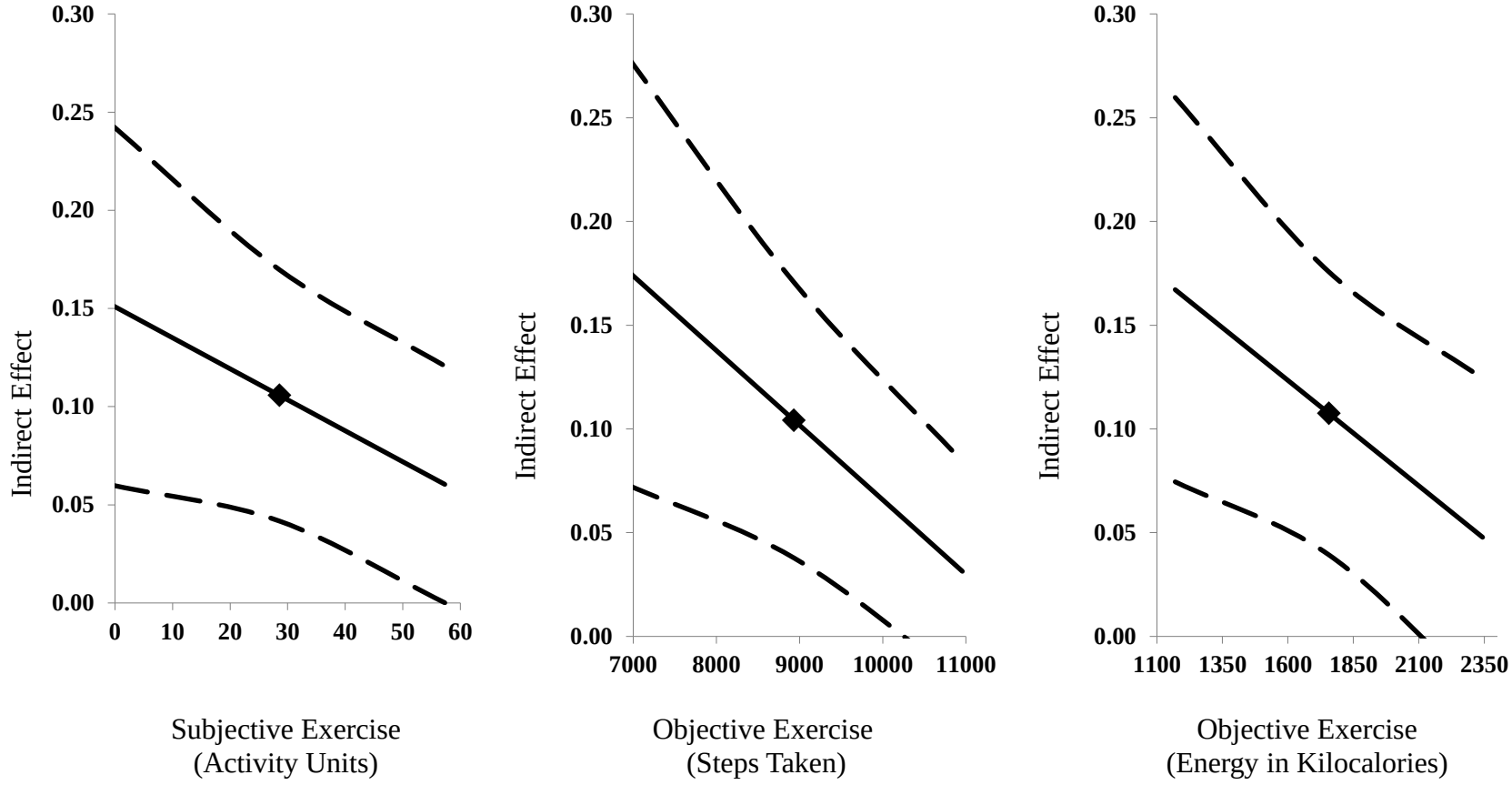

Figure 2: Conditional indirect effects for subjective and objective measurements of exercise. The solid line represents indirect effect estimates at each level of the moderator (mean level indicated by center diamond) and the dashed lines represent 95% confidence intervals from 10,000 bootstrap samples. The effect of supervisor undermining on home undermining (via subjective sleep quality) was significant at low and moderate exercise levels, but not at high exercise levels.