Sleep, Energy, and Work to Family Spillover: A Positive Perspective

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In 2014 it was reported that over one-third of adults in the United States were getting less than 7 hours of sleep on any given day (Center for Disease Control and Prevention, 2014). This is problematic as it is recommended that adults between the ages 18 and 64 get between 7 and 9 hours of sleep each day (National Sleep Foundation, 2015). Thus, there is a troubling disparity between the amount of sleep that American adults *should* be getting and the amount of sleep that they are *actually* getting. Furthermore, problems with sleep (e.g., lack of sleep) have independently been tied to both fatigue (Gander et al., 2017) and work-family conflict (WFC; Nylen et al., 2007). Although past research has found that poorer sleep quality and lower levels of sleep quantity are associated with more WFC (Crain et al., 2014), less research has examined associations between sleep and positive work-non work experiences (e.g., positive work-family spillover; Crain et al., 2018). Positive work-to-family spillover (PWFS) refers to the transfer of affect, values, skills, and behaviors from the work to the family domain (Edwards & Rothbard, 2000). Thus, the goal of the current paper is to utilize longitudinal data to better understand the relationships between sleep quality/quantity, workplace burnout, and positive work-to-family spillover across time.

Work, Nonwork, Sleep Framework

The Work, Nonwork, and Sleep (WNS) framework from Crain, Brossoit, and Fisher (2018) offers a unifying work-family framework that focuses on the important role of sleep (i.e., the three aforementioned "main areas" of life: work, family, and sleep). This is in contrast to most other work-family theories that only cover two areas (work and nonwork). Broadly

speaking, this framework suggests that sleep quality and quantity impact work and nonwork domains (upstream) which in turn impact later sleep quality and quantity (downstream).

Moreover, the WNS framework is comprehensive because it integrates underlying resource mechanisms such as human energy that are suggested to play a crucial role in the relationship between sleep, work, and nonwork. Human energy is broken down into two distinct categories: physical energy (i.e. the capacity to do work) and energetic activation (e.g. vitality, vigor, and enthusiasm). Energetic activation can take the form of brief episodes, such as emotions towards something or someone, be slightly longer lasting (e.g., a mood), or even be a much longer lasting disposition, which are considered to be more stable over time (Quinn et al., 2012). In total, the framework posits that sleep positively influences resources such as energy, which in turn positively influences work/nonwork (e.g., attitudes, behaviors, and states). In other words, energy may play a mediation role between sleep and the work/nonwork domains which then influences further resource gain, impacting future sleep (Crain et al., 2018). For example, an employee may receive a very good night's rest, which then could lead to that employee feeling as if they have more emotional resources to expend at work, which would then aid in the transfer of a good mood from work to home. Following this, the employee would then likely feel as if they have even more resources to expend, thus resulting in better future sleep.

Workplace Burnout and Positive Work-to-Family Spillover

Workplace burnout can be measured via three distinct dimensions: emotional exhaustion, depersonalization, and diminished personal accomplishment (Lee & Ashforth, 1996). The relevant component for the purpose of the current paper, emotional exhaustion, is when a person exhausts all emotional resources and feels as though they have nothing left to give on a psychological level (Maslach & Florian, 1988). In other words, a person experiencing emotional

exhaustion would have less psychological vigor or energy. Thus, burnout is equitable to energetic activation in that both pertain to a person's perception of being energized.

There has been a limited, albeit growing, amount of literature on the relationship between burnout and PWFS. Predominantly negative associations have been demonstrated between PWFS and burnout, such that those who have more PWFS experience less job-related exhaustion on average (Kinnunnen et al., 2006; Lee et al., 2016). Additionally, past research has investigated less direct paths between PWFS and burnout. For example, past cross-sectional research has shown that work-to-family enrichment (a related construct to PWFS; Masuda et al., 2012) enhanced engagement (the inverse of burnout) through an increase in worker's job resources (Haar et al. 2018). Similarly, using cross-sectional data, it was demonstrated that job resources were positively related to work-to-family enrichment, consequently decreasing feelings of job burnout in secondary school teachers (Liu & Cheung, 2015).

Importantly, using longitudinal data from Norwegian workers, Innstrand et al. (2008) revealed significant lagged effects from work-to-family facilitation (a construct related to PWFS) to future exhaustion (i.e. burnout), such that high levels of work-to-family facilitation were associated with lower levels of future exhaustion. The same study also found significant lagged negative effects from exhaustion which were related to future decreased work-to-family facilitation. It should be noted that in Innstrand et al.'s model, work-to-family facilitation was a stronger predictor of burnout than the inverse. However, as this is only one study, it is imperative that more research be done to gather a better understanding of the temporal ordering of these variables. Thus, based on the limited amount of evidence and the theoretical underpinnings of Crain et al.'s (2018) WNS it is assumed that burnout will likely predict future PWFS.

Sleep and the Work-Family Interface

There has been a large amount of cross-sectional research that focuses on the associations between sleep quality and work-family conflict. Past research on this topic has demonstrated negative associations between work-family conflict and sleep quality, such that those that experience more work-family conflict report worse overall sleep quality (see Buxton et al., 2016; Nylén, et al., 2007; Sekine et al.,2006). Moreover, using longitudinal data Jacobsen et al. (2014) found that more work-family conflict predicted sleep insufficiency after a 2-year time lag.

There has been less frequent research on the associations between sleep quantity and work-family conflict. Past cross-sectional research has demonstrated that both objective and subjective measures of sleep quantity are negatively associated with work-family conflict, such that those who experience more work-family conflict have shorter sleep durations (Crain et al., 2014). Similarly, it has been shown that increased work-to-family conflict (WTFC) and family-to-work conflict (FTWC) are both associated with low levels of sleep quantity (Eshak, 2019). Interestingly, Berkman et al., (2015) found that higher levels of family-to-work conflict was related to shorter sleep duration, but, higher work-to-family conflict was related with longer sleep duration. For many of these studies, sleep quality and quantity are often the investigated outcome variables – even if data is measured cross-sectionally (Crain et al., 2018). In contrast, using daily diary data, Lee et al. (2017) found that poorer sleep quality preceded more next-day work-to-family conflict, but did not find WTFC to predict nightly sleep quality. Using a mediation model, another study also found a similar temporal ordering with poor previous night sleep quality predicting more WTFC through decreased work productivity (Lawson & Lee, 2018). Thus, although there is evidence that the work-family interface has implications for future sleep, it is less clear whether sleep may be associated with future work-family interactions. Using Crain et al.'s (2018) WNS model, the current study will focus on the understudied "upstream"

effects of sleep on the work-family interface, rather than the "downstream" effects of the work-family interface on future sleep.

Despite sleep and work-family conflict being well-studied, less research, however, has examined the associations between sleep quantity/quality and positive work-to-family spillover (Crain et al., 2018). Positive work-to-family spillover refers to the transfer of affects, values, skills, and behaviors from the work to the family domain (Edwards & Rothbard, 2000). For example, an employee in a positive mood at work may ultimately be in a better mood at home after the work day ends. This focus on the positive side of work-family spillover is important because it allows for a more complete picture of the occurrences between domains. That is to say, the positive perspective allows for the focus of individual strengths (i.e., potential) rather than weaknesses (e.g., impairment; Greenhaus & Powell, 2006). Specifically, the current study focuses in on the transfer of positive affect from work-to-family.

There has been a very limited amount of research on the topic of sleep and PWFS. The results from these studies are also largely mixed. Using cross-sectional data, Williams et al., (2006) found a positive association between positive family-to-work spillover and self-report sleep quality, such that those with better sleep quality experienced more positive family-to-work spillover on average. However, in the same study no significant association was found between positive work-to-family spillover and sleep quality. In slight contrast to these findings, using longitudinal data, Vedaa et al. (2016) found positive work-to-family spillover (but not positive family-to-work) to be a significant predictor of fewer insomnia symptoms after a 2-year period. Last, using cross-sectional data, Magee (2018) found no direct association between work-family enrichment and sleep quality, but did find that work-family enrichment was indirectly related to sleep quality via either a positive or negative hedonic balance.

Present Study & Hypotheses

Using a longitudinal sample of IT workers, the present study will examine both workplace burnout and sleep as a predictor of PWFS. This type of research is important in that it focuses on the understudied "positive psychology" portion of the work-family interface and its relation to sleep. As previously stated, the negative side of the interface (conflict) is well-studied, but only offers a limited view when examining how the work and family domains interact. Furthermore, the present study is one of the first within the positive work-family literature to examine both sleep and burnout simultaneously, as proposed by Crain et al.'s (2018).

Last, the present study uses longitudinal data compared to the cross-sectional nature of most previous studies, which only offer a snapshot of the phenomenon. This is important because research shows that sleep, burnout, and work-family processes are not static and can vary across time (Alarcon, 2011; Buysse et al., 2010; Lawson et al., 2014). For example, work assignments may change over time, and children grow older and require different types and level of care. This would likely have an impact on the patterns of associations between work-family variables. Thus, by using longitudinal data with multiple time points, environmental factors (e.g., assignments at work) and individual factors (e.g., gender) are controlled for.

The following predictions are based off of past research and Crain's (2018) WNS theory,

Hypothesis 1: It is hypothesized that burnout will be negatively associated with positive work-to-family spillover, such that on average, those that experience less burnout will have higher levels of PWFS.

Hypothesis 2: It is hypothesized that PWFS will significantly change over time.

Hypothesis 3: It is hypothesized that sleep quality and quantity will be positively associated with PWFS, such that on average, those with better sleep will have higher levels of PWFS.

Method

Participants

The present study used control group data from a larger longitudinal study designed to examine the effects of a workplace intervention on work, family, and health. Put forth by Work, Family, Health Network (WFHN), the aim of this intervention was to improve the health and wellbeing of information technology employees as well as their families by increasing family-supportive supervisor behaviors and employees' schedule control. The WFHN utilized a multi-site, randomized controlled trial to investigate the intervention effects (see Bray et al., 2013 and King et al., 2012 for more information about the larger project).

The current study only used the control sample from the study because the intervention was designed to influence the variables of interest. The sample for the current project will include employees from a broad range of information technology positions, including software development engineer, IT project manager, IT analyst, etc. A total of 503 employees completed all waves (basline, 6-, 12-, and 18-month follow-ups) of the survey and actigraphy assessments (described below). After removing those in the intervention condition from the dataset and using partial completion data, there were a total of four hundred (n = 400; 150 female, 250 male) usable participants. The female to male distribution was expected given the population of IT workers. The average age of participants was 45.33 years (SD = 9.28). It should be noted that a large majority of participants (66.83%) identified as White with the remaining 33.17%

identifying as nonwhite (e.g., Black, Asian, Hispanic, etc.). Furthermore, there were a range of different annual household incomes reported by participants in the larger study, but a large portion (25.9%) reported having an income of 150,000 or more. Problematically, as will be discussed later, a large portion (43.5%) of participants reported having no children in the home at least four days a week.

Data Collection

Data from the larger study was collected during paid company time. Computer assisted trained field interviewers collected data at four different time points: baseline (pre-intervention), 6-month, 12-month, and 18-month follow-ups. During the 60-minute worksite interviews, demographic, workplace, family, and health information were collected. For each completed wave, participants were compensated with $20. Following the completion of the personal interview, actigraphy watches were introduced and explained to the participants. The purpose of these watches was to collect objective sleep data. Those that agreed to wear the sleep monitor (Spectrum, Respironics-Phillips, Murrysville, PA) were instructed to keep the watch on their nondominant wrist for a week only taking it off under circumstances that the watch could be damaged (e.g., excessive impact or extreme temperatures; Crain et al., 2019). Those that took part in the actigraphy portion of the study gained an additional $20 per wave, totaling $40 per wave for both the interview and the actigraphy process at each assessment (baseline, 6-month, 12-month, and 18-month).

Measures

In line with recommendations from Crain et al. (2018), measures of both sleep quality and quantity were included as they are distinct constructs that are crucial to resource mechanisms (i.e., burnout). In line with recommendations from Crain et al. (2019), both objective and

subjective measures were used, as it is the case that objective actigraphy data is less influenced by common method bias, but cannot fully capture all aspects of sleep quality (e.g., sleep insufficiency).

Sleep Quality

Objective Sleep Quality. The measure of objective sleep quality will utilize a previously established method by Crain et al. (2019) that uses actigraphy sleep data: wake after sleep onset (WASO). In the present study, WASO is the average amount of time (minutes) spent awake during nighttime sleep. Still in line with Crain et al. (2019), the present study also accounted for valid days by calculating WASO as the total amount of wake time divided by the number of valid days. Therefore a final WASO average was calculated for each wave, allowing it to be analyzed in a longitudinal manner.

Of note, a recording was counted as invalid if the watch device had a malfunction resulting in consistent false activity or if the data could not be recovered from the device. Furthermore, individual days could be counted as invalid if a watch error occurred (e.g., battery failure) or if the participant did not adhere to given actigraphy procedure for that day (e.g., keeping the watch off for more than 4 hours during a day). As suggested by Olson et al. (2015), and consistent with Crain et al. (2019), participants were only included in the current studies' analyses if they had 3 or more valid days that could be accounted for. Past validation research that compared actigraphy to the gold standard of sleep research (i.e., polysomnography) found that actigraphy produces highly accurate estimates of WASO when wake time < 30 min., but tends to overestimate when wake time > 30 min. (Marino et al., 2013). This is a limitation specific to WASO.

Subjective Sleep Quality. The subjective sleep quality was measured using a combination of self-report sleep insufficiency (1 question) and insomnia symptom (2 question) related questions. Specifically, the three questions were selected from the full Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1989) that was administered during data collection. See appendix A. Past research has commonly used this combination of items from the PSQI to represent subjective sleep quality (see Buxton et al., 2016; Crain et al., 2019). Furthermore, the following Cronbach's alphas were calculated for each of the waves in the current study: baseline (α = -.17), 6-month (α = -.15), 12-month (α = -.35), 18-month (α = -.40).

Sleep Insufficiency. To measure sleep insufficiency the participants were asked "How often during the past four weeks did you get enough sleep to feel rested upon waking up." This item was measured on a 5-point Likert scale ranging from 1 (*never*) to 5 (*very often*). These items were reversed scored, thus higher scores were indicative of great sleep insufficiency.

Insomnia Symptoms. To measure insomnia symptoms participants were asked "During the past four weeks, how often could you not get to sleep within 30 minutes?" and "During the past four weeks, how often did you wake up in the middle of the night or early morning?" These items were measured on a 4-point Likert scale ranging from 1 (*never*) to 4 (*three or more times a week*). The average score of these questions was then taken as the total insomnia symptom score, with higher scores indicating more frequent insomnia experiences.

Sleep Quantity

Objective Sleep Quantity. The measure of objective sleep quantity will be from the actigraphy sleep data. Actigraphy data have shown to be both reliable and valid (Ancoli-Israel et al., 2003; Marino et al., 2013). Specifically, in line with Crain et al. (2019, p. 186), total sleep time was computed as "the average amount of sleep attained per day in minutes (including naps)

over the course of the study…divided by total number of valid days." Similar to the objective measure of sleep quantity, this allowed an average sleep time to be calculated for each of the different waves. Furthermore, the same variable of valid days that was used to calculate the objective sleep quality was also used to calculate the objective sleep quantity. For rules related to valid days, review the section on objective sleep quality.

Workplace burnout

The emotional exhaustion subscale of the Maslach Burnout Inventory (MBI; Maslach & Jackson, 1986) was used to assess participant's workplace burnout. The subscale administered consisted of three questions with responses ranging from 1 (*everyday*) to 7 (*never*). An example question is "You feel emotionally drained from you work. How often do you feel this way?" (See appendix B for the entire scale). Item scores were averaged together, and higher scores were indicative of more human energy resources. Past research has found the emotional exhaustion subscale of the MBI to be adequately valid (Rafferty et al., 1986). Additionally, in a meta-analysis, it was found that the emotional exhaustion subscale of the MBI has demonstrated consistent coefficient alpha estimates of .80 or higher across numerous other studies (Wheeler et al., 2011). Furthermore, the following Cronbach's alphas were calculated for each of the waves in the current study: baseline (α = .84), 6-month (α = .91), 12-month (α = .92), 18-month (α = .95).

Positive work-to-family spillover

PWFS was measured using the affective subscale of the Multidimensional Scale of Perceived Work-Family Positive Spillover (Hanson et al., 2006). This is a 4-item subscale with responses ranging from 1 (*strongly agree*) to 5 (*strongly disagree*). An example question is "When things are going well at work, your outlook regarding your family or personal life is

improved." (See appendix C for the scale). Item scores were averaged together, and higher scores are indicative of more PWFS. The subdimensions of this scale have been shown to have good reliability with Cronbach's alpha for this measure being between 0.90 and 0.93 (Hanson et al., 2006). This subscale has also been shown to have adequate dimensionality and internal consistency as well as criterion validity (Hanson et al., 2006). Furthermore, the following Cronbach's alphas were calculated for each of the waves in the current study: baseline (α = .86), 6-month (α = .90), 12-month (α = .88), 18-month (α = .92).

Analytic Strategy

The current study will utilize hierarchical linear modeling (HLM) to conduct a longitudinal analysis of the research questions. That is, time, burnout, and sleep quality/quantity (both objective and subjective) will each be used as predictors of the outcome variable—positive work-to-family spillover. For this longitudinal HLM analysis, waves (baseline, 6-month follow-up, 12-month follow-up, 18-month follow-up) were nested within participants.

The analytic strategy for the current study consisted of several steps. First, as described above, totals were calculated for each of the variables of interest. For example, sleep time was calculated as the total amount of sleep attained per day throughout the study, divided by the total amount of valid days registered by the actigraphy watch. Following this, a null model was created using PWFS as the outcome variables. The null model was used as a starting point for all model comparisons. Next, to test the above hypotheses, model 1 was created to predict PWFS from workplace burnout, time, sleep quality, and sleep quantity. Last, for exploratory purposes, a third a final model was created (model 2). This model added demographic predictors to model 1. That is, the time invariant variables (i.e., gender and level of education) were included as predictors of PWFS. These variables were added as predictors to answer the call of Edwards and

Rothbard (2000) to better understand the impacts of individual differences (e.g., gender and gender roles) on linking mechanisms. Despite this call, there has been a lack of research examining gender and WFPS (Straub et al., 2019). Additionally, no empirical research was found on the connections between level of education and PWFS. Thus, the current study included these variables for exploratory reasons. Importantly for model comparisons, each model was nested within the subsequent model. That is, the null model was nested within model 1, and model 1 was nested within model 2. Using a nested structure such as this allows for the use of the Chi squared deviance test to be used for model comparisons. For the specific formulas of each model, see figure 2.

Interestingly, model 1 included only time varying covariates, whereas model 2 included both time varying and time invariant covariates. In other words, model 1 included predictors (e.g., burnout) that varied along with the measurement occasion (i.e., measured at each wave). In contrast, the time invariant variables (e.g., education) added in model 2 were only measured at the baseline data collection period. Thus, all time varying covariates were considered level-1 predictors (measurement level) and all time invariant covariates were considered to be level-2 predictors (participant level).

Results

Table 1 introduces the correlations of the fixed effects as well as the descriptive statistics of the study variables. All correlations between variables were relatively small (between .01 and .26).

To test the above hypotheses, a null model and two random intercepts hierarchical linear models conducted. That is, coefficient estimates, t-values, and model fit indices were calculated. All of the aforementioned inferential statistics can be found in Table 2. Based on a model

comparison statistics, model two ($\chi^2 = 9.72$) was the significantly ($p < .01$) best fitting model to the data. This would imply that the addition of demographic variables likely significantly added to the prediction of PWFS. As indicated in Table 2, the model two results demonstrate that both time ($\beta = -0.03$, $t = -2.67$) and workplace burnout ($\beta = 0.05$, $t = 4.17$) were significant predictors of PWFS. In contrast to hypothesis 1, more workplace burnout was predictive of more PWFS. Interestingly, none of the sleep variables in this model were predictive of PWFS. In line with prediction of significant change from hypothesis 2, time being a significant predictor of PWFS suggest that as time continued, PWFS decreased.

As is indicated in Table 2, the model 2 results demonstrated that both gender ($\beta = 0.13$, $t = 2.52$) and level of education ($\beta = 0.11$, $t = 2.33$) were significant predictors of PWFS. Thus, being male was predictive of having more PWFS. Furthermore, having a higher levels of education were predictive of having more PWFS.

Discussion

The present study set out to examine the relationships between sleep, positive work-family spillover, and emotional burnout over time. Although created based on previous research, the findings of the current study did not support the core hypotheses. For the most part, the findings are in contrast to that of previous research. Although, being one of the first studies to attempt longitudinal effects, the findings are still useful for informing future research on the topic of positive work-family linking mechanisms. First, the lack of significant relationship between PWFS and the sleep variables are in line with the mixed results of a past positive work-family linking mechanism literature. For example, Magee (2018) found no direct association between work-family enrichment and sleep quality. In contrast, Williams et al. (2006) did find an association between positive family-to-work spillover and sleep quality. There are two

reasonable explanations for these null results. First, only linear relationships were measured in the current study. This could explain the lack of findings in that the relationship does not match a linear path and in actuality is cyclical. Second, interactions were not included in the current study, which if included, could find a significant relationship. For example, an interaction between gender and sleep variables. Thus, it is clear that the associations between sleep and positive work-family spillover is still not well understood, and future research is still needed.

Second, the current study found that workplace burnout was a significant predictor of PWFS. However, the current finding was in the opposite direction of the majority of past research. In other words, it was found that having increased burnout was predictive of having more PWFS. This finding is interesting considering past research has primarily demonstrated that those with decreased burnout had more PWFS on average (Kinnunnen et al., 2006; Lee et al., 2016). This finding could potentially be explained by the longitudinal nature of the current study. That is, the current study examined the effects of burnout on PWFS over time. This could suggest that the relationship between burnout and PWFS is much more flexible and prone to change over time than once expected. Thus, more research is needed to flush out the true relationship between burnout and PWFS over time.

Third, the current study found that time was a significant predictor of PWFS. Given that work-family processes are not static across time (Lawson et al., 2014), this finding was expected. The current paper demonstrated that time continuing was predictive of less PWFS. This would suggest over the course of year and half, PWFS decreased on average for participants. Moreover, this finding is interesting because it would suggest the potential for PWFS to decrease with age. Although, this assumption isn't fully supported given the relatively short time frame that the data was collected in. That is, the current study only used an 18 month time span and also modeled

linear change. It is quite possible that the relationship is cyclical in that time impacts PWFS in an on-again/off-again manner. The effects of aging on PWFS should be considered as a path for future research.

Last, the current study found that both education and gender were associated with PWFS. Although these variables were not included in the original hypotheses, the findings are still interesting and interpretable. First, the relationship with gender could possibly be explained by traditional gender roles between men and women. That is, women could feel more responsibility for managing family affairs, and thus could have worse PWFS experience as they are interacting with the family more often. Second, the relationship with education could possibly be explained by the correlation between education and better work benefits. For example, higher paying positions may have access to daycare and thus feel less pull from family. This could make the relationship between work and family easier and as a result more positive in nature.

This research primarily contributes to the literature in three different ways. First, as previously discussed in depth, this research examined the understudied positive side of work-family linking mechanisms. Second, this research used longitudinal data giving one of the first looks into the lasting relationships between burnout and sleep on PWFS. Indeed, the current study demonstrated that many of these effects may be found in cross-sectional research, but not as long lasting as we might have once believed. Finally, this research answers Crain et al.'s (2018) call for holistic research to better understand the collective effects of human energy, sleep, time, and work-family mechanisms. This research was one of the few studies to investigate the upstream effects of the model and can help guide future research.

Although it is our belief that the present study makes a number of contributions, as with any research design, it does not go without limitations. First, the current study was not able to

use the desired statistical procedures that would be required to fully test Crain et al.'s (2018) proposed model. That is, the upstream portion of the WNS model essentially suggests that sleep impacts future energy which in turn impacts future PWFS. However, due to limitations with the sample size, the current study was only capable of predicting future PWFS from sleep and burnout, separately.

Another major limitation in the current study was the measure of the dependent variable, PWFS. One specific item on the PWFS questionnaire could be considered problematic when considering participants that do not have a direct family. The question that asked participants to rate how often "Having a good day at work allows you to feel positive with your family" could be consider confusing for workers without direct family or that do not actively participate in family activities. In fact, 43.5% reporting having zero children in the house. Childcare responsibilities could explain some of the findings in that it is a core component of family responsibilities and could be more taxing on those with children. Although this might seem like a minor flaw, it could have major impacts on the final results of the study.

Third, the present study did not directly investigate specific changes in the variables between each of the time points, but rather focused on the averages across time. Thus, important details or impacts that could occur on a more micro level could have been overlooked. Last, the sample used for the current study had an average household income that exceeds that of the national average, suggesting that the SES of the sample was higher than the average population. Thus, the generalizability of the findings to the general population could be hindered.

We believe this research has several direct implications for future research as well. First, the current study investigated the human energy portion of the WNS framework on PWFS, but it did not investigate other portions such as free time. Future research should consider a more

including the impacts of sleep on free time and energy simultaneously. Furthermore, as previously mentioned, the current study was unable of investigating the direct temporal ordering of effects that were proposed by Crain et al. (2018). Future research should considering setting up a sufficient amount of participants to be able to investigate the exact questions proposed in the WNS framework. That is, sleep impacts energy, which in turn impacts PWFS. Finally, this study was one of the first to investigate the effects of burnout and sleep on PWFS. However, given the number of different positive linking mechanisms found in work-family interface literature (e.g., work-family enrichment or work-to-family facilitation; Edward & Rothbard, 2000), future research should consider integrating these constructs into the WNS model. Although these constructs are similar to PWFS, they are unique and thus may interact with burnout and sleep differently.

Conclusion

The present study offered a unique first glimpse at using the WNS model is relation to the positive portions of the interactions between work and family. We drew from work-family interface theory to demonstrate and explain the impacts of burnout, sleep, and time on PWFS. Indeed, we demonstrated that both time and burnout were predictive of future PWFS. Although the direction of these effects was unpredicted, they still offer important insight into how these variables may interact with PWFS. Thus, it is our hope that this study sheds some light on these factors and spurs future research on the understudied positive side of the work-family interface research.

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Figure 1. Hypotheses

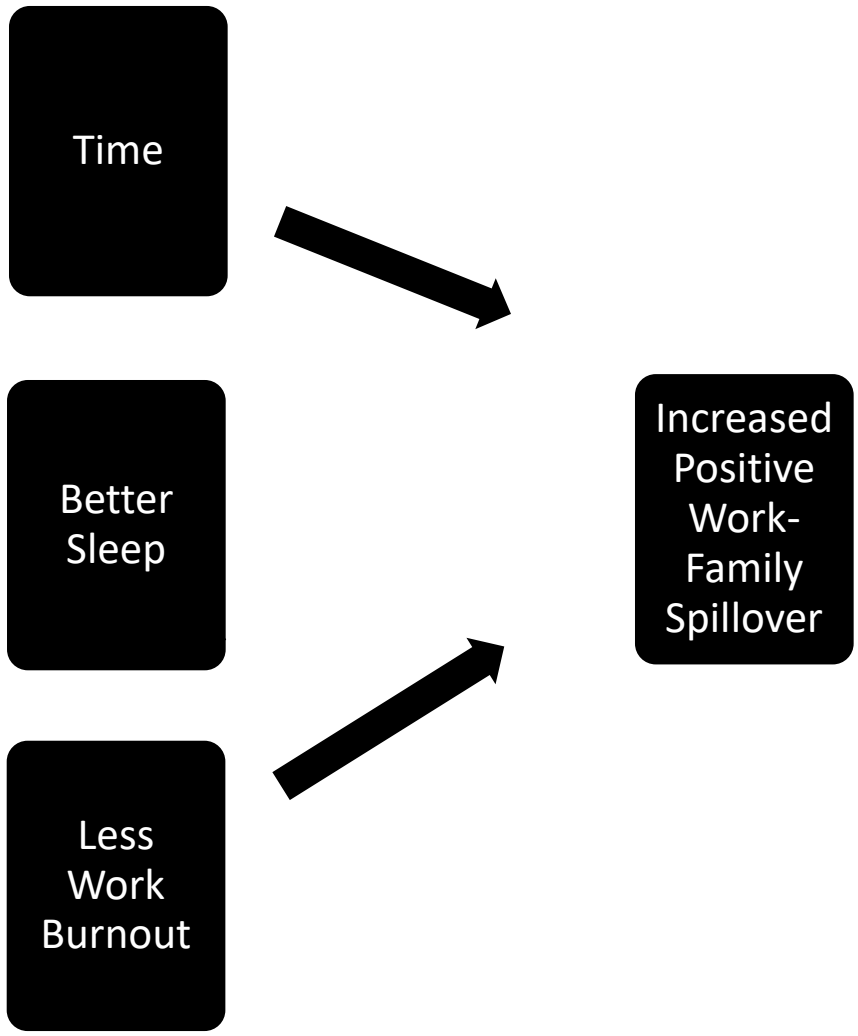

Figure 2. Model Formulas

Null model

Level 1:

$PWFSit = \pi_{0i} + \varepsilon_{it}$

Level 2:

$\pi_{0i} = \beta_{00} + r_{0i}$

Model 1

Level 1:

$PWFSit = \pi_{0i} + \pi_{1i}(Wave) + \pi_{2i}(Burnout) + \pi_{3i}(Insomnia) + \pi_{4i}(Sleep\ Insufficiency) + \pi_{15}(Sleep\ Time) + \pi_{6i}(WASO) + \varepsilon_{it}$

Level 2:

$\pi_{0i} = \beta_{00} + r_{0i}$

$\pi_{1i} = \beta_{10} + r_{1i}$

$\pi_{2i} = \beta_{20} + r_{2i}$

$\pi_{3i} = \beta_{30} + r_{3i}$

$\pi_{4i} = \beta_{40} + r_{4i}$

$\pi_{5i} = \beta_{50} + r_{5i}$

$\pi_{6i} = \beta_{60} + r_{6i}$

Model 2

Level 1:

$PWFSit = \pi_{0i} + \pi_{1i}(Wave) + \pi_{2i}(Burnout) + \pi_{3i}(Insomnia) + \pi_{4i}(Sleep\ Insufficiency) + \pi_{15}(Sleep\ Time) + \pi_{6i}(WASO) + \varepsilon_{it}$

Level 2:

$\pi_{0i} = \beta_{00} + \beta_{01}(Gender) + \beta_{01}(Education) + r_{0i}$

$\pi_{1i} = \beta_{10} + r_{1i}$

$\pi_{2i} = \beta_{20} + r_{2i}$

$\pi_{3i} = \beta_{30} + r_{3i}$

$\pi_{4i} = \beta_{40} + r_{4i}$

$\pi_{5i} = \beta_{50} + r_{5i}$

$\pi_{6i} = \beta_{60} + r_{6i}$

Table 1. Variable Descriptive and Correlations

Variable	M	SD	1	2	3	4	5	6	7	8
1. Wave	-	-	-							
2. Burnout	4.05	1.58	0.12	-						
3. Insomnia	2.69	0.75	-0.00	0.17**	-					
4. Sleep Insufficiency	2.77	0.92	0.02	0.31**	0.25*	-				
5. Sleep Time	439.40	54.80	0.01	0.01	0.12*	-0.12*	-			
6. WASO	44.52	16.75	0.00	-0.06	0.05	-0.04	0.06	-		
7. Gender	1.38	0.48	-0.03	0.05	0.08	0.01	0.35**	-0.01	-	
8. Education	4.77	0.49	0.01	0.03	-0.13**	-0.03	-0.18**	-0.09	0.21**	-

Note. $N = 400$. WASO = wake after sleep onset. Gender: 1 = male, 2 = female. WASO and Sleep Time measured in minutes.

* = $p < .05$

** = $p < .01$

Table 2. Inferential Statistics on Models

Fixed Effects	Null	Model 1		Model 2	
		β	*t*	*β*	*t*
Intercept		3.97	23.05*	3.32	10.78*
Wave		-0.03	-2.67*	-0.03	-2.76*
Burnout		0.05	4.17*	0.05	4.00*
Insomnia		0.01	0.27	0.01	0.30
Sleep Insufficiency		0.00	0.15	0.00	0.10
Sleep Time		-0.00	-0.30	-0.00	-0.85
WASO		0.00	0.18	0.00	0.42
Gender (Male)			-	0.13	2.52*
Education			-	0.12	2.33*
Fit Indices	Null	Model 1		Model 2	
AIC	1986.4	1654.5		1648.8	
BIC	2002.2	1699.8		1704.2	
Deviance Statistic	1980.4	1636.5		1626.8	

Note. $N = 400$. Gender: 1 = male, 2 = female.

* $p < .05$

Appendix

Appendix A: Subjective Sleep Quality

PH_PSQI5	Now, please turn to response card #20. How often during the past 4 weeks did you get enough sleep to feel rested upon waking up? Would you say never, rarely, sometimes, often or very often? never 1 NEVER rarely 2 RARELY sometimes 3 SOMETIMES often 4 OFTEN voften 5 VERY OFTEN		Sleep Insufficiency
PH_PSQI6	Please turn to response card #21. During the past 4 weeks, how often could you not get to sleep within 30 minutes? Would you say never, less than once a week, once or twice a week, or three or more times a week? never 1 NEVER less1wk 2 LESS THAN ONCE A WEEK oncewk 3 ONCE OR TWICE A WEEK threewk 4 THREE OR MORE TIMES A WEEK		Insomnia
PH_PSQI7	During the past 4 weeks, how often did you wake up in the middle of the night or early morning? (Would you say never, less than once a week, once or twice a week, or three or more times a week?) never 1 NEVER less1wk 2 LESS THAN ONCE A WEEK oncewk 3 ONCE OR TWICE A WEEK threewk 4 THREE OR MORE TIMES A WEEK		Insomnia

Appendix B: Workplace Burnout

Variable Name	Item text	Reverse-coded	Subscale
WM_BURN1	You feel emotionally drained from your work. How often do you feel this way?	R	
WM_BURN2	You feel burned out by your work. How often do you feel this way?	R	
WM_BURN3	You feel used up at the end of the workday. How often do you feel this way?	R	

Appendix C: Positive Work-to-Family Spillover

Variable Name	Item text	Reverse-coded	Subscale
WM_WFPS1	When things are going well at work, your outlook regarding your family or personal life is improved.	R	
WM_WFPS2	Being in a positive mood at work helps you to be in a positive mood at home.	R	
WM_WFPS3	Being happy at work helps you to be happy at home.	R	
WM_WFPS4	Having a good day at work allows you to feel positive with your family.	R	