



# What's not fair about work keeps me up: Perceived unfairness about work impairs sleep through negative work-to-family spillover



Soomi Lee<sup>a,\*</sup>, Jacqueline A. Mogle<sup>b</sup>, Chandra L. Jackson<sup>c</sup>, Orfeu M. Buxton<sup>d,e,f,g</sup>

<sup>a</sup> School of Aging Studies, University of South Florida, Tampa, FL, USA

<sup>b</sup> College of Nursing, Pennsylvania State University, University Park, PA, USA

<sup>c</sup> Epidemiology Branch, National Institute of Environmental Health Sciences, National Institutes of Health, Department of Health and Human Services, Research Triangle Park, NC, USA

<sup>d</sup> Department of Biobehavioral Health, Pennsylvania State University, University Park, PA, USA

<sup>e</sup> Department of Social and Behavioral Sciences, Harvard Chan School of Public Health, Boston, MA, USA

<sup>f</sup> Division of Sleep and Circadian Disorders, Departments of Medicine and Neurology, Brigham and Women's Hospital, Boston, MA, USA

<sup>g</sup> Division of Sleep Medicine, Harvard Medical School, Boston, MA, USA

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## ABSTRACT

This study examined whether perceived unfairness about work was linked to midlife workers' insomnia symptoms over time, and if the association was mediated by negative work-to-family spillover (NWFS). We used 3 waves of longitudinal data across 20 years from the Midlife in the United States Study ( $N = 971$ ,  $M_{\text{age}} = 40.52$ ). Results revealed that, wave-to-wave increases in perceived unfairness about work predicted wave-to-wave increases in NWFS over 20 years. Wave-to-wave increases in NWFS, in turn, predicted wave-to-wave increases in insomnia symptoms. Perceived unfairness about work was indirectly, but not directly associated with insomnia symptoms through NWFS. These within-person indirect mediation pathways were found after controlling for sociodemographic and family characteristics, work hours, neuroticism, physical health, and between-person associations between perceived unfairness about work, NWFS, and insomnia symptoms. These findings suggest that perceived unfairness about work may degrade workers' sleep health over time, through the spillover of work stress to the personal domain.

## 1. Introduction

Work promotes one's well-being by providing tangible and intangible resources that reach beyond financial compensation, including the opportunity to increase one's social network, knowledge and sense of purpose in life (Jahoda, 1982). Some work contexts, however, may threaten workers' well-being. One such context is when workers are treated unfairly at the workplace, such as wage inequality and racial inequality (Card et al., 2012; Gerstel and Clawson, 2015; Huffman and Cohen, 2004; Huffman and Torres, 2001; Ong et al., 2009). Inequity or unfairness on the job has negative consequences important for employers and society, including high turnover rates (Card et al., 2012) and job segregation (Huffman and Cohen, 2004). Less is known about overall *perceived unfairness about work* that indicates subjective feelings of unfairness an average worker can experience on the job (not specific to wage, gender,

\* Corresponding author. School of Aging Studies, University of South Florida, 4202 E. Fowler Avenue, MHC 1344, Tampa, FL, 33620, USA  
E-mail address: [soomilee@usf.edu](mailto:soomilee@usf.edu) (S. Lee).

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or race), and how it is associated with health consequences among the workers, particularly for sleep.

Negative work-to-family spillover (NWFS) is a possible mediator between perceived unfairness about work and sleep. NWFS refers to the psychological carryover of strain from the work context to one's family and personal context (Grzywacz and Marks, 2000; Lavner and Clark, 2017) and represents one process by which work-related stressors may have a negative impact on workers' sleep. To advance the understanding of stress process originates from perceived unfairness about work, this study examines the potential mediating role of NWFS in the link between perceived unfairness about work and sleep. Despite prevalent sleep problems in working populations, there is lack of research identifying specific types of work stressors associated with workers' poor sleep, which is essential important information for future intervention studies intended to decrease work-related sleep disparities. Furthermore, most studies have used cross-sectional data, and lack the ability to investigate the longitudinal link between perceived unfairness about work and sleep. Due to cross-sectional study designs, testing a mediating mechanism between perceived work stressors and sleep has also not been possible. Using three repeated measurements over 20 years, the current study tests the longitudinal pathways linking perceived unfairness about work, NWFS, and insomnia symptoms, one of the most prevalent sleep problems among workers.

## 2. Literature review

### 2.1. Theoretical mechanisms linking perceived unfairness about work to sleep

The work-family spillover theory explains that workers' experiences on the job carry over into the family (non-work) domain, and thus, stressors from work impinge on the lives of workers (Perry-Jenkins and Wadsworth, 2017; Staines, 1980). Perceived unfairness about work may lead to workers' poor health and well-being outcomes, including sleep; this association may be explained by negative work-to-family spillover. Negative work-to-family spillover (NWFS) indicates that work-based stressors interfere with family/personal activities (Grzywacz and Marks, 2000; Lavner and Clark, 2017). This is a psychological construct that focuses on how one evaluates the degree to which work context negatively influences family and personal lives. We posit that NWFS may represent a psychological stress process by which perceived unfairness about work permeates into the personal domain and has a negative impact on workers' sleep.

According to the stress process model (Pearlin, 1989; Pearlin et al., 1981), NWFS is a secondary stressor derived from primary stressors such as perceived unfairness about work. For example, workers who perceive greater unfairness on their job and work situations may be more likely to experience higher NWFS – more stress from the work domain carried over to the non-work domain (c.f., Pearlin et al., 1990). The spilled-over stress may further disturb workers' sleep, for example through worry or rumination while trying to get to sleep or when awakened during the night.

The majority of previous studies have found the mediating role of NWFS in the links between work characteristics and employee outcomes (Baeriswyl et al., 2016; Demerouti et al., 2005). Moreover, some recent research has observed the direct link between NWFS and poor sleep among employees (Buxton et al., 2016; Lee et al., 2016a, 2016b, 2016c). Studies also have reported a positive association of NWFS with insomnia symptoms (Berkman et al., 2015; Buxton et al., 2016; Crain et al., 2014). There has been, however, lack of studies linking NWFS with perceived unfairness about work and examining the mediating role of NWFS in the potential association between perceived unfairness about work and sleep. In this study, we test whether perceived unfairness about work (primary stressor) is associated with NWFS (secondary stressor), and whether NWFS, is further associated with works' sleep.

### 2.2. Perceived unfairness about work as a critical stressor leading to negative health outcomes

The stress process model posits that most stress does not start from the actual existence of a stressor, rather from the perception of it (Pearlin, 1989), and that this stress appraisal or psychological stress may have more salient effects on one's health and well-being than actual stressors (Lazarus and Folkman, 1984). This notion is supported by a meta-analysis showing the negative association between perceived unfairness and employee health (e.g., physical health, mental health, perceived stress, absences), beyond that accounted for by organizational injustice alone (Robbins et al., 2012).

In prior literature, a similar concept, perceived discrimination, has been more frequently examined. Many studies have reported the negative effects of perceived discrimination on psychological and physical health outcomes (Pascoe and Richman, 2009). As the discrimination experiences usually involve personal or social identity, previous research has examined perceived discrimination due to respondents' race (Meyer, 2014; Shippee et al., 2012), age (Chou and Choi, 2011), gender (Blau and Tatum, 2000; Schmitt et al., 2002), or weight (Carr and Friedman, 2005; Robinson et al., 2017; Sutin et al., 2015). Unlike perceived discrimination, perceived unfairness about work can capture a broader experience of fairness or unfairness for an average worker. For example, independent of wage and sociodemographic characteristics, workers may vary in their subjective evaluations about relative opportunities, rewards, and relationships on the job (Ryff et al., 1999; Schwartz, 2017). Perceived unfairness about work probes the extent to which workers have an awareness of an unequal distribution of work resources, and thus, may have particularly important implications for workers' sleep by the mechanism of stress spillover (i.e., NWFS).

### 2.3. Insomnia symptoms associated with work-based stressors

We examine insomnia symptoms (i.e., trouble getting to sleep or staying asleep) as an outcome of negative spillover of stress from perceived unfairness about work. Insomnia symptoms are one of the most significant sleep issues among contemporary workers. Approximately 40% of workers (working 30 h or more per week for pay) report a few awakenings at night per week (Swanson et al.,

2011). Workers' sleep problems such as insomnia symptoms are a public concern, as they may lead to decreased productivity at work (Katz et al., 2014; Kessler et al., 2011; Rosekind et al., 2010) and increased risks of developing cardiovascular disease in later life (Jackson et al., 2015; Rangaraj and Knutson, 2016). One important source of insomnia symptoms is work-related stressors (Jansson and Linton, 2006). Thus, examining insomnia symptoms as an outcome of perceived unfairness about work will provide directions for future research in how to decrease sleep disparities due to work experiences.

Thus far, no studies have tested the impact of perceived unfairness about work on insomnia symptoms through NWFS. There are few studies that report the direct associations of workplace inequity with workers' sleep problems. Although not specific to perceived unfairness about work, lab-based studies using polysomnography have shown that individuals experiencing more racial/ethnic discrimination had more Stage 2 (light) sleep and less Stage 4 (deep) sleep (Thomas et al., 2006; Tomfohr et al., 2012). Population-based studies using self-reported sleep data also have shown that perceived racial discrimination is associated with increased risks of sleep disturbance (e.g., trouble falling asleep or staying asleep or sleeping too much) and daytime fatigue (Grandner et al., 2012). Greenberg (2006) study is one of the rare studies focusing on the adverse effect of wage unfairness on insomnia, where insomnia symptoms were greater among nurses whose pay was reduced than among those whose pay remained unchanged. Moreover, the degree of insomnia was lower among nurses whose supervisors were trained in interactional justice (e.g., interpersonal training about treating others with politeness, dignity, and respect). However, such negative influence of unfairness about work on insomnia symptoms has been tested neither based on workers' perceptions of unfairness, nor through NWFS. Building on the work-family spillover theory (Perry-Jenkins and Wadsworth, 2017; Staines, 1980) and the stress process model (Pearlin, 1989; Pearlin et al., 1981), the goal of this study was to examine the negative spillover effect of perceived unfairness about work on workers' insomnia symptoms over time.

#### 2.4. Present study

Using three waves' data from the Midlife in the United States study that sampled midlife workers across both occupations and industry sectors, we examined the longitudinal associations between perceived unfairness about work, NWFS, and insomnia symptoms over 20 years. We hypothesized that workers who report increases in perceived unfairness about work from baseline over 20 years would report increases in NWFS (hypothesis 1). We also hypothesized that increases in NWFS would predict increases in insomnia symptoms over the same time period (hypothesis 2). On the whole, we hypothesized that the potential longitudinal association of perceived unfairness about work with insomnia symptoms would be mediated by NWFS (hypothesis 3). The hypothesized specific paths are illustrated in Fig. 1.

### 3. Methods

Data for the current study were drawn from the Midlife in the United States Survey (MIDUS). Comprehensive details of the design and sample can be found in Brim et al. (2004), with details relevant to the current analyses provided below.

#### 3.1. Participants and procedure

An initial sample of 7108 participants completed a telephone survey of demographic characteristics and well-being in MIDUS Wave 1 (W1: 1995–1996). Of these, 4963 individuals participated in MIDUS Wave 2 (W2: 2004–2006), and 3293 individuals participated in MIDUS Wave 3 (W3: 2013). Reasons for attrition included refusal, loss of contact, deceased, and no longer eligible. Longitudinal participants who provided all three waves' data ( $n = 3293$ ) were more likely to be younger, female, White, married, highly educated, working, and healthier than attriters and thus represent a selected population. Among these, 1659 participants worked across all the three waves. After excluding missing responses on perceived unfairness about work, NWFS, and insomnia symptoms across all the three waves, 971 workers were the final analytic sample of the current study. The non-respondents ( $n = 688$ ) did not significantly differ from the final sample of respondents ( $n = 971$ ) in sex, marital status, presence of children under age 18, neuroticism and physical health. However, they differed in age, education, and work hours, such that respondents were older, had higher education, and worked shorter hours than non-respondents.

Sample characteristics showed that (see Table 1), at baseline, the mean age was 40.52 ( $SD = 8.51$ ,  $Range = 24-72$ ), the mean

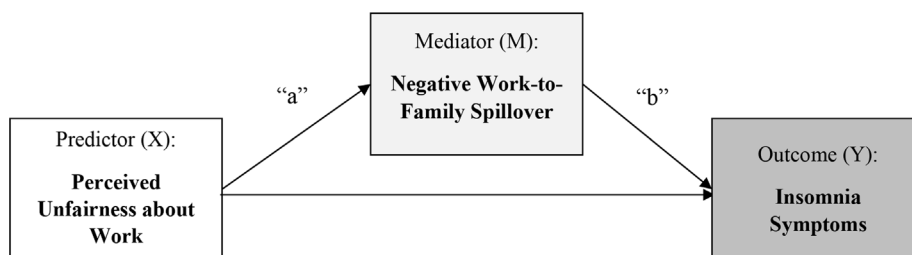


Fig. 1. Conceptual model examining the indirect effect of perceived unfairness about work on insomnia symptoms mediated by negative work-to-family spillover. Note.  $a \times b$  indicates the indirect effect of X on Y through M, even without the total effect of X on Y.

**Table 1**  
Descriptive statistics of variables used in this study.

N = 971	Wave 1 Baseline		Wave 2 10 years later		Wave 3 20 years later		ICC <sup>b</sup>
	M	(SD)	M or n	(SD) or %	M	(SD)	
<b><i>Time-Variant Main Variables</i></b>							
X: Perceived unfairness about work (1-4)	1.68	(0.55)	1.52	(0.49)	1.51	(0.49)	0.48
M: Negative work-to-family spillover (1-5)	2.70	(0.64)	2.60	(0.63)	2.52	(0.70)	0.41
Y: Insomnia symptoms (1-6)	2.19	(1.46)	2.86	(1.66)	3.07	(1.71)	0.39
<b><i>Time-Variant Covariates</i></b>							
Age (in years)	40.52	(8.51)	49.43	(8.45)	58.51	(8.43)	
Work hours	42.88	(13.73)	41.00	(13.60)	37.68	(14.73)	
Self-rated physical health (1-5)	3.81	(0.82)	3.89	(0.85)	3.84	(0.87)	
<b><i>Time-Invariant Covariates</i></b>							
Gender, n (%)							
Men			508	52.32%			
Women			463	47.68%			
Race, n (%)							
White			919	94.64%			
Non-White			52	5.36%			
Final educational level (1-12) <sup>1</sup> at Wave 3			8.16	(2.40)			
Neuroticism (1-4) at Wave 1			2.78	(0.64)			
Final number of children living in household at Wave 3			0.52	(0.88)			
Marital status across waves, n (%)							
Married/partnered throughout			634	65.29%			
Single to partnered			99	10.20%			
Other change patterns			131	13.49%			
Single throughout			107	11.02%			

<sup>a</sup> Education was coded as 1 = no school/some grade school to 12 = professional degrees (e.g., Ph.D., ED.D., MD).

<sup>b</sup> ICC represents Intra-class Correlations (between-person variance/total variance).

work hours was 42.88 ( $SD = 13.73$ ), and the average physical health status was “very good” ( $M = 3.81$  on a 5-point scale,  $SD = 0.82$ ). About half were men (52%), and the majority were White (95%), and had, on average, two years of college or vocational school graduates at final wave ( $M = 8.16$  on a 12 level scale,  $SD = 2.40$ ). The average level of neuroticism was moderate ( $M = 2.22$  on a 4-point scale,  $SD = 0.64$ ). Mean total number of children living in household was 0.52 ( $SD = 0.88$ ,  $Range = 0-5$ ). More than half of the sample were married or living with a romantic partner throughout the waves (65%), 10% became married/partnered from single status, 13% exhibited other transitions including married/partnered to single, and 11% maintained single status across the waves.

### 3.2. Measures

#### 3.2.1. Perceived unfairness about work

At each wave, participants responded to six items on perceived unfairness about work, previously used and validated in studies analyzing the MIDUS sample (Ryff et al., 1999; Schwartz, 2017). The items are, “(1) I feel cheated about the chances I have had to work at good jobs, (2) When I think about the work I do on my job, I feel a good deal of pride (reverse coded), (3) I feel that others respect the work I do on my job (reverse coded), (4) Most people have more rewarding jobs than I do, (5) When it comes to my work life, I’ve had opportunities that are as good as most people’s (reverse coded), and (6) It makes me discouraged that other people have much better jobs than I do.” Responses were coded as 1 (*not at all*), 2 (*a little*), 3 (*some*) and 4 (*a lot*), and higher scores reflected higher levels of perceived unfairness about work. The mean of the scale was computed for cases that had valid values for at least 3 items. The Cronbach’s alpha was .78, .75 and 0.75, at W1, W2 and W3 respectively.

#### 3.2.2. Negative work-to-family spillover (NWFS)

Participants also responded to four items on negative work-to-family spillover scale, previously used in Grzywacz and Marks (2000). The items are, “(1) Your job reduces the effort you can give to activities at home, (2) Stress at work makes you irritable at home, (3) Your job makes you feel too tired to do the things that need attention at home, and (4) Job worries or problems distract you when you are at home.” Responses ranged from 1 (*never*) to 5 (*all the time*), and higher scores reflected higher levels of NWFS. The mean of the scale was computed for cases that had valid values for at least 2 items. The Cronbach’s alpha was .79, .78 and 0.84, at W1, W2 and W3 respectively.

#### 3.2.3. Insomnia symptoms

Participants were asked about the frequency of experiencing trouble falling asleep or trouble staying asleep because of worry. The item reads, “During the past 30 days, how often have you experienced trouble getting to sleep or staying asleep?” Responses ranged from 1 (*not at all*), 2 (*once a month*), 3 (*several times a month*), 4 (*once a week*), 5 (*several times a week*), and 6 (*almost every day*). This

item has been shown to be valid to capture insomnia symptoms (Buysse et al., 1989), and has been used in several previous studies (Ailshire and Burgard, 2012; Grandner et al., 2010). We treated this monthly frequency of insomnia symptoms as a continuous variable in our analyses.

### 3.2.4. Covariates

We controlled for respondents' sociodemographic, family, work, psychological, and health characteristics that may be associated with perceived unfairness about work, NWFS and insomnia symptoms (Ailshire and Burgard, 2012; Buxton et al., 2016; Grandner et al., 2010). Those were age (in years), gender (0 = women, 1 = men), race (0 = non-white, 1 = white), educational level (1 = no school/some grade school to 12 = professional degrees, e.g., Ph.D., ED.D., MD), marital status (0 = single, 1 = married), and number of respondents' children living in the household. Moreover, we took into account work hours at main job. In addition, the personality trait of neuroticism (the mean of 4 items; 1 = less neurotic to 4 = more neurotic; Keyes et al., 2002) was included to consider potential negativity effect in the evaluation of unfairness about work, NWFS, and insomnia symptoms. Neuroticism has been considered one of the personality traits most relevant to psychopathology, in particular depression and anxiety (Muris et al., 2005; Ormel et al., 2001). We chose to take into account the potential influence of trait neuroticism on NWFS and insomnia symptoms, because it is a trait that can persist even after remission from depressive and/or anxious episodes (Roelofs et al., 2008). Lastly, self-reported physical health (1 = poor to 5 = excellent) was controlled for.

Considering the potential meaning of these variables for our mediator and outcome, we divided them into *time-variant* and *time-invariant* covariates. Time-variant covariates were age, work hours, and physical health. For these variables, baseline responses were included as between-person level covariates, and changes from baseline at each wave were included as within-person level covariates. Marital status can be time-varying, and for our interpretation, we created a between-person level indicator that represents transitions in marital status across the three waves: (a) married/partnered throughout, (b) single to partnered and (c) other change patterns including partnered to single (vs. single throughout). Time-invariant covariates were gender, race, and neuroticism (measured at W1; this personality trait had relatively lack of variation across time, with Intra-class Correlation = 0.62). In addition, final educational level and final number of children living in the household measured at W3 were included. The number of children living in the household can be time-varying, but it was highly correlated with age at the within-person level. Due to this reason, we controlled for the number of children at the final wave, following the practice of previous studies analyzing MIDUS longitudinal data (Lee et al., 2016a, 2016b, 2016c). We centered between-person level continuous covariates at sample means and within-person level continuous covariates at baseline values.

### 3.3. Analytic strategy

This study used multilevel mediation in *MPlus* (version 7.2). Three waves' repeated data were clustered within individuals (i.e., 2913 observations within 971 participants). Multilevel mediation can test the indirect effect of a predictor X (perceived unfairness about work) on an outcome Y (insomnia symptoms) through a mediator M (NWFS) at the within-person and between-person levels (Preacher et al., 2010). An indirect effect, calculated by  $a (X \rightarrow M) \times b (M \rightarrow Y)$ , warrants significant role of M in the link between X and Y, even without the total effect of X on Y (Hayes, 2013, 2009). Our particular interest was the within-person level mediation, whether wave-to-wave changes in perceived unfairness about work were associated with wave-to-wave changes in insomnia symptoms through wave-to-wave changes in negative work-family spillover across the three waves. To test this, we centered X and M at the baseline levels, such that W2's and W3's values represent changes from W1 (Sliwinski and Buschke, 2004).

## 4. Results

Table 1 shows sociodemographic and work-related characteristics of MIDUS study participants. At baseline (W1), our sample of workers reported perceiving “a little” unfairness about work on average ( $M = 1.68 \pm 0.55$ , on a 4-point scale), a moderate level of negative work-to-family spillover ( $M = 2.70 \pm 0.64$ , on a 5-point scale), and experiencing trouble getting to sleep or staying asleep “once a month” on average ( $M = 2.19 \pm 1.46$ , on a 6-point scale). Although the overall sample-level trend of perceived unfairness about work did not change much, 28% and 27% of participants increased perceived unfairness at W2 and W3, respectively. Among these, 18% and 17% exhibited increases in perceived unfairness about work greater than  $\frac{1}{2}$  baseline SD, at W2 and W3, respectively. Fifty-two percent of the sample reported that they experienced insomnia symptoms at least “once a month”. Among these, 34% reported experiencing insomnia symptoms “several times a month” or more. The prevalence of frequent insomnia symptoms (several times a month or more) increased to 50% and 55% at W2 and W3, respectively. The Intra-class correlations (ICCs) of the main variables ranged from 0.39 to 0.48, indicating that 39%–48% of the variance was attributable to between-person differences and the remaining variance was due to variation over time. These ICCs suggest sufficient within-person variation to test multilevel mediation.

Table 2 presents results from a multilevel mediation model that tests the indirect effect of perceived unfairness about work on insomnia symptoms through NWFS. The first column shows the relationship of changes in perceived unfairness about work with changes in NWFS. At the within-person level, wave-to-wave increases in perceived unfairness about work were significantly related to wave-to-wave increases in NWFS over 20 years. Specifically, a one unit increase in perceived unfairness about work (on a 4 point scale) was associated with 0.14 units increase in NWFS (95% CI = [0.07 to 0.21], which was 14 times greater than the effects of age and work hours and 2.4 times greater than the effect of physical health. The effects of within-person covariates showed that increases in age and physical health were negatively, and increases in work hours were positively associated with increases in NWFS. At the between-person level, perceived unfairness about work was also significantly associated with NWFS, such that workers who

**Table 2**

The indirect effect of perceived unfairness about work on insomnia symptoms, through negative work-to-family spillover.

	M: Negative work-to-family spillover		Y: Frequency of insomnia symptoms	
	B	(SE)	B	(SE)
Intercept	0.04	(0.08)	−0.24	(0.17)
<i>WITHIN-PERSON (WP) LEVEL</i>				
<b>X: Increases in perceived unfairness about work</b>	<b>0.14</b>	<b>***</b>	<b>(0.04)</b>	<b>(0.08)</b>
<b>M: Increases in negative work-to-family spillover</b>	−	−	<b>0.14</b>	<b>*</b>
Increases in age (years from baseline)	−0.01	**	(0.00)	***
Increases in work hours	0.01	***	(0.00)	(0.00)
Increases in physical health	−0.06	**	(0.02)	**
<i>BETWEEN-PERSON (BP) LEVEL</i>				
<b>X: Perceived unfairness about work</b>	<b>0.23</b>	<b>**</b>	<b>(0.07)</b>	<b>(0.16)</b>
<b>M: Negative work-to-family spillover</b>	−	−	0.10	(0.14)
Baseline age (in years)	−0.00		(0.00)	0.00
Baseline work hours	0.00		(0.00)	0.00
Baseline physical health	−0.02		(0.02)	−0.11
Gender, Men (vs. women)	−0.06	*	(0.03)	−0.31
Race, White (vs. non-white)	−0.01		(0.08)	0.29
Final education level (at Wave 3)	−0.01		(0.01)	−0.01
Neuroticism (at Wave 1)	0.06	**	(0.02)	0.10
Total number of children in household (at Wave 3)	0.05	**	(0.02)	−0.01
Marital status across waves				
Partnered throughout (vs. single throughout)	0.00		(0.04)	0.26
Single to partnered (vs. single throughout)	0.11	*	(0.06)	0.13
Other changes (vs. single throughout)	−0.01		(0.06)	0.13
<i>Fit Statistics</i>				
Indirect Effect of X on Y, through M	WP: $B = 0.02$ , $SE = 0.01$ , $p < 0.05$			
	BP: $B = 0.02$ , $SE = 0.03$ , $p > 0.10$			
Model Fit Information	$\chi^2(34, n = 958) = 558.99^{***}$			

Note. 2913 observations from three waves were nested within 971 workers; 2859 observations from 958 workers were used due to missing responses in covariates.

\* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

perceived higher work unfairness at baseline reported more NWFS at baseline compared with those reporting lower work unfairness at baseline. This between-person association was after taking into account the effects of between-person covariates: Being men (vs. women), having higher neuroticism, living with more children, and transitioning from single to partnered status (vs. single throughout) were significantly associated with more NWFS. Thus, our hypothesis 1 that workers who report increases in perceived unfairness about work from baseline over 20 years would also report increases in NWFS was supported.

The second column shows results predicting the frequency of insomnia symptoms. At the within-person level, wave-to-wave increases in NWFS was significantly related to wave-to-wave increases in insomnia symptoms. The magnitude of the effect of NWFS on insomnia symptoms ( $B = 0.14$ , 95% CI = [0.02 to 0.26]) was comparable to the known negative effect of physical health on insomnia symptoms ( $B = -0.16$ , 95% CI = [-0.26 to -0.05]). There was no significant between-person effect of NWFS on insomnia symptoms. The effects of between-person covariates indicated that longer baseline work hours, poorer baseline physical health, and being women (vs. men) and partnered throughout (vs. single) were associated with more insomnia symptoms on average. Thus, our hypothesis 2 that workers who report increases in increases in NWFS over 20 years would also report increases in insomnia symptoms was supported.

Together, there was an indirect association of perceived unfairness about work with insomnia symptoms through NWFS at the within-person level. Without NWFS in the model, there was no total effect of perceived unfairness about work on insomnia symptoms either at the within-person level or at the between-person level. However, there were significant within-person level pathways linking perceived unfairness about work to insomnia symptoms. Over time, increases in perceived unfairness about work were indirectly linked to increases in insomnia symptoms through increases in NWFS ( $B = 0.02$ ,  $SE = 0.01$ ,  $p < 0.05$ ). Thus, our hypothesis 3 was also supported.

## 5. Discussion

This study examined the longitudinal association of perceived unfairness about work with insomnia symptoms and if this association was mediated by negative work-to-family spillover. Grounded in the work-family spillover theory (Perry-Jenkins and Wadsworth, 2017; Staines, 1980) and the stress process model (Pearlin, 1989; Pearlin et al., 1981) that suggests the mechanisms of perceived stressors for health consequences, we expected that perceived unfairness about work would predict negative work-to-family spillover, which would, in turn, predict insomnia symptoms over time. Our findings, based on longitudinal data over 20 years, corroborated this expectation. Wave-to-wave increases in perceived unfairness about work predicted wave-to-wave increases in negative work-to-family spillover, which, in turn, predicted wave-to-wave increases in insomnia symptoms over 20 years. These

within-person associations over time were found after taking into account baseline associations as well as differences due to sociodemographic and family characteristics, work hours, neuroticism, and self-rated health status. This study contributes to the social science and health literature by identifying that perceived unfairness about work is an indirect predictor of workers' insomnia symptoms. Furthermore, the results reveal that negative work-to-family spillover is a significant pathway linking perceived unfairness about work to insomnia symptoms across time, and a modifiable means by which unfairness “gets under the skin” in ways that may promote health disparities.

Previous studies have focused on unfairness on the job due to sociodemographic differences, such as race and gender (Card et al., 2012; Huffman and Cohen, 2004; Huffman and Torres, 2001; Ong et al., 2009). We found that workers' overall *perceptions* of unfairness about work uniquely predicted negative work-to-family spillover (NWFS) independent of age, race, gender, and education, thus strengthening the notion that perceived stressors have more salient effects on one's well-being than actual stressors (Lazarus and Folkman, 1984; Pearlin, 1989; Pearlin et al., 1981). We also accounted for family characteristics (i.e., marital status and number of children), neuroticism, work hours, and physical health status that might be associated with the experience of NWFS. Our multilevel modeling allowed us to separate between-person effects and within-person effects. At the between-person level, workers who perceived higher work unfairness about work at baseline also reported greater NWFS at baseline. This is consistent with previous research on work-family interface in that work-related stressors are positively associated with experiencing more NWFS (Byron, 2005; Schieman et al., 2009). Regardless of the baseline association between perceived unfairness about work and NWFS, however, at the within-person level, workers who increased perceived unfairness about work also exhibited increases in NWFS wave-to-wave over 20 years. Our findings reveal that perceived unfairness about work is a significant predictor of NWFS, linking work-derived stressors and workers' health and well-being outcomes (Baeriswyl et al., 2016; Demerouti et al., 2005).

The adverse effects of NWFS on workers' sleep outcomes have been well documented in prior literature (Berkman et al., 2015; Buxton et al., 2016; Crain et al., 2014; Lee et al., 2016b). Most of the studies, however, focused on cross-sectional associations, lacking the ability to examine the linkages over time. Furthermore, few studies have examined the association between NWFS and insomnia symptoms; most studies focused on sleep duration and sleep quality. Insomnia symptoms (i.e., trouble getting to sleep or staying asleep) are frequent sleep complaints among workers and can capture sleep difficulties mostly related to work and social stressors (Jansson and Linton, 2006; Swanson et al., 2011). Our results indicated that NWFS was not associated with insomnia symptoms at the between-person level after controlling for other known risk factors of insomnia such as older age and poorer physical health (LeBlanc et al., 2009). However, within-person level increases in NWFS were significantly related to increases in insomnia symptoms wave-to-wave from baseline over the 20 years. Notably, this effect was found after controlling for age-related changes in insomnia symptoms and the effects of changes in physical health, highlighting the adverse effect of NWFS on increasing insomnia symptoms over time.

Combining these results, this study observed that perceived unfairness about work was indirectly associated with insomnia symptoms through NWFS across 20 years. It was not perceiving high work unfairness *per se*, but the path from perceiving high work unfairness to greater NWFS that led to more insomnia symptoms over time. Using longitudinal data with three waves, this study contributes to understanding the mechanism through which work-related stressors—perceived unfairness about work—affect workers' insomnia symptoms in the process of their aging.

Our findings suggest that it is necessary to decrease perceived unfairness about work and negative spillover in order to improve workers' insomnia symptoms. This requires collective efforts from both employers and employees. Based on our finding that perceived unfairness about work was a stressor associated with NWFS, employers could provide workplace-based stress reduction programs for their employees. Mindfulness-based training has been proven to be effective to reduce stress (Heckenberg et al., 2018). Some research also has shown positive effects of mindfulness on sleep (Allen et al., 2015). To the extent that perceived unfairness about work is also modifiable by individuals' efforts, workers could also practice transforming their perceptions about work situations. Incorporating training sessions about “fairness” into workplace interventions may help workers to treat their colleagues fairly and effectively deal with unfair situations so that they evaluate their work environment more positively. Furthermore, given the significant mediating role of NWFS, employers need to consider how to reduce the incidence and degree of work-based stressors interfering with family and personal activities. This could be done by changing workplace culture and structures as were done by the Support-Transform-Achieve-Results (STAR) intervention (Kelly et al., 2014; Kossek et al., 2014; Lee et al., 2016a, 2016b, 2016c; Marino et al., 2016; Olson et al., 2015). Given that workers' sleep problems can significantly reduce work productivity (Katz et al., 2014; Kessler et al., 2011; Rosekind et al., 2010), employers may consider implementing well-designed workplace interventions to reduce perceived unfairness and NWFS, which are indirectly and directly associated with workers' insomnia symptoms.

Several of this study's limitations provide useful directions for future research. First, we used self-reports of perceived unfairness about work, NWFS, and insomnia symptoms that may pose a risk for common-method bias (Podsakoff et al., 2003). For example, a worker who experienced more insomnia symptoms might have responded negatively to the items of perceived unfairness about work and NWFS. This may be an issue for between-person associations, however, our within-person effects may reduce the bias because we examined change-change associations over time after controlling for important baseline differences such as neuroticism and reported physical health. Future research may benefit from incorporating objective measures of sleep, such as actigraphy sleep data. Second, our sample was a national sample of U.S. midlife adults drawn from the MIDUS study (Brim et al., 2004), however, it may not be representative of U.S. workers. Therefore, our findings may not generalize to the full population of workers. More importantly, most of our study participants were White (Table 1), thus we were unable to test possible racial differences in the associations. For example, racial/ethnic minorities might experience and perceive more as well as unique forms of unfairness about work than Whites and these workers might experience more disparities in terms of sleep (c.f., Jackson et al., 2013). Third, although our analyses imply that perceived unfairness about work is a predictor, NWFS is a mediator, and the frequency of insomnia symptoms is an outcome and

reveals within-person change-change mediation pathways over time, our findings are correlational in nature and causality can operate also in the other direction. For example, it is possible that workers who have more insomnia symptoms perceive greater unfairness about work, which, may be associated with higher NWFS. Or, those who experience higher NWFS may be more likely to ruminate, such as about the benefits of other jobs, and thus perceive greater unfairness. To test causal mediation, future studies could incorporate a randomized experimental design to decrease perceived unfairness about work that elicits changes in insomnia symptoms at a subsequent time point, mediated by changes in NWFS.

This study reports that perceived unfairness about work is an important work-related stressor that may increase workers' insomnia symptoms over time through negative work-to-family spillover. At the most general level, both unfairness about work and sleep problems are public health concerns, and thus future research should continue to focus on this topic by examining diverse pathways linking work unfairness to sleep problems. It cannot be emphasized enough that more fairness in the workplace and workers with better sleep may improve productivity and health.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ssresearch.2019.03.002>.

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