Extended Abstract Submission for the 2019 PAA

The Influence of Sleep Duration and Sleep Problems on Health: Do Types of Work Shift Matter?

LEI CHAI
lei.chai@mail.utoronto.ca

SCOTT SCHIEMAN
scott.schieman@utoronto.ca

Department of Sociology
University of Toronto

ABSTRACT

Although a growing body of research has documented the relationship between sleep and health, most of the previous studies have heavily relied on cross-sectional data with conventional samples. In this paper, using four waves (2011-2017) of the Canadian Work Stress and Health study along with fixed effects models, we ask: (1) how do sleep duration and sleep problems associate with health (i.e., physical symptoms and psychological distress) over time? (2) Do types of work shift moderate those relationships? And (3) do any observed patterns differ for men and women. Our preliminary results indicate that short sleep duration (i.e., fewer than seven hours) was associated with higher levels of distress and physical symptoms for men and women. Additionally, we find that types of work shift moderated the relationship between sleep duration and health. However, the patterns varied based on types of health and gender. These various patterns had also been observed for the relationship between sleep problems and health. This study adds complexity to the literature on sleep and health.

EXTENDED ABSTRACT

Research Questions:

In this paper, we ask: (1) how do sleep duration and sleep problems associate with health (i.e., physical symptoms and psychological distress) over time? (2) Do types of work shift moderate that relationship? And (3) do any observed patterns differ for men and women.

Data and Methods:

Sample

We analyze data from four waves (2011 – 2017) of the *Canadian Work Stress and Health* study (CAN-WSH), a national longitudinal study of the Canadian labor force. The number of cases and retention rates for each successive wave of data collection are as follows: Wave 2 N = 4,423 (73.7 percent of Wave 1), Wave 3 N = 3,805 (63.4 percent of Wave 1 and 86.0 percent of Wave 2), and Wave 4 N=3,378 (56.3 percent of Wave 1, 76.4 percent of Wave 2, and 88.8 percent of Wave 3). After removing respondents who only appeared in Wave 1 and missing data, a sample of 3,916 unique individuals (1,553 men and 2,281 women) and 11,852 observations (or person-years) remained. Our data, therefore, take the form of unbalanced panel sample where the number of time periods may differ across individuals.

Focal Measures

Psychological distress. We use seven well-known items of generalized psychological distress adapted from the Kessler index (Kessler et al 2002). These items ask about the frequency that participants have experienced the following symptoms in the past month: “anxious or tense,” “nervous,” “worry a lot about little things,” “had trouble keeping your mind on what you were doing,” “restless or fidgety,” “sad or depressed,” and “hopeless.” Response choices are “all of the time” (1), “most of the time” (2), “some of the time” (3), “a little of the time” (4), and “none

of the time" (5). We reverse-coded responses and averaged them to create the index; higher scores indicate more distress (α_{w1} = .83).

Physical symptoms. We use five items to measure physical symptoms. These items ask: in the past month, how often did you have "headaches," "stomach pain or problems like indigestion or heartburn," "chest pain," "neck or back pain," and "muscle aches, soreness, or stiffness." Response choices are "all of the time" (1), "most of the time" (2), "some of the time" (3), "a little of the time" (4), and "none of the time" (5). We reverse-coded responses and averaged them to create the index; higher scores indicate more physical symptoms (α_{w1} = .65).

Sleep problems. Respondents were asked how often in the past month they had trouble falling or staying asleep; woke up before [they] wanted to; and, woke up feeling refreshed (reverse-coded). Responses included "none of the time" (1), "a little of the time" (2), "some of the time" (3), "most of the time" (4), and "all of the time" (5). We averaged the items to create sleep problems index; higher scores reflect worse sleep problems (α_{w1} = .72).

Sleep duration. Respondents were asked the following question: "How long do you usually spend sleeping each night?" We re-coded responses to four categories, including fewer than six hours, six hours, seven hours, and more than seven hours.

Control Measures

We included the following control variables. *Age* was coded in years. *Marital status* indicated whether the respondent was married, cohabiting, previously married, or never married (single). *Education* was coded as follows: less than high school (1), high school (2), some college (3), college (4). And post-graduate degree (5). *The presence of children* was coded as the number of children younger than age 18 residing in the household. *Personal income* was coded in dollars. We used the natural log of incomes in all regression models to help normalize the

distribution. *Occupation* was coded as a binary dummy variable, indicating whether the respondent was in managerial/professional position versus some other kind of occupation. *Weekly work hours* were measured in hours. Finally, we included *survey years*.

Analytical Models

We use fixed effects models to remove unobserved heterogeneity by focusing on within-individual changes over time (Hsiao 2003; Wooldridge 2009). We conduct a series of Hausman tests to determine whether fixed- or random effects models are more appropriate, with the null hypothesis being that individual effects are not correlated with other independent variables in the models. We performed the Hausman test for each dependent variable, and for men and women; the results indicate that random effects models would produce biased estimates and that fixed effect models are the more appropriate analytical approach.

Results

Our preliminary results indicate that short sleep duration (i.e., fewer than seven hours) was associated with higher levels of distress and physical symptoms for men and women. Additionally, we find that types of work shift moderated the relationship between sleep duration and health. However, the patterns varied based on types of health and gender. These various patterns had also been observed for the relationship between sleep problems and health.

Table 1. Fixed Effects Models Predicting Physical Symptoms and Psychological Distress for Men

	Physical symptoms				Psychological Distress			
	Model 1a		Model 1b		Model 2a		Model 2b	
	b	SE	b	SE	b	SE	b	SE
Sleep duration								
7 hours (REF)								
<6 hours	.119***	.032	.092*	.038	.291***	.035	.276***	.042
6 hours	.056**	.019	.076***	.022	.127***	.021	.122***	.024
>7 hours	-.020	.020	-.001	.023	-.039	.022	-.050*	.025
Work shift								
Regular day (REF)								
Regular night/evening	-.044	.044	-.009	.066	-.032	.048	-.026	.072
Rotating/split	.031	.032	.059	.049	.036	.035	-.065	.053
Flexible/on call	-.016	.024	.021	.036	.015	.027	.033	.039
Sleep duration X work shift								
<6 hours X regular night/evening			.073	.097			-.014	.106
<6 hours X rotating/split			.051	.084			**.234***	.091
<6 hours X flexible/on call			.041	.078			-.127	.084
6 hours X regular night/evening			-.012	.091			.027	.100
6 hours X rotating/split			-.062	.062			.107	.067
6 hours X flexible/on call			**-.113***	.051			-.035	.056
>7 hours X regular night/evening			-.143	.084			-.017	.091
>7 hours X rotating/split			-.067	.067			**.146***	.073
>7 hours X flexible/on call			-.045	.050			.009	.055
Intercept	1.893	.054	1.883	.054	1.969	.059	1.974	.059
N (person-years)	4,829		4,829		4,829		4,829	

Note: All models include the following control variables: age, the presence of children, marital status, education, log personal income, occupation, hours worked, and survey years.

All continuous variables (age, log personal income, and hours worked) are grand mean centered.

*p<.05, **p<.01, ***p<.001.

Table 2. Fixed Effects Models Predicting Physical Symptoms and Psychological Distress for Women

	Physical symptoms				Psychological Distress			
	Model 1a		Model 1b		Model 2a		Model 2b	
	b	SE	b	SE	b	SE	b	SE
Sleep duration								
7 hours (REF)								
<6 hours	.155***	.027	.153***	.031	.224***	.030	.242***	.034
6 hours	.068***	.018	.071***	.020	.107***	.020	.134***	.022
>7 hours	-.016	.017	-.019	.019	-.045*	.019	-.052*	.021
Work shift								
Regular day (REF)								
Regular night/evening	-.003	.042	.059	.068	.019	.046	.210**	.075
Rotating/split	.004	.028	-.020	.041	-.005	.031	-.030	.045
Flexible/on call	.048	.025	.039	.039	.043	.028	.061	.043
Sleep duration X work shift								
<6 hours X regular night/evening			-.050	.099			-.332**	.109
<6 hours X rotating/split			-.029	.075			-.007	.082
<6 hours X flexible/on call			.092	.074			.052	.081
6 hours X regular night/evening			-.100	.086			-.254**	.094
6 hours X rotating/split			.039	.054			-.030	.059
6 hours X flexible/on call			-.024	.053			-.104	.058
>7 hours X regular night/evening			-.091	.082			-.201*	.090
>7 hours X rotating/split			.059	.056			.131*	.061
>7 hours X flexible/on call			.018	.051			.013	.057
Intercept	2.126	.047	2.127	.048	2.226	.052	2.220	.052
N (person-years)	7,023		7,023		7,023		7,023	

Note: All models include the following control variables: age, the presence of children, marital status, education, log personal income, occupation, hours worked, and survey years.

All continuous variables (age, log personal income, and hours worked) are grand mean centered.

*p<.05, **p<.01, ***p<.001.

Table 3. Fixed Effects Models Predicting Physical Symptoms and Psychological Distress for Men

	Physical symptoms				Psychological Distress			
	Model 1a		Model 1b		Model 2a		Model 2b	
	b	SE	b	SE	b	SE	b	SE
Sleep problems	-.135***	.011	-.130***	.012	-.214***	.011	-.208***	.013
Work shift								
Regular day (REF)								
Regular night/evening	-.030	.043	-.032	.043	-.006	.046	-.005	.046
Rotating/split	.023	.031	.020	.031	.029	.034	.026	.034
Flexible/on call	-.013	.024	-.014	.024	.023	.026	.022	.026
Sleep problems X work shift								
... X regular night/evening			**-.090***	.037			-.031	.040
…X rotating/split			-.027	.029			**-.064***	.031
…X flexible/on call			.020	.022			.014	.024
Intercept	1.937	.052	1.937	.052	2.053	.056	2.053	.056
N (person-years)	4,829		4,829		4,829		4,829	

Note: All models include the following control variables: age, the presence of children, marital status, education, log personal income, occupation, hours worked, and survey years.

All continuous variables (age, log personal income, and hours worked) are grand mean centered.

*p<.05, **p<.01, ***p<.001.

Table 4. Fixed Effects Models Predicting Physical Symptoms and Psychological Distress for Women

	Physical symptoms				Psychological Distress			
	Model 1a		Model 1b		Model 2a		Model 2b	
	b	SE	b	SE	b	SE	b	SE
Sleep problems	-.132***	.009	-.124***	.010	-.249***	.010	-.247***	.011
Work shift								
Regular day (REF)								
Regular night/evening	.004	.041	.004	.042	.029	.043	.032	.044
Rotating/split	.013	.027	.010	.028	.013	.029	.012	.029
Flexible/on call	.046	.025	.040	.025	.039	.026	.036	.027
Sleep problems X work shift								
... X regular night/evening			-.003	.035			.012	.037
…X rotating/split			-.026	.023			-.004	.025
…X flexible/on call			**-.045***	.023			-.025	.024
Intercept	2.146	.046	2.147	.046	2.246	.048	2.247	.048
N (person-years)	7,023		7,023		7,023		7,023	

Note: All models include the following control variables: age, the presence of children, marital status, education, log personal income, occupation, hours worked, and survey years.

All continuous variables (age, log personal income, and hours worked) are grand mean centered.

*p<.05, **p<.01, ***p<.001.

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