



## Original Article

## Associations of insomnia with job strain, control, and support among male Japanese workers

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## ABSTRACT

*Objective:* To assess the relationship between job stress and insomnia among office workers.*Methods:* This cross-sectional study examined 1209 male workers (mean age 43 years) at periodic health checkups in 2007. Insomnia was defined as consistently experiencing any of three sleep disorder symptoms (i.e., difficulty initiating sleep, difficulty maintaining sleep, and early-morning awakening) in a recent two-week period. Job stress indices included job demand, control, strain (job demand/control), and social support, as measured by the Job Content Questionnaire.*Results:* The prevalence of insomnia was 4.7%. After adjusting for age, perceived daily stress, sleep dissatisfaction, lifestyle factors, and physical comorbidities, the risk of insomnia increased with a higher degree of job strain (odds ratio 2.3, 95% confidence intervals 1.3–4.0) and decreased with a higher degree of job control (0.5, 0.3–0.8). The combination of high job strain with low degree of control or social support had an approximately three times higher risk of insomnia than that of low job strain with high degree of control or support.*Conclusions:* Both job strain and job control had an independent effect on insomnia, and the association between job strain and insomnia was mediated by the buffering effects of control and support.

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## 1. Introduction

Insomnia is one of the most common and widely recognized health problems in the general population. The reported risk profiles include female gender [1–3], increasing age [2,3], psychological factors including sleep dissatisfaction [4–6] and job stress [7–10], socioeconomic factors such as lower education [1,11] and lower income [1,11,12], lifestyle factors including drinking, smoking, and low levels of exercise [13,14], and physical comorbidities [13]. Among these risk factors, we particularly focused on job stress in workers because job stress may be more preventable than individual lifestyle factors. For example, occupational health staff can more easily intervene in workers as a population than in individual lifestyle preference.

Numerous studies have investigated psychosocial job characteristics and sleep problems. However, simple comparison of the results of these studies is difficult because of the diverse definitions of “job stress” and “insomnia” used. Nevertheless, several studies have investigated the association of job stress and insomnia using the relatively valid and reliable Job Content Questionnaire (JCQ). The JCQ was developed from Karasek’s job demand-control model [15], in which the combination of higher job demand and lower

job control increases the risk of adverse health outcomes. Previous studies have suggested that insomnia increases with job stress, including job demands [16,17] and job strain [9,10,18,19], and decreases with higher degree of job control [17] and social support at work [7,8]. However, the reported results have been inconsistent, especially when adjusting for potential confounders such as psychological stress and lifestyle factors. More studies and evidence are needed to clarify and confirm the relationship between job stress and insomnia.

Hence, we aimed to assess the relationship between job stress and insomnia while adjusting for psychological stress, lifestyle factors, and physical comorbidities. We also examined the buffering effects of job control and social support, which are known to decrease the risk of insomnia [7,8,17]. Identifying the buffering effects of these two factors on self-perceived insomnia could contribute occupational intervention and benefit to a large number of workers suffering from job stress.

## 2. Materials and methods

## 2.1. Participants

This investigation was conducted as a part of a mandatory annual health checkup of office workers at a Japanese company in April 2007. We recruited all employees to answer a self-administered

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questionnaire. The target population included 1429 employees, of whom 1398 responded to the questionnaire (response rate 98%). Among the respondents, we excluded 188 female workers because the sample number was too small to use in multiple analyses. In addition, because insomnia is significantly associated with depression, subjects having depression scores above the 60th percentile for the Profile of Mood States were excluded [20]. Thus, the final analysis involved 1209 male workers. Table 1 presents the characteristics of the subjects. The Occupational Safety and Health Committee, comprised of company representatives, managers, and workers, approved the study. We explained the content of the study to the candidate participants, providing written information on the study protocol, and only included subjects who gave written consent.

## 2.2. Insomnia

Insomnia was defined as having at least one of the following three sleep symptoms: difficulty initiating sleep (DIS), difficulty maintaining sleep (DMS), and early-morning awakening (EMA). The subjects answered the following questions: Do you have difficulty falling asleep at night? Do you wake up during the night after you have gone to sleep? Do you wake up too early in the morning and have difficulty getting back to sleep? The three response choices were “almost every night for more than two weeks,” “sometimes,” and “seldom or never.” For each question, we judged the answer “almost every night for more than two weeks” to indicate insomnia.

## 2.3. Psychological factors

We examined the following psychological factors: perceived daily stress (yes/no), sleep dissatisfaction (yes/no), and job stress indices. Job stress indices were measured by the Japanese version

of the Job Content Questionnaire (JCQ). The reliability and validity of the JCQ are considered excellent for assessing job stress among Japanese employees [21]. The parameter of job demand is conceptualized as stressors present in the work environment (Cronbach's  $\alpha = 0.66$ ); that of job control is measured by two theoretically distinct subdimensions of decision latitude, namely skill discretion ( $\alpha = 0.64$ ) and decision authority ( $\alpha = 0.71$ ); and that of social support includes support of supervisors ( $\alpha = 0.90$ ) and coworkers ( $\alpha = 0.78$ ). Items were scored on a four-point Likert-type scale, using anchors of 1 for “agree” and 4 for “disagree.” Job strain was estimated by job demand divided by job control, with job demand, job control, job strain, and social support used as job stress indices.

## 2.4. Lifestyle factors

The investigated lifestyle factors were current smoking habit (yes/no), drinking habit (never, 1–2 days per week, 3–5 days per week, 6 or more days per week), and regular exercise (none, 1–2 times per week, 3 or more times per week).

## 2.5. Physical comorbidities

Physical comorbidities included obesity, hypertension, hypertriglycemia, decreased high-density lipoprotein (HDL) cholesterol, and impaired fasting glucose. Obesity was characterized by body mass index (BMI)  $\geq 25$  kg/m<sup>2</sup>, hypertension by systolic blood pressure (SBP)  $\geq 130$  or diastolic blood pressure (DBP)  $\geq 80$  mm Hg, hypertriglycemia by serum levels of triglyceride  $\geq 50$  mg/dL, low HDL cholesterol by serum levels of HDL  $< 40$  mg/dL, and impaired fasting glucose by blood levels of fasting blood sugar (FBS)  $\geq 120$  mg/dL.

## 2.6. Data analyses

A logistic regression model was used to assess the risk factors for insomnia as well as for the three sleep symptoms (i.e., DIS, DMS, and EMW). Odds ratios (both crude and adjusted for age), job stress indices, psychological factors, lifestyle factors, and physical comorbidities were calculated with their 95% confidence intervals (95% CI). Each job stress index was dichotomized into a higher or lower group by respective mean scores, [8] except for job strain, which was dichotomized with upper quartiles [22]. Because job strain is defined as job demand/job control, it was analyzed in a model that excluded job demand and control. Age was treated as a continuous independent variable, and therefore odds ratios reflected an increase in the odds of insomnia per 1-year increase in age. *P*-values for both drinking and exercise habits were calculated based on the statistical significance of the items. Variables selected at a significance level of 0.1 in univariate models were entered in the multivariate models. To assess the reliability of the variable selection, model selection was performed by stepwise methods (entry significance level = 0.3, stay significance level = 0.35) [23]. Finally, to assess the buffering effects of job control and social support on the relationship between insomnia and job strain, subjects were grouped according to four job strain levels: low strain with high degree of control or social support, low strain with low control or social support, high strain with high control or social support, and high strain with low control or social support. The odds ratios for insomnia at each level of job strain were then calculated in univariate and multivariate stepwise logistic models. Trend *p*-values were also calculated assuming that the combination of low job strain with high degree of control or social support protected most against insomnia, while the combination of high job strain with low degree of control or social support had the greatest risk for insomnia.

**Table 1**  
Subjects' characteristics (*n* = 1209)

Variables		
Age (means $\pm$ SD)	43	$\pm 10$ years
	<i>n</i>	%
Psychological factors		
Perceived daily stress (Positive)	386	32
Sleep dissatisfaction (Positive)	524	43
Job stress indices <sup>a</sup>		
Higher demand	706	58
Higher control	806	67
Higher strain	297	25
Higher support	643	53
Lifestyle factors		
Current smoking habit (Positive)	478	40
Drinking habit		
Never	216	18
1–2 days per week	294	24
3–5 days per week	348	29
6–7 days per week	308	25
Regular exercise (at least 30 min)		
None	508	42
1–2 times per week	544	45
3 or more times per week	124	10
Physical comorbidities <sup>b</sup>		
High BMI	503	42
Hypertension	481	40
Hypertriglycemia	341	28
Low HDL cholesterol	117	10
Impaired fasting glucose	65	5

<sup>a</sup> Job stress indices were dichotomized into higher or lower groups by respective mean scores, except for job strain which was by the upper quartile.

<sup>b</sup> Each of the physical comorbidities is defined in the text.

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