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Perceived psychosocial job stress and sleep bruxism among male and female workers

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Abstract – *Objective:* Psychosocial job stress has been associated with sleep disturbances, but its association with sleep bruxism (SB), the stereotype movement disorder related to sleep, is not well understood. The aim of this epidemiological study was to examine the relationship between psychosocial job stress and SB. *Methods:* 1944 male and 736 female factory workers participated in this study (response rate 78.1%). Perceived job stress was evaluated with the Japanese version of the generic job stress questionnaire, which covered 13 job stress variables. SB was assessed by the question, 'Do you grind or clench your teeth during your sleep or has anyone in your family told you that you grind your teeth during your sleep?' Response options were 'never', 'seldom', 'sometimes' or 'often'. SB was considered present if the answer was 'sometimes' or 'often'. *Results:* Overall, 30.9% of males and 20.2% of females reported SB. In males, workers with low social support from supervisors [odds ratio (OR) = 1.34, 95% confidence interval (CI) 1.08–1.68] or from colleagues (OR 1.47, 95% CI 1.17–1.83), and high depressive symptoms (OR 1.60, 95% CI 1.26–2.03) had a significantly increased risk of SB after controlling for confounders. By contrast, no significant association was found in females. *Conclusions:* We conclude that SB is weakly associated with some aspects of job stress in men but not in women among the Japanese working population.

Key words: epidemiology; job stress; parasomniao; psychosocial aspects of oral health; sleep bruxism

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Sleep bruxism (SB) is a periodical, stereotype movement disorder characterized by an involuntary, parafunctional, excessive grinding or clenching of the teeth during sleep (1). The disorder is common among general population and represents the third most frequent parasomnia. The prevalence of SB among adult population has been estimated to be 3.7–22.6% depending on the definition, methodology and population used in the studies (2–7). The consequences of SB include excessive tooth wear, fractures of the teeth, muscle pain, inflammation and recession of the gums, temporomandibular joint discomfort, increased risk of periodontal problems, and overloads of dental implants (8, 9). These symptoms are also associated with headaches, facial pain, tightening and stiffness of the shoulder, oral infection, frequent arousals with altered daytime functioning and obstructive sleep apnea (9–17). The grinding sounds are often reported to disrupt sleep of the bed partner (2).

Several previous studies demonstrated that demographic and lifestyle factors such as a young age (2, 10, 20), higher educational status (18, 19), smoking (2, 19–22), caffeine intake (2) and heavy alcohol drinking (2) are associated cofactors of SB. Psychological stress has also been discussed as a predisposing, precipitating and perpetuating factor for SB (23). For example, Hicks and Conti (24) compared the number of stress-related symptoms between nocturnal bruxers and nonbruxers and observed that frequent bruxers experienced more

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stress symptoms than non-bruxers. An epidemiological study conducted in three European countries (UK, Germany and Italy) including 13 057 subjects revealed that people with a highly stressful life and those with anxiety had respective 1.3 times higher prevalence of SB as compared with either low stress or non-anxiety counterparts (2). In a clinical study, Pingitore et al. (8) found that the total score of life stress events, as measured by Homes and Rahe's Life Events Perception Scale, was significantly and positively correlated with bruxism in 125 dental patients ($r = 0.27$, $P = 0.001$). These studies indicate that SB occurred more often in subjects exposed to high stress, suggesting SB as a behavioural response to stress.

There have been few epidemiological reports concerned with the effects of job-related stress on bruxism, although job stress is a well-known factor that deteriorates sleep (25–32). Ahlberg et al. (33) reported that experience of severe job stress was the most significant factor associated with frequent bruxism among 1339 multi-professional media personnel; the OR was as high as 5.0 (95% CI 2.8–8.8) as compared with the less severe counterpart. Another study by Ahlberg et al. (18) examined the effects of shift work on bruxism, and found that those workers who were dissatisfied with their current shift work schedule, but not shift work itself, was associated with 1.9 times higher prevalence of bruxism than those who felt satisfied with their schedule. These studies suggest that perceived poor work environment could be a risk factor for SB.

The effects of different sources of psychosocial job stress on SB in the working population have not yet been systematically investigated. To clarify the association of broad aspects of job stress with the prevalence of SB in male and female workers, we have conducted a cross-sectional survey among workers in small and medium-sized enterprises in Japan. Sociodemographics, lifestyle, physical/psychological conditions and occupational factors were included as confounding variables.

Materials and methods

Subjects and procedure

The study design was cross-sectional and data were collected by self-rated questionnaire from August to December 2002. Subjects were full-time workers in small and medium-sized enterprises with 1 to 158 workers in Yashio city, Saitama and Ohta ward (Tokyo). Yashio city has the highest percentage of manufacturing plants in Saitama prefecture. The Ohta ward, which is a so-called 'industrial area', is unique for its number of SMEs. Questionnaires were distributed to 2591 workers from 248 factories in the Yashio city and 1102 workers from 52 factories in the Ohta ward by visiting each factory ($n = 3693$). Finally, responses were obtained from 2884 workers (2022 men, 862 women) from 296 enterprises, representing a response rate of 78.1%. Among 2884 participants, we excluded 204 because of missing responses in demographics.

The questionnaire elicited information on demographics, lifestyle, height and body weight, history of physical/psychological disease(s) and job type. Job stress and SB were included under the topics of lifestyle and physical and/or psychological disease(s). The questions shown in Table 1 were answered by 1944 male and 736 female workers.

The study was approved by the Medical Ethical Committee of the University of Tokyo, and written informed consent was obtained from all participants.

Job stress questionnaire

The Japanese version of the generic job stress questionnaire (GJSQ) developed by the US National Institute for Occupational Safety and Health (NIOSH) was used to assess participants' level of job stress (34–36). Examination of the psychometric properties of the Japanese version of the questionnaire following translation showed consistently high levels of internal reliability (Cronbach's alpha, 0.68–0.95), test–retest reliability over 1 year (r, 0.44–0.71) and factor-based validity (36).

Eight scales of psychological job stressors, two scales of psychological stress reactions and three scales of social support were selected. The scale that included job control, social supports and job satisfaction was a positively oriented scale, in which higher scores indicate low stress. The remaining eight scales were negatively-oriented with higher scores indicating high stress. The psychometric properties of 13 GJSQ scales used in this study are shown in Table 2. Cronbach's alphas for each subscale were satisfactory in the range 0.66–0.95. The average scores for job stress scales by gender are presented in Table 3.

Participants were dichotomized into two categories (high/low) based on median scores on all job stress scales, with the exception of the Center for

Table 1. Characteristics of survey respondents stratified by sex[a,b]

Characteristics	Men	Women
Number of subjects	1944	736
Age (years), mean (SD)	45.1 (13.4)	45.0 (13.9)
Age group, years		
16–29	294 (15.1)	145 (19.7)
30–39	468 (24.1)	123 (16.7)
40–49	336 (17.3)	118 (16.0)
50–59	539 (27.7)	249 (33.8)
60–83	307 (15.8)	102 (13.9)
Marital status		
Married	1314 (67.6)	484 (65.8)
Not married	630 (32.4)	252 (34.2)
Highest education		
Junior high school	434 (22.3)	143 (19.4)
High school	864 (44.4)	399 (54.2)
Vocational/college/university	646 (33.2)	194 (26.4)
Smoking status		
Current	1146 (59.0)	166 (22.6)
Former	226 (11.6)	39 (5.3)
Never	572 (29.4)	531 (72.1)
Alcohol consumption (grams of ethanol per day)		
Non-drinker	472 (24.3)	399 (54.2)
0.01–4.9	249 (12.8)	177 (24.0)
5.0–14.9	437 (22.5)	103 (14.0)
15.0–24.9	383 (19.7)	34 (4.6)
>25.0	403 (20.7)	23 (3.1)
Caffeine intake (cups of coffee or tea per day)		
Almost none	193 (9.9)	54 (7.3)
1 to 2	909 (46.8)	323 (43.9)
3 or more	842 (43.3)	359 (48.8)
Body mass index [kg/height $(m)^2$]		
<20.0	297 (15.3)	206 (28.0)
20.0–22.5	609 (31.3)	259 (35.2)
22.6–25.0	583 (30.0)	158 (21.5)
>25.0	455 (23.4)	113 (15.4)
Disease(s) currently under treatment (yes)	542 (27.9)	176 (23.9)
Job type		
Managerial/clerical	395 (20.3)	387 (52.6)
Sales/service	206 (10.6)	11 (1.5)
Technical	91 (4.7)	18 (2.4)
Production/manufacturing	931 (47.9)	232 (31.5)
Other	321 (16.5)	88 (12.0)

[a]Unless otherwise indicated, values are expressed as *n* (%).
[b]Data may not total to 100% due to rounding.

Epidemiologic Studies Depression (CES-D) scale for depressive symptoms. The CES-D scale cut-off score was 16, which differentiates between those exhibiting high levels of depressive symptoms (16 or higher) from those with lower levels of depression (15 and below) (37).

Perceived sleep bruxism

A question with regard to SB during the past one-year period was developed for this study as follows: Do you grind or clench your teeth during your sleep or has anyone in your family told you that you grind your teeth during your sleep? Response options were: 1 = never; 2 = seldom; 3 = sometimes; 4 = often. SB was considered present if the answer was 'sometimes' or 'often'.

Potential confounding variables

Other variables were age, marital status, educational level, lifestyle, physical/psychological diseases currently under treatment and job type. Lifestyle factors included smoking status (never, former, current), alcohol consumption (number of alcoholic drinks consumed per day, with one drink estimated as about 9 g of pure ethanol), caffeine intake (cups of tea or coffee per day), and body mass index (BMI, calculated as weight in kilograms divided by the square of height in metres). Disease(s) currently under treatment included hypertension, hyperlipidemia, diabetes mellitus, menopausal syndrome, heart disease, cancer, liver disease, renal disease, peptic ulcer, gastrointestinal diseases, neurological diseases, musculoskeletal disorders and psychiatric illnesses (self-report).

Statistical analyses

All analyses were carried out separately for men and women because there were large gender differences in job stress scores (Table 3). The comparison of job stress scores between men and women was made by Student's t test or Welch's test. A difference in the frequency of SB by gender was calculated using the χ^2 test. The risk of SB because of job stress was estimated using univariate and multivariate logistic regression with ORs and 95% CIs as measures of association. The model adjusted for age in 10-year increments, marital status (married/not married), highest educational level (junior high school, high school, vocational/college/university), smoking status (never, former, current), alcohol consumption (0, 0.01–4.9, 5.0–14.9, 15.0–25.0, >25.0 g/day), caffeine intake (almost none, 1 to 2, 3 or more cups per day), BMI (<20.0, 20.0–22.5, 22.6–25.0, >25.0), disease(s) currently under treatment (yes/no), and job type. Subjects with missing data were excluded for each job stress scale (listwise exclusion). The significance level for all statistical analyses was $P < 0.05$ (two-tailed test). All data were analyzed using the Statistical Package for the Social Sciences version 11.5 (SPSS, Inc., Chicago, IL, USA).

Table 2. Psychometric properties of 13 scales of the NIOSH job stress questionnaire

Job stress scale	Number of items	Mean	SD	Observed range	Possible range	α	Construct measured
Job stressors							
Quantitative workload (Quinn)	4	12.2	4.2	4–20	4–20	0.89	How much work the worker must do in the daily job.
Variance in workload	3	8.6	3.3	3–15	3–15	0.90	How often the workload varies.
Job control	16	45.3	14.1	16–80	16–80	0.95	How much the worker feels tasks, workplace setting, and decisions at work are controllable.
Skill underutilization	3	11.1	3.1	3–15	3–15	0.81	How much the worker feels that one's skills and ability are utilized in one's job.
Responsibility for people	4	9.6	4.4	4–20	4–20	0.91	How much responsibility the respondent feels for the future, job security, morale, welfare and lives of other workers.
Intragroup conflict at the workplace	8	23.0	4.6	8–40	8–40	0.66	How much the worker feels the relationships with the working group are friendly, harmonious, cooperative, and supportive.
Job future ambiguity	4	15.5	4.0	4–20	4–20	0.84	How certain the worker is about their career future such as opportunities for promotion and advancement, usefulness of one's job skills, and future responsibilities in one's job.
Employment opportunities	3	11.8	2.0	3–15	3–15	0.73	Feelings about the job in relationship to other jobs, which one might get.
Social support							
Supervisors	4	13.9	4.2	4–20	4–20	0.87	Amount of social support received from supervisors.
Coworkers	4	14.4	3.7	4–20	4–20	0.84	Amount of social support received from colleagues.
Family	4	15.0	4.1	4–20	4–20	0.84	Amount of social support received from family.
Psychological stress reactions							
Job satisfaction	4	8.1	1.9	4–13	4–16	0.72	Whether the worker would accept the current job if given another choice, take a new job or recommend the job to others.
Depressive symptoms	20	15.2	8.3	0–52	0–60	0.83	Level of depressive symptoms experienced in the past week.

SD, standard deviation.

Table 3. Mean scores of the NIOSH-GJSQ in men and women (SD)

Job stress scales	Men	Women	P^a
Quantitative workload[b]	12.6 (4.2)	11.1 (4.4)	<0.001
Variance in workload[b]	8.9 (3.3)	7.7 (3.4)	<0.001
Job control[c]	47.1 (14.4)	40.3 (12.5)	<0.001
Skill underutilization[b]	10.7 (3.1)	12.1 (3.0)	<0.001
Responsibility for people[b]	10.3 (4.4)	7.8 (4.4)	<0.001
Intragroup conflict at the workplace[b]	22.7 (4.6)	23.0 (4.8)	0.200
Job future ambiguity[b]	15.4 (4.0)	16.3 (4.0)	<0.001
Employment opportunities[b]	11.9 (2.0)	12.0 (2.1)	0.036
Social support from supervisors[c]	13.8 (4.2)	14.0 (4.2)	0.219
Social support from coworkers[c]	14.3 (3.7)	14.6 (3.8)	0.054
Social support from family[c]	14.8 (4.2)	15.7 (3.7)	<0.001
Job satisfaction[c]	8.1 (1.9)	8.0 (1.9)	0.706
Depressive symptoms (CES-D scores)[b]	15.4 (8.2)	15.3 (8.0)	0.770

SD, standard deviation.
[a]Compared with the Student's t test or Welch's test.
[b]Higher scores indicate higher stress.
[c]Higher scores indicate lower stress.

Results

Subjects characteristic

Mean ages for both men and women were 45 years (Table 1). Overall, 73% of the sample was male, two-thirds were married, and one-third were college graduates. Fifty-nine percent of men and 23% of women were current smokers. Three quarters of men and less than half of women were current drinkers. One in four workers had disease(s) currently under treatment. About half of men were production/manufacturing workers and more than half of women were managerial/clerical workers.

Job stress scales

Mean scores on the NIOSH–GJSQ for men and women are shown in Table 3. Men and women's reported levels of job stress were significantly different on many scales. For example, men reported higher scores for quantitative workload, variance in workload, job control and responsibility for people than women. Women had higher scores for skill underutilization, job future ambiguity, employment opportunities and support from family and society.

Prevalence of perceived SB

Frequency distribution of perceived SB among men and women are shown in Table 4. Overall, 9.2% of men and 4.6% of women reported that SB occurred 'often', and 21.7% of men and 15.6% of women reported SB 'sometimes'. Men reported significantly more SB than women (χ^2-test, $P < 0.001$).

Table 4. Frequency distribution of perceived sleep bruxism in the study population (95% CI)[a]

Sleep bruxism	Men ($n = 1944$)	Women ($n = 736$)
Never	41.6 (39.4–43.8)	55.6 (52.0–59.2)
Seldom	27.6 (25.6–29.6)	24.2 (21.1–27.3)
Sometimes	21.7 (19.8–23.5)	15.6 (13.0–18.2)
Often	9.2 (7.9–10.5)	4.6 (3.1–6.1)

[a]A significant difference in sleep bruxism was found between men and women (χ^2-test, $P < 0.001$).

Association of psychosocial job stress with SB

The univariate logistic regression analyses indicated that four out of 13 psychosocial job stress variables were significantly associated with SB in men; in contrast, only one psychosocial job stress factor was significantly associated with SB in women (Table 5). Workers with low social support from supervisors or colleagues and high depressive symptoms had significantly increased risk of SB in the multivariate model for men. However, none of the stress variables remained significant for women.

Discussion

The purpose of the present study was to examine the relationship between variety of sources of psychosocial job stress factors and perceived SB in male and female workers individually. The subjects were dichotomized into two equal-sized groups based on a median split of job stress scale scores and compared on the prevalence of SB

Table 5. The relationship between job stressors, social support or psychological stress reactions and sleep bruxism[a]

		Men						Women					
		Unadjusted			Adjusted[d]			Unadjusted			Adjusted[d]		
Job stress scales[b,c]		OR	95% CI	*P*	OR	95% CI	*P*	OR	95% CI	*P*	OR	95% CI	*P*
Job stressors													
Quantitative workload	High	1.18	0.97–1.43	0.104	1.08	0.87–1.35	0.481	1.23	0.87–1.76	0.248	1.09	0.71–1.67	0.696
Variance in workload	High	1.25	1.03–1.52	0.027	1.19	0.95–1.49	0.124	1.18	0.82–1.69	0.376	0.97	0.63–1.49	0.887
Job control	Low	0.90	0.73–1.10	0.306	0.93	0.74–1.18	0.556	0.85	0.59–1.23	0.388	1.02	0.66–1.59	0.917
Skill underutilization	High	0.92	0.75–1.12	0.385	0.97	0.77–1.21	0.762	0.80	0.55–1.16	0.247	0.93	0.59–1.46	0.746
Responsibility for people	High	1.09	0.90–1.33	0.372	1.00	0.80–1.26	0.999	1.07	0.75–1.53	0.701	1.02	0.66–1.56	0.942
Intragroup conflict at the workplace	High	1.07	0.87–1.30	0.527	1.13	0.90–1.41	0.302	1.43	1.00–2.05	0.049	1.49	0.97–2.28	0.071
Job future ambiguity	High	1.05	0.86–1.28	0.619	1.18	0.94–1.47	0.160	0.90	0.62–1.29	0.554	0.95	0.61–1.49	0.836
Employment opportunities	High	0.97	0.79–1.19	0.735	1.04	0.82–1.32	0.762	0.87	0.60–1.26	0.455	0.96	0.62–1.50	0.866
Social supports													
Supervisors	Low	1.26	1.03–1.53	0.022	1.34	1.08–1.68	0.009	0.86	0.60–1.23	0.398	0.99	0.64–1.53	0.969
Coworkers	Low	1.33	1.09–1.61	0.005	1.47	1.17–1.83	0.001	1.00	0.70–1.44	0.990	1.34	0.86–2.08	0.196
Family	Low	0.85	0.70–1.04	0.106	0.94	0.74–1.18	0.583	0.99	0.68–1.43	0.946	1.04	0.66–1.64	0.858
Psychological stress reactions													
Job satisfaction	Low	1.05	0.86–1.28	0.642	1.14	0.90–1.42	0.275	0.89	0.61–1.28	0.514	0.87	0.56–1.35	0.542
Depressive symptoms (CES-D)	CES-D > 15	1.40	1.14–1.72	0.001	1.60	1.26–2.03	<0.001	1.23	0.85–1.79	0.273	1.12	0.71–1.75	0.630

OR, odds ratio; CI, confidence interval.

[a]Sleep bruxism was defined as present if the answer to the question was 'sometimes' or 'often'.

[b]All scales were divided into two approximately equal size groups by the median scores, with exception of CES-D scale for depressive symptoms.

[c]Compared to the low (or high) counterpart.

[d]Adjusted for 10-year increments in age, marital status, educational level, smoking status, alcohol consumption, caffeine intake, BMI, disease(s) currently under treatment and job type.

during the last 1-year period. The results revealed that male workers with low social support from supervisors or colleagues and high depressive symptoms were significant cofactors for frequent SB. Grinding or clenching teeth during sleep may be a sign of high stress symptoms (13, 23). By contrast, we could not detect any significant effects of job stress on SB in females. The results suggest that SB is weakly associated with some aspects of job stress in men but not in women among the Japanese working population.

The strength of our study is that we evaluated job stress with a well-established and validated questionnaire, i.e., the Japanese version of the GJSQ. We selected 13 scales from this questionnaire to assess various subtypes of job stress. Previous studies reporting the relationship between job stress and SB were based on a single question on job stress (33). Also, the analyses were done separately for men and women and adjusted for a broad range of potential confounders in the multivariate analyses, thereby overcoming the analytical shortcomings of some previous studies that have failed to account for unique gender differences. Finally, nonclinical subjects with a large sample size were used to avoid information bias, thus increasing the potential to generalize the results.

However, we need to keep in mind several limitations of our study. First, SB was a point estimate with self-report, which may underestimate the prevalence of SB among those without a bed partner or other household members and those of edentulous individuals, as reported in several previous studies (2, 13, 14, 20). In addition, although we tried to follow the minimal criteria for diagnosis of SB by the International Classification of Sleep Disorders (1, 2), the validity of our questionnaire assessing SB is uncertain. Thus, the study's accuracy in evaluating SB is limited. Second, we did not ask about stress levels outside their jobs. Subjects may be exposed to high stress unrelated to their job, which may affect SB. Third, because a large set of statistical tests examined here might have increased a possibility of type I error, the statistical significance of the results should be interpreted carefully. Fourth, although the response rate seems acceptable (78.1%) to represent the sample, response bias may have occurred if the nonrespondents differed from the respondents with respect to job stress and SB. Fifth, the study design was cross-sectional, making it possible to identify only associations, but not causal relationships.

Our main finding was that social support from supervisors or colleagues was a factor associated with increased SB in men. Based on the 2002 national survey in Japan, poor human relationships at workplace was ranked first followed by high job demands, poor quality of work, less aptitude to work, greater job future ambiguity, etc. (38). Thus, it is plausible that difficulty in obtaining social support from fellow employees is a source of job stress affecting SB in Japanese men.

In the current study, high depressive symptoms as measured by CES-D scores of 16 or higher were significantly associated with SB in men. The finding is consistent with that of a study by Manfredini et al. (39) showing higher depressive symptoms in bruxers than nonbruxers. The results may also be supported by the fact that subjects with depressive symptoms are more associated with other dental problems such as periodontal diseases (40) or attachment loss (41). Depressive symptoms may associate not only with poor mental health but also with poor oral health status.

Males had 1.5 times higher prevalence of SB as compared with females in this study. Several previous studies reported that females had higher prevalence of SB than males (19, 33, 39), while other reports observed no gender differences (2–4, 6, 21) or even lower prevalence (42). The findings are open to several interpretations. First, males may be exposed to higher job stress than females as suggested in Table 3, which may lead to a higher prevalence of SB. Second, prevalence of smoking in males were 2.6 times higher than those of females (males 59.0%, females 22.6%), consequently leading to a higher prevalence of SB in males as compared with females. This speculation can be supported by the fact that smoking is a significant risk factor associated with bruxism reported in many previous studies (2, 19–22). In fact, both male and female current smokers in this study had significantly higher prevalence of SB (males 35.1%, females 30.9%) than never-smoking counterparts (males 22.9%, females 15.4%, $P < 0.05$). Third, females may be more likely to under-report their SB than males because of social desirability in the Japanese culture, or males may not be willing to point out females having SB. Alternatively, females may go to bed later than their male partners, which would increase the detectability of SB in males as compared with females (43). A time use survey in Japan reported that average sleep duration for females

were 15 min less than those of males (males 7 h 55 min, females 7 h 40 min). However, such possibilities need to be tested in future studies.

In conclusion, despite the fact that job stress and SB were assessed by self-report as well as with other limitations, these data suggested that male workers with low social support from colleagues or supervisors and high depressive symptoms are significantly associated with frequent SB. By contrast, job stress indicators had no significant relationship with SB in females. We conclude that SB is weakly associated with some aspects of job stress in men but not in women among the Japanese working population. Further investigations are needed to clarify mechanisms underlying the described association.

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