Workplace Bullying could Play Important Roles in the Relationships between Job Strain and Symptoms of Depression and Sleep Disturbance

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Abstract: Workplace Bullying could Play Important Roles in the Relationships between Job Strain and Symptoms of Depression and Sleep Disturbance: Jiro Takaki, *et al*. Department of Public Health, Okayama University Graduate School of Medicine, Dentistry and Pharmaceutical Sciences— **Objective:** The purpose of this study was to assess whether workplace bullying mediates between job strain, evaluated by the job demand–control model, and symptoms of depression and sleep disturbance. **Methods:** The subjects in this cross-sectional study were recruited from all the workers (N=2,634) at 50 organizations in Japan. Due to missing data, the numbers of subjects included in the analyses varied from 1,646 to 2,062 (response rates varied from 62.5% to 78.2%). Job strain and workplace social support, workplace bullying, depression, and sleep disturbance were assessed using the Japanese versions of the Job Content Questionnaire, the Negative Acts Questionnaire, the Center for Epidemiologic Studies Depression Scale, and the Pittsburgh Sleep Quality Index, respectively. Mediation analysis followed the approach outlined by Baron and Kenny. We quantitatively estimated the mediation effects and tested their significance after adjustment for various combinations of demographic variables and workplace social support. **Results:** Total effects of job strain index on depression or sleep disturbance were all positive and significant ($p<0.05$) in both genders. Mediation effects of workplace bullying were also all positive and significant ($p<0.05$) in both genders. Even after adjustment for workplace social support, the mediation effects were decreased, especially in women, but remained significant ($p<0.05$). **Conclusions:** Workplace bullying seems to play important roles in the relationships of job strain with depression or sleep disturbance in both genders.
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The job demand–control (JDC) model developed by Karasek[1] has been used in the assessment of job stress. In the model, employees who face high demands and have little control over their job are hypothesized to be at greater risk of becoming ill[1]. There are well-established relationships of high job demand, low job control, or high job strain evaluated by the JDC model with depression[1–5] and poor sleep quality[6–10]. However, their mechanisms still remain theoretical speculation. Some studies have assumed that job strain directly causes depression or sleep disturbance[1, 2, 4, 5, 8]. A recent meta-analytic review of psychosocial work environment and mental health suggested that low self-esteem and declining mastery are mediating factors between poor work conditions and psychological distress, as they mediate between life events and depression[3]. However, self-esteem and mastery are abstract concepts and how to intervene them seems unclear. If the mechanisms were explained concretely, measures could be taken to prevent depression and sleep disorders among those who face high demands and have little control over their job.

A stressful work environment often causes worsened interpersonal relationships, leading to workplace bullying[11]. In the healthcare setting, factors that increase the risk of hostile behaviors include stress[12]. The perioperative setting fosters bullying behavior because of its inherent stress including work demands[13]. Matthiesen and Einarsen reported that even the perpetrators of bullying, as well as targets and provocative victims of bullying, showed elevated levels of role stress in the form of unclear or conflicting demands and expectations regarding work tasks and daily work[14].

On the other hand, workplace bullying has been suggested to cause symptoms of depression[15–21] or suicide ideation[22] and sleep disturbance[23]. Therefore, we hypothesized that workplace bullying mediates the well-established relationships between job strain evaluated by the JDC model and symptoms of depression and sleep disturbance. In this study, we quantitatively estimated the mediation effect and tested its significance.

Methods

Participants

The subjects of this study were recruited from all the workers (N=2,634) at 50 organizations comprising manufacturing factories and health-care or welfare institutions in Japan. The organizations were selected out of convenience. The questionnaires were mailed to the organizations and were distributed to the workers. The purpose and procedure of the survey were explained to the participants in documents accompanying the questionnaires. Written informed consent was obtained from all participants, who were not compensated for their participation. A total of 2,500 questionnaires were returned sealed in envelopes, providing a temporal response rate of 94.9%. Listwise deletion was used in each mediation analysis. Due to missing data, the total numbers of men and women included in each analysis varied from 1,646 to 2,062 (final response rates varied from 62.5% to 78.2%). This study was approved by the ethics committee of Okayama Prefectural University.

Measures

Participants completed a self-administered questionnaire including background information such as measures of age, gender, occupational status, annual household income, current smoking, alcohol consumption, and measures of job strain, workplace social support, workplace bullying, depression, and sleep quality.

Job strain and workplace social support were measured using the Japanese version of the job content questionnaire (JCQ)[1, 24, 25]. The parameter of job demand was conceptualized as stressors present in the work environment, and job control was measured by two theoretically distinct subdimensions of decision latitude,

namely skill discretion and decision authority. The combination of high demand and low control is considered to be job strain. The job strain index, which is calculated as job demand divided by job control, was used as an indicator of job strain; higher scores indicate greater strain[25]. Workplace social support was calculated as the total of coworker support and supervisor support[24, 25]. The internal consistency and factor- and construct-validity of the scale have been confirmed to be excellent among the Japanese population[24].

Workplace bullying was assessed using the Japanese version of the Negative Acts Questionnaire (NAQ)[26, 27]. The NAQ is a self-administered questionnaire originally developed by Einarsen and Raknes and measures exposure to specific negative acts which are typical of bullying[26]. It contains 22 items that refer to both direct and indirect behaviors but do not require respondents to label themselves as targets of bullying (e.g., "Someone withholding necessary information so that your work gets complicated," "Social exclusion from co-workers or work group activities"). Respondents indicate on a five-point scale (1=never, 2=now and then, 3=monthly, 4=weekly, and 5=daily) whether they have experienced the designated negative acts in the context of their job[26]. The Japanese version of the NAQ has been developed using a back-translation method[27]. The sum of the answers for the 22 items has been confirmed to have acceptable levels of internal consistency reliability and construct validity among the Japanese population[27]. Higher scores indicate greater bullying[26, 27]. Recently, a revised version of the NAQ has also been introduced and is now recommended by Einarsen[28]. Its Japanese version has also been developed and its reliability and validity have been confirmed[29].

Depression was assessed using the Center for Epidemiologic Studies Depression Scale (CES-D), which is a self-administered questionnaire originally developed by Radloff[30] that has been widely used for clinical and epidemiological research. The Japanese version of the CES-D was used for the present study. Its reliability and validity have been confirmed to be excellent among the Japanese population[31]. Higher scores indicate deeper depressive mood[30, 31].

Sleep disturbance was assessed with the Pittsburgh Sleep Quality Index (PSQI), which is a self-administered questionnaire originally developed by Buysse and colleagues[32] that has been widely used for clinical and epidemiological research. The Japanese version of the PSQI was used in the present study[33, 34]. The PSQI assesses sleep quantitatively and qualitatively during the previous month and generates seven components (with scores of 0–3): sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. The sum of these seven component scores produces one global
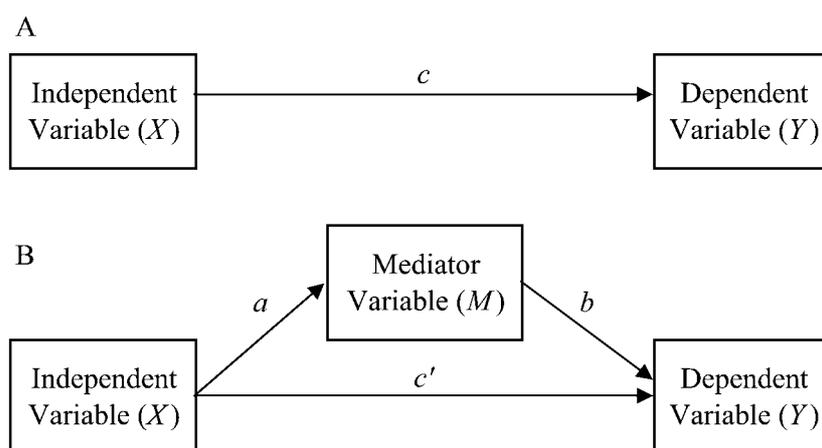
A

| Independent Variable (X) | → c → | Dependent Variable (Y) |

B

Mediator Variable (M)

a ↗   ↘ b

| Independent Variable (X) | → c' → | Dependent Variable (Y) |

Fig. 1. Diagram of paths in mediation models.

score for subjective sleep quality[32–34]. Its reliability and validity have been confirmed to be excellent among the Japanese population[33]. Higher scores indicate poorer sleep quality[32–34].

Data analyses

For gender differences, continuous variables were compared by the unpaired *t*-test and categorical variables were compared by the chi-square test. The mediation analysis of this study follows the approach outlined by Baron and Kenny[35]. A path model in Fig. 1A shows total effect and the other model in Fig. 1B shows mediation effect. To establish mediation, the following conditions must hold: Paths *a*, *b*, and *c* are significant and path *c* is significantly reduced to path *c'* (i.e., *c–c'* is significant)[35]. If the total and mediation effects are assessed using the same sample, *c–c'* is equal to *ab*[36, 37]. Thus, the significance of *c–c'* can be assessed by testing the significance of *ab*[36, 37]. In each regression analysis, the job strain index was included as an independent variable; depression or sleep disturbance was included as a dependent variable; and workplace bullying was used as a mediator variable. Total and direct effects (*c* and *c'* coefficients) and *a* and *b* coefficients were evaluated using standardized regression coefficients in the respective regression models. Mediation effects (*c–c'=ab*) and their 95% confidence intervals (CIs) were calculated according to MacKinnon *et al.*[37, 38] using regression coefficients corresponding to the *a* and *b* coefficients and their standard errors. If the 95% CI of the mediation effect does not include zero, the proposed mediator (i.e., workplace bullying) significantly mediated between job strain index and symptoms of depression or sleep disturbance[36, 37]. We included various covariates in the analyses. We also included workplace social support as an additional covariate, not as a mediator, in the analyses

because it is not assumed to result from job strain[25] and because the potentially preventable fraction of mediation effects of workplace bullying by workplace social support might be assessed. Because of possible gender differences, we analyzed the data for men and women separately. SPSS 11.0J (SPSS Tokyo, Japan) was used for the statistical analyses.

Results

Participant characteristics according to gender are shown in Table 1. Age, job demand, job control, job strain index, depression, poor sleep quality, occupational status, household income, alcohol consumption, and tobacco use were significantly ($p<0.05$) different between men and women. The answers for the NAQ in this study are shown in Table 2. Of those who answered all the items of the NAQ, 81.2% reported having experienced at least one of the behaviors measured by the NAQ during the previous six months.

Results of mediation analyses with various covariates are shown in Table 3. Total effects (*c* coefficients) of job strain index on depression or sleep disturbance were all positive and significant ($p<0.05$) in both genders (Table 3). Direct effects (*c'* coefficients) were significant ($p<0.05$) except for two of those on sleep disturbance among men (Table 3). All the effects of job strain index on workplace bullying (*a* coefficients) and all the effects of workplace bullying on depression or sleep disturbance (*b* coefficients) were positive and significant ($p<0.05$) in both genders (data not shown). All the mediation effects of workplace bullying (*c–c'=ab*) were positive and significant ($p<0.05$) in both genders (Table 3). Even after adjustment for workplace social support, mediation effects were decreased, especially in women, but remained significant ($p<0.05$) (Table 3).

Table 1. Participant characteristics according to gender

| | Men (N=923)[a] | | Women (N=1,542)[a] | | p[c] | N of missing |
	Mean	SD[b]	Mean	SD		data
Age (yr)	41.6	13.6	39.4	12.1	<0.001	14
Psychosocial work environment						
Job Content Questionnaire						
Job demand (12–48)	33.2	5.3	34.0	5.2	<0.001	87
Job control (24–96)	65.8	10.1	63.7	9.3	0.005	126
Job strain index (0.125–2.000)	0.516	0.119	0.538	0.120	<0.001	171
Workplace social support (8–32)	22.4	4.1	22.3	4.2	0.402	119
Workplace bullying						
Negative Acts Questionnaire total score (22–110)	28.7	8.4	28.2	8.3	0.205	161
Depression						
Center for Epidemiologic Studies Depression Scale score (0–60)	14.4	7.9	15.2	9.3	0.029	174
Sleep disturbace						
Pittsburgh Sleep Quality Index global score (0–21)	4.7	2.7	5.2	3.1	<0.001	295
	N	%	N	%		
Working hours per week					<0.001	184
< 40	70	7.9	287	20.6		
40–48	551	62.3	901	64.5		
48<	264	29.8	208	14.9		
Career in the current job (yrs)					<0.001	20
2 or less	224	24.4	508	33.2		
10 or less	373	40.7	798	52.2		
10<	320	34.9	222	14.5		
Supervisory or management position	163	17.8	134	8.9	<0.001	45
Annual household income (yen)					<0.001	194
<3,000,000	194	22.0	544	38.9		
<5,000,000	391	44.4	444	31.8		
<8,000,000	228	25.9	281	20.1		
<10,000,000	35	4.0	77	5.5		
10,000,000 or more	33	3.7	52	3.7		
Alcohol consumption					<0.001	66
Rare or none	403	44.8	1,081	72.1		
Regularly, but not nearly every day	223	24.8	277	18.5		
Almost every day	273	30.4	142	9.5		
Smoking status					<0.001	62
Never smoker	297	33.0	1,032	68.6		
Ex-smoker	196	21.8	175	11.6		
Current smoker	406	45.2	297	19.7		

[a]: N of missing data for gender was 35. [b]: Standard deviation. [c]: Continuous variables were compared using the unpaired *t*-test and categorical variables were compared using the chi-square test.

Discussion

In this study, total effects of job strain evaluated by the JDC model on symptoms of depression or sleep disturbance were significant in both genders. These results are consistent with previous studies[1–10]. Previous studies have suggested that stressful work environments can cause worsened interpersonal relationships, leading to hostile or bullying behaviors[11–14], and our results also indicate that job strain evaluated by the JDC model was associated with workplace bullying in both genders (i.e., *a* coefficients were significant). Workplace bullying was associated with symptoms of depression and sleep disturbance in previous studies[15–23] and in the present

Table 2. Percentages of workers who endorsed each item on the Negative Acts Questionnaire

	Never (%)	Now and then (%)	Monthly (%)	Weekly or Daily (%)[a]	Missing data (%)
1. Someone withholding necessary information so that your work gets complicated	33.3	47.3	6.8	11.1	1.5
2. Unwanted sexual advances	92.1	5.2	0.8	0.9	0.9
3. Ridicule or insulting teasing	74.0	19.1	2.6	3.3	1.1
4. Ordered to do work below your level of competence	65.6	26.5	3.4	3.2	1.2
5. Being deprived of responsibility or work tasks	77.6	15.9	2.1	2.6	1.8
6. Gossip or rumors about you	58.1	32.8	3.2	4.1	1.9
7. Social exclusion from co-workers or work group activities	83.4	11.9	1.4	2.0	1.5
8. Repeated offensive remarks about you or your private life	78.7	15.3	2.4	2.5	1.1
9. Verbal abuse	80.6	13.8	2.4	2.0	1.2
10. Unwanted sexual attention	93.5	4.4	0.6	0.4	1.2
11. Hint or signals from others that you should quit your job	89.8	7.0	1.0	0.9	1.3
12. Physical abuse or threats of physical abuse	95.4	2.5	0.6	0.3	1.2
13. Repeated reminders about your blunders	78.2	16.9	1.9	1.5	1.4
14. Silence or hostility as a response to your questions or attempts at conversations	70.7	21.4	3.2	3.2	1.4
15. Devaluing of your work and efforts	60.1	29.8	3.8	4.6	1.7
16. Neglect of your opinions or views	66.3	24.8	3.6	3.5	1.7
17. Offending telephone calls or written messages	85.4	10.6	1.5	0.8	1.6
18. "Funny" surprises	85.1	11.1	1.5	0.8	1.5
19. Devaluing of your "rights" and opinions with reference to your gender	90.9	6.0	0.9	0.8	1.5
20. Devaluing of your "rights" and opinions with reference to your age	83.6	11.3	2.1	1.6	1.4
21. Exploitation at work, such as private errands	88.8	7.2	1.3	1.1	1.6
22. Reactions from others because you work too hard	69.2	21.4	3.3	4.8	1.6

[a]: Response categories "weekly" and "daily" have been thrown together to make one category.

study (i.e., *b* coefficients were significant). We quantitatively estimated the mediation effects of workplace bullying and found it significant in both genders. Thus, workplace bullying mediated between job strain evaluated by the JDC model and symptoms of depression and sleep disturbance in both genders. We are not aware of any previous research showing the mechanisms with quantitative estimations. As for the relationship between workplace bullying and symptoms of depression, negative affectivity was suggested to be the mechanism[16]. Regarding the relationship between workplace bullying and sleep disturbance, hyper-arousal due to fight/flight reaction to bullying and subsequent over-activation of the noradrenergic system or post traumatic stress disorder might be the mechanism[16, 39].

It seems that the additional adjustment for social support constitutes over-adjustment because workplace social support can protect people from some of the harmful effects of bullying[20]; alternatively, low workplace social support might be one of the causes of workplace bullying. When adjusted for workplace social support, mediation effects of workplace bullying decreased

especially among women in this study. The decrease might indicate the potentially preventable fraction of mediation effects of workplace bullying by workplace social support.

The NAQ item 4 "Ordered to do work below your level of competence" and item 5 "Being deprived of responsibility or work tasks" may be interpreted as reduction of job demand or job strain, but actually the answers for the NAQ items were significantly ($p < 0.001$) and positively correlated with the JCQ job demand score in both Pearson and Spearman correlations in this study (data not shown). The JCQ job demand score consists of the JCQ item 10 "My job requires working very fast", item 11 "My job requires working very hard", item 12 "I am not asked to do an excessive amount of work", item 13 "I have enough time to get the job done", and item 14 "I am free from conflicting demands that others make". Each answer for NAQ item 4 or 5 positively correlated with the answer to JCQ item 10 and negatively with the answer to JCQ items 12, 13, and 14 in both Pearson and Spearman correlations (all $p < 0.001$). The answers to NAQ items 4 and 5 did not significantly ($p > 0.05$) correlate

Table 3. Total and direct effects of job strain index on depression or sleep disturbance and mediation effects of workplace bullying according to gender

	Men		Women	
Depression				
	Model 1[a] (N=803)[b]	Model 2[c] (N=726)	Model 1 (N=1,259)	Model 2 (N=1,051)
Total effect (c coefficient)	0.237 (0.170, 0.304)[d]	0.242 (0.171, 0.314)	0.272 (0.219, 0.324)	0.250 (0.191, 0.309)
Direct effect (c' coefficient)	0.103 (0.039, 0.167)	0.110 (0.041, 0.180)	0.137 (0.087, 0.188)	0.120 (0.064, 0.176)
Mediation effect ($c–c'=ab$)	0.134 (0.101, 0.170)	0.132 (0.098, 0.170)	0.134 (0.108, 0.163)	0.130 (0.101, 0.161)
	Model 3[e] (N=786)	Model 4[f] (N=713)	Model 3 (N=1,233)	Model 4 (N=1,034)
Total effect (c coefficient)	0.203 (0.135, 0.272)	0.218 (0.146, 0.291)	0.193 (0.136, 0.249)	0.180 (0.118, 0.242)
Direct effect (c' coefficient)	0.099 (0.034, 0.164)	0.112 (0.042, 0.182)	0.126 (0.112, 0.219)	0.113 (0.055, 0.171)
Mediation effect ($c–c'=ab$)	0.104 (0.074, 0.138)	0.106 (0.075, 0.142)	0.066 (0.044, 0.090)	0.067 (0.043, 0.094)
Sleep disturbance				
	Model 1 (N=748)	Model 2 (N=681)	Model 1 (N=1,187)	Model 2 (N=999)
Total effect (c coefficient)	0.169 (0.098, 0.240)	0.177 (0.103, 0.252)	0.240 (0.185, 0.295)	0.197 (0.137, 0.258)
Direct effect (c' coefficient)	0.066 (–0.005, 0.138)	0.082 (0.006, 0.157)	0.146 (0.090, 0.201)	0.118 (0.057, 0.179)
Mediation effect ($c–c'=ab$)	0.103 (0.073, 0.136)	0.096 (0.065, 0.130)	0.094 (0.072, 0.119)	0.079 (0.057, 0.105)
	Model 3 (N=732)	Model 4 (N=667)	Model 3 (N=1,157)	Model 4 (N=979)
Total effect (c coefficient)	0.155 (0.081, 0.229)	0.159 (0.082, 0.237)	0.183 (0.123, 0.242)	0.152 (0.088, 0.217)
Direct effect (c' coefficient)	0.071 (–0.002, 0.144)	0.081 (0.004, 0.159)	0.135 (0.077, 0.193)	0.112 (0.048, 0.175)
Mediation effect ($c–c'=ab$)	0.084 (0.057, 0.115)	0.078 (0.050, 0.110)	0.048 (0.030, 0.067)	0.040 (0.023, 0.060)

[a]: Adjusting for age. [b]: N varied due to missing data. [c]: Adjusting for age, working hours per week, career, position, annual household income, current smoking, and alcohol consumption. [d]: Figures in parentheses represent 95% confidence intervals for each effect. [e]: Adjusting for age and workplace social support. [f]: Adjusting for variables included in model 2 and workplace social support.

with those to JCQ item 11. Workers who were ordered to do work below their level of competence or who were deprived of responsibility or work tasks seemed to be in high demand situations with excessive amounts of work and conflicting demands that others made.

Most of the direct effects of job strain on depression and those on sleep disturbance were significant in this study. The direct effects were considered to include true direct effects and mediation effects of factors other than workplace bullying evaluated using the NAQ (e.g., low self-esteem, declining mastery)[3]. As for the direct effects of job strain on sleep disturbance, Utsugi et al. suggested that hypothalamic-pituitary-adrenal axis activation may mediate the effects[6].

The strengths of this study were that we used a relatively large sample size of workers to produce reliable results and analyzed the data for men and women separately to avoid potential confounding caused by gender. Also, reliable and valid instruments were used to measure variables of exposure, mediator and outcome. The analyses included various covariates to avoid further potential confounding. The NAQ measures exposure to only 22 specific negative acts typical of bullying[26, 27], and inclusion of other specific bullying behaviors (e.g.,

"Being given tasks with unreasonable or impossible targets or deadlines"[28, 29]) in the measurement may have led to stronger mediation effects than those found in this study.

We must also note several limitations. First, we need to be cautious in interpreting the causality in our results because this study used a cross-sectional design. Second, because this study used convenience sampling, the results may not be applicable to the entire workforce in Japan. However, because we investigated 50 organizations and obtained response rates of 62.5–78.2%, some generalizability is expected. Third, the observed variables were self-reported and more objective measurements are needed in future studies. Nevertheless, the presence of measurement error in the mediator tends to produce underestimation of the effect of the mediator on the dependent variable when all coefficients are positive[35].

The results of the present study suggest that the associations of job strain with depression and sleep disturbance are mediated by workplace bullying. This means that in order to prevent depression or sleep disorders among those experiencing a stressful work environment with high demand and low control, prevention of workplace bullying must be given high

attention. Prevention may include enhancing workplace social support because workplace social support was negatively associated with workplace bullying[16, 27], support at work could protect people from some of the harmful effects of bullying[20], and mediation effects of workplace bullying were decreased after adjusting for workplace social support in this study. On the other hand, as the mediation effects remained significant after adjusting for workplace social support, other measures such as the introduction of occupational conventions against bullying, looking actively for workplace bullying, and taking measures to deal with it through a mediation committee or by top executives with aspects of criminal, civil, social, industrial or occupational law may be necessary[40].

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