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Article

The impact of work-related physical assaults on mental health among Japanese employees with different socioeconomic status: The Japan Work Stress and Health Cohort Study (JSTRESS)

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ABSTRACT

Background: Work-related physical assaults or violence has severely impacted on the safety of the work environment and employees' mental health. The aim of the present study was to investigate the prevalence of physical assaults, the effect of socioeconomic status (SES) on it and depression associated with it in employees working at large companies.

Methods: A total of 22,770 Japanese employees responded to a self-administered questionnaire including SES (educational status and occupational status), violence victimization, worksite social support and depression (response rate, 85%). The 12-month prevalence of physical assaults and depression was examined using a single question and the Center for Epidemiologic Studies Depression scale, respectively.

Results: The prevalence of physical assaults was 1.8% both in males and females. Although the risk of exposure to physical assaults was 2–3 times higher in the blue-collar group than in the manager group, the association of exposure to physical assaults with depression was stronger in the manager and white-collar worker group (Prevalence ratio [PR]=2.1 in males; 1.8 in females) than in the blue-collar worker group (PR=1.7 in males; 1.5 in females) after adjusting demographic and occupational covariates. A similar pattern was observed for education in males; the association was stronger than in the lower education group (PR=2.1 and 1.8).

Conclusions: Low SES is a risk factor of exposure to physical assaults, however, the association of physical assaults with depression was significantly greater among company employees of higher SES than those of lower SES.

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1. Introduction

Work-related physical assaults or violence such as kicking, hitting or pushing has severely impacted on the safety in the work environment and employees' health. In European countries, it was reported that an average of 1.9% of workers had experienced physical violence at the workplace (Parent-Thirion, Fernández Macías, Hurley, & Vermeylen, 2007). Work-related physical assaults and threats are associated with poor mental health (Hogh, Sharipova, & Borg, 2008) such as depression (Wieclaw et al., 2006), depressive and anxiety disorders (Virtanen et al., 2008), fatigue (Hogh, Borg, & Mikkelsen, 2003) and burnout (Couto & Lawoko, 2011).

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Most researchers have focused on health care workers in this field as there is high prevalence of violence in clinical setting. For instance, 13.2% and 10.4–39.1% of nurses had experienced these behaviors in the United States (Nachreiner et al., 2005) and in European countries, respectively (Camerino, Estryng-Behar, Conway, van Der, & Hasselhorn, 2008). Given the high prevalence in clinical setting, studies on employees in other industries such as white-collar workers, e.g., professionals, engineers or clerks, or blue-collar workers, e.g., salespersons, drivers or cleaners, are limited (Camerino et al., 2008; Hogh et al., 2008; Nachreiner et al., 2005; Tolhurst et al., 2003). There are, however, several studies that reported the prevalence rates based on national representative samples of working population which were carried out in Europe (0.08% in Denmark (Hogh et al., 2003), 0.8% in the UK (Clark et al., 2012) and 7.7% in Turkey (Aytac et al., 2011)). In Asia, there is no other study except for a South Korean study that reported 0.7% of Korean national representative working samples had experienced physical violence at the workplace (Lee, Kim, & Park, 2014), while other studies conducted surveys only among

health care workers (Alameddine, Kazzi, El-Jardali, Dimassi, & Maalouf, 2011; Arimatsu et al., 2008; Chen, Hwu, Kung, Chiu, & Wang, 2008; Kamchuchat, Chongsuvivatwong, Oncheunjit, Yip, & Sangthong, 2008). Nevertheless, information on prevalence of physical assaults at work especially in Asian countries are still lacking.

On the other hand, it is also important to identify the risk factors for physical assaults in order to prevent employees from being subjected to violence. To the best of our knowledge, there are only two studies that have reported the risk groups and consequences of physical assaults or violence (Aytac et al., 2011; Wieclaw et al., 2006). Among those two studies, one Danish study (Wieclaw et al., 2006) revealed a high prevalence of occupational violence among male workers in personal services and teaching association; female workers in health association, teaching association and personal services. The other study which included workers from various sectors in Turkey (Aytac et al., 2011) revealed that males or security sector workers were usually the victims of physical violence. These studies indicated that workers who are engaged in helping others are more likely to experience physical violence.

Meanwhile, researches which focused on socioeconomic status (SES) of the victims are also limited. In recent years, SES (e.g., educational status, income and occupational status) have attracted considerable attention as an important risk factor for violence. For example, recent study showed that low SES were more likely to be exposed to workplace bullying or interpersonal conflicts (Inoue & Kawakami, 2010; Tsuno et al., 2015). Among the minimal researches on work-related physical assaults which focused on SES, high school graduate workers were found to be more exposed to violence compared with university graduate workers (Aytac et al., 2011). Similarly, females with low income were also more vulnerable to violence (Virtanen et al., 2008). These studies indicate that workers of lower SES are at high risk for exposure to physical assaults. In Japan, remuneration is rewarded according to the employee's educational status. For example, in 2013, the average lifetime wage of high school graduates is JPY 208.7 million for males and JPY 172.2 million for females but university graduates could earn an average of JPY 261.4 million for males and JPY 212.5 million for females (The Japan Institute of Labour Policy and Training, 2015). Such hierarchical pattern exist even within the same organization, which means educational status cause lower position in the workplace.

Low SES is not only at high risk for exposure to physical assaults but also at a high risk for poor mental health; in fact, it has a direct relationship with depression and anxiety (Sakurai, Kawakami, Yamaoka, Ishikawa, & Hashimoto, 2010; Virtanen et al., 2008). In the same manner, workers with low SES were more likely to have mental health problems from occupational stress events such as interpersonal conflicts or organizational injustice (Inoue & Kawakami, 2010; Inoue, Kawakami, Tsuno, Tomioka, & Nakanishi, 2013). Therefore, one could hypothesize that the association between exposure to work-related physical assaults and mental health is stronger in low SES individuals than in high SES individuals. However, when investigating separately for males and females, the results are slightly different. For instance, the association of interpersonal conflict with depression was significantly greater among males of high SES than males of a low SES, though this pattern was not observed in females (Inoue & Kawakami, 2010). Although low SES is a risk factor both for exposure to violence and mental illness, the effect of SES on the association between violence and mental health is inconclusive.

The objective of this study was therefore to investigate the prevalence, the effect of SES on prevalence and consequences of work-related physical assaults among people in large Japanese companies using data from the large-scale cross-sectional survey

within the Japan Work Stress and Health Cohort Study (JSTRESS) (Kawakami et al., 2004).

2. Methods

2.1. Participants and procedure

A baseline survey of the JSTRESS using a self-administered questionnaire was conducted on employees from six manufacturing companies located in Kanto and Chubu areas. Recruitment strategies were as previously described (Kawakami et al., 2004). A total of 22,770 (19,033 males and 3737 females) questionnaires were returned with written consent obtained (85% response rate). We excluded 2444 males and 618 females because of at least one missing response for variables in the study. Finally, data of 16,589 males and 3119 females were analyzed.

2.2. Measurements

2.2.1. Socioeconomic status (SES)

SES was measured by the total years of education and occupational status. The respondents were classified into either lower (12 years or less) or higher (more than 12 years) education groups and if they were blue-collar workers (service workers including salespersons or security guards, production skills workers that require technical proficiency, involve running a machine or frequently involve exertion of physical strength or others) or managers and white-collar workers (professionals, engineers, or clerks). The questionnaire in this study did not include income-related questions.

2.2.2. Physical assaults

Physical assaults were measured by the single-item question from the National Institute for Occupational Safety and Health Generic Job Stress Questionnaire (NIOSH-GJSQ) (Haratani et al., 1996; Hurrell Jr. & McLaney, 1988). The participants were asked "How often have you been physically assaulted within the past 12 months while performing your job?" with response options from 1 = "not at all" to 5 = "very often". Respondents were classified into two groups, those with experience of physical assault ("once in a while", "sometimes", "often" or "very often") and those without experience ("not at all"). We did not ask the respondents who the perpetrator was, however, they could be more likely to imagine physical assaults from people outside their workplaces rather than inside workers such as supervisors or coworkers because our question in terms of physical assaults was described just after the questions "Does your job primarily involve providing direct service to specific groups of people or client populations?" and "How often does your job expose you to verbal abuse and/or confrontations with clients or the general public?".

2.2.3. Worksite support

Worksite social support was assessed by the Japanese version of the National Institute for Occupational Safety and Health Generic Job Stress Questionnaire (NIOSH-GJSQ) (Haratani et al., 1996; Hurrell Jr. & McLaney, 1988). Based on the Caplan Social Support Instrument (Caplan, Cobb, French, Harrison, & Pinneau, 1975), the NIOSH-GJSQ social support scale consists of four items for supervisor support (4–20 score) and four items for coworker support (4–20 score). The response options were from 1 ("don't have any of such person") to 5 ("very much"). The internal consistency, reliability, and validity are acceptable for this Japanese version (Haratani et al., 1996). The Cronbach's alpha was 0.84 for supervisor support and 0.81 for coworker support in this study.

2.2.4. Depression

Depression was measured by the Japanese version of the Center for Epidemiologic Studies Depression (CES-D) scale (Radloff, 1977; Shima, Shikano, Kitamura, & Asai, 1985). The CES-D consists of 20 items requiring participants to rate how often they experienced symptoms associated with depression over the past week. The response options were from 0 (“rarely” or “never”) to 3 (“most” or “almost all of the time”). Respondents were classified into those with depression (a score of 16 or more) and those without (15 or less) (Radloff, 1977; Shima et al., 1985). The Japanese version of the CES-D has a good reliability and validity (Shima et al., 1985). The Cronbach's alpha was 0.82 in this study.

2.2.5. Other covariates

Demographic and occupational variables were also asked using the self-administered questionnaire. Demographic variables included age (years), gender and marital status (married, never married or divorced). Occupational variables included working pattern (daytime or shift).

2.3. Statistical analyses

All analyses were conducted separately for males and females, taking into account the possibility of gender differences in job attitude (Baird, Zelin, & Marxen, 1998). Firstly, the odds ratios of physical assaults were estimated by logistic regression analyses to investigate the risk group of it. Then using the non-victim group as a reference, the prevalence ratios of depression (defined as having

a CES-D score of 16+) among those who had experienced physical assaults were estimated by log-binomial regression model. The reason why this model was selected is in this study prevalence of depression was frequent and odds ratio could strongly overestimate the prevalence ratio (Barros & Hirakata, 2003). In the series of analyses, we first adjusted gender, age, education and marital status. Subsequently, occupational status and working pattern was adjusted followed by supervisor support and co-worker support. Finally, to investigate the effect of SES, these analyses were conducted separately for lower and higher education as well as managers/white-collar and blue-collar workers. We tested the statistical significance of the interaction between physical assaults and educational or occupational status to determine if the effects of physical assaults on depression vary by SES. The level of significance was 0.05 (two-tailed). The statistical analyses were conducted using SPSS 23.0J for Windows (IBM, Japan).

3. Results

3.1. Characteristics of respondents

Table 1 shows the characteristics, experiences of physical assaults, worksite social support and depression scores of male and female respondents. Most of respondents were males (84.2%), high school graduates (52.8%), married (76.4%), blue-collar (49.8%) and daytime workers (97.9%). Significant differences were found among males and females for the most part, i.e., age, educational

Table 1
Demographic and occupational characteristics, physical assaults in the worksite, worksite support and depression among respondents (N=19,708).

Variables	Males (n=16,589)		Females (n=3119)		p Value
	Average (SD)	n (%)	Average (SD)	n (%)	
Demographic characteristics					
Age (years)	40.6 (9.02)		36.6 (10.6)		< 0.001 ^a
Educational status					
Junior high school graduate		1989 (12.0)		634 (20.3)	< 0.001 ^b
High school graduate		8442 (50.9)		1956 (62.7)	
College graduate		1109 (6.69)		425 (13.6)	
University/graduate school graduate		5047 (30.4)		104 (3.33)	
Marital status					
Currently married		12,980 (78.2)		2085 (66.8)	< 0.001 ^b
Never married		3305 (19.9)		897 (28.8)	
Divorced/widowed		304 (1.83)		137 (4.39)	
Occupational characteristics					
Occupation					
Manager		2567 (15.5)		4 (0.13)	< 0.001 ^b
White-collar					
Professional		2413 (14.5)		80 (2.56)	
Engineer		2576 (15.5)		105 (3.37)	
Clerical job		1095 (6.60)		1052 (33.7)	
Blue-collar					
Service worker		168 (1.01)		68 (2.18)	
Craft worker		2226 (13.4)		100 (3.21)	
Machinery operator		3527 (21.3)		782 (25.1)	
Physical worker		1226 (7.39)		742 (23.8)	
Others		791 (4.77)		186 (5.96)	
Working pattern					
Daytime worker		16,373 (98.7)		2916 (93.5)	< 0.001 ^b
Shift worker		214 (1.29)		202 (6.48)	
Physical assaults during work		303 (1.83)		58 (1.86)	0.891 ^b
Social support (NIOSH-GJSQ)^c					
Supervisor support	14.8 (3.14)		13.9 (3.37)		< 0.001 ^a
Co-worker support	15.2 (2.80)		15.2 (2.93)		0.523 ^a
Depression (CES-D) ^c	12.2 (6.68)	3848 (23.2)	13.4 (6.69)	937 (30.0)	< 0.001 ^a

^a T-test.

^b Chi-square test.

^c NIOSH-GJSQ: National Institute for Occupational Safety and Health Generic Job Stress Questionnaire; CES-D: Center for Epidemiologic Scale for Depression.

Table 2Relative risks associated with demographic and occupational characteristics for physical assaults at work^a among male employees ($n=16,589$): Logistic Regression Analysis.

Variables	<i>n</i>	No. of cases (%)	Crude ORs (95% CI) ^b	Adjusted ^c ORs (95% CI)
Age (years)				
Under 19	61	4 (6.56)	4.85 (1.68–14.0)	4.11 (1.32–12.8)
20–29	2189	70 (3.20)	2.28 (1.54–3.38)	2.08 (1.26–3.43)
30–39	5164	91 (1.76)	1.24 (0.85–1.80)	1.38 (0.90–2.12)
40–49	6373	98 (1.54)	1.08 (0.74–1.56)	1.15 (0.79–1.69)
50 and above	2802	40 (1.43)	1.00	1.00
Educational status				
Junior high school graduate	1989	43 (2.16)	1.69 (1.15–2.50)	1.13 (0.67–1.91)
High school graduate	8442	177 (2.10)	1.64 (1.23–2.19)	0.97 (0.67–1.41)
College graduate	1109	18 (1.62)	1.26 (0.74–2.14)	0.94 (0.55–1.62)
University/graduate school graduate	5047	65 (1.29)	1.00	1.00
Marital status				
Currently married	12,980	192 (1.48)	1.00	1.00
Never married	3305	100 (3.03)	2.08 (1.63–2.65)	1.41 (1.04–1.92)
Divorced/widowed	304	11 (3.62)	2.50 (1.35–4.64)	2.08 (1.11–3.88)
Occupation				
Manager	2567	22 (0.86)	1.00	1.00
White-collar	8651	78 (1.28)	1.50 (0.93–2.42)	1.08 (0.65–1.78)
Blue-collar	7938	203 (2.56)	3.04 (1.95–4.72)	2.17 (1.27–3.70)
Working pattern				
Daytime worker	16,373	300 (1.83)	1.00	1.00
Shift worker	214	3 (1.40)	0.76 (0.24–2.39)	0.69 (0.21–2.22)
Supervisor support (scores)				
Low (4.00–15.0)	8976	231 (2.57)	2.77 (2.12–3.61)	1.85 (1.37–2.49)
High (15.1–20.0)	7613	72 (0.95)	1.00	1.00
Coworker support (scores)				
Low (4.00–15.0)	8310	221 (2.66)	2.73 (2.12–3.53)	2.17 (1.63–2.90)
High (15.1–20.0)	8279	82 (0.99)	1.00	1.00

^a Physical assaults during working time and social support were measured by the National Institute for Occupational Safety and Health Generic Job Stress Questionnaire (NISOH-GJSQ).

^b OR: odds ratio; CI: confidence interval.

^c Adjusted by all variables in Table 2.

status, marital status, occupational status, working pattern, supervisor support and depression. On the other hand, there was no significant difference between males and females in terms of violence experiences and coworker support.

3.2. Risk groups of physical assaults during the working time

Table 2 shows relative risks associated with demographic and occupational characteristics for physical assaults during working time among male employees. Among them, those who were under 29 years old, unmarried, graduated from junior high school or high school, worked as a blue-collar worker or had low supervisor and coworker support were more likely to experience physical assaults while at work. After adjusting all variables, the significance remained except educational status.

On the other hand, different patterns were observed among females (Table 3). Female employees who were under 29 years old and graduated from high school were less likely to be exposed to physical assaults during working time. Marital status did not associate with experiences of physical assaults among them. However, in common with males, female blue-collar workers with low supervisor and coworker support were more likely to experience physical assaults while working. After adjusting all variables, the significance remained except age and supervisor support. Working pattern did not associate with physical assault experiences among

both genders.

3.3. Main effects of physical assaults and SES on depression

Tables 4 and 5 show prevalence ratios (PRs) for depression, separately in males and females. Significant main effects of experiencing physical assaults and being a blue-collar worker were observed against depression even after adjusting the gender, age, education, marital status, occupational status, working pattern, and worksite social support. Compared to female respondents, males had slightly higher PRs for depression when they experienced physical assaults during working time. On the other hand, the main effects of low education on depression were not observed in females, while significant before additionally adjusting for worksite social support in males.

3.4. Physical assaults and depression compared by SES

Among male respondents, after adjusting the gender, age, marital status, and working pattern, those with higher education level were more likely to have depression compared with lower education level when they experienced physical assaults at work (PR=2.10 [95%CI: 1.73–2.55], 1.77 [1.56–2.02], respectively) (Table 4). Similarly, the association of physical assaults with depression was significantly stronger among the manager or white-collar

Table 3
Relative risks associated with demographic and occupational characteristics for physical assaults at work^a among female employees ($n=3119$): Logistic Regression Analysis.

Variables	<i>n</i>	No. of cases (%)	Crude ORs (95% CI) ^b	Adjusted ^c ORs (95% CI)
Age (years)				
18–29	1048	15 (1.43)	0.44 (0.21–0.93)	0.89 (0.26–3.04)
30–39	813	13 (1.60)	0.49 (0.23–1.07)	1.00 (0.35–2.81)
40–49	851	17 (2.00)	0.62 (0.30–1.28)	0.84 (0.38–1.86)
50 and over	407	13 (3.19)	1.00	1.00
Educational status				
Junior high school graduate	634	22 (3.47)	0.90 (0.30–2.66)	0.45 (0.10–1.95)
High school graduate	1956	26 (1.33)	0.34 (0.12–0.98)	0.20 (0.06–0.71)
College graduate	425	6 (1.41)	0.36 (0.10–1.29)	0.35 (0.10–1.30)
University/graduate school graduate	104	4 (3.85)	1.00	1.00
Marital status				
Currently married	2085	40 (1.92)	1.00	1.00
Never married	897	15 (1.67)	0.87 (0.48–1.58)	1.22 (0.52–2.89)
Divorced/widowed	137	3 (2.19)	1.14 (0.35–3.75)	0.86 (0.26–2.92)
Occupation				
Manager/white-collar	1241	14 (1.13)	1.00	1.00
Blue-collar	1878	44 (2.34)	2.10 (1.15–3.85)	2.30 (1.01–5.26)
Working pattern				
Daytime worker	2916	54 (1.85)	1.00	1.00
Shift worker	202	4 (1.98)	1.07 (0.38–2.99)	0.86 (0.30–2.49)
Supervisor support (scores)				
Low (4.00–15.0)	2050	44 (2.15)	1.65 (0.90–3.03)	1.15 (0.59–2.26)
High (15.1–20.0)	1069	14 (1.31)	1.00	1.00
Coworker support (scores)				
Low (4.00–15.0)	1562	40 (2.56)	2.25 (1.28–3.94)	2.02 (1.08–3.77)
High (15.1–20.0)	1557	18 (1.16)	1.00	1.00

^a Physical assaults during working time and social support were measured by the National Institute for Occupational Safety and Health Generic Job Stress Questionnaire (NISOH-GJSQ).

^b OR: odds ratio; CI: confidence interval.

^c Adjusted by all variables in Table 3.

worker group (PR=2.07 [1.73–2.47]) than blue-collar worker group (PR=1.72 [1.50–1.97]). Additionally after adjusting worksite social support, the magnitude of prevalence ratios was smaller but remained significant. The interaction between physical assaults and education or occupation against depression were also significant in each model.

Similar trend was also observed among female respondents (Table 5); the association of physical assaults with depression was stronger among the higher education group and the manager/white-collar worker group than lower education group or blue-collar worker group after adjusting demographic and occupational

covariates. However, when additionally adjusting worksite social support, the significant association of physical assaults with depression was only observed in the lower education group or the blue-collar worker group. On the other hand, the interaction between physical assaults and education or occupation against depression were significant in each model.

4. Discussion

The current study of nearly 20,000 Japanese employees revealed a considerable number of company employees suffered from physical assaults at work. Against our hypothesis, we found that the association of physical assaults with depression was greater among employees of higher SES than those of lower SES. Blue-collar employees were at high risk for exposure to physical assaults as well as depression, however, its combined association with depression was greater among managers or white collar employees. A similar trend was observed for educational status.

Exposure to physical assaults was significantly associated with depression among both males and females even after adjusting demographic, occupational characteristics and worksite social support, which are in line with previous reports (Couto & Lawoko, 2011; Hogh et al., 2003, 2008; Virtanen et al., 2008; Wieclaw et al., 2006). Additionally, the magnitude of these odds ratios was similar or higher than previously reported (Virtanen et al., 2008; Wieclaw et al., 2006). On the other hand, the association of physical assaults with depression was significantly greater among employees of higher SES than those of lower SES, which was contrary to our hypothesis as well as reports that have shown strong association of low SES with depression and anxiety (Sakurai et al., 2010; Virtanen et al., 2008). One possible explanation for this is psychological preparedness, which may promote a sense of control over the trauma (Hoge, Austin, & Pollack, 2007). In other words, when workers do not have psychological preparedness for stressful events, they are more likely to suffer from serious psychological distress afterwards (Tsuno, Oshima, Kubota, & Kawakami, 2014). As general managers and white-collar employees are less likely to be exposed to physical assaults at their workplace, therefore, when he/she experienced it, he/she may experience delayed shocked and depression compared to blue-collar employees who are at high risk for these behaviors. Another possible explanation is that employees with high SES are more likely to suffer psychologically from interpersonal problems. Some studies have shown that the association of intergroup and intragroup conflicts with depression was greater among workers of high SES (Inoue & Kawakami, 2010; Tsuno et al., 2014). On the other hand, prevalence ratios became smaller both in high SES and low SES group after additionally adjusting worksite social support. In females, the significant association of physical assaults with depression was disappeared in the higher SES group when additionally adjusting worksite social support. This indicates that social support is an important predictor for depression with experience of physical assaults, especially in females. Although a bit different result was observed in females, the current study in general suggests that having higher education level or being in a white-collar profession strengthens the relationship between work-related physical assaults and depression.

The overall 12-month prevalence of physical assaults in this study was 1.8%. Among males, younger employees under 29 years old who received no college/university education, unmarried, worked as a blue-collar worker and had low supervisor and coworker support were at the highest risk for exposure to physical assaults at work. On the other hand, blue-collar females were at the highest risk for exposure to physical assaults at work but high school graduates were at lower risk compared with university/

Table 4
Prevalence ratios associated with physical assaults at work for depression among male employees (n=16,589): Log-Binomial Regression Analysis.

Physical assaults at work	n	No. of cases (%)	Prevalence Ratio (95% confidence interval)			
			Crude	Demographic adjusted ^a	Demographic and occupational adjusted ^b	All adjusted ^c
<i>Main effects compared by SES</i>						
Higher education						
No	6073	1275 (21.0)	1.00	1.00	1.00	1.00
Yes	83	43 (51.8)	2.47 (1.99–3.05)	2.12 (1.75–2.58)	2.10 (1.73–2.55)	1.64 (1.37–1.95)
Lower education						
No	10,211	2422 (23.7)	1.00	1.00	1.00	1.00
Yes	220	107 (48.6)	2.05 (1.78–2.36)	1.84 (1.61–2.10)	1.77 (1.56–2.02)	1.50 (1.32–1.69)
Manager or white-collar worker						
No	8551	1706 (20.0)	1.00	1.00	1.00	1.00
Yes	100	50 (50.0)	2.51 (2.05–3.06)	2.07 (1.73–2.46)	2.07 (1.73–2.47)	1.57 (1.33–1.85)
Blue-collar worker						
No	7735	1992 (25.8)	1.00	1.00	1.00	1.00
Yes	203	100 (49.3)	1.91 (1.66–2.21)	1.72 (1.50–1.98)	1.72 (1.50–1.97)	1.49 (1.31–1.69)
<i>Main and interaction effects</i>						
Violence (yes)			2.18 (1.94–2.45)	1.90 (1.70–2.12)	1.84 (1.65–2.05)	1.52 (1.38–1.69)
Education (low)			1.13 (1.07–1.20)	1.13 (1.07–1.20)	1.09 (1.00–1.17)	1.07 (0.99–1.15)
Occupation (blue-collar)			1.30 (1.23–1.37)	1.24 (1.15–1.33)	1.20 (1.12–1.29)	1.19 (1.11–1.27)
Violence × education			2.13 (1.85–2.45)	1.88 (1.66–2.14)	1.74 (1.53–1.97)	1.45 (1.29–1.63)
Violence × occupation			2.15 (1.87–2.48)	1.85 (1.62–2.11)	1.75 (1.54–2.00)	1.47 (1.31–1.66)

^a Adjusted for age, education, and marital status.^b Additionally adjusted for occupational status and working pattern.^c Additionally adjusted for supervisor and coworker support.**Table 5**
Prevalence ratios associated with physical assaults at work for depression among female employees (n=3119): Log-Binomial Regression Analysis.

Physical assaults at work	n	No. of cases (%)	Prevalence ratio (95% confidence interval)			
			Crude	Demographic adjusted ^a	Demographic and occupational adjusted ^b	All adjusted ^c
<i>Main effects compared by SES</i>						
Higher education						
No	519	156 (30.1)	1.00	1.00	1.00	1.00
Yes	10	5 (50.0)	1.66 (0.88–3.13)	1.68 (0.89–3.18)	1.66 (0.82–3.36)	1.37 (0.66–2.84)
Lower education						
No	2542	753 (29.6)	1.00	1.00	1.00	1.00
Yes	48	23 (47.9)	1.62 (1.20–2.19)	1.57 (1.17–2.11)	1.53 (1.14–2.05)	1.44 (1.10–1.90)
Manager or white-collar worker						
No	1227	339 (27.6)	1.00	1.00	1.00	1.00
Yes	14	7 (50.0)	1.81 (1.06–3.08)	1.76 (1.04–2.98)	1.76 (1.04–2.98)	1.55 (0.93–2.57)
Blue-collar worker						
No	1834	570 (31.1)	1.00	1.00	1.00	1.00
Yes	44	21 (47.7)	1.54 (1.12–2.11)	1.50 (1.10–2.04)	1.51 (1.11–2.05)	1.40 (1.04–1.88)
<i>Main and interaction effects</i>						
Violence (yes)			1.63 (1.24–2.13)	1.61 (1.23–2.10)	1.56 (1.19–2.03)	1.44 (1.12–1.87)
Education (low)			0.98 (0.85–1.13)	1.11 (0.95–1.29)	0.98 (0.83–1.16)	0.96 (0.82–1.13)
Occupation (blue-collar)			1.13 (1.01–1.26)	1.25 (1.10–1.42)	1.31 (1.15–1.50)	1.28 (1.12–1.45)
Violence × education			1.61 (1.19–2.17)	1.61 (1.20–2.16)	1.54 (1.15–2.06)	1.47 (1.11–1.94)
Violence × occupation			1.60 (1.17–2.19)	1.64 (1.20–2.24)	1.62 (1.19–2.21)	1.63 (1.20–2.23)

^a Adjusted for age, education, and marital status.^b Additionally adjusted for occupation and working pattern.^c Additionally adjusted for supervisor and coworker support.

graduate school graduates. This generally indicates that employees of low SES were at high risk for exposure to work-related physical assaults, which are in line with previous studies (Aytac et al., 2011;

Virtanen et al., 2008; Tsuno et al., 2015). However, the mechanism as to why female high school graduates were less likely to be exposed to violence remains unknown. In this study, the number of

female victims was small ($n=58$). Hence, future studies to investigate a larger group of samples are needed to clarify this gender difference.

Although there are few studies on employees in large companies, the overall prevalence of physical assaults in this study was higher than those of Danish, British and Korean representative workers sample (Clark et al., 2012; Hogh et al., 2003; Lee et al., 2014) but lower than Turkish (Aytac et al., 2011) and EU studies (Parent-Thirion et al., 2007). Although it is hard to compare these prevalence because our sample was not representative, our results show a number of company employees suffered from physical assaults from their clients, customers, or colleagues while working, which is unexpected because such reports were not previously available and the prevalence among general employees was previously unknown in the Japanese society. The reason why gender differences for overall prevalence was not observed in this study is potentially due to the number of blue-collar females in this study since blue-collar employees were more likely to experience physical assaults. This may overestimate the prevalence of physical violence among females.

This study has some limitations that should be noted. First, we did not obtain information about income, which is thought to be an important component of SES (Winkleby, Jatulis, Frank, & Fortmann, 1992). This may confound the relationship between physical assaults and depression. Second, the sample size was relatively small for female respondents, which may result in reduced statistical significance of the results because physical assaults are low incidence. Third, our sample was only from manufacturing companies in Japan; therefore, generalization of the findings should be done with caution. Fourth, physical assaults and degree of depression were measured by self-report, which may result in common method bias. Finally, a causal relationship cannot be determined because this is a cross-sectional study. A prospective study is required to elucidate the causal relationship between physical assaults at work and depression compared by SES.

In conclusion, exposure to physical assaults was strongly associated with depression but the magnitude of risk for depression was stronger among managers or white-collar workers and employees with high education especially in males. This finding points to the importance of paying more attention to employees with low risk for exposure to physical assaults, in addition to high-risk employees such as blue-collar workers. Prevention of physical assaults or violence at workplaces should receive high priority when framing safety and health policies. It is also important to provide satisfactory organizational and individual support for victims in order to prevent mental illness among workers. Employers should also put focus on the risk of exposure to violence among both white-collar and blue-collar employees and provide the appropriate support for victims.

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References

- Alameddine, M., Kazzi, A., El-Jardali, F., Dimassi, H., & Maalouf, S. (2011). Occupational violence at Lebanese emergency departments: Prevalence, characteristics and associated factors. *Journal of Occupational Health, 53*, 455–464.
- Arimatsu, M., Wada, K., Yoshikawa, T., Oda, S., Taniguchi, H., Aizawa, Y., & Higashi, T. (2008). An epidemiological study of work-related violence experienced by physicians who graduated from a medical school in Japan. *Journal of Occupational Health, 50*, 357–361.
- Aytac, S., Bozkurt, V., Bayram, N., Yildiz, S., Aytac, M., Sokullu Akinci, F., & Bilgel, N. (2011). Workplace violence: A study of Turkish workers. *International Journal of Occupational Safety and Ergonomics, 17*, 385–402.
- Baird, J. E., Zelin, R. C., & Marxen, D. E. (1998). Gender differences in the job attitudes of accountants. *Mid-American Journal of Business, 13*, 35–42.
- Barros, A. J., & Hirakata, V. N. (2003). Alternatives for logistic regression in cross-sectional studies: An empirical comparison of models that directly estimate the prevalence ratio. *BMC Medical Research Methodology, 3*, 21.
- Camerino, D., Estryn-Behar, M., Conway, P. M., van Der, B. I. J. M., & Hasselhorn, H. M. (2008). Work-related factors and violence among nursing staff in the European NEXT study: A longitudinal cohort study. *International Journal of Nursing Studies, 45*, 35–50.
- Caplan, R. D., Cobb, S., French, J. R. P., Harrison, R. V., & Pinneau, S. R., Jr (1975). *Job demands and worker health: Main effects and occupational differences*. Cincinnati: National Institute for Occupational Safety and Health.
- Chen, W. C., Hwu, H. G., Kung, S. M., Chiu, H. J., & Wang, J. D. (2008). Prevalence and determinants of workplace violence of health care workers in a psychiatric hospital in Taiwan. *Journal of Occupational Health, 50*, 288–293.
- Clark, C., Pike, C., McManus, S., Harris, J., Bebbington, P., Brugha, T., Jenkins, H., Meltzer, S., Weich, S., & Stansfeld, S. (2012). The contribution of work and non-work stressors to common mental disorders in the 2007 Adult Psychiatric Morbidity Survey. *Psychological Medicine, 42*, 829–842.
- Couto, M. T., & Lawoko, S. (2011). Burnout, workplace violence and social support among drivers and conductors in the road passenger transport sector in Maputo City, Mozambique. *Journal of Occupational Health, 53*, 214–221.
- Haratani, T., Kawakami, N., Araki, S., Hurrell Jr., J. J., Sauter, S. L. & Swanson, N. G. (1996). Psychometric properties and stability of the Japanese version of the NIOSH job stress questionnaire. In *Book of abstracts, 25th international congress on occupational health*, Stockholm (p. 393).
- Hoge, E. A., Austin, E. D., & Pollack, M. H. (2007). Resilience: Research evidence and conceptual considerations for posttraumatic stress disorder. *Depression and Anxiety, 24*, 139–152.
- Hogh, A., Borg, V., & Mikkelsen, K. L. (2003). Work-related violence as a predictor of fatigue: A 5-year follow-up of the Danish Work Environment Cohort Study. *Work Stress, 17*, 82–194.
- Hogh, A., Sharipova, M., & Borg, V. (2008). Incidence and recurrent work-related violence towards healthcare workers and subsequent health effects. a one-year follow-up study. *Scandinavian Journal of Public Health, 36*, 706–712.
- Hurrell, J. J., Jr., & McLaney, M. A. (1988). Exposure to job stress—A new psychometric instrument. *Scandinavian Journal of Work, Environment & Health, 14*, 27–28.
- Inoue, A., & Kawakami, N. (2010). Interpersonal conflict and depression among Japanese workers with high or low socioeconomic status: Findings from the Japan Work Stress and Health Cohort Study. *Social Science & Medicine, 71*, 173–180.
- Inoue, A., Kawakami, N., Tsuno, K., Tomioka, K., & Nakanishi, M. (2013). Organizational justice and psychological distress among permanent and non-permanent employees in Japan: A prospective cohort study. *International Journal of Behavioral Medicine, 20*, 265–276.
- Kamchuchat, C., Chongsuvivatwong, V., Oncheunjit, S., Yip, T. W., & Sangthong, R. (2008). Workplace violence directed at nursing staff at a general hospital in southern Thailand. *Journal of Occupational Health, 50*, 201–207.
- Kawakami, N., Haratani, T., Kobayashi, F., Ishizaki, M., Hayashi, T., Fujita, O., Aizawa, Y., Miyazaki, S., Hiro, H., Masumoto, T., Hashimoto, S., & Araki, S. (2004). Occupational class and exposure to job stressors among employed men and women in Japan. *Journal of Epidemiology, 14*, 204–211.
- Lee, H. E., Kim, H. R., & Park, J. S. (2014). Work-related risk factors for workplace violence among Korean employees. *Journal of Occupational Health, 56*, 12–20.
- Nachreiner, N. M., Gerberich, S. G., McGovern, P. M., Church, T. R., Hansen, H. E., Geisser, M. S., & Ryan, A. D. (2005). Relation between policies and work related assault: Minnesota Nurses' Study. *Occupational and Environmental Medicine, 62*, 675–681.
- Parent-Thirion, A., Fernández Macías, E., Hurley, J., & Vermeylen, G. (2007). *Fourth European survey on working conditions*. Dublin: European Foundation for the Improvement of Living Standards.
- Radloff, L. S. (1977). The CES-D scale: A self-report depression scale for research in

- the general population. *Appl. Psychol. Meas.*, 1, 385–401.
- Sakurai, K., Kawakami, N., Yamaoka, K., Ishikawa, H., & Hashimoto, H. (2010). The impact of subjective and objective social status on psychological distress among men and women in Japan. *Social Science & Medicine*, 70, 1832–1839.
- Shima, S., Shikano, T., Kitamura, T., & Asai, M. (1985). New self-rating scales for depression. *Seishin Igaku*, 27, 717–723.
- The Japan Institute of Labour Policy and Training (2015). *Useful labour statistics 2015*. Tokyo: The Japan Institute of Labour Policy and Training.
- Tolhurst, Baker, L., Murray, G., Bell, P., Sutton, A., & Dean, S. (2003). Rural general practitioner experience of work-related violence in Australia. *Australian Journal of Rural Health*, 11, 231–236.
- Tsuno, K., Kawakami, N., Tsutsumi, A., Shimazu, A., Inoue, A., Odagiri, Y., Yoshikawa, T., Haratani, T., Shimomitsu, T., & Kawachi, I. (2015). Socioeconomic determinants of bullying in the workplace: A national representative sample in Japan. *PLoS One*, 10, e0119435.
- Tsuno, K., Oshima, K., Kubota, K., & Kawakami, N. (2014). Personal resilience and post-traumatic stress symptoms of local government employees: Six months after the 2011 magnitude 9.0 East Japan Earthquake. *Sangyo Eiseigaku Zasshi*, 56, 245–258.
- Virtanen, M., Koskinen, S., Kivimäki, M., Honkonen, T., Vahtera, J., Ahola, K., & Lönnqvist, J. (2008). Contribution of non-work and work-related risk factors to the association between income and mental disorders in a working population: The Health 2000 Study. *Occupational and Environmental Medicine*, 65, 171–178.
- Wieclaw, J., Agerbo, E., Mortensen, P. B., Burr, H., Tüchsen, F., & Bonde, J. P. (2006). Work related violence and threats and the risk of depression and stress disorders. *Journal of Epidemiology & Community Health*, 60, 771–775.
- Winkleby, M. A., Jatulis, D. E., Frank, E., & Fortmann, S. P. (1992). Socioeconomic status and health: How education, income, and occupation contribute to risk factors for cardiovascular disease. *American Journal of Public Health*, 82, 816–820.