

Effect of work-related events on depressive symptoms in Japanese employees: a web-based longitudinal study

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Abstract: While a number of work-related events have been proposed as risk factors for depression, a majority of studies have focused only on a few events in a single study. Therefore, we conducted a web-based longitudinal study to comprehensively investigate the impact of various work-related events on depressive symptoms. Ten thousand Japanese workers representing the Japanese working population were recruited online and questioned on their experiences of 36 work-related events in the past year. Their depressive symptoms were also assessed based on the Center for Epidemiologic Studies Depression Scale. Two years later, 3,098 participants responded to a follow-up study. By excluding 1,030 participants who were classified as being depressed in the baseline survey, data of 2,068 participants were analyzed. Odds ratios (OR) were calculated using multivariate logistic regression to assess the effect of work-related events on depressive symptoms. Sixteen events were found to be risk factors and were sorted into four types as follows: experience of an accident or disaster (OR: 4.78–7.67), excessive responsibility (OR: 3.01–3.62), drastic change in workstyle or workload (OR: 2.38–3.08), and interpersonal conflict (OR: 2.41–11.16). The current results, including magnitude relationship of ORs, should be utilized for promoting psychosocially healthy work environment.

Key words: Industrial accident compensation insurance, Depression, Longitudinal study, Mental health, Work-related events

Introduction

For employed workers, a poorly functioning work environment is a risk factor for depressive symptoms^{1, 2}. Therefore, strategies to prevent this consequence are

necessary not only for ensuring employee health but also for the stable management of the company^{3–5}. Indeed, the number of workers having work-related mental disorders, with accompanying applications for industrial accident compensation insurance (IACI), remains high in Japan⁶. Accordingly, studies focused on the relationship between work-related exposure to a variety of events and depressive symptoms are valuable for securing a good work environment and retaining high-quality workers. A number of previous studies have focused on work-related stress factors such as exposure to a disaster^{7, 8}, interpersonal conflict⁹, and job characteristics^{10, 11}. For example, a

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report by Theorell *et al.* revealed subacute potential risk factors for myocardial infarction and other stress-related illnesses, including neurosis at work in >9,000 construction workers in Stockholm country¹²). Stressful job conditions, such as high demand and low social support, are also known as a predictors of depressive symptoms according to a 3 yr follow-up¹³). In addition, meta-analytic reviews have discussed the risk factors related to the mental health of workers^{1, 2}). Although many work-related events have been proposed as risk factors for depression, the majority of studies related to this issue have focused on only one or two events. Therefore, limited data exist regarding the comprehensive risk of multiple events, and no single study has investigated this issue. Moreover, research on potential risk factors targeting nation-wide working population is urgently required. Although insurance program covering work-related mental disorders and suicide differs between countries, research on work-related events and depressive symptoms will contribute to the development of safe and comfortable workplaces worldwide.

In Japan, employed workers are covered by IACI if their injury or disorder, including mental disorder and suicide, is caused by work or work-related commute. During the investigation process to determine compensation for mental disorders from the IACI, the existence and severity of 36 types of events are evaluated. Initially, 43 events, including life events and chronic stressors, were selected in 1999 based on both international and domestic studies of the objective evaluation of stress intensity such as life event method of Holmes and Rahe¹⁴), and Cooper^{15, 16}). Lately, by incorporating the latest knowledge, the current criteria were revised in 2011 to a newly selected list of 36 events¹⁷). Since the 36 events were originally listed for estimating the mental load of an IACI applicant, no study had yet investigated the quantitative impact of the government-selected 36 events on the mental health of normal workers in a single study.

In the current study, as an additional work-related event, we focused on “power harassment”, which is characterized by harassing behavior (both physical and psychological) with an abuse of the perpetrator’s position of authority toward his or her subordinates or colleagues¹⁸). While workplace bullying, a well-known psychosocial factor at work^{3, 19}), has already been listed in the IACI list, “power harassment” is currently under consideration for the same. Because the issue of “power harassment” is gaining increased attention as a specific issue in the Japanese working environment^{20, 21}), to evaluate the effect of abuse of power apart from workplace bullying, the experience of

being a subject of power harassment was also determined in the participants.

In this study, we conducted a prospective web-based survey to evaluate the risk of having depressive symptoms as a result of 36 work-related events, particularly for the Japanese working population. A Japanese version of the Center for Epidemiologic Studies Depression Scale (CES-D), which is a widely used and evaluated brief self-report questionnaire for depressive symptoms, was employed to evaluate the mental health of the participants²²).

Subjects and Methods

Survey and sample

An internet survey targeting Japanese workers was carried out in November 2016. A follow-up study was also conducted in February 2019. While the number of follow-up years vary among studies¹), we followed-up for 2 yr considering the dropout rate of our previous internet-based investigations. Both surveys were conducted by a research company that randomly sends participation requests by e-mail to enrolled workers. All of the participants received reward points from the company according to their participation. In the first survey, the first 10,000 workers that matched our predefined sample population were recruited. The initial sample size was determined considering the average follow-up rate of our previous online surveys. The sample population was selected based on a composition ratio of gender, age group, and industry as reported in the Labor Force Survey published regularly by the Statistics Bureau, Ministry of Internal Affairs and Communications, Japan²³). Demographic data for the details of the classification of ages and industries are shown in Table 1. In the second survey, participation requests were sent by e-mail to the same 10,000 workers, and 3,098 of them completed a follow-up survey, which consisted of the same question items as the first survey. As explained later, by excluding 1,030 participants who scored more than the cutoff point for CES-D (≥ 16) in the baseline survey from the followed-up 3,098 participants, 2,068 participants were selected for the final analysis (Fig. 1). The web survey was comprised of a variety of questions related to demographic data, history of events, and worker health. From the data obtained, we used demographic data, event history at work, and the CES-D questionnaire to answer the research questions.

All participants provided web-based informed consent prior to participation. The current study was approved by the Research Ethics Committee of the National Institute

Table 1. Demographic data of each population

	Baseline (N=10,000)	Follow-up (N=3,098)	Final analysis (N=2,068)
Age			
20s	1,649 (16.5%)	273 (8.8%)	146 (7.1%)
30s	2,331 (23.3%)	694 (22.4%)	436 (21.1%)
40s	2,828 (28.3%)	1,083 (35.0%)	712 (34.4%)
50s	2,302 (23.0%)	852 (27.5%)	613 (29.6%)
60–65	890 (8.9%)	196 (6.3%)	161 (7.8%)
Mean ± SD	42.9 ± 11.4	44.5 ± 9.8	45.4 ± 9.7
Sex			
Men	5,650 (56.5%)	1,927 (62.2%)	1,291 (62.4%)
Women	4,350 (43.5%)	1,171 (37.8%)	777 (37.6%)
Industries			
Agriculture and forestry	248 (2.5%)	66 (2.1%)	45 (2.2%)
Construction	741 (7.4%)	234 (7.6%)	165 (8.0%)
Manufacturing	1,646 (16.5%)	591 (19.1%)	415 (20.1%)
Information and communications	383 (3.8%)	91 (2.9%)	51 (2.5%)
Transport and postal activities	553 (5.5%)	160 (5.2%)	108 (5.2%)
Wholesale and retail trade	1,623 (16.2%)	544 (17.6%)	366 (17.7%)
Finance and insurance	267 (2.7%)	91 (2.9%)	59 (2.9%)
Real estate and goods retail and leasing	197 (2.0%)	78 (2.5%)	57 (2.8%)
Scientific research, professional, and technical services	347 (3.5%)	115 (3.7%)	78 (3.8%)
Accommodation, eating, and drinking services	659 (6.6%)	177 (5.7%)	111 (5.4%)
Living-related and personal services and amusement services	355 (3.6%)	112 (3.6%)	78 (3.8%)
Education, learning support	527 (5.3%)	131 (4.2%)	79 (3.8%)
Medical, health care, and welfare	1,322 (13.2%)	345 (11.1%)	210 (10.2%)
Compound services	102 (1.0%)	30 (1.0%)	22 (1.1%)
Services, not elsewhere classified	677 (6.8%)	211 (6.8%)	145 (7.0%)
Government, except elsewhere classified	353 (3.5%)	122 (3.9%)	79 (3.8%)
Type of employment			
Regular employee	6,387 (63.9%)	2,122 (68.5%)	1,422 (68.8%)
Part-time worker, albeit (temporary worker)	2,181 (21.8%)	530 (17.1%)	353 (17.1%)
Dispatched, contract, and entrusted employee	1,061 (10.6%)	325 (10.5%)	206 (10.0%)
Other	371 (3.7%)	121 (3.9%)	87 (4.2%)
Type of occupation			
Administrative and managerial workers	1,116 (11.2%)	423 (13.7%)	310 (15.0%)

	Baseline (N=10,000)	Follow-up (N=3,098)	Final analysis (N=2,068)
Professional and engineering workers	1,871 (18.7%)	543 (17.5%)	363 (17.6%)
Clerical workers	2,683 (26.8%)	920 (29.7%)	602 (29.1%)
Shop clerk	505 (5.1%)	133 (4.3%)	90 (4.4%)
Sales workers	646 (6.5%)	211 (6.8%)	133 (6.4%)
Service workers	1,388 (13.9%)	368 (11.9%)	232 (11.2%)
Security workers	61 (0.6%)	14 (0.5%)	7 (0.3%)
Agricultural, forestry, and fishery workers	145 (1.5%)	39 (1.3%)	29 (1.4%)
Production/technical workers in manufacturing processes	314 (3.1%)	100 (3.2%)	63 (3.0%)
Production/technical workers in inspection/monitoring work	99 (1.0%)	24 (0.8%)	15 (0.7%)
Production/technical workers in other processes	404 (4.0%)	136 (4.4%)	95 (4.6%)
Transport worker	243 (2.4%)	64 (2.1%)	43 (2.1%)
Construction worker	111 (1.1%)	29 (0.9%)	19 (0.9%)
Other, except elsewhere classified	414 (4.1%)	94 (3.0%)	67 (3.2%)
Work time management system			
Fixed shift system	7,166 (71.7%)	2,301 (74.3%)	1,561 (75.5%)
Flextime system	902 (9.0%)	269 (8.7%)	177 (8.6%)
Variable working hour system	1,097 (11.0%)	272 (8.8%)	162 (7.8%)
Deemed working hour system for working outside the workplace	159 (1.6%)	48 (1.5%)	31 (1.5%)
Discretionary labor system	427 (4.3%)	143 (4.6%)	96 (4.6%)
Other, except elsewhere classified	249 (2.5%)	65 (2.1%)	41 (2.0%)
Night shift status			
Applicable	1,946 (19.5%)	569 (18.4%)	320 (15.5%)
Not applicable	8,054 (80.5%)	2,529 (81.6%)	1,748 (84.5%)
Smoking habit			
Currently smoking	2,574 (25.7%)	846 (27.3%)	560 (27.1%)
Not currently smoking	1,985 (19.9%)	605 (19.5%)	397 (19.2%)
Never smoked	5,441 (54.4%)	1,647 (53.2%)	1,111 (53.7%)
Frequency of alcohol drinking			
Almost never	5,014 (50.1%)	1,413 (45.6%)	940 (45.5%)
1–2 d per week	2,097 (21.0%)	672 (21.7%)	438 (21.2%)
3–5 d per week	1,059 (10.6%)	353 (11.4%)	237 (11.5%)
More than 6 d per week	1,830 (18.3%)	660 (21.3%)	453 (21.9%)
The Center for Epidemiologic Studies Depression Scale (CES-D)			
Depression (≥16)	3,705 (37.1%)	1,030 (33.2%)	0 (0.0%)
Not qualified	6,295 (63.0%)	2,068 (66.8%)	2,068 (100.0%)
Raw score (mean ± SD)	15.9 ± 9.7	15.2 ± 9.3	10.0 ± 3.6

All demographic data shown here were collected at the first survey.

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H3027).

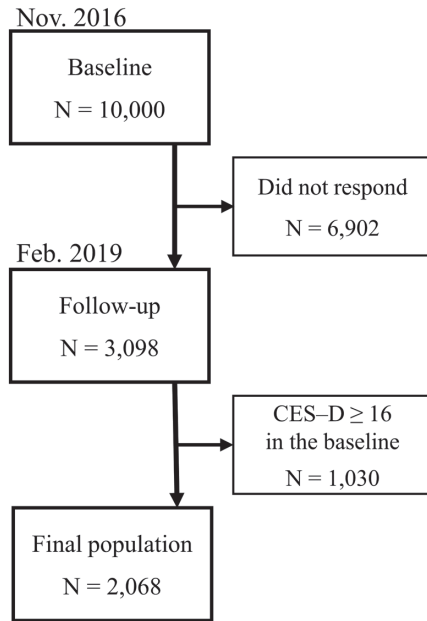


Fig. 1. Flow chart showing the selection of participants for the analysis.

Measures

The collected demographic data included gender, age (years), industry (16 types), type of employment (4 types), type of occupation (14 types), work time management system (6 types), night shift status (yes or no), smoking status (3 types), and frequency of alcohol drinking (4 types). These data were then used as covariates for subsequent statistical tests.

Exposure to any of the 36 work-related events in the past single year was collected as a major explanatory variable of having depressive symptoms. As explained above, these events are investigated during the IACI application process, particularly those related to mental disorders. The events designated as “transferred” or “relocated” were merged into a single event, No. 21 “transferred or relocated,” for participant convenience. In addition to the original events, the presence of power harassment was determined for its impact on mental health.

The degree of depression was assessed by the Japanese version of the CES-D^{22, 24}. The CES-D is a widely used questionnaire with a high reliability for screening depression^{1, 2}. Consistent with previous studies, the cutoff point was set at 16 points. For subsequent statistical analyses, 1,179 participants (33.2% of the follow-up participants) who had already met the screening criteria for the CES-D at the first survey were excluded. Therefore, data from 2,068 participants were included in the final analysis.

Statistical analysis

Multivariate logistic regression analysis, yielding odds ratios (ORs) with 95% confidence intervals (95% CIs) of meeting the criteria of depressive symptoms, was conducted to estimate the risk of exposures using R version 3.6.1 (R core team) running on a Windows 10 computer. Three models were developed for testing the effect of each exposure. The first model consisted of an exposure to each event, but no confounder to calculate crude ORs. The second model included gender, age (coded to every 10 yr), history of smoking, and drinking habits as confounders in addition to the first model. The last model included industry, type of employment, type of occupation, work time management system, and night shift status in addition to the second model. Because 36 events were separately tested, the estimation of the false discovery rate (q value threshold = 0.1) on Wald’s test p values were applied to control the family-wise error rate while investigating risk factors from the IACI event list. Detailed demographic data, including details of the confounders, are shown in Table 1 (and Supplementary Table 1).

To compare demographic data between the completers and dropouts, t tests for numerical data and χ^2 tests for countable data were conducted. The effect size (Hedge’s g , phi, or Cramer’s V) of each test was also calculated.

Results

The demographic data are shown in Table 1. Of the 3,098 participants, 37.8% were woman, with a mean age of 44.5 ± 9.8 yr. This sample was approximately similar to the average ratio of Japanese workers in each industry type as reported in the Labor Force Surveys in November 2016²³. The participants who were followed-up answered all questions (no missing data). The dropout analysis on demographic data showed significant difference between completers and dropouts ($p < 0.05$). However the effect sizes for chi-squared tests were < 0.08 for all tests, indicating small effect sizes. Hedge’s g for the t -tests was also low (< 0.20).

The number and ratio of participants who scored equal to or more than 16 points in the CES-D are shown in Table 2 for each event. The ORs calculated by logistic regression analysis are shown in Table 3. Because the ORs of models 2 and 3 showed similar results, the ORs of model 3 have been reported. Exposure to event Nos. 2, 3, 6, 8–10, 15, 18, 19, 27, 29–31, 34–36 showed significantly higher relation with depressive symptoms in the fully-adjusted model (model 3) after FDR correction for multiple tests. The

Table 2. Number of participants who were exposed to each event

No.	Event*	CES-D		Total
		Depression (≥16)	Not qualified (<16)	
Experience of an accident or disaster				
1	Suffered a (serious) illness or injury	8	33	41
2	Experienced or witnessed a terrible accident or disaster	9	9	18
Failure in work, excessive responsibility, etc.				
3	Caused a serious accident causing injury or death or other serious accident in relation to my duties	9	9	18
4	Made a serious mistake on the job that may affect the company's business	4	5	9
5	Held liable for an accident or event that occurred in the company	2	8	10
6	Made a large loss in the job wherein I was involved	5	9	14
7	Forced to commit an illegal act in relation to my duties	1	11	12
8	Imposed with a quota difficult to achieve	14	29	43
9	Failed to achieve a quota	26	52	78
10	Assigned to a new project or a position responsible for the reconstruction of the company	7	13	20
11	Received an unreasonable demand from a customer or business partner	13	46	59
12	Received a complaint from a customer or business partner	24	105	129
13	Forced to make a presentation at a large briefing session or on a formal occasion	3	11	14
14	Appointed as a proxy during the absence of the superior	7	44	51
Quality and quantity of duties				
15	There was an incident that (significantly) affected the details of my duties and workload	21	58	79
16	Engaged in overtime work for 80 h or more in 1 month	29	159	188
17	Engaged in work continuously without holidays over 2 wk	8	32	40
18	Experienced a change in the working style	10	24	34
19	Experienced a change in the working pace or activities	32	76	108
Changes in roles and positions				
20	Forced to resign	1	3	4
21	Transferred or relocated	12	53	65
22	Placed in sole charge of duties that had previously involved multiple co-workers	8	26	34
23	Received discriminatory or disadvantageous treatment due to being a non-regular worker	5	11	16
24	Got promoted	10	32	42
25	The number of subordinates decreased	10	38	48
26	Became a candidate subject to an early retirement system	0	1	1
27	Approaching expiry date of a non-regular work contract	6	12	18
Interpersonal relationships				
28	Experienced (serious) harassment, bullying, or assault	4	12	16
29	Difficulties with a superior	19	51	70
30	Difficulties with a co-worker	20	29	49
31	Difficulties with a subordinate	7	11	18
32	An understanding person at the workplace was transferred	7	25	32
33	A superior was replaced	16	88	104
34	A co-worker was promoted ahead of me	6	13	19
Sexual harassment				
35	Experienced sexual harassment	4	2	6
Power harassment				
36	Experienced power harassment	28	65	93

N=2,068; CES-D: Center for Epidemiologic Studies Depression Scale; *Work-related events selected by the Japanese government to evaluate the psychological burden on an applicant of the industrial accident compensation insurance run by the government.

Table 3. Odds ratios estimated for experiencing each event

No.	Event*	Crude OR (95% CI)	Adj. OR (95% CI)**	Type***
Experience of an accident or disaster				
1	Suffered a (serious) illness or injury	1.49 (0.68–3.27)	1.62 (0.72–3.67)	
2	Experienced or witnessed a terrible accident or disaster	6.27 (2.47–15.93)	7.67 (2.74–21.45)	I
Failure in work, excessive responsibility, etc.				
3	Caused a serious accident causing injury or death or other serious accident in relation to my duties	6.27 (2.47–15.93)	4.78 (1.79–12.79)	I
4	Made a serious mistake on the job that may affect the company's business	4.94 (1.32–18.50)	3.66 (0.88–15.30)	
5	Held liable for an accident or event that occurred in the company	1.53 (0.32–7.24)	1.17 (0.22–6.24)	
6	Made a large loss in the job wherein I was involved	3.43 (1.14–10.32)	3.31 (1.04–10.57)	I
7	Forced to commit an illegal act in relation to my duties	0.55 (0.07–4.30)	0.41 (0.05–3.34)	
8	Imposed with a quota difficult to achieve	3.05 (1.59–5.84)	3.01 (1.51–6.00)	II
9	Failed to achieve a quota	3.25 (2.00–5.30)	3.19 (1.89–5.40)	II
10	Assigned to a new project or a position responsible for the reconstruction of the company	3.34 (1.32–8.45)	3.62 (1.37–9.56)	II
11	Received an unreasonable demand from a customer or business partner	1.76 (0.94–3.30)	1.71 (0.87–3.33)	
12	Received a complaint from a customer or business partner	1.43 (0.90–2.27)	1.33 (0.82–2.15)	
13	Forced to make a presentation at a large briefing session or on a formal occasion	1.67 (0.46–6.03)	1.77 (0.47–6.70)	
14	Appointed as a proxy during the absence of the superior	0.97 (0.43–2.18)	1.01 (0.44–2.29)	
Quality and quantity of duties				
15	There was an incident that (significantly) affected the details of my duties and workload	2.31 (1.38–3.86)	2.38 (1.39–4.07)	III
16	Engaged in overtime work for 80 h or more in 1 month	1.13 (0.74–1.71)	1.17 (0.75–1.81)	
17	Engaged in work continuously without holidays over 2 wk	1.54 (0.70–3.38)	1.59 (0.70–3.63)	
18	Experienced a change in the working style	2.60 (1.23–5.49)	2.60 (1.18–5.76)	III
19	Experienced a change in the working pace or activities	2.77 (1.79–4.26)	2.73 (1.74–4.31)	III
Changes in roles and positions				
20	Forced to resign	2.04 (0.21–19.67)	1.74 (0.17–17.57)	
21	Transferred or relocated	1.40 (0.74–2.65)	1.44 (0.74–2.81)	
22	Placed in sole charge of duties that had previously involved multiple co-workers	1.90 (0.85–4.25)	1.95 (0.85–4.48)	
23	Received discriminatory or disadvantageous treatment due to being a non-regular worker	2.81 (0.97–8.14)	2.75 (0.90–8.39)	
24	Got promoted	1.94 (0.94–3.99)	1.84 (0.87–3.89)	
25	The number of subordinates decreased	1.63 (0.80–3.31)	1.70 (0.81–3.57)	
26	Became a candidate subject to an early retirement system	-	-	
27	Approaching expiry date of a non-regular work contract	3.10 (1.15–8.32)	3.08 (1.07–8.89)	III
Interpersonal relationships				
28	Experienced (serious) harassment, bullying, or assault	2.05 (0.66–6.40)	2.01 (0.62–6.55)	
29	Difficulties with a superior	2.36 (1.37–4.07)	2.41 (1.37–4.27)	IV
30	Difficulties with a co-worker	4.45 (2.48–7.98)	4.39 (2.38–8.11)	IV
31	Difficulties with a subordinate	3.96 (1.52–10.29)	4.07 (1.47–11.31)	IV
32	An understanding person at the workplace was transferred	1.73 (0.74–4.03)	1.48 (0.62–3.55)	
33	A superior was replaced	1.12 (0.65–1.93)	1.09 (0.62–1.92)	
34	A co-worker was promoted ahead of me	2.86 (1.08–7.58)	3.22 (1.16–8.91)	IV
Sexual harassment				
35	Experienced sexual harassment	12.37 (2.26–67.84)	11.16 (1.94–64.06)	IV
Power harassment				
36	Experienced power harassment	2.80 (1.77–4.45)	2.71 (1.67–4.39)	IV

N=2,068; The odds ratios (ORs) of significant risk factors after multiple testing correction via false discovery rate estimation applied to Wald's test *p* values (*q* value threshold = 0.1) are indicated in bold; *Work-related events selected by the Japanese government to evaluate the psychological burden on an applicant of the industrial accident compensation insurance run by the government; **Odds ratios and 95% confidence intervals of model 3 (fully adjusted model); ***Event typing of significant risk factors: I, experience of an accident or disaster; II, excessive responsibility; III, drastic change in work style or workload; IV, interpersonal conflict.

event “experienced sexual harassment” showed the highest OR in the current study [OR=11.16 (1.94–64.06), No. 35].

For the sake of brevity of results, the authors including physician, psychologist, occupational health practitioner, and occupational health researcher classified the identified significant risk factors. As a result, four major types of risk factors were found (Table 2). The first type was the experience of an accident or disaster (event No. 2, 3 and 6) such as “experienced or witnessed a terrible accident or disaster (No. 2).” The second type was excessive responsibility (event Nos. 8–10) represented by the event “imposed with a quota difficult to achieve [OR=3.01 (1.04–10.57), No. 8]”. The third type was a drastic change in work style or workload (event No. 15, 18, 19, and 27) such as “there was an incident that (significantly) affected the details of my duties and workload [OR=2.38 (1.39–4.07), No. 15].” The last type involved interpersonal conflicts (event No. 29–31, 35, and 36) such as “experienced sexual harassment [OR=11.16 (1.94–64.06), No. 35]”. All significant ORs were greater than 1, indicating that all significant events had a negative impact on depressive symptoms.

Discussion

The present study aimed to investigate the effect of exposure to 36 work-related events on depressive symptoms in 10,000 Japanese workers simulating national working population through an online questionnaire approach. Although there have been a number of studies that have investigated the relationship between psychosocial events and depressive symptoms, this study is the first to focus on the nationally selected and utilized work-related event battery, which covers a broad range of events in the workplace for IACI assessment. As a result, 16 out of the 36 events were found to negatively impact the mental health of workers. None of the events had a positive impact on mental health. Four major types of events were found as risk factors: 1) experience of an accident or disaster, 2) excessive responsibility, 3) drastic change in work style or workload, and 4) interpersonal conflict.

Experiencing or witnessing an accident or disaster was strongly related to depression. This is not surprising given that disaster workers exposed to the September 11, 2001 attacks in New York City are reportedly more likely to have depression compared with unexposed comparison subjects²⁵. Workers who have been exposed to a natural disaster are also likely to be depressed²⁶. In addition, causing an accident related to other workers showed a

high OR [OR=4.78 (1.79–12.79), No. 3] in this study. Guilt for inflicting harm on others may increase the risk of depression. For example, medical error is a well-known risk factor that affects the mental health of medical professionals^{27, 28}. Similarly, events causing a certain kind of company loss showed a high OR [OR=3.31 (1.04–10.57), No. 6].

High job demand is a major risk factor for mental health²⁹; thus, excessive responsibility may introduce impaired mental health in associated workers. Moreover, excessive responsibility can be easily connected to failure in accomplishing an assigned job. This would be problematic since declined self-efficacy is related to attachment anxiety, feelings of loneliness, and subsequent depression³⁰.

Events with a drastic change in work style or workload are also important for mental health. Indeed, the management standards promulgated by the Health and Safety Executive of the United Kingdom have listed organizational (small or large) change as one of the six potential stressors at work³¹. On the other hand, the risk of an excessive workload itself, such as long working hours and continuous work (No. 16 and 17), was low in the current study. Humans are able to adapt to a variety of environmental stresses, including long work hours; however, drastic changes in work style or workload may exceed the limit of that ability. Notably, a change in one’s role or position was not found to be a risk factor. Thus, although not all workers may accept a change to their role as an accomplishment, the majority appears to accept it positively.

Social conflict is known as a major source of stress^{9, 32}. Consistent with previous studies, the majority of the events related to interpersonal conflict were risk factors in the current study, with both intragroup and intergroup conflicts known to be associated with depression^{33, 34}. Interestingly, conflicts with a colleague or subordinate (No. 30 and 32) showed higher ORs than conflicts with a superior (No. 12, 30, and 36) in this study. This is likely because it may be easier for workers to internally manage a conflict with a superior than a colleague or subordinate. Furthermore, bullying at work is a well-known risk factor of depression^{2, 3, 19}. However, in this study, bullying did not reach significance (No. 28), whereas exposure to power harassment significantly correlated with depressive symptoms [OR=2.71 (1.67–4.39), No. 36]. Since workplace bullying is a frequently reported risk factor of worker’s health, the abuse of one’s position in the workplace can make a situation worse. However, it has to be noted that asking about experiences on both bullying and power harassment in a single questionnaire may lead to a

biased response (number of event No. 28 decreased and lowered the statistical power).

The ORs for the first group (experience of an accident or disaster) was >3.3 . Although a natural disaster is unavoidable, reducing accidents at the workplace may contribute to reduced levels of depression. Secondly, interpersonal conflicts showed ORs around 3. In particular, the OR of experiencing sexual harassment (No. 36) was 5.88, which was the second highest OR among all the events listed. From its characteristics and severe impact on mental health³⁵, sexual harassment should be taken independently from other interpersonal conflicts in the workplace. Lastly, the remaining two groups were related to job demands and management and showed ORs around 2.5 to 3. Although not all changes are predictable, appropriate management strategies may serve to reduce the experience of drastic changes or excessive demands in the workplace.

Several issues must be noted as limitations of the current study. First, some of the events showed lower ORs than we expected. For example, No. 20 “forced to resign” and No. 7 “Forced to commit an illegal act in relation to my duties” had lower than expected ORs. These results may be from the low number of cases, which resulted in lower statistical power. Accordingly, only four workers out of 2,377 participants (0.17%) were “forced to resign” in the current study. The results may be also biased because of methodological issues; all event experiments were reported based on the participants’ subjectivity. The sensitivity to subjective bias differs among events. In addition, since the event battery was organized based on practical convenience for an IACI investigation, some cases may overlap with each other, such as events 28 and 36 were both related to workplace bullying events 16 and 17 were related to long working hours. With the numerous possible event pairs, this overlap made it difficult to assess the combination effects between events. Nearly 70% of the participants were absent from the second survey and the reasons why they dropped out are unknown. Although the dropout analysis indicated that there is not much difference between the completers and dropouts, it is possible that severe cases may have dropped out from the follow-up survey and therefore were not included in the analysis. Finally, the chronic effects of events have not been investigated in the present study. Multi-wave longitudinal studies are required to address this issue in the future.

In conclusion, by conducting a longitudinal study with 10,000 participants, 16 out of 36 events from the IACI event list were found to be potential risk factors that may worsen depressive symptoms. Among them, we identified

four major types: 1) experience of an accident or disaster, 2) excessive responsibility, 3) drastic change in work style or workload, and 4) interpersonal conflict. In particular, experiencing an accident or disaster showed the highest OR among all events listed in the current study. Sexual harassment also showed a high OR. Although the working environment in Japan and other countries may differ, the results that were found, including magnitude relationship of ORs of risk factors, can be utilized for promoting psychosocially healthy work environment in the world. These risk factors are recommended to be controlled in order to create a psychosocially healthy work environment for both employers and employees.

Conflict of Interest

None declared.

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