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F. 研究発表

1. 論文発表

2. 学会発表

1) 吉池卓也, 栗山健一, 本間元康, 金吉晴. 高照度光照射による恐怖条件付け学習効果の検討. 第19回日本時間生物学会学術大会, 札幌, 2012.9.15-16.

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G. 知的所有権の取得状況

1．特許取得

2．実用新案登録

3．その他

Ⅲ．研究成果の刊行に関する一覧表

研究成果の刊行に関する一覧表

書籍

著者氏名	論文タイトル名	書籍全体の編集者名	書　籍　名	出版社名	出版地	出版年	ページ
金　吉晴	集団的災害対応精神医療システム	精神保健福祉白書編集委員会編	精神保健福祉白書2014年版	中央法規	東京	2013	

雑誌

発表者氏名	論文タイトル名	発表誌名	巻号	ページ	出版年
金　吉晴	災害時の不安障害のマネジメント	保健医療科学	62(2)	144-149	2013
金　吉晴	自然災害後の精神医療対応の向上の取り組み	日本精神科病院協会雑誌	32(10)	19-26	2013
加茂　登志子	家庭内暴力被害母子への相互関係介入プログラム	BIRTH（医学出版）	第2巻第2号	77～83	2013
加茂　登志子	女性とうつ病	最新医学（最新医学社）	第68巻第12号	102～105	2013
成澤知美	検視（検死）及び司法解剖時の被害者遺族に対する警察官の対応及び意識について	被害者学研究	第24号		印刷中

IV. 研究成果の刊行物

Relationships Between Mental Health Distress and Work-Related Factors Among Prefectural Public Servants Two Months After the Great East Japan Earthquake

Maiko Fukasawa · Yuriko Suzuki · Akiko Obara · Yoshiharu Kim

Abstract

Background In times of disaster, public servants face multiple burdens as they engage in a demanding and stressful disaster-response work while managing their own needs caused by the disaster.

Purpose We investigated the effects of work-related factors on the mental health of prefectural public servants working in the area devastated by the Great East Japan Earthquake to identify some ideas for organizational work modifications to protect their mental health.

Methods Two months after the earthquake, Miyagi prefecture conducted a self-administered health survey of prefectural public servants and obtained 4,331 (82.8 %) valid responses. We investigated relationships between mental health distress (defined as K6≥13) and work-related variables (i.e., job type, overwork, and working environment) stratified by level of earthquake damage experienced.

Results The proportion of participants with mental health distress was 3.0 % in the group that experienced less damage and 5.9 % in the group that experienced severe damage. In the group that experienced less damage, working >100 h of overtime per month (adjusted odds ratio [OR], 2.06; 95 % confidence interval [CI], 1.11–3.82) and poor workplace communication (adjusted OR, 10.96; 95 % CI, 6.63–18.09) increased the risk of mental health distress. In the group that experienced severe damage, handling residents' complaints (adjusted OR, 4.79; 95 % CI, 1.55–14.82) and poor workplace communication (adjusted OR, 9.14; 95 % CI, 3.34–24.97) increased the risk, whereas involvement in disaster-related work (adjusted OR, 0.39; 95 % CI, 0.18–0.86) decreased the risk.

Conclusions Workers who have experienced less disaster-related damage might benefit from working fewer overtime hours, and those who have experienced severe damage might benefit from avoiding contact with residents and engaging in disaster-related work. Facilitating workplace communication appeared important for both groups of workers.

Keywords Mental health · Public servants · Disaster-related work · Overwork · Great East Japan Earthquake

Introduction

On March 11, 2011, the Great East Japan Earthquake and tsunami hit the northeastern coast of Japan leaving 18,550 dead or missing [1]. Another 2,688 people died owing to the effects of this disaster [2]. Professionals dispatched to support those affected in the devastated area were highly concerned about the level of exhaustion of local public servants [3, 4]. Disaster exposure, such as bereavement and property damage, is known to adversely affect mental health [5]. In times of disaster, public servants face multiple burdens as they engage in demanding and stressful disaster-response work while managing their own needs caused by the disaster.

Although many studies have investigated the effects of post-disaster work on mental health, these have focused mainly on first responders trained to handle traumatic events, such

M. Fukasawa (✉) · Y. Suzuki · Y. Kim
Department of Adult Mental Health, National Institute of Mental Health, National Center of Neurology and Psychiatry, 4-1-1 Ogawa-Higashi, Kodaira, Tokyo 187-8553, Japan
e-mail: s05fukasawa@ncnp.go.jp

A. Obara
Miyagi Mental Health and Welfare Center, 5-7-20 Furukawaasahi, Osaki, Miyagi 989-6117, Japan

Y. Kim
National Information Center of Disaster Mental Health, National Institute of Mental Health, National Center of Neurology and Psychiatry, 4-1-1 Ogawa-Higashi, Kodaira, Tokyo 187-8553, Japan

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as rescue workers, firefighters, and police [6–8]. The few studies focusing on public servants or company employees other than first responders were conducted among recovery workers such as construction workers, cleanup workers, and municipal workers [9–13], transit workers responding to the 2001 World Trade Center attack [14], or recovery workers involved in later phases of the response to the 2005 Pakistani earthquake [15]. These studies indicated that the mental health of the workers involved was affected by exposure to traumatic events in the course of their work [9, 12–14] or the duration of the work engagement [10, 11, 13], as well as by disaster-related damage experienced, such as losing family members or friends or household goods and property damage [11, 14, 15]. However, most of these studies were conducted several years after the disaster, and they did not consider the synergistic effect of work-related stressors and disaster-related damage on mental health.

In this study, we compiled data from a health survey of prefectural public servants conducted 2 months after the Great East Japan Earthquake, compared the perceived health condition and mental health status of these public servants by level of earthquake damage they experienced, and investigated relationships between work-related variables and mental health stratified by level of earthquake damage experienced. We hypothesized that post-disaster job type, overwork, or working environment might affect the mental health of public servants differently depending on the level of earthquake damage they experienced. We aimed to find some clues about organizational work modifications in the more acute phase of the disaster to assist public servants who experienced severe damage by the earthquake.

Method

Survey

A web-based self-administered health survey was conducted by the Labor Welfare Division of Miyagi prefecture, for all its public servants 2 months after the Great East Japan Earthquake (May 2011). Miyagi prefecture has a population of approximately 2,327,110 [16] and is located on the Pacific side of the northeastern region of mainland Japan. The prefecture was heavily damaged by the earthquake, and more than 10,000 were reported dead or missing [1].

Study Population

The May 2011 survey (the first survey) involved 4,334 (82.8 %) participants among all public servants in the prefecture as of May 2011 (N=5,233). From this survey, we included 4,331 (82.8 %) participants in our analysis who had no missing data on mental health distress as measured by the K6

and no missing data for the questions concerning the damage they experienced from the earthquake (i.e., degree of property damage, existence or non-existence of dead or missing family members, and experience of living someplace other than their own house). This study did not include police, firefighters, or teachers because they belonged to a different personnel system.

Study Variables

Damage Caused by the Great East Japan Earthquake

The survey asked about degree of property damage as listed in the official report (i.e., none or minimal, partial collapse, half collapse, or total collapse of the home). As for information on the degree of property damage, we also used data from the October 2011 survey (the second survey), which we conducted in the same manner for the same population as the first survey. Among the 4,334 participants in the first survey, 3,743 (86.4 %) were involved in the second survey, which represented 71.5 % of all public servants in the prefecture as of May 2011. We compared responses on property damage between the first and second surveys among workers who participated in both surveys (n=3,743) and found that 1,069 (28.6 %) participants had reported different degrees of property damage. Thus, at the time of the first survey, degree of property damage possibly was not yet certified, or it might have changed by the time of the second survey. Therefore, to enhance data accuracy, we used data from the second survey for participants who responded to both surveys and data from the first survey for participants who did not respond to the second survey.

We also asked for information on dead or missing family members (yes or no) and whether participants were living someplace other than their own house such as a shelter (no; previously, yes; or currently, yes).

Work-Related Variables

Variables representing job type included involvement in disaster-related work (yes or no) and job description (work at a morgue, handling residents' complaints, or other). Variables representing overwork included working more than 100 hours overtime per month (yes or no) and taking 1 day off per week (yes or no). Variables representing working environment included work site (inland area or coastal area) and level of workplace communication (i.e., communication with bosses, colleagues, and subordinates [poor, reasonable, or good]).

Health-Related Variables

We asked for information on subjective physical condition (bad, not so good, as usual, or good), sleep (sleepless, not so

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good, good, or excellent), appetite (unchanged, decreased, or increased), and change in alcohol intake (unchanged, decreased, increased, or nondrinker).

Mental health distress was assessed by the K6, a six-item standardized screening instrument of non-specific psychological distress over the past 30 days [17, 18]. Items are rated on a five-point Likert scale from 0 (none) to 4 (all the time), with a summary score ranging from 0 to 24. In this study, mental health distress was defined as a K6 score of ≥13 [19].

Demographic Characteristics

We obtained information on gender and age, with age used as a categorical variable divided into four age groups (18–29, 30–39, 40–49, and 50–64 years).

Statistical Analysis

We divided participants into two groups by level of earthquake-related damage experienced: the less damaged group and the severely damaged group. The severe damaged group comprised participants whose homes had half collapsed or totally collapsed, who had a family member(s) who had died or was missing, or who were living someplace other than their own home at the time of the first survey. The less damaged group comprised all other participants.

First, we compared demographic characteristics, work-related variables, and health-related variables between these two groups (chi-square tests). Second, we examined the relationships between mental health distress (K6 ≥13) and work-related variables within each group (chi-square tests). Then, for each group, we calculated the adjusted odds ratio (OR) and 95 % confidence interval (CI) for job type, overwork, and level of workplace communication on mental health distress, controlling for gender, age group, and work site using logistic regression analysis.

All statistical analysis was performed using Stata 12.0 for Windows (StataCorp LP, College Station, TX). Statistical significance was set at 0.05, and all tests were two-tailed.

Results

Table 1 shows the level of earthquake-related damage by group, with 667 participants categorized in the severely damaged group and 3,664 participants in the less damaged group. Table 2 shows the demographic characteristics and work-related variables of the study groups. More than three-quarters of all participants were men. No statistical differences in these variables were found between the two groups except for work site. As would be expected, the severely damaged group included more participants who worked in a coastal area.

Table 3 shows the comparison of health condition between the study groups. Severely damaged participants were more likely to perceive their physical condition as not so good or bad, be dissatisfied with their sleep, and have decreased or increased appetite and alcohol intake. Regarding mental health distress, the proportion of participants whose score exceeded the K6 cutoff point of ≥13 was larger in the severely damaged group ($n=39$, 5.9 %) than in the less damaged group ($n=111$, 3.0 %).

In the less damaged group, bivariate analysis (chi-square tests) of relationships between demographic characteristics and work-related variables and mental health distress showed that those who were female, in their thirties or forties, worked >100 h overtime per month or did not have good workplace communication were more likely to score ≥13 on the K6. As for job type, we found no significant correlations with mental health distress (Table 4). In the severely damaged group, those who were female, not involved in disaster-related work, or who did not have good workplace communication were more likely to have mental health distress. As for overwork, we found no significant correlation with mental health distress (Table 5).

Table 6 shows the results of the logistic regression analysis of the relationship between work-related variables and mental health distress, controlling for gender, age group, and work site in each group. In the less damaged group, working >100 h overtime per month (adjusted OR, 2.06; 95 % CI, 1.11–3.82) and poor workplace communication (adjusted OR, 10.96; 95 % CI, 6.63–18.09) increased the risk of mental health distress. In the severely damaged group, handling residents' complaints (adjusted OR, 4.79; 95 % CI, 1.55–14.82) and poor workplace communication (adjusted OR, 9.14; 95 % CI, 3.34–24.97) increased the risk of mental health distress, and involvement in disaster-related work reduced the risk (adjusted OR, 0.39; 95 % CI, 0.18–0.86).

Discussion

The main findings of this study can be summarized as follows. In the severely damaged group, handling residents' complaints increased the risk of mental health distress, although engagement in disaster-related work decreased the risk. In the less damaged group, working >100 h overtime per month increased the risk. In both groups, poor workplace communication increased the risk.

In the severely damaged group, although job type was related to mental health distress, overwork was not. When responding to a major disaster as part of an organization, disaster-related work might produce a sense of belonging to an organization or society, or a sense of contributing to the disaster response, factors which might be more protective to mental health than reducing overwork, particularly for those

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Table 1 Description of damage caused to participants by the Great East Japan Earthquake by level of damage

	All participants		Less damaged participants[a]		Severely damaged participants[b]	
	N 4,331	%	n 3,664	%	n 667	%
Property damage						
None or minimal	2,409	55.6	2,354	64.3	55	8.3
Partial collapse	1,342	31.0	1,310	35.8	32	4.8
Half collapse	366	8.5	0	0.0	366	54.9
Total collapse	214	4.9	0	0.0	214	32.1
Dead or missing family member(s)						
No	4,223	97.5	3,664	100.0	559	83.8
Yes	108	2.5	0	0.0	108	16.2
Lives someplace other than their own house (e.g., a shelter) (n=4,330)						
No	3,359	77.6	3,001	81.9	358	53.8
Previously, yes	887	20.5	663	18.1	224	33.6
Currently, yes	84	1.9	0	0.0	84	12.6

[a] Participants who did not meet the criteria for "severely damaged participants" described below

[b] Participants whose house was half collapsed or totally collapsed, had dead or missing family member(s), or who were living someplace other than their own house as of 2 months after the disaster

who have experienced severe disaster-related damage. On the other hand, handling residents' complaints increased the risk of mental health distress. A previous survey conducted among the firefighters responding to the Great Hanshin–Awaji Earthquake in 1995 found similar findings [20]. Arguably, how to handle residents' complaints is a major challenge for an organization to address in order to perform necessary disaster relief activities while protecting the mental health of its workers. Furthermore, public servants who are responsible for contacting community residents must often repeatedly hear about experiences of the disaster and its impact on residents' lives, which might serve to increase their own distress. When making allowances for severely affected workers, a possible countermeasure is to modify those work assignments requiring close contact with residents.

In the less damaged group, working >100 h overtime per month increased the risk of mental health distress. Previous studies also indicated that extending working hours increased the risk of mental health distress among workers [3, 21, 22]. Managing workloads to avoid extending working hours should not be neglected, not even in the face of disaster relief.

As for workplace communication, poor communication with bosses, colleagues, and subordinates increased the risk of mental health distress in both groups, much more than job type or overwork. In a previous study, promoting communication was significantly and negatively correlated with psychological distress among workers [23]. Although good communication might be dependent upon supervisors or the organizational system, it might also depend upon the communication skills of workers. Therefore, improving workplace communication could be difficult in the short term after a disaster. Daily efforts to promote workplace communication in normal times might protect the mental health of workers without regard to gender, age, or degree of disaster-related damage.

In our study, working at a morgue did not increase the risk of mental health distress. We had anticipated an increased risk based on an earlier study that showed a significantly higher prevalence of posttraumatic stress disorder among those who performed disaster response tasks not common in their usual occupations [10]. In our study, we asked participants only whether or not they worked at a morgue but did not delve into the nature or amount of this work, which contaminated the relationship between morgue work and mental health distress.

When comparing health condition between the less damaged and severely damaged groups, participants in the severely damaged group were more likely to rate their physical condition as low, be dissatisfied with their sleep, and have changes in their appetite and/or alcohol intake. The effects of property damage or loss of family members due to the earthquake or a subsequent change in living environment or lifestyle seemed to detrimentally affect their health.

To evaluate the participants' mental health, we used a score of ≥13 on the K6 [17] to indicate mental health distress. Kessler selected a score of 13 as the optimal cutoff point to screen for serious mental illness as, among other factors, it equalized false-positive and false-negative results [19]. The analysis of the data obtained by the United States National Health Interview Survey in 1997–2009 indicated the proportion of people scoring ≥13 was 3.1 % [24], although some reports revealed a great variety in the proportion among regions or races [25, 26]. In regard to surveys conducted after a disaster, a community survey conducted in the area affected by Hurricane Katrina indicated the proportion of people scoring ≥13 on the K6 increased from 6.1 % before the disaster to 11.3 % about 6 months after it [27]. In a survey conducted 2 to 3 years after the World Trade Center attack, 10.7 % of survivors of collapsed or damaged buildings scored ≥13 on the K6 [28].

Table 2 Demographic participant characteristics and work-related variables by level of damage

	All participants		Less damaged participants[a]		Severely damaged participants[b]		df	χ^2	p value
	N 4,331	%	n 3,664	%	n 667	%			
Gender									
Male	3,351	77.4	2,829	77.2	522	78.3	1	0.4	0.551
Female	980	22.6	835	22.8	145	21.7			
Age group (years)									
18–29	501	11.6	425	11.6	76	11.4	3	7.4	0.060
30–39	1,031	23.8	898	24.5	133	19.9			
40–49	1,426	32.9	1,199	32.7	227	34.0			
50–65	1,373	31.7	1,142	31.2	231	34.6			
Work-related variables									
Job type									
Involved in disaster-related work									
No	1,093	25.2	914	25.0	179	26.8	1	1.1	0.303
Yes	3,237	74.8	2,749	75.1	488	73.2			
Works at a morgue (n=4,327)									
No	4,028	93.1	3,402	92.9	626	94.0	1	1.0	0.317
Yes	299	6.9	259	7.1	40	6.0			
Handles residents' complaints (n=4,327)									
No	4,053	93.7	3,429	93.7	624	93.7	1	0.0	0.976
Yes	274	6.3	232	6.3	42	6.3			
Overwork									
Works > 100 h overtime per month (n=4,330)									
No	4,017	92.8	3,394	92.7	623	93.4	1	0.5	0.493
Yes	313	7.2	269	7.3	44	6.6			
Takes one non-work day each week (n=4,330)									
No	213	4.9	178	4.9	35	5.3	1	0.2	0.670
Yes	4,117	95.1	3,485	95.1	632	94.8			
Working environment									
Work site									
Inland area	3,672	84.8	3,161	86.3	511	76.6	1	40.8	<0.001**
Coastal area	659	15.2	503	13.7	156	23.4			
Workplace communication (n=4,330)									
Poor	143	3.3	116	3.2	27	4.1	2	2.9	0.236
Reasonable	3,117	72.0	2,628	71.7	489	73.3			
Good	1,070	24.7	919	25.1	151	22.6			

Chi-square tests were used

[a] Participants who did not meet the criteria for "severely damaged participants" as described below

[b] Participants whose house was half collapsed or totally collapsed, had dead or missing family member(s), or who were living someplace other than their own house as of 2 months after the disaster

**p<0.01

Community surveys conducted in Japan in normal times reported the proportion of people scoring ≥13 on the K6 was 3.0 % [29] and 2.7 % [30]. According to data from the Comprehensive Survey of Living Conditions, among people aged 15 to 65 years in Miyagi prefecture, the proportion scoring ≥13 was 5.5 % in 2010 and 5.4 % in 2007 [31]. A survey of local government staff reported a proportion of 2.5 % [32]. As for surveys conducted after the Niigata Chuetsu Earthquake in Japan, the corresponding proportion was 2.4 % 1 year after the earthquake, 3.6 % 2 years after it, and 1.8 % 3 years after it among participants of annual health

checkup programs conducted by the city affected by the earthquake [33]. In consideration of these reported proportions, the proportion obtained in this study, 3.5 %, is comparable.

In Japan, a score of 5 on the K6 has been recommended as the best cutoff point to maximize the sum of sensitivity and specificity [30] and has been used in several studies [34, 35]. The proportion of people scoring ≥5 on the K6 was reported between 27.5 % [29] to 31.3 % [30] in community settings, 26.7 % in men and 33.1 % in women in a national representative sample of employees [34], 41.6 % among permanent

Table 3 Health condition by level of earthquake damage

	All participants		Less damaged participants [a]		Severely damaged participants [b]		df	χ^2	p value
	N 4,331	%	n 3,664	%	n 667	%			
Physical condition									
Bad	38	0.9	26	0.7	12	1.8	3	20.9	<0.001**
Not so good	575	13.3	461	12.6	114	17.1			
As usual	3,245	74.9	2,761	75.4	484	72.6			
Good	473	10.9	416	11.4	57	8.6			
Sleep									
Sleepless	20	0.5	13	0.4	7	1.1	3	16.2	0.001**
Not so good	623	14.4	503	13.7	120	18.0			
Good	2,675	61.8	2,271	62.0	404	60.6			
Excellent	1,013	23.4	877	23.9	136	20.4			
Appetite (n=4,330)									
Unchanged	3,651	84.3	3,119	85.2	532	79.8	2	12.5	0.002**
Decreased	296	6.8	239	6.5	57	8.6			
Increased	383	8.9	305	8.3	78	11.7			
Change in alcohol intake (n=4,326)									
Unchanged	2,076	48.0	1,795	49.0	281	42.3	3	13.4	0.004**
Decreased	734	17.0	610	16.7	124	18.7			
Increased	426	9.9	342	9.3	84	12.6			
Nondrinker	1,090	25.2	914	25.0	176	26.5			
Mental health distress (K6 score)									
≥5	1,814	41.9	1,478	40.3	336	50.4	1	23.4	<0.001**
≥10	429	9.9	328	9.0	101	15.1	1	24.2	<0.001**
≥ 13	150	3.5	111	3.0	39	5.9	1	13.4	<0.001**

Chi-square tests were used

[a] Participants who did not meet the criteria for "severely damaged participants" as described below

[b] Participants whose house was half collapsed or totally collapsed, had dead or missing family members, or who were living in other than their own house as of 2 months after the disaster

**p<0.01

employees of a manufacturing company [35], and 17.6 % in a survey of local government staff [32]. Among the participants in the above-mentioned annual health checkup programs conducted after the Niigata Chuetsu Earthquake, the proportion was 23.4 % 1 year after the earthquake [33]. Considering these reported proportions, the proportion obtained in this study (i.e., 41.9 % of all participants scoring ≥5) seems relatively high.

To the best of our knowledge, no other surveys have reported K6 scores of public servants working in a devastated area soon after a major disaster. Therefore, we are not able to compare our results with those of other studies. We reasoned that our study population faced especially stressful circumstances as disaster victims and as workers with increased workloads in the disaster's aftermath. They would have had to cope with unfamiliar disaster-related duties and respond to residents' complaints or anger. Thus, we would expect their K6 scores to be higher and that a larger proportion of them would score ≥5. Furthermore, 2 months after the disaster, resources that could have been used to care for them were limited. This is why we used a score of 13 on the K6 as the cutoff point to identify (and give priority to) highly distressed

participants. The suitable cutoff point for them might vary over time as their circumstances change.

To promote the mental health of workers serving in devastated areas, high-risk workers who are severely affected by a disaster might benefit from engaging in disaster-related work that offers a sense of contribution to disaster relief as well as from avoiding stressful contact with community residents. Workers who have experienced less damage might benefit from coordinated work schedules that prevent unduly long overtime hours. Finally, facilitating good workplace communication would seem to be of benefit to all workers.

Limitations

In this study, we used the K6, a simple screening instrument of non-specific psychological distress, to measure our participants' mental health status. Earlier studies on post-disaster mental health focused on posttraumatic stress disorder [6–8], and several studies identified the differences between risk factors of posttraumatic stress disorder from those of depressive symptoms [11, 14, 15]. We might have been able to

Table 4 Relationships between demographic characteristics and work-related variables and mental health distress as measured by the K6 in less damaged participants

	All		K6<13		K6≥13		df	χ^2	p value
	N 3,664	%	n 3,553	%	n 111	%			
Demographic characteristics									
Gender									
Male	2,829	77.2	2,759	77.7	70	63.1	1	13.0	<0.001**
Female	835	22.8	794	22.4	41	36.9			
Age group (years)									
18–29	425	11.6	414	11.7	11	9.9	3	13.2	0.004**
30–39	898	24.5	858	24.2	40	36.0			
40–49	1,199	32.7	1,159	32.6	40	36.0			
50–65	1,142	31.2	1,122	31.6	20	18.0			
Work-related variables									
Job type									
Involved in disaster-related work (n=3,663)									
No	914	25.0	885	24.9	29	26.1	1	0.1	0.772
Yes	2,749	75.1	2,667	75.1	82	73.9			
Works at a morgue (n=3,661)									
No	3,402	92.9	3,295	92.8	107	96.4	1	2.1	0.148
Yes	259	7.1	255	7.2	4	3.6			
Handles residents' complaints (n=3,679)									
No	3,429	93.7	3,328	93.8	101	91.0	1	1.4	0.241
Yes	232	6.3	222	6.3	10	9.0			
Overwork									
Works >100 h overtime per month (n=3,663)									
No	3,394	92.7	3,297	92.8	97	87.4	1	4.7	0.031*
Yes	269	7.3	255	7.2	14	12.6			
Takes one non-work day each week (n=3,663)									
No	178	4.9	174	4.9	4	3.6	1	0.4	0.545
Yes	3,485	95.1	3,379	95.1	106	96.4			
Working environment									
Work site									
Inland area	3,161	86.3	3,072	86.5	89	80.2	1	3.6	0.058
Coastal area	503	13.7	481	13.5	22	19.8			
Workplace communication (n=3,663)									
Poor	116	3.2	90	2.5	26	23.4	2	160.4	<0.001**
Reasonable	2,628	71.7	2,553	71.9	75	67.6			
Good	919	25.1	909	25.6	10	9.0			

Chi-square tests were used
*p<0.05, **p<0.01

identify different risk factors had we used the assessment scale for posttraumatic stress symptoms as an outcome measure. We also identified participants who scored ≥13 on the K6 to have mental health distress but did not consider the severity of their distress. Therefore, we cannot argue that work-related variables increased the risk of mental health distress among participants who had already scored ≥13 due to the effects of earthquake damage.

In addition, the use of a score of ≥13 as a cutoff point produced small samples with mental health distress, which raised questions about the robustness of our results. To confirm the stability of our findings, we also conducted repeated analysis of the data using cutoff scores of 10, 11, and 12 and obtained almost the same results as those with a cutoff score of ≥13. In the less damaged group, adjusted odds ratios for working >100 h overtime per month fell within 1.30 to 1.53, although they were not statistically significant. In the severely damaged group, adjusted odds ratios of handling residents' complaints fell within 1.54 to 2.45 and of disaster-related work 0.52 to 0.95, although they were not statistically

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Table 5 Relationships between demographic characteristics and work-related variables and mental health distress as measured by the K6 in severely damaged participants

	All		K6<13		K6≥13		df	χ^2	p value
	N 667	%	n 628	%	n 39	%			
Demographic characteristics									
Gender									
Male	522	78.3	501	79.8	21	53.9	1	14.5	<0.001**
Female	145	21.7	127	20.2	18	46.2			
Age group									
18–29	76	11.4	70	11.2	6	15.4	3	2.8	0.427
30–39	133	19.9	125	19.9	8	20.5			
40–49	227	34.0	211	33.6	16	41.0			
50–65	231	34.6	222	35.4	9	23.1			
Work-related variables									
Job type									
Involved in disaster-related work									
No	179	26.8	161	25.6	18	46.2	1	7.9	0.005**
Yes	488	73.2	467	74.4	21	53.9			
Works at a morgue (n=666)									
No	626	94.0	589	93.9	37	94.9	1	0.1	0.812
Yes	40	6.0	38	6.1	2	5.1			
Handles residents' complaints (n=666)									
No	624	93.7	590	94.1	34	87.2	1	3.0	0.085
Yes	42	6.3	37	5.9	5	12.8			
Overwork									
Works >100 h overtime per month									
No	623	93.4	586	93.3	37	94.9	1	0.1	0.703
Yes	44	6.6	42	6.7	2	5.1			
Takes one non-work day each week									
No	35	5.3	33	5.3	2	5.1	1	0.0	0.973
Yes	632	94.8	595	94.8	37	94.9			
Working environment									
Work site									
Inland area	511	76.6	481	76.6	30	76.9	1	0.0	0.962
Coastal area	156	23.4	147	23.4	9	23.1			
Workplace communication									
Poor	27	4.1	19	3.0	8	20.5	2	37.3	<0.001**
Reasonable	489	73.3	458	72.9	31	79.5			
Good	151	22.6	151	24.0	0	0.0			

Chi-square tests were used
*p<0.05, **p<0.01

significant. As for workplace communication, adjusted odds ratios fell within 7.02 to 9.00 in the less damaged group and 5.37 to 8.01 in the severely damaged group with statistical significance (results available upon request).

Furthermore, that the clinical importance of scores ≥13 on the K6 is not known is a major limitation of this study. However, there are practical and ethical problems in conducting more detailed assessments of mental disorders in a disaster setting with limited resources. Instead, repeated use of the K6 or other brief scales and accumulating the patterns of

score distributions might be practically useful when responding to future disasters. In future studies, although the clinical meaning of a particular score and available resources might vary with the situation, in ordinary times, we need to establish an evidence base for the proportion of people who need support as determined by particular K6 scores.

As for property damage, we were able to use the data from the second survey only for 3,743 (86.4 %) participants. Among them, 1,069 participants reported a level of property damage different from the first survey, 968 of whom reported

Table 6 Adjusted odds ratios and 95 % confidence intervals of work-related variables for mental health distress (score ≥13 on the K6)

		Less damaged participants[a]		Severely damaged participants[b]	
		OR	95 % CI	OR	95 % CI
Job type					
Disaster-related work					
	No	1.00		1.00	
	Yes	0.96	0.60–1.55	0.39	0.18–0.86
Work at a morgue					
	No	1.00		1.00	
	Yes	0.56	0.20–1.61	1.68	0.35–8.04
Handling residents' complaints					
	No	1.00		1.00	
	Yes	1.41	0.70–2.84	4.79	1.55–14.82
Overwork					
Works >100 h overtime per month					
	No	1.00		1.00	
	Yes	2.06	1.11–3.82	1.10	0.23–5.27
Takes one non-work day each week					
	No	1.00		1.00	
	Yes	1.46	0.51–4.21	0.80	0.17–3.74
Working environment					
Workplace communication					
	Good or reasonable	1.00		1.00	
	Poor	10.96	6.63–18.09	9.14	3.34–24.97

Logistic regression analyses were performed with adjustment of gender, age-group, and work site

[a] Participants who did not meet the criteria for "severely damaged participants" as described below

[b] Participants whose house was half collapsed or totally collapsed, had dead or missing family member(s), or who were living someplace other than their own house as of 2 months after the disaster

more severe damage in the second survey. Therefore, because the property damage of those who did not participate in the second survey might have been more severe, we might have underestimated the property damage of our study participants. Furthermore, as for severity of earthquake damage, we could use data only on property damage, dead or missing family members, and whether living someplace other than their own home. Therefore, the less damaged group might have included participants who experienced severe damage, including damage to their parent's house, dead or missing relatives or friends, or being injured or their family being injured.

Small group sizes, especially for the severely damaged group, hindered our efforts to detect relationships between several work-related factors and mental health distress. Also, the cross-sectional nature of our data made it difficult to infer causality. We could not obtain information on many well-known risk factors for post-disaster mental health such as socioeconomic status, family factors, pre-disaster psychological symptoms, social support [5], and prior trauma history [12, 15] because we had to limit the number of study questions considering the time constraints of conducting this study only 2 months after a major disaster. Future studies are needed to consider the aforementioned factors when exploring the relationships between work-related variables and mental health in efforts to reform the working conditions of public servants working in a devastated area soon after a disaster.

Ethical Considerations All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975 as revised in 2000. This study involved secondary analysis of existing data. The study protocol was reviewed and approved by the Ethics Committee of the National Center of Neurology and Psychiatry.

Conflict of Interest None.

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