

Correlates of Depressive Symptoms among Workers in Small- and Medium-scale Manufacturing Enterprises in Japan

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Abstract: Correlates of Depressive Symptoms among Workers in Small- and Medium-scale Manufacturing Enterprises in Japan: Tomoko IKEDA, et al. Department of Nursing, School of Health Sciences, Ibaraki Prefectural University of Health Sciences—Background: Although the relationship between job stress and depressive symptoms has been well documented among workers in large scale enterprises, the situation in small- and medium-scale enterprises (SMEs) is not fully understood. **Objectives:** To clarify the factors associated with depressive symptoms in SMEs in Japan. **Methods:** 1,516 male and 738 female Japanese workers at SMEs were surveyed using a self-administered questionnaire. We applied hierarchical multiple linear regression with depressive symptoms (Center for Epidemiologic Studies Depressive Symptoms Scale) as the dependent variable, and (1) Individual, (2) Lifestyle, (3) Job stressors, and (4) SME unique factors as independent variables entered in 4 steps. Analyses were stratified by sex due to large differences in stress scores and demographic variables. **Results:** Perceived lack of understanding from others with regard to health was the strongest factor associated with increased depressive symptoms (BETA=0.29 in males and 0.28 in females). Higher intragroup conflict (BETA=0.15 in males and 0.09 in females), perceived job future ambiguity (BETA=0.09 in males and 0.11 in females), higher quantitative workload (BETA=0.06 in males and 0.10 in females), and being an employer or a member of the employer's family (BETA=0.06 in males and 0.10 in females) were additional factors associated with high depressive symptoms. Economic

concern, being single, cigarette smoking, shorter sleep duration, and skill underutilization were male specific, while younger age and lower social support at work were female specific factors significantly associated with increased depressive symptoms. **Conclusions:** These data suggest that poor mental health may be prevented by creating a workplace climate which focuses on the high value of the health of fellow workers.

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Key words: Depressive symptoms, Job stress, Small- and medium-scale enterprises, Healthy workplace climate, Japan

Suicide has become a grave social problem in Japan since 1998¹⁾. The annual number of victims has increased steadily, exceeding 30,000 cases. One of the major reasons for this increase could be attributable to a sustained economic recession during this period, and is supported by the fact that suicide cases have increased rapidly among middle-aged working males^{2,3)}. Working people comprised 24% of all suicide cases and about half of this population was self-employed according to records of the National Police Agency for 2004³⁾. In western societies, more than 90% of suicide victims were diagnosed as having psychiatric problems in some way at the time of their death, and about two-thirds were diagnosed as having depressive syndromes^{4,5)}. In Japan, a cohort study conducted from 1989 to 1995 demonstrated that those who answered affirmatively to more than 7 out of 12 questions in the Zung self-rating depression scale had about 10 times increased risk of suicide, even after adjusting for confounders (adjusted relative risk (ARR) 9.95, 95% confidence interval (CI) 1.89–52.44)⁶⁾. Thus, depressive symptoms could be suspected as a principle risk factor for attempting suicide.

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Evidence showing a link between job stress and depressive symptoms has been accumulated during the past two decades⁷⁻¹⁸. Research has generally utilized two theoretical models, i.e., the job demand-control (JDC) model⁷ and the effort-reward imbalance (ERI) model¹⁹. Some of these studies used the Center for Epidemiologic Studies- Depression (CES-D) scale^{20, 21} to assess depressive symptoms as an outcome. Common findings of these studies are that workers with low job control (decision latitude)^{8, 10-12}, high job strain as represented by a combination of high job demands and low job control^{9, 10}, low levels of social support at work^{8, 10}, or a high effort-reward imbalance^{9, 11, 12} had higher depressive symptoms than their counterparts. Except one study from Japan¹², almost all of the studies focused on workers of large-scale enterprises (LSEs) with 300 workers or more, and lack evidence from workers of small- and medium-scale enterprises (SMEs).

In fact, SMEs defined as less than 299 workers, account for 99.7% of all enterprises and 88.0% of all workers in Japan²². They are believed to be experiencing a worsening of mental health problems, because the adverse effects of recessionary conditions tend to be concentrated in SMEs. Moreover, Japanese enterprises with fewer than 50 workers are exempt by law from the requirement to appoint an occupational medical doctor to carry out occupational and environmental health consultations. Since most SMEs have fragile operational bases, there is little possibility of their carrying out health measures by themselves²³⁻²⁶. Job stress prevention measures were conducted in only 20.2–44.0% in 2002 of SMEs compared to 64.7–90.6% of LSEs²⁷.

Under this situation, workers of SMEs might be suffering from kinds of stress different from those of LSEs. This study aimed to clarify the factors associated with depressive symptoms by gender in SMEs. These findings may contribute to the establishment of appropriate job stress preventive measures for SME workers in Japan.

Hypothetical model for job stress in workers of SMEs in Japan

We built a hypothetical model for job stress in workers of SMEs as follows.

As a preliminary procedure, focus groups and individual interviews with 31 SME workers were conducted in order to comprehend the unique stress factors of SME workers²⁸. A hypothetical model was designed on the basis of the results of our interviews and the U.S. National Institute for Occupational Safety and Health (NIOSH) job stress model²⁹ to examine a wide range of stress factors. The U.S. NIOSH job stress model, developed by NIOSH, is a theoretical model that identifies the specific components of the interaction between psychosocial factors at work and the worker that adversely

affect health. Three components of the NIOSH job stress model, i.e., individual factors, job stressors, and buffer factors, were used and lifestyle factors and SME unique job stressors were added in this study as an original item from our interviews. The defining limits of a stress response were designated as depressive symptoms taking the form of an acute reaction.

Methods

Subjects

The data was collected in a cross-sectional study with a self-rating questionnaire from August to December 2002^{30, 31}. The subjects were workers in SME manufacturing factories with 1 to 158 workers in Yashio city, Saitama prefecture, Japan. The city has the highest percentages both of manufacturing plants and of people working in manufacturing in the prefecture. In this area, 1,813 small- and medium-scale manufacturing factories were listed in the 2000 edition of the city commercial directory.

We randomly selected about 20% of factories from this directory weighted according to the distribution of types of businesses in the city (Metalworking=39.6%, Machinery=15.8%, Chemical=17.1%, Textiles=2.7%, Papermaking=7.1%, Leather=2.3%, Woodwork=1.0%, Printing=2.6%, Food=6.9%, Ceramics/Clay/Stone=1.8%, and others=3.2%). We contacted 350 factories by telephone and asked them to participate in the questionnaire survey. Employees and employers at the 350 factories totaled of 3,514 workers. Two hundred and forty-eight factories agreed to participate in the survey and questionnaires were distributed during visits to each factory to all the full-time workers (n=2,591). Responses were obtained from 2,302 workers from 244 factories (response/distribution=88.9%), and the mean number of workers at each company was 14.1. The questionnaire was not distributed to 102 factories employing 923 workers (26.3%). The main reasons why the questionnaire was not distributed to these workers were: the person responsible for the worksite did not have the time to go and ask the workers for their cooperation, the cooperation of the workers was not obtained, the factory was a long way away, or bankruptcy. The Medical Ethical Committee of The University of Tokyo approved the study.

Measures

Individual factors

Age was subjects' actual age in years at the time of the survey. *Education level* was the highest education level reached, categorized as: Junior high school=1, High school=2, College=3, and University/ Post-graduate=4. *Household financial situation* was categorized into 5 levels: Finding it very difficult=1, Finding it difficult=2, Just getting by=3, Comfortable=4, and Very

comfortable=5. *Marital status* was dichotomized as: Unmarried, Divorced, and Widowed=1, Married=2.

Lifestyle factors

We also assessed the following lifestyle factors: *Alcohol consumption per week* as calculated by multiplying number of days drinking per week and number of cups (one cup is equivalent to 9g of pure ethanol) consumed, *number of cigarettes smoked per day*, and *regular sleep hours per day*.

Job stressors

Quantitative workload, job control, skill underutilization, employment opportunities, job future ambiguity, intragroup conflict at the workplace, and social support were included using some of the scales used in the Japanese version of Generic Job Stress Questionnaire (GJSQ)^{32,33}. GJSQ is a set of scales for a range of job and other stress sources, such as individual factors, job stressors, non-work factors, and buffer factors. It was developed by the U.S. NIOSH²⁹ and translated into Japanese by Haratani *et al.*^{32,33}.

Social support at work comprised a simple addition of the variables *Social support from superiors* and *Social support from colleagues* in the Japanese version of GJSQ, since there were a significant number of workers who had no superiors or colleagues in their company. *Social support from family* was a modified version of the item *Social support from spouse, friends, and relatives* in the Japanese version of GJSQ.

SME stress questions (SMESQ)

SMESQ included a set of original items derived from our interviews²⁸. *Co-workers of the same generation in the company* were asked in the form: "Are there any people from the same generation as you in your company?" (No=1, Yes=2). *Company future ambiguity* was measured with an item: "Are you concerned about the future of your company?" (Very little=1, A little=2, Much=3, Very much=4).

Lack of understanding from others with regard to health was developed by the authors, and was measured by two items: "When you think you are not feeling well or sick, do coworkers think that you are not motivated to work?" and "Have you ever felt difficulty in expressing your wish to visit a doctor when you feel sick?" Possible choices for both questions were: Not at all=1, Very little=2, A little=3, Much=4, Very much=5. The reliability of *Lack of understanding from others with regard to health* as expressed by Chronbach's alpha was 0.68, which could be considered as sufficient (Table 1). Exploratory factor analysis of these two items incorporated in the scale, identified *Lack of understanding from others with regard to health* as being an independent variable that is different from *Intragroup conflict at the workplace* (Table 2).

Three factors were extracted and the highest loads (0.73 and 0.71) were observed on the third factor.

A *personal relationship with the owner of company* was asked by "What is your relationship with the owner of the company where you work?" The choices were: an owner's family member, an owner's sibling, an owner's relative, non-family/non-relative, and an owner. We dichotomized the responses to this question into 1) an owner's relative or non-family/non-relative and 2) an owner or an owner's family member including siblings.

Depressive symptoms

Depressive symptoms were measured by the Japanese version of the Center for Epidemiologic Studies Depressive Symptoms Scale (CES-D)^{20,21}, as a dependent variable. The CES-D consists of 20 items, and all items were answered on a scale ranging from 0 (Rarely or never) to 3 (Everyday).

The descriptive statistics and internal consistency coefficients for all continuous variables measured by the scales are provided in Table 1.

Statistical analysis

Multiple linear regression analysis was applied to determine statistical significance. Analyses were stratified by sex due to large differences between male and female workers regarding job stress scores (6 out of 9) and demographic variables as indicated in Table 3. We also decided to run separate analyses of males and females because a previous study in Japan reported that the negative health effects of job stress were positive among male but not among female workers¹⁰.

We set *depressive symptoms* as a dependent variable, and (1) Individual, (2) Lifestyle, (3) Job stressors, and (4) SME unique factors as independent variables. The variables (1)–(4) were entered in 4 steps in the above order. The significance level was set at less than $p < 0.05$. To avoid multiple-collinearity between the study variables, we calculated intercorrelation coefficients between all variables (Table 4) and variables with extremely high correlations were excluded. SPSS for Windows Version 14.0 statistical software was used for statistical analyses.

Results

The demographic characteristics

Table 3 shows the characteristics of the subjects. The mean age of the 1,516 male workers was 44.9 (SD=13.5) and their mean number of years of employment was 16.4 (SD=13.4). The mean age of the 738 female workers was 45.5 (SD=13.7) and their mean number of years of employment was 11.5 (SD=10.4).

Sixty-three percent of male and 45% of female workers were engaged in manual labor, 18% of male and almost half of female workers were engaged as clerical or management workers, while the remaining workers were

Table 1. Psychometric properties of 8 scales of the NIOSH job stress questionnaire (GJSQ), SME stress questions (SMESQ), and Depressive symptoms (CES-D) of 2,281 workers

Job stress scale	Number of items	Mean	SD	Observed range	Possible range	Cronbach's α	Construct measured
<i>Job stressors:</i>							
Quantitative workload	4	12.2	4.3	4-20	4-20	0.88	How much work must be done daily.
Job control	16	45.3	14.4	16-80	16-80	0.96	How much the worker feels that tasks, workplace setting, and decisions at work are controllable.
Skill underutilization	3	11.2	3.1	3-15	3-15	0.81	How much the worker feels that his skills and ability are utilized in the job.
Employment opportunities	3	12.0	2.0	3-15	3-15	0.72	Feelings about the job in relationship to other jobs that the worker might get.
Job future ambiguity	4	15.6	4.1	4-20	4-20	0.85	How certain the worker is about future career such as opportunities for promotion.
Intragroup conflict at the workplace	8	22.7	4.8	8-40	8-40	0.65	How much the worker feels that relationships with the working group are friendly, harmonious, cooperative, and supportive.
Social support at work	8	28.4	7.2	8-40	8-40	0.89	Amount of social support received from supervisors and colleagues.
Social support from family	4	15.2	4.0	4-20	4-20	0.83	Amount of social support received from family.
<i>SME stress questions:</i>							
Company's future ambiguity	1	2.9	0.8	1-4	1-4	-	How certain the company is about future prospects.
Lack of understanding from others with regard to health	2	4.1	1.8	2-10	2-10	0.68	Feeling that it would be difficult to take time off from work to consult a doctor about mental or physical problems, because the atmosphere was one in which the other workers showed a lack of sympathy or understanding about questions of ill health.
<i>Psychological stress reaction:</i>							
Depressive symptoms (CES-D)	20	15.4	8.1	0-52	0-60	0.87	Level of depressive symptoms experienced in the past week.

SD, standard deviation. A dash denotes index the calculation of Chronbach's alpha was not appropriate.

Table 2. Factor analysis results for *Intragroup conflict at the workplace* and *Lack of understanding from others with regard to health*

Item content	Factor pattern			h2	
	1	2	3		
Intragroup conflict at the workplace	Conflict	0.69	0.02	0.20	0.49
	At my company there are often disputes about who should do what.	0.80	-0.10	0.18	0.63
	At my company there are different opinions among the employees.	0.87	-0.07	0.18	0.76
	At my company there are conflicting opinions.	0.58	-0.15	0.18	0.35
Harmony	At my company there are conflicts between small groups.	-0.27	0.67	-0.22	0.49
	There is harmony at my company.	0.05	0.58	-0.11	0.35
	The employees at my company support each other's opinions.	-0.10	0.83	-0.12	0.70
Lack of understanding from others with regard to health	There is a friendly atmosphere among the employees at my company.	-0.01	0.75	-0.12	0.57
	There is a feeling of fellowship among the employees at my company.	0.21	-0.16	0.73	0.53
	When you think you are not feeling well or sick, do coworkers interpret that you are not motivated to work?				
	Have you ever felt difficulty in expressing your wish to visit a doctor?	0.15	-0.12	0.71	0.50
<i>Eigen values</i>					
<i>Inter-factor correlations</i>					
	Factor 1	2.36	2.13	1.26	5.75
	2	1.00	-0.11	0.25	
	3	-0.11	1.00	-0.19	
		0.25	-0.19	1.00	

Factor extraction through principal factor analysis (rotation method: Promax).

Table 4. Correlations for the 8 scales of the NIOSH job stress questionnaire (GJSQ), SME stress questions (SMESQ), and Depressive symptoms (CES-D) of 2,281 workers

Variables	1	2	3	4	5	6	7	8	9	10	11
1 Quantitative workload											
2 Job control	0.19***										
3 Skill underutilization	-0.31***	-0.38***									
4 Employment opportunities	-0.06**	0.01	0.11***								
5 Job future ambiguity	-0.06**	-0.40***	0.27***	0.06**							
6 Intragroup conflict at the workplace	0.18***	-0.19***	0.07**	-0.06**	0.22***						
7 Social support at work	-0.11***	0.03	-0.10***	-0.03	-0.14***	-0.21***					
8 Social support from family	0.01	0.12***	-0.12***	-0.02	-0.13***	-0.08***	0.29***				
9 Company's future ambiguity	0.07***	-0.03	0.08***	0.08***	0.25***	0.21***	-0.21***	-0.05*			
10 Lack of understanding from other workers with regard to health	0.24***	-0.10***	0.01	-0.04*	0.12***	0.24***	-0.16***	-0.07***	0.12***		
11 Depressive symptoms	0.16***	-0.10***	0.08***	0.00	0.20***	0.26***	-0.20***	-0.14***	0.13***	0.38***	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 5. Comparisons of GJSQ data^{#1} for nationwide workers^{#2} and the subjects, by gender

	Male workers				Female workers				
	The nationwide data (a)		Current study sample data (b)		The nationwide data (c)		Current study sample data (d)		
	Mean ^{#3}	(N=19,699)	Mean (SD)	(N=1,516)	Mean ^{#3}	(N=3,374)	Mean (SD)	(N=738)	
Variance in workload	9.1	9.0 (3.3)	9.0 (3.3)	9.0 (3.3)	7.8	7.8	7.7 (3.3)	7.7 (3.3)	-1.3%
Cognitive demands	15.0	15.1 (2.6)	15.1 (2.6)	15.1 (2.6)	14	14	14.3 (2.8)	14.3 (2.8)	2.1%
Job control	47.4	47.6 (14.6)	47.6 (14.6)	47.6 (14.6)	38.7	38.7	40.1 (12.6)	40.1 (12.6)	3.6%
Skill underutilization	10.3	10.7 (3.1)	10.7 (3.1)	10.7 (3.1)	12.7	12.7	12.2 (3.0)	12.2 (3.0)	-3.9%
Responsibility for people	10.7	10.4 (4.5)	10.4 (4.5)	10.4 (4.5)	6.7	6.7	8.0 (4.1)	8.0 (4.1)	19.4%
Intragroup conflict at the workplace	19.9	22.6 (4.8)	22.6 (4.8)	22.6 (4.8)	20.6	20.6	22.9 (4.8)	22.9 (4.8)	11.2%
Job future ambiguity	14.5	15.2 (4.1)	15.2 (4.1)	15.2 (4.1)	16.8	16.8	16.3 (4.0)	16.3 (4.0)	-3.0%
Employment opportunities	12.2	11.9 (2.0)	11.9 (2.0)	11.9 (2.0)	12.4	12.4	12.1 (2.1)	12.1 (2.1)	-2.4%
Social support from superiors	14.8	14.0 (4.3)	14.0 (4.3)	14.0 (4.3)	13.8	13.8	14.1 (4.2)	14.1 (4.2)	2.2%
Social support from colleagues	15.2	14.3 (3.8)	14.3 (3.8)	14.3 (3.8)	15.2	15.2	14.6 (3.8)	14.6 (3.8)	-3.9%
Depressive symptoms	12.2	15.4 (8.2)	15.4 (8.2)	15.4 (8.2)	13.4	13.4	15.3 (8.0)	15.3 (8.0)	14.2%

^{#1}The data of General Job Stress Questionnaire, based on the NIOSH job stress-model. ^{#2}The data for nationwide workers; Haratani *et al.*: The difference of the value of NIOSH scale for the type of job³⁴. ^{#3}Data do not include standard deviation.

engaged as salespersons, engineers, or drivers.

Almost 70% of both genders were married. Forty-four percent of male and 54% of female workers had graduated from high schools, and 25% of male and 22% of female workers had graduated from junior high schools. Almost half of both genders reported their household financial situation as just getting by, while 33% of male and 27% of female workers reported it as difficult, and only 6% of male and 7% of female workers reported it as comfortable.

Twenty-three percent of male and 28% of female workers had family members in the same companies. Twenty-nine percent of male and 23% of female workers had no coworkers from the same generation at their companies. Seventeen percent of male workers were employers and 23% of female workers were employed by family member.

Comparisons the GJSQ data with the nationwide data

First, in order to gain an understanding of the situation regarding the occupational stressors for the subject group, we took the mean values of some of the GJSQ scales, and compared these with nationwide data³⁴⁾ for each of the items (Table 5). *Quantitative workload* could not be compared because the score versions differed from each other. The mean (SD) of *Depressive symptoms* was 15.4 (8.2) among male workers and 15.3 (8.0) among female workers in the current study, while the mean figures were 12.2 among male workers and 13.4 among female workers in the nationwide data. *Intragroup conflict at the workplace* was 22.6 (4.8) among male workers and 22.9 (4.8) among female workers in current study, while it was 19.9 among male workers and 20.6 among female workers in the nationwide data. In female workers, the mean (SD) of *Responsibility for people* was 8.0 (4.1), while it was 6.7 in the nationwide data.

Factors associated with depressive symptoms

The results of the multiple linear regression analyses are shown in Tables 6 and 7. R Square change of SME job stressors were 0.078 in males and 0.084 in females, and both of the models were significant (<0.001). In male workers (Table 6), the adjusted R square was 0.047 in the first step and 0.232 in the final step. Influential variables included in the first and second steps were: *poor household financial situation*, *being unmarried*, *many cigarettes consumed*, and *shorter sleep hours*. They remained significant through to the final step. For job stressors, higher *quantitative workload*, higher *skill underutilization*, higher perceived *job future ambiguity*, and higher *intragroup conflict at the workplace* were significantly associated with depressive symptoms in the third and the final steps. The factor, perceived *lack of understanding from others with regard to health* had the strongest association with depressive symptoms. *Being*

an employer or a member of the employer's family was associated with depressive symptoms.

For female workers (Table 7), the adjusted R square was 0.020 in the first step rising to 0.217 in the final step. The same tendencies were observed for female workers as for male workers; higher *quantitative workload*, higher perceived *job future ambiguity*, and higher *intragroup conflict at the workplace* remained significant in the third and the final steps. In the final step, perceived *lack of understanding from others with regard to health* and *being an employer or a member of the employer's family* remained significant, the same as for male workers.

Discussion

To clarify the situation with regard to job stress and factors associated with depressive symptoms, we conducted a cross-sectional study. This study identified the characteristics of job stressors for SME manufacturing workers.

First, we compared mean values of some scales of GJSQ with nationwide data (Table 5). The nationwide data comprise results collected from 25,143 male and female workers from nine large-scale enterprises (LSE) throughout Japan during 1996 to 1998³⁴⁾. Although we were unable to statistically compare each score of the present data with the nationwide data, substantially higher scores for *depressive symptoms* and *intragroup conflict at the workplace* were observed for SME workers. These factors could be a key to understanding high levels of depressive symptoms among SME workers.

Mean CES-D scores were 15.4 for male and 15.3 for female workers, which were 26.2% and 14.2% higher than those of male and female workers in the nationwide data, respectively. Some previous studies of Japanese workers reported that the mean value of the CES-D score was 13.5 for 213 male workers at an electronic parts manufacturing factory³²⁾, 10.0 for 110 male workers at hospitals or companies²¹⁾, and 7.0 for 534 male workers at a large electrical company³⁵⁾. Comparisons between our data and these previous data confirm that SME workers in our study included workers with a high level of depression.

The mean of *Intragroup conflict at the workplace* was 13.6% higher for male and 11.2% higher for female workers compared to the values in the nationwide data. Given that SMEs have a unique work organization, interpersonal relationships may be more complicated than in LSEs.

This study identified factors associated with depressive symptoms by gender for the SME workers (Tables 6 and 7). In both genders, *Lack of understanding from others with regard to health* had the strongest association with increased depressive symptoms. The likelihood of depressive symptoms was heightened by the feeling that

Table 6. Association of job stress factors with depressive symptoms by multiple linear regression analysis for male workers (N=1,516)

	Model 1		Model 2		Model 3		Model 4	
	Standardized BETA	p	Standardized BETA	p	Standardized BETA	p	Standardized BETA	p
Individual factors								
Age (actual age)	-0.05	0.15	-0.03	0.408	0.00	0.949	0.02	0.454
Education level (Junior high school=1 - University/ Post-graduate=4)	-0.01	0.67	-0.03	0.385	-0.03	0.335	-0.02	0.426
Household financial situation (Very difficult=1 - Very comfortable=5)	-0.15	0.00	-0.15	0.000	-0.09	0.001	-0.09	0.001
Marital status (Unmarried=1, Married=2)	-0.15	0.00	-0.14	0.000	-0.12	0.000	-0.11	0.001
Life-style factors								
Alcohol consumption per week (Number of days drinking per week *number of cups)			-0.02	0.430	-0.02	0.469	-0.02	0.461
Number of cigarettes smoked per day			0.06	0.045	0.06	0.028	0.05	0.034
Regular sleep hours per day			-0.11	0.000	-0.07	0.009	-0.05	0.041
Quantitative workload (4-20)					0.13	0.000	0.06	0.031
Job control (16-80)					0.01	0.876	0.01	0.834
Skill underutilization (3-15)					0.08	0.011	0.07	0.022
Employment opportunities (3-15)					0.00	0.871	0.00	0.921
Job future ambiguity (4-20)					0.10	0.001	0.09	0.002
Intragroup conflict at the workplace (8-40)					0.18	0.000	0.15	0.000
Social support at work (8-40)					-0.10	0.000	-0.05	0.064
Social support from family (4-20)					-0.04	0.190	-0.06	0.061
SME job stressors								
Co-workers of the same generation in the company (No=1, Yes=2)							-0.05	0.061
Company future ambiguity (Very little=1- Very much=4)							-0.02	0.539
Lack of understanding from others with regard to health (2-10)							0.29	0.000
A personal relationship with the owner of company (An owner's relative or non-family/non-relative=1, An owner or an owner's family member=2)							0.06	0.027
<i>R square</i>								
<i>Adjusted R square</i>		0.050				0.166		0.244
<i>R Square change</i>		0.047				0.156		0.232
<i>F change</i>						0.101		0.078
<i>Significance of F change</i>						18.305		31.055
						0.000		0.000

Bold letters, the values of standardized BETA and p which p<0.05.

Table 7. Association of job stress factors with depressive symptoms by multiple linear regression analysis for female workers (N=738)

	Model 1		Model 2		Model 3		Model 4	
	Standardized BETA	p	Standardized BETA	p	Standardized BETA	p	Standardized BETA	p
Individual factors								
Age (Actual age)	-0.11	0.04	-0.11	0.05	-0.15	0.00	-0.13	0.01
Education level (Junior high school=1–University/ Post-graduate=4)	-0.10	0.04	-0.10	0.03	-0.10	0.04	-0.08	0.07
Household financial situation (Very difficult=1–Very comfortable=5)	-0.10	0.03	-0.08	0.07	-0.02	0.64	0.01	0.87
Marital status (Unmarried=1, Married=2)	-0.01	0.83	-0.01	0.83	0.03	0.49	0.03	0.56
Life-style factors								
Alcohol consumption per week (Number of days drinking per week *number of cups)			0.06	0.19	0.06	0.19	0.05	0.26
Number of cigarettes smoked per day			0.05	0.26	0.05	0.25	0.05	0.29
Regular sleep hours per day			-0.09	0.06	-0.06	0.20	-0.04	0.30
Job stressors								
Quantitative workload (4–20)					0.12	0.01	0.10	0.02
Job control (16–80)					0.02	0.64	-0.01	0.89
Skill underutilization (3–15)					0.04	0.38	0.03	0.55
Employment opportunities (3–15)					0.06	0.17	0.06	0.15
Job future ambiguity (4–20)					0.10	0.02	0.11	0.01
Intragroup conflict at the workplace (8–40)					0.11	0.02	0.09	0.04
Social support at work (8–40)					-0.21	0.00	-0.14	0.00
Social support from family (4–20)					-0.04	0.42	-0.05	0.24
SME job stressors								
Co-workers of the same generation in the company (No=1, Yes=2)							0.02	0.56
Company future ambiguity (Very little=1–Very much=4)							0.03	0.48
Lack of understanding from others with regard to health (2–10)							0.28	0.00
A personal relationship with the owner of company (An owner's relative or non-family/non-relative=1, An owner or an owner's family member=2)							0.10	0.03
<i>R square</i>		0.028		0.042		0.163		0.247
<i>Adjusted R square</i>		0.020		0.028		0.136		0.217
<i>R Square change</i>				0.014		0.121		0.084
<i>F change</i>				2.387		8.585		13.188
<i>Significance of F change</i>				0.070		0.000		0.000

Bold letters, the values of standardized BETA and p which $p < 0.05$.

it would be very difficult to take time off from work to consult a doctor regarding mental/physical health, because the work climate was not helpful for improving one's health status.

The following narratives from workers were typical responses observed in our interview²⁸: "My boss told me that I'd never be able to call myself a really accomplished worker unless my hearing was damaged or I got some sort of injury through work", or "I am proud of the fact that I lost one of my fingers because that is the honorable mark of an accomplished worker". This kind of workplace climate seems to be particularly unique to SMEs. The explanation of such a severe workplace climate might be that the strict attitude toward work has been transmitted from generation to generation along with the skills necessary to work. This kind of attitude forms a framework for an individual psychological situation in which the worker feels "I shouldn't take time off because that means I won't be an accomplished worker", or "because it will cause problems for others if I am not there", or even "because I may be laid off." Such traditional culture is difficult to change and great care must be taken in consideration of such workplace situations. However, one way of improving the situation may be to establish a healthy workplace climate in which workers are treated with respect. It is important to note that not only to achieve a temporary improvement of health, the transmission of skills in SME factories should include a healthy workplace climate.

Higher *intragroup conflict at the workplace* also showed a strong association with increased depressive symptoms in both genders. In SMEs, a close human relationship that develops over long years of shared joys and sorrows goes beyond a simple work relationship, and becomes deeply connected to the personal lives of the individual participants. This relationship could be as intimate as being a family member. It can be inferred from this that preserving the harmony between people is very important.

Kawakami *et al.* showed that poor *human relations at the workplace* were significantly associated with *depressive symptoms* in a two year prospective design, while *job overload* and *lack of control over workplace* were significantly associated with *depressive symptoms* in a one year prospective design¹⁵. The study concluded that poor *human relations at the workplace* seem to be risk factors for long-lasting *depressive symptoms*. A high *intragroup conflict at the workplace* over the long term may have a strong impact on *depressive symptoms* not only among LSE but also among SME workers.

Being an employer or a member of the employer's family carries responsibilities for operating, managing, and maintaining the business. In addition, in SMEs it is common that such persons handle the human relations at work and have responsibilities for employees' personal

lives. Such responsibilities could be a burden to employers when economic downturns are in progress.

In male workers, being *single* was associated with increased depressive symptoms. A previous study supported our results¹³. Being married in a SME population may have a protective effect against depressive symptoms. A negative effect of difficulty in *household financial situation* on mental health was observed in male workers. This finding is reasonable in a logical manner reflecting the effects of a recession. *Skill underutilization* was also associated with increased depressive symptoms among male workers. SME workers had less chance to use their skills because of recent reductions in demand for their products. In this study sample, most workers were highly skilled craftsmen whose work can not be automated. The lack of opportunity to utilize their professional skills seems to cause job stress. *Cigarette consumption* and shorter *sleep hours* were associated with higher *depressive symptoms*, consistent with previous studies³⁶⁻⁴⁰. These factors are important and controllable in preventing depressive symptoms. Control of smoke at the workplace and sleep education along with job stress countermeasure could be a promising approach for establishing a better work climate.

In female workers, *younger age* was associated with increased depressive symptoms. Seki suggested that young people tend to find easier jobs because they are less confident about their career prospects⁴¹. They might have had difficulty in adapting to the workplace and as a consequence taken another job by a negative selection. In contrast, *social support at work* indicated a direct positive effect on depressive symptoms in female workers, although it was difficult to find similar female coworkers within the same generation in the workplace.

Some limitations of our study should be acknowledged. The interpretation of this study is based on cross-sectional data which does not allow us to observe cause-and-effect relationships. Although the study included a large number of workers in SMEs, it was not representative of the entire Japanese workforce, making generalizability less definitive. Moreover, only subjective rating results were obtained because a self-rating questionnaire was used.

Conclusion

In sum, poor workplace climate such as showing little or no regard to health, high interpersonal conflict, being an employer or a member of his/her family, job loss concern, and high quantitative workload were clearly associated with increased depressive symptoms in SME workers. To prevent poor mental health of SME workers, it may be effective to focus on the above factors in SME workers although a number of barriers to success might be anticipated.

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