

Associations of Health Behaviors on Depressive Symptoms among Employed Men in Japan

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Abstract: The associations between health behaviors and depressive symptoms have been demonstrated in many studies. However, job strain has also been associated with health behaviors. The aim of this study was to analyze whether health behaviors such as physical activity, sleeping, smoking and alcohol intake are associated with depressive symptoms after adjusting for job strain. Workers were recruited from nine companies and factories located in east and central areas of Japan. The Center for Epidemiologic Studies Depression (CES-D) Scale was used to assess depressive symptoms. Psychological demand and control (decision-latitude) at work were measured with the Job Content Questionnaire. Multiple logistic regression analysis was used to determine the independent contribution of each health behavior to depressive symptoms. Among the total participants, 3,748 (22.7%) had depressive symptoms, which was defined as scoring 16 or higher on the CES-D scale. Using the multiple logistic regression analysis, depressive symptoms were significantly associated with physical activity less than once a week (adjusted relative risk [ARR]=1.18, 95% confidence interval [CI], 1.14 to 1.25) and daily hours of sleep of 6 h or less (ARR, 1.25; 95% CI, 1.14 to 1.35). Smoking and frequency of alcohol intake were not significantly associated with depressive symptoms. This study suggests some health behaviors such as physical activity or daily hours of sleep are associated with depressive symptoms after adjusting for job strain.

Keywords: Health behaviors, Depressive symptoms, Job strain

Introduction

Depressive symptoms are common mental health problems in workplaces. The cost due to depression is high¹. Greenberg *et al.* assessed that the economic impact of depression in the workplace in 2000 was approximately 51.5 billion dollars per year in the United States². There is an urgent need to establish effective primary preventive strategies for depressive symptoms.

The association between depressive symptoms and health behaviors, such as physical activity, sleeping, smoking, and alcohol intake has been reported³⁻⁷ while the association

between health behaviors and job strain has been shown in several studies⁸⁻¹². High job demand has been associated with higher fat diet, less frequent physical activity and smoking. On the contrary, high job control has been associated with more frequent physical activity.

Since both health behaviors and depressive symptoms have been related to job strain¹³, the effects of job strain should be controlled to elucidate the relationship between health behaviors and depressive symptoms. To our knowledge, there has been no studies about the associations of health behaviors adjusted for job strain on depressive symptoms.

The aim of this study was to determine the associations between health behaviors and depressive symptoms by adjusting for job strain among Japanese male workers.

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Methods

Study design and participants

A cross sectional study was conducted at the workplaces in the east and central areas of Japan by Japan Work Stress and Health Cohort Study Group. Workers were recruited from nine companies and factories, comprising one light metal factory, three electrical manufacturing factories, two steel factories belonging to the same company, one heavy-metal manufacturing factory, one automobile plant, and one car product factory.

Recruitment strategies were slightly different among the sites. At four sites, all employees were invited to participate; at three sites, all participants taking part in a periodical health examination were invited; at one site, only men who participated in a health examination were invited; and at one site, all managers were invited.

A questionnaire was mailed to 29,417 eligible participants with a letter of invitation explaining the objectives and procedure of the study between April 1996 and May 1998. A total of 25,104 (21,248 men, 3,745 women and 111 who did not indicate gender) questionnaires were returned. The mean response rate was 85.3%. The response rate ranged from 73.0% to 100% among the sites, with an exception at one site whose response rate was 43.0%.

In this study, we analyzed only men. A total of 16,486 male workers were analyzed and 4,762 men who did not complete either Job Content Questionnaire (JCQ) or Center of the Epidemiological Studies Depression Scale (CES-D) were excluded from this study.

Measures

Demographic information: The demographic information included gender, age, education (junior high school, high school or vocational college, college degree or higher), marital status (married, never married or previously married which included divorced and widowed), and occupations based on the International Standard Classification of Occupations. This classification has nine categories: managers, professionals, technicians, clerks, service workers, skilled workers, machine operators, laborers and others¹⁴.

Health behaviors: Health behaviors included frequency of physical activity, daily hours of sleep, current smoking status, and frequency of alcohol intake. The question about physical activity was “How many times have you done sweating exercise during the past month?” The mean daily hours of sleep were categorized as 5 h or less, 6 h, 7 h, 8 h,

9 h, and 10 h or more. Smoking status was classified as current smokers, ex-smokers and non-smokers. The ex-smokers were defined as smokers who quit smoking for one year or more. Frequency of alcohol consumption was defined as the number of times alcohol intake occurred in the past month.

Depressive symptoms: We used the CES-D scale in this study as a measure of depressive symptoms¹⁵. The CES-D scores range from 0 to 60, with higher scores indicating increasing severities of depressive symptoms. Using a validated Japanese version of the CES-D scale, depressive symptoms were defined as a dichotomized variable with the cut-off score of 16 or higher¹⁶.

Job strain: For the measurement of job strain, we used the Japanese version of Job Content Questionnaire (JCQ)^{17–19}. Kawakami *et al.* tested the reliability and validity of the Japanese version of JCQ and found it to be acceptable¹⁹.

Job strain was defined as job demand and job control. Job strain was determined by five psychological job demand scales and nine job control (job decision-latitude) scales. Each question was asked using 4 response options. The scores were weighted and summed up to calculate a total score. High scale scores (the range of score) indicate a greater quantitative workload (12–48) and a greater learning opportunity and influence at work (24–96). The total score was dichotomized at their respective medians (25 and 66) and cross-tabulated to form a demand-control model (Table 1). ‘High strain’ is the most deleterious effect on health¹⁸. Then job strain is decreased subsequently as ‘passive’, ‘active’ and ‘low strain’ in the association with depressive symptoms¹³.

Statistical analysis

The software used for analysis was the Statistical Package for Social Sciences (SPSS) 10.0J²⁰. Multiple logistic regression analysis was carried out to determine the associations between depressive symptoms and each health behavior in three steps. First, an age-adjusted model was performed (model 1). Second, the model was adjusted additionally for education, marital status and occupations (model 2). In model 3, we adjusted for age, education, marital status and job strain. To avoid over-adjustment^{21–24}, in model 3, we adjusted for not occupations but job strain. Odds ratios were converted to adjusted relative risk (ARR) by means of the formulas which Zhang *et al.* indicated²⁵.

Table 1. Job strain model

		Job control	
		–	+
Job demand	–	Passive	Low strain
	+	High strain	Active

Ethics

The Human Subjects Committee of Gifu University School of Medicine, Japan approved the recruitment, consent, and field procedures of the study before the survey was conducted.

Results

The demographic characteristics of participants in this study are shown in Table 2. Age distribution was 34.0% for 18–29 yr old, 26.5% for 30–39 yr old, 19.8% for 40–49 yr old while 15.4% for 50–69 yr old. There are not significant differences in age between the studied subject groups and the excluded groups due to lack of the data of CES-D and JCQ (The data is not shown). The prevalence of depressive symptoms was 22.7%. Table 3 shows the associations between health behaviors and job strain. Workers who slept for 6 h or less were overrepresented among the active (48.9%) and high strain (46.0%) group. The active group was also inclined to take more alcohol (42.0% for 6 times or more a week). Table 4 shows the associations between health behaviors and depressive symptoms. The depressed group tended to take less sleep (47.4% for sleeping for 6 h or less).

The results of multiple logistic regression analysis on the associations between health behaviors and depressive symptoms are shown in Table 5. The age adjusted model (model 1) showed the significant associations between depressive symptoms and physical activity less than once a week (ARR, 1.19; 95% confidence interval [CI], 1.12 to 1.25), daily hours of sleep for 6 h or less (ARR, 1.20; 95% CI, 1.10 to 1.30), smoking (ARR, 1.08; 95% CI, 1.01 to 1.14) and alcohol intake 6 times or more a week (ARR, 0.93; 95% CI, 0.86 to 0.99). In model 2, physical activity less than once a week (ARR, 1.20; 95% CI, 1.13 to 1.28) and daily hours of sleep for 6 hours or less (ARR, 1.31; 95% CI, 1.20 to 1.42) were significantly associated with depressive symptoms. In model 3, physical activity less than once a week (ARR, 1.18; 95% CI, 1.14 to 1.25) and daily hours of

Table 2. Demographic characteristics of participants

	Number of participants	Depressed (%)
All	16,486	22.7
Age group (y)		
18–29	1,998	34.0
30–39	5,017	26.5
40–49	6,607	19.8
50–69	2,864	15.4
Education		
16 yr–(college or higher)	4,332	18.7
10–15 yr (high school or vocational college)	10,337	23.4
–9 yr (junior high school or less)	1,817	28.4
Occupation		
Managers	2,714	12.7
Professionals	2,500	20.9
Technicians	2,451	25.3
Clerks	1,129	20.8
Service workers	165	20.0
Skilled workers	2,130	23.2
Machine operators	3,409	28.0
Laborers	965	30.9
Others	1,023	24.0
Marital status		
Married	13,051	21.0
Never married	3,067	29.0
Previously married	368	32.1

Table 3. The associations between health behaviors and job strain (%)

	High strain	Passive	Active	Low strain
Physical activity				
Less than once a week	55.0	54.3	51.7	48.1
Once a week or more	45.0	45.7	48.3	51.9
Sleeping				
6 h or less	46.0	36.0	48.9	36.8
7 h	40.5	42.2	39.9	47.1
8 h or more	13.5	21.8	11.2	16.1
Smoking				
Smoker	54.2	56.7	49.6	51.6
Ex-smoker	10.6	12.2	13.5	13.3
Non-smoker	35.2	31.1	36.9	35.1
Alcohol intake				
Less than once a week	32.2	32.2	25.0	30.4
2–5 times a week	29.2	28.2	33.0	43.5
6 times or more a week	38.6	39.6	42.0	26.1

Table 4. The associations between health behaviors and depressive symptoms (%)

	Not depressed	Depressed
Physical activity		
Less than once a week	51.1	56.3
Once a week or more	48.9	43.7
Sleeping		
6 h or less	39.9	47.4
7 h	44.0	37.0
8 h or more	16.1	15.6
Smoking		
Smoker	52.2	54.4
Ex-smoker	34.7	34.8
Non-smoker	13.1	10.8
Alcohol intake		
Less than once a week	27.4	31.4
2–5 times a week	30.2	31.2
6 times or more a week	42.4	37.4

sleep for 6 h or less (ARR, 1.25; 95%CI, 1.14 to 1.35) were significantly associated with depressive symptoms.

Discussion

The association between health behaviors and depressive symptoms were not consistent in other studies. Although some studies suggested health behaviors have been related to depressive symptoms, the job related factors such as job strain were not addressed^{3–7}. We believed that job strain should be included, since it is related to both health behaviors and depressive symptoms. In this study, we are able to adjust for a broad range of work-related and demographic factors to clarify the association between health behaviors and depressive symptoms.

In age-adjusted models, depressive symptoms were associated with physical activity, daily hours of sleep, smoking and alcohol intake. Adjusting for demographic factors such as age, education, marital status and occupations, physical activity and daily hours of sleep were associated with depressive symptoms. Adjusting for age, education, marital status and job strain, physical activity and daily hours of sleep were associated with depressive symptoms as well.

There were not so much differences between model 2 and model 3. This could be because job strain was significantly correlated with occupations in this cohort group²³. On the contrary, there is an argument that the job strain model might be too simple to show the differences among occupations²⁴, even though the categories of occupations have not been established among health

researchers. Our results could imply that the job strain model might be adequate enough to show the differences between occupations concerning depressive symptoms.

Our results agree with previous findings that job strain is associated with health behaviors^{10–12, 26–28}. However, the patterns were not the same across the various health behaviors. One reason may be that health behaviors might not be consistently interrelated. Less physical activity is associated with high strain^{10, 12, 28}. Poor sleep is associated with job strain, which is consistent with previous studies suggesting that psychosocial stress at the workplace might affect sleeping^{4–5}. In accordance with results by Tsutsumi *et al.*²⁴, job demand was associated with smoking in men.

The association between physical activity and depressive symptoms did not agree with previous studies. In Finland and the U.S., there were significant associations between physical activity and depressive symptoms^{29–30}, whereas in Japan, there was no significant association among middle-aged adults³¹.

Sleeping was associated with depressive symptoms. This association has been previously described^{4, 32}. Since insomnia is a common symptom of depressive symptoms, further researches are still required to find the effect of sleeping on the onset of depressive symptoms.

A previous study by Takeuchi *et al.*⁶ showed a significant association between smoking and depressive symptoms, whereas the current study failed to show such an association. The lack of adjustment for job strain in the previous study may explain the difference in these results.

Alcohol consumption was not associated with depressive symptoms in this study. Some alcohol intake might contribute to stress coping³³. We assessed the frequency of alcohol intake not the amount of alcohol consumption because the validity of self-reported alcohol consumption has not been determined and the amount of alcohol consumption could be under-reporting³⁴. However, the amount of alcohol consumption has been shown to be associated with poor intrinsic reward and ambiguity of job role in the future among male workers in a Japanese company³⁵. Further studies are needed to find the association between the amount of alcohol consumption and depressive symptoms.

There are limitations with the present study. First, because this is a cross-sectional study, it is not possible to ascertain whether the association of some of the health behaviors studied (e. g. physical activity, sleeping pattern, smoking, alcohol intake) with depressive symptoms. Further studies are necessary to determine the effects of health behaviors on depressive symptoms by intervention studies or cohort studies. Second, these data are self-reported. Depressive

Table 5. Adjusted relative risk (ARR) and 95% confidence intervals (CI) for the associations between health behaviors and depressive symptoms

	Model 1 ^a		Model 2 ^b		Model 3 ^c	
	ARR [†]	(95% CI)	ARR [†]	(95% CI)	ARR [†]	(95% CI)
Physical activity						
Less than once a week	1.19	(1.12–1.25)	1.20	(1.13–1.28)	1.18	(1.14–1.25)
Once a week or more	1.00		1.00		1.00	
Sleeping						
6 h or less	1.20	(1.10–1.30)	1.31	(1.20–1.42)	1.25	(1.14–1.35)
7 h	0.94	(0.85–1.03)	1.00	(0.90–1.08)	0.97	(0.88–1.06)
8 h or more	1.00		1.00		1.00	
Smoking						
Smoker	1.08	(1.01–1.14)	1.01	(0.95–1.08)	1.03	(0.96–1.11)
Ex-smoker	0.84	(0.76–0.92)	0.99	(0.89–1.10)	0.99	(0.86–1.10)
Non-smoker	1.00		1.00		1.00	
Alcohol intake						
Less than once a week	1.00		1.00		1.00	
2–5 times a week	0.95	(0.88–1.02)	0.99	(0.97–1.02)	1.00	(0.98–1.02)
6 times or more a week	0.93	(0.86–0.99)	0.99	(0.98–1.01)	1.00	(0.98–1.01)

^a: adjusted for age.

^b: adjusted for age, education, marital status and occupations.

^c: adjusted for age, education, marital status and job strain.

[†]: Calculated by the formula which Zhang *et al.*²⁵⁾ showed.

symptoms might affect the choice of variables, such as job strain and health behaviors. In addition, the workers who did not answer the CES-D and the JCQ might have depressive symptoms. Third, the different ways to collecting data might be a cause of selection bias. It could affect the results even though some of them were significant. Finally, other risk factors not studied such as biological trait (e. g. personal traits), physical health (e. g. chronic illness, injuries) and social environment (e. g. lack of social support, stressful life events, job insecurities) might account for some of the association between health behaviors and depressive symptoms.

In spite of those limitations, this study provides additional knowledge on the association between health behaviors and depressive symptoms. The results of this study could show the associations between depressive symptoms and physical activity as well as daily hours of sleep among Japanese male workers. These findings might contribute to establishing primary prevention programs related to health behaviors on depressive symptoms in workplaces.

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