Low Self-efficacy Is a Risk Factor for Depression among Male Japanese Workers: A Cohort Study

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Abstract: The identification of risk factors for depression is necessary for the primary prevention of depression. The aim of this study is to determine whether self-efficacy (SE) is associated with onset of depression among workers. Medical expenditure records of 1,803 workers, who were clerks, system engineers, researchers, and service and sales workers in a software development company, were analyzed. Gender, age, job post, marital status, working hours, and SE were measured at baseline. Participants were divided according to quartiles of SE points. Risk ratios for undergoing a medical consultation due to depression were calculated using a multivariable Cox proportional hazards model. Of the 1,803 participants, 58 underwent medical consultation due to depression during a mean of 1.8 years of follow-up. Compared with the lowest quartile (Q1) of SE, adjusted hazard ratios (HR) were 0.65 (95%CI 0.34–1.25) for Q2, 0.49 (0.24–1.00) for Q3, and 0.40 (0.18–0.88) for Q4. In men, adjusted HRs were 0.87 (0.41–1.86) for Q2, 0.61 (0.26–1.41) for Q3, and 0.37 (0.14–0.98) for Q4. In women, no significant association was found. The present study suggests that low SE is a risk factor for onset of depression among male Japanese workers.

Key words: Self-efficacy, Risk factor, Depression, Japanese workers, Cohort study

Introduction

Depression is estimated to affect 350 million people in the world[1]. The World Mental Health (WMH) Survey conducted in 17 countries found that on average about 1 in 20 people reported having an episode of depression in the previous year[1]. Who gets depression varies considerably across the populations of the world. The lack of standard diagnostic screening criteria makes it difficult to compare depression rates cross-nationally. In most countries, the lifetime prevalence of depression is between 8 and 12%[2]. In 1998, the number of people who committed suicide in Japan exceeded 30,000, and approximately 30% of them were workers. This high number of suicides has persisted over 10 consecutive years[3]. The suicide rate in Japan per 100,000 population was 24.4 in 2009, twice as high as the United States and almost 3 times that of the United Kingdom[4, 5]. Furthermore, middle-aged men, who are presumed to have a lot of mental and social burdens, are the main contributor to the surging number of suicides[6, 7]. Many subjects who committed suicide were affected by mental diseases such as depression. In Japan, the prevalence of major depression according to DSM-IV criteria was 1 to 2% for 12 months and 3 to 7% for lifetime according to the World Mental Health Japan (WMHJ) Survey conducted from 2002 to 2006[8]. The data from high (i.e., United States, Belgium, France, and Germany) and low- to middle-income countries (i.e., Brazil, Colombia, India, and

Lebanon) in the WMH Survey indicated that the prevalence of major depression in Japan was lower than in other countries[9]. Whereas the risk of depression in Western countries is greater for women and adolescents, in Japan the risk is higher among middle-aged men and women[8]. Therefore, depression is highly prevalent in the workplace and the socioeconomic burden of depression is great in Japan.

Depression is a predominant factor not only for suicide but also for decreased productivity in the workplace[10, 11]. Major depression is a substantial but modifiable contributor to not only absenteeism (i.e., productivity loss due to absence from the workplace) but also to reduced productivity at the workplace[12, 13]. Therefore, mental health measures to help prevent depression at workplaces are needed[14, 15]. Primary prevention of depression requires the ability to predict future onset of depression.

Since the1970s, the social cognitive theory proposed by Bandura has been one of the most influential theories used to guide the understanding of human behavior and the motivational determinants of behavior. According to Bandura, self-efficacy (SE) is the most pivotal factor affecting a person's cognition[16, 17]. Many studies have shown that SE is associated with efficient regulation of the stress process[18, 19]. In particular, many studies have reported that SE is strongly related to the prevalence of depression[18, 20, 21]. Based on these previous studies, a causal relationship between SE and depression has been hypothesized. Nevertheless, the temporality of the relationship between SE and depression has not been shown because the designs of previous studies were cross-sectional[18–20].

A causal relationship between SE and depression has been revealed in caregivers[22] and mothers with postpartum depressive symptoms[23]. Although SE is one of the key factors of depression, to the best of our knowledge, only limited data are available on the relationship between SE and the future onset of depression among workers. Hence, a cohort study was conducted to examine whether low SE could be a risk factor for the onset of depression among workers.

Methods

In the present cohort study, 2,946 workers aged 20 to 72 yr who worked for a software development company as clerks, system engineers, researchers, and service and sales workers in Tokyo, Japan, were invited to complete a mental health questionnaire that was administered by the Healthcare Marketing Intelligence Incorporated Company in September 2005. A total of 1,011 workers

did not complete the questionnaire. Of the 1,935 workers who returned the questionnaire (response rate, 65.7%), 28 workers with a history of depression and 88 workers with incomplete questionnaires were excluded. In addition, 16 workers with fewer than 7 working hours per day, who were considered part-time staff, were excluded. Thus, 1,803 participants (1,361 men and 442 women), aged 20 to 70 yr in 2005, were followed up until August 2007 using their medical expenditure records. Workers who retired, changed employers, or died during the follow-up period were treated as censored cases. In Japan, health insurance is compulsory for everyone. A portion of medical fees of employees and their dependents are covered by Health Insurance Societies of their corporations. A Health Insurance Society covers costs of medical treatment for illness and injury, including diagnostic tests, medication, surgery, supplies and materials, physicians and other personnel costs, and most dental treatment. Therefore, medical expenditure records include the physician-diagnosed disorder, the number of days of inpatient and outpatient medical consultations, and any other information related to the employee's or dependent's medical condition. In this study, de-identified medical expenditure records were linked to the mental health questionnaires using the workers' insurance numbers. Anonymous data were collected by Healthcare Marketing Intelligence Incorporated. Thus, informed consent was not obtained from participants. The protocol of this cohort study was approved by the institutional review board of the Dokkyo Medical University School of Medicine.

The self-rated questionnaire consisted of questions about gender, age, job post (managerial post: yes or no), marital status (married: yes or no), working hours per day (hours), and SE. Workers in managerial positions supervised other employees, and their job titles were line manager, subsection chief, group leader, and team leader.

The concept of SE has been used in research in 2 different ways: as "task self-efficacy," denoting the perceived ability to perform a particular behavior, and as "coping self-efficacy," denoting the perceived ability to prevent, control, or cope with potential difficulties that might be encountered when engaged in a particular job[24]. So, SE differs in different domains of functioning. In the present study, SE was measured using the General Self-Efficacy Scale (GSES)[25], which measures general SE across a variety of settings. The validity of the GSES questionnaire was examined in a previous study among Japanese[26]. The GSES has been widely used in many fields in Japan[27–29]. In contrast, the validity and reliability of "task self-effica-

Table 1. Characteristics of participants according to quartiles of self-efficacy (SE) in 2005

Variables	Range of SE (points)					*p* for difference
	All (16-64)	Q1 (16–33)	Q2 (34–38)	Q3 (39–43)	Q4 (44–64)	
Number of participants	1,803	453	453	446	451	
Age, yr*	35.5 ± 8.5	34.0 ± 7.9	35.4 ± 8.2	35.7 ± 8.9	36.9 ± 8.8	<0.0001[†]
Male, n (%)	1,361 (75.5)	320 (70.6)	343 (75.7)	337 (75.6)	361 (80.0)	0.013 [‡]
Managerial post, n (%)	766 (42.5)	145 (32.0)	201 (44.4)	188 (42.2)	232 (51.4)	<0.0001 [‡]
Married, n (%)	893 (49.5)	189 (41.7)	210 (46.4)	233 (52.2)	261 (57.9)	<0.0001 [‡]
Working hours per day* (hours)	9.4 ± 1.3	9.3 ± 1.4	9.3 ± 1.4	9.3 ± 1.3	9.5 ± 1.3	0.060[†]
Type of job (n=1,785[§])						0.005[‡]
Clerks, n (%)	1,275 (71.4)	311 (69.4)	337 (75.2)	319 (72.2)	308 (68.9)	
System engineers, n (%)	299 (16.8)	88 (19.7)	72 (16.1)	72 (16.3)	67 (15.0)	
Researchers, n (%)	121 (6.8)	34 (7.6)	26 (5.8)	27 (6.1)	34 (7.6)	
Service and sales workers, n (%)	90 (5.0)	15 (3.3)	13 (2.9)	24 (5.4)	38 (8.5)	

*Mean ± SD. [†]Least-squares method or analysis of variance. [‡]χ^2 test. [§]18 workers were excluded due to non-response.

Table 2. Adjusted hazard ratios of self-efficacy in 2005 for receiving medical consultation due to depression[†]

Variables	Q1	Q2	Q3	Q4	All
Person-yr	794.1	812.8	799.8	812.5	3,219.2
No. of participants	453	453	446	451	1,803
No. of events (%)	23 (5.1)	15 (3.3)	11 (2.5)	9 (2.0)	58 (3.2)
Hazard ratios*	1	0.65	0.49	0.40	
95% CI	reference	0.34–1.25	0.24–1.00	0.18–0.88	
p-value		0.20	0.05	0.02	

*Tested by Cox proportional hazards regression analysis. [†]Adjusted for age, managerial post, and marital status.

cy" and "coping self-efficacy" have not been sufficiently examined at the workplace. Therefore, we used the GSES in this study. The GSES consists of 16 questions rated using a 4-point Likert scale. The higher the score on the GSES, the higher the SE.

Participants were followed up using their medical expenditure records. Depression was defined when diagnoses described in the medical expenditure records included a mood disorder (F30−F39) according to the International Classification of Diseases, 10th edition (ICD-10)[30].

Participants were divided according to the quartiles of SE points at baseline in 2005 (Q1: 16–33 points, Q2: 34–38 points, Q3: 39–43 points, and Q4: 44–64 points). Hazard ratios of the total and each quartile for onset of depression were calculated using a Cox proportional hazards analysis. Person-years of follow-up were calculated from September 1, 2005, to the date when the subject received a medical consultation for depression or to August 1, 2007, whichever occurred first. Hazard ratios of SE were adjusted based on age, gender, job post, and marital status. The statistical analysis was performed using SAS, version 9.3 (SAS Institute, Inc., Cary, NC, USA).

Results

Baseline characteristics of study participants according to SE quartiles are shown in Table 1. The mean age was significantly different among quartiles (*p* for difference<0.001). In addition, the proportion of male participants was significantly different among quartiles (*p* for difference=0.013). The proportion of participants with managerial posts and who were married was significantly different among quartiles (*p* for difference<0.001), as well. The mean number of hours worked was not significantly different among quartiles (*p* for difference=0.060).

Of the 1,803 participants, 58 developed depression during a mean of 1.8 yr of follow-up. Table 2 shows the hazard ratios of the total and each quartile of SE for onset of depression using a Cox proportional hazards model. Compared with the lowest quartile (Q1: reference), the multivariable hazard ratio of the highest quartile (Q4) was significantly lower (*p*=0.02) (Table 2). In men, compared with Q1, the multivariable hazard ratio of the highest quartile (Q4) was significantly lower (*p*=0.04) (Table 3). In women, no significant association was found.

Table 3. Adjusted hazard ratios of self-efficacy in 2005 for receiving medical consultation due to depression by gender[†]

	Variables	Q1	Q2	Q3	Q4	All
Males	Person-yr	576.8	622.7	610.6	666.8	2476.9
	No. of participants	320	343	337	361	1361
	No. of events (%)	14 (4.4)	13 (3.8)	9 (2.7)	6 (1.7)	42 (3.1)
	Hazard ratios*	1	0.87	0.61	0.37	
	95%CI	reference	0.41–1.86	0.26–1.41	0.14–0.98	
	p-value		0.72	0.25	0.04	
Females	Person-yr	217.3	190.1	189.2	145.7	742.3
	No. of participants	133	110	109	90	442
	No. of events (%)	9 (6.8)	2 (1.8)	2 (1.8)	3 (3.3)	16 (3.6)
	Hazard ratios*	1	0.25	0.28	0.55	
	95% CI	reference	0.06–1.18	0.06–1.32	0.15–2.05	
	p-value		0.08	0.11	0.37	

*Tested by Cox proportional hazards regression analysis. [†]Adjusted for age, managerial post, and marital status.

Discussion

The present prospective cohort study showed that higher SE was associated with lower risk for onset of depression among male Japanese workers. To the best of our knowledge, this is the first cohort study that has showed an association between SE and risk of future onset of depression in Japanese male workers.

Many cross-sectional studies have reported a significant inverse correlation between SE and depression. However, these studies were conducted in university students[25], high school students[20], cancer survivors[31], kidney transplant recipients[32], elderly people[33], and community residents[18]. Although these studies showed the correlation between SE and depression, a causal relationship could not be ascertained due to the cross-sectional study designs.

In contrast, an intervention study was conducted in 169 women caregivers aged 50 yr and older (mean, 63.7 yr)[22]. This study showed that, compared with before the intervention, the increase in scores of Caregiving Self-Efficacy correlated with the decrease in scores for depression assessed with the Multiple Affect Adjective Checklist. Similarly, a longitudinal cohort study was conducted in 563 postpartum women[23]. A low level of SE was associated with postpartum depression symptoms assessed by the Patient Health Questionnaire, showing a possible association between SE and depression. These findings are consistent with the present study.

In this study, the prevalence of depression (F30–39) was 3.2% (58 out of 1,803 persons) for a mean follow-up period of 1.8 yr. This seems to be a reasonable value since the prevalence of major depression according to DSM-IV criteria is 1 to 2% for a 12-month period[8]. However, the prevalence of depression in Japan was lower than in other Western countries[9]. Japanese workers may be reluctant to visit doctors for mental health problems due to the stigma related to mental illness. If their supervisors or colleagues knew that they had a mental disorder, they may be intimidated, harassed, dismissed, or forced to resign[34, 35]. The low prevalence of depression may also be due to the "Healthy Worker Effect" in that the severely ill and chronically disabled are ordinarily excluded from employment[36]. The reluctance for consultation might lead to a spuriously low proportion of participants diagnosed with depression. According to the WMHJ Survey, among those who experienced major depression, 27% were seen by a physician and only 14% were seen by a psychiatrist[8]. Thus, the prevalence of depression might be underestimated. Mental disorders are generally associated with a higher rate of suicide, physical disorders, economic difficulties, interpersonal troubles, and drug abuse. However, psychological autopsy studies have revealed that more than 90% of people who completed suicides had one or more mental disorders. A link between depression and suicide is strongly suggested[37]. Therefore, it may be helpful to educate people who are not depressed about appropriate consultation for mood disorders. Moreover, measures focusing on workers with low SE who are prone to depression might be needed. The present study did not show an association between SE and risk of onset of depression among women. Some studies have reported gender differences between SE and depression[20, 38, 39]. In this study, the prevalence of depression in women was 3.6% (16 out of 442), whereas in men it was 3.1% (42 out of 1,361) (Table 3). WHO has reported that depression is 2 or 3 times more common in women than in men[1]. The lack of a significant association

among women might be due to the small sample size of the present study. Sample size calculations should refer to the number of subjects required for the primary analysis. However, we could not perform a power-calculation due to the use of secondary data.

A possible mechanism explaining the relationship between SE and depression has been proposed. A person's self-perception of coping abilities affects the arousal threshold and the ability to tolerate emotional threats such as anxiety and depression[20, 21]. The findings of the present study might be explained by this mechanism.

The strength of the present study is that medical expenditure records were used for ascertaining the diagnosis of depression, as opposed to previous studies in which diagnosis of depression was dependent on self-report[17, 18, 20, 22, 31, 32]. Furthermore, due to the prospective cohort design, the temporality of the association between SE and onset of depression was shown[40].

The present study, however, had several limitations. First, we defined depression as inclusive of multiple mood disorders (F30−F39) according to ICD-10 codes. However, in Japan, the estimated proportion of patients with depression (F32−33) was approximately 65% of mood disorders in 2008[41]. Second, SE was measured by GSES, which consists of 16 questions answered using a 4-point Likert scale; this scale was developed for use among Japanese subjects[25]. Thus the results in the present study are not absolutely comparable with those of previous studies[26]. In addition, SE differs in different domains of functioning. Therefore, future prospective studies using "coping self-efficacy" and "work-specific self-efficacy" are warranted. Third, the difference between work tasks was not analyzed due to the possibility of misclassification of job category. Among 4 types of jobs, "clerk" had the highest proportion (around 70%). This might be due to self-report of job title. Fourth, other factors related to depression, such as health behaviors (e.g., smoking, alcohol intake, and physical activity) and physical disorders (including taking medicine and visiting physicians) were not examined due to the lack of data. Also, job strain was not examined due to the possibility of multicollinearity. The scale for job strain is similar in content to the GSES. Moreover, job strain is thought to be causally related to SE, so future research is warranted. Fifth, the follow-up period of 1.8 years might be relatively short. Thus the long-term effect of SE is unclear. Finally, generalizability is uncertain, as all study participants worked in the same company. Further studies are warranted to examine the generalizability of these results.

In conclusion, the present study suggests that low SE is a risk factor for the onset of depression among male Japanese workers. Measures to help workers with low SE might be needed in Japanese workplaces. Moreover, future prospective studies to assess the association among women and the generalizability of the association between SE and risk of incident depression are warranted.

Acknowledgements

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