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ORIGINAL ARTICLE

Risk factors of recurrent sickness absence due to depression: a two-year cohort study among Japanese employees

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Abstract
Purpose Depression has a high recurrence rate among employees. There have been few studies investigating risk factors for recurrent sickness absence due to depression after return to work (RTW). The objective of this study was to identify potential risk factors.
Methods Subjects were 540 full-time employees at the biggest telecommunication company in Japan who returned to work from April 2002 to March 2008 after their first leave of absence due to depression. The Cox proportional hazard model was employed to find risk factors for recurrent sickness absence by analyzing variables including demographic, work-related and work environmental factors.
Results Of 540 study subjects, 200 employees (37.0 %) experienced recurrent sickness absence due to depression after RTW within the follow-up period. Higher organizational job demand evaluated by the Brief Job Stress Questionnaire (BJSQ) was found to be a risk factor (OR 1.46, 95 % CI 1.01–2.10) for recurrent sickness absence due to depression adjusted for confounding factors.
Conclusions High organizational job demand (evaluated by BJSQ) is a risk factor for recurrent sickness absence due to depression after RTW.

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Keywords Depression · Recurrent sickness absence · Risk factors · Brief job stress questionnaire · Cox proportional hazard model

Introduction

In developed countries, depression is one of the major public health problems (Muto et al. 1999; Bijl et al. 1998; Kawakami 2007; Hensing and Wahlström 2004). According to the World Health Organization, depression is expected to be one of the top two leading causes of disability-adjusted life years in 2020, with a lifetime prevalence of 15.4 % and a yearly prevalence of 5.8 % for depression (World Health Organization 2000). Depression is a mood disturbance characterized by a loss of interest or pleasure in normal everyday activities (Norder et al. 2012) and is associated with prolonged sickness absence and work disability (Lexis et al. 2012).

Sickness absence is defined as a financially compensated temporary medically certified absence due to any illness or injury (Norder et al. 2012). In the past few decades, there has been a marked increase in sickness absence rates due to depression among the working age population (Okumura and Higuchi 2011; Knudsen et al. 2012; Roelen et al. 2011). The management of depression in workers is an important component of the occupational health field, in that depression is a major contributor to reduced work performance, sickness absence, staff replacement costs and both social insurance and medical costs of long-term work disability (Okumura and Higuchi 2011; Knudsen et al. 2012; Roelen et al. 2011; Takada et al. 2009). Sickness absence is not only affected by the personal characteristics of the patient, such as gender, marital status, and educational background, but also as a result of interaction with

the work environment, such as job category, working hours, job demand, job control and the health care system (Vlasveld et al. 2008; Tsutsumi et al. 2007).

It is well known from previous studies that depression has a high recurrence rate (Simpson et al. 1997; Mueller et al. 1999; Maj et al. 1992; Pintor et al. 2004). Almost half of patients who recover from a first episode of depression have one or more additional episodes in their lifetime (Burcusa and Iacono 2007). In occupational health, depression is known to be associated with recurrent sickness absence after return to work (RTW) (Endo et al. 2013; Arends et al. 2010). A Japanese study reported that almost half of RTW employees experienced recurrent sickness absence during the 8.5-year follow-up period (Endo et al. 2013). There has been great interest in the development of strategies that might reduce the recurrence of depression (Burcusa and Iacono 2007). However, we need to pay attention to the clear distinction between recurrence of depression and recurrence of sickness absence due to depression. After RTW, some depressed employees may have a relapse of sickness absence, while others continue to work (Norder et al. 2012).

To our knowledge, only a few studies have investigated risk factors for recurrent sickness absence due to depression after RTW (Koopmans et al. 2010; Arends et al. 2013; Virtanen et al. 2011). Koopmans et al. (2008) pointed out that work-related factors should be included to evaluate risk factors for recurrent sickness absence. With regard to work-related factors, Karasek's job-demand control model (JDC model), which is the leading work stress model in occupational health psychology, is often used by researchers and practitioners to describe the psychosocial work environment. (De Jonge et al. 2010; Kondo et al. 2006; Shimomitsu et al. 2000; The Japan Ministry of Health, Labour and Welfare 2005; De Croon et al. 2002). High job stress evaluated by the JDC model as a psychological work characteristic has advanced effects not only on psychiatric problems but also on sickness absence (Ishizaki et al. 2006). In previous studies using the JDC model, there were reports that the psychosocial work environment can be significantly associated with sickness absence (Ishizaki et al. 2006; Inoue et al. 2010; Roelen et al. 2007; Magee et al. 2011; Nielsen et al. 2006). Roelen et al. (2007) reported that psychological job demands were related to long-term absence; however, to our knowledge, no study has investigated the association between the work environment using the JDC model and recurrent sickness absence due to depression. We thought that understanding and improving the psychosocial work environment could reduce sickness absence, as Magee et al. (2011) pointed out.

In Japan, a brief job stress questionnaire (BJSQ) developed by the Japan Ministry of Health, Labor and Welfare (JMHLW) based on the JDC model is often used to measure work environment characteristics. Inoue et al. (2010) concluded that job control may be an important predictor of sickness absence among Japanese male employees. BJSQ has proven to be a useful tool for mental health care at Japanese worksites (Kawakami et al. 2006).

Herein, we hypothesized that recurrent sickness absence due to depression might be associated with organizational job stress. The objective of this study was to find risk factors for recurrent sickness absence due to depression after RTW.

Methods

Study design and participants

This was a longitudinal cohort study on the prognosis of RTW employees with depression. Company A, to which participants of this study belonged, is one of the biggest telecommunication companies in Japan and is involved in various fields: regional, international telecommunication, big data and mobile services (installing and maintaining telephones, faxes, telegrams, internet systems, cell phones, etc.). The number of employees working for this company on a full-time basis from 2002 to 2010 was about 68,000. Employees' turnover rate is quite low in this company.

As a rule, sickness absence due to depression in company A is accepted only with a psychiatrist's certificate stating that 'this employee needs to rest due to depression.' For RTW, firstly, sick employees submit a psychiatrist's certificate stating that 'this person can return to work' to the Human Resources Department of the company. Secondly, occupational physicians judge whether they can return to work medically, based on the occupational physician's interview and the information from psychiatrists, and the company. If the company accepts the psychiatrist's and the occupational physician's documents that employees are ready to return to work, they can return to work. Similarly, recurrent sickness absence after RTW is also accepted only with a psychiatrist's certificate. The data for this study were therefore collected based on psychiatrists' certificates. We also counted the episodes of recurrent sickness absence, even if an employee experienced recurrent sickness absence the day after the RTW day, based on the psychiatrist's certificate. In that case, the participants could be on only 100 % working or 100 % sickness absence.

As the participants of this study, employees who were registered in the Health Data System and returned to work from April 1, 2002, to March 31, 2008, after their first sickness absence due to depression (F3; ICD-10, based on a psychiatrist's certificate) were included. This criterion

meant that this study population did not include employees who had had previous episodes of psychiatric disorder before April 1, 2002. Details of the design and the sickness absence and return to work system in company A have been described in a previous study (Endo et al. 2013). These participants were followed up in the Health Data System from the RTW day until the day of recurrent sickness absence, until 730 days (2 years) had passed since the RTW day, until the end of follow-up (September 30th, 2010), or until censoring, whichever came first. The day of censoring was the day of resigning, the day of being transferred to another company, the day of maternity leave, or the day of sickness absence due to other diseases except depression certified by physicians, such as malignancy, hernia, gastric ulcer. That means that, by using the Health Data System, we had all corresponding information on employees who had been on sick leave for other reasons. Sickness absence due to other reasons after RTW included two cases of low back pain, two cases of tumor, and one case of heart disease.

The maximum follow-up time was 2 years. The reason why we chose to follow the participants for 2 years was as follows: firstly, according to our previous study, many recurrences of sickness absence due to depression occurred within the 2 years after RTW, and the Kaplan–Meier curve seemed to be stable after 2 years (Endo et al. 2013). Secondly, if the follow-up period was more than 3 years, it could be difficult to evaluate the organizational BJSQ score precisely because we need to take the employees' transfer to the other departments into account. In this company, in general, the employees are supposed to return to work in the same department where they worked before the sickness absence, and few employees seemed to be transferred to other departments less than 2 years after RTW. As the study population, we used the data of 540 Japanese employees.

Variables

In this study, we included the following variables: age at RTW, sex, age at entering the company, duration of the first sickness absence, living with family, manager, job title, organizational job demand and job control (evaluated by BJSQ). This information was extracted from the Health Data System. We did not use 'tenure' but 'age at entering the company' as variables. Tenure equals 'age at RTW' minus 'age at entering the company.' We thought that 'tenure' and 'age at RTW' should not be included in the multivariable analysis, as older RTW employees have longer tenure. We chose 'age at entering the company' as a variable, because we thought that employees who began to work at this company at younger age seemed to have higher adaptability after RTW. Seven variables (age at RTW, sex, age at entering the company, duration of the first sickness absence, living alone, manager) were dichotomized based on their mean scores of the participants. Job title was divided into four groups: office worker, sales worker, technician, and researcher.

Organizational job demand and job control evaluated by BJSQ

In order to assess the psychological characteristics of the work environment into which the employees with depression returned to work, we used the organizational score of BJSQ. BJSQ is a simplified questionnaire for employees due to the relatively few question items. It is a 57-item multidimensional job stress questionnaire, composed of questions related to job stressors (17 items), stress response (29 items), social factors (9 items), and work and life satisfaction (2 items).

Reliability and validity of the BJSQ among Japanese employees has been established (Shimomitsu et al. 2000; Kawakami et al. 1995). In this study, the organizational scores of 'psychological job demand' and 'job control' were calculated as the mean scores of these personal scores and divided by gender, according to BJSQ guidelines (Shimomitsu et al. 2000; The Japan Ministry of Health, Labour and Welfare 2005). The personal scores of 'psychological job demand' and 'job control' are calculated as follows (Shimomitsu et al. 2000; The Japan Ministry of Health, Labour and Welfare 2005); of the 57 items in BJSQ, the three following questions are used to calculate the personal 'psychological job demand': 'Q1: Do you have to work hard?' 'Q2: Do you have to do a lot of work?' and 'Q3: Do you have difficulty completing your tasks within your schedule?' The score is calculated for each item, and response options are based on a 4-point Likert scale ranging from agree = 4 points, somewhat agree = 3 points, somewhat disagree = 2 points, to disagree = 1 point. The personal psychological job demand is evaluated by summing the scores of 'Q1,' 'Q2,' and 'Q3.'

Similarly, the three following questions are used to calculate personal 'job control': 'Q4: Can you work at your own pace?' 'Q5: Can you decide the order and content of your work?' 'Q6: Does your opinion affect your workplace?' A personal decision latitude is evaluated by summing the scores of 'Q4,' 'Q5,' and 'Q6.'

In this company, BJSQ is conducted as an annual health checkup of mental health and is used as important tool for evaluating and improving the psychological work environment. Every autumn (usually in November), it is mandatory for employees of this company to answer the BJSQ for mental health (response rate: more than 90 % every year in almost all organizations). After employees have completed the BJSQ, the occupational physicians make an

Table 1 Basic characteristics of the study population

	Study population ($N = 540$)	Recurrent sickness absence ($N = 200$)	Recurrence rate (%)	Person-days	Recurrence per 1,000 person-days
Age (year)					
18–29	52	17	32.7	29,354	0.58
30–39	173	71	41	85,511	0.83
40–49	200	74	37	104,337	0.71
50 and higher	115	38	33	65,581	0.58
Sex					
Male	455	171	37.6	238,455	0.72
Female	85	29	34.1	46,328	0.63
Age at entering the company (year)[a]					
18–21	266	89	33.5	146,391	0.61
22–23	147	60	40.8	75,902	0.79
24 and higher	99	41	41.4	48,108	0.85
Duration of the first sickness absence (day)					
0–60	171	69	40.4	84,235	0.82
61–120	240	8(1	33.3	132,116	0.61
121 and higher	129	51	39.5	68,432	0.75
Living with family/alone[a]					
Living with family	419	149	35.6	227,018	0.66
Living alone	108	47	43.5	52,775	0.89
Time for commute (min)[a]					
$\leq$70	275	111	40.4	144,528	0.77
$\geq$71	238	78	32.8	128,769	0.61
Manager/Non-manager[a]					
Manager	78	31	39.7	42,012	0.74
Non-Manager	459	168	36.6	241,300	0.70
Job title					
Office worker	234	94	40.2	118,007	0.80
Sales worker	126	50	39.7	71,800	0.70
Technician	137	41	29.9	75,115	0.55
Researcher	11	3	27.3	6,337	0.47
Organizational job demand[a]					
High	310	125	40.3	154,329	0.81
Low	213	69	32.4	121,762	0.57
Organizational job control[a]					
High	259	99	38.2	137,338	0.72
Low	264	95	36	138,561	0.69

[a] Missing data were 28 in 'age at entering the company,' 13 in 'living with family/alone,' 27 in 'time for commute,' 3 in 'manager/non-manger, 32 in 'job title,' 17 in 'organizational job demand,' and 17 in 'organizational job control, respectively

'organizational stress figure' by using these organizational scores of job demand and job control, and present appropriate opinions to the manager of the organization.

We used the organizational scores of job demand and job control from 150 departments, such as the General Affairs and Personnel Department, IT Innovation Department, Corporate Strategy Planning Department, Accounts and Finance Department, Global Business Department, branches, to which approximately 100–1,000 employees belong. Employees with depression who returned to work within the follow-up period belonged to 109 departments. Based on the mean 'organizational job demand' or 'organizational job control' scores of these 109 departments, the departments were dichotomized into two groups: 'high/low job demand organization' and 'high/low job control organization.'

Statistical method

The probability of recurrence after RTW was calculated by Kaplan–Meier survival analysis. The person-days was calculated by the follow-up period. In order to investigate

risk factors for recurrent sickness absence due to depression, hazard ratios (HRs) and their 95 % confidence intervals (CIs) were calculated using the Cox proportional hazard model in IBM SPSS 19.0. The Cox model assumes that the hazard ratio remains constant over time. We virtually checked the Log minus log graphs to test this assumption and found no indication of such violation. We performed univariable analyses for all variables and multivariable analyses including all variables. We built a prediction model using a stepwise backward selection model and analyzed relationships among continuous variables. As the decision rules in the multivariable model, backward elimination was continued until only variables with a p value < 0.05 remained in the multivariable model. Data were analyzed using IBM SPSS ver.19.0 software for Windows. The study protocol was approved by the Medical Ethics Committee of Dokkyo Medical University.

Results

Basic characteristics of the study population

The basic characteristics of the participants are as follows (shown in Table 1): 540 participants were 455 (84.3 %) men and 85 (15.7 %) women, aged 41.7 ± 8.7 years (mean ± SD). The age at entering the company was 21.1 ± 3.7 years. The duration of the first sickness absence due to depression was 94.6 ± 67.2 days. Commuting time was 70.2 ± 27.2 min. Organizational job demand score was 8.54 ± 0.57. Organizational job control score was 8.03 ± 0.26.

Recurrences per 1,000 person-days presented in Table 1 were calculated by dividing the numbers of the employees with recurrent sickness absence with the each person-day in every stratification.

Risk factors of recurrent sickness absence due to depression

We collected the data of whether the study population had recurrent sickness absence due to depression from the day of RTW within the 2-year follow-up period. Of 540 study subjects who returned to work, 200 participants (37.0 %) experienced recurrent sickness absence due to depression after RTW within the follow-up period. The cumulative recurrence rate for the total study population was 19.3 % at 182 days after the day of RTW (about 6 months), 28.4 % at 365 days (about 12 months), 34.0 % at 547 days (about 18 months), and 37.9 % at 730 days by Kaplan–Meier survival analysis. Before using Cox regression analysis, we confirmed that no variables correlated with each other (correlation coefficient < 0.25) by checking all the correlation coefficients in the correlation matrix for all combinations.

The univariable and multivariable analyses of factors for recurrent sickness absence are shown in Table 2. There were no statistically significant differences except for organizational job demand. Within the follow-up period, high job demand from the organizational score (BJSQ) was a risk factor (OR 1.46, 95 % CI 1.01–2.10) for recurrent sickness absence due to depression after RTW. By excluding irrelevant variables from the multivariable model with a stepwise, backward selection method, only organizational job demand, which went from a HR of 1.099 to 2.074, became significant in the multivariable model. By analyzing relationships among continuous variables as presented 'p for trend' in Table 2, only organizational job demand was significant ($p = 0.021$) as a predictor of recurrent sickness absence.

Discussion

Depression has been reported to have a high risk of recurrence (Burcusa and Iacono 2007; Koopmans et al. 2011; Endo et al. 2013). To the best of our knowledge, this was the first study in Japan to clarify the predictors for recurrent sickness absence among employees who had returned to work from the first episode of depression.

Risk factors for recurrent sickness absence

Our study showed that employees who returned to work in an organization with a higher psychological job demand had more risk for recurrent sickness absence. The result of our study is in accordance with that of expert group consensus that psychological work demands are predictors of recurrent sickness absence due to depression (Norder et al. 2012). Considering the previous studies on the association between job demand and sickness absence, the above results seem reasonable: Magee et al. (2011) reported that psychological demand may be a strong predictor of sickness absence, and DeSanto et al. (2010) reported that high job demand had a significant association with depression.

On the other hand, there were no statistically significant differences between job control evaluated by BJSQ and recurrent sickness absence due to depression in our study. This is compatible with a US study using the JDC model, in which job control was not strongly associated with depression (DeSanto Iennaco et al. 2010). Lack of job control, however, was found to have the strongest impact on registered sickness absence in the Denmark occupational health study (Nielsen et al. 2006). Inoue et al. (2010) concluded that employees with high job control had a significantly lower hazard ratio for sickness absence due to

Table 2 Univariable and multivariable analysis for recurrent sickness absence by Cox proportional hazard model

Variables	Categories	Univariable analyses		Multivariable analyses		
		HR (95 % CI)	*P* value	HR (95 %CI)	*P* value	*p* for trend
Age (years)	≤41	1				
	≥42	0.878 (0.665–1.160)	0.359			
Sex	Men	1				
	Women	0.875 (0.590–1.297)	0.507			
Age at entering the company (years)	≤23	1				
	≥24	1.316 (0.989–1.749)	0.059			
Duration of the first sickness absence, days	≤129	1				
	≥130	0.973 (0.726–1.304)	0.856			
Living with family/alone	With family	1				
	Alone	1.341 (0.959–1.847)	0.088			
Time for commute (min)	≤70	1				
	≥71	0.805 (0.603–1.076)	0.143			
Manager/non-manager	Non-manager	1				
	Manager	1.063 (0.725–1.559)	0.754			
Job title	Office worker	1				
	Sales worker	0.734 (0.509–1.060)	0.099			
	Technician	0.844 (0.599–1.189)	0.332			
	Researcher	0.622 (0.197–1.964)	0.418			
Organizational job demand	Low	1		1		
	High	1.385 (1.040–1.872)	0.027*	1.456 (1.010–2.098)	0.044*	$p = 0.021$*
Organizational job control	High	1				
	Low	1.057 (0.798–1.400)	0.7			

depression than those with low job control. These differences might have been caused by the characteristics of the population, such as job category, working hours, and the health care system.

So far, there is insufficient evidence on the association between other factors and recurrent sickness absence due to depression (Koopmans et al. 2010, 2011; Roelen et al. 2010). In our study regarding demographic factors such as age or sex, there were no statistically significant differences in recurrent sickness absence.

While Virtanen's study showed that manual workers had a significantly higher risk of recurrent sickness absence than others, in this study, 'manager,' and 'job title' were not statistically significant predictors of recurrence (Virtanen et al. 2011). In Arends' study, three main predictors of recurrent sickness absence were 'company size > 100 workers,' 'conflicts with supervisors,' and 'chronic diseases.' It is very interesting to consider why Arends' study did not find job demands to be significant, while our study found job demand to be a significant predictor for recurrent sickness absence. We thought the different results were due to the two reasons, 'relevant variables included in the analysis' and 'difference in sampled population.' Our study did not include other relevant variables such as 'conflicts with the supervisor' as in Arends' study. Our population 'was not recruited by a cluster-randomized controlled trial,' 'did not include employees diagnosed as F4,' 'did not survey a variety of companies,' and 'differed from Dutch company culture.

Strengths and limitations

There are three strengths of this study. Firstly, the study included a rather large group of participants (men). The number of subjects with recurrent sickness absence was more than 500, which was larger than in previous studies, which ranged from 71 to 431 subjects (Simpson et al. 1997; Mueller et al. 1999; Maj et al. 1992; Pintor et al. 2004; van Weel-Baumgarten et al. 1998; Eaton et al. 1997, 2008), except the Dutch study (Koopmans et al. 2008). Secondly, we used objective measures of depression and sick leave. This study was based on sickness absence data medically certified by psychiatrists' certificates, different from many studies based on self-reporting (Koopmans et al. 2010). The ICD-10 diagnosis of a single depressive episode employed in our study was used in their daily clinical practice with sufficient precision (Bock et al. 2009), which was why we had higher validity and reliability to some

extent. Thirdly, instead of personal ratings of job demand and job control, measures were based on mean scores from each department. This is likely to reduce the personal rating bias, but also reduces precision.

When interpreting the results of this study, its limitations should be noted. First, we could not deny the existence of comorbidities of depression. Occupational physicians register one diagnosis per one absence episode, but employees among this population may have had other psychiatric disorders (Kessler et al. 2003). Second, we cannot completely rule out all the employees who had had previous episodes of psychiatric disorder before the follow-up period, because some employees might have had previous episodes of psychiatric disorder before working at this company and no episode after employment. Third, as these were no such data for a comparison group, such as individuals without depression, it was impossible to gain knowledge on whether recurrent sickness absence is more or less common among individuals with depression than in individuals with other health problems. Fourth, the Cox regression model is built on the assumption that predictors remain constant during follow-up, which may not be true (Hardeveld et al. 2013). If the risk of recurrence declines over time, the effect of the factors determining this risk might also not be constant. Fifth, these data were collected from a large-scale Japanese IT company. It is somewhat difficult to generalize the results to other countries, and different types, sizes, and cultures of companies.

Specifically, as for the variability in demands and control, in our study, the workers were probably exposed to rather homogenous work conditions, which reduced the chances to find significant relationships between exposure (work conditions) and outcome (sickness absence), i.e., a low statistical power. Sixth, with regard to the role of sex, the limited number of female participants is a limitation of the study. In addition, we only included a limited number of predictors in the study; no variables on social support/conflicts with supervisor/co-workers, and no variables on comorbidity/psychotropic medication use.

Regarding the prediction of recurrent sickness absence, it may be difficult because of its complexity; it is likely that multiple predictors will be identified and that predictors interact with one another producing an aversive cascade of synergetic events resulting in the recurrence of a depressive state (Hardeveld et al. 2013; Knudsen et al. 2012). Stressful life and work events, anxiety symptoms that were not assessed in this study, might need to be included in future research on predictors of recurrent sickness absence in workers with depression (Norder et al. 2012). For interventions to prevent recurrent sickness absence due to depression, it might be better to improve work conditions, especially organizational and psychological job demand (Norder et al. 2012).

As future tasks, research is needed to more fully understand the association between work-related factors and recurrent sickness absence. In addition, although we focused on 'time to recurrent sickness absence' as the outcome measure in this study, it would be interesting to consider 'number of days of recurrent sickness absence' or 'number of recurrent sickness absence' as the outcome measure. Analyzing whether different predictors are relevant for these two other outcomes would provide a more comprehensive picture.

Conclusion

High organizational job demand (evaluated by BJSQ) is a risk factor for recurrent sickness absence due to depression after RTW. This study may help prevent relapses due to depression by considering that occupational health professionals should follow up RTW employees very carefully who return to work in organizations whose organizational job demand (BJSQ) is quite high.

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Conflict of interest The authors declare that they have no conflict of interest.

References

Arends I, Klink JJ, Bültmann U (2010) Prevention of recurrent sickness absence among employees with common mental disorders: design of a cluster-randomised controlled trial with cost-benefit and effectiveness evaluation. BMC Public Health 10:132

Arends I, van der Klink JJL, van Rhenen W, de Boer MR, Bultmann U (2013) Predictors of recurrent sickness absence among workers having returned to work after sick leave due to common mental disorders. Scand J Work Environ Health. doi:10.5271/sjweh.3384

Bijl RV, Ravelli A, van Zessen G (1998) Prevalence of psychiatric disorder in the general population: results of The Netherlands Mental Health Survey and Incidence Study (NEMESIS). Soc Psychiatry Psychiatr Epidemiol 33(12):587–595

Bock C, Bukh JD, Vinberg M, Gether U, Kessing LV (2009) Validity of the diagnosis of a single depressive episode in a case register. Clin Pract Epidemiol Ment Health 5:4. doi:10.1186/1745-0179-5-4

Burcusa SL, Iacono WG (2007) Risk for recurrence in depression. Clin Psycho Rev 27(8):959–985

De Croon E, Blonk RW, de Zwart BC, Frings-Dresen MH, Broersen JP (2002) Job stress, fatigue, and job dissatisfaction in Dutch lorry drivers: towards an occupation specific model of job demands and control. Occup Environ Med 59:356–361

De Jonge J, van Vegchel N, Shimazu A, Schaufeli W, Dormann C (2010) A longitudinal test of the demand-control model using specific job demands and specific job control. Int J Behav. Med 17(2):125–133

DeSanto Iennaco J, Cullen MR, Cantley L, Slade MD, Fiellin M, Kasl SV (2010) Effects of externally rated job demand and control on depression diagnosis claims in an industrial cohort. Am J Epidemiol 171(3):303–311. doi:10.1093/aje/kwp359

Eaton WW, Anthony JC, Gallo J, Cai G, Tien A, Romanoski A et al (1997) Natural history of diagnostic interview schedule/DSM-IV major depression. The baltimore epidemiologic catchment Area follow-up. Arch Gen Psychiatry 54(11):993–999

Eaton WW, Shao H, Nestadt G, Lee HB, Bienvenu OJ, Zandi P (2008) Population-based study of first onset and chronicity in major depressive disorder. Arch Gen Psychiatry 65(5):513–520

Endo M, Haruyama Y, Muto T, Yuhara M, Asada K, Kato R (2013) Recurrence of sickness absence due to depression after returning to work at a Japanese IT company. Ind Health 51:165–171

Hardeveld F, Spijker J, Graaf RD, Nolen WA, Beekman ATF (2013) Recurrence of major depressive disorder and its predictors in the general population: results from the Netherlands Mental Health Survey and Incidence Study (NEMESIS). Psychol Med 43(1):39–48

Hensing G, Wahlström R (2004) Swedish council on technology assessment in health care (SBU). Chapter 7. Sickness absence and psychiatric disorders. Scand J Public Health 32(63):152–180

Inoue A, Kawakami N, Haratani T, Kobayashi T, Ishizaki M, Hayashi T et al (2010) Job stressors and long-term sick leave due to depressive disorders among Japanese male employees: finding from the Japan Work Stress and Health Cohort study. J Epidemiol Community Health 64(3):229–235

Ishizaki M, Kawakami N, Honda R, Nakagawa H, Morikawa Y, Yamada Y (2006) The Japan work stress and health cohort study group. Psychosocial work characteristics and sickness absence in Japanese employees. Int Arch Occup Environ Health 79(8):640–646

Kawakami N (2007) Epidemiology of depressive disorders in Japan and the world. Nippon Rinsho 65(9):1578–1584 (in Japanese)

Kawakami N, Kobayashi F, Araki S, Haratani T, Furui H (1995) Assessment of job stress dimensions based on the job demands-control model of employees of telecommunication and electric power companies in Japan: reliability and validity of the Japanese version of the job content questionnaire. Int J Behav Med 2(4):358–375

Kawakami N, Takao S, Kobayashi Y, Tsutsumi A (2006) Effects of web-based supervisor training on job stressors and psychological distress among workers: a workplace-based randomized controlled trial. J Occup Health 48(1):28–34

Kessler RC, Berglund P, Demler O, Jin R, Koretz D, Merikangas KR et al (2003) The epidemiology of major depressive disorder: results from the National Comorbidity Survey Replication (NCS-R). JAMA 289(23):3095–3105

Knudsen AK, Harvey SB, Mykletun A, Overland S (2012) Common mental disorders and long-term sickness absence in a general working population. The Hordaland Health Study. Acta Psychiatr Scand 127(4):287–297

Kondo K, Kobayashi Y, Hirokawa K, Tsutsumi A, Kobayashi F, Haratani T et al (2006) Job strain and sick leave among Japanese employees: a longitudinal study. Int Arch Occup Envion Health 79(3):213–219

Koopmans PC, Roelen CA, Groothoff JW (2008) Risk of future sickness absence in frequent and long-term absentees. Occup Med(Lond) 58(4):268–274

Koopmans PC, Roelen CA, Bültmann U, Hoedeman R, van der Klink JJ, Groothoff JW (2010) Gender and age differences in the recurrence of sickness absence due to common mental disorders: a longitudinal study. BMC Public Health 10:426. doi:10.1186/1471-2458-10-426

Koopmans PC, Bultmann U, Roelen CA, Hoedeman R, Klink J, Groothoff JW (2011) Recurrence of sickness absence due to common mental disorders. Int Arch Occup Environ Health 84:193–201

Lexis MA, Jansen NW, van Amelsvoort LG, Huibers MJ, Berkouwer A, Tjin A, Ton G et al (2012) Prediction of long-term sickness absence among employees with depressive complaints. J Occup Rehabil 22:262–269

Magee C, Stefanic N, Caputi P, Ivarson D (2011) Occupational factors and sick leave in Australian employees. JOEM 53(6):627–632

Maj M, Veltro F, Pirozzi R, Lobrace S, Magliano L (1992) Pattern of recurrence of illness after recovery from an episode of major depression: a prospective study. Am J Psychiatry 149(6):795–800

Mueller TI, Leon AC, Keller MB, Solomon DA, Endicott J, Coryell W et al (1999) Recurrence after recovery from major depressive disorder during 15 years of observational follow-up. Am J Psychiatry 156(7):1000–1006

Muto T, Sumiyoshi Y, Sawada S, Momotani H, Itoh I, Fukuda H et al (1999) Sickness absence due to mental disorder in Japanese workforce. Ind Health 37:243–252

Nielsen ML, Rugulies R, Smith-Hansen L, Christensen KB, Kristensen TS (2006) Psychosocial work environment and registered absence from work: estimating the etiologic fraction. Am J Ind Med 49(3):187–196

Norder G, Roelen CA, van Rhenen W, Buitenhuis J, Bultmann U, Anema JR (2012) Predictors of recurrent sickness absence due to depressive disorders: a Delphi approach involving scientists and physicians. PLoS ONE 7(12):e51792. doi:10.1371/journal.pone.0051792

Okumura Y, Higuchi T (2011) Cost of depression among adults in Japan. Prim Care Companion CNS Disord 13(3). pii: PCC.10m01082. doi: 10.4088/PCC.10m01082

Pintor L, Torres X, Navarro V, Matrai S, Gastó C (2004) Is the type of remission after a major depressive episode an important risk factor to relapses in a 4-year follow up? J Affect Disord 82(2):291–296

Roelen CA, Koopmans PC, de Graaf JH, van Zandbergen JW, Groothoff JW (2007) Job demands, health perception and sickness absence. Occup Med 57:499–504

Roelen CA, Koopmans PC, Anema JR, van der Beek AJ (2010) Recurrence of medically certificated sickness absence according to diagnosis: a sickness absence register study. J Occup Rehabil 20:113–121

Roelen CA, Koopmans PC, Schreuder JA, Anema JR, van der Beek AJ (2011) The history of registered sickness absence predicts future sickness absence. Occup Med 61(2):96–101

Shimomitsu T, Ohno H, Maruta T, Tanigawa T (2000). Investigation research report concerning prevention of disease related to work in 1997 the Ministry of labor: stress measurement research group report (in Japanese)

Simpson HB, Nee JC, Endicott J (1997) First-episode major depression. Few sex differences in course. Arch Gen Psychiatry 54(7):633–639

Takada M, Suzuki A, Shima S, Inoue K, Kazukawa S, Hojoh M (2009) Association between lifestyle factors, working environment, depressive symptoms and suicidal ideation: a large-scale study in Japan. Ind Health 47:649–655

The Japan Ministry of Health, Labour and Welfare (2005) Manual of evaluating stress in work environment using brief job stress questionnaire. (Syokugyousei Stress Kanni Tyousahyou wo Motiita Stress no genjou haaku no tameno mannual) (in Japanese)

Tsutsumi A, Kayaba K, Ojima T, Ishikawa S, Kawakami N et al (2007) Low control at work and the risk of suicide in Japanese men: a prospective cohort study. Psychother Psychosom 76(3):177–185

van Weel-Baumgarten E, van der Bosch W, van der Hoogen H, Zitman FG (1998) Ten year follow-up of depression after diagnosis in general practice. Br J General Practice 48: 1643–1646

Virtanen M, Kawachi I, Oksanen T, Salo P, Tuisku K, Pulkki-Raback L, Pentti J, Elovainio M, Vahtera J, Kivimaki M (2011) Socio-economic differences in long-term psychiatric work disability: prospective cohort study of onset, recovery and recurrence. Occup Environ Med 2011(68):791–798

Vlasveld MC, Anema JR, Beekman AT, van Mechelen W, Hoedeman R, van Marwijk HW et al (2008) Multidisciplinary collaborative care for depressive disorder in the occupational health setting: design of a randomized controlled trial and cost-effectiveness study. BMC Health Serv Res 8:99. doi:0.1186/1472-6963-8-99

World Health Organization (2000) World Health Report 2000