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Influence of work-related psychosocial factors on the prevalence of chronic pain and quality of life in patients with chronic pain

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ABSTRACT

Objectives: Working is a common cause of chronic pain for workers. However, most of them need to continue working despite the pain in order to make a living unless they get a sick leave or retirement. We hypothesised that the therapeutic effect of vocational rehabilitation may depend on psychosocial factors related to the workplace. To test this hypothesis, we examined the association of work-related psychosocial factors with the prevalence of chronic pain or health-related quality of life (HRQoL) among workers with chronic pain.

Methods: We examined 1764 workers aged 20–59 years in the pain-associated cross-sectional epidemiological survey in Japan. The outcomes were (1) chronic pain prevalence among all workers and (2) low Euro QoL (EQ-5D <0.76; mean value of the current study) prevalence among workers with chronic pain according to the degree of workplace social support and job satisfaction. Workplace social support and job satisfaction were measured using the Brief Job Stress Questionnaire. Multivariable-adjusted ORs were calculated using a logistic regression model including age, sex, smoking, exercise, sleep time, work hours, body mass index, personal consumption expenditure, intensity of pain and the presence of severe depressive symptoms.

Results: Chronic pain prevalence was higher among males reporting job dissatisfaction compared with those reporting job satisfaction. No difference was observed among women. Chronic pain prevalence did not differ between workers of either sex reporting poor workplace social support compared with those reporting sufficient support. Among workers with chronic pain, low HRQoL was more frequent in those reporting job dissatisfaction. Similarly, low HRQoL was more frequent in patients with chronic pain reporting poor social support from supervisors or co-workers compared with patients reporting sufficient support.

Conclusions: Work-related psychosocial factors are critical for HRQoL in patients with chronic pain.

Strengths and limitations of this study

- Our study included a large population and used the specialised questionnaire for pain medicine.
- This is the first study to investigate the association between work-related psychosocial factors and health-related quality of life of patients with chronic pain.
- Our questionnaire included only three psychosocial factors: social support from supervisors, support from co-workers and job satisfaction.
- Patients with severe chronic pain who took sick leave or had retired because of pain were not included in our study.

health problem.[1] Although most workers need to continue their work despite pain, in order to make a living, unless they get sick leave or retire, workers with chronic pain are likely to have lower productivity. Physical and mental overwork can cause chronic pain, which, according to the classical rehabilitation model, requires rest for relief and remission.[2] In contrast, the recent vocational rehabilitation model recommends continuing work or prompt return as soon as possible based on studies showing the benefits of remaining active despite pain.[2–4] However, patients with chronic pain may require added motivation or appropriate accommodation; thus, success of vocational rehabilitation may depend on psychosocial factors related to the workplace environment.

Poor work-related psychosocial factors were associated with a higher chronic pain prevalence among European and North American workers,[2 5 6] but these relationships have not been examined among Asian workers. Workplace environments vary among cultures; therefore, the influence of psychosocial factors on chronic pain may also differ in Asia.[7]

INTRODUCTION

The existence of chronic pain among workers is an economic burden and major public

Health-related quality of life (HRQoL) measures are frequently used in epidemiology to quantify general health and functional status. Furthermore, HRQoL has been associated with worker productivity and is often used to calculate the cost-effectiveness of healthcare programmes.[8] Thus, HRQoL is an appropriate metric to evaluate the effects of work-related psychosocial factors on workers with health problems, but the relationship between work-related psychosocial factors and HRQoL of patients with chronic pain has not been explored.

Thus, we analysed the association between work-related psychosocial factors and chronic pain prevalence in the Japanese workplace. In addition, we examined the association between work-related psychosocial factors and HRQoL among patients with chronic pain.

MATERIALS AND METHODS
Study population
The pain-associated cross-sectional epidemiological study was an internet survey (conducted from 10 to 18 January 2009) designed to evaluate pain in a large Japanese population, using a self-reported questionnaire.[9] The sampling procedure ending in the sample being analysed in the current study is shown in figure 1. A total of 20 044 respondents (9746 men and 10 298 women) aged 20–79 years, matching the Japanese demographic composition in 2007,[10] were recruited by email from 1 477 585 candidates who registered with an internet survey company (Rakuten Research Inc, Tokyo, Japan).[11] Invitation emails containing a link to the first questionnaire were sent by computer system until the targeted sample number was achieved. Incomplete questionnaires were rejected automatically, so the response rate was not calculated. The first questionnaire included items on age, sex, job, HRQoL and pain. Subsequently, detailed questionnaires about lifestyle and psychosocial factors were sent to 5000 respondents aged 20–79 years who answered the first questionnaire, 2500 reporting pain and 2500 with no pain. The profile of these 5000 respondents was consistent with the Japanese demographic composition for sex and age in 2007.[10] A total of 2480 workers aged 20–59 years responded to the second questionnaire and 716 workers who had acute or subacute pain were excluded from our analyses. Thus, we included the data on 1764 workers aged 20–59 years, 532 with chronic pain and 1232 with no pain, in the analyses.

The proportions for the different job categories were 29.5% specialists, 8.6% managers, 28.2% white-collar workers, 8.4% sales workers, 3.3% service workers, 0.6% primary sector workers, 2.2% transportation or communication workers, 6.0% menial labourers, and 13.2% others. The majority, 86.2%, were full time while 13.8% were part time.

Ethics
All participants had given their informed consent before responding to the questionnaire. A credit point for internet shopping was given as an incentive to the respondents.

Measures
Job satisfaction and social support from supervisors and co-workers were measured using subscales of the Brief Job Stress Questionnaire.[12] The questionnaire section on social support from supervisors and co-workers consisted of three items ('How well do you get along with your supervisors/co-workers?, 'When you experience difficulties, how much do you rely on your supervisors/co-workers?' and 'How often do you consult your supervisors/co-workers about your private issues/problems?'). Each item was rated on a four-point scale ranging from 1 (sufficient) to 4 (poor), and the total score was calculated by summing the three items for a total score ranging from 3 to 12 points (with lower scores indicating greater levels of support). Subsequently, we calculated the quartiles of scores for social support from supervisors and from co-workers (higher quartile indicating greater level of support) and classified supervisor support as low (Q1, 12–10), intermediate (Q2, 9; Q3, 8–7) or high (Q4, 6–3 points), and co-worker support as low (Q1, 12–9), intermediate (Q2, 8; Q3, 7–6) or high (Q4, 5–3). Job satisfaction was classified into four categories: dissatisfied, somewhat dissatisfied, relatively satisfied or satisfied.

The primary outcome measure was chronic pain prevalence in the entire cohort. The participants also answered questions related to their own pain such as the pain sites, pain intensity at each site, the site of dominant pain, the duration of dominant pain and disability due to dominant pain. Pain intensities were scored on an 11-point Numerical Rating Scale (NRS) (0=no pain, 10=worst pain imaginable). A score ≥ 5 for the dominant pain site during the past 3 months was defined as chronic pain.

The secondary outcome was the prevalence of low Euro QoL (EQ-5D), defined as below the mean of 0.76 of the present study, in workers with chronic pain according to the NRS. We used the Japanese version of the EQ-5D instrument to measure HRQoL.[13] The EQ-5D includes five dimensions: mobility, self-care, usual activities, pain or discomfort, and anxiety or depression. Each dimension is divided into three degrees of severity: 1 (no problem), 2 (moderate) and 3 (extreme problems). The five numbers expressing severity on the five dimensions (eg, 11 233, 22 112 or 11 333) are arranged in the order above, generating 3^5 (or 243) different health statuses. The 243 health statuses are then converted into a single index score called the 'utility value' from 0 (dead) to 1 (full health) according to the conversion table for the Japanese EQ-5D.[13]

The presence of severe depressive symptoms was treated as a confounding factor and used as an adjustment variable because depression is strongly associated with psychosocial factors, chronic pain and quality of
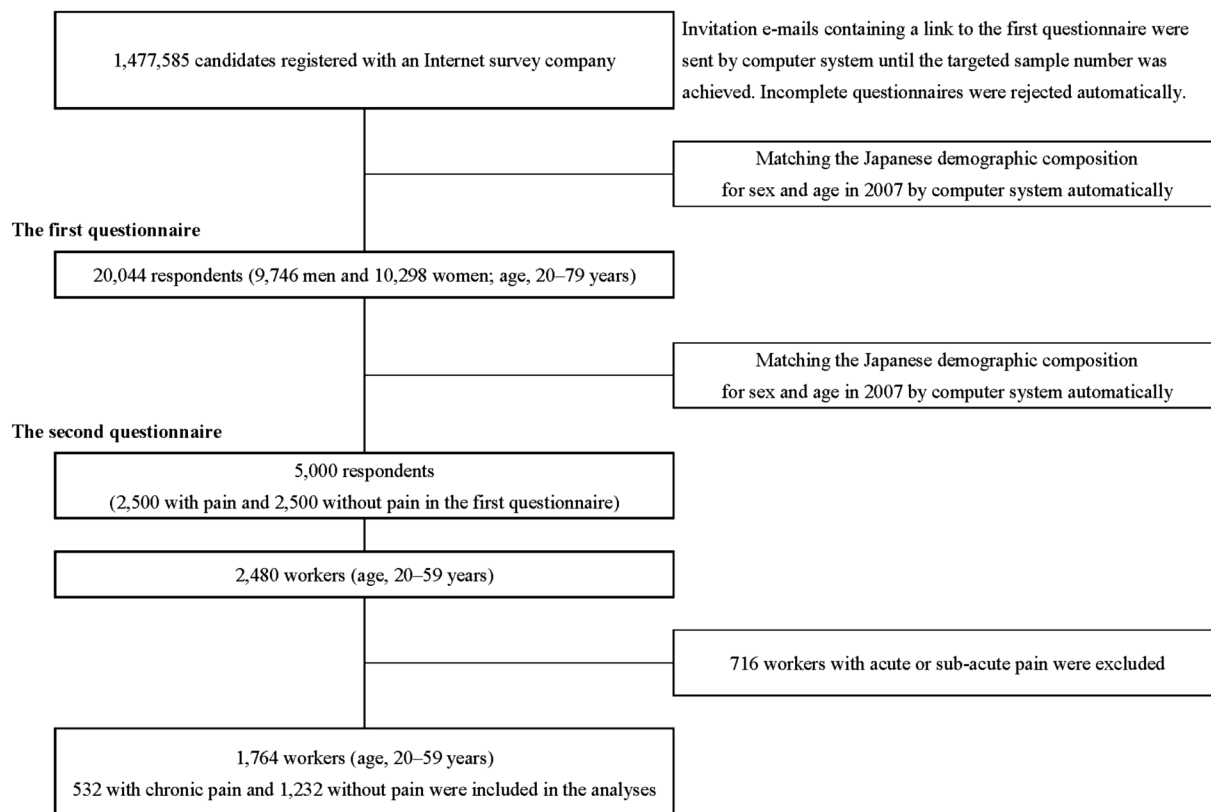
Figure 1 Flow chart of the sampling procedure ending in the sample being analysed in the current study.

life.[14] In the present study, the presence of severe depressive symptoms was defined as a Mental Health Inventory (MHI-5) score <52.[15] The MHI-5 is equal to the 36-item Short Form Health Survey (SF-36) 'mental health' domain.[16] The MHI-5 contains the following five questions: 'How much of the time during the last month have you: (1) been a very nervous person, (2) felt down-hearted and blue, (3) felt calm and peaceful, (4) felt so down in the dumps that nothing could cheer you up and (5) been a happy person?' The respondents choose a number from 1 (all of the time) to 6 (none of the time). The score on the MHI-5, ranging from 5 to 30 points, is converted to a 100-point scale.[15] A previous Japanese study confirmed that the cut point of <52 on the MHI-5 (corresponding to ≥56 on the 20-item Zung Self-rating Depression Scale, ZSDS) was useful for screening severe depressive symptoms, with sensitivity of 91.8% and specificity of 84.6%.[15]

Statistical analysis

Analysis of covariance was used to test for differences in age-adjusted means and proportions of the various clini-codemographic characteristics recorded for the analysis. We analysed the association between work-related psychosocial factors and the prevalence of chronic pain among all workers, and the prevalence of low EQ-5D (<the mean of 0.76) among workers with chronic pain.

Multivariable-adjusted ORs and 95% CIs were calculated using the logistic regression model. The adjustment variables included age, sex, smoking status (never-smoker, ex-smoker or current smoker), exercise habit (exercise longer than 30 min more than twice a week; yes or no), sleeping time (hours/day), working hours (<40, 40 to 49, 50 to 59, 60 to 69 or >70 h/week), body mass index (kg/m^2, categorised in quintiles), personal consumption expenditure (JPY/month) and presence of severe depressive symptoms (MHI-5<53). When we analysed the association between work-related psychosocial factors and the EQ-5D of workers with chronic pain, we further adjusted for pain intensity as expressed on an 11-point NRS (0=no pain, 10=worst pain imaginable). We could not analyse the data according to job category because the numbers in each were small.

p Values of <0.05 for two-tailed tests were considered statistically significant. All statistical analyses were performed using SAS V.9.4 (SAS Institute Inc, Cary, North Carolina, USA).

RESULTS

We identified 532 workers aged 20–59 years (309 men and 223 women) who had chronic pain, and 1232 workers (783 men and 449 women) without pain. A total of 306 workers with chronic pain (57.5%) reported a severity of 5 points or more on the 11-point NRS for low back pain or neck pain. The prevalence of chronic pain in female workers was significantly higher than in

male workers (24.5% vs 19.7%, p<0.05). The prevalence of severe depressive symptoms in patients with chronic pain was 35.3% for men and 37.2% for women, about two-times higher than in pain-free workers (18.1% for men and 21.4% for women).

Table 1 shows the age-adjusted means and proportions of clinicodemographic characteristics according to work-related psychosocial factor category (support from supervisors, support from co-workers, job satisfaction). Workers who received poor support from supervisors and/or co-workers (Q1) and were dissatisfied with their jobs demonstrated a higher prevalence of severe depressive symptoms. A greater proportion of male workers who were dissatisfied with their job exhibited short sleep compared to those with good work-related psychosocial factors. Male workers receiving poor support from supervisors and/or co-workers, and who were dissatisfied with their jobs, exhibited a higher prevalence of chronic pain compared with those satisfied with their jobs and receiving sufficient support. Pain intensity of patients with chronic pain did not vary according to work-related psychosocial factor category.

Table 2 shows the age-adjusted and multivariable ORs of chronic pain patient characteristics according to work-related psychosocial factor category. Male workers with poor job satisfaction exhibited a higher prevalence of chronic pain, and the association remained statistically significant after adjustment for confounding factors and the presence of severe depressive symptoms. The degree of social support from supervisors/co-workers was associated with a progressive decrease in the prevalence of chronic pain among male workers. However, after adjustment for confounding variables and presence of severe depressive symptoms, most of these individual associations between chronic pain prevalence and support quartile were no longer statistically significant. No such associations were found for female workers.

Table 3 shows the age-adjusted and multivariable ORs for low EQ-5D (less than the mean of 0.76) in workers with chronic pain. The mean EQ-5D value of all workers was 0.90 (SD 0.14), 0.96 for those without chronic pain (SD 0.09) and 0.76 (SD 0.12) for those with chronic pain; therefore, 0.76 was used as the cut-off point. Work-related social factors were significantly associated with the low EQ-5D (less than the mean of 0.76) among workers of both sexes with chronic pain in the age-adjusted model and model 1. However, those associations were no longer statistically significant in the severe depressive syndrome-adjusted model (model 2), except for the category, support from supervisors/co-workers for female workers. In the entire cohort of patients with chronic pain (men and women), there was a significantly higher prevalence of low EQ-5D in those reporting poor support from supervisors and from those reporting poor support from co-workers. These associations were statistically significant in neither men nor women separately.

DISCUSSION

These results reveal a significant association between job dissatisfaction and the prevalence of chronic pain in Japanese male workers, in accord with previous findings of a link between job dissatisfaction and chronic musculoskeletal pain among European and North American workers.[2] [5] [6] However, no gender differences were found in those studies, while the link between job dissatisfaction and chronic pain was specific to men in the current study.

In general, there are gender differences in pain and analgaesia,[17] [18] so we stratified participants by sex. Previous studies have found that women experience chronic pain more often than men.[17] [18] Similarly, the prevalence of chronic pain was significantly higher in women than in men in the current study. However, job satisfaction was associated with the prevalence of chronic pain only among men. It was suggested that the incidence of chronic pain may be more influenced by job satisfaction among men than among women in Japan. Men generally work longer hours than do women in Japan, with an average daily working time of 416 min for men and 290 min for women in 2011.[19] On the other hand, many Japanese men do not share housework, averaging only 42 min daily compared with 215 min for women.[19] In our study, the proportion of male workers who had been working >60 h per week (15.5%) were more than that of female workers (4.2%).Thus, women may be more strongly affected by psychosocial factors at home than at work due to shorter working hours or cultural expectations. However, psychosocial factors in private life were not examined in this study, so we could not investigate the reasons for this gender difference in the impact of psychosocial factors on chronic pain.

Several recent studies have recommended that patients with chronic pain should continue to work and not take prolonged leave;[2–4] however, the success of this vocational rehabilitation model could depend on a favourable work environment. Indeed, support from supervisors and co-workers did have a positive effect on workers with chronic pain according to self-reported HRQoL. Similarly, supportive relationships at work led to better HRQoL of employees with severe mental illness.[4] This need for supportive supervisors and co-workers may result from a lower resiliency and capacity to cope with stress compared with healthy workers.[20]

We investigated the prevalence of low EQ-5D (defined as below the mean of 0.76) among workers with chronic pain as the secondary outcome of our research. In a Finnish study, the mean EQ-5D of the general population was 0.84 and that of the subpopulation with back pain was 0.74.[21] This is similar to the mean EQ-5D of Japanese workers in the current study, most of whom suffered from back or neck pain. Thus, EQ-5D appears to reflect impaired QoL resulting from chronic musculoskeletal pain. The EQ-5D can also detect meaningful changes in other clinical conditions.[22] For instance,

Table 1 Age-adjusted mean values and proportions of characteristics according to the categories of work-related psychosocial factors among workers aged 20–59 years

The quartiles of scores for social support Score; with lower scores indicating greater levels of support	Support from supervisors				Support from co-workers				Job satisfaction			
	Q4	Q3	Q2	Q1	Q4	Q3	Q2	Q1				
	6–3 points	8–7 points	9 points	12–10 points	5–3 points	7–6 points	8 points	12–9 points	Satisfied	Relatively satisfied	Somewhat dissatisfied	Dissatisfied
Men, n=1092												
n	285	332	232	243	200	351	226	315	136	638	234	84
Age (years)	40.0 (0.6)	42.7 (0.5)	40.3 (0.7)	41.2 (0.6)	40.6 (0.6)	43.0 (0.7)	41.4 (0.5)	39.6 (0.7)	39.6 (0.9)	41.6 (0.4)	41.1 (0.7)	40.4 (1.1)
Current smoker (%)	32.2	37.3	28.4	32.5	37.0	31.6	32.3	32.7	31.6	31.3	36.8	38.1
Have an exercise habit (%)	32.3	26.2	27.2	27.6	29	29.3	27	27.6	37.5	28.2	23.9	26.2
Short sleep (%)	6.0	2.7	3.0	8.2	3.5	5.1	3.5	6.3	3.7	4.4	3.8	13.1†
Overwork (%)	14.7	12.3	14.7	20.6	13.0	13.7	19.0	15.9	11.8	14.4	19.7*	15.5
Body mass index ≥25 (%)	25.6	26.2	26.7	25.9	23.5	24.2	29.2	27.6	22.8	27.0	26.5	23.8
Personal consumption expenditure (×10 000 JPY/month)	29.1	32.2	28.7	27.6	26.3	34.7*	28.6	26.7	32.8	28.8	28.9	32.6
Severe depressive symptoms (%)	13.7	17.2	23.3†	41.6‡	11.5	14.8	19.5*	41.9‡	8.8	13.5	38.5‡	75.0‡
Chronic pain (%; number of participants with chronic pain, n=309)	23.5 (67)	25.9 (86)	30.6 (71)	35.0† (85)	25.0 (50)	21.4 (75)	30.1 (69)	36.5† (115)	19.9 (27)	25.7 (164)	32.1* (75)	51.2‡ (43)
Intensity of pain of participants with chronic pain (Numerical Rating Scale)	7.0	7.0	6.9	6.9	7.2	7.0	7.0	6.8	6.4	7.1*	6.9	7.0
Women, n=672												
n	160	210	110	192	149	215	95	213	74	411	134	53
Age (years)	38.9 (0.7)	38.4 (0.9)	40.1 (0.7)	40.2 (0.8)	38.7 (0.7)	40.3 (1.0)	39.6 (0.7)	40.0 (0.8)	40.3 (1.2)	39.8 (0.5)	38.9 (0.9)	37.2 (1.4)
Current smoker (%)	19.4	21.9	21.8	17.7	22.1	22.8	18.9	16.4	20.3	19.2	20.9	24.5
Have an exercise habit (%)	26.9	19.5	18.2	18.8	19.5	22.3	25.3	18.3	27.0	23.6	11.9	13.2
Short sleep (%)	4.4	4.3	1.8	6.3	3.3	4.2	7.4	4.2	1.4	4.1	7.5*	3.8

Continued

Table 1 Continued

The quartiles of scores for social support Score; with lower scores indicating greater levels of support	Support from supervisors				Support from co-workers				Job satisfaction			
	Q4	Q3	Q2	Q1	Q4	Q3	Q2	Q1				
	6–3 points	8–7 points	9 points	12–10 points	5–3 points	7–6 points	8 points	12–9 points	Satisfied	Relatively satisfied	Somewhat dissatisfied	Dissatisfied
Overwork (%)	5.6	5.2	1.8	3.1	5.4	4.7	2.1	3.8	6.8	4.4	3.7	0
Body mass index ≥25 (%)	13.1	13.3	15.5	14.1	12.8	15.8	10.5	14.1	9.5	14.8	17.2	3.8
Personal consumption expenditure (×10 000 JPY/ month)	25.6	27.3	29.5	24.6	24.3	27.3	26.2	27.3	24.2	25.8	30.1	26.3
Severe depressive symptoms (%)	10.6	23.3†	27.3†	43.2‡	12.1	23.3*	25.3*	40.8‡	10.8	16.1	46.3‡	81.1‡
Chronic pain (%; number of participants with chronic pain, n=223)	30.0 (48)	31.4 (66)	37.2 (41)	35.4 (68)	33.6 (50)	31.6 (68)	26.3 (25)	37.6 (80)	29.7 (22)	29.2 (120)	44.0* (59)	41.5 (22)
Intensity of pain of participants with chronic pain (Numerical Rating Scale)	7.5	6.9	7.4	7.8	7.5	7.2	6.8*	7.6	7.4	7.2	7.7	7.5

Test for significance from the category of Q4, or satisfied.
In parentheses: SEs.
The quartiles of scores for social support from supervisors and from co-workers were calculated, and classified as low (Q1), intermediate (Q2; Q3) or high (Q4).
*p<0.05, †<0.01, ‡<0.001.

Table 2 ORs (ORs, 95% CI) of chronic pain according to the categories of work-related psychosocial factors among workers aged 20–59 years

The quartiles of scores for social support Score; with lower scores indicating greater levels of support	Support from supervisors				Support from co-workers				Job satisfaction			
	Q4	Q3	Q2	Q1	Q4	Q3	Q2	Q1		Relatively	Somewhat	
	6–3 points	8–7 points	9 points	12–10 points	5–3 points	7–6 points	8 points	12–9 points	Satisfied	satisfied	dissatisfied	Dissatisfied
Men, n=1092												
Number of participants	285	332	232	243	200	351	226	315	136	638	234	84
Number of participants with chronic pain	67	86	71	85	50	75	69	115	27	164	75	43
Age-adjusted OR (95% CI)	1.00	1.14 (0.79 to 1.65)	1.44 (0.97 to 2.13)	1.75 (1.20 to 2.56)†	1.00	0.82 (0.54 to 1.23)	1.32 (0.86 to 2.03)	1.73 (1.16 to 2.56)†	1.00	1.40 (0.88 to 2.21)	1.91 (1.15 to 3.15)*	4.23 (2.32 to 7.72)‡
Model 1 OR (95% CI)	1.00	1.22 (0.84 to 1.78)	1.47 (0.98 to 2.19)	1.81 (1.23 to 2.68)†	1.00	0.88 (0.58 to 1.34)	1.35 (0.87 to 2.10)	1.81 (1.21 to 2.72)†	1.00	1.39 (0.87 to 2.22)	1.87 (1.12 to 3.14)*	4.35 (2.35 to 8.04)‡
Model 2 OR (95% CI)	1.00	1.18 (0.81 to 1.73)	1.35 (0.90 to 2.03)	1.42 (0.95 to 2.13)	1.00	0.85 (0.56 to 1.30)	1.25 (0.80 to 1.95)	1.40 (0.92 to 2.13)	1.00	1.35 (0.84 to 2.16)	1.51 (0.89 to 2.57)	2.76 (1.43 to 5.31)‡
Women, n=672												
Number of participants	160	210	110	192	149	215	95	213	74	41	134	53
Number of participants with chronic pain	48	66	41	68	50	68	25	80	22	120	59	22
Age-adjusted OR (95% CI)	1.00	1.07 (0.68 to 1.67)	1.36 (0.81 to 2.27)	1.26 (0.80 to 1.98)	1.00	0.91 (0.58 to 1.42)	0.71 (0.40 to 1.25)	1.17 (0.76 to 1.82)	1.00	0.97 (0.56 to 1.67)	1.84 (1.00 to 3.36)*	1.62 (0.77 to 3.41)
Model 1 OR (95% CI)	1.00	1.03 (0.65 to 1.64)	1.45 (0.85 to 2.48)	1.31 (0.81 to 2.10)	1.00	0.95 (0.60 to 1.51)	0.78 (0.43 to 1.40)	1.28 (0.81 to 2.03)	1.00	1.03 (0.58 to 1.82)	1.66 (0.87 to 3.17)	1.98 (0.90 to 4.36)
Model 2 OR (95% CI)	1.00	0.95 (0.59 to 1.52)	1.29 (0.75 to 2.24)	1.05 (0.64 to 1.71)	1.00	0.86 (0.54 to 1.38)	0.69 (0.38 to 1.26)	1.04 (0.65 to 1.68)	1.00	0.98 (0.55 to 1.74)	1.31 (0.67 to 2.56)	1.23 (0.53 to 2.86)
Total, n=1764												
Number of participants	445	542	342	435	349	566	321	528	210	1049	368	137
Number of participants with chronic pain	115	152	112	153	100	143	94	195	49	284	134	65
Age-adjusted OR (95% CI)	1.00	1.12 (0.84 to 1.49)	1.41 (1.03 to 1.92)*	1.53 (1.15 to 2.05)†	1.00	0.85 (0.63 to 1.15)	1.07 (0.77 to 1.50)	1.47 (1.10 to 1.97)*	1.00	1.21 (0.86 to 1.72)	1.88 (1.28 to 2.77)†	2.94 (1.85 to 4.68)‡
Model 1 OR (95% CI)	1.00	1.15 (0.86 to 1.53)	1.44 (1.05 to 1.98)*	1.58 (1.17 to 2.12)†	1.00	0.90 (0.66 to 1.22)	1.01 (0.78 to 1.56)	1.55 (1.15 to 2.09)†	1.00	1.20 (0.84 to 1.72)	1.76 (1.18 to 2.62)†	3.13 (1.94 to 5.06)‡
Model 2 OR (95% CI)	1.00	1.08 (0.81 to 1.45)	1.31 (0.95 to 1.81)	1.25 (0.91 to 1.70)	1.00	0.84 (0.62 to 1.15)	1.01 (0.71 to 1.43)	1.22 (0.89 to 1.67)	1.00	1.15 (0.80 to 1.65)	1.42 (0.94 to 2.13)†	1.99 (1.19 to 3.32)†

Model 1: adjusted for age, sex, smoking, exercise habit, sleep time, working time, body mass index and personal consumption expenditure.
Model 2: adjusted for the aforementioned variables plus existence of severe depressive symptoms.
The quartiles of scores for social support from supervisors and from co-workers were calculated, and classified as low (Q1), intermediate (Q2; Q3) or high (Q4).
Test for significance from the category of Q4 or satisfied.
*p<0.05, †p<0.01, ‡p<0.001.

Table 3 ORs (ORs, 95%CI) of below Euro QoL (EQ-5D) mean value according to the categories of work-related psychosocial factors among workers aged 20–59 years

The quartiles of scores for social support Score; with lower scores indicating greater levels of support	Support from supervisors				Support from co-workers				Job satisfaction			
	Q4	Q3	Q2	Q1	Q4	Q3	Q2	Q1				
	6–3 points	8–7 points	9 points	12–10 points	5–3 points	7–6 points	8 points	12–9 points	Satisfied	Relatively satisfied	Somewhat dissatisfied	Dissatisfied
Men, n=309												
Number of participants	67	86	71	85	50	75	69	115	27	164	75	43
Number of participants with<EQ-5D mean value	20	24	21	47	12	20	24	56	8	45	29	30
Age-adjusted OR	1.00	0.87 (0.43 to 1.78)	0.99 (0.48 to 2.06)	2.87 (1.46 to 5.65)†	1.00	1.08 (0.47 to 2.50)	1.57 (0.68 to 3.61)	2.91 (1.37 to 6.14)‡	1.00	0.87 (0.35 to 2.13)	1.44 (0.56 to 3.73)	5.56 (1.94 to 15.98)‡
Model 1 OR	1.00	0.81 (0.39 to 1.70)	0.84 (0.39 to 1.82)	2.60 (1.28 to 5.29)†	1.00	1.03 (0.43 to 2.45)	1.45 (0.62 to 3.42)	2.70 (1.24 to 5.90)*	1.00	0.78 (0.31 to 1.96)	1.25 (0.47 to 3.34)	5.09 (1.70 to 15.25)†
Model 2 OR	1.00	0.61 (0.27 to 1.36)	0.66 (0.29 to 1.51)	1.43 (0.65 to 3.12)	1.00	0.87 (0.34 to 2.24)	1.10 (0.44 to 2.75)	1.48 (0.63 to 3.47)	1.00	0.74 (0.28 to 1.99)	0.71 (0.24 to 2.10)	2.09 (0.62 to 7.09)
Women, n=223												
Number of participants	48	66	41	68	50	68	25	80	22	120	59	22
Number of participants with <EQ-5D mean value	13	25	17	41	14	22	13	47	6	42	32	16
Age-adjusted OR	1.00	1.64 (0.73 to 3.69)	1.90 (0.78 to 4.64)	4.09 (1.84 to 9.10)‡	1.00	1.23 (0.55 to 2.74)	2.78 (1.02 to 7.58)*	3.66 (1.71 to 7.84)‡	1.00	1.44 (0.52 to 3.95)	3.15 (1.08 to 9.19)*	7.24 (1.90 to 27.55)†
Model 1 OR	1.00	1.63 (0.68 to 3.92)	1.71 (0.67 to 4.35)	3.95 (1.69 to 9.22)†	1.00	1.11 (0.47 to 2.60)	2.49 (0.85 to 7.30)*	3.45 (1.55 to 7.66)†	1.00	1.42 (0.46 to 4.38)	3.43 (1.05 to 11.26)*	7.55 (1.77 to 32.20)†
Model 2 OR	1.00	1.19 (0.47 to 3.01)	1.22 (0.45 to 3.32)	2.54 (1.04 to 6.21)*	1.00	0.86 (0.35 to 2.12)	1.60 (0.51 to 5.05)	2.59 (1.12 to 5.97)*	1.00	1.36 (0.42 to 4.38)	2.06 (0.58 to 7.28)	3.49 (0.74 to 16.36)
Total, n=532												
Number of participants	115	152	112	153	100	143	94	195	49	284	134	65
Number of participants with <EQ-5D mean value	33	49	38	88	26	42	37	103	14	87	61	46

Continued

Table 3 Continued

The quartiles of scores for social support Score; with lower scores indicating greater levels of support	Support from supervisors				Support from co-workers				Job satisfaction			
	Q4	Q3	Q2	Q1	Q4	Q3	Q2	Q1	Satisfied	Relatively satisfied	Somewhat dissatisfied	Dissatisfied
	6–3 points	8–7 points	9 points	12–10 points	5–3 points	7–6 points	8 points	12–9 points				
Age-adjusted OR	1.00	1.16 (0.68 to 1.98)	1.30 (0.74 to 2.29)	3.35 (2.00 to 5.61)‡	1.00	1.19 (0.67 to 2.11)	2.01 (1.08 to 3.74)*	3.32 (1.95 to 5.67)‡	1.00	1.11 (0.56 to 2.17)	2.07 (1.02 to 4.22)*	6.57 (2.88 to 15.03)‡
Model 1 OR	1.00	1.07 (0.62 to 1.85)	1.15 (0.65 to 2.06)	3.03 (1.78 to 5.15)‡	1.00	1.12 (0.62 to 2.02)	1.82 (0.97 to 3.44)	3.18 (1.84 to 5.50)‡	1.00	1.06 (0.53 to 2.15)	1.94 (0.92 to 4.09)	6.42 (2.72 to 15.19)‡
Model 2 OR	1.00	0.82 (0.46 to 1.48)	0.89 (0.48 to 1.66)	1.85 (1.04 to 3.28)*	1.00	0.92 (0.49 to 1.74)	1.38 (0.70 to 2.73)	2.07 (1.15 to 3.70)*	1.00	1.02 (0.49 to 2.11)	1.14 (0.52 to 2.52)	2.77 (1.09 to 7.01)*

Model 1: adjusted for age, sex, smoking, exercise habit, sleep time, working time, body mass index, personal consumption expenditure, intensity of pain.
Model 2: adjusted for aforementioned variables plus existence of severe depressive symptoms.
The quartiles of scores for social support from supervisors and from co-workers were calculated, and classified as low (Q1), intermediate (Q2; Q3) or high (Q4).
Test for significance from the category of Q4 or satisfied.
*p<0.05, †p<0.01, ‡p<0.001.

intensity of migraine was correlated with EQ-5D.[23] Patients with chronic pain reporting poor support in the workplace showed a higher prevalence of low mean EQ-5D, indicating that these work-related psychosocial factors are important for maintenance of general health status and functional well-being.

Absence from work because of sickness for regional pain symptoms is much less common in Japan compared with that in the UK.[24] Compared with the UK, the reported rates of sick leave for regional pain symptoms in Japan are less than one-third (only 5%).[24 25] According to the population-based survey,[26] the prevalence of chronic pain in Japan (22.9%) is similar to that in Europe;[2] therefore, the number of people who are working with chronic pain without absence from work may be larger in Japan than in the UK. This cultural difference may reflect the result of a wide range HRQoL of workers with chronic pain being observed in the present study; thus, the association between work-related psychosocial factors and EQ-5D among workers with chronic pain may be detected sensitively in the current Japanese study.

Depression is strongly associated with psychosocial factors, chronic pain and QoL in the clinical setting.[14] The lifetime prevalence of major depression in primary care settings is 5–10%,[27] and the reported prevalence of pain in patients with depression averages about 65% (range 15–100%).[28] The estimated coexistence of major depression with chronic pain in the general population is 18% (4.7–22%).[28] In fact, the presence of severe depressive symptoms was the most powerful confounder in our study.

Limitations

There are several limitations to our study. First, the participants may not be truly representative of the general population. Although the demographic profile of respondents was consistent with the Japanese demographic composition for sex and age in 2007, the 1764 participants who answered the detailed questionnaire were selected purposefully (by eliminating those with acute and subacute pain). According to the Annual Report on the Labor Force Survey in 2009,[29] the percentage of the Japanese labour force aged 20–59 years was 92.5% for men and 69.9% for women, while 88.5% of male respondents and 52.2% of female respondents were currently in the labour force. The proportions of job categories were biased. Specialists and white-collar workers have a majority (57.7%), and the proportion of primary sector workers was very low (0.6%). Moreover, factors influencing the decision to respond to the web-based survey may have biased the distribution. For example, it may have selected against extremely busy workers or older workers less familiar with the internet. In addition, the respondents may have been particularly interested in pain research, possible due to personal affliction. The sampling issues of the web-based survey were noted before.[30] This difference, particularly the

low portion of female respondents in the workforce, could have influenced the results.

Second, our questionnaire included only three psychosocial factors, social support from supervisors, support from co-workers and job satisfaction. 'Job demand' and 'job control'[31] have also been included as work-related psychosocial factors, but these were not examined in this study. Our questionnaire did not include social support in private life. Furthermore, individual psychosocial factors such as 'fear avoidance', 'pain catastrophising' and 'resilience' were not investigated in the present study.

Third, patients with severe chronic pain who took sick leave or had retired due to pain were not included in our study. This limitation could reduce the statistical power to examine the association between work-related psychosocial factors and chronic pain.

CONCLUSION

Male workers reporting job dissatisfaction had a higher prevalence of chronic pain than those reporting job satisfaction. Among workers with chronic pain, those reporting poor social support and job dissatisfaction had a greater frequency of low HRQoL. Thus, work-related psychosocial factors are critical influences on the HRQoL of workers with chronic pain.

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