

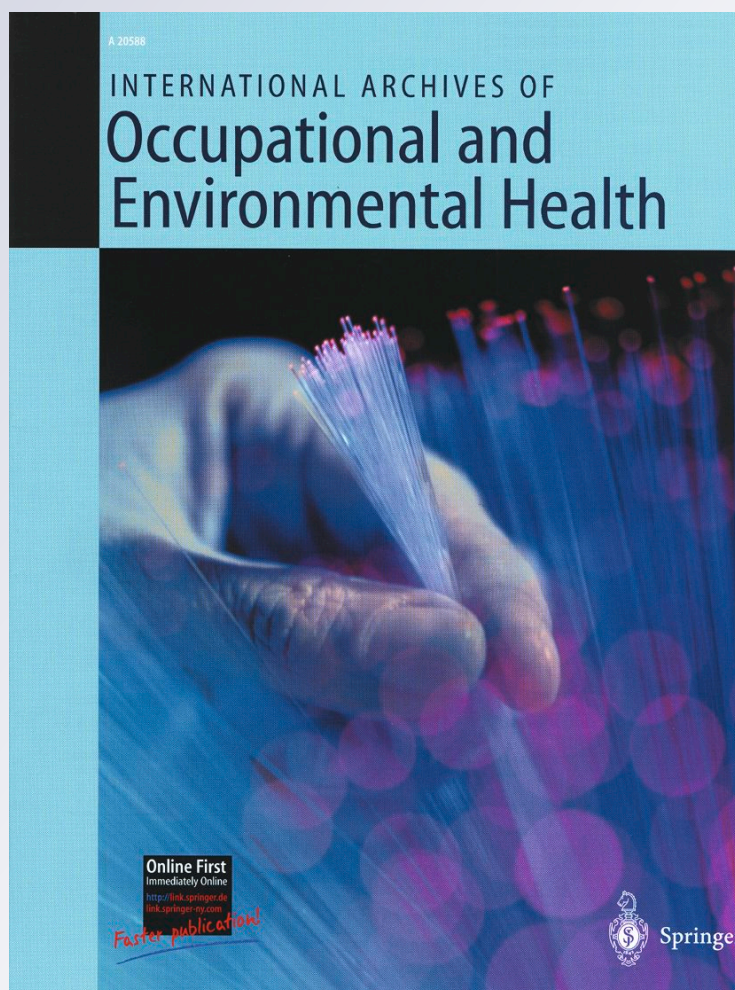
*Can high psychological job demands,
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follow-up of middle-aged Swedish workers*

**Catarina Canivet, BongKyoo Choi,
Robert Karasek, Mahnaz Moghaddassi,
Carin Staland-Nyman & Per-Olof
Östergren**

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Can high psychological job demands, low decision latitude, and high job strain predict disability pensions? A 12-year follow-up of middle-aged Swedish workers

Catarina Canivet · BongKyo Choi ·
Robert Karasek · Mahnaz Moghaddassi ·
Carin Staland-Nyman · Per-Olof Östergren

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Abstract

Objectives The aim of this study was to investigate whether job strain, psychological demands, and decision latitude are independent determinants of disability pension rates over a 12-year follow-up period.

Methods We studied 3,181 men and 3,359 women, all middle-aged and working at least 30 h per week, recruited from the general population of Malmö, Sweden, in 1992. The participation rate was 41 %. Baseline data include sociodemographics, the Job Content Questionnaire, lifestyle, and health-related variables. Disability pension information was obtained through record linkage from the National Health Insurance Register.

Results Nearly 20 % of the women and 15 % of the men were granted a disability pension during the follow-up period. The highest quartile of psychological job demands and the lowest quartile of decision latitude were associated with disability pensions when controlling for age, socioeconomic position, and health risk behaviours. In the final

model, with adjustment also for health indicators and stress from outside the workplace, the hazard ratios for high strain jobs (i.e. high psychological demands in combination with low decision latitude) were 1.5 in men (95 % CI, 1.04–2.0) and 1.7 in women (95 % CI, 1.3–2.2). Stratifying for health at baseline showed that high strain tended to affect healthy but not unhealthy men, while this pattern was reversed in women.

Conclusions High psychological demands, low decision latitude, and job strain were all confirmed as independent risk factors for subsequent disability pensions. In order to increase chances of individuals remaining in the work force, interventions against these adverse psychosocial factors appear worthwhile.

Keywords Disability leave · Stress, physiological · Stress, psychological · Gender · Longitudinal studies

Introduction

In 2008, more than half a million Swedish people, representing 9 % of the population aged between 19 and 64, were paid full or partial disability pension benefits (Swedish Social Insurance Agency 2010). Similar figures, ranging from 4.6 % to 12.4 % of the population, were reported from other industrialised countries (Stattin 2005). Since a demographic change in the Western world has seen a decreasing proportion of the population having to provide for all (SHARE 2009), attempts to reduce both marginalisation in the labour market and costs for disability pension benefits have become increasingly important for the political agenda (Börsch-Supan et al. 2009; Sundquist et al. 2007). Measures intended to restrict access to disability pension benefits are currently being implemented in

C. Canivet (✉) · M. Moghaddassi · P.-O. Östergren
Division of Social Medicine and Global Health,
Department of Clinical Sciences Malmö, Malmö University
Hospital, Lund University, 205 02 Malmö, Sweden
e-mail: Catarina.canivet@med.lu.se

B. Choi
Center for Occupational and Environment Health,
University of California, Irvine, CA, USA

R. Karasek
Department of Work Environment,
University of Massachusetts, Lowell, MA, USA

C. Staland-Nyman
Unit of Social Medicine, Department of Public Health
and Community Medicine, University of Gothenburg,
Gothenburg, Sweden

Sweden (Government Offices of Sweden 2010) and discussed in other contexts (Börsch-Supan et al. 2009; OECD 2003). A Norwegian attempt to tighten eligibility criteria for disability benefits has mostly affected women, people with little formal education, and those with 'medically imprecise' diagnoses (Claussen 1998). Even if regulations regarding disability pensions vary considerably across countries and over time, poor health remains the prime factor in the granting of such pensions (Gjesdal et al. 2004, 2009; Hult et al. 2010). Hence, in order to reduce societal costs for disabilities and prevent the marginalisation of individuals, it would be useful to identify the health-related mechanisms causing a person to prematurely leave the labour market.

One such factor may involve work-related stress, which has been connected to the development of musculoskeletal (Bongers et al. 1993; Östergren et al. 2005), psychiatric (Stansfeld and Candy 2006), and cardiovascular (Belkic et al. 2004; Kivimäki et al. 2006) disease. The three also comprise the most common diagnostic groups that account for retirement on grounds of ill health (Alexanderson and Norlund 2004). Poor health may thus constitute the intermediate step in the pathway from work stress to disability for those who are healthy at the outset. It has been hypothesised that on-the-job stress may lead to poor health in at least two ways: indirectly by boosting such behaviours as smoking or lack of exercise (Smith et al. 2008); and directly by neuroendocrine stress responses (Chandola et al. 2010). Furthermore, the likelihood of being awarded a disability pension for a worker with health problems (from whatever cause) may depend on his or her level of work stress. For example, work stress may exacerbate (rather than cause) an employee's existing health problems and increase the possibility that a worker will leave the labour market because of a disability. This would constitute a dual role for job strain's effect on disability: it both causes health problems in those who are healthy at the outset and mediates the path from health problems to disability in those with pre-existing health conditions.

Longitudinal studies assessing work-related stress exposures and the granting of disability pensions as the outcome are rare. Those undertaken have shown positive associations between the award of disability pension and 'mentally strenuous work', as in a Finnish study by Krause et al. (1997) and with low job control (studies from Denmark and Norway) (Krokstad et al. 2002; Claussen and Dalgard 2009; Friis et al. 2008; Christensen et al. 2008). However, to our knowledge, only two studies have employed the Job Content Questionnaire (JCQ) in this context. The JCQ is based on the demand-control (or job strain) model developed by Karasek (1979). Stattin and Järholm (2005) followed a large cohort of Swedish construction workers for a decade. In accordance with the job

strain model, the risk of being granted a disability pension escalated steeply in situations marked by high psychological demands and low control at work. However, this study took place from 1971 to 1992, that is, before the economic crisis of the 1990 s. We are not aware of any recent Swedish examinations correlating work-related stress with disability pensions. In the second study, using the JCQ (Laine et al. 2009) over 25,000 Finnish public sector employees participated. Job strain at baseline was associated with twice the risk of being granted a disability pension by the time of follow-up in 2005.

The aim of the present study was to investigate whether 'job strain', and its components 'psychological demands' and 'decision latitude', influenced disability pension rates over a 12-year follow-up period. Several sociodemographic and lifestyle-related variables, such as age, socioeconomic position, obesity, and smoking, have been linked to subsequent disability pensions (Allebeck and Mastekaasa 2004) and were accounted for in the analyses. In most countries, women are under-represented in contributory disability programmes; the opposite is true in the Nordic countries, which have a high level of female employment (Stattin 2005). Risk patterns have been shown to vary by gender with regard to physiological disease markers (Straface et al. 2010), occurrence of disease (Östergren et al. 2005), and societal factors behind disability pension awards (Gjesdal et al. 2004). Therefore, analyses were stratified by gender. In order to establish whether job strain played a role in determining whether poor health led to disability pension or not, we also performed a separate analysis with stratification for health status at baseline.

Methods

Participants and procedure

The cohort, from the Malmö Shoulder and Neck Study (MSNS) (Östergren et al. 2005), is composed of men and women who were aged between 45 and 65 in 1991. The subjects all resided in the city of Malmö (240,000 inhabitants) and were recruited into the larger Malmö Diet and Cancer Study (MDCS) (Manjer et al. 2001) from February 1992 to December 1994 ($n = 14,555$). The participation rate of the MDCS was 41 %. It consisted of a baseline questionnaire, anthropometric testing, and blood samples. All participants were followed until the awarding of a disability pension, emigration, death, or the termination of the study on December 31, 2005. The end point for each individual in the study was obtained through record linkage with the Swedish Social Insurance Agency (Försäkringskassan), which also supplied information on the principal diagnoses justifying disability pensions, the Cause-of-

Death Register maintained by the Centre for Epidemiology at The National Board of Health and Welfare (Socialstyrelsen), and the Total Population Register at Statistics Sweden (Statistiska centralbyrån).

Participants in the study had to be employed and vocationally active, working a minimum of 30 h a week, under 65 years old (the conventional retirement age in Sweden), and must not have previously received a disability pension. Those on sick leave at baseline must have returned to work in less than a year. All criteria were fulfilled by 6,675 individuals. Others who were excluded lacked complete data ($n = 147$) regarding the following variables: psychological job demands and decision latitude; neck, shoulder, or lumbar pain; 'other somatic disorder'; smoking; alcohol consumption; body mass index (BMI); self-rated health; and stress from outside the workplace. Thus, the study population consisted of 6,540 individuals (3,181 men and 3,359 women), representing 58,215 person-years. Ninety-five per cent of the participants (data missing in 3 % of cases) had worked three years or more at their present location.

In order to acquire an approximation of the later evolution of the work situation for the cohort, data from a follow-up study (Choi et al. 2011) were used. This inquiry was filled in by 82 % of the participants after about 1 year, and the following categories were registered: 'low-low' (low strain at both measurements), 'high-low', 'low-high', and 'high-high'.

The study was approved by the Research Ethics Committee of Lund University.

Outcome

Disability pensions in Sweden may be granted for 25, 50, 75, or 100 % of full-time employment. Changing levels over time is common; a person on a 50 % disability pension may go on full-time sick leave and eventually be granted a full disability pension, etc. For the purpose of our study, we considered any level of acquired disability pension as a 'case of disability pension'. Until recently, a person in Sweden could be granted a disability pension temporarily or permanently, with the former almost invariably resulting in the latter. In the present study, 983 people were granted permanent disability pensions immediately, while 98 cases were preceded by a temporary pension. When the follow-up ended, 43 people were receiving temporary disability pensions. We chose to identify all these ($n = 1,124$) as 'cases of disability pension'. The outcome is thus the first event of any partial or full-time disability pension, whether temporary or permanent.

Work-related variables

Occupational class was categorised according to job title and work tasks, using the socioeconomic index (SEI)

manual issued by Statistics Sweden (1982). Three groups were established: 'upper non-manual' (consisting of 'high' and 'middle' non-manual positions), 'lower non-manual', and 'manual.'

Following the demand-control model, a job strain situation was defined as a combination of high psychological demands and low decision latitude (Karasek 1979). These variables were assessed by eleven items adapted (Karasek et al. 2007) from the JCQ (Karasek 1979; Theorell et al. 1991). Quartiles of psychological demands and decision latitude were created by using means, and means $\pm 0.67 \times$ SD, as cut-off points. Thus, each individual received a score of 1-4 in psychological demands and decision latitude, resulting in a sixteen-cell distribution (Fig. 1) with 5 possible combinations of these variables. This resulted in five 'job types': (a) low strain (low psychological demands combined with high decision latitude), (b) active (high demands and high decision latitude), (c) passive (low demands and low decision latitude), (d) high strain (high demands and low decision latitude), and (e) mixed. The 6 questions regarding job support received from supervisors and co-workers from the Swedish version of the Job Content Questionnaire (Theorell et al. 1991) were also included, and this variable was dichotomised into high and low job support at the median.

Other baseline characteristics

Age was used as a continuous variable in all of the multivariate analyses. Country of origin was dichotomized into individuals born in Sweden as opposed to born in other countries. Marital status was recorded as married and/or cohabiting or not. Those who affirmed smoking regularly were classified as smokers; all others were considered non-smokers. Use of alcohol was quantified by answers concerning consumption volume during the previous month. The resulting figures were adjusted by gender and categorised by the quantity-frequency method (Armor and

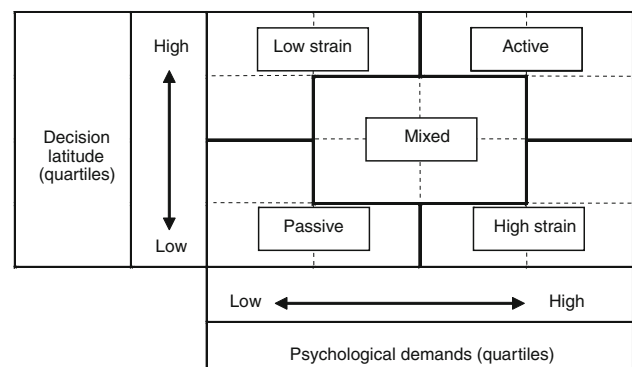


Fig. 1 Job type, according to combined quartiles of psychological job demands and decision latitude

Polich 1982; Isacson et al. 1987) into two groups: 'low-/medium-risk' and 'high-risk' alcohol consumption. Obesity was defined as having a BMI of 30 or more at baseline.

A modified version (Östergren et al. 2005) of the Standardised Nordic Questionnaire (SNQ) (Kuorinka et al. 1987) was used to assess neck, shoulder, and/or lumbar pain experienced 'often' or 'all the time'. Furthermore, subjects were asked to indicate by yes/no answers whether they were or had been afflicted by any of the following diseases: myocardial infarction, stroke, claudication, diabetes of 5 years duration or more, cancer of less than 5 years duration, rheumatoid arthritis, asthma/chronic bronchitis, or inflammatory bowel disease. All persons with an affirmative answer were classified as having 'other somatic disorder'.

Self-rated health (Kaplan and Camacho 1983) was assessed by the question 'How do you feel right now, physically and emotionally, if you consider your health and your general well-being?' The reply alternatives ranged from 1 to 7, with the extremes spelled out as (1) '(I am) feeling very good, could not feel better' and (7) 'feeling very bad, could not feel worse'. The answers were dichotomised into poor (1–3) and medium/good (4–7).

As a measure of psychological distress that was not work-related, a yes/no answer to the following question was used: 'Lately, have you felt under stress or psychological pressure due to problems or demands outside the workplace?'

Statistical analyses

Survival curves are presented to graphically illustrate the proportion of disability pension cases by age-adjusted levels of psychological demands, decision latitude, and 'job type, according to combinations of demands and decision latitude'. Hazard ratios (HR) according to the Cox regression model were calculated to analyse associations between the different variables and new awards of disability pensions. Table 3 shows different levels of demands and decision latitude; and five 'job types' tested against disability pension awards, with potential confounders constituting three models of adjustment subsequently added: (A) age plus socioeconomic status; (B) A plus health risk behaviour (i.e. smoking, high-risk alcohol consumption, and obesity); and (C) B plus health indicators ('neck, shoulder, or lumbar pain', 'other somatic disorder', poor self-rated health), and 'stress from outside the workplace'. Finally, a multivariate analysis was performed (Table 4), in which the high strain variable (yes/no) was tested against disability awards, with results stratified by health status at baseline.

All analyses are reported separately by gender. A standard statistical analysis programme (SPSS version 17.0) was used.

Results

Background variables and new cases of disability pensions are presented in Table 1. Most measures differed by gender. By the end of the follow-up period, 19.8 % of the women and 14.5 % of the men had been granted a disability pension. The main diagnoses behind the disability pension awards were, for men and women, musculoskeletal disease (36 and 41 %), psychiatric disease (11 and 19 %), circulatory disease (18 and 6 %), and other injuries and diseases (31 and 29 %), respectively. Data were lacking for 4 % of the men and for 5 % of the women in the sample.

Table 2 shows that the following variables were significantly associated with receiving disability pensions for both genders: age, non-Swedish origin, low socioeconomic status, daily smoking, obesity, experiencing stress from outside the workplace, reporting low job support, poor self-rated health, suffering from neck, shoulder, or lumbar pain, and having an 'other somatic disorder'. High-risk drinking was not associated with receiving a disability pension. As for work characteristics, high job demands and low decision latitude were associated with disability pensions in both men and women. A graphic representation of this is seen in the upper part of Fig. 2, which displays the age-adjusted survival curves for disability pensions by levels of psychological demand and decision latitude.

'High strain' (i.e. high psychological demands in combination with low decision latitude) in the workplace was associated with being granted disability pensions in both genders: the HRs in men were 2.7 (95 % CI, 2.0–3.8) and in women 2.4 (1.8–3.1). The corresponding graphic view is presented in the lower part of Fig. 2.

Table 3 shows changes in the hazard ratios for demands, decision latitude, and 'job type' on the one hand, and disability pensions on the other, when potential confounders are added step by step. Adjustment for socioeconomic position and health risk behaviour only marginally affected the HRs for high demands. In the final model, in which adjustment was also made for health indicators, the HR was 1.4 in men (1.05–1.8) and 1.5 in women (1.2–1.8).

The age-adjusted HR for the lowest quartile of decision latitude decreased to 1.4 in men (1.1–1.9) and 1.4 in women (1.1–1.8), after adjustment for socioeconomic position. Further adjustment for health risk behaviour did not alter these HRs, but in the full model, which included adjustment for health indicators, the HR decreased to 1.3 in men (0.9–1.7) and 1.2 in women (CI, 0.96–1.6).

The HR for 'high strain' remained at 1.9 in men (1.4–2.7) and 2.1 in women (1.6–2.7), after adjustment for age, socioeconomic position, and health risk behaviour. In the final step, following the additional adjustment for health indicators, the HR decreased to 1.5 in men (1.04–2.1) and 1.7 in women (1.3–2.2).

Table 1 Baseline variables and new cases of disability pension awards 1992–2005 in a cohort of middle-aged vocationally active men ($n = 3,181$) and women ($n = 3,359$)

	Men		Women		<i>p</i> value for difference between men and women
	Ns	%	Ns	%	
<i>Sociodemographic background factors</i>					
<i>Age</i>					
45–49	608	19.1	700	20.8	0.033
50–54	1,143	35.9	1,266	37.7	
55–59	961	30.2	951	28.3	
60–64	469	14.7	442	13.2	
Total	3,181	100.0	3,359	100.0	
<i>Country of birth</i>					
Sweden	2,837	89.2	3,003	90.3	0.153
Other	342	10.8	325	9.7	
<i>Married/cohabiting</i>					
Yes	2,590	81.5	2,254	67.1	<0.001
No	587	18.5	1,104	32.9	
<i>Socioeconomic status</i>					
Non-manual, high + middle	1,611	50.6	1,215	36.2	<0.001
Non-manual, low	522	16.4	1,145	34.1	
Manual	1,048	32.9	999	29.7	
<i>Health risk behaviour</i>					
<i>Daily smoking</i>					
No	2,439	76.7	2,488	74.1	0.015
Yes	742	23.3	871	25.9	
<i>Alcohol consumption</i>					
Low/medium risk	2,342	73.6	3,001	89.3	<0.001
High risk	839	26.4	358	10.7	
<i>Obese, BMI ≥ 30</i>					
No	2,837	89.2	3,008	89.6	0.659
Yes	344	10.8	351	10.4	
<i>Health indicators</i>					
<i>Self-rated health</i>					
Good/medium	2,539	79.8	2,501	74.5	<0.001
Poor	642	20.2	858	25.5	
<i>Neck, shoulder, or lumbar pain</i>					
No	2,412	75.8	2,149	64.0	<0.001
Yes	769	24.2	1,210	36.0	
<i>Other somatic disorder</i>					
No	2,939	92.4	3,163	94.2	0.005
Yes	242	7.6	196	6.7	
<i>Stress from outside the workplace</i>					
No	2,377	74.7	2,167	64.5	<0.001
Yes	804	25.3	1,192	35.5	

Table 1 continued

	Men		Women		<i>p</i> value for difference between men and women
	Ns	%	Ns	%	
<i>Work characteristics</i>					
<i>Demands, quartiles</i>					
Lowest	736	23.1	965	28.7	<0.001
	687	21.6	707	21.0	
	898	28.2	848	25.2	
Highest	860	27.0	839	25.0	
<i>Decision latitude, quartiles</i>					
Highest	974	30.6	570	17.0	<0.001
	1,044	32.8	998	29.7	
	635	20.0	836	24.9	
Lowest	528	16.6	955	28.4	
<i>Job type, according to combinations of demands and decision latitude</i>					
Low strain	624	19.6	556	16.6	<0.001
Passive	419	13.2	712	21.2	
Active	857	26.9	566	16.9	
High strain	416	13.1	655	19.5	
Mixed	865	27.2	870	25.9	
<i>Low job support</i>					
No	1,456	46.3	1,691	50.9	<0.001
Yes	1,688	53.7	1,630	49.1	
<i>New cases of disability pension</i>					
No	460	14.5	664	19.8	<0.001
Yes	2,721	85.5	2,695	80.2	
<i>Malmö shoulder neck study</i>					

In men, ‘passive’ jobs also entailed a higher probability of receiving a disability pension (see Table 2); however, after adjustment for socioeconomic position, this HR decreased sharply and the association was no longer statistically significant. In women, ‘active’ jobs resulted in an age-adjusted HR of 1.6 (1.2–2.1; Table 2). Again, the HR decreased after adjustment for potential confounders, as shown in Table 3, resulting in a final HR of 1.4 (1.03–1.8).

Poor health at baseline was expected to lead to high disability pension rates, and this was confirmed in the results. Thus, unfavourable scores in the three variables describing health at baseline (self-rated health; neck, shoulder, or lumbar pain; and other somatic disorder) were related to subsequently receiving a disability pension, as was the compound variable ‘poor health at baseline’ (one or more negative scores in any of those). The age-adjusted HR for poor health at baseline was 3.2 in men (2.6–3.8) and 2.3 in women (1.9–2.7; data not shown in table). In order to disentangle how high job strain affected populations with different health status at baseline, a stratified approach was

Table 2 Cumulative incidences and age-adjusted hazard ratios with 95 % confidence intervals for background variables and new cases of disability pension awards 1992–2005 in a cohort of middle-aged vocationally active men ($n = 3,181$) and women ($n = 3,359$)

	Men			Women		
	N of cases	%	HR (95 % CI)	N of cases	%	HR (95 % CI)
<i>Sociodemographic background factors</i>						
Age						
45–49	86	14.1	1	163	23.3	1
50–54	184	16.1	1.2 (0.97–1.6)	306	24.2	1.2 (0.96–1.4)
55–59	164	17.1	2.5 (1.9–3.4)	161	16.9	1.6 (1.3–2.0)
60–64	26	5.5	2.3 (1.4–3.6)	34	7.7	2.5 (1.7–3.7)
Total	460	14.5		664	19.8	
Country of birth						
Sweden	372	13.1	1	584	19.3	1
Other	88	25.7	2.1 (1.6–2.6)	80	24.6	1.4 (1.1–1.7)
Married/cohabiting						
Yes	364	14.1	1	449	19.9	1
No	96	16.4	1.2 (0.9–1.4)	215	19.5	1.0 (0.9–1.2)
Socioeconomic status						
Non-manual, high + middle	154	9.6	1	202	16.6	1
Non-manual, low	64	12.3	1.3 (0.97–1.7)	167	14.6	0.9 (0.7–1.1)
Manual	242	23.1	2.6 (2.1–3.2)	295	29.5	2.0 (1.7–2.5)
<i>Health risk behaviour</i>						
Daily smoking						
No	313	12.8	1	454	18.2	1
Yes	147	19.8	1.6 (1.3–2.0)	210	24.1	1.3 (1.1–1.6)
Alcohol consumption						
Low/medium risk	330	14.1	1	596	19.9	1
High risk	130	15.5	1.1 (0.9–1.3)	68	19.0	0.9 (0.7–1.1)
Obese, BMI ≥ 30						
No	385	13.6	1	571	19.0	1
Yes	75	21.8	1.7 (1.3–2.2)	93	26.5	1.6 (1.3–2.0)
<i>Health indicators</i>						
Self-rated health						
Good/medium	285	11.2	1	409	16.4	1
Poor	175	27.3	2.7 (2.2–3.3)	255	29.7	2.0 (1.7–2.3)
Neck, shoulder, or lumbar pain						
No	254	10.5	1	327	15.2	1
Yes	206	26.8	2.8 (2.3–3.4)	337	27.9	2.0 (1.7–2.4)
Other somatic disorder						
No	397	13.5	1	597	18.9	1
Yes	63	26.0	2.4 (1.8–3.2)	67	34.2	2.3 (1.8–3.0)
Stress from outside the workplace						
No	303	12.7	1	389	18.0	1
Yes	157	19.5	1.6 (1.3–1.9)	275	23.1	1.3 (1.1–1.5)
<i>Work characteristics</i>						
Demands, quartiles						
Lowest	80	10.9	1	152	15.8	1
	84	12.2	1.1 (0.8–1.5)	119	16.8	1.1 (0.8–1.3)
	145	16.1	1.5 (1.2–2.0)	167	19.7	1.3 (1.0–1.6)
Highest	151	17.6	1.7 (1.3–2.2)	226	26.9	1.8 (1.5–2.2)

Table 2 continued

	Men			Women		
	N of cases	%	HR (95 % CI)	N of cases	%	HR (95 % CI)
Decision latitude, quartiles						
Highest	108	11.1	1	94	16.5	1
	138	13.2	1.2 (0.9–1.5)	181	18.1	1.2 (0.9–1.6)
	93	14.6	1.4 (1.1–1.8)	169	20.2	1.3 (1.05–1.7)
Lowest	121	22.9	2.3 (1.7–2.9)	220	23.0	1.6 (1.3–2.0)
Job type, according to combinations of demands and decision latitude						
Low strain	59	9.5	1	76	13.7	1
Passive	64	15.3	1.8 (1.2–2.5)	120	16.9	1.3 (0.99–1.8)
Active	116	13.5	1.5 (1.1–2.0)	119	21.0	1.6 (1.2–2.1)
High strain	96	23.1	2.7 (2.0–3.8)	187	28.5	2.4 (1.8–3.1)
Mixed	125	14.5	1.6 (1.2–2.2)	162	18.6	1.4 (1.1–1.9)
Low job support						
No	181	12.4	1	304	18.0	1
Yes	268	15.9	1.3 (1.1–1.6)	353	21.7	1.2 (1.03–1.4)

Malmö shoulder neck study

tried in Table 4. In men who were healthy at baseline, high strain was associated with an HR of 1.5, but the association did not reach statistical significance (0.996–2.3). Unhealthy men exposed to job strain had the same disability pension rates as those who were not exposed to job strain. Such was also the case for women who were healthy at baseline. However, in women who were unhealthy at baseline, high strain led to a higher HR than in those ‘unhealthy’ women who did not suffer from high strain; the HR was 1.6 (1.3–2.0) in the high strain group. These HRs are adjusted for age, socioeconomic status, stress from outside the workplace, smoking, alcohol habits, and obesity.

Of the 5,363 people who also participated in the follow-up study, 74 % continued to report low strain; 6 % changed from high to low; 10 % from low to high; and 9 % declared high strain at both times.

Discussion

Main findings and possible mechanisms

A disability pension was granted more often to persons with high job strain at baseline, even after adjustment for potential confounders, than to persons with low strain. Psychological demands and decision latitude were also tested separately. The elevated likelihood associated with low decision latitude decreased when adjustment was made for socioeconomic position, while the greater probability associated with high demands was more stable. Stratifying for health at baseline showed that high strain tended to

affect healthy but not unhealthy men, while this pattern was reversed in women.

Musculoskeletal morbidity has been linked to low decision latitude, although the mechanisms at work may be somewhat dependent on physical work conditions (Punnett et al. 2009). Adjusting for socioeconomic status decreased the strength of the association between low decision latitude and disability pension in the present study and thus may reflect confounding. By contrast, time pressure and other indicators of high demands have well-documented effects on cardiovascular disease and mental health (Punnett et al. 2009), agreeing with our findings that high demands are a more stable predictor of disability pension than decision latitude.

As outlined in the Introduction, adverse working conditions may produce neuroendocrine stress responses in an individual and thus cause or aggravate disease. A stressful work environment may also cause poor health indirectly by promoting smoking and other negative lifestyle habits. We found support for the first pathway, but not for the second. A diagnosis confirming the presence of a disease responsible for partial or complete incapacity to work is mandatory for a disability pension to be awarded. However, the award of a disability pension rests upon an administrative decision. Although it is based on a medical diagnosis, a disability pension is not the automatic consequence of a specific medical condition. Therefore, hypotheses that link adverse working conditions to disability pensions need to be broadly based. According to the allostatic load (AL) model, when stress occurs repeatedly, the body experiences wear-and-tear due to over-activation. Over time, this causes

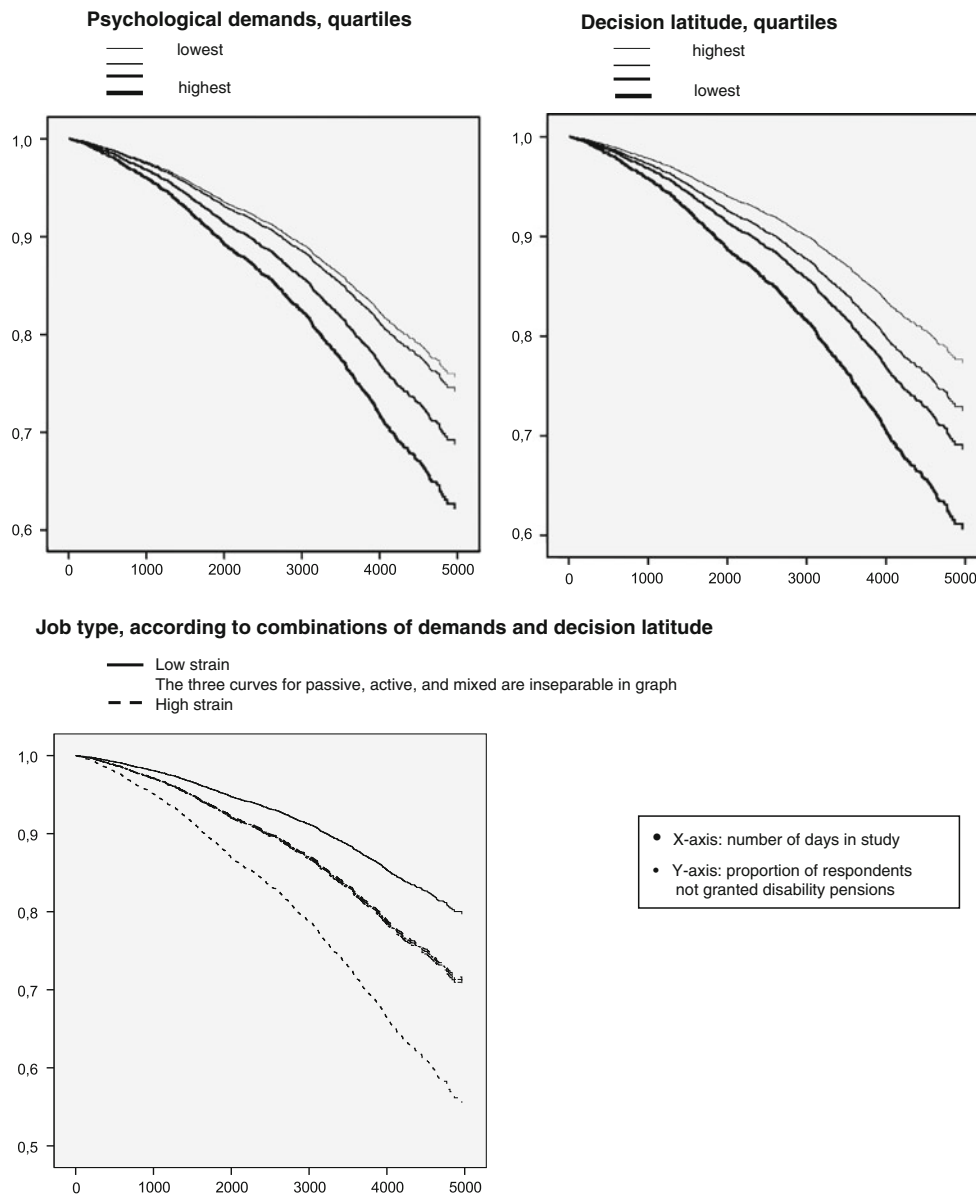


Fig. 2 Age-adjusted survival curves for disability pensions by levels of psychological job demands, decision latitude, and ‘job type’ (according to combinations of these two)

imbalance in the sympathetic–adrenal–medullary axis, the hypothalamic–pituitary–adrenal axis, and other stress-sensitive systems. In an intermediate stage, there are pathological levels of several biological indicators (a high ‘AL index’), which in turn has been shown to predict numerous diseases (Gallo et al. 2011). Support for such a pathway being involved in the framework of work-related stress has been found in a number of studies (Gallo et al. 2011; Bellingrath et al. 2009; Chandola et al. 2006). On the other hand, the stress-recovery theory suggests that not only incessant stress stimulation but also insufficient restitution, such as provided by rest, recreation, and sleep, may contribute to a progression of initially reversible psychophysiological reactions of acute stress into

multi-system imbalances and subsequent ill health (Geurts and Sonnentag 2006). High demands, low control, or both, could thus lead to less ‘internal recovery’ during the workday if they decrease the opportunity of taking short breaks. In a recent study with a 1-year time lag, there were significant negative effects of job demands and control on sleep—the supreme recovery activity (de Lange et al. 2009). Summing up, this pathway would lead directly from job strain to deterioration of health. In our study, this may have been the course taken by those men initially in good health who were exposed to job strain, and who subsequently tended to become disability pensioners to a greater degree than those not experiencing such exposure (see Table 4).

Table 3 Hazard ratios and 95 % confidence intervals for subsequent disability pensions awarded for job strain and its elements

	A Age + Socioeconomic position		B* A + Health risk behaviour		C** B + Health indicators and stress from outside the workplace	
	Men	Women	Men	Women	Men	Women
Demands, quartiles						
Lowest	1	1	1	1	1	1
	1.1 (0.8–1.5)	1.0 (0.8–1.3)	1.1 (0.8–1.5)	1.0 (0.8–1.3)	1.1 (0.8–1.5)	1.0 (0.8–1.2)
	1.5 (1.1–2.0)	1.2 (1.0–1.6)	1.5 (1.2–2.0)	1.2 (1.0–1.5)	1.4 (1.1–1.9)	1.1 (0.9–1.4)
Highest	1.7 (1.3–2.3)	1.8 (1.5–2.2)	1.7 (1.3–2.2)	1.8 (1.5–2.2)	1.4 (1.05–1.8)	1.5 (1.2–1.8)
Decision latitude, quartiles						
Highest	1	1	1	1	1	1
	1.0 (0.8–1.3)	1.1 (0.9–1.4)	1.0 (0.8–1.3)	1.1 (0.8–1.4)	1.0 (0.8–1.3)	1.0 (0.8–1.3)
	1.1 (0.8–1.4)	1.2 (0.9–1.5)	1.1 (0.8–1.4)	1.2 (0.9–1.5)	1.0 (0.7–1.3)	1.0 (0.8–1.4)
Lowest	1.4 (1.1–1.9)	1.4 (1.1–1.8)	1.4 (1.1–1.9)	1.4 (1.1–1.8)	1.3 (0.9–1.7)	1.2 (0.96–1.6)
Job type, according to combinations of demands and decision latitude						
Low strain	1	1	1	1	1	1
Passive	1.3 (0.9–1.9)	1.2 (0.9–1.6)	1.4 (0.9–2.0)	1.2 (0.9–1.6)	1.2 (0.9–1.8)	1.1 (0.8–1.5)
Active	1.6 (1.1–2.1)	1.6 (1.2–2.2)	1.6 (1.2–2.2)	1.6 (1.2–2.2)	1.3 (0.97–1.8)	1.4 (1.03–1.8)
High strain	1.9 (1.4–2.7)	2.1 (1.6–2.7)	1.9 (1.4–2.7)	2.1 (1.6–2.7)	1.5 (1.04–2.0)	1.7 (1.3–2.2)
Mixed	1.4 (0.99–1.9)	1.3 (1.01–1.7)	1.4 (1.01–1.9)	1.3 (0.98–1.7)	1.3 (0.9–1.7)	1.1 (0.8–1.5)

Calculated in a cohort of middle-aged vocationally active men ($n = 3,181$) and women ($n = 3,359$). Malmö shoulder neck study

* In addition to age and socioeconomic position, hazard ratios adjusted for smoking status, alcohol consumption, and obesity at baseline

** In addition to age, socioeconomic position, and health risk behaviour, hazard ratios adjusted for health indicators (neck, shoulder, or lumbar pain; other somatic disorder; and self-rated health status), and stress from outside the workplace

However, job strain may also affect the inclination of a person in poor health to apply for a disability pension. After a prolonged period of sick leave, a successful rehabilitation and return to work could appear as a much less realistic a goal for a person subjected to adverse working conditions. Such an appraisal may be done by physicians and social security staff responsible for decisions about disability, as well as by the individual worker involved. A mechanism of this sort was corroborated by a recent study where high job strain remained a significant independent predictor for a delayed return to work after acute coronary syndrome, even after controlling for depressive symptoms (Fukuoka et al. 2009). In another study, job strain was related to significantly higher odds ratios for disbelieving in the possibility of influencing one's own health (Ali and Lindström 2008). In the present study, this trajectory may have been taken by those women who were in poor health at the inception of the study, and who were more likely to receive a disability pension if they were exposed to job strain (see Table 4). It is of course also possible that their medical condition was directly worsened by the stress mechanisms discussed in the previous paragraph.

These gender differences are not easy to explain, and although they can neither be confirmed nor denied from our results, some hypotheses suggest themselves. Experiencing

job strain may be more harmful to an otherwise healthy man if he identifies himself with the social construct of masculinity described as 'the strong, silent type', that is, someone who maintains control at all costs, ignoring pain and suppressing his emotions (Emslie et al. 2006). This may be exhibited by responding promptly to increasing demands (even unreasonable ones) from an employer and may ultimately be at the expense of an employee's health. Women may feel less pressure in this domain and thus tend to protect themselves from being tasked excessively. However, in our study, this tentative explanation would only hold true for women who were in good health.

Women in poor health when the study began—approximately half of all women in our cohort—were awarded disability pensions more often if they were exposed to job strain. At a first glance, this seems to corroborate the second pathway suggested above, that job strain somehow modulates the step from poor health to disability pension. However, the mechanism at hand may in fact be the first one, that is, job strain leading directly to poor health, although this scenario may have occurred prior to measurement. In either case, it is difficult to understand why 'unhealthy' men would seem more impervious to job strain. At baseline, more women than men reported suffering both from poor health and being exposed to job strain, a fact that would yield more statistical power in the

Table 4 Multivariate analysis of hazard ratios and 95 % confidence intervals for subsequent disability pensions awarded, with exposure variables adjusted for age and for each other

	Men		Women	
	Healthy at baseline (<i>n</i> = 1,934)	Unhealthy at baseline (<i>n</i> = 1,247)	Healthy at baseline (<i>n</i> = 1,675)	Unhealthy at baseline (<i>n</i> = 1,684)
High strain				
No	1	1	1	1
Yes	1.5 (0.996–2.3)	1.1 (0.9–1.5)	1.0 (0.7–1.5)	1.6 (1.3–2.0)
Socioeconomic status				
Non-manual (high + middle)	1	1	1	1
Non-manual (low)	1.1 (0.7–1.8)	1.4 (0.99–2.0)	0.6 (0.4–0.9)	0.9 (0.7–1.2)
Manual	2.5 (1.8–3.6)	2.1 (1.6–2.8)	1.7 (1.3–2.3)	1.8 (1.4–2.2)
Stress from outside the workplace				
No	1	1	1	1
Yes	1.6 (1.1–2.3)	1.2 (0.96–1.5)	1.2 (0.9–1.6)	1.1 (0.9–1.3)
Daily smoking				
No	1	1	1	1
Yes	1.5 (1.05–2.1)	1.4 (1.1–1.8)	1.4 (1.06–1.9)	1.1 (0.9–1.4)
Alcohol consumption				
Low/medium risk	1	1	1	1
High risk	0.9 (0.7–1.3)	1.1 (0.9–1.4)	0.8 (0.5–1.3)	1.0 (0.8–1.4)
Obese, BMI \geq 30				
No	1	1	1	1
Yes	1.7 (1.1–2.6)	1.5 (1.1–2.0)	1.6 (1.1–2.5)	1.3 (1.02–1.7)

Cohort stratified into 'healthy at baseline', that is, no musculoskeletal pain, other somatic disorder, or poor self-rated health (*n* = 3,609) and 'unhealthy at baseline', that is, one or more of above exposures (*n* = 2,931). Malmö shoulder neck study

group of women. A selection process before baseline, in which people in poor health moved on to occupations having less favourable working conditions, could also have influenced women to a greater extent. Alternatively, one could imagine that a man with health problems may feel relieved of the internal pressure to act as a hero and therefore be less inclined to accept unreasonable demands from an employer, just as a woman in good health might do. This situation would also lead to job strain turning into a factor of less importance in this group.

In an attempt to further elucidate the reasons behind the emerging gender differences, we performed a new multivariate analysis, now adding job support in the final step in the analysis shown in Table 4. The rationale behind this procedure came from the findings of another MSNS sub-cohort. In that study, levels of job support were significantly reduced in female (but not in male) workers during a 1-year follow-up period (Choi et al. 2011). Our study results were not affected by this added variable. However, low job support was marginally associated with pensions in healthy female workers (HR in the full model, 1.26; *p* value, 0.093). This implies that other work-related stressors may be more important than job strain as predictors for disability pension in healthy female workers.

Methodological considerations

Our results may have been biased by selection, misclassification, and confounding. There is a known tendency for greater participation in studies by individuals in more affluent socioeconomic groups. These people tend to be healthier than others (Manjer et al. 2001). A comparison with a public health survey covering 74.6 % of the same age cohort suggests that the MDCS population (see 'Methods'), of which our population comprised a random sub-sample, was selected towards better health than the general population (Manjer et al. 2001). Both these circumstances may have biased the estimated effects towards the null, but there may also be other effects of selection bias due to the participation rate of only 41 %.

The evolution of exposures and confounders in this population during the 12-year follow-up period is largely unknown and constitutes a weakness of this study. However, in the majority of the cohort, psychosocial work characteristics did not change during the year following the baseline assessment, while 6 % reported better working conditions and 10 % worse ones. The cohort was recruited during a period of major political and financial crisis in Sweden, when, among other things, the unemployment rate

increased dramatically from 1.7 % (1990) to 9.4 % (1994) (Choi et al. 2011). It is not unreasonable to assume that over time moving from the non-job strain group to the job strain group would be more likely than the reverse. This would in turn imply a differential exposure misclassification, again biasing the results towards the null.

The methods of measuring sociodemographic data, psychosocial work characteristics, social networks, self-rated health, musculoskeletal symptoms, and 'other somatic disorder' were either self-explanatory or previously well validated. However, the question about 'stress from outside the workplace' has not been validated previously and might be a rough proxy for psychological distress. If such were the case, it would most likely infer non-differential misclassification. In a recent study investigating associations between psychological distress and the five-year probability of receiving a long-term disability pension (Rai et al. 2011), it was found that higher levels of psychological distress at baseline were associated with a greater likelihood of obtaining a disability pension, even after adjustment for self-reported daily pain and the presence of chronic disease at the outset. Our results coincide with these findings: high job strain may account for the origin of some or all of the psychological distress experienced by certain individuals.

As to the outcome, the Swedish Social Insurance Agency, which provides all long-term sick leave and disability pension payments in Sweden, maintains comprehensive records, allowing us access to complete data. The high level (17 %) of disability pensions awarded to those in this study is not surprising in view of the relatively high mean age of the cohort. From 1996 to 2004, the rate at which new disability pensions were granted in Sweden rose steadily from 39,000 to 74,000. As a result, in December 2008, 32 % of all women and 22 % of all men aged 60–64 received a disability allowance (Swedish Social Insurance Agency 2010).

The information on job strain is dependent on self-reporting. Persons having a disease that has not yet manifested itself may project their discomfort and erroneously rate their work as strenuous. Such dependent misclassification may also occur in the case of persons suffering from the kind of non-work-related psychological strain that the question used in our study failed to capture. Finally, so-called negative affectivity may lead to the same scenario. In all of these instances, the magnitude of the associations we investigated would be inflated. However, this issue has been much debated (Bonde 2008), and a recent meta-analysis using populations without common mental disorders at the inception of the study concluded that associations between job strain and subsequent poor mental health could not be explained by response bias (Stansfeld and Candy 2006).

Conclusions

Studies supporting the notion that adverse working conditions are linked to poor health have been accumulating for the past two decades. The present study adds to these by confirming low decision latitude, to a certain extent, and more robustly, high psychological demands and job strain as independent risk factors for receiving a disability pension. Researchers have been unsuccessfully urging policy makers and politicians to take action to diminish stress in the workplace. However, with an ageing population and the need to retain individuals in the labour force longer (as illustrated by raising the qualifying age for pensions), there is even more reason nowadays to keep the work force in good health. Alarming signs of rising stress and deteriorating mental health have also been noted among younger people (Melchior et al. 2007). One may, therefore, seriously question the strategy of simply restricting access to sickness and disability benefits by technical and legal means, rather than addressing adverse psychosocial condition in the workplace and taking action to ameliorate them.

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

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