# 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.

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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

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**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 hours 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 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 to 2.0) and 1.7 in women (95% CI 1.3 to 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.

## INTRODUCTION

In 2008 more than half a million Swedish people, representing 9% of the population between the ages of 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 Sweden (Government Offices of Sweden 2009) 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. 2009; Gjesdal et al. 2004; 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 Järvholm (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, i.e., before the economic crisis of the 1990s. 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 if 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 between 45 and 65 years old 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 endpoint 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 hours 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

percent 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) was used. This inquiry was filled in by 82% of the participants after about one 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 = 1124) 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 ± 0.67 x standard deviations, as cut-off points. Thus, each individual received a score of 1 to 4 in psychological demands and decision latitude, resulting in a sixteen-cell distribution (Fig. 1) with five 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 six 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.

---------- Fig. 1 about here ----------

**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 Polich 1982; Isacsson 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 five years duration or more, cancer of less than five 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 was 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.

---------- Fig. 2 about here ----------

'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% confidence interval 2.0 to 3.8) and in women 2.4 (1.8 to 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 to 1.8) and 1.5 in women (1.2 to 1.8).

The age-adjusted HR for the lowest quartile of decision latitude decreased to 1.4 in men (1.1 to 1.9) and 1.4 in women (1.1 to 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 to 1.7) and 1.2 in women (CI 0.96 to 1.6).

The HR for 'high strain' remained at 1.9 in men (1.4 to 2.7) and 2.1 in women (1.6 to 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 to 2.1) and 1.7 in women (1.3 to 2.2).

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 to 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 to 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; 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 to 3.8) and 2.3 in women (1.9 to 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 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 to 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 to 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 5363 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 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 one-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).

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', i.e., 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, i.e., 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 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 one-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 toward better health than the general population (Manjer et al. 2001). Both these circumstances may have biased the estimated effects toward 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. 2010), 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 ages 60 to 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 aging 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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**Figure captions**

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

**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)

**Table 1** Baseline variables and new cases of disability pension awards 1992–2005 in a cohort of middle-aged vocationally active men (n = 3181) and women (n = 3359). Malmö Shoulder Neck Study

| | | Men | | Women | | P value for difference between men and women |
|---|---|---|---|---|---|---|
| | | Ns | % | Ns | % | |
| ***Sociodemographic background factors*** | | | | | | |
| *Age* | *45–49* | 608 | 19.1 | 700 | 20.8 | 0.033 |
| | *50–54* | 1143 | 35.9 | 1266 | 37.7 | |
| | *55–59* | 961 | 30.2 | 951 | 28.3 | |
| | *60–64* | 469 | 14.7 | 442 | 13.2 | |
| | *Total* | 3181 | 100.0 | 3359 | 100. | |
| *Country of birth* | *Sweden* | 2837 | 89.2 | 3003 | 90.3 | 0.153 |
| | *Other* | 342 | 10.8 | 325 | 9.7 | |
| *Married/cohabiting* | *Yes* | 2590 | 81.5 | 2254 | 67.1 | <0.001 |
| | *No* | 587 | 18.5 | 1104 | 32.9 | |
| *Socioeconomic status* | *Non-manual, high + middle* | 1611 | 50.6 | 1215 | 36.2 | <0.001 |
| | *Non-manual, low* | 522 | 16.4 | 1145 | 34.1 | |
| | *Manual* | 1048 | 32.9 | 999 | 29.7 | |
| ***Health risk behaviour*** | | | | | | |
| *Daily smoking* | *No* | 2439 | 76.7 | 2488 | 74.1 | 0.015 |
| | *Yes* | 742 | 23.3 | 871 | 25.9 | |
| *Alcohol consumption* | *Low/medium risk* | 2342 | 73.6 | 3001 | 89.3 | <0.001 |
| | *High risk* | 839 | 26.4 | 358 | 10.7 | |
| *Obese, BMI ≥ 30* | *No* | 2837 | 89.2 | 3008 | 89.6 | 0.659 |
| | *Yes* | 344 | 10.8 | 351 | 10.4 | |
| ***Health indicators*** | | | | | | |
| *Self-rated health* | *Good/medium* | 2539 | 79.8 | 2501 | 74.5 | <0.001 |
| | *Poor* | 642 | 20.2 | 858 | 25.5 | |
| *Neck, shoulder, or lumbar pain* | *No* | 2412 | 75.8 | 2149 | 64.0 | <0.001 |
| | *Yes* | 769 | 24.2 | 1210 | 36.0 | |
| *Other somatic disorder* | *No* | 2939 | 92.4 | 3163 | 94.2 | 0.005 |
| | *Yes* | 242 | 7.6 | 196 | 6.7 | |
| ***Stress from outside the workplace*** | *No* | 2377 | 74.7 | 2167 | 64.5 | <0.001 |
| | *Yes* | 804 | 25.3 | 1192 | 35.5 | |
| ***Work characteristics*** | | | | | | |
| *Demands, quartiles* | *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 | |
| *Decision latitude, quartiles* | *Highest* | 974 | 30.6 | 570 | 17.0 | <0.001 |
| | | 1044 | 32.8 | 998 | 29.7 | |
| | | 635 | 20.0 | 836 | 24.9 | |
| | *Lowest* | 528 | 16.6 | 955 | 28.4 | |
| *Job type, according to combinations of demands and decision latitude* | *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 | |
| *Low job support* | *No* | 1456 | 46.3 | 1691 | 50.9 | <0.001 |
| | *Yes* | 1688 | 53.7 | 1630 | 49.1 | |
| ***New cases of disability pension*** | *No* | 460 | 14.5 | 664 | 19.8 | <0.001 |
| | *Yes* | 2721 | 85.5 | 2695 | 80.2 | |

**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 = 3181) and women (n = 3359). Malmö Shoulder Neck Study

| | | Men | | | Women | | |
|---|---|---|---|---|---|---|---|
| | | N of cases | % | HR (95% CI) | N of cases | % | HR (95% CI) |
| ***Sociodemographic background factors*** | | | | | | | |
| *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) |
| ***Health risk behaviour*** | | | | | | | |
| *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) |
| ***Health indicators*** | | | | | | | |
| *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) |
| ***Work characteristics*** | | | | | | | |
| *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) |
| *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) |

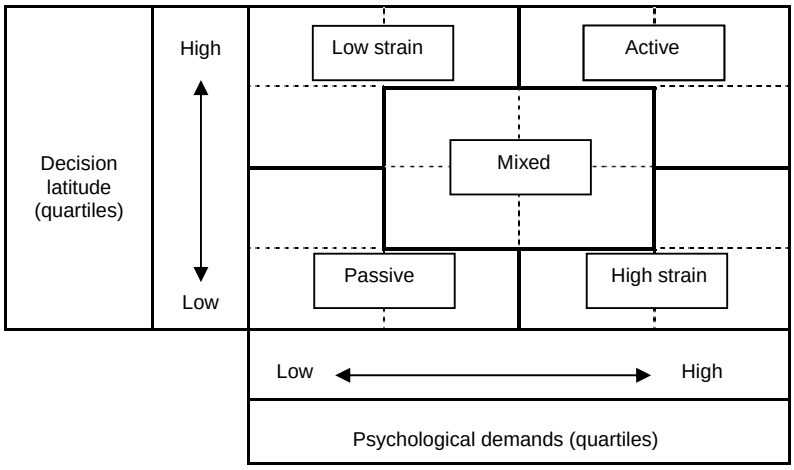
**Table 3** Hazard ratios and 95% Confidence Intervals for subsequent disability pensions awarded for job strain and its elements. Calculated in a cohort of middle-aged vocationally active men (n = 3181) and women (n = 3359). Malmö Shoulder Neck Study.

| | | A<br>Age + Socioeconomic position | | B*<br>A + Health risk behaviour | | C**<br>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) |

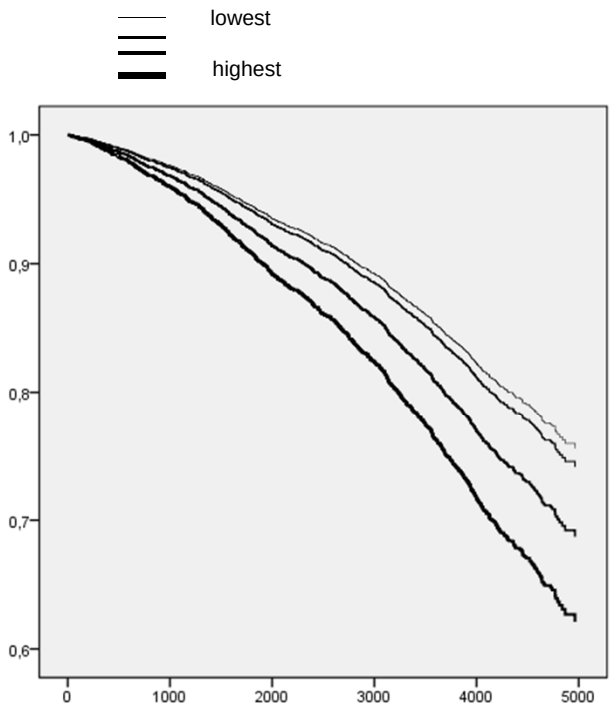
* In addition to age and socioeconomic position, hazard ratios adjusted for smoking status, alcohol consumption, and obesity at baseline.
** In addition to age, socioeconomic position, and health risk behaviour, hazard ratios adjusted for health indicators (neck, shoulder, or lumbar pain; other somatic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

**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. Cohort stratified into 'healthy at baseline', i.e., no musculoskeletal pain, other somatic disorder, or poor self-rated health (n = 3609) and 'unhealthy at baseline', i.e. one or more of above exposures (n = 2931). Malmö Shoulder Neck Study.

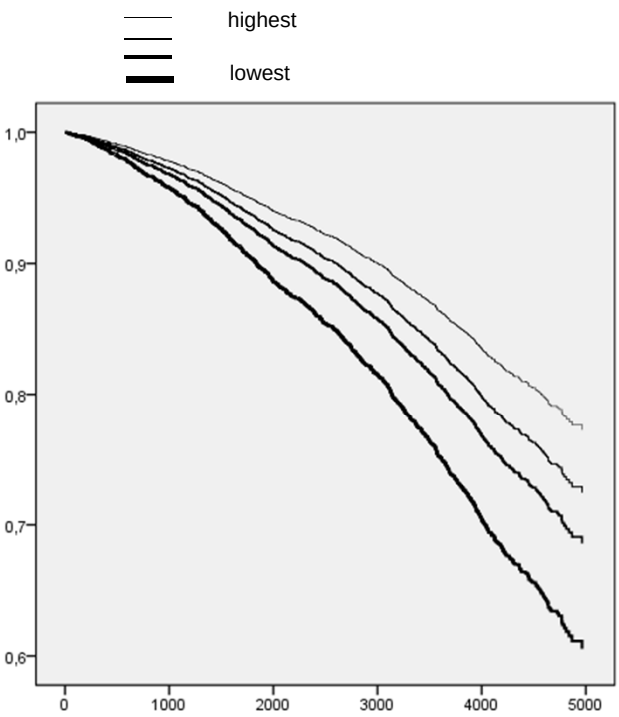
| | | Men | | Women | |
|---|---|---|---|---|---|
| | | Healthy at baseline (n = 1934) | Unhealthy at baseline (n = 1247) | Healthy at baseline (n = 1675) | Unhealthy at baseline (n = 1684) |
| *High strain* | *No* | 1 | 1 | 1 | 1 |
| | *Yes* | 1.5 (0.996–2.3) | 1.1 (0.9–1.5) | 1.0 (0.7–1.5) | 1.6 (1.3–2.0) |
| *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 ≥ 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) |


Decision latitude (quartiles)
High
Low
Low strain
Active
Mixed
Passive
High strain
Low
High
Psychological demands (quartiles)

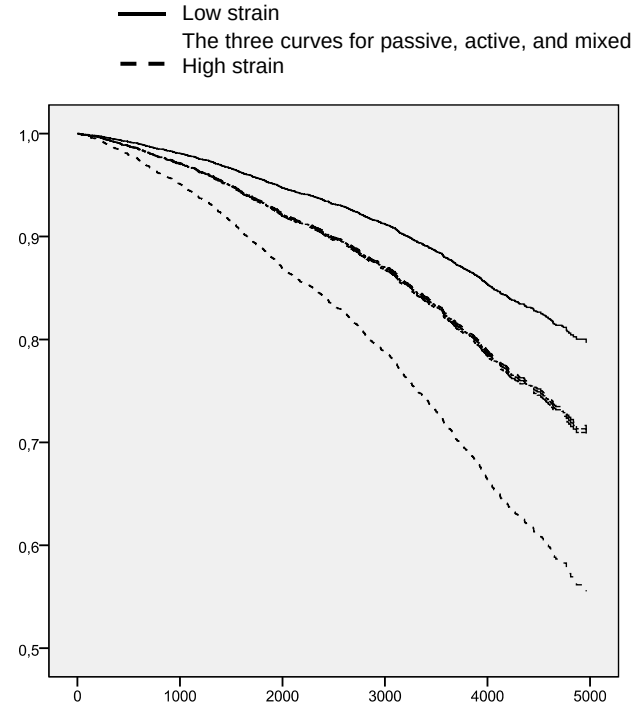
**Psychological demands, quartiles**




**Decision latitude, quartiles**




**Job type, according to combinations of demands and decision latitude**




- X-axis: number of days in study
- Y-axis: proportion of respondents not granted disability pensions