

Work environment and disability pension – an 18-year follow-up study in a Norwegian working population.

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ABSTRACT

Aims: To investigate the associations between work environment indicators and health-related work disability.

Methods: A health survey of 5,749 working 40-42-year-old Norwegians from Nordland County were linked to a national register for disability pension during a follow-up of over 18 years. The risk for disability pension following various self-reported physical and psychosocial work environmental exposures (individual and cumulative) were estimated using Cox regression analysis.

Results

Both cumulative physical and psychosocial work environmental exposures were associated with an increased risk for disability pension, although this association was attenuated for most variables after adjusting for health and education. An increase in five poor psychosocial work environmental exposures was associated with a 22% increased risk for disability (adjusted hazard ratio, aHR, 1.22, 95% CI 1.04-1.44), whereas a similar increase in five poor physical work environmental exposures was associated with a 29% increased risk (aHR, 1.29, 95% CI 1.16-1.44). There were no indications of statistical interaction between either sex or education and work exposures.

Conclusion

People who report a poor work environment are at a higher risk for subsequent work disability. This finding suggests that improving working conditions may be an area of intervention in order to reduce the number of people who leave the labour market with a disability pension.

Key terms: Occupational Health, work disability, work environment, work exposures, epidemiology.

INTRODUCTION

Despite improvements in the general health status of the working-age population, an considerable proportion of the workforce experience health impairments that result in disability pension and labour market exclusion [1]. Several studies have demonstrated considerable differences between occupational groups [2,3] and occupations [4,5] in the risk of receiving medically based disability pension, suggesting that characteristics at the workplace might be of importance. Hence, identification of risk factors at the work place is needed in order to implement interventions aimed at reducing health-related labour market exclusion.

Theories trying to explain how work influences health, often focuses of imbalance of some kind, including the demand-control [6] and the effort-reward [7] model. Heavy physical work [2,8-10], monotonous work [11], whole-body vibrations [12], poor ergonomic work environment [13], work in uncomfortable positions, long working hours, noise at work, and repetitive muscle strain [8], have all been linked to work disability. Additionally, the psychosocial work environment has been studied in relation to work disability, including interpersonal conflicts [11], poor job satisfaction [14], mental job strain, and lack of social support from supervisors [8]. Furthermore, part-time work [2], shift work [15], transition from public to private sector [16], low control [9], low control over working times [17], low skill discretion [18], low decision authority [2,19], low variation in work [11,19], and non-stimulating work [20] have also been linked with disability pension.

However, existing evidence is limited despite the large numbers of studies because the findings seem inconclusive. A review of several work-related environmental risk factors did only provide moderate evidence for the impact of low job control on disability pension and limited evidence for the impact of physically demanding work [21]. A Danish study investigated a number of both physical and psychosocial work environmental factors but could only conclusively determine job insecurity and standing work as risk factors for disability pension [22].

Although several studies have revealed associations between various work environmental factors, many have investigated only single factor exposures [11,12,14] or focused on either physical or psychosocial work environment while neglecting the other [13,15]. Moreover, proper adjustments for well-known risk factors such as socio-economy, health and health behaviour are often lacking. A recent study by Lahelma et al. [9] recommended a more

comprehensive work environment framework, while previous studies have focused on limited or specific working conditions. This study contains information on both physical exposures and whether these exposures are reported as uncomfortable, as well as information regarding various psychosocial work environmental factors. The study also attempts to measure the work environment more comprehensively by using indexes where aggregated physical and psychosocial work environment factors are measured.

The aim of the study, which followed 5,749 persons over 18 years, was to investigate the associations between various psychosocial and physical work environmental factors and subsequent disability pension, while adjusting for baseline health, health behaviour and education.

MATERIAL AND METHODS

The Nordland Health Study was a part of the national health screening conducted in Nordland County from August 1988 to March 1989. The study population (N=10,497) included all individuals living in Nordland County aged 40-42 years at the time. All participants underwent a physical health examination and completed a self-administered questionnaire [23]. Information from the health survey was linked to the national benefit registry, administered by Statistics Norway and the Norway Social Insurance Service. The follow-up period was from 1992 to 2007.

Disability pension

In Norway, disability pension is a state-financed social insurance scheme for people whose earning ability is permanently impaired by at least 50% due to inborn defects, illness or injury. The dependent variable in this study was the first day of work disability, defined as the point of time when a person's earning was permanently reduced.

Health measures

The study had self-reported baseline information pertaining to various aspects of the patients' health. Self-rated health was assessed by the question, "what is your health condition like?" with four answer categories ranging from "Very Good" to "Poor". Depression was assessed with the question "have you been sad or depressed the last 14 days?" with four answer categories ranging from "never/rarely" to "almost all the time." Questions about headache and

pains in the neck and shoulders were measured with a four-point scale ranging from “never/rarely” to “daily.” Alcohol was assessed with a four-point scale where the answer categories ranged from “non-drinker” to “daily drinker”, and a three-point scale assessed smoking with the responses of “non-smoker”, “former smoker” and “smoker”. The authors also created a summated index that included a number of chronic illnesses. The following conditions were included: myocardial infarction, angina pectoris, stroke/cerebral infarction, Bechterew’s disease, cancer, diabetes, chronic bronchitis, arthritis, epilepsy, migraine and gastro-intestinal problems.

Socio-economic status

Education was used as a measure of socio-economic status and was categorised as primary school, high school, and college/university.

Work-related factors

Psychosocial work factors

Psychosocial work factors were measured using 11 questions with a 4-point scale (“most often”, “sometimes”, “rarely” and “never”, the responses of the latter two were combined). The individual questions with the distributions of the respondents are presented in table 1. A summation index of cumulative psychosocial work exposure was calculated based on the number of poor psychosocial work exposures reported, which ranged from zero to 11 (summing the number of the most negative values on the 11 items).

Table 1.

Physical exposure during work

The distributions of responses on 13 physical work exposures are presented in table 2. A summation index of cumulative physical work exposures was calculated based on the number of physical work exposures reported, which ranged from zero to 13 (summing the number of the negative physical exposures on the 13 items). The respondents could also report if they were exposed at the current workplace and whether they found this exposure discomforting.

Table 2.

Multiple imputation of missing data

Patterns of missing variables are displayed in table 1 and 2. To avoid possible bias and loss of statistical power due to missing data, we performed a multiple imputation (chained equations with 20 datasets) [24].

Statistics

Associations between each individual physical and psychosocial work environmental factors and disability pension were estimated using a Cox proportional hazard regression analysis and was reported as hazard ratios (HRs) with 95% confidence intervals (95% CIs). This analysis was performed in three models. Model 1 was adjusted for sex and age as time axis. In model 2, baseline health, smoking and alcohol consumption was added to model 1. In model 3, education was added to model 2. The main analyses were performed on complete-case data.

We tested the statistical interactions between cumulative work environmental exposures and sex and level of education. We also tested for possible statistical interaction between the two cumulative physical and psychosocial work exposure indicators.

There were indications of non-proportional hazard by sex, self-reported health and the summated index of chronic illnesses (on the basis of Schoenfeld residuals). Hence, the follow-up time was split after ten years, and we included product terms between these variables and follow-up time. Following this procedure, the proportional hazards assumptions were met ($p > 0.1$).

All analyses were conducted using STATA 12 software (StataCorp LP, Texas, USA).

Ethical approval

The Regional Committee for Medical Research Ethics approved the study (2009/205-4).

RESULTS

Descriptive statistics

A total of 4,302 (78%) men and 4,310 (86%) women participated in the health screening, giving the Nordland Health Study an overall attendance rate of 82%. Of the 7,985 participants that returned the questionnaire, 990 were excluded because they received disability pension

before the start of the follow-up period and 1,246 were excluded because they did not have a job at the time they answered the questionnaire. Therefore, we were left with a total of 5,749 participants for follow-up. The descriptive statistics pertaining to the respondents are provided in table 3.

Table 3.

Main findings

Table 4 shows the associations between psychosocial work factors and disability pension. The work factors are ranked in decreasing order based on the strength of the associations. The hazard ratios (HRs) for disability pension were considerably attenuated for most variables after adjusting for baseline health and education. The respondents who reported the poorest co-work and fellowship, highest fear of reorganisation, and lowest work variation had an increased risk of receiving disability pension during the follow-up period even after adjusting for baseline health and education. A five-point increase on the cumulative index for psychosocial work environment was associated with an unadjusted 59% (95% CI 1.38-1.84) increased risk for work disability. In the fully adjusted model 3, this association was attenuated to an increase of 22% (95% CI 1.04-1.44). A categorization of the cumulative index of psychosocial work environment gave no evidence of nonlinearity in the association. The results from the analysis performed on the imputed data (data not shown), were not substantially different from the main results. On the imputed data, the HR of a five-point increase on the cumulative index was 1.20 (95% CI 1.03-1.40) in the fully adjusted model.

Table 4.

Table 5 shows the association between physical work exposure and disability pension, and the work factors are ranked similarly to the psychosocial work environmental factors. The hazard ratios for disability pension were considerably attenuated for all of the variables after adjusting for baseline health and education. Vibrations, heavy lifting and noise were the strongest predictors of disability pension. A five-point increase on the cumulative index for physical work environment was associated with an unadjusted 59% increased risk (95% CI 1.45-1.75) for work disability. In the fully adjusted model 3, this association was attenuated to an increase of 29% (95% CI 1.16-1.44). A categorization of the cumulative index of physical

work environment gave no evidence of nonlinearity in the association. The results from the analysis performed on the imputed data (data not shown), were not substantially different from the main results. On the imputed data, the HR of a five-point increase on the cumulative index was 1.23 (95% CI 1.12 to 1.34) in in the fully adjusted model.

The models were also performed on three levels of exposure, where the level of discomfort was included, but the results were not substantially different from the two level models presented in table 5 (data not shown).

Table 5.

In a model including both cumulative work indicators, the fully adjusted hazard ratio of the cumulative psychosocial and physical exposures was 1.18 (95% CI 0.98-1.41) and 1.27(95% CI 1.14-1.41), respectively. There was no indication of effect measure modification between the cumulative work indicators (p-value >0.4). There was poor evidence of effect measure modification between sex (p-value >0.3) and level of education (p-value >0.6) and the aggregated psychosocial and physical work environment variables (data not shown). Women had a considerably higher disability risk than men (HR 2.08, 95% CI 1.68-2.58) in the fully adjusted analysis, there was no indication of effect measure modification between sex and level of education (p-value >0.3), and the aggregated psychosocial and physical work environment variables (data not shown).

DISCUSSION

Indicators of the work environment factors were associated with the risk of receiving disability pension, but adjusting for baseline health considerably attenuated the associations. The reductions of the estimates following adjustment were most evident for the psychosocial factors, but also apparent for all the physical exposures. However, the results indicated a cumulative impact of psychosocial and physical work exposures with the risk of receiving disability pension.

Strengths and limitations:

This study was based on a cohort with a long follow-up time, with a high response rate, and several work environmental factors included. An additional strength of our study is that we included both private and public sector employees. Several other large studies have included only public sector employees [9] that have been found to have a higher risk for disability pension than private sector employees [22]. Last, the study used reliable and complete data about disability pension recipients from a source established by Statistics Norway and the Norway Social Insurance Service.

The work environment indicators were based on self-report. It is possible that a more thorough screening of the work environment for stressful work environment, including biological markers for stress could have provided more reliable data. Furthermore, we do not have any knowledge about subsequent changes in work or work environment after baseline. Hence, we could not assess possible time-dependent factors that could influence the work environment after registration of the work exposure indicators. In addition, we do not have information regarding the duration of workplace exposures. Although the health information was based on self-report, we included comprehensive health measures and information about diseases and complaints that are recognised as risk factors for disability pension. Although education is widely used as a proxy for socioeconomic position, a more refined measure could have provided a better confounding adjustment. Lastly, a substantial proportion of participants had missing data on the work environment indicators and other covariates. However, the results from our sensitivity missing imputation analysis did not appear to substantially differ from the results of the main analysis.

Previous literature and possible mechanisms

The relationship between health, working conditions, occupational social class, and disability pension is complex, and it is difficult to determine the direction of the association[25]. A poor work environment may cause poor health. Conversely, people with poor health may report a more adverse work environment. Some authors have suggested that by adjusting for baseline health, one may run the risk of over adjustment [9, 14] because poor health might also be caused by work environmental factors. However, a positive association between the quality of the work environment and health may be both a result of discrimination from employers (if those with poor health are assigned less interesting work tasks, receive less wages, are not included in worker skills improvement programs, etc.) or a result of a systematic variation in their perceived work environment (if those with poor health view the same work environment

to be worse than a healthy worker). Work disability is ultimately a combination of a deterioration of health combined with the requirements posed by the occupation, and the results might indicate that a self-reported poor work environment can act as a mediator on a pathway from poor health to disability pension.

Further adjustment for education reduced the estimates even more, indicating the presence of socio-economic differences in the risk for disability pension. Socio-economic differences in the risk of work disability have been documented in numerous studies [26, 27], and in this study, lower education probably means more physically demanding work and thus an increased risk of disability pension.

Poor colleague fellowship, fear of reorganisation and low work satisfaction were the strongest psychosocial risk factors for disability pension in our study. Poor colleague fellowship was the only variable that was not attenuated by adjusting for health and education. This indicates that poor colleague fellowship might be a substantial risk factor for disability pension independent of health status and education. Previous studies have suggested that women reporting low social support and interpersonal conflicts in the workplace are at a higher risk for disability pension [11, 22]. It is unclear why fear of reorganisation increases the risk of disability pension, but one explanation is that the perceived uncertainty is higher among those with fewer alternative work opportunities and thus a higher risk of leaving the labour market in the first place. Low job satisfaction has been shown to be associated with an increased risk for disability pension [8, 14]. Work satisfaction has also been found to be associated with better health [28].

According to our findings, among the physical exposures, vibrations, exhaust and heavy lifting were the strongest risk factors for disability pension. A Danish study previously revealed that exposure to whole-body-vibrations predicted subsequent disability pension retirement [12]. Exposure to vibrations is common among drivers of cars, vans, forklift trucks, tractors and other vehicles and has been identified as a cause for musculoskeletal disorders. In addition, a US review of low back pain revealed that 37% of low back pain was attributed to work factors, especially vibrations and lifting [29]. In a Finnish study [10], heavy lifting was one of several measures of “physical loading” that predicted disability pension especially due to musculoskeletal disorders and cardiovascular diseases.

The cumulative indexes of psychosocial and physical work exposures were both associated with a risk of disability pension, indicating that the accumulation of multiple diverse negative physical and psychosocial exposures might be of importance. Although the results from previous studies are not conclusive, these results build on former evidence that the accumulation of poor work environment factors may play an important role in health related work exclusion. [22, 30], Our analysis controlling for the cumulative exposure of the other group (physical and psychosocial) gave approximately the same results as the original models. Neither did we find any evidence of effect measure modification between the two cumulative exposures.

We found substantial higher risk of disability pension among women compared with men. Several studies have indicated that the association of various work environmental factors and disability pension is different for men and women [11, 14, 22]. Our study however, found no indication of statistical interaction between sex and the combination of multiple work exposures on the risk of disability pension. It is possible that the influence of work environmental factors between men and women is dependent of the regional labour market. Hence, further studies with refined measures of occupation would be an advantage. Previous studies have indicated considerable differences between occupational classes [2, 3], which is likely to be closely connected to educational level. Although adjusting for educational level reduced the estimates for many of the single work exposures, this study found no interaction effect between educational level and the combination of multiple work exposures on the risk of disability pension.

Conclusions

This study examined the associations of physical and psychosocial work environmental factors with subsequent disability pension. We used survey data that included information pertaining to work factors, health measures and education, and linked these factors with register data on retirement over a follow-up time of 18 years. We found that a number of work environmental factors were associated with disability pension. After adjusting for baseline health, health behaviour and education attenuated the results considerably for most variables. The results indicate an increased risk for work disability in persons who experience cumulative work exposures, such as those exposed to several poor psychosocial and physical work environments. The findings suggest that improvements in working conditions may be an

important area of intervention in order to reduce the number of people who leave the labour market with a disability pension.

Competing interests

The authors declare that they have no competing interests.

Author's contributions

MS carried out the data processing, the epidemiological modelling and statistical analysis and wrote the manuscript. KP, RJ and JHB contributed to the epidemiological modelling, statistical analysis, data interpretation and writing of the manuscript. NF, ES and SOS participated in the design of the study and helped to write the manuscript. All authors read and approved the final manuscript.

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What's new in this paper

A recent study on work conditions and disability pension recommended a more comprehensive framework, while previous studies have focused on limited or specific working conditions. This study attempts to measure the work environment more comprehensively, using indexes measuring aggregated physical and psychosocial work environment factors. The results indicate increased risk for work disability in persons experiencing cumulative negative work exposure.

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