Psychosocial working conditions and exhaustion in a working population sample of Swedish middle-aged men and women

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Background: Exhaustion is a concept of interest for both occupational health research and stress-disease theory research. The aim of the present study was to explore associations between chronic stressors, in terms of psychosocial working conditions, and exhaustion in a Swedish middle-aged population sample.

Methods: A vocationally active population sample of the Malmö Shoulder and Neck Study cohort, comprising 2555 men and 2466 women between 45 and 64 years of age, was used. Psychosocial working conditions, assessed by means of the demand-control-support model, were measured longitudinally with a 1-year interval. Exhaustion was assessed by the SF-36 vitality scale and measured at follow-up, yielding a cross-sectional study design.

Results: Exhaustion was twice as common in women as in men. High psychological job demands, low job control and low job support were independently associated with exhaustion in both men and women. These associations remained after controlling for a variety of potential confounders and mediators, including socio-demographic factors, lifestyle factors, musculoskeletal pain, disease, other work-related factors (including physical workload) and non-work-related factors. High demands in combination with low control (job strain), and job strain combined with low job support (iso-strain), increased the risk for exhaustion.

Conclusion: Psychosocial working conditions seem to contribute to exhaustion in middle-aged men and women. Future research should include exploration of exhaustion as a possible mediator between work stress and disease, as well as exploration of other chronic stressors, including non-work-related stressors, regarding their effects on exhaustion in men and women.

Keywords: chronic stress, demand-control-support model, exhaustion

Introduction

Exhaustion, in terms of prolonged fatigue and loss of strength or vitality, is conceived of as a condition that may arise during the course of chronic stress.1,2 Exhaustion explored in a work context has been related to consequences such as sickness absence and work disability.3,4 The exhaustion concept has also received scientific interest as a potential intermediate condition between chronic stress and manifest disease, mainly discussed in the context of cardiovascular disease.1,2,5,6 Exhaustion in non-clinical population samples has been associated with an attenuated diurnal cortisol pattern,3 and elevated inflammatory markers,4 suggesting possible mechanisms for disease development.3,5,6,8,10 In order to further examine exhaustion as a potential mediator between chronic stress and disease, its relationship with potential stressors would need to be established.

A large amount of research on health effects of chronic stress has been performed in the context of work stress. This research field has been dominated by the demand-control-support model during the last few decades,12 a model which contains two main hypotheses: the ‘job strain hypothesis’ and the ‘iso-strain hypothesis’. The job strain hypothesis proposes that workers who are exposed to a combination of high job demands and low control at work (referred to as a job strain situation) have an increased risk of psychological strain and stress-related disease.13,14 The iso-strain hypothesis predicts that when job strain is combined with low job support (referred to as isolated strain, or iso-strain), the risk increases further.15,16

Previous epidemiological research concerning associations between psychosocial working conditions and exhaustion has, to a large extent, been performed by means of using measures of ‘burnout’ as outcome measures.12,17–19 Burnout is generally defined and measured as a condition of exhaustion that is specifically related to work.20–22 Kristensen23 stated in his overview of methodological considerations concerning the job strain model that ‘it is of vital importance that the environment side is conceptualised and measured independently of the person side’. Few studies have explored associations
between psychosocial working conditions and exhaustion using (work-) context-free measures of exhaustion.

The aim of this study was to investigate associations between psychosocial working conditions, by means of the demand-control-support model, and exhaustion in a Swedish middle-aged working population sample.

Methods

The population-based Malmö Shoulder and Neck Study (MSNS) cohort was utilized. This cohort is a subset of the larger Malmö Diet and Cancer study (MDCS) cohort, which consists of all men and women residing in the city of Malmö between 45 and 65 years of age in 1991 when the cohort was defined. The MDCS data collection was performed between 1991 and 1996, with a participation rate of 42%. The MSNS cohort (n = 14,555) consists of the participants who completed the baseline examination (Time 1, T1) of the MDCS between February 1992 and December 1994. A one-year-follow-up assessment (Time 2, T2; mean follow-up time 403 days, standard deviation 49) of the MSNS was accomplished by a postal questionnaire sent to all MSNS baseline participants, of whom 12,607 (87%) responded.²⁴

The criteria for inclusion in the present study were that the participants were vocationally active, working minimum 30 hours a week at T1 and at T2, that they were <65 years of age (the conventional age for retirement in Sweden), and that they were not sick-listed at T1. The analyses were performed on participants with complete data on exhaustion, job demands, job control and job support at T1 and T2, yielding a study population of 5001 (2555 men and 2446 women).

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

Exhaustion

Exhaustion was measured at T2 by the SF-36 vitality scale, one of eight subscales in The Medical Outcomes Study Short Form (SF-36) general health survey.²⁵ The SF-36 vitality scale consists of the following items: How much of the time during the past 4 weeks (from 1—all of the time, 2—most of the time, 3—a good bit of the time, etc., to 6—none of the time) ‘did you feel full of life’, ‘did you have a lot of energy’, ‘did you usually experience your work/housework? They were used as continuous variables and the response categories ranged from 0 (very, very light) to 14 (very, very heavy). ‘Number of work hours per week’ was a continuous variable which included overtime. ‘Degree of physical strain at work’ and ‘Degree of physical strain in housework’ were assessed asking: How physically demanding do you usually experience your work/housework? They were included as assessments in the baseline (T1) questionnaire only.

Covariates

Several factors that potentially can influence the relationship between psychosocial working conditions and exhaustion were considered in the analyses. ‘Age’ was used as a continuous variable. ‘Socio-economic status’ was categorized into self-employed, high-level non-manual workers, middle-level non-manual workers low-level, non-manual workers, skilled manual workers and unskilled manual workers. ‘Marital status’ was categorized as married/cohabiting or not. ‘Nationality’ was dichotomized into having been born in Sweden or in another country. ‘Daily smoking’ was dichotomous (yes or no) and ‘Alcohol consumption’ was continuous (grams per week). ‘Musculoskeletal pain’ was a dichotomous variable, defined as problems with pain in either the neck, shoulders, lumbar region, hands, hand joints or elbows more often than ‘sometimes’ (i.e., ‘often’ or ‘all of the time’) during the past 12 months. ‘Somatic disease’ was defined to be present if a history of treatment was reported for any of the following disorders, i.e. myocardial infarction, stroke, claudicatio intermittens, diabetes, thyroid disease, gastric ulcer, cancer, asthma, rheumatoid arthritis, inflammatory bowel disease or renal calculus. ‘Number of work hours per week’ was a continuous variable which included overtime. ‘Degree of physical strain at work’ and ‘Degree of physical strain in housework’ were assessed asking: How physically demanding do you usually experience your work/housework? They were included as assessments in the baseline (T1) questionnaire only.

Statistical analysis

Initial interaction analysis demonstrated effect measure modification by sex on the association between exposure variables and exhaustion, and therefore all subsequent analysis was performed by gender split. Logistic regression analysis of longitudinal exposures of work characteristics (high or low at both T1 and T2, or change from high or low, respectively, between T1 and T2) was performed. Participants who at both T1 and T2 reported low demands, high control, or high job support, respectively, were used as reference categories. The covariates were entered at seven steps, yielding seven different models; Model 1: age; Model 2: age, socio-economic status, marital status and nationality; Model 3: age, smoking and alcohol consumption; Model 4: age, disease and pain; Model 5: age, number of work hours per week, physical strain at work, number of housework hours per week, physical strain in housework and having children living at home. Model 6: age and the two other psychosocial working
conditions; Model 7: all previous covariates entered simultaneously.

Potential interactions (adjusted for age) between demands and control, and between job strain and job support, were tested using cross-sectional exposures at T2, as well as longitudinal (T1 and T2) exposures. In the latter case, only participants who did not change exposure from high to low, or vice versa, between T1 and T2, were included in the analyses; this yielded a sub-sample of 2976 men and women for investigating interactions between demands and control, and a sub-sample of 3128 for interactions between job strain and job support. Interaction analysis was performed by means of using synergistic interaction methodology. A synergy index equal to unity (S = 1) is defined to represent additive effects of exposures without interaction. Synergy is defined to be present if the effect of both exposures is more than additive compared with their independent effects (S > 1), and antagonism represents a combined effect that is less than additive (S < 1). Confidence intervals (95%) for the synergy indexes were calculated. Both additive and synergistic interaction effects (i.e. S ≥ 1) were defined to support the job strain and iso-strain hypotheses.12

Results

Descriptive statistics of the study group showed that exhaustion was twice as common among women (16%) as among men (8%). Women reported having low job control more often than men did, whereas men reported high job demands and low job support somewhat more often than women did. Men spent somewhat more time at work, whereas women spent more than double the amount of time on housework compared with men. More men than women were married or cohabiting and had children living at home. Women reported more problems with musculoskeletal pain and somewhat more somatic disease than men did (table 1).

Regression analyses showed that exposure to high job demands, low job control, and low job support, respectively, at both T1 and T2 (‘consistent exposures’) were associated with exhaustion for both men and women. These associations remained after controlling for a variety of covariates. Associations for exposures reported at either T1 or T2 only (‘non-consistent exposures’) were less clear or absent. The general tendency was that consistent exposures were more associated with exhaustion than were non-consistent exposures (table 2).

Strong and statistically significant synergistic interaction between high demands and low control was found for women using both cross-sectional T2 exposures and longitudinal exposures. For men, the synergy index pointed in the same direction but they were weaker and did not reach statistical significance (table 3). Similarly, strong and statistically significant synergistic interaction between job strain and job support was found for women using both cross-sectional T2 exposures and longitudinal exposures. For men, synergistic interaction (close to statistically significant) between job strain and low job support appeared using longitudinal exposures, whereas the obtained synergy index using cross-sectional T2 exposures indicated weaker interaction and was not statistically significant (table 4).

Discussion

In this study of a Swedish middle-aged working population sample, it was demonstrated that high psychological job demands, low job control and low job support were independently associated with exhaustion in both men and women. The strongest associations were found for low job support. The job strain and iso-strain hypotheses were supported for both men and women. Synergy between high job demands and low job control and between job strain and low job support was most evident for women, but synergy was indicated also for men.

Chronic stress is hypothesized to involve dysregulation of the hypothalamo–pituitary–adrenal (HPA) axis, leading to HPA hypoactivity and exhaustion.13,5,7,8,10 There are, however, a number of possible reasons for exhaustion, other than chronic stress, at hand. The present study results would corroborate that exhaustion can develop from psychosocial working conditions (theoretically through physiological stress level dysregulation) in that several potential confounders and mediators, such as socio-demographic factors, lifestyle factors, disease and musculoskeletal pain, other work-related factors (including number of work hours, and having a physically demanding work) and non-work-related factors (including time spent on housework, having physically demanding housework, and having children living at home), were controlled for in the analyses. Furthermore, the idea that exhaustion develops during the course of chronic stress would seem to receive support by the current results, considering the general tendency that more long-term exposure (i.e. exposure reported at both T1 and T2) to an adverse working condition was more associated with exhaustion than was current exposure that had lasted for less than one year (reported at T2 but not at T1). These results would seem to parallel results presented by Kivimäki et al., demonstrating larger impact of assuming more long-term work stress exposure, as assessed by repeated measurements, on cardiovascular disease.

Job strain and iso-strain have been extensively examined with regard to a variety of outcomes. As previously mentioned, when it comes to exhaustion the research has mainly concerned burnout, a condition defined as primarily characterized by exhaustion and related to working conditions.20,22 The burnout concept thus includes both the individual stress state (exhaustion) and the environmental stressor (bad working conditions) causing the stress state. This conceptual overlap is most evidently reflected in the construct of burnout emotional exhaustion in the Maslach burnout inventory, which has been the dominant burnout measure used in 90% of all studies concerning burnout.22 The burnout emotional exhaustion scale includes items such as ‘I feel emotionally drained from my work’, ‘I feel tired when I get up in the morning and have to face another day on the job’ and ‘Working all day is really a strain for me’.21 In epidemiological studies of associations between working conditions and burnout, an overlap between exposure and outcome inherent in the outcome measure should create potential overestimation of associations, seemingly demonstrated by studies, yielding very high odds ratios (up to 34) for the association between working conditions and burnout emotional exhaustion. Therefore, it would seem uncertain as to what extent conclusions on the relationship between work stressors and exhaustion can be drawn from present research on burnout.

The associations found here between demands, control, and support, respectively, and exhaustion were in line with results from the Maastricht Cohort Study and the BELSTRESS study, although in the present study job support stood out as more strongly associated with exhaustion as compared with demands and control. Another Belgian study, performed without gender-split, did not find any relationship between demands and fatigue. Concerning the job strain and iso-strain hypotheses, the current results were also in line with previous studies. Synergy indexes for demands and control were not presented by Bültmann et al., but can be calculated from their data given in table 4: for men the same level of
Table 2 Odds ratios (95 % confidence interval) for associations between longitudinal exposures of psychosocial working conditions and exhaustion

<table>
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<tr>
<th>Exposure at T1–T2</th>
<th>n</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
<th>Model 5</th>
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<td>Low–low</td>
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Model 1: adjusted for age. Model 2: adjusted for age, socio-economic status, marital status and nationality. Model 3: adjusted for age, smoking and alcohol consumption. Model 4: adjusted for age, number of working hours per week, physical strain at work, number of housework hours per week, physical strain in housework and children living at home. Model 5: adjusted for age, disease and pain. Model 6: adjusted for age and the two other psychosocial working conditions. Model 7: adjusted for age, socioeconomic status, nationality, smoking, alcohol consumption, number of working hours per week, physical strain at work, number of housework hours per week, physical strain in housework, children living at home, disease, pain and the two other psychosocial working conditions.
synergy ($S = 1.6$) as in the current study was indicated, whereas for women much smaller synergy ($S = 1.2$) appeared.

One of the major proposed predictions of job strain and iso-strain has concerned cardiovascular disease. As yet, results from studies investigating cardiovascular effects of job strain and iso-strain have been inconclusive (including potential different effects in men and women). Considering that exhaustion is hypothesized to mediate chronic stress and cardiovascular disease, one possible line of further research may be to investigate whether taking exhaustion into consideration as a potential intermediate condition would enhance the explicative power of work conditions and exhaustion rather than that the working conditions and exhaustion could not be determined. However, the general tendency that consistent exposures were associated with higher odds ratios than were non-consistent exposures may be said to indicate a kind of 'dose-response-effect', whereas low job control was more common in men than in women. High demands, high control was twice as common in women as in men. High demands, low control, and low job support were more common in men than in women. Therefore, these working conditions may not obviously seem to explain the found gender difference in exhaustion levels. These issues have been little explored with respect to exhaustion and remains to be investigated in future research.

### Methodological issues

In the current study exhaustion was measured by means of the SF-36 vitality scale, which assesses feelings of being worn out and fatigued without relating to potential stressors. Overestimation of associations, as discussed above, would thus seem unlikely. Instead, associations may have been underestimated due to a 'healthy worker effect', in that workers who have become exhausted due to work stress exposure have already left the workforce and were not included in the study (the relatively old population sample should have increased the likelihood of such a healthy worker effect). A strength of the study was the possibility to control for a large number of potential confounders and mediators in the regression analyses. A limitation of the study was that because of the cross-sectional design, the causal direction between psychosocial working conditions and exhaustion could not be determined. However, the general tendency that consistent exposures were associated with higher odds ratios than were non-consistent exposures may be said to indicate a kind of 'dose-response-effect', supporting the existence of a causal relationship between working conditions and exhaustion rather than that the observed associations would be due to reversed causality. Furthermore, evidence of causal effects of the working conditions and exhaustion rather than that the working conditions and exhaustion could not be determined. However, the general tendency that consistent exposures were associated with higher odds ratios than were non-consistent exposures may be said to indicate a kind of 'dose-response-effect', supporting the existence of a causal relationship between working conditions and exhaustion rather than that the observed associations would be due to reversed causality. Furthermore, evidence of causal effects of the working conditions and exhaustion rather than that the working conditions and exhaustion could not be determined. However, the general tendency that consistent exposures were associated with higher odds ratios than were non-consistent exposures may be said to indicate a kind of 'dose-response-effect', supporting the existence of a causal relationship between working conditions and exhaustion rather than that the observed associations would be due to reversed causality. Furthermore, evidence of causal effects of the working conditions and exhaustion rather than that the working conditions and exhaustion could not be determined. However, the general tendency that consistent exposures were associated with higher odds ratios than were non-consistent exposures may be said to indicate a kind of 'dose-response-effect', supporting the existence of a causal relationship between working conditions and exhaustion rather than that the observed associations would be due to reversed causality. Furthermore, evidence of causal effects of the working
conditions studied here on exhaustion has been found previously.32

Conclusions

We conclude that job demands, job control and job support all seem to exert independent main effects on exhaustion, although the causal effects would need to be further established in future research. The job strain and iso-strain hypotheses were supported with respect to exhaustion. Potential pathways between work stressors and disease should be further investigated using exhaustion as a possible intermediate condition. Moreover, future research should continue to explore potential stressors involved in the development of exhaustion, including stressors in the private-life and whether they have different impacts in men and women.

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Key points

- In this vocationally active population sample of Swedish middle-aged men and women, those with high psychological job demands, low job control or low job support were at increased risk of experiencing exhaustion.
- Experiencing both high job demands and low job control (job strain) further increased the risk for exhaustion, especially for women.
- Experiencing a job strain situation and at the same time having low support at work (iso-strain) was associated with the highest risk for exhaustion.
- Work-related psychosocial factors seem important in the understanding of causes of exhaustion, and preventive strategies should be implemented with the aim of improving work environment.

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