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 men as in women. 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 explored in a work context has been related to consequences mainly discussed in the context of cardiovascular disease.5–7

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. 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 men as in women. 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
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.1,25 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 feel worn out’, and ‘did you feel tired’. The last two item scores were reversed in order to yield an exhaustion score (scores ranged from 4 to 24, median score was 10). For subsequent analysis, the exhaustion score was dichotomized and the cut-off for exhaustion was set at ≥16, indicating exhaustion ‘a good bit of the time’ or more during the past four weeks. This cut-off was chosen in that it previously has been associated with an attenuated diurnal cortisol pattern, compatible with chronic stress, in a working population.8

**Psychosocial working conditions**

Job demands, job control and job support were measured at T1 and T2. Job demands and job control were assessed by a Swedish version26 of the Karasek Job Content Questionnaire (JCQ), including five (work fast, work hard, excessive work, insufficient time, and conflicting demands) and six (learn new things, job requires skills, job requires creativity, non-repetitious work, freedom as to how to work and freedom as to what to do at work) items, respectively. Comparability-facilitating algorithms, from a specific population-based comparative study, developed in order to yield JCQ equivalent scores,27 were applied to the original two scales. The job support scale was composed of six items oriented toward the atmosphere of the workplace: ‘There is a calm and pleasant atmosphere at my workplace’; ‘There is a good fellowship’; ‘My workmates support me’; ‘If I have a bad day, I’m met with acceptance’; ‘I get on well with my supervisors’; and ‘I get on well with my workmates’.28 The job demands, control, and support variables were dichotomized into high and low categories at their baseline (T1) means.

**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 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, claudication 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 used as continuous variables and the response categories ranged from 0 (very, very light) to 14 (very, very heavy). ‘Number of housework hours per week’ was a continuous variable of time spent on housework (including shopping). ‘Children living at home’ was categorized as having a child/children living at home or not. Further, each of the three psychosocial working conditions was controlled for the two other psychosocial working conditions in order to yield independent effects of each working condition.

All covariates were assessed at T2, with the exception of socio-economic status, nationality and somatic disease which 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 in 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 were included as assessments in the baseline (T1) questionnaire.
and iso-strain hypotheses. 12

Indexes were calculated. 30 Both additive and synergistic inter-
additive (antagonism represents a combined effect that is less than
present if the effect of both exposures is more than additive
of exposures without interaction. Synergy is defined to be
equal to unity (S = 1) is defined to represent additive effects
ently associated with exhaustion in both men and women. The
demands, low job control and low job support were independ-
Discussion

Exposures, whereas the obtained synergy index using
interaction (close to statistically significant) between job
exposures and longitudinal exposures. For men, synergistic
support was found for women using both cross-sectional T2
significant synergistic interaction between job strain and job
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 longitudi-
inal exposures. For men, the synergy indexes pointed in the
same direction but they were weaker and did not reach statisti-
cal 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).

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
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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 independ-
ently 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.1,5,7,8,10 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.31 demonstrating
larger impact of assuming more long-term work stress
exposure, as assessed by repeated measurements, on cardio-
vascular 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 studies18,19 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,32–34 although in the present study job support stood
out as more strongly associated with exhaustion as compared
with demands and control. Another Belgian study,35
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.32,34 Synergy indexes for demands and control
were not presented by Bültmann et al.,32 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>
<thead>
<tr>
<th>Exposure at T1–T2</th>
<th>Men ( n = 2555 )</th>
<th>Women ( n = 2446 )</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Men</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Job demands</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low–low</td>
<td>633</td>
<td>1</td>
</tr>
<tr>
<td>High–low</td>
<td>329</td>
<td>1.0 (0.6–1.7)</td>
</tr>
<tr>
<td>Low–high</td>
<td>286</td>
<td>1.4 (0.9–2.1)</td>
</tr>
<tr>
<td>High–high</td>
<td>1292</td>
<td>3.5 (1.9–6.4)</td>
</tr>
<tr>
<td><strong>Job control</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High–low</td>
<td>408</td>
<td>0.7 (0.4–1.3)</td>
</tr>
<tr>
<td>Low–low</td>
<td>260</td>
<td>2.3 (1.5–3.6)</td>
</tr>
<tr>
<td><strong>Job support</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High–low</td>
<td>122</td>
<td>0.9 (0.5–1.6)</td>
</tr>
<tr>
<td>Low–low</td>
<td>282</td>
<td>3.2 (2.2–4.7)</td>
</tr>
</tbody>
</table>

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.
No job strain, high control

Low demands, low control

High demands, low control

High demands, high control

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 results from studies investigating cardiovascular effects of job strain). Furthermore, there was more evidence of synergistic effects between demands and control and between job strain and job support with respect to exhaustion for women. Thus, psychosocial working conditions still may contribute to exhaustion being more prevalent in women. In addition, differences in stressful conditions outside work, and how men and women manage to balance between work-life and private-life, may further explain gender differences 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 suggests that a kind of ‘dose-response-effect’, may be said to indicate a kind of ‘dose-response-effect’, one possible line of further research may be to investigate whether taking exhaustion into consideration as a potential intermediate mediator in the regression analyses.

**Table 3 Interaction effects between job demands and job control in relation to exhaustion**

<table>
<thead>
<tr>
<th></th>
<th>Cross-sectional T2 exposures</th>
<th>Longitudinal exposures</th>
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<tbody>
<tr>
<td></td>
<td>Men (n = 2555)</td>
<td>Women (n = 2446)</td>
</tr>
<tr>
<td></td>
<td>n  OR (95% CI) S (95% CI)</td>
<td>n  OR (95% CI) S (95% CI)</td>
</tr>
<tr>
<td>Low demands, high control</td>
<td>689 1 (95% CI) 1.7 (0.9–2.5)</td>
<td>534 1 (95% CI) 1.7 (0.9–1.8)</td>
</tr>
<tr>
<td>Low demands, low control</td>
<td>441 1.5 (0.9–2.5)</td>
<td>619 1.3 (0.9–1.8)</td>
</tr>
<tr>
<td>High demands, high control</td>
<td>986 1.8 (1.2–2.8)</td>
<td>607 1.7 (1.2–2.5)</td>
</tr>
<tr>
<td>High demands, low control</td>
<td>439 3.2 (2.0–5.0)</td>
<td>686 3.1 (2.2–4.3)</td>
</tr>
</tbody>
</table>

CI = confidence interval; S = synergy index

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<td></td>
<td>n  OR (95% CI) S (95% CI)</td>
<td>n  OR (95% CI) S (95% CI)</td>
</tr>
<tr>
<td>No job strain, high job support</td>
<td>1270 1 (95% CI) 1.4 (0.7–2.7)</td>
<td>1103 1 (95% CI) 1.8 (1.2–2.7)</td>
</tr>
<tr>
<td>No job strain, low job support</td>
<td>846 2.3 (1.6–3.2)</td>
<td>657 2.4 (1.8–3.2)</td>
</tr>
<tr>
<td>Job strain, high job support</td>
<td>196 2.1 (1.2–3.6)</td>
<td>306 1.8 (1.2–2.7)</td>
</tr>
<tr>
<td>Job strain, low job support</td>
<td>243 4.2 (2.0–5.0)</td>
<td>380 5.0 (3.7–6.8)</td>
</tr>
</tbody>
</table>

CI = confidence interval; S = synergy index

a: Odds ratios adjusted for age
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.

Acknowledgement
The authors wish to thank Mahnaz Moghaddassi for skilful help with data management and statistical support.

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Conflicts of interest: None declared.

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 preventing strategies should be implemented with the aim of improving work environment.

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