Int Arch Occup Environ Health (2002) 75: 259–266
DOI 10.1007/s00420-001-0294-0

ORIGINAL ARTICLE

U. Bültmann · I.J. Kant · C.A.P. Schröer · S.V. Kasl

The relationship between psychosocial work characteristics and fatigue and psychological distress

Received: 9 April 2001 / Accepted: 21 September 2001 / Published online: 16 November 2001

Abstract ***Objectives***: To examine the associations between psychosocial work characteristics and fatigue in employees in the Maastricht Cohort Study. A second objective was to compare the relationships for fatigue versus psychological distress with these psychosocial work characteristics. ***Methods***: The design was cross-sectional and included 11,020 employees who responded to the self-administered baseline questionnaire of the Maastricht Cohort Study. Fatigue was measured with the Checklist Individual Strength, a 20-item self-report instrument. Psychological distress was measured with the 12-item version of the General Health Questionnaire. Psychosocial work characteristics comprised: psychological demands, decision latitude, and social support at work as measured by the Job Content Questionnaire, as well as emotional demands at work, physical demands at work, job insecurity, and conflict with supervisor/co-worker, which were assessed with items from existing Dutch questionnaires. ***Results***: Low decision latitude and low social support at work were associated with fatigue in both men and women. Associations were also found between emotional demands at work, job insecurity, physical demands and conflict with supervisor and fatigue in men; and high psychological demands and fatigue in women. As regards psychological distress, there was no association with low decision latitude, but strong associations with emotional demands and conflict with supervisor in both genders. ***Conclusions***: The study provides strong support for associations between psychosocial work characteristics and fatigue in men and women, even after adjustment for psychological distress. Moreover, it suggests some differential effects of psychosocial work characteristics on fatigue and psychological distress.

Keywords Fatigue · Psychological distress · Epidemiology · Working population · Psychosocial work characteristics

U. Bültmann (✉) · I.J. Kant
Department of Epidemiology,
Maastricht University,
P.O. Box 616,
6200 MD Maastricht, The Netherlands
E-mail: U.Bultmann@epid.unimaas.nl
Fax: +31-43-3884128

C.A.P. Schröer
Department of Medical Sociology,
Maastricht University,
Maastricht, The Netherlands

S.V. Kasl
Department of Epidemiology and Public Health,
Yale University School of Medicine, New Haven,
Connecticut, USA

Introduction

Fatigue is a common complaint. Community and primary care studies have shown that some degree of fatigue is found in nearly all the population (Loge et al. 1998; Pawlikowska et al. 1994; David et al. 1990). In recent years, prolonged fatigue has attracted attention in occupational (mental) health research (Mounstephen and Sharpe 1997; Meijman and Schaufeli 1996), since it may affect the individual's performance and functioning in the occupational as well as in the home setting, and may lead to sickness absenteeism and work disability (Schröer 1997). As reported by Houtman (1999), about one in every three work disability benefit recipients in the Netherlands is classified as disabled for work on mental grounds. Some 90% of recipients of this kind of work disability benefit suffer from an "exogenous reaction" (Van Eck 1991), the official diagnostic label that includes overstrain, chronic job stress, and burnout – mental states which include prolonged fatigue as a major symptom. Prolonged fatigue is, in contrast to acute fatigue, not easily reversible and not task specific; the compensating mechanisms that are useful in reducing acute fatigue are no longer effective (Meijman 1991). Given the unfavorable prognosis of prolonged fatigue and the high cost implications

for employees, employers, and society (Schröer 1997), it is of paramount importance to develop preventive measures.

The increasing awareness of the impact of prolonged fatigue on absenteeism and work disability has led to the recognition that there is very little information about work characteristics which predict fatigue. This absence of data as well as the urgent need for preventive measures has prompted the establishment of the large-scale epidemiological Maastricht Cohort Study of "Fatigue at Work" (Kant et al. 2000; Bültmann et al. 2000). Cross-sectional analyses at baseline revealed that 22% of the 12,000 employees reported fatigue (Bültmann et al. 2001). The same study explored whether the construct of fatigue is conceptually and operationally distinct from psychological distress and found that fatigue was fairly well associated with psychological distress, expressed by a correlation of 0.62. Moreover, there was no clear distinction in patterns of associations with demographic and health factors. A principal component analysis, however, showed a separation between fatigue items and psychological distress items, suggesting the measurement of different underlying constructs (Bültmann et al. 2001).

For the development of effective preventive measures for fatigue, it is important to identify the psychosocial factors at work involved in the onset of fatigue. While the likely multifactorial etiology of fatigue is emphasized in the literature (Lewis and Wessely 1992), with "psychosocial" (e.g., work, family, and lifestyle) being the commonest reason for the feeling of fatigue (Pawlikowska et al. 1994), only very few studies have examined the relationship between psychosocial factors at work and fatigue. Using specific occupational groups in the workforce of the UK National Health Service Trusts, Hardy et al. (1997) reported that high work demands and role conflict are related to high levels of fatigue and that these factors were sufficient to explain occupational and gender differences. Moreover, fatigue was associated with high levels of psychological distress. A generalization of these findings, however, is difficult because the study was conducted on a limited range of occupations.

In the Maastricht Cohort Study, a large, heterogeneous working population was used to explore the relationship between a broad range of psychosocial factors at work and fatigue. Moreover, to further determine whether fatigue is conceptually distinct from psychological distress, associations between psychosocial work characteristics and psychological distress were also examined. We included work characteristics, such as psychological demands and decision latitude, which have been extensively examined as determinants of (mental) health, and for which many studies have accumulated evidence for a relationship with psychological outcomes, e.g., psychological distress, depressive symptoms (Karasek 1979; Karasek and Theorell 1990; Landsbergis et al. 1992; Stansfeld et al. 1995; Bourbonnais et al. 1996; Stansfeld et al. 1997; Niedhammer et al. 1998). Since fatigue is a somewhat different construct, and therefore may be associated with different work characteristics, we also included measures of emotional demands, physical demands, job insecurity and conflict with supervisor/co-workers.

The objective of the present study was to determine whether psychosocial work characteristics are associated with fatigue in employees in the Maastricht Cohort Study. A second objective was to compare the associations for fatigue and psychological distress with these psychosocial work characteristics. Given the observed difference between men and women with respect to psychological distress, all analyses were conducted separately for men and women.

Material and methods

Study design and participants

In May 1998, a total of 26,978 male and female employees, aged 18–65 years, from 45 companies and organizations, received both a letter at home inviting participation, and the questionnaire "Fatigue at Work". The letter explained the purpose and the general outline of the study, described how the data would be used, and guaranteed anonymity of responses. The voluntary nature of participation was emphasized. The self-administered questionnaire included items on fatigue, psychological distress, demographic variables, and work characteristics, as well as on family and individual characteristics. To minimize reporting bias, none of these items was indicated by subheadings. Altogether 12,161 employees completed and returned the baseline questionnaire and gave written consent. The overall response rate was 45%. Sixty-six questionnaires were excluded from the analysis because of technical reasons or because the age criterion was not met. Full details of the procedure, the baseline characteristics, and the non-response analyses have been reported elsewhere (Kant et al. 2000; Bültmann et al. 2001). In the present study we also excluded 1,075 employees who reported themselves to be absent from work due to illness or reported working under modified conditions related to former sickness absence (e.g., fewer hours, modified tasks or other functions). The final study sample was therefore 11,020 employees; 8,159 (74%) men and 2,861 women (26%). The mean age of the total cohort was 41.0 years (SD 8.9); 42.0 years (SD 8.7) in men and 38.0 years (SD 8.8) in women. Further characteristics of the study population are given in Table 1.

Psychosocial work characteristics

A validated Dutch version of the self-administered Job Content Questionnaire (JCQ) was used to measure psychological demands, decision latitude and support at work (Karasek 1985; Houtman 1995). Psychological demands (Cronbach's alpha coefficient of 0.69 for both genders) were measured by the sum of five items (excessive work, conflicting demands, insufficient time to do work, working fast, and working hard). Decision latitude (Cronbach's alpha coefficient 0.82 for men and 0.78 for women) was measured by the sum of two subscales: skill discretion (keep learning new things, can develop skills, job requires skill, task variety, work not repetitious, job requires creativity) and decision authority (have freedom to make decisions, can choose how to perform work, and have a lot to say on the job). The response options for each item varied on a four-point scale from "strongly disagree" to "strongly agree". The total score was then grouped into tertiles. Support was measured with two scales, each consisting of four items: co-worker support (they take a personal interest in me, are friendly, helpful in getting the job done, and competent in doing the work) and supervisor

Table 1. Characteristics of the study population

Characteristics	Total		Men		Women	
	($n = 11{,}020$)		($n = 8{,}159$)		($n = 2{,}861$)	
	n	%	*n*	%	*n*	%
Educational level						
Primary school	446	4.2	386	4.8	60	2.2
Lower vocational education	1,617	15.1	1,360	17.0	257	9.5
Lower secondary school	1,356	12.7	830	10.4	526	19.5
Intermediate vocational education	2,563	24.0	1,894	23.7	669	24.8
Upper secondary school	913	8.5	596	7.4	317	11.8
Upper vocational education	2,541	23.7	1,948	24.3	593	22.0
University	1,264	11.8	990	12.4	274	10.2
Living alone						
No	9,905	90.0	7,384	90.6	2,521	88.3
Yes	1,100	10.0	765	9.4	335	11.7
Presence of disease						
No	8,419	78.4	6,306	79.3	2,113	75.8
Yes	2,323	21.6	1,649	20.7	674	24.2
Employment status						
Permanent contract	10,696	97.3	8,014	98.4	2,682	94.1
Temporary contract	300	2.7	131	1.6	169	5.9

support (concerned about the welfare of those under him/her, pays attention, helpful in getting the job done, successful in getting people to work together). The Cronbach's alpha coefficient for co-worker support was 0.74 for men and 0.79 for women, and for supervisor support 0.84 for both genders. The total score for each scale was dichotomized at the median.

In addition, the four categories of the so-called demand/control model (Karasek 1979; Karasek and Theorell 1990) were created by first dichotomizing psychological demands and decision latitude at their median (psychological demands: men = 33, women = 32; decision latitude: men = 74, women = 70) and then cross-classifying the two measures: high-strain work (high demands, low decision latitude), low-strain work (low demands, high decision latitude), passive work (low demands, low decision latitude) and active work (high demands, high decision latitude).

Emotional demands at work were measured by the sum of five items (confronted with personally upsetting things, personally attacked or threatened, getting annoyed with others, moving work situations, and one or more shocking events at work during the past year e.g., accident, violent crime, sexual harassment, aggression at work). The response option for each item was yes/no. The questions were derived from a Dutch questionnaire on work and health (Gründemann et al. 1993) and from a Dutch questionnaire on perception and judgment of work (Van Veldhoven and Meijman 1994), and there was one new item (shocking events at work). The Cronbach's alpha coefficient was 0.64 for men and 0.53 for women. For the present study, emotional demands at work was indicated as "no emotional demands" (score = 0), "low emotional demands" (score = 1), and "high emotional demands" (score = 2–5). To assess whether employees perceived their work as being physically demanding, a single item (yes/no) from the Dutch questionnaire on work and health (Gründemann et al. 1993) was used. Another three items from the Dutch questionnaire on perception and judgment of work (Van Veldhoven and Meijman 1994) were used to measure job insecurity (yes/no), conflict with supervisor (yes/no), and conflict with co-worker (yes/no).

Fatigue

The self-report Checklist Individual Strength (CIS), which was originally developed for hospital studies of chronic fatigue syndrome, was used to measure fatigue (Vercoulen et al. 1994, 1999). The 20 statements cover four aspects of fatigue, such as severity, concentration, motivation, and physical activity level. These factors were confirmed in a principal component analysis (Bültmann et al. 2001). The CIS was extensively tested in the clinical setting (Vercoulen et al. 1996a, 1996b), and was validated in the working population during pilot work (Beurskens et al. 2000). Using a seven-point Likert scale, participants are instructed to indicate how they had felt during the previous 2 weeks. Higher scores indicate a higher degree of fatigue, more concentration problems, reduced motivation or low levels of activity. In the Maastricht Cohort Study, the responses to the individual statements were summed to generate a CIS total score, ranging from 20 to 140. The Cronbach's alpha coefficient was 0.93 for both genders. The cutoff point for case classification used in the present study was CIS total > 76, with a specificity of 90% and a sensitivity of 73%. This cutoff was established in a separate pilot study on the basis of receiver operating characteristic (ROC) analysis in defined samples with differences in fatigue levels (Bültmann et al. 2000). All those employees scoring > 76 on the CIS were designated as probable fatigue cases.

Psychological distress

Psychological distress was assessed with a Dutch translation of the 12-item version of the General Health Questionnaire (GHQ-12) (Goldberg and Williams 1988; Koeter and Ormel 1991). The GHQ-12 was developed as a screening instrument for detecting minor psychiatric disorder in the general population. For the four-point response scale, two scoring systems were used. The Likert scoring method (0, 1, 2, 3) summed the responses of the 12 items to give a continuous distribution of the scores ranging from 0 to 36. The Cronbach's alpha coefficient was 0.87 for men and 0.88 for women. The traditional GHQ scoring method (0, 0, 1, 1) is designed to identify individuals reporting sufficient psychological distress to be classified as probable cases of minor psychiatric disorder. Given a possible range of scores from 0 to 12, the threshold for case classification in the present study was 4 or higher. That means that all those employees scoring on four or more of the 12 GHQ-items were considered to be probable cases of psychological distress. The threshold for case classification is high, but comparable to the

threshold used in previous studies in the working population (Hardy et al 1997; Wall et al 1997).

Demographic and health variables

The respondents provided information on gender, age, educational level, living alone (yes/no), employment status (permanent contract or temporary contract), and the presence of a disease (yes/no). Details of these measures, which are considered in the analyses as confounding factors, have been reported elsewhere (Bültmann et al. 2001).

Statistical analysis

All analyses were conducted separately for men and women because of the observed gender difference with respect to psychological distress (Bültmann et al. 2001). The prevalence of fatigue and psychological distress was calculated, and Pearson intercorrelations were computed for the study variables. To examine the associations between psychosocial work characteristics separately as well as between the four demand/control categories and fatigue and psychological distress, we used logistic regression. Adjustments for potential confounding variables were made in 3 steps. In step 1, we adjusted for age and educational level; in step 2 we controlled for age, educational level, employment status, living alone, and the presence of a disease. Additionally, since fatigue and psychological distress are fairly well associated, and to study effects independent of the other outcome measure, we adjusted in step 3 for the continuous scores of either the GHQ or the CIS when fatigue or psychological distress was considered as the dependent variable. All analyses were conducted on the individual level since analyses on the job title/occupational level showed that "occupation" adds little explanatory information above the perceived measures of the work environment. Odds ratios (ORs) and 95% confidence intervals (95% CIs) were calculated for psychosocial work characteristics and for the four demand/control categories. Statistical analyses were performed with SPSS 9.0 (SPSS 1998).

Results

Among the 8,159 men and 2,861 women the prevalence of fatigue was 20% and 19%, respectively, and the prevalence of psychological distress was 20% and 23%, respectively. As shown in Table 2, fatigue was fairly well associated with psychological distress, expressed by the correlations of 0.59 for men and 0.60 for women. In both genders, the highest correlation between psychosocial work characteristics was observed for supervisor social support and conflicts with supervisor. Overall, work characteristics were rather weakly correlated with each other.

Since the ORs after the adjustment in step 2 (see data analysis above) did not vary meaningfully from those after step 1, we omitted step 1. The additional adjustment for either psychological distress or fatigue at step 3 had a stronger effect on the size of the associations, and these are presented.

Psychosocial work characteristics in men

As shown in Table 3, all psychosocial work characteristics were associated with fatigue after adjustments in step 2, with ORs ranging from 1.64 for low co-worker support to 2.70 for high emotional demands. Although the ORs were reduced in size after the additional adjustment for psychological distress, the associations remained significant for most of the psychosocial work characteristics, with the strongest association for low decision latitude (OR = 1.94; 95% CI 1.62–2.31). For high psychological demands and conflict with co-worker, however, the association with fatigue became nonsignificant. Compared with men in low-strain work, men in high-strain work and passive work were at a higher risk of fatigue, even after additional adjustment for psychological distress.

As in fatigue, there was a consistent picture of psychosocial work characteristics associated with psychological distress (Table 4). In contrast, all work

Table 2. Correlation matrix of the study variables for men (bold) and women

	1	2	3	4	5	6	7	8	9	10	11
1. Psychological demands		**0.01**	**–0.20****	**–0.06****	**0.26****	**0.18****	**0.17****	**0.08****	**0.05****	**0.16****	**0.22****
2. Decision latitude	0.03		**0.36****	**0.22****	**–0.14****	**–0.32****	**–0.16****	**–0.05****	**–0.14****	**–0.27****	**–0.21****
3. Supervisor support	–0.20**	0.31**		**0.25****	**–0.24****	**–0.16****	**–0.39****	**–0.10****	**–0.16****	**–0.23****	**–0.23****
4. Co-worker support	–0.09**	0.18**	0.30**		**–0.17****	**–0.07****	**–0.07****	**–0.22****	**–0.11****	**–0.15****	**–0.14****
5. Emotional demands	0.25**	–0.03	–0.17**	–0.09**		**0.26****	**0.29****	**0.26****	**0.18****	**0.25****	**0.32****
6. Physical demands	0.22**	–0.13**	–0.05*	–0.02	0.33**		**0.13****	**0.06****	**0.07****	**0.17****	**0.14****
7. Conflict supervisor	0.16**	–0.13**	–0.33**	–0.06**	0.20**	0.04*		**0.23****	**0.10****	**0.16****	**0.20****
8. Conflict co-worker	0.12**	–0.07**	–0.14**	–0.20**	0.22**	0.04	0.26**		**0.08****	**0.10****	**0.14****
9. Job insecurity	0.02	–0.11**	–0.13**	–0.07**	0.06**	–0.01	0.07**	0.03		**0.14****	**0.18****
10. Fatigue	0.18**	–0.17**	–0.23**	–0.13**	0.18**	0.09**	0.12**	0.13**	0.10**		**0.59****
11. Psychological distress	0.20**	–0.15**	–0.21**	–0.15**	0.22**	0.08**	0.17**	0.14**	0.11**	0.60**	

*$P < 0.05$; **$P < 0.01$

Table 3. Adjusted odds ratios (*OR*) and 95% confidence intervals (*95% CI*) for fatigue among men by psychosocial work characteristics

Characteristic	Level	OR[a]	95% CI	OR[b]	95% CI
Psychological demands	High	1.81	1.58–2.09	1.13	0.96–1.32
	Medium	1.26	1.08–1.47	0.98	0.82–1.17
	Low	1		1	
Decision latitude	Low	2.62	2.24–3.06	1.94	1.62–2.31
	Medium	1.36	1.16–1.59	1.25	1.05–1.49
	High	1		1	
Supervisor support	Low	1.84	1.63–2.06	1.26	1.10–1.45
	High	1		1	
Co-worker support	Low	1.64	1.46–1.86	1.34	1.17–1.54
	High	1		1	
Emotional demands	High	2.70	2.34–3.12	1.32	1.11–1.56
	Low	1.79	1.55–2.08	1.38	1.17–1.62
	No	1		1	
Physical demands	Yes	1.77	1.53–2.04	1.29	1.09–1.53
	No	1		1	
Job insecurity	Yes	2.33	1.92–2.83	1.30	1.03–1.63
	No	1		1	
Conflict with supervisor	Yes	2.18	1.85–2.57	1.22	1.00–1.49
	No	1		1	
Conflict with co-workers	Yes	1.91	1.57–2.32	1.22	0.97–1.54
	No	1		1	
High-strain work		3.48	2.89–4.20	1.88	1.52–2.32
Passive work		1.96	1.61–2.38	1.56	1.26–1.95
Active work		1.63	1.34–1.98	1.10	0.88–1.36
Low-strain work		1		1	

[a] Adjusted for age, educational level, living alone, employment status, and presence of disease
[b] Adjusted for age, educational level, living alone, employment status, and presence of disease, and for the continuous GHQ-12 score

Table 4. Adjusted odds ratios (*OR*) and 95% confidence intervals (*95% CI*) for psychological distress among men by psychosocial work characteristics

Characteristic	Level	OR[a]	95% CI	OR[b]	95% CI
Psychological demands	High	2.56	2.22–2.95	2.05	1.75–2.41
	Medium	1.52	1.29–1.78	1.38	1.15–1.65
	Low	1		1	
Decision latitude	Low	2.17	1.86–2.52	1.25	1.05–1.48
	Medium	1.22	1.05–1.43	1.00	0.85–1.19
	High	1		1	
Supervisor support	Low	2.23	1.98–2.51	1.65	1.44–1.88
	High	1		1	
Co-worker support	Low	1.72	1.53–1.94	1.31	1.15–1.50
	High	1		1	
Emotional demands	High	4.19	3.62–4.85	2.95	2.51–3.47
	Low	1.99	1.70–2.32	1.53	1.29–1.82
	No	1		1	
Physical demands	Yes	1.74	1.51–2.01	1.27	1.07–1.49
	No	1		1	
Job insecurity	Yes	3.23	2.68–3.89	2.43	1.96–3.02
	No	1		1	
Conflict with supervisor	Yes	2.85	2.43–3.35	2.04	1.70–2.45
	No	1		1	
Conflict with co-workers	Yes	2.37	1.97–2.86	1.94	1.56–2.40
	No	1		1	
High-strain work		4.05	3.34–4.91	2.17	1.75–2.69
Passive work		1.85	1.51–2.27	1.26	1.00–1.58
Active work		2.33	1.92–2.84	1.94	1.57–2.40
Low-strain work		1		1	

[a] Adjusted for age, educational level, living alone, employment status, and presence of disease
[b] Adjusted for age, educational level, living alone, employment status, and presence of disease, and for the continuous fatigue score

characteristics remained significant when we also controlled for fatigue, with the strongest associations for high emotional demands (OR = 2.95; 95% CI 2.51–3.47), experiencing job insecurity, high psychological demands, and conflict with supervisor. Next to high-strain work and passive work, a strong association was found between active work and psychological distress.

Psychosocial work characteristics in women

Table 5 shows that, except for physical demands, significant associations were found between psychosocial work characteristics and fatigue. Of these, low decision latitude (OR = 1.82; 95% CI 1.36–2.44) and low supervisor support (OR = 1.71; 95% CI 1.35–2.16) as well as high psychological demands, low co-worker support, and conflict with co-worker were still significant after adjustment for psychological distress. Compared with women reporting low-strain work, those in high-strain work and passive work were at a higher risk for fatigue, even after adjustment for psychological distress.

In contrast, low decision latitude and conflict with co-worker were no longer significantly associated with psychological distress when we adjusted for fatigue (Table 6). Strong associations, however, were found for conflict with supervisor (OR = 2.44; 95% CI 1.69–3.53) and high emotional demands (OR = 1.73; 95% CI 1.32–2.25). As shown in Table 6, a higher risk for psychological distress was found in women reporting active work.

Discussion

Our findings showed that psychosocial work characteristics were associated with fatigue in both men and women, even after adjustment for psychological distress. As regards the comparison of associations, the results provide some support for differential effects of psychosocial work characteristics on fatigue and psychological distress, which lends weight to the argument that they are different constructs.

To our knowledge, this is the first comprehensive study of the relationship between psychosocial factors at work and fatigue. The findings provide support for the existence of an association between psychosocial work

Table 5. Adjusted odds ratios (*OR*) and 95% confidence intervals (*95% CI*) for fatigue among women by psychosocial work characteristics

Characteristic	Level	OR[a]	95% CI	OR[b]	95% CI
Psychological demands	High	1.79	1.39–2.28	1.36	1.02–1.81
	Medium	1.23	0.94–1.61	1.20	0.89–1.62
	Low	1		1	
Decision latitude	Low	2.22	1.72–2.87	1.82	1.36–2.44
	Medium	1.25	0.96–1.62	1.03	0.77–1.39
	High	1		1	
Supervisor support	Low	2.25	1.83–2.77	1.71	1.35–2.16
	High	1		1	
Co-worker support	Low	1.68	1.34–2.09	1.30	1.01–1.69
	High	1		1	
Emotional demands	High	1.94	1.51–2.49	1.29	0.97–1.71
	Low	1.42	1.07–1.87	1.09	0.80–1.49
	No	1		1	
Physical demands	Yes	1.13	0.89–1.43	0.99	0.76–1.30
	No	1		1	
Job insecurity	Yes	1.99	1.41–2.80	1.39	0.93–2.08
	No	1		1	
Conflict with supervisor	Yes	1.96	1.39–2.78	1.14	0.76–1.71
	No	1		1	
Conflict with co-workers	Yes	2.16	1.51–3.09	1.52	1.00–2.30
	No	1		1	
High-strain work		2.85	2.07–3.92	2.01	1.41–2.88
Passive work		1.92	1.39–2.65	1.51	1.05–2.17
Active work		1.72	1.26–2.34	1.25	0.89–1.76
Low-strain work		1		1	

[a] Adjusted for age, educational level, living alone, employment status, and presence of disease

[b] Adjusted for age, educational level, living alone, employment status, and presence of disease, and for the continuous GHQ-12 score

Table 6. Adjusted odds ratios (*OR*) and 95% confidence intervals (*95% CI*) for psychological distress among women by psychosocial work characteristics

Characteristic	Level	OR[a]	95% CI	OR[b]	95% CI
Psychological demands	High	1.90	1.51–2.39	1.36	1.04–1.76
	Medium	1.08	0.84–1.38	0.91	0.68–1.20
	Low	1		1	
Decision latitude	Low	1.55	1.22–1.97	0.95	0.71–1.25
	Medium	1.28	1.02–1.62	1.09	0.84–1.42
	High	1		1	
Supervisor support	Low	1.90	1.57–2.30	1.30	1.05–1.62
	High	1		1	
Co-worker support	Low	1.73	1.41–2.13	1.35	1.06–1.72
	High	1		1	
Emotional demands	High	2.21	1.75–2.79	1.73	1.32–2.25
	Low	1.72	1.33–2.22	1.52	1.14–2.03
	No	1		1	
Physical demands	Yes	1.21	0.97–1.50	1.01	0.78–1.30
	No	1		1	
Job insecurity	Yes	1.92	1.39–2.64	1.42	0.97–2.08
	No	1		1	
Conflict with supervisor	Yes	3.11	2.26–4.29	2.44	1.69–3.53
	No	1		1	
Conflict with co-workers	Yes	2.37	1.69–3.34	1.47	0.99–2.19
	No	1		1	
High-strain work		2.44	1.82–3.29	1.34	0.95–1.88
Passive work		1.71	1.27–2.30	1.25	0.90–1.75
Active work		1.96	1.49–2.58	1.50	1.11–2.04
Low-strain work		1		1	

[a] Adjusted for age, educational level, living alone, employment status, and presence of disease

[b] Adjusted for age, educational level, living alone, employment status, and presence of disease, and for the continuous fatigue score

characteristics and fatigue in men and women. As regards high psychological demands, there was only an association with fatigue in women, but not in men. It is notable that we found the strongest association between low decision latitude and fatigue in both men and women. In men, we also found associations between high emotional demands, job insecurity, and conflict with supervisor and fatigue. These associations, however, were stronger when psychological distress was the dependent variable. In women, conflict with co-workers was also associated with fatigue, but emotional demands and conflict with supervisor were related only to psychological distress. Moreover, our findings showed that in both genders, high-strain work and passive work were found to be associated with fatigue. Both high-strain and passive work include low levels of decision latitude, indicating the possible negative impact of low levels of decision latitude on fatigue. In both genders, no association was found between low decision latitude and psychological distress.

Given the cross-sectional design of the study, it is important to note that the observed associations between psychosocial work characteristics and either fatigue or psychological distress are not readily interpretable as cause-effect associations. Whether, for example, reverse causation (Zapf et al. 1996) may partly account for the observed associations cannot be determined.

Another important issue concerns the assessment of both the independent and dependent variables, i.e., the potential limits related to self-reported measures in terms of shared method variance or shared response biases (Amick and Kasl 2000). In our study, information on psychosocial work characteristics, as well as on fatigue and psychological distress, is obtained by a self-administered questionnaire, which may result in an overestimation of the associations. Moreover, we have to keep in mind the potential underlying effects of negative affectivity (Watson and Clark 1984) on the relationship between self-reported measures: individuals high on negative affectivity may perceive their work environment more negatively, thereby creating spurious associations between work characteristics and the reports of adverse health outcomes, which are also influenced by negative affectivity. In the present study negative affectivity was

not measured. However, we controlled for either psychological distress or fatigue when appropriate, which as a proxy for negative affectivity may overestimate its effect and lead to overcorrection.

An overall response rate of 45% was reasonable for a survey in the working population, though potential biasing of the results related to selective participation of the employees cannot be ruled out. A non-response analysis, however, revealed that non-respondents were less likely to report fatigue and sickness absence, which may have led to a slight overestimation of the level of fatigue.

The validated CIS was used to measure fatigue in the working population (Beurskens et al. 2000). Fatigue is, like many medical conditions, best viewed as a continuum as opposed to a dichotomy (Lewis and Wessely 1992; David et al 1990). This is in line with our previous findings, indicating a continuous rather than a discrete distribution of fatigue (Bültmann et al. 2001). Although one may lose important information when using a cutoff point, it is useful when employees have to be monitored or when employees have to be selected for treatment. With respect to the CIS and GHQ-12 it is important to note that both instruments were used with their original time periods in order to leave their validity intact. Given the time course of cause and effect of fatigue and psychological distress, major methodological implications due to a time discrepancy of 2 weeks are unlikely.

Whereas this study primarily focused on the relationship between psychosocial work characteristics and fatigue (and psychological distress), other work-related aspects (e.g., working hours), work-family aspects (e.g., domestic load), and non-work-related aspects (e.g., lifestyle habits, individual characteristics) may also be considered as related to fatigue in men and women.

In conclusion, although the present study has limitations related to the cross-sectional nature of its design, it provides strong support for associations between psychosocial work characteristics and fatigue in men and women. It also suggests some differential effects of psychosocial work characteristics on fatigue and psychological distress, even after adjustment for each other. Since these psychosocial work characteristics represent potentially modifiable conditions, which can be addressed by interventions at the workplace to improve health, further research is needed to clarify their role in the onset of fatigue.

Acknowledgments The Maastricht Cohort Study is part of The Netherlands concerted research action on "Fatigue at work" granted by The Netherlands Organization for Scientific Research (NWO). The work presented in this paper was, and is currently, supported by The Netherlands Organization for Scientific Research (NWO grant no. 580-02.251).

References

Amick B, Kasl S (2000) Work Stress. In: McDonald C (ed) Epidemiology of work-related diseases. BMJ Publishing Group, London, pp 283–308

Beurskens A, Bültmann U, Kant IJ, Vercoulen JH, Bleijenberg G, Swaen GM (2000) Fatigue among working people: validity of a questionnaire measure. Occup Environ Med 57: 353–357

Bourbonnais R, Brisson C, Moisan J, Vezina M (1996) Job strain and psychological distress in white-collar workers. Scand J Work Environ Health 22: 139–145

Bültmann U, De Vries M, Beurskens A, Bleijenberg G, Vercoulen J, Kant IJ (2000) Measurement of prolonged fatigue in the working population: determination of a cutoff point for the Checklist Individual Strength. J Occup Health Psychol 5: 411–416

Bültmann U, Kant IJ, Kasl S, Beurskens A, Van den Brandt P (2001) Fatigue and psychological distress in the working population: psychometrics, prevalence, and correlates. J Psychosom Res (in press)

David A, Pelosi A, McDonald E, Stephens D, Ledger D, Rathbone R, et al. (1990) Tired, weak, or in need of rest: fatigue among general practice attenders. BMJ 301: 1199–1202

Goldberg DP, Williams P (1988) A user's guide to the general health questionnaire. NFER-Nelson, Windsor

Gründemann R, Smulders P, Winter de C (1993) Handleiding Vragenlijst Arbeid en Gezondheid (Questionnaire on work and health manual). Swets and Zeitlinger, Lisse

Hardy GE, Shapiro DA, Borrill CS (1997) Fatigue in the workforce of National Health Service Trusts: levels of symptomatology and links with minor psychiatric disorder, demographic, occupational and work role factors. J Psychosom Res 43: 83–92

Houtman I (1995) Reliability and validity of the Dutch version of the Karasek job content questionnaire. APA/NIOSH conference on Work, stress and health. APA, Washington, DC

Houtman I (1999) Feiten en fabels op een rij. Werkdruk in cijfers (Work pace in numbers). Arbeidsomstandigheden 75: 2–5

Kant IJ, Beurskens A, Schröer C, Nijhuis F, Schayck van C, Van den Elzen H, et al. (2000) De Maastrichtse Cohort Studie naar langdurige psychische vermoeidheid in de arbeidssituatie (The Maastricht Cohort Study of prolonged fatigue at work). TBV 8: 226–232

Karasek RA (1979) Job demands, job decision latitude, and mental strain: implications for job redesign. Adm Sci Q 24: 285–309

Karasek RA (1985) Job content questionnaire and users' guide. Department of industrial and systems engineering, University of Southern California, Los Angeles, Calif

Karasek R, Theorell T (1990) Healthy work: stress, productivity, and the reconstruction of working life. Basic Books, New York

Koeter M, Ormel J (1991) General health questionnaire. Handleiding Nederlandse bewerking (General health questionnaire manual, Dutch version). Swets and Zeitlinger, Lisse

Landsbergis PA, Schnall PL, Deitz D, Friedman R, Pickering T (1992) The patterning of psychological attributes and distress by "job strain" and social support in a sample of working men. J Behav Med 15: 379–405

Lewis G, Wessely S (1992) The epidemiology of fatigue: more questions than answers. J Epidemiol Community Health 46: 92–97

Loge JH, Ekeberg O, Kaasa S (1998) Fatigue in the general Norwegian population: normative data and associations. J Psychosom Res 45: 53–65

Meijman TF (1991) Over vermoeidheid: arbeidspsychologische studies naar beleving van belastingseffecten. (Fatigue: studies on the perception of workload effects). University of Amsterdam, Amsterdam

Meijman T, Schaufeli W (1996) Psychische vermoeidheid en arbeid. Ontwikkelingen in de A&O-psychologie (Fatigue at work. Developments in industrial and organizational psychology). De Psycholoog 6: 236–241

Mounstephen A, Sharpe M (1997) Chronic fatigue syndrome and occupational health. Occup Med (Oxf) 47: 217–227

Niedhammer I, Goldberg M, Leclerc A, Bugel I, David S (1998) Psychosocial factors at work and subsequent depressive symptoms in the Gazel cohort. Scand J Work Environ Health 24: 197–205

Pawlikowska T, Chalder T, Hirsch SR, Wallace P, Wright DJ, Wessely SC (1994) Population based study of fatigue and psychological distress. BMJ 308: 763–766

Schröer C (1997) De toename van arbeidsongeschiktheid wegens psychische aandoeningen (The increase of work disability due to mental disorders). TBV 5: 16–23

SPSS (1998) Base 9.0 for Windows, user's guide. SPSS Inc, Chicago, Ill

Stansfeld SA, North FM, White I, Marmot MG (1995) Work characteristics and psychiatric disorder in civil servants in London. J Epidemiol Community Health 49: 48–53

Stansfeld SA, Fuhrer R, Head J, Ferrie J, Shipley M (1997) Work and psychiatric disorder in the Whitehall II Study. J Psychosom Res 43: 73–81

Van Eck M (1991) De Diagnosestelling 'Categorie V' (The diagnose 'category V'). In: Bijl R, Bauduin D (eds) Categorie V: Arbeidsongeschiktheid wegens psychische stoornissen (Category V: work disability due to mental disorders). NcGV, Utrecht, pp 79–94

Van Veldhoven M, Meijman T (1994) Het meten van psychosociale arbeidsbelasting met een vragenlijst: De Vragenlijst Beleving en Beoordeling van de Arbeid (VBBA) (Questionnaire on perception and judgement of work). NIA, Amsterdam

Vercoulen JH, Swanink CM, Fennis JF, Galama JM, van der Meer JW, Bleijenberg G (1994) Dimensional assessment of chronic fatigue syndrome. J Psychosom Res 38: 383–392

Vercoulen JH, Hommes OR, Swanink CM, Jongen PJ, Fennis JF, Galama JM, et al. (1996a) The measurement of fatigue in patients with multiple sclerosis. A multidimensional comparison with patients with chronic fatigue syndrome and healthy subjects. Arch Neurol 53: 642–649

Vercoulen JH, Swanink CM, Fennis JF, Galama JM, van der Meer JW, Bleijenberg G (1996b) Prognosis in chronic fatigue syndrome: a prospective study on the natural course. J Neurol Neurosurg Psychiatry 60: 489–494

Vercoulen JH, Alberts M, Bleijenberg G (1999) De Checklist Individuele Spankracht (CIS) [The Checklist Individual Strength (CIS)]. Gedragstherapie 32: 131–136

Wall TD, Bolden RI, Borrill CS, Carter AJ, Golya DA, Hardy GE, et al. (1997) Minor psychiatric disorder in NHS trust staff: occupational and gender differences. Br J Psychiatry 171: 519–523

Watson D, Clark LA (1984) Negative affectivity: the disposition to experience aversive emotional states. Psychol Bull 96: 465–490

Zapf D, Dormann C, Frese M (1996) Longitudinal studies in organizational stress research: a review of the literature with reference to methodological issues. J Occup Health Psychol 1: 145–169