

Fatigue, emotional exhaustion and perceived health complaints associated with work-related characteristics in employees with and without chronic diseases

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Abstract

Objectives Ageing of the Dutch working force and increasingly more stringent restrictions regarding early retirement and disability benefits are leading to higher numbers of workers with ill health. Until now, only a few studies have explored how employees with ill health perceive their work. This study investigated possible differences in scores on fatigue, emotional exhaustion, perceived health complaints and various work-related characteristics between chronically ill (CIWs) and non-chronically ill workers (NCIW), as well as differences in associations between work- and health-related characteristics.

Methods A questionnaire was sent to all employees of a Dutch university to collect data on perceived work-related and health-related characteristics (response 49.1%). Differences in various scores were analysed using χ^2 -tests and the general linear model. Associations between the work- and the health-related characteristics were determined by multiple linear regression analyses in the CIWs ($n = 444$) and NCIW ($n = 1,347$) separately. Interaction terms were included to detect differences between the two groups.

Results The results indicated that the CIWs had less favourable scores on the three health-related charac-

teristics. Also, the CIWs scored less favourably than the NCIW on almost all the work-related characteristics. In the two groups, negative work-related aspects, such as higher work pressure, contributed most to explaining the variance in the health-related characteristics. However, in the CIWs, fatigue was not explained by the work-related aspects as much as in the NCIW. In the CIWs, the association between unpleasant treatment and the health-related characteristics was stronger than in the NCIW, but there were indications that autonomy, possibilities for learning and social support from superiors also played an important role.

Conclusions CIWs perceived more fatigue, emotional exhaustion and health complaints than NCIW. There were different patterns of associations between work- and health-related characteristics in the NCIW and CIW. Future studies on associations between work-related characteristics and health should take the presence of chronic disease into account.

Keywords Chronically ill workers · Fatigue · Health complaints · Psychosocial workload

Introduction

Since the end of the 1980s, the Dutch government has been attempting to promote participation in employment, among other things to spread the financial burdens of health care, social welfare and pension schemes (that will increase due to ageing of the population) over a larger number of people with paid employment (Kerkhofs et al. 2000). This policy is expressed for example in the recent plans to increase the retirement

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age by constraining pension regulations. In addition, it has become much more difficult to be declared disabled and it is strived for that as many people as possible who are receiving unemployment benefits or disability pension will find jobs in the short-term (Wevers et al. 1996). If this government policy succeeds, it will mean that a large proportion of workers have non-optimal health. This not only applies to the 60-year-olds who cannot take early retirement and to the people who have been excluded from receiving disability pension, but also to newcomers to the labour market: research has shown that a larger proportion of unemployed people suffer from health problems than people with paid jobs (Wetenschappelijke Raad voor het Regeringsbeleid 2001). Frequently, adjustments in the work situation will be necessary in order to make it possible for employees with non-optimal health to function adequately.

Until now, very little research has been performed into the question of how employees with ill health perceive their work. Do they experience the same problems as their healthy colleagues? or do they complain about more or different aspects of their work? It is necessary to gain more insight into work-related characteristics that might cause problems, to help advise employers about desired adjustments to the working environment or workload.

If the burden from the work or from work-home interference becomes too high, this can lead to health effects, such as fatigue, emotional exhaustion and perceived health complaints (Van Dijk et al. 1990; Donders et al. 2003). Many employees complain of fatigue. Prevalence rates of chronic fatigue in the general population vary widely: depending on the definition and measurement method used, they vary from 7 to 45% (Lewis and Wessely 1992). In a large cohort study on the working population in the south of the Netherlands, a recent prevalence of 22% 'long-term fatigue' has been established (Kant et al. 2003). In the case of emotional exhaustion, a central symptom of burnout, the feeling of being mentally and emotionally 'spent' was found to be correlated with chronic overburdening at work (De Ridder et al. 2000). Besides fatigue and emotional exhaustion, a person's perceived health in broader terms serves as a relevant means to measure health status. Perceived health complaints appeared to be associated with work-related characteristics (Karasek 1979; Donders et al. 2003; Sluiter et al. 2003) and absenteeism, both in chronically ill and non-chronically ill workers (Roskes et al. 2004).

Recent research has shown that chronically ill workers have higher levels of fatigue (Franssen et al. 2003; Boot 2004) and absenteeism than their healthy col-

leagues (Kessler et al. 2001; Baanders et al. 2002). Fatigue was often found to be a concomitant and very invalidating symptom of the chronic disease concerned (Swain 2000; Franssen et al. 2003; Weijman et al. 2003). By correcting for chronic disease, such as for example in the study on fatigue by Bültmann et al. (2002b), meaningful differences between the chronically ill and their healthy counterparts may have been missed. Possible differences in associations between work-related characteristics and health effects will be more easily identifiable if separate analyses are performed on the two groups.

In this study, the work perceptions of workers with chronic diseases were compared to the perceptions of workers without chronic diseases. Data were available from a questionnaire survey on work and health in employees at a Dutch university. Differences in scores on fatigue, emotional exhaustion, perceived health complaints and work-related characteristics were investigated between these two groups. In addition, data from the chronically ill workers (CIWs) and the non-chronically ill workers (NCIW) were analysed separately to see whether there were differences in associations between work-related characteristics and the three health-related characteristics in the two groups.

Methods

Data collection

Data for the present study were obtained via a questionnaire mailed to the home addresses of all the workers at a Dutch university. By means of an accompanying booklet, the employees were informed about the objectives of the study and assured that their responses would be handled with confidentiality. After 3 weeks, all the workers received a reminder. Both the University Board and Works Council of the university approved the study. Demographic characteristics that have been mentioned as potential confounders in the literature (e.g. sex, age, employment function, hours worked weekly) were included in the questionnaire (Van de Mheen et al. 1999; McDonough and Walters 2001; Kessler et al. 2001; Molarius and Janson 2002), as well as chronic disease, work- and health-related characteristics.

Demographic characteristics

Sex was coded as 0 = male and 1 = female. Age was divided into four categories: (1) <36 years, (2) 36–45 years, (3) 46–55 years and (4) >55 years. Education

level was categorised into three categories: primary school/lower vocational education, secondary/higher vocational education or university. Based on occupation and education level, employment function was categorised as: lower-educated non-scientific personnel (1 = low NSP), higher-educated non-scientific personnel (level of education is college or university degree; 2 = high NSP) or scientific personnel (3 = SP). Total numbers of hours worked weekly (all jobs together, including overtime) were categorised as: (1) <25 h, (2) 25–40 h, (3) >40 h.

Chronic disease

In response to the question ‘do you have a chronic disease?’ the respondents could choose from the following options: no, diabetes, psychological disorder (depression, anxiety, addiction), cancer, cardiovascular disease, respiratory disease (asthma, bronchitis, COPD), neurological disease (Parkinson, multiple sclerosis, etc.), musculoskeletal complaints (rheumatic arthritis, osteo-arthritis, etc.), or ‘other, namely...’. These options correspond with the chronic diseases most prevalent in the Netherlands (Van den Bos et al. 2000). Those respondents who gave a positive answer to one or more of these chronic diseases were categorised as chronically ill workers (CIWs). Those respondents who marked the option ‘other, namely...’ were also considered to be chronically ill when their disease fell within one of the following newly formed categories: skin disease or gastro-intestinal disease. The remaining respondents were considered individually and categorised as CIWs when they were indeed found to have a disease in the category ‘other, namely...’. Any respondents who reported a complaint that could not be assumed to be a chronic disease (e.g. often having a cold) or who simply did not answer the question on chronic disease were excluded from the analyses ($n = 52$). All the other respondents were categorised as non-chronically ill workers (NCIW).

Health-related characteristics

Fatigue (4 items) was assessed using the Shortened Fatigue Questionnaire (Alberts et al. 1997; Boot 2004). Emotional exhaustion (4 items) was measured using the Dutch version of the Maslach Burnout Inventory (De Jonge et al. 2000). Perceived health complaints were measured using the VOEG-13 that includes 13 dichotomous items to assess whether a person occasionally suffers from a range of psychosomatic complaints (Dirken 1969; Geurts et al. 1999).

Work-related characteristics

Work-related characteristics were assessed using various parts of previously validated questionnaires. Work variety (3 items) and professional expertise (2 items) were measured using the Maastricht Risk Assessment Questionnaire (De Jonge 1994; De Jonge et al. 2000). Work pressure (8 items) and autonomy (10 items) were measured using the Maastricht Autonomy Questionnaire (De Jonge et al. 1995). Role conflict (5 items), role ambiguity (5 items), social support from superiors (5 items) and social support from colleagues (5 items) were measured using the Questionnaire Organizational Stress-D (Bergers et al. 1986). Information on work (3 items), communication (4 items), possibilities for learning (4 items), decision latitude (9 items) and physical workload (3 items) were assessed using the Questionnaire on Experience and Evaluation of Work (Van Veldhoven and Meijman 1994; Van Veldhoven and Broersen 1999). Career opportunities (3 items) and employment terms (5 items) were also measured (De Jonge et al. 2000; Donders et al. 2003).

Analyses

The small number of respondents with missing data (mean percentage 1.7%) on health- and/or work-related items were assigned the mean item score for the corresponding category of employment function. Item scores on fatigue and perceived health complaints were summed for every respondent and mean item scores were calculated for emotional exhaustion and all the work-related characteristics. Cronbach’s alphas were calculated for each of the health- and work-related characteristics. A Cronbach’s alpha of 0.70 or higher was taken to reflect good internal consistency (Nunnally 1978). Cronbach’s alphas were high for the health-related characteristics (>0.75). Most of the work-related characteristics also had high Cronbach’s alphas (>0.70), with the exception of work variety (0.67), career opportunities (0.68) and employment terms (0.63).

Differences between CIWs and NCIWs

Demographic data of the CIWs and NCIWs were compared using the χ^2 -test. Mean scores of the CIWs and NCIWs on the various health- and work-related characteristics were compared using the general linear model (GLM). Sex, age, employment function and hours worked weekly were included as ‘fixed factors’, in order to adjust for potential confounding influences (Van de Mheen et al. 1999; McDonough and Walters

2001; Kessler et al. 2001; Molarius and Janson 2002). The significance level in all the tests was set at $P \leq 0.05$.

Associations between work- and health-related characteristics

Linear regression (enter method) was used to investigate the degree to which the different work-related characteristics contributed to explaining the variation in emotional exhaustion, fatigue and perceived health complaints. Analyses were performed on the total population, with presence of chronic disease as variable in the model. In addition, separate analyses were performed on the CIWs and NCIWs to investigate where differences were present between the two groups. If the regression coefficient in one group was clearly higher than that in the other group, then an interaction term was made between presence of chronic disease and the relevant work-related characteristic by multiplying the variables with each other. Subsequently, regression models were calculated that also included the relevant interaction terms. The interaction terms between presence of chronic disease and the potential confounders sex, age, employment function and hours worked weekly, were included in each model, irrespective of whether there were differences between the two groups.

All the analyses were conducted in SPSS 12.0.1.

Results

Response rate and characteristics of the population

A total of 3,881 questionnaires was distributed and 1,843 were returned, which yielded a crude response rate of 47.5%. However, 16 people indicated the receipt of two questionnaires because they had more than one job at the university, 41 questionnaires were returned as undeliverable and 73 individuals were no longer employed at the university anymore. The adjusted response rate was 49.1%. Compared to the sex distribution in a personnel database, fewer men than women responded ($\chi^2 = 71.8$, $P < 0001$). Analyses were performed on 444 CIWs (24.8%) and 1,347 NCIWs (75.2%).

The distribution of chronic disease among the CIWs was as follows: musculoskeletal complaints (33.3%), respiratory diseases (22.1%), psychological disorders (11.7%), cardiovascular diseases (10.1%), diabetes (6.1%), cancer (4.3%), neurological diseases (3.6%), gastro-intestinal diseases (3.2%), skin diseases (3.2%)

and other (e.g. allergies, migraine, diseases of the thyroid gland, etc.) (19.4%). Comorbidity was present in 13.3% of the CIWs.

Significant differences in age, education level, employment function and hours worked weekly were found between the CIWs and NCIWs, but not in sex (Table 1). On average, the CIWs were older than the NCIWs. A higher percentage of the CIWs also had a lower education level and a low NSP function than the NCIWs. Compared to the NCIWs, more of the CIWs worked for <25 h a week, while fewer of them worked for >40 h a week.

Work- and health-related characteristics in CIWs and NCIWs

The CIWs reported significantly higher scores on fatigue, emotional exhaustion and perceived health complaints than NCIWs (Table 2). In addition, the scores of CIWs on work-related characteristics in general were less favourable than those of NCIWs. The CIWs had significantly higher scores than the NCIWs on the negative work-related characteristics physical workload and role conflict. Regarding the positive work-related characteristics, the scores of the CIWs were significantly lower, especially on social support from superiors and colleagues, decision latitude and

Table 1 Demographic characteristics of the study population in percentages

	NCIWs		CIWs		χ^2 P value
	n	%	n	%	
Sex					
Male	724	53.8	224	50.8	0.27
Female	621	46.2	217	49.2	
Age					
<36 years	478	36.0	104	24.1	<0.01
36–45 years	372	28.8	107	24.8	
46–55 years	340	25.6	142	32.9	
>55 years	137	10.3	79	18.3	
Education level					
Primary school/lower vocational	96	7.1	68	15.4	<0.01
Secondary/higher vocational	407	30.3	149	33.8	
University	842	62.6	224	50.8	
Employment function					
Lower-educated non-scientific personnel (low NSP)	331	24.6	141	32.0	<0.01
Higher-educated non-scientific personnel (high NSP)	337	28.1	128	29.0	
Scientific personnel (SP)	635	47.3	172	39.0	
Hours worked weekly					
<25 h	182	13.6	88	19.9	<0.01
25–40 h	694	52.0	227	51.2	
>40 h	458	34.3	128	28.9	

NCIWs, non-chronically ill workers; CIWs, chronically ill worker

Table 2 Mean scores and standard deviations (SD) for the health- and work-related aspects (adjusted for sex, age, employment function and hours worked weekly)

	No. of items	Range ^a	Mean (SD)		GLM <i>P</i> value
			CIWs (<i>n</i> = 428)	NCIWs (<i>n</i> = 1,321)	
Health-related aspects ^a					
Fatigue	7	4–28	14.47 (6.78)	11.64 (7.85)	<0.001
Emotional exhaustion	4	1–5	2.63 (0.99)	2.40 (1.14)	<0.001
Perceived health complaints	13	0–13	3.88 (2.57)	2.34 (2.98)	<0.001
Negative work-related aspects ^b					
Unpleasant treatment	6	1–4	1.06 (0.16)	1.08 (0.17)	0.131
Role conflict	5	1–4	1.70 (0.45)	1.63 (0.52)	0.008
Work pressure	8	1–5	3.10 (0.72)	3.05 (0.84)	0.220
Role ambiguity	5	1–4	2.03 (0.61)	1.97 (0.71)	0.048
Physical workload	3	1–4	1.70 (0.58)	1.53 (0.67)	<0.001
Positive work-related aspects ^c					
Employment terms	5	1–5	3.58 (0.87)	3.45 (0.75)	0.001
Work variety	3	1–5	3.17 (0.67)	3.25 (0.78)	0.033
Information on work	3	1–4	2.93 (0.68)	3.01 (0.72)	0.021
Career opportunities	3	1–5	2.49 (0.94)	2.64 (1.09)	0.002
Communication	4	1–4	2.63 (0.69)	2.73 (0.80)	0.012
Professional expertise	2	1–5	4.03 (0.79)	4.07 (0.82)	0.388
Possibilities for learning	4	1–4	2.76 (0.65)	2.85 (0.76)	0.009
Decision latitude	11	1–4	2.59 (0.61)	2.69 (0.71)	0.002
Autonomy	8	1–5	3.45 (0.70)	3.52 (0.74)	0.060
Social support from superiors	5	1–4	3.14 (0.68)	3.28 (0.79)	<0.001
Social support from colleagues	5	1–4	3.17 (0.56)	3.29 (0.65)	<0.001

CIWs, chronically ill workers; NCIWs, non-chronically ill workers

^a ‘Fatigue’ and ‘perceived health complaints’ are sum scores, all other scales are mean item scores

^b On these scales, a higher score is unfavourable

^c On these scales, a higher score is favourable

career opportunities. The associations between the work-related characteristics and the health-related characteristics are shown in Table 3.

Chronic disease

Presence of chronic disease was included as variable in the model that contained the total population. The results showed that the presence of chronic disease was positively associated with each of the three health-related characteristics (Table 3). The association with emotional exhaustion was less strong than with perceived health complaints, while the association with fatigue lay between these.

Fatigue

In the total population, higher scores on the negative characteristics role conflict, work pressure, role ambiguity and physical workload were associated with more fatigue. Greater satisfaction with employment terms, work variety, information on work, possibilities for learning and support from colleagues were associated with less fatigue.

In the separate analyses on the CIWs and NCIWs, role conflict, work pressure, role ambiguity, physical workload, employment terms, information on work and social support from colleagues played a part in the NCIWs, but not in the CIWs. Unpleasant treatment and autonomy played a part in the CIWs, but not in the NCIWs. The difference in unpleasant treatment between the CIWs and NCIWs was significant: this interaction term was retained in the last regression model. This means that in the CIWs, unpleasant treatment played a more important part than in the NCIWs. In the NCIWs, the work-related characteristics explained a larger proportion of the variance in fatigue than in the CIWs (24 vs. 16%).

Emotional exhaustion

More role conflict, work pressure, role ambiguity and physical workload were associated with more emotional exhaustion. Particularly work pressure played a large part ($\beta = 0.32$). Employment terms, work variety, possibilities for learning, social support from superiors and from colleagues were negatively associated with emotional exhaustion, which means that a higher score

Table 3 Standardised regression coefficients (β) and proportions of explained variance (R^2) in the total group (Total), non-chronically ill workers (NCIW's, $n = 1,347$) and chronically ill workers (CIW's, $n = 444$)

	Fatigue			Emotional exhaustion			Perceived health complaints			
	Total (β)	NCIW's (β)	CIW's (β)	Total (β)	NCIW's (β)	CIW's (β)	Total (β)	NCIW's (β)	CIW's (β)	
				Interaction (P)			Interaction (P)			Interaction (P)
Negative work-related characteristics ^a										
Unpleasant treatment	0.03	0.01	0.10	0.049	0.02	-0.01	0.09	0.01	0.16	0.000
Role conflict	0.12	0.14	0.09		0.13	0.16	0.07	0.09	0.11	0.07
Work pressure	0.18	0.20	0.11		0.32	0.32	0.32	0.15	0.17	0.11
Role ambiguity	0.09	0.10	0.08		0.07	0.07	0.09	0.10	0.10	0.12
Physical workload	0.10	0.11	0.05		0.06	0.08	-0.01	0.16	0.15	0.20
Positive work-related characteristics ^b										
Employment terms	-0.12	-0.13	-0.10		-0.12	-0.12	-0.12	-0.05	-0.05	-0.04
Work variety	-0.05	-0.05	-0.06		-0.08	-0.08	-0.08	-0.11	-0.13	-0.08
Information on work	0.06	0.09	0.02		0.02	0.02	0.03	0.07	0.06	0.11
Career opportunities	0.02	0.04	-0.05		0.04	0.04	0.02	-0.03	-0.02	-0.09
Communication	0.03	0.02	0.02		0.05	0.07	-0.03	0.00	0.02	-0.06
Professional expertise	-0.01	-0.01	0.00		0.00	-0.02	0.06	0.04	0.04	0.06
Possibilities for learning	-0.09	-0.09	-0.09		-0.12	-0.10	-0.18	-0.01	0.02	-0.09
Job Control ^b										
Decision latitude	-0.04	-0.04	-0.03		-0.01	-0.01	-0.01	-0.05	-0.07	0.01
Autonomy	0.06	0.03	0.12		0.06	0.04	0.08	0.01	-0.01	0.08
Social support ^b										
Social support from superiors	0.02	0.01	0.02		-0.09	-0.07	-0.12	-0.01	0.00	-0.06
Social support from colleagues	-0.07	-0.08	-0.06		-0.10	-0.12	-0.05	-0.08	-0.09	-0.06
Other variables										
Sex (0 = male, 1 = female)	0.07	0.06	0.12		0.01	0.03	-0.03	0.09	0.09	0.13
Age	-0.06	-0.10	0.02	0.006	-0.05	-0.06	-0.03	0.01	0.00	0.03
Employment function	0.09	0.12	0.02		0.08	0.11	0.00	-0.01	0.01	-0.04
Hours worked weekly	-0.07	-0.07	-0.07		0.00	0.01	-0.03	-0.01	-0.02	-0.02
Presence of chronic disease (0 = no, 1 = yes)	0.14				0.07			0.20		
R^2	0.22	0.24	0.16		0.37	0.37	0.36	0.26	0.20	0.28

In the column 'Interaction', the P value of a significant interaction term is presented. Figures in bold typeface indicate significant associations ($P < 0.05$)

^a A positive relationship means that a higher score on the work-related aspect is associated with a higher score on the health-related characteristic

^b A negative relationship means that a higher score on the work-related aspect is associated with a lower score on the health-related characteristic

on these work-related characteristics was related with less emotional exhaustion. More autonomy, however, was associated with more emotional exhaustion.

In the separate analyses, differences were found in unpleasant treatment, role conflict, physical workload, communication, possibilities for learning, social support from superiors and from colleagues between the NCIWs and CIWs. On the basis of the interaction terms, it appeared that unpleasant treatment in the CIWs was more strongly associated with emotional exhaustion, whereas in the NCIWs, there was a stronger association with physical workload. The other differences were not statistically significant. Percentages of explained variance were comparable between the NCIWs and CIWs: 37 and 36%, respectively.

Perceived health complaints

Once again, associations were found with negative work-related characteristics: more unpleasant treatment, role conflict, work pressure, role ambiguity and physical workload were associated with more perceived health complaints. In the total population, the positive work-related characteristics work variety and information on work played a part. In addition, it was found that more social support from colleagues was associated with fewer perceived health complaints.

Differences between the NCIWs and CIWs occurred in unpleasant treatment, role conflict, work pressure, physical workload, work variety and social support from colleagues. The interaction model showed that this difference was only significant for unpleasant treatment: the association was stronger in the CIWs than in the NCIWs. Percentages of explained variance were slightly higher in the CIWs: 28 versus 20%.

Sex, age, employment function and hours worked weekly

Sex, age, employment function and hours worked weekly were included as potential confounders. Table 3 shows that women experienced more fatigue and health complaints than men. This applied to the CIWs and NCIWs. Younger workers in the NCIW group reported more fatigue and emotional exhaustion than the older workers. In the case of fatigue, the interaction term between presence of chronic disease and age remained in the model, which means that the association between age and fatigue was stronger in the NCIWs than in the CIWs. In the total population and in the NCIWs, people with a higher-ranking job reported more fatigue and exhaustion than workers with lower-ranking jobs. A negative association was found between

hours worked weekly and fatigue in the total population and in the NCIWs: more hours worked weekly was associated with less fatigue.

Discussion

This study investigated whether there were differences in scores on the health-related characteristics fatigue, emotional exhaustion and perceived health complaints and various work-related characteristics between workers with chronic diseases and those without chronic diseases. In addition, it was investigated whether there were associations between work-related characteristics and health-related characteristics and whether there were differences between the CIWs and NCIWs.

Comparison of the two groups showed that on average, the CIWs were older, had a lower education level, lower-ranking jobs and more of them were employed part-time than NCIWs (Table 1). These findings support those from other research (Merens et al. 2000; Franssen et al. 2003; CBS 2003a). Generally, it has been found that more women have chronic diseases, but in the present study, this difference was very small.

After correction for sex, age, employment function and hours worked weekly, CIWs had fewer positive work-related characteristics in their work and more negative characteristics (Table 2). Merens et al. (2000) reported the same on the basis of national rates. They remarked that it remained unclear whether CIWs did indeed have poorer jobs (which was possible in view of their lower education level and lower employment status) or whether it was chiefly a perception effect in which the work was experienced as heavier because the people in question were feeling more vulnerable. In our study group, it is most likely that particularly the latter played a part. The CIWs and NCIWs were working for the same employer and it is improbable that this employer was creating better working conditions for NCIWs than for CIWs.

Associations between work- and health-related characteristics

The regression model with interaction terms showed that there were significant differences between NCIWs and CIWs regarding unpleasant treatment and in the association between physical workload and fatigue. It was striking that in each of the three health-related characteristics, unpleasant treatment came forward as a bottleneck in the CIWs. Differences in the association between physical workload and fatigue between

the two groups were not very relevant: in the CIWs there was no association, whereas in the NCIWs, the association was significant but weak ($\beta = 0.08$).

Separate regression analyses on the two groups showed that in the NCIWs, more work-related characteristics had a significant association than in the CIWs. However, the NCIW group was much larger than the CIW group ($n = 1,347$ and 444 , respectively), which means that regression coefficients will pass the significance level more quickly in the NCIWs. This occurred for example in the association between work variety and emotional exhaustion. In the two groups, β was 0.08 , but in the CIWs, this association was not significant. When regression coefficients of larger than 0.10 (Cohen 1977) were taken into account, it was found that particularly the negative work-related characteristics contributed to explaining the variance in the three health-related characteristics.

In the two groups, support from superiors was associated with less emotional exhaustion, but there were indications that the role of social support from superiors was more important in the CIWs than in the NCIWs. Dettlele et al. (2003) also reported that social support from superiors was an important factor in a study on people with chronic diseases. Work adjustments are crucial in order to retain employment for employees with chronic diseases (Wevers et al. 1996). In most cases, this does not mean that adjustments need to be made to the physical working environment, but instead, changes are needed in the tasks, increasing job control, lowering of the work pace and changes in working hours. The barrier against actually using such facilities is smaller when the employee feels supported by his/her superiors (Wevers et al. 1996; Dettlele et al. 2003).

According to theories on work-related stress, sufficient job control is essential to prevent (psychological) stress and health complaints (Karasek 1979; Johnson and Hall 1988). On the basis of these findings, it was expected that decision latitude and autonomy would have a protective influence on health effects (Karasek 1979). However, the results did not show any significant association between decision latitude and health-related characteristics. In a previous study on this population of university employees, Donders et al. (2003) were also unable to demonstrate any association. A probable explanation is that all the employees within the business-culture of a university have sufficient decision latitude. Thus, this aspect did not make any notable contribution to the explained variance. In the total population, autonomy was positively associated with fatigue and emotional exhaustion. A plausible explanation is that people

make greater use of possibilities in the area of autonomy owing to their health problems.

In the NCIW group, fatigue was stronger related with role conflict, role ambiguity and physical workload compared with the CIWs. Moreover, stronger associations were found between social support from colleagues and emotional exhaustion and between work variety and perceived health complaints.

Besides differences, several similarities were found between the NCIWs and CIWs: in the two groups, there was an association between work pressure and the three health-related characteristics and between employment terms and emotional exhaustion. The same applied to the association between physical workload and perceived health complaints and to possibilities for learning and emotional exhaustion. The latter two associations were slightly stronger in the CIWs than in the NCIWs.

Percentages of explained variance for fatigue due to work-related characteristics were higher in the NCIWs than in the CIWs. In people with chronic diseases, fatigue depends to a large extent on their diseases (Swain 2000; Sharpe and Wilks 2002; Bensing and van Lindert 2003). People with chronic diseases often experience changes in their daily functioning, such as decreased physical or mental activity (Franssen et al. 2003). This has a negative influence on the general state of health and on psychosocial functioning. In addition, fatigue is often a symptom of the chronic diseases itself (Franssen et al. 2003; Weijman et al. 2003). The part played by work-related characteristics was therefore somewhat smaller in CIWs than in NCIWs.

Emotional exhaustion in the NCIWs and CIWs was explained to an equal degree by work-related characteristics. A probable explanation is that emotional exhaustion (as formulated in the questionnaire) expressly concerned work-related tiredness. Particularly work pressure was associated with a higher score on emotional exhaustion, which confirmed the results of other research (Houtman et al. 2000; Janssen and Nijhuis 2004). Emotional exhaustion can predominantly be considered as mental tiredness. Physical limitations in people with chronic diseases do not necessarily have any influence on this. It was striking that physical workload did play a part in the NCIWs, although the association was rather weak.

Perceived health complaints were explained to a larger extent by work-related characteristics in the CIWs than in the NCIWs. These complaints were assessed using the VOEG-13. The questions in the VOEG-13 address physical complaints that are often labelled as functional or psychosomatic, but can also form part of a physical disorder (Furer et al. 1995).

This might partly explain the higher VOEG scores in CIWs. Percentages of explained variance were higher in the CIWs than in NCIWs, which indicated that work-related characteristics, such as unpleasant treatment and physical workload, nevertheless played a part. The largest association, however, was found with physical workload. Owing to their poorer health, CIWs had less capacity and therefore became more easily physically overburdened (Wevers et al. 1996; Merens et al. 2000; Weijman et al. 2003). This might mean that benefit can be gained from improving the working conditions so that despite their poorer health, CIWs can function as well as possible. It is important in this respect to emphasize that people with chronic diseases were somewhat over-represented among the workers with a lower education level and with a lower-educated non-scientific function. Particularly in these groups, the work is often heavier in a physical sense (Merens et al. 2000).

The women had higher average scores on fatigue and perceived health complaints than men, both in CIWs and NCIWs. These findings agree with the results from many other studies that showed more health complaints in women (Donders et al. 2003) and more fatigue than in men (Bültmann et al. 2002b; Bensing and van Lindert 2003; CBS 2003b). In CIWs, fatigue did not appear to be associated with age, whereas in NCIWs, particularly the younger workers seemed to have more fatigue. In general, relationships between age and fatigue are not very clear (Griffiths 2000; Bültmann et al. 2002a).

In the NCIWs, there were indications that workers with higher-ranking jobs experienced greater fatigue and emotional exhaustion. On average, the part played by employment function was not very large. Bültmann et al. (2001) described that it were particularly work-related characteristics and not so much job descriptions that contributed to the explanation of fatigue and psychological complaints. This was confirmed by the present research, because the contributions of (negative) work-related characteristics were greater than employment function.

Methodological considerations

A limitation of the present study was the cross-sectional design. It was assumed that work-related characteristics led to health effects, but as they were measured simultaneously, it was not possible to say anything about the causality or direction of the associations found.

The proportion of employees with chronic diseases in the study population was comparable with the

prevalence of self-reported chronic diseases in the Dutch working population (CBS 2001; Kant et al. 2003). Owing to the fact that the data were gathered anonymously, it is impossible to establish whether selective non-response occurred. Our results showed that the CIWs were older and had a lower education level than the NCIWs, concordant with the situation in the Dutch population (CBS 2003a). The education level of our study population of university employees, however, was higher than the average level in the general population, which means that the generalisability of the results is only limited.

The information on chronic diseases, demographics, work-related characteristics and the three health-related characteristics were obtained with the aid of a questionnaire that was compiled from (parts of) validated questionnaires. Internal consistency of the scales was generally good. A point of consideration is whether the questions on work-related characteristics were distinguishing enough for CIWs. It is possible that the questions were too general to adequately assess the specific problems chronically ill people experience at work (Detaille et al. 2003).

Misclassification of the workers into the categories chronically ill and non-chronically ill may have affected the results (Kleinbaum et al. 1982) and led to underestimation of the differences. Kessler et al. (2001) reported that recall bias, ignorance or unwillingness to admit to having a chronic disease due to possible stigmatisation may be of influence. However, other literature showed that the reliability of self-reported chronic diseases was moderate. Particularly self-reported cardiovascular diseases and diabetes were in agreement with the professional diagnosis, whereas there was less agreement in the case of musculoskeletal complaints and lung disorders (Heliövaara et al. 1993; Kriegsman et al. 1996). Respondents with a high education level, like many of the participants in this study, reported more in agreement with the medical diagnosis than those with a low education level (Heliövaara et al. 1993). It is unlikely that the CIWs filled in the questionnaire differently from the NCIWs through deviations in involvement in the study, because the questionnaire addressed many subjects and did not lay emphasis on being chronically ill.

In this study, chronic diseases were analysed as one group, without making any distinctions between diagnoses and comorbidity. Analysing differences between various chronic diseases was not possible due to the small numbers of the sub-groups. However, it is possible that in the various diagnostic categories, there were differences in associations between work-related characteristics and health-related characteristics. The study

by Dettle et al. (2003) showed that different groups of chronically ill employees were experiencing the same bottlenecks, but their prioritization varied. For example, support from superiors was the most important characteristic in workers with rheumatoid arthritis, whereas this characteristic took third place in workers with diabetes mellitus.

This study focused solely on associations between the three health-related characteristics and psychosocial work-related characteristics. However, it is possible that other factors also play a part, such as factors in private life (e.g. demands at home, leisure time activities), work-family interference and individual characteristics (e.g. health behaviour, coping style) (Bültmann et al. 2002b).

Conclusions

This study showed clear differences in the scores on work- and health-related characteristics between CIWs and NCIWs. In addition, differences were found in the work-related characteristics that contributed to the explanation of fatigue, emotional exhaustion and perceived health complaints. Particularly unpleasant treatment played a larger role in the CIWs than in NCIWs. Fatigue in the CIWs was explained to a smaller extent by work-related characteristics than in the NCIWs, probably because the chronic disease itself had the most influence on this. Perceived health complaints were explained more strongly by work-related characteristics in the CIWs than in the NCIWs. Based on the differences found in this study, we recommend that in future research, distinctions should be made between people with and without chronic diseases. Important differences will be missed by simply correcting for chronic diseases. Within the working population, chronically ill workers should be considered as a group with lower capacity. They will derive extra benefit from attention to the work-related problems that they experience.

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References

- Alberts M, Smets EMA, Vercoulen JHMM, Garssen B, Bleijenberg G (1997) 'Verkorte vermoeidheidsvragenlijst': een praktisch hulpmiddel bij het scoren van vermoeidheid ('Abbreviated fatigue questionnaire': a practical tool in the classification of fatigue). *Ned Tijdschr Geneesk* 141:1526–1530
- Baanders AN, Rijken PM, Peters L (2002) Labour participation of the chronically ill. A profile sketch. *Eur J Public Health* 12:124–130
- Bensing JM, van Lindert H (2003) Vermoeider dan ooit (More tired than ever). *Med Contact* 58:551–555
- Bergers GPA, Marcelissen FHG, de Wolf CH (1986) Vragenlijst Organisatie Stress-D (Questionnaire organizational stress). Department of Work and Organizational Psychology, University of Nijmegen, Nijmegen
- Boot CRL (2004) Sick leave in asthma and COPD: the role of the disease, adaptation, work, psychosocial factors and knowledge. Radboud Universiteit Nijmegen, Nijmegen
- Bültmann U, Kant IJ, van Amelsvoort LGPM, van den Brandt PA, Kasl SV (2001) Differences in fatigue and psychological distress across occupations: results from the Maastricht cohort study of fatigue at work. *J Occup Environ Med* 43:976–983
- Bültmann U, Kant IJ, Kasl SV, Beurskens AJHM, van den Brandt PA (2002a) Fatigue and psychological distress in the working population: psychometrics, prevalence, and correlates. *J Psychosom Res* 52:445–452
- Bültmann U, Kant IJ, van den Brandt PA, Kasl SV (2002b) Psychosocial work characteristics as risk factors for the onset of fatigue and psychological distress: prospective results from the Maastricht cohort study. *Psychol Med* 32:333–345
- CBS (2001) Bijna anderhalf miljoen mensen met een arbeids handicap (Nearly one and a half million disabled workers). <http://www.cbs.nl/nl/publicaties/persberichten/2001/pb01n280.pdf>
- CBS (2003a) Profiel arbeidsgehandicapten (Profile disabled workers). <http://www.statline.cbs.nl>
- CBS (2003b) Vrouwen hebben meer gezondheidsklachten ondanks gezondere leefstijl (Women have more health complaints despite a healthier life style). <http://www.cbs.nl/nl/publicaties/persberichten/2003/pb03n106.pdf>
- Cohen J (1977) Statistical power analysis for the behavioral sciences. Academic, New York
- De Jonge J (1994) Maastrichtse Risico-Inventarisatie. versie 1.1 (Maastricht risk assessment questionnaire. version 1.1). Rijksuniversiteit Maastricht, Maastricht
- De Jonge J, Landeweerd JA, Nijhuis FJN (1995) Constructie en validering van de vragenlijst ten behoeve van het project 'autonomie in het werk' (Construction and validation of the questionnaire used in the project 'autonomy in work'). Rijksuniversiteit Limburg, Maastricht
- De Jonge J, Bosma H, Peter R, Siegrist J (2000) Job strain, effort-reward imbalance and employee well-being: a large-scale cross-sectional study. *Soc Sci Med* 50:1317–1327
- De Ridder D, Schreurs K, Schaufeli W (2000) De psychologie van vermoeidheid (The psychology of fatigue). Van Gorcum, Assen
- Dettle SI, Haafkens JA, van Dijk FJH (2003) What employees with rheumatoid arthritis, diabetes mellitus and hearing loss need to cope at work. *Scand J Work Environ Health* 29:134–142
- Dirken JM (1969) Arbeid en stress (Work and stress). Wolters Noordhoff, Groningen
- Donders NCGM, van der Gulden JWJ, Furer JW, Tax B, Roscam Abbing EW (2003) Work stress and health effects among university personnel. *Int Arch Occup Environ Health* 76:605–613
- Franssen PML, Bültmann U, Kant IJ, van Amelsvoort LGPM (2003) The association between chronic diseases and fatigue in the working population. *J Psychosom Res* 54:339–344
- Furer JW, König-Zahn C, Tax B (1995) Het meten van de gezondheidstoestand. Beschrijving en evaluatie van vragenlijsten. Van Gorcum, Assen

- Geurts S, Rutte C, Peeters M (1999) Antecedents and consequences of work-home interference among medical residents. *Soc Sci Med* 48:1135–1148
- Griffiths A (2000) Designing and managing healthy work for older workers. *Occup Med (Lond)* 50:473–477
- Heliövaara M, Aromaa A, Klaukka T, Knekt P, Joukamaa M, Impivaara O (1993) Reliability and validity of interview data on chronic diseases. The mini-Finland health survey. *J Clin Epidemiol* 46:181–191
- Houtman ILD, Schaufeli WB, Taris T (2000) Psychische vermoeidheid en werk. NWO/Samsom, Alphen aan den Rijn
- Janssen N, Nijhuis FJ (2004) Associations between positive changes in perceived work characteristics and changes in fatigue. *J Occup Environ Med* 46:866–875
- Johnson JV, Hall EM (1988) Job strain, work place social support, and cardiovascular disease: a cross-sectional study of a random sample of the Swedish working population. *Am J Public Health* 78:1336–1342
- Kant IJ, Bültmann U, Schröer CAP, Beurskens AJHM, van Amelsvoort LGPM, Swaen GMH (2003) An epidemiological approach to study fatigue in the working population: the Maastricht cohort study. *Occup Environ Med* 60:i32–i39
- Karasek RA (1979) Job demands, job decision latitude, and mental strain: implications for job redesign. *Adm Sci Q* 24:285–308
- Kerkhofs MJM, Megens M, Schalen MJD, Zijlstra FRH (2000) Ontwikkelingen in arbeidsparticipatie en gezondheid. In: Heuze CA, Eggelte JJA, den Butter FAG (eds) Naar een vrijwel volledige arbeidsparticipatie. Wetenschappelijke Raad voor het Regeringsbeleid, Den Haag
- Kessler RC, Greenberg PE, Mickelson KD, Meneades LM, Wang PS (2001) The effects of chronic medical conditions on work loss and work cutback. *J Occup Environ Med* 43:218–225
- Kleinbaum DG, Kupper LL, Morgenstern H (1982) Information bias. In: Kleinbaum DG, Kupper LL, Morgenstern H (eds) *Epidemiologic research*. Van Nostrand Reinhold, New York
- Kriegsman DMW, Penninx BWJH, van Eijk JThM, Boeke AJP, Deeg DJH (1996) Self-reports and general practitioner information on the presence of chronic diseases in community dwelling elderly. A study on the accuracy of patients' self-reports and on determinants of inaccuracy. *J Clin Epidemiol* 49:1407–1417
- Lewis G, Wessely S (1992) The epidemiology of fatigue: more questions than answers. *J Epidemiol Community Health* 46:92–97
- McDonough P, Walters V (2001) Gender and health: reassessing patterns and explanations. *Soc Sci Med* 52:547–559
- Merens A, Schoemakers-Salkinoja I, de Klerk M (2000) Arbeidsparticipatie en kenmerken van de arbeid. In: De Klerk MMY (ed) *Rapportage gehandicapten 2000*. Sociaal en Cultureel Planbureau, Den Haag
- Molarius A, Janson S (2002) Self-rated health, chronic diseases, and symptoms among middle-aged and elderly men and women. *J Clin Epidemiol* 55:364–370
- Nunnally JC (1978) *Psychometric theory*. McGraw-Hill, New York
- Roskes K, Donders NCGM, van der Gulden JWJ (2004) Health- and work-related aspects associated with sick leave: a comparison of chronically-ill and non-chronically-ill workers. *Int Arch Occup Environ Health* 78(4):270–278
- Sharpe M, Wilks D (2002) Fatigue. *BMJ* 325:480–483
- Sluiter JK, de Croon EM, Meijman TF, Frings-Dresen MHW (2003) Need for recovery from work related fatigue and its role in the development and prediction of subjective health complaints. *Occup Environ Med* 60:i62–i70
- Swain MG (2000) Fatigue in chronic disease. *Clin Sci (Lond)* 99:1–8
- Van de Mheen H, Stronks K, Schrijvers CTM, Mackenbach JP (1999) The influence of adult ill health on occupational class mobility and mobility out of and into employment in the The Netherlands. *Soc Sci Med* 49:509–518
- Van den Bos GAM, Danner SA, de Haan RJ, Schadé E (2000) Chronisch zieken en gezondheidszorg (Chronically ill and health care) (in Dutch). Elsevier Gezondheidszorg, Maarsse
- Van Dijk FJH, van Dormolen M, Kompier MAJ, Meijman TF (1990) Herwaardering model belasting-belastbaarheid (Reappraisal of the model of workload and capacity). *T Soc Gezondheidsz* 68:3–10
- Van Veldhoven M, Meijman TF (1994) Het meten van psychosociale arbeidsbelasting met een vragenlijst. De Vragenlijst Beleving en Beoordeling van de Arbeid (VBBA) (The measurement of psychosocial workload and workstress with a questionnaire. The questionnaire on the experience and evaluation of work). Nederlands Instituut voor Arbeidsomstandigheden, Amsterdam
- Van Veldhoven M, Broersen JPJ (1999) Psychosociale arbeidsbelasting en werkstress in Nederland. Een verkenning gebaseerd op gegevens verzameld door arbodiensten met de Vragenlijst Beleving en Beoordeling van de Arbeid (VBBA) in de periode 1995 t/m 1998. (Psychosocial workload and workstress in The Netherlands. An exploration based on data collected through occupational health services with the questionnaire on the experience and evaluation of work in the period 1995 through 1998). Stichting Kwaliteitsbevordering Bedrijfsgezondheidszorg (SKB), Amsterdam
- Weijman I, Ros WJG, Rutten GEHM, Schaufeli WB, Schabracq MJ, Winnubst JAM (2003) Fatigue in employees with diabetes: its relation with work characteristics and diabetes related burden. *Occup Environ Med* 60:i93–i98
- Wetenschappelijke Raad voor het Regeringsbeleid (2001) Doorgroei van arbeidsparticipatie. WRR-rapport nr. 57. Sdu Uitgevers, Den Haag
- Wevers CWJ, van Putten DJ, Nijboer ID (1996) Werken met een chronische aandoening (Working with a chronic condition). Samsom BedrijfsInformatie, Alphen aan den Rijn