

Diabetes, Employment and Fatigue-Related Complaints: A Comparison Between Diabetic Employees, “Healthy” Employees, and Employees With Other Chronic Diseases

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The work situation and fatigue-related complaints of employees with diabetes (N = 141) were compared with “healthy” employees (N = 8946) and employees with other chronic diseases (N = 1883). Baseline data from a Dutch Cohort Study on Fatigue at Work were used to test differences in background variables, work characteristics, lifestyle factors, and fatigue-related complaints. Odds ratios were calculated for prolonged fatigue, the need for recovery, burnout, and psychological distress. Results showed that employees with diabetes work more daytime hours and work less overtime than the other groups. If they have no comorbidity, they are no more likely to report fatigue-related complaints than “healthy” employees, except for a depressed mood. Comorbidity (the presence of one or more additional chronic diseases) is associated with increased fatigue-related complaints. Therefore, this group will need special attention from professionals. (J Occup Environ Med. 2004; 46:828–836)

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The number of people with diabetes is increasing. In 2000, 482,700 people in the Netherlands were estimated as having diabetes,¹ and every year 58,100 people are newly diagnosed as such.² Many are employed, but little is known about their work situations and the (work-related) health problems they face.

Diabetes differs in several aspects from other chronic diseases. It is, to a large extent, a self-managed disease,³ which requires a variety of daily disease-related tasks to be performed by the patient. People with diabetes, and especially patients who require insulin injections, have to follow a strict and daily regimen.^{4,5} It is quite important that self-management activities are performed during working hours as well as to ensure that blood glucose levels are kept near normal to minimize symptoms and to prevent long-term complications. Because self-management may be perceived as a burden, as frustrating, and even as overwhelming,^{6,7} suffering from diabetes might lead to an increase in health complaints.^{8,9} In the current study, we focus on fatigue and fatigue-related health problems. The prevalence of fatigue is increasing: a recent study indicated that in the Netherlands many more individuals currently reported being fatigued compared with 15 years ago.¹⁰ As it is, fatigue is a widely reported symptom in general: the prevalence of fatigue varies between 7% and 45%.¹¹ Fatigue is

frequently reported by employees.¹² Besides, it is also a common problem in people with diabetes and other chronic diseases,¹³⁻¹⁶ especially when they suffer from multiple diseases.^{17,18} For those suffering from diabetes, fatigue may directly result from physiological processes. It is a symptom of hypoglycemia as well as hyperglycemia.¹⁹ As such, it is associated with diabetes-related symptoms in general.²⁰

Fatigue in itself is a common phenomenon, but without ability for recovery, fatigue may prolong and become a problem.^{13,21} Work stress theories try to explain relations between work-related variables and health complaints. The Job Demands-Control-Support Model^{22,23} predicts that a high workload, a lack of decision latitude, and a lack of support affect health negatively.

The aim of the present study is to investigate the differences in demographic, work and lifestyle factors (smoking, alcohol consumption) and fatigue-related health status between individuals with diabetes, other common chronic diseases, and individuals without a chronic disease. Employees with a chronic disease have to cope with both their work and their disease. It is assumed that therefore the risk of developing fatigue and fatigue-related complaints will be higher for them than for the 'healthy' working population. It is also hypothesized that people with multiple chronic diseases will more often report fatigue-related complaints.

Methods

The Maastricht Cohort Study

This study used baseline data from the Maastricht Cohort Study of Fatigue at Work. The Maastricht Cohort Study surveys a large heterogeneous population of employees from 45 different companies and organizations and follows them for 3 years.²⁴ Inclusion criteria were age 18 to 65 years and minimal 50% employment for each subject. Temporary employ-

ees were excluded because they generally change jobs frequently. At baseline, both exposure and outcome are measured at an individual level by means of a self-administered questionnaire, which consists of about 220 questions on work, family situation, individual characteristics, health, and several fatigue-related outcomes.²⁴

The baseline questionnaire was mailed to 26,978 employees in May 1998. A reminder was sent out 2 weeks later. Six weeks later, a random sample of 600 persistent nonrespondents was asked to complete a brief questionnaire about the reasons for nonresponse, demographics, fatigue, and health complaints. Nonresponse analysis showed no significant differences between respondents and nonrespondents as regards demographic factors and difficulties in work execution because of health complaints. With respect to fatigue however, nonrespondents were a little less likely to report fatigue complaints (42% vs 55%, $\chi^2 = 11.1$).²⁴ A total of 12,161 employees (45%) completed and returned the questionnaire. Sixty-six questionnaires were excluded from the analysis because of technical reasons or because inclusion criteria were not met, resulting in a final study population for the Maastricht Cohort Study of 8840 men and 3255 women ($n = 12,095$).

Study Population

At baseline, respondents provided information on the presence of a chronic disease. Participants reported whether they had 1 or more of 20 chronic diseases, including diabetes, heart problems, stroke, liver problems, cancer, respiratory disorders, metabolic disorders, skin disorders, musculoskeletal problems, and severe consequences of an accident (eg, fractures). For the current study, 346 questionnaires were discarded from the analysis because of missing data with respect to these chronic disease(s). Therefore, the population for the presented analyses consisted of 11,749 employees.

At baseline, 141 employees (1.2%) reported that they suffered from diabetes, of which 76 reported having diabetes without any other chronic disease (= without comorbidity), whereas 65 employees reported having diabetes in combination with another chronic disease (= with comorbidity); 8946 employees (76.1%) reported no chronic disease. This group of "healthy" employees served as the main reference group. 2848 employees (24.2%) reported suffering from one or more chronic diseases. Within this group, migraine, rheumatism, chronic obstructive pulmonary disease (COPD; asthma or bronchitis), and chronic back pain were reported most frequently. Employees reporting one of these four chronic diseases (with or without comorbidity) served as secondary reference groups. A distinction was made between participants who reported a single chronic disease and participants who reported more than one chronic disease. The following subgroups were formed: (1) employees with diabetes without comorbidity ($n = 76$); (2) employees with diabetes with comorbidity ($n = 65$); (3) employees with migraine, rheumatism, COPD, or chronic back pain; without comorbidity ($n = 999$); (4) Employees with migraine, rheumatism, COPD, or chronic back pain; with comorbidity ($n = 884$); and (5) employees without a chronic disease ($n = 8946$).

Measures of Fatigue-Related Outcomes

The Dutch version of the Checklist Individual Strength (CIS) was used to measure prolonged fatigue. The CIS is a 20-item questionnaire developed to measure several aspects of prolonged fatigue, that is, symptoms of fatigue during the last 2 weeks: subjective experience of fatigue, concentration, motivation, and physical activity level.^{25,26} Items of the CIS are scored on 7-point Likert scales. Higher scores indicate a higher degree of fatigue, more con-

centration problems, reduced motivation, and less activity. A composite CIS total score, ranging from 20 to 140, can be constructed by adding the individual's scores on the four factors. Based on receiver operating characteristic analysis, employees scoring >76 were designated as probable cases of prolonged fatigue.²⁷

Besides prolonged fatigue, other well-known fatigue-related variables were studied, namely the need for recovery and burnout.^{28,29} Psychological distress was assessed because it was shown to have clear links with prolonged fatigue.^{30,31} Besides the extra risk for developing fatigue, it is known that people with diabetes more frequently report symptoms of depression than the general population.³² Fatigue and depressive symptomatology are also highly interrelated.^{14,33,34} Therefore, the presence of a depressed mood was also included in this study.

Psychological distress was assessed by means of a Dutch version of the 12-item General Health Questionnaire (GHQ-12).^{35,36} All employees scoring 4 or more of the 12 items were considered to represent probable cases of psychological distress.^{37,38}

Need for recovery was measured by a scale from a Dutch questionnaire on the Perception and Judgment of Work (VBBA).^{39–41} The scale comprises 11 dichotomous items, representing short-term effects of a day of work (eg, "It is difficult for me to relax at the end of a workday"). According to the test manual, responses to the 11 items were summed up to generate a total score ranging from 0 to 100. Higher scores indicate more complaints, ie, a higher need for recovery. Because there is no cut-off point for case classification, the highest quartile was used to define cases, that is, employees with a high need for recovery.

Burnout was assessed with the Dutch version of the Maslach Burnout Inventory-General Survey (MBI-

GS).^{42,43} The MBI-GS consists of three subscales: exhaustion (five items), cynicism (five items), and professional efficacy (five items). All items are scored on a 7-point frequency scale, ranging from 0 (never) to 6 (daily). High scores on exhaustion and cynicism and low scores on professional efficacy are indicative for burnout. Employees scoring in the highest quartile of exhaustion and either in the highest quartile of cynicism or in the lowest quartile of professional efficacy were classified as burnout cases.

Depressed mood was assessed with a single item stating "Did you feel down almost every day during the past two weeks, yes or no?" It was concluded from a study among stroke patients that a single item can be accurate in screening for depression,⁴⁴ although we did not intend to measure clinical depression.

Assessment of Work Characteristics

A Dutch version of the Job Content Questionnaire was used to measure psychological job demands, decision latitude, and social support at work.^{45–47} Psychological job demands were assessed by the sum of five items. Decision latitude was measured by the sum of two subscales: skill discretion and decision authority. Social support was assessed by two scales, each consisting of four items: supervisor support and coworker support. The response options varied from "strongly disagree" to "strongly agree" on a four-point scale. For each scale, the total score was calculated by adding the responses to the items.

In addition, employees provided information about their working hours per week (>40 h, 36–40 h, 26–35 h, and ≤ 25 h), regular overtime work, work schedules (day work versus shift work), executive position (yes/no), and having multiple jobs (yes/no).

Assessment of Background Variables

Family Situation. Two items assessed the family situation. Employees were asked whether they had dependent children at home and whether they were able to combine work and family life adequately. These items were self-formulated and the response to each item was yes/no.

Demographic Factors and Health Status. Information on gender, age, and educational level was obtained through answers to the respective questions in the questionnaire. The educational levels were divided into three categories (see Table 1). The self-rated general health status was applied, which is adapted from a widely-used generic health status measure, the SF-36.⁴⁸ The general health status item was scored on a five-point scale. Sickness absence frequency was assessed as the number of sick leave spells in the past four months.

Lifestyle Factors. Alcohol consumption was measured by reported weekly consumption in glasses, divided into four categories (0 glasses, 1–14 glasses, 15–21 glasses, ≥ 22 glasses/week). Smoking status was assessed by a single item: "Do you smoke every day?" (yes/no).

Statistical Analysis

Independent samples t-tests and chi-square tests were used to test univariate differences between the five groups of employees. The use of larger sample sizes might have generated significant differences between these groups, while based on the same mean scores the differences between smaller groups (groups of employees with diabetes) might have been insignificant. For this reason and because of multiple comparisons we did not only focus on the significance level, but also on practically relevant results. We took a difference in means of more than a half standard deviation as guideline for practically significant differences.⁴⁹

Multivariate logistic regression analyses were performed in four steps to examine the association between the chronic diseases and fatigue-related outcomes. In a first step, crude odds ratios (ORs) and 95% confidence intervals were calculated. In a second step, adjustments were made for demographics (age, gender, educational level). Third, we additionally adjusted the ORs for subjective work characteristics (psychological job demands, decision latitude, coworker and supervisor social support). Finally, we adjusted the ORs for “objective” work factors (working hours, overtime, daytime working hours) and lifestyle factors. In all analyses, the differences were considered to be statistically significant at $P < 0.05$. Statistical analyses were performed with SPSS 9.0.⁵⁰

Results

Study Population

Of the total study population, 1.2% suffered from diabetes. We also studied the prevalence of diabetes in more detail by age category. It turned out that for the age category 25 to 49 years, the prevalence of diabetes in our study population is comparable to or higher than the prevalence in the Dutch popula-

tion.⁵¹ The prevalence for the age category 50 to 64 years is much lower (Table 1).

Table 2 shows the characteristics of the different subgroups. Individuals with diabetes were, on average, older than individuals without a chronic disease and individuals with other chronic diseases. Overall, employees who reported more than one disease were also older than those who reported a single disease. The percentage of women in the diabetic groups is comparable to the group of healthy employees. The highest percentage of women was found in the group with a single disease other than diabetes (65.2%). Employees without a chronic disease were, in general, more highly educated than those employees with a chronic disease.

There are few differences between the groups with regard to lifestyle factors. One such difference is that fewer people with diabetes with comorbidity smoke on a daily basis compared with other groups. If we examine objective characteristics of the work situation (Table 2), it would seem that employees with diabetes differ from employees without a chronic disease and from employees with other chronic disease in that they work more daytime hours and work overtime less frequently. Fur-

thermore, employees with diabetes as well as employees with other diseases reported more days off during the last four weeks than healthy employees.

Most differences in work experience (workload, decision latitude, and social support) are small, although statistically significant (Table 3). If we examine practically relevant differences, we see that employees with diabetes without comorbidity reported more psychological task demands compared to people with diabetes with comorbidity.

Table 3 also shows the differences in health status between the different groups. Employees with diabetes without any concomitant disorder did not report more fatigue-related complaints than healthy employees, although they reported a worse general health status and a more depressed mood.

In general, there are no differences in health status between employees with diabetes without comorbidity and people with another single chronic disorder. Furthermore, those employees with diabetes without comorbidity reported less health complaints compared to people with both diabetes and another chronic disorder.

Employees with diabetes and comorbidity reported comparable levels of complaints as employees with more than one other chronic condition. Both groups have more fatigue-related health complaints than healthy employees. About 41% and 48% of them had a range of symptoms of prolonged fatigue (scores above the cut-off score of 76), compared with 17% of healthy employees, which means that they are “at risk” of subsequent sick leave or work disability. Although most differences in means between employees with a single other disease than diabetes and healthy employees were statistically significant, most of these differences were not relevant. Still, their general health status is worse and they reported more prolonged fatigue.

TABLE 1

Diabetes Mellitus: Prevalence in the General Dutch Population and in the Maastricht Cohort Study for Men and Women Separately

Age Category (years)	Dutch Population*		Maastricht Cohort Study	
	Men	Women	Men	Women
20–24	0.00	0.00	0.00	0.00
25–29	0.00	0.34	0.00	0.68
30–34	0.19	0.32	0.35	0.64
35–39	0.71	0.67	0.73	0.90
40–44	1.06	0.77	0.92	0.70
45–49	1.11	0.53	1.74	1.24
50–54	3.47	2.43	2.57	0.70
55–59	6.31	3.65	3.21	1.06
60–64	7.70	8.25	2.38	0.00

Data are presented as percentages.

* Poos MJJC, Gijsen R. Prevalentie, incidentie en sterfte naar leeftijd en geslacht [Prevalence, incidence and mortality according to age and sex]. In: *Volksgezondheid Toekomst Verkenning, Nationaal Kompas Volksgezondheid*. Bilthoven: RIVM; 2003.

TABLE 2
Background Variables, Lifestyle Factors, and Objective Work Factors

	1. Healthy Employees (8946)	2. Diabetic Employees Without Comorbidity (76)	3. Diabetic Employees With Comorbidity (65)	4. Employees With a Single Chronic Disease (999)	5. Employees With >1 Chronic Disease (884)
Mean age in years (SD)	40.33 (8.88) ^{2,3,4,5}	45.03 (7.92) ^{1,3,4}	48.55 (7.26) ^{1,2,5}	41.22 (8.90) ^{1,2,5}	43.70 (8.55) ^{1,3,4}
Gender (% women)	25.9% ⁵	18.4% ⁴	17.2% ⁵	65.2% ^{1,2}	31.9% ^{1,3}
Educational level					
% lower	18.1% ^{2,4,5}	26.3% ¹	23.5%	24.9% ^{1,5}	32.7% ^{1,4}
% middle	44.4%	52.7%	54.7%	47.3%	48.0%
% higher	37.5%	21.0%	21.9%	27.9%	19.3%
Alcohol consumption (glasses/week)					
0	25.5% ^{4,5}	35.5%	23.1%	31.2% ^{1,5}	34.1% ^{1,4}
1–14	63.0%	56.6%	64.6%	59.4%	57.0%
15–21	8.5%	6.6%	7.7%	7.6%	5.7%
>21	3.0%	1.3%	4.6%	1.8%	3.3%
Smoking daily	26.7% ⁵	31.6% ³	16.9% ^{2,5}	24.7% ⁵	34.7% ^{1,3,4}
Hours worked per week:					
<16	1.5% ^{4,5}	1.3%	1.6%	2.7% ¹	2.5% ¹
16–25	9.2%	5.3%	14.1%	14.4%	12.8%
26–35	14.7%	16.0%	10.9%	15.5%	15.3%
36–40	53.3%	54.7%	57.8%	49.8%	54.6%
>40	21.3%	22.7%	15.6%	17.5%	14.8%
Overtime	46.9% ^{2,5}	32.0% ¹	37.5%	43.6%	39.5% ¹
Daytime working hours	70.4% ^{3,4}	78.4% ⁴	82.8% ^{1,5}	67.2% ^{1,2}	66.6% ³
More than one job	4.1%	1.3%	7.8%	3.9%	4.6%
Management tasks	25.6% ^{4,5}	24.0%	22.2%	20.6% ¹	17.5% ¹
Number of sick leave spells in the last 4 months (SD)	1.41 (0.66) ^{2,3,4,5}	1.57 (0.82) ^{1,3}	2.09 (1.24) ^{1,2}	1.66 (0.80) ^{1,5}	1.90 (1.02) ^{1,4}
Combining home-work well	88.6% ⁵	95.9% ⁴	91.9% ⁵	87.4% ^{2,5}	80.7% ^{1,3,4}
Care for children living at home	54.0%	44.4%	50.8%	54.0%	54.2%

Data are presented as percentages, unlike data on age and number of sick leave spells, which is a mean (SD). An indication is given per study group as to which group's mean or percentages differ significantly.

TABLE 3
JDACS Work Factors and Health Variables

	1. Healthy Employees (8946)	2. Diabetic Employees Without Comorbidity (76)	3. Diabetic Employees With Comorbidity (65)	4. Employees With a Single Chronic Disease (999)	5. Employees With >1 Chronic Disease (884)
Skill discretion	36.67 (5.46) ^{2,4,5}	35.42 (5.34) ¹	35.51 (5.37)	35.95 (5.34) ^{1,5}	34.72 (5.97) ^{1,4}
Decision authority	35.71 (7.01) ⁵	34.14 (6.77)	34.81 (7.67) ⁵	34.53 (7.10) ^{1,5}	32.76 (7.74) ^{1,3,4}
Decision latitude	72.39 (11.22) ^{2,4,5}	69.62 (10.89) ¹	70.32 (12.13)	70.49 (11.18) ^{1,5}	67.51 (12.19) ^{1,4}
Supervisor social support	10.54 (2.30) ⁵	10.01 (2.87)	10.14 (2.22)	10.20 (2.43) ⁵	9.81 (2.64) ^{1,4}
Coworker social support	11.92 (1.58) ^{4,5}	11.68 (1.73)	11.72 (1.45)	11.77 (1.68) ¹	11.65 (1.79) ¹
Psychological task demands	33.09 (5.62) ^{2,5}	34.76 (5.42) ^{1,3,4}	32.45 (4.68) ^{2,5}	33.36 (5.64) ^{2,5}	34.38 (6.13) ^{1,3,4}
General health	2.56 (0.79) ^{2,3,4,5}	2.99 (0.92) ^{1,3}	3.59 (0.68) ^{1,2}	3.06 (0.75) ^{1,5}	3.51 (0.73) ^{1,4}
Psychological distress	1.75 (2.73) ^{3,4,5}	2.12 (3.38) ³	3.32 (3.72) ^{1,2}	2.22 (2.88) ^{1,5}	3.84 (3.95) ^{1,4}
% psychological distress	18.7% ^{3,4,5}	25.3%	35.9% ¹	24.5% ^{1,5}	42.1% ^{1,4}
Depressed mood	6.2% ^{2,3,4,5}	15.8% ¹	20.3% ¹	9.7% ^{1,5}	24.0% ^{1,4}
Fatigue	53.52 (21.89) ^{3,4,5}	55.77 (20.27) ³	71.23 (24.74) ^{1,2}	60.98 (22.48) ^{1,5}	74.42 (25.48) ^{1,4}
% fatigued	16.6% ^{3,4,5}	17.8% ³	40.6% ^{1,2}	25.5% ^{1,5}	48.0% ^{1,4}
Need for recovery	0.35 (0.26) ^{3,4,5}	0.37 (0.28) ³	0.49 (0.27) ^{1,2}	0.42 (0.26) ^{1,5}	0.53 (0.28) ^{1,4}
% high need for recovery	21.0% ^{3,4,5}	24.0% ³	41.3% ^{1,2}	28.7% ^{1,5}	46.5% ^{1,4}
Exhaustion	1.69 (1.09) ^{3,4,5}	1.76 (1.05) ^{3,4}	2.25 (1.28) ^{1,2,5}	2.03 (1.12) ^{1,2,5}	2.67 (1.36) ^{1,3,4}
Depersonalization	1.45 (1.06) ^{3,4,5}	1.51 (1.12) ³	1.89 (1.23) ^{1,2}	1.61 (1.06) ^{1,5}	1.99 (1.24) ^{1,4}
Personal accomplishment	4.13 (0.94) ^{3,4,5}	3.97 (1.04)	3.83 (1.02) ¹	4.00 (0.93) ^{1,5}	3.76 (1.03) ^{1,4}
% burnout cases	12.2% ^{3,4,5}	13.3% ⁴	23.5% ^{1,5}	19.4% ^{1,2,5}	41.8% ^{1,3,4}

Data are presented as a mean (SD) and percentages. An indication is given per study group as to which group's mean or percentages differ significantly ($P < 0.05$).

Table 4 shows the results of logistic regression analyses for the relation between diabetes and other chronic diseases and fatigue, need for recovery, burnout, psychological distress and depressed mood. When adjusted for all confounding factors (demographics, subjective and objective work characteristics, and lifestyle factors), the results show that having diabetes without any other chronic disease was not a predictor of ill health, except in the case of depressed moods. If employees with diabetes also have one or more other chronic disorders, their risk of complaints is 2.31 to 3.78 times higher compared with healthy employees, after controlling all the confounding factors. Compared with employees who have multiple other chronic dis-

eases, the risk of employees with diabetes was comparable. An exception was the risk of burnout, which was lower for employees with diabetes.

For employees with migraine, rheumatism, COPD, and chronic back pain without comorbidity, the risk of developing health complaints was around one and a half times higher than for healthy employees. However, the risk is lower for them compared to employees with comorbidity. The risk for the latter group was 2.55 to 4.13 times higher than for healthy employees. Crude odds ratios and odds ratios adjusted for all confounding factors differ for all outcome measures. Odds ratios, in particular, changed after controlling for subjective work characteristics.

Conclusion and Discussion

The results of this study show that diabetes per se is not associated with fatigue and related health complaints. This might be surprising because fatigue is a symptom of the disease,¹⁹ as well as a problem related to the burden of (self-management of) the disease.^{6,7,9} We should keep in mind that only employees who are currently employed participated in our study. They may have a more favorable health status than the unemployed. This is supported by the data that show that less people in the ages 50 to 64 years are employed. Possibly, they more often receive disability pension. The health status of employees with another single disease, however, is worse than the

TABLE 4
Odds Ratios and 95% CI Regarding the Relationship Between Diabetes, Other Chronic Diseases and Fatigue-Related Variables

	Crude		After Additional Controlling for Demographic Factors		After Additional Controlling for Work Experience		After Additional Controlling for Work Factors		After Additional Controlling for Lifestyle Factors	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Prolonged fatigue										
Diabetes	1.06	0.53–2.04	1.06	0.55–2.05	0.89	0.45–1.74	0.87	0.44–1.72	0.87	0.44–1.70
Diabetes+	3.04***	1.81–5.12	3.04***	1.80–5.15	3.01***	1.74–5.20	3.10***	1.79–5.36	3.14***	1.81–5.43
Chr. disease	1.79***	1.51–2.11	1.74***	1.47–2.06	1.65***	1.38–1.96	1.65***	1.39–1.97	1.66***	1.39–1.98
Chr. disease+	4.82***	4.12–5.64	4.65***	3.96–5.46	4.02***	3.40–4.76	4.04***	3.41–4.77	4.01***	3.39–4.75
Need for recovery										
Diabetes	1.22	0.69–2.14	1.19	0.68–2.11	0.91	0.50–1.65	0.93	0.51–1.69	0.93	0.51–1.69
Diabetes+	2.47***	1.47–4.13	2.36**	1.40–3.98	2.69***	1.55–4.66	2.95***	1.69–5.15	3.09***	1.77–5.40
Chr. disease	1.57***	1.34–1.84	1.58***	1.35–1.85	1.51***	1.27–1.79	1.52***	1.28–1.81	1.53***	1.29–1.82
Chr. disease+	3.41***	2.92–3.98	3.44***	2.93–4.03	2.95***	2.49–3.50	3.03***	2.56–3.60	3.01***	2.54–3.58
Burnout										
Diabetes	1.36	0.64–2.90	1.35	0.63–2.89	0.97	0.41–2.30	0.96	0.40–2.29	0.97	0.41–2.32
Diabetes+	2.06*	1.05–4.03	2.05*	1.04–4.06	2.20*	1.00–4.84	2.27*	1.03–5.00	2.31*	1.05–5.10
Chr. disease	1.80***	1.47–2.20	1.76***	1.44–2.17	1.71***	1.35–2.17	1.71***	1.35–2.16	1.72***	1.35–2.18
Chr. disease+	5.39***	4.49–6.47	5.32***	4.41–6.43	4.13***	3.31–5.15	4.16***	3.33–5.19	4.13***	3.31–5.16
Psychological distress										
Diabetes	1.42	0.81–2.50	1.45	0.82–2.55	1.12	0.62–2.03	1.14	0.63–2.07	1.14	0.63–2.07
Diabetes+	2.51***	1.48–4.24	2.54***	1.49–4.31	2.76***	1.59–4.79	2.79***	1.60–4.86	2.80***	1.61–4.89
Chr. disease	1.48***	1.26–1.75	1.44***	1.22–1.70	1.34**	1.12–1.59	1.34**	1.12–1.59	1.34**	1.13–1.60
Chr. disease+	3.13***	2.67–3.67	3.04***	2.58–3.57	2.55***	2.15–3.02	2.55***	2.16–3.03	2.55***	2.15–3.03
Depressed mood										
Diabetes	2.75**	1.39–5.42	2.81**	1.41–5.57	2.22*	1.09–4.52	2.28*	1.12–4.66	2.33*	1.14–4.74
Diabetes+	3.38***	1.75–6.54	3.45***	1.77–6.75	3.58***	1.79–7.17	3.65***	1.82–7.31	3.78***	1.88–7.61
Chr. disease	1.55***	1.21–2.00	1.47**	1.14–1.89	1.32*	1.02–1.72	1.31*	1.01–1.71	1.34*	1.03–1.75
Chr. disease+	4.91***	4.05–5.96	4.59***	3.76–5.60	3.76***	3.06–4.63	3.78***	3.07–4.65	3.74***	3.03–4.61

Uncorrected results are shown (columns 2 and 3) and results additionally corrected for demographic variables (age, gender, educational level), work experience (job demands, decision latitude, support), work characteristics (working hours, overtime, normal working hours), and lifestyle factors (alcohol consumption, smoking). * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

Diabetes+, diabetes with co-morbidity; Chr. disease+, more than one other chronic disease.

health status of employees with diabetes without comorbidity. This may be explained by differences in characteristics of the diseases. Diabetes without complications is a disease that is not associated with physical pain or other discomfort. In migraine, rheumatism, COPD, or chronic back pain, physical pain or discomfort is often present. Moreover, employees with diabetes are required to have a healthy lifestyle, which may be burdensome, but at the same time may have a favorable impact on their health status.

For employees with a chronic disease and comorbidity, we can conclude that the risk of developing fatigue-related problems is higher compared to healthy employees. In general, having more than one chronic disease increases the risk of developing health complaints.^{17,18} This finding stresses the fact that it is important to make the physical and psychosocial impact of a disease manageable as much as possible.

A depressed mood seems to be common in employees with diabetes, even in patients with no other chronic disease. Therefore, this finding was not consistent with the other findings in the current study. Although in our study, depressive mood was assessed with a single item and was not intended to measure clinical depression, results are in agreement with other studies among the diabetes population, which showed that employees with diabetes are at a higher risk of reporting depressive symptoms.^{32,52,53} Talbot and Noewen⁵⁴ suggested that this high prevalence is resulting from the fact that diabetes requires many adjustments while it is also concordant with biochemical changes that can lead to a reduced enjoyment of life.

Contrary to differences in health status, the work situations with regard to Job Demands-Control-Support components were comparable for persons with and without a chronic disease. Most differences, although statistically significant, were so small that they were not

relevant. Other, more objective factors in the workplace differed between the groups. People with diabetes engage in more daytime working hours and work less overtime. In this respect, their working situation is more favorable. They may perhaps anticipate problems that can arise from irregular working hours. Furthermore, the subjective work situation of employees with diabetes with comorbidity is more favorable compared with employees without a chronic disease. Adjusted odds show that under the same working conditions, their risk of health complaints would increase. Possibly, their work situation may be adapted because of their disease and its consequences and facilitating those situations (minimizing job demands, and increasing decision latitude and social support) would be useful in minimizing health complaints.

A limitation of the present study was that it was not possible to distinguish between individuals with type 1 and type 2 diabetes and individuals with or without diabetes-related complications. Employees with type 1 diabetes were often diagnosed with diabetes before their active working life. In contrast to people with type 2 diabetes, they have the possibility of taking their disease into consideration when looking for a job and having the time to learn to cope with it. Furthermore, self-management activities may already be integrated in their daily life when they start working. Another limitation concerns the number of participants that reported being fatigued compared with nonparticipants,²⁴ which implies that results regarding prevalence of fatigue can be overestimated. Also, the percentage of nonparticipants was relatively high. However, we are in the opinion that a response rate of 45% is reasonable because written informed consent, including the use of sick leave data, was obtained from all participants and personal issues were included in the survey.

In conclusion, employees with diabetes who have no comorbidity do not experience more fatigue-related complaints than employees without chronic disorders. They are, however, more susceptible to depressed moods. Employees with multiple chronic disorders experience more fatigue-related complaints. This group will need more special attention from professionals. It is recommended that information is provided on ways of adapting the work situation to allow for better disease self-management.

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