Diabetes at Work

Fatigue in relation to job characteristics, diabetes symptoms and self-management

Iris Weijman

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Cover: Polarized light digital image of crystallized glucose.
Glucose was first isolated in 1747 from raisins by Andreas Marggraf and was named in Greek ***glycos*** for sugar (or sweet) in 1838 by Jean Dumas. Glucose features a molecular weight of 180.16. With 6 carbons, 12 hydrogens, and 6 oxygens glucose is molecularly simple in structure as a chain or ring compound. Crystalline glucose is either colorless or found as a white crystalline powder that is odorless and soluble in warm water. Melting at 146 degrees Celsius, a 0.5 molar solution of glucose is acidic at pH 5.9. Highly unstable glucose levels in the bloodstream are characteristic of diabetes mellitus.

Image and text provided by courtesy of dr Michael W. Davidson, National High Magnetic Field Laboratory of Florida State University, Tallahassee, Florida, USA

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Diabetes op het werk
Relaties tussen werkfactoren, diabetessymptomen, zelfmanagement en vermoeidheid
(met een samenvatting in het Nederlands)

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door

Iris Weijman

geboren op 18 maart 1976 te Utrecht

Promotores:

Prof.dr J.A.M. Winnubst
Prof.dr G.E.H.M. Rutten
Prof.dr W.B. Schaufeli

Co-promotor:

Dr W.J.G. Ros

The proper function of man is to live, not to exist

Jack London (1876-1916)

Beoordelingscommissie:

Prof.dr F.J.H. van Dijk
Prof.dr I.M. Hoepelman
Prof.dr D.T.D. de Ridder
Prof.dr F.J. Snoek

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Chapter 1

General introduction

Job stress, fatigue and diabetes mellitus

Job stress and fatigue are widely known phenomena that have been studied extensively. Most studies have been performed in the general working population, or in specific work segments. There are studies aimed at determining risk groups for developing fatigue that focused especially on differences between men and women, different age groups, specific professions (such as interpersonal professions, like nurses and teachers) and educational levels.[1] However, in organizational psychology, not enough research has been carried out into employees with diabetes, especially because in the Netherlands, 70% to 75% of the people with diabetes have employment.[2] This thesis is dedicated to employees with insulin-treated diabetes and focuses specifically on the relationships between job stress, diabetes symptoms, diabetes self-management and fatigue.

Every employee has to deal with job demands. Under particular circumstances such demands may develop into stressors that lead to health complaints such as chronic fatigue and related psychological disorders such as burnout and depression. Employees with a chronic disease have to deal not only with ordinary job demands, but with the burden of their disease and its treatment as well. This might easily turn job demands into stressors. Hence, it is expected that – compared to employees without a chronic medical problem – their risk of fatigue and fatigue-related health complaints will be higher.

Fatigue is a strong predictor of future work disability and the risk of receiving workers' compensation is even higher in the case of people with a chronic condition.[3] In the Netherlands, one third of those who are incapacitated for work (under the Disablement Insurance Act, Dutch abbreviation: WAO) suffer from mental problems,[4] of which chronic fatigue is a core aspect. Fatigue is not only related to mental problems, but also to physical problems[5,6] So, it is important from a psychological as well as a socio-economic perspective to prevent chronic fatigue and work disability.

Social security is a valued privilege of employees in the Netherlands and many other industrialized societies. It is often of essential value to employees with chronic diseases. However, early retirement is costly from an economic point of view and disabling from a psychosocial perspective. In the Netherlands, there were and there are still many debates about the WAO, due to the large number of Dutch inhabitants who receive WAO compensation and the considerable costs involved. Recent Dutch occupational disability legislation ('Wet Verbetering Poortwachter') provides stricter rules for admission to occupational disability benefits. Its focus is on abilities rather than on disabilities. Both employees and employers have a responsibility to reduce work-related health complaints, sickness absence and work disability. A greater insight

into the abilities and disabilities of employees with chronic disorders prevents unnecessary claims for workers' compensation. This makes it even more important to explore how healthy work can be enhanced, or in other words how to prevent chronic fatigue, and not only for financial reasons. Preventing fatigue and sickness absence may also enhance people's quality of life.[7] It can be defended that people with and without disabilities are on average better off working than not working.[8,9] Employment can in itself have a therapeutic effect on people with diabetes.[10] As Valdmanis, Smith and Page state: *'employment and higher income enhance one's ability to increase well-being and reduce disease burden'*.[11]

The International Diabetes Federation states: 'While many people with diabetes continue to enjoy very productive working lives, both in paid employment and at home, some may not be able to continue working. Loss of productivity (resulting from disability, sickness absence, premature retirement or premature death) is the most significant contributor to the indirect costs of diabetes'.[12] With this objective in mind it is important to identify work-related factors and person-related factors that must be taken into account to facilitate 'normal' functioning at work without the risk of developing excessive fatigue.

This thesis studies the relationships between diabetes-related factors, work-related factors (job demands, decision latitude, and social support at the workplace) and fatigue and also explores the role of some personal characteristics. At the start of our research, awareness of these interrelated factors was expected to yield clues to healthier workplaces and healthy living with diabetes at the workplace. We first discuss the disease under study, that is diabetes. Secondly, job stress and fatigue are discussed. Finally, we focus on the aims and research questions.

Diabetes

Diabetes is a chronic metabolic disorder, characterized by unbalanced glucose homeostasis. Diagnosis is based on abnormal high blood glucose levels (hyperglycemia), caused by insufficient pancreatic functioning or by insulin resistance. Signs of hyperglycemia are a persistent thirst, a dry mouth and a need to urinate frequently. Two major types of diabetes can be distinguished, which both have different origins.

Type 1 diabetes usually develops at an early stage of life, in childhood or adolescence. Symptoms include excessive thirst, excessive passing of urine, weight loss and a lack of energy. Type 1 diabetes results from the destruction of pancreatic

insulin-producing cells (β-cells), leading to an absolute insulin deficiency. The administration of insulin is therefore necessary for survival.

Type 2 diabetes usually occurs in adults and is much more common than type 1 diabetes. It results from a progressive insulin secretory defect and/or as a result of insulin resistance (i.e. tissues cannot optimally utilize the insulin which is available in the blood stream). Symptoms are often less obvious and type 2 diabetes remains sometimes undiagnosed for years.[12,13]

Diabetes is recognized as a growing health problem in the Netherlands as well as world-wide.[14] In 2000, 482,700 members of the Dutch population were estimated as having diabetes.[15] In the Netherlands, the incidence is still rising for a number of different reasons. Firstly, the screening for diabetes by family physicians is more effective due to guidelines that advise case finding during surgery hours[16] and easier methods of blood glucose monitoring. Consequently, fewer people have undiagnosed diabetes. Secondly, the rising number of people who are overweight, insufficient physical activity by the big majority of adult people and unhealthy dietary habits (more high-fat diet/fast food diet) and the fact that the population is ageing are the main causes for the increase of type 2 diabetes.[12,17] It is expected, on the basis of demographic developments, that in 2020 the number of patients with diagnosed diabetes will have increased by 35.7% compared with data for 2000.[18]

For people with both type 1 and type 2 diabetes, self-management is an important aspect of the life-long treatment of their disease.[12,19] People with diabetes themselves have to play an active role in the management of their disease. A considerable part of the responsibility rests with the patient. To regulate the blood glucose levels adequately, flexibility in self-management is seen as more important than it was in earlier decades.[20] One of the treatment goals in diabetes care concerns controlling the blood glucose levels to near-normal to prevent complications in the short and long term. Diabetics who inject insulin (all patients with type 1 diabetes and about 20% of patients with type 2) have to monitor and manage their own glucose levels. The frequency of injections varies between one and four times daily. In addition, patients have to plan their meals and exercise. These activities also have to be integrated. Many people with diabetes are employed and have to manage their condition during working hours as well. Self-management may be perceived as a burden but it has positive short-term and long-term results.

Diabetes can be managed well and short-term and long-term diabetic complications can be prevented to a certain extent by adequate treatment.[12] Short-term complications result from excessive (hyperglycemias) or too low blood glucose levels (hypoglycemias). Short-term symptoms vanish when the blood glucose levels have been stabilized again. Long-term complications have a chronic character and include

retinopathy (eye disease), nephropathy (kidney disease), neuropathy (nerve disease), cardiovascular disease (disease of the circulatory system), foot ulceration and amputation. Self-management is an important aspect in preventing complications.

Job stress: the JDCS model and stress-coping theories

Effort and dedication are required to achieve an appropriate work performance, which after a period of time will result in fatigue. This is a normal phenomenon linked to demanding activities, which can be rectified by a period of recuperation. It only becomes problematic when work is prolonged and compensation mechanisms (such as recovery) are insufficient.[21] Combining different definitions, Lazarus and Folkman defined psychological stress as 'a particular relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being'.[22] Resources can refer to the person's biological, psychological, or social systems'.[23]

According to current work stress theories, which lie at the basis of many empirical studies, unfavorable work situations are associated with increasing health complaints. The Job Demands Control Support (JDCS) model,[24] which is a widely-used model in occupational psychology, supposes that workload, decision latitude, social support, and the interactions between these factors play a role in the development of stress reactions and health complaints in the workplace.[24-26] The term 'psychological job demands' has been operationalized by a Job Content Questionnaire[26,27] as *'work pace and the quantity of work, the requirement to work hard, the available time to finish one's work and conflicting demands'*.[28] Karasek describes decision latitude as *'a composite of two empirically related, but theoretically distinct constructs: the worker's authority to make decisions on the job (decision authority) and the breadth of skills used by the worker on the job (skill discretion)'* (pp.137).[29] The JDCS model assumes that high job demands, a lack of decision latitude, and a lack of social support (from colleagues and superiors) each affect health negatively. In addition to these so-called main effects, the JDCS model also predicts two-way (i.e. high demands and a lack of decision latitude) and three-way (i.e. high demands, a lack of decision latitude and a lack of social support) interaction effects.

Different types of jobs can be distinguished that have a distinct effect on health outcomes:

1. high strain jobs (high workload, low decision latitude),
2. active jobs (high workload, high decision latitude),
3. low strain jobs (low workload, high decision latitude),
4. passive jobs (low workload, low decision latitude).

These four job types can occur in combination with low or high social support. According to the JDCS model, most health complaints are to be expected in high strain jobs and least in low strain jobs. Mortality and morbidity as a result of cardiovascular diseases in employees with high job demands, low decision latitude and low social support (from supervisor and colleagues) were shown to be higher than in employees with low job demands, high decision latitude and substantial social support.[e.g.30] Although the main focus of the research of Karasek and Theorell was initially on cardiovascular effects, in their JDCS model they make no distinction between the effects of job characteristics on different health outcomes, since they assume that the effects are comparable as far as a variety of health outcomes are concerned.[24,31,32] In this thesis the focus is on fatigue and fatigue-related health complaints. Fatigue is the central health concept in this thesis because it is a prevalent problem affecting employees in general[e.g.33,34] as well as people with diabetes.[e.g.35]

The focus of the JDCS model is primarily on environmental factors. Other chronic (personal) stressors, such as having a chronic disease or life events, have not been taken into account. Karasek and Theorell link their ideas with research on psychological and physiological mechanisms of individual responses to the environment, but causes in the workplace are assumed to be the starting point, which in their turn will influence other (personal) factors.[24] From an organizational psychological perspective, the main focus is on work-related factors. This might be a strength as well as a weakness of the JDCS model. On the other hand, coping theories[22,36] pay more attention to factors outside work. In these theories, a chronic disease is regarded as a stressor that affects health, possibly in the same way as stressors in the workplace do. Moreover, personal factors play a more prominent role in the theories on chronic diseases compared to theories on job stress, because it is the relationship between environmental events and personal characteristics that is of special importance. Many environmental and personal factors must act in concert in order to generate stress and produce negative outcomes. Coping and cognitive appraisal are two aspects that Lazarus & Folkman mention as important factors in the stress process.[22] The stress-coping approach of De Ridder and Schreurs[37] also assumes that people who are confronted with stressors in general (adaptive tasks) will make a compensatory effort to regulate stress resulting from this confrontation (the coping process). The way these adaptive tasks are dealt with affects well-being, either

positively or negatively.[36] Social support is valued as a coping resource, but may also directly affect well-being.

In this thesis, diabetes is seen as a possible stressor above and beyond work as a possible stressor. The role of self-efficacy, social support and coping were addressed in relationship to diabetes self-management. In a qualitative study, the role of personal factors is also explored in relationship to fatigue.

Fatigue and fatigue-related health complaints

Fatigue is a subjective feeling of tiredness that is influenced by circadian rhythm and varies in unpleasantness, duration and intensity.[38] Nevertheless, definitions of fatigue differ. According to Meijman, fatigue indicates that we feel unable to do something. People make a judgement about their ability and their motivation to accomplish certain (work) demands.[21] Energy is a necessary resource for biological, social and psychological processes. Hence, fatigue can be regarded as the physical and psychological manifestation of energy deficits. The consequences of the subjective feelings and the way of communicating to the self and to others may differ from person to person.

Fatigue is an increasing problem in the overall population. Among the Dutch population, many more individuals reported being fatigued compared to fifteen years ago.[39] Various studies have documented the prevalence of fatigue, which varies between 7% and 45%[5,6,40-43] depending on the specific operationalization of the concept and the population under study. Because of the high prevalence of fatigue, it is important to identify its determinants. Fatigue is also prevalent in employees.[33,44] Therefore, the workplace is one of the contexts where fatigue has been frequently related to and where it may be possible to intervene. Interventions may be necessary because the productivity and creativity of employees suffering from fatigue usually drops. This may also have consequences for their sickness leave rate and their level of work disability.[45] Also, chronic fatigue can be interpreted as a warning signal for the risk of burnout or overstrain and long-term health problems.

Fatigue is also one of the most frequently-reported complaints of individuals with chronic disorders and many people experience it as the most demanding aspect of their disease.[46,47] Fatigue is strongly related to diabetes. It may directly result from physiological processes: it is a symptom of hypoglycemia as well as hyper-glycaemia.[12,48] Furthermore, fatigue can result from the burden associated with treatment and from long-term diabetes-related complications.[49] In this way, fatigue affects the functioning and quality of life.[50] A study by Foets and Sixma showed that

the number of chronic complaints is positively related to fatigue.[51] Furthermore, fatigue is a prominent symptom of depression and the percentage of diabetics with depressive symptoms is relatively high: ranging from 8.5 % to 27.3 %.[52] Depression again has a negative effect on glycaemic control and the risk of long-term complications.[53]

Aims and research questions

The aim of this thesis is to contribute to a better understanding of the relationships between work-related factors, diabetes-related variables, fatigue and fatigue-related health complaints. Based on the results, we expect to make recommendations with regard to the organization of the job, with the goal of reducing health problems for employees with diabetes and to improve the understanding for the functioning of people with diabetes at work.

As was shown above, job stress and stress-related health complaints have been studied extensively. Moreover, extensive literature is available on fatigue among the general (diabetes) population, but so far no studies have been reported on fatigue among employees with diabetes and its relationships with job characteristics. Moreover, few studies based on the JDCS model focus on employees with chronic disorders. Of the 63 studies that were reviewed[31] only one dealt with a sample of workers with a chronic condition, namely with rheumatoid arthritis.[54]

The focus of this thesis is on employees with diabetes because of various reasons:

1. The number of people with diabetes is growing.
2. Diabetes is expected to become a major health problem in the future.[17] This implies that the number of employees with diabetes is also growing.
3. The impact of self-management is relatively large. Contrary to many other chronic diseases, the daily responsibility for managing diabetes rests with the patient.
4. Diabetes is also an issue at the workplace as self-management activities need to be performed during working hours.

This thesis seeks to answers the following main research questions:

1. What are the prevalences of fatigue and fatigue-related health problems in the diabetes working population compared to other groups of employees?
2. Which work-related factors, which diabetes-related factors and which personal factors are related to fatigue in employees with insulin-treated diabetes?

3. Which work-related and which personal factors are associated with performing self-management activities in insulin-treated diabetic employees?

Outline of the thesis

In *chapter 2*, an outline of the literature on diabetes and employment is given. In order to determine whether employees with diabetes indeed differ from other employees, data from the Maastricht Cohort Study (MCS) was used.[55] The MCS surveys a large heterogeneous population of employees from 45 different companies and organizations and followed them for three years. The survey included employees with various chronic diseases.

Chapter 3 describes the working situation and the fatigue-related health status of employees with diabetes (type 1 and type 2) in comparison to employees with migraine, rheumatism, COPD, or chronic back pain and to employees without chronic conditions.

Chapter 4 describes a study that explores relationships between components of the JDCS model, diabetes complaints, the perceived burden of self-management activities and fatigue.

Chapter 5 describes the relationships between self-management (whether participants frequently or infrequently perform self-management activities and whether they do or do not perceive this as burdensome) and a variety of health outcomes.

Many factors can constitute a barrier to self-management.[56] Therefore, in *chapter 6*, a study that explores relationships between demographic variables, JDCS components, coping, social support in the private situation, and self-efficacy with self-management (frequency and perceived burden) is presented.

To find out whether unfavorable working conditions result in more fatigue or whether fatigue influences the level of job demands, job control and social support over time, longitudinal relationships between these variables were studied and presented in *chapter 7*.

On the basis of findings of the quantitative studies, some of the participants were selected for interviews. The interviews were intended to expand and clarify relationships found in earlier studies. In addition, more insight was needed into the personal experiences of the participants regarding their work and diabetes. The results of this qualitative study among employees who experience many diabetes complaints are presented in *chapter 8*. Fatigued individuals were compared to non-fatigued individuals.

In *chapter 9*, the results of the different studies are discussed. This chapter also includes recommendations for further research as well as practical implications.

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Chapter 2

Diabetes in the workplace: an outline of the literature

Introduction

During the last decades, much attention has been paid to job stress and work-related (health) problems such as psychological fatigue, disablement and burnout. From time to time, employees have to deal with stressors in the workplace, such as a high workload, lack of control and a lack of social support, with the risk of developing work-related complaints. Theories on job stress and workload explain how stress in the workplace develops and how it can be prevented. In addition to the interest in (psychosocial) factors related to work stress, there is also growing attention for the psychosocial processes accompanying chronic diseases, such as diabetes. At first sight, these aspects seem to have little in common. However, job stress and diabetes are likely to be related, while many people with a chronic disease are part of the workforce. In the Netherlands, 70% to 75% of the people with diabetes are employed.[1] With the rising incidence of diabetes in the general population,[2] the number of employees with diabetes is increasing as well. Because diabetes is to a great extent a self-managed disease, people have to perform several self-management activities by themselves, also during working hours. These employees consequently cannot always solely focus on their work. Self-management activities include self-monitoring of blood glucose, using medication properly, following an appropriate eating plan, adjusting medication, food and exercise on the basis of circumstances and of blood glucose levels.[3,4] As Polin points out: *'Whereas many people go through their days with little thought about exact time schedules, mandatory exercise, stress control, medication, medical issues, and food preparation, the diabetic population must concentrate on these as well as on family, work, and societal pressures'*.[5]

For employees with a chronic disease, it seems important from a socio-economic perspective as well as from a psychological perspective to be and to remain employed. 'Employment and higher income enhance one's ability to increase well-being and reduce disease burden'.[6] For this aim, studying different processes in the working diabetes population is important to get insight into possible problems they might face and into possibilities for facilitating 'normal' functioning at the workplace without the risk of developing excessive health complaints.

To be able to determine what is known about the topic 'diabetes at the workplace' thus far and to determine which topics need further investigations, medical and psychological databases were searched (PsychInfo, Medline). Also, references in dissertations and articles were used to trace relevant literature. Combined with the term 'diabetes', the following general keywords were used to select relevant literature: 'employment', 'occupation', 'work' and 'stress'. A selection of the most prominent studies in the field of diabetes and employment will be outlined in this chapter.

Diabetes and employment

Various subjects regarding diabetes at the workplace have been described in literature. Differences between employees with diabetes and healthy employees were most often studied. In this respect, unemployment rates, absenteeism and work disability will be dealt with in this chapter, but also the characteristics that make people with diabetes highly valuable employees. In addition, the problems that people with diabetes encounter at the workplace, relationships between work-related factors and diabetes regulation and possibilities for work adjustments are described.

Unemployment, sickness absenteeism and work disability

When searching medical and psychological databases it turns out that most studies about diabetes and employment describe differences between healthy employees and employees with diabetes in terms of sickness absence and work disability. A selection of these studies is presented below.

The *unemployment* rate is one of the indicators of problems associated with occupational life. In the US, about fifteen years ago people with diabetes tended to lose their jobs at a rate more than three times higher than that of non-disabled workers.[7] More recently in Oklahoma, the unemployment rate was 16% for diabetics, compared to 3% for comparison respondents,[8] in Sweden 29% versus 15%.[9] Greene and Geroy showed that people with diabetes have a higher unemployment rate, reduced employment prospectives, a more difficult time during the employment process, higher rate of job denial and a greater frequency of job loss than those without diabetes.[10] In Finland, the rate of premature retirement is twice as high in employees with type 1 and type 2 diabetes compared to the general population.[11] In another Finish study, only men with type 2 diabetes were more often retired and unemployed than healthy controls. These differences were not found for people with type 1 diabetes.[12] A study among Mexican Americans found gender differences. Diabetes had an impact on the employment propensity of men but not of women; in women, diabetes had an impact on their productivity and their income.[13] A Swedish study reported that people with diabetes are more unemployment than healthy subjects, but it turned out that diabetes only had social consequences when long-term diabetes complications were present.[9]

Tebbi et al., on the contrary, found similar employment rates for young employees with diabetes and employees without a chronic disease,[14] which was also confirmed by a Dutch study. They found that the unemployment rate was lower in people with diabetes compared with the general Dutch population. However, very few participants

were low educated, while the unemployment rate is highest in the group of people with primary school only. This might have influenced the results.[15]

Data on *sickness absenteeism* are indicative for problems people with diabetes face in the workplace. Numerous studies dealt with this issue of which some will be discussed here. Mayfield et al. (1999) found that people with diabetes work as many hours as people without, but they reported more work-loss days with men reporting more off days than women.[16] Another study confirms that people with diabetes report more non-productive days.[17] The frequency and duration of sickness absenteeism seems to be higher in diabetics than in non-diabetics. However, it appears that only a small proportion of the employees with diabetes is responsible for these high sickness rates.[18] A recent study among employees with type 2 diabetes found that they had not more frequent absences than other employees, but they earned less and had higher productivity losses. The level of productivity was assessed by means of work absences and work efficiency. Probably, people with diabetes in this study had longer periods of sickness absences, but not more often than healthy colleagues.[19]

Mayfield, Deb and Whitecotton (1999) reported on *work disability* in people with diabetes. Work disability has been defined as not working because of illness or disability for at least 6 months. They concluded that diabetes was associated with disability. 20.5% of the men and 30.0% of the women with diabetes reported being disabled, compared to 7.7% of the men and 7.8% of the women without diabetes. These results are based on data from a population of 1502 people with diabetes and 20405 people without diabetes.[16] In a Swedish study, the rate of disability pension was also found to be higher in people with diabetes compared to healthy individuals.[20] These findings were confirmed by other studies that concluded that people with diabetes had more days of total disability and more days of poor physical and mental health than matched control subjects without diabetes.[8]

Favorable (employment) characteristics

Most literature that reports about unemployment rates, work disability and absenteeism seem to indicate that, probably with the exception of younger people, employees with diabetes face more problems in the workplace than healthy colleagues. For employers it is possibly not attractive to hire people with diabetes. However, on the other hand, people with diabetes have favorable employment characteristics: disciplined behavior, reliability, a healthy diet and a general health-conscious life style.[5] These aspects may result in an above average concern with good work habits.[21] Waclawski and Gill (2000) also underline the fact that the work record of people with diabetes is good and that they are perfectly satisfactory employees.[22] This was confirmed by research of Greene and Geroy (1993), who studied the effect of diabetes

on job performance. They dealt with four aspects of job performance: task behaviors, interpersonal behaviors, absenteeism, and hazardous behaviors (a measure of hypoglycemia-related injury). The supervisors of each participant made a rating of each measure compared to the job performance of people with comparable characteristics. Participants with diabetes were rated better than the control group on all measures. No differences were found for type 1 or type 2 diabetes, duration of diabetes and length of employment.[10]

Work-related problems faced by people with diabetes

Employees with diabetes find it a difficult task to manage both diabetes and work. A study of the Centers for Disease Control and Prevention (1997) demonstrates that half of people with diabetes, between 18 to 69 years of age, are unable to work or are limited in the kind or amount of work activity they can healthily manage.[23] From interview data, Trief et al. (1999) concluded that a majority of people state that diabetes affects their functional ability and interpersonal relationships. Also, a majority reported making specific behavioral changes at work to accommodate their diabetes care regimen.[24]

However, studies in younger employees show different findings. A study in the Netherlands among young type 1 patients found that only a small number of people face problems at their workplace. Ten percent of the employed people between 20 and 35 years mention that diabetes interferes with their job.[15] In another study young employees with type 1 diabetes had similar problems in the workplace compared to healthy employees.[14] Probably, differences exist between younger and older employees.

Studies suggest that (diabetes-related) health variables have an impact on work-related problems. People with problems at work and people incapacitated for work reported more medical and diabetes-related complaints than healthy workers and unemployed. Diabetic symptoms and diabetes-related complications influenced daily functioning.[1,15] This was also mentioned in a study among insulin-dependent people in Hong Kong. Hypoglycemia proved to influence the working life of half of the subjects. Effects varied from the necessity to stop working and taking a break to changing jobs.[25] People with poor or fair health and people with diabetes-related complications were also less likely to be in the labor force compared to individuals with excellent health. Besides, the presence of diabetes complications was found to be the best predictor of lost of productivity costs.[26]

Relationships between diabetes-related and work-related factors

From the above-mentioned literature it can be concluded that a part of the employees with diabetes experience problems in the workplace, probably dependent on age and the level of health complaints. This notion raises the question which other factors are associated to the job performance and health status of employees with diabetes. Only few studies have focused on the needs of employees with diabetes in the workplace and thus far, few studies have explored relationships between diabetes-related factors and health variables in a working population. Studies dealing with relationships between work characteristics and blood glucose control and psychological adaptation to the disease are described in the next sections.

Work characteristics, diabetes regulation and psychological adaptation

Stress produces physiological effects in individuals with diabetes. In people with diabetes, stress is associated with increased blood glucose levels. As a result, the short-term signs and symptoms of diabetes increase as well. Moreover, emotional problems such as depression (which is prevalent in diabetes patients[27]) and job stresses tend to increase keto-acidosis and hyperglycemia in addition to poorly controlled blood glucose levels.[28-31]

Trief et al. (1999) reported on the impact of the work environment on glycemic control and adaptation to diabetes. Hundred-twenty-nine persons with insulin-treated diabetes (71.7% type-1 and 27.3% type-2) employed outside their home participated. Work pressure, involvement, supervisor support, coworker cohesion, managerial control and perceptions of support at the workplace did not relate directly to glycemic control (HbA1c%/GlyHb). However, they found that more perceived supervisor support is related to more positive appraisal, while more positive appraisal is related to proper glycemic control.[24]

Netterstrøm & Sjol (1991) found some evidence for the relation between job strain and glycosated hemoglobin (HbA1c/GlyHb) among men aged between 50 and 60 years. Levels of HbA1c were significantly higher among participants with objective job strain, which was surveyed on the basis of the participant's job, occupation, work schedule and mode of payment. However, subjective job strain, defined as a combination of a low degree of decision latitude and high work pace, was not significantly related to Hba1c-levels. Perceived monotony in the job and feelings of not having enough time to perform the job satisfactory did significantly correlate with HbA1c-levels.[32] Kawakami et al. (2000) demonstrated the significant influence of job strain and social support on GlyHb.[33] Earlier studies[34,35] also showed a relation between job stress and elevated HbA1c-levels.

Although the research of Trief et al. (1999) did not yield direct evidence for relations between work characteristics and glycemic control, they found that work variables did relate to psychological adaptation to the disease (for example, satisfaction, worry, thoughts and feelings about diabetes). People who experience more cohesion with their coworkers report less diabetes-related worry. Work pressure had no relationship with any of the psychosocial adaptation measures.[24] Padgett et al. (1995) focused on the importance of making employers aware of the needs of workers with diabetes, because a majority of the supervisors did not make important job accommodations such as allowing breaks when needed. The one-on-one approach of employees and supervisors may be the most effective, which highlights the need for adequate communication.[36] To conclude, it appears that work characteristics are often associated to diabetes regulation as well as to psychological adaptation to the disease. Besides, persons under stress may take care of themselves less adequately, forgetting exercise, breaks, dietary guidelines, etc.,[5,29] which in turn may lead to inadequate glucose regulation.

Studies on work adjustments

In regard to work adjustments, several factors were described that might be helpful for employees with diabetes for maintaining satisfactory job functioning. Two main themes will be discussed. First of all, high-risk jobs or tasks were described in literature. It seems important to prevent such circumstances. Other studies have focuses on circumstances that make it possible to perform self-management activities at work and to optimize job performance in general.

Various studies and also diabetes associations in different countries have referred to jobs or specific tasks that are unsuitable for people with diabetes or that may be problematic. Only some will be discussed here, because it goes beyond the subject of this thesis. Waclawski (1989) interviewed occupational physicians to establish the prevalence and restrictions placed on diabetic workers such as shift-work, driving and civil aviation. These restrictions refer to the risks of hypoglycaemia.[37]

Employers also mentioned some circumstances that can be problematic, but only 65 firms, out of 1060, reported that people with diabetes would not be given the same employment opportunities as people without the disease, mainly because of the unsuitability of certain jobs for a diabetic employee. They tended to report that jobs in transportation, operating and manufacturing fields were unsuitable for diabetic workers. Eight percent of the 1060 employers mentioned job conditions that were unsuitable for employees with diabetes: strenuous work (13%), traveling (3%), working at heights (20%), working alone (10%), shift work (27%), irregular hours (2%), working with hazardous machinery or confined spaces at high temperature

(22%), most job conditions in firm (3%).[38] Other authors refer especially to short shift cycles (in which day, evening and night shifts follow each other at 2-day intervals) that may be problematic.[22]

In addition to specific tasks, work-related tasks and diabetes-related factors that need to be taken into consideration were also described in literature. The advantages of adequate self-management were highlighted by Testa and Simonson (1998) who studied the health economic benefits of good glycemic control in patients with type 2 diabetes. They found that improved glycemic control is associated with substantial short-term health economic benefits, such as less absenteeism, higher retained employment and fewer restricted-activity days.[39] Licciardone et al. (1997) came to a similar conclusion studying work and school loss and the impact of self-management training programs.[40] Waclawski and Gill (2000) mention the advantage of a flexible insulin injection regimen, which allows more variation in the timing of meals that consequently facilitates shift work.[22] In earlier decades, following the prescriptions from physicians was advised, but nowadays to regulate the blood glucose levels adequately, flexibility in self-management is seen as more important than it was in earlier decades.[41]

Polin (1997), a psychologist and a diabetic herself, described work adjustments that facilitate the performance of self-management. She wrote a review article about the needs of diabetics in the workplace and concluded that all in all, it can be concluded that the vast majority of people with diabetes need few special accommodations. Still, they would benefit from a private place to monitor blood glucose levels, regular meals and breaks to control hypo- and hyperglycemia, stress management seminars or classes, smoke cessation classes, nutritional education, regular exercise and protection form extreme heat and cold.[5] Out of the 29% of the participants who have job accommodations, 61% reported that these accommodations had to do with the adaptation of regularity: such as no irregular services; no or less guard duty or the possibility of more breaks during work.[1,15]

Detaille et al. (2003) developed a topic list for professional use to explore possible work-related adjustments in patients with a chronic disease. Topics were: self-care (possibilities for performing self-care at work and problems at work that hinder self-care), work conditions and aids, communication with management, colleagues, and health care professionals. These aspects facilitate that people can keep on working. With regard to the work situation, social support at the workplace was most important.[42] The importance of improving communication between employees and employers was also stressed by others.[22]

With regard to disease-related factors that are important for job functioning, self-acceptance and self-care were seen as the most important factors.[42] The presence of

complicating factors is the most important predictive factor in lost productivity costs attributable to diabetes. Employees need time to deal with restrictive complications (loss of vision, numbness of fingers and hands) when these are present.[5]

Conclusions and Discussion

It appears that diabetes affects the work status of employees with diabetes, although results of various studies are not always consistent. In comparison with healthy employees, most studies concluded that employees with diabetes have more absenteeism, are more often disabled, and are more often unemployed. Only a few studies showed other results. It appears that younger employees face fewer problems in the workplace. Possibly, they experience fewer diabetes-related complications or other health complaints. Health complaints and hypoglycemia were associated with problems faced at the workplace and unemployment.[15,25,43]

Conclusions about relationships between work-related factors and diabetes regulation were not consistent, but it appears that work stressors affect blood glucose levels. More research is needed for more final conclusions. Several studies have described various work-related and diabetes-related factors that would facilitate job functioning for employees with diabetes. Interesting conclusions were drawn, but it is difficult to indicate recurrent themes that are in particular important.

When studying literature on the relation between diabetes, work and health some further points should be noticed. Many studies have an explorative character and especially longitudinal data are absent. Furthermore, the studies are difficult to compare because they deal with various topics and various measurement instruments were used. It also seems that work stress theories are hardly integrated in studies in the working diabetes population. For example, few studies based on the JDCS model focus on employees with chronic disorders.[44] Application of this work stress model in studies among employees with diabetes would increase insight into the stress processes in employees with diabetes. According to coping theories,[45,46] a chronic disease is seen as a stressor that affects health, possibly in the same way as stressors in the workplace do. This makes it important to study components of the JDCS model in relation to disease characteristics. The studies, in which health-related variables were taken into account, focus most often on diabetes regulation and hypoglycemia. It would also be interesting to study more general health indicators. To our opinion, fatigue is especially an important variable to take into account in research on employment and diabetes. In the Netherlands, chronic fatigue at work is prevalent among employees.[47] While employees with diabetes have to manage their disease in

addition to the usual job stress their risk of fatigue and fatigue-related complaints may be higher than that of healthy employees. Moreover, fatigue may also result directly from physiological processes inherent in the diabetes,[48] from the burden associated with treatment and from long-term diabetes-related complications.[49]

To summarize, it is most probable that in every company a part of the employees with diabetes experience problems at the workplace. It is possible that older employees, employees working in specific work segments are at higher risk. Yet, it remains unclear whether adjustments, when necessary, need to be focuses on the work situation or that the focus has to be on more personal or diabetes-related factors. More research is needed on mechanisms at the workplace and valuable (work) adjustments.

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Chapter 3

Diabetes, employment and fatigue-related complaints: a comparison between diabetic employees, 'healthy' employees and employees with other chronic diseases

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Abstract

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 co-morbidity, they are no more likely to report fatigue-related complaints than 'healthy' employees, except for a depressed mood. Co-morbidity (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.

Introduction

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 in order 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 to 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 (JDCS 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 employees 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 non-respondents was asked to complete a brief questionnaire about the reasons for non-response, demographics, fatigue, and health complaints. Non-response analysis showed no significant differences between respondents and non-respondents as regards demographic factors and difficulties in work execution because of health complaints. With respect to fatigue however, non-respondents were a little less likely to report fatigue complaints (42% vs. 55%, χ^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 8,840 men and 3,255 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 (e.g., 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 co-morbidity), while 65 employees reported having diabetes in combination with another chronic disease (=with co-morbidity); 8,946 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 co-morbidity) 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 co-morbidity (N=76); (2) Employees with diabetes with co-morbidity (N=65); (3) Employees with migraine, rheumatism, COPD or chronic back pain; without co-morbidity (N=999); (4) Employees with migraine, rheumatism, COPD or chronic back pain; with co-morbidity (N=884); (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 concentration problems, reduced motivation, and less activity. A composite CIS total score, ranging from 20 to140, 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 (e.g., "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, i.e., 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 sub-scales: 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 5 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 co-worker 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. 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 odd's 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 population.[51] The prevalence for the age category 50 to 64 years is much lower (Table 1).

Table 1. Diabetes mellitus: prevalence in the general Dutch population and in the Maastricht Cohort Study for men and women separately

	Dutch population*		Maastricht Cohort Study	
Age category (years)	**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 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 co-morbidity 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 diseases in that they work more daytime hours and work overtime less frequently. Furthermore, 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 co-morbidity reported more psychological task demands compared to people with diabetes with co-morbidity.

Table 2. Background variables, lifestyle factors and objective work factors

	1 healthy employees (8946)	2 diabetic employees without co-morbidity (76)	3 diabetic employees with co-morbidity (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 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.

Table 3. JDCS work factors and health variables

	1 healthy employees (8946)	2 diabetic employees without co-morbidity (76)	3 diabetic employees with co-morbidity (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]
Co-worker 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 ($p<0.05$).

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

Employees with diabetes and co-morbidity 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 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 diseases, the risk of employees with diabetes was comparable. An exception was the risk of burnout, which was lower for employees with diabetes.

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

For employees with migraine, rheumatism, COPD, and chronic back pain without co-morbidity, 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 co-morbidity. 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.

Conclusions 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 are employed. Possibly, they more often receive disability pension. The health status of employees with another single disease, however, is worse than the health status of employees with diabetes without co-morbidity. 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 co-morbidity, 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 Noewen[54] 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 co-morbidity 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 non-participants,[24] which implies that results regarding prevalence of fatigue can be overestimated. Also, the percentage of non-participants 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 co-morbidity 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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Chapter 4

Fatigue in employees with diabetes: its relation with work characteristics and diabetes related burden

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Abstract

Aims: *To examine the relations between work characteristics as defined by the Job Demand-Control-Support model (JDCS) (that is, job demands, decision latitude, and social support), diabetes related burden (symptoms, seriousness of disease, self-care activities, and disease duration), and fatigue in employees with diabetes mellitus.*
Methods*: Employees (n=292) aged 30-60 years, with insulin treated diabetes, filled in self administered questionnaires that assess the above mentioned components of the JDCS Model and diabetes related burdens.*
Results: *Both work and diabetes related factors are related to fatigue in employees with diabetes. Regression analyses revealed that work characteristics explain 19.1% of the variance in fatigue; lack of support, and the interaction of job demands and job control contribute significantly. Diabetes related factors explain another 29.0% of the variance, with the focus on diabetes related symptoms and the burden of adjusting insulin dosage to circumstances. Fatigue is more severe in case of lack of social support at work, high job demands in combination with a lack of decision latitude, more burden of adjusting insulin dosage to circumstances, and more diabetic symptoms. Furthermore, regression analysis revealed that diabetic symptoms and the burden of adjusting the insulin dosage to circumstances are especially relevant in combination with high job demands.*
Conclusions: *Both diabetes and work should be taken into consideration - by (occupational) physicians as well as supervisors - in the communication with people with diabetes.*

Main messages

- *Fatigue in employees with diabetes can to a large degree be explained by the components of the JDCS Model: lack of socfial support and a combination of high demands with a lack of decision latitude. These findings can be expected for all employees.*
- *In addition to these work related factors, other important factors that explain fatigue in employees with diabetes are mainly the diabetic symptoms and, to a much lesser extent, the experienced burden of adjusting insulin dosage to circumstances.*

Policy implications

- *When fatigue is reported in employees with diabetes, interventions in the workplace should focus on improving co-worker and supervisor social support and preventing high job demands in combination with a lack of decision latitude. This particularly refers to people with diabetes who experience diabetes related symptoms. Supervisors of people with diabetes should be aware of the impact of these issues and discuss them with the employee.*
- *Medical professionals working with people with diabetes should, in addition to medical points of interest, also take the working conditions of these people into account when examining their health.*

Introduction

Many people consider fatigue to be a problem; hence it is a common problem in community.[1] A diversity of data is presented about the prevalence of fatigue, which varies between 7% and 45%,[1-6] due to various operationalisations of the concept and to differences in study populations. Fatigue has frequently been related to the working situation; it is a complaint employees often report.[7] Work can be a source of stress for everyone, which may lead to health complaints such as fatigue. Fatigue is also a main issue for people with diabetes; they report it twice as often as non-diabetics.[8] Although literature is available about fatigue in the general diabetes population, thus far no studies focus on the level of fatigue in the working diabetes population. Because employees with diabetes have to manage the stress related to work, as well as the burden of their disease, it is expected that – compared to employees without a chronic condition – their risk of fatigue will be higher. If employees suffer from fatigue, their performance may drop. This may also have consequences for their sickness absence rate and work disability.[9] The frequency and duration of sickness absence is higher in diabetics than non-diabetics. However, it seems that only a small proportion of the employees with diabetes is responsible for the high sickness rates.[10] Other studies found that people with diabetes work as many hours as people without diabetes, but they report more work-loss days,[11] more days of total disability, and more days of poor physical and poor mental health than control subjects without diabetes.[12] Furthermore, fatigue is a strong predictor of future work disability and the risk for receiving a disability pension is even higher in people with a chronic condition.[13] In this respect, it is important to explore the role of work and diabetes related variables in explaining fatigue, with the objective of promoting the performance of employees with diabetes with as few symptoms of fatigue as possible. Both aspects will be discussed in this contribution.

Work stress theories try to explain how stress in the workplace develops. The Job Demand-Control-Support (JDCS) model,[14,15] for instance, assumes that high job demands, lack of decision latitude, and lack of support (from colleagues and superiors) each have a negative effect on health. In addition to these so-called main effects, the JDCS model also predicts significant two way interaction effects (that is, high demands and lack of decision latitude), as well as three way interaction effects (that is, high demands, lack of decision latitude, and lack of social support). Nevertheless, the interaction hypotheses are not often supported.[16,17] In contrast, the main effects are generally found - that is, high job demands, low decision latitude, and lack of support are related to poor workers health and wellbeing.[16]

In addition to the fact that fatigue is a work related complaint, it is also one of the most frequently reported complaints of individuals with chronic disorders and many of them experience it as the most demanding aspect of their disease.[18,19] In the case of people with diabetes, fatigue may directly result from physiological processes; it is a symptom of hypoglycemia as well as hyperglycemia.[20] Furthermore, fatigue can result from the burden associated with treatment and from long term diabetes related complications: retinopathy, nephropathy, neuropathy, and risk of cardiovascular diseases.[8] Diabetic treatment aims at controlling the blood glucose levels to near normal. To achieve this, type 1 diabetics and about 20% of type 2 diabetics have to inject insulin one or more times a day. In addition, they have to test their blood glucose level, plan their meals, and exercise. All these activities have to be geared to one another.

As indicated above, we can assume that both work and diabetes contribute to fatigue separately. Both aspects will probably also interact: in the workplace, people with diabetes who need to inject insulin and control their blood glucose levels are confronted with all the work related tasks on top of the burden of diabetes. In this study, the role of job characteristics and the role of diabetes related variables – in relation to fatigue – are explored. We consider people with diabetes as 'normal' employees, who – in addition to the usual job stressors that are experienced by every employee – have to cope with their specific disease related demands. It is therefore hypothesised that diabetes related variables explain a significant proportion of the variance of experienced fatigue in addition to the proportion explained by the usual job stressors.

Subjects and methods

Study sample

A total of 874 subjects with insulin treated diabetes mellitus (type 1 and type 2), from three outpatient diabetes clinics in the Netherlands, were invited by letter (from their physician) to take part in the study. Information about the study was attached to the letter. They also received a form on which they could indicate whether they were willing to participate and whether they met the inclusion criteria. People with diabetes who were treated with insulin, were employed, and were between 30-60 years of age were invited to take part. A total of 248 subjects did not meet the inclusion criteria. From the remaining 626 subjects, 347 were willing to participate (response rate 55.4%), 201 did not return the consent form, and 78 persons returned the form but indicated that they were not willing to participate. After returning the consent form,

participants received a set of questionnaires, which they filled in at home. If they did not return the questionnaire within three weeks, they received a reminder. Altogether, 317 people with diabetes (166 type 1 and 151 type 2) filled in and returned the set of questionnaires (return rate 91.4%). Among them, 25 persons were unemployed (n=10), not treated with insulin (n=4), pregnant (n=1), had not worked for more than six weeks due to illness (n=8), or did not fill in the questionnaire properly (n=2). Consequently, data from 292 employees with diabetes (159 type 1 and 133 type 2) could be analysed.

Assessment of diabetes related factors

Seriousness of disease, disease duration, diabetes related symptoms, and burden of self-care activities have been used as indicators of the total diabetes related burden. Based on the self reported long term complications of diabetes, an index of disease severity has been established: no complications (0), micro- or macro-vascular complications (1), and micro- as well as macro-vascular complications (2). Disease duration has been defined as the time from the diagnosis up to the date when participants fill in the questionnaire. The score on the Diabetes Symptom Checklist-Revised (DSC-R) was used as a measure of symptom severity.[21] A score of total symptom severity has been established, based on eight underlying dimensions: hyperglycemic, hypoglycemic, psychosocial-cognitive, psychosocial-fatigue related, cardiovascular, neurological-pain related, neurological-sensory, and ophthalmologic complaints. A coefficient α of 0.93 was found for the total scale. Scores range from 0 to 170. The burden of self-care activities has been assessed with a scale (composed by the authors), which measures the burden of nutritional self-care, injecting insulin, blood glucose testing, and adjusting the insulin dosage to the circumstances. The total scale consists of questions on the burden of the specific self-care activity at home, at work, and during special occasions (for example, a party, a day out, or vacation) (for example, 'Is it difficult for you to regularly check your blood glucose at home/at work/during special occasions?'). For the injection of insulin a score has been established on the basis of six items: three that focus on the frequency and three that focus on the amount of insulin injections. The subscale on nutritional self-care also consists of six items: three that focus on nutritional guidelines and three that focus on the regularity of meals. The other two subscales consist of three items. Acceptable coefficients α were found for the four scales, ranging from 0.75 to 0.90. The correlations between the four self-care variables were low (from 0.04 to 0.22) and, therefore, it is not possible to establish a homogeneous index for the general burden of self-care activities. The four scales have therefore been used separately in the analyses. Finally, diabetes type (1 or 2) is taken into account in relation to fatigue.

Assessment of work characteristics

Job characteristics have been assessed by using five scales of the VBBA (Questionnaire on the Experience and Assessment of Work), a validated and frequently used instrument for measuring job stress.[22] Based on the JDCS model,[14,15] psychological demands of work have been measured with the 'work pace and amount of work' scale (11 items; for example, 'Do you have to work under time pressure?'), decision latitude with the 'job autonomy' scale (11 items; for example, 'Are you allowed to decide the order in which you perform your tasks?') and the 'participation in work' scale (eight items; for example, 'Do you have a say in what is and what isn't part of your task?'), and social support with the 'support from colleagues' scale (nine items; for example, 'Do you have a good relationship with your colleagues?'), and the 'support from the direct superior' scale (nine items; for example, 'Can you rely on your supervisor when you experience problems in your work?'). The coefficient α for the job demands scale in this study is 0.89. Following the suggestion of Karasek, Schwartz and Theorell, who combined the skill discretion and decision authority scales (measure of decision latitude) and the supervisor and co-worker support scales (measure of social support),[14,23] in this study one score (mean score of the two separate scales) has been established for decision latitude, with a coefficient α of 0.81, and for social support with a coefficient α of 0.73. Scores for all VBBA scales range from 0 to 100. High scores indicate many problems within the specific dimension.

Assessment of fatigue

The Checklist Individual Strength (CIS)[24] assesses general fatigue. The CIS is composed of four components: lack of motivation (four items; for example, 'I feel no desire to do anything'), subjective fatigue (eight items; for example, 'I feel tired'), lack of concentration (five items; for example, 'I have trouble concentrating'), and physical activity (three items; for example, 'I don't do much during the day'). For the analyses, a composite total score was used, because we wanted to gain more insight into general fatigue in the working diabetes population. A coefficient α of 0.95 was found in this study. Scores range from 0 to 140. High scores indicate many reported fatigue symptoms. The CIS was also used in other studies with diverse samples, for instance healthy employees and fatigued employees. Based on these data, a cut off point of 76 was determined, indicating an "at risk" situation for subsequent sick leave or work disability.[25]

Statistical analyses

SPSS 10.0.5 for Windows was used to analyse the data. Regression analyses were conducted to explore the relations between work characteristics, diabetes related

variables, and fatigue as the dependent variable. Initial step by step univariate regression analyses were used to examine the relation of work and diabetes related variables with fatigue separately. Variables were entered into the model when the significance level of their F value was less than 0.05 and variables were removed when their level was greater than 0.10. After this exploration the variables that were entered into the two models were selected for the final integrated model. The selected work related variables were entered into the regression analyses as a whole, followed by the two way and three way interaction terms of demands, control, and support. Furthermore, the selected diabetes related variables were entered as a whole and the two way interaction terms of these variables. Finally, the interactions between the diabetes and work related variables were added.

Results

Table 1 shows characteristics of the population. About 30% of the study population (n=86) had a CIS score above the cut off score of 76. The mean score in this population is 62.01.

Table 1. **Study population (N=292): baseline characteristics.**

Gender (% male)	66.8%
Age (y)	44.6
Level of education	
Lower	34.3%
Middle	31.1%
Higher	31.9%
Unknown	2.7%
Occupational groups	
Education, culture, healthcare & government	23.2%
Agrarian, (manufacturing/construction), industry and transport	27.0%
Economic, administratively and commercial	43.9%
Other	5.9%
Variables under study	
Disease duration (y)	16.1 (10.7)
Diabetic symptoms (0-170)	18.6 (14.1)
Seriousness of disease (0-2)	0.5 (0.6)
Burden nutritional self-care (0-100)	31.9 (22.2)
Burden blood sugar control (0-100)	32.5 (30.2)
Burden injecting insulin (0-100)	7.3 (13.1)
Burden adjusting insulin dosage (0-100)	18.9 (28.9)
Job demands (0-100)	45.2 (16.6)
Lack of decision latitude (0-100)*	37.5 (21.1)
Lack of support (0-100)	21.9 (13.7)
Fatigue (0-140)	62.0 (26.5)

Results expressed as percentages and means (SD).
* N=269

Correlation coefficients between the independent variables under study were calculated, in particular to look for conceptual overlap. It turned out that the correlations between the diabetes related variables were rather low (ranging from 0.00 to 0.40), with the exception of the correlation between diabetes type and disease duration (r=0.52). The correlations between the work related variables range from 0.12 to 0.41. Based on these findings, we decided that all variables could be included in the regression analyses.

Work characteristics explain 16.3% of the variance in fatigue (table 2). Job demands (β=0.15; p=0.01), lack of decision latitude (β=0.19; p=0.00), and lack of support (β =0.21; p=0.00) were all entered into the model, each having a significant effect on fatigue.

Table 2. Results of stepwise multiple regression analysis, fatigue predicted by work characteristics

Predictors	β	p value of t-test	R^2
Variables entered in model:			0.163
Lack of social support	0.207	0.002	
Lack of decision latitude	0.194	0.002	
Job demands	0.148	0.013	

Estimated standardized regression coefficients (β) and variance explained (R^2) are presented.

Diabetes related variables explain 43.5% of the variance in fatigue, mostly because of diabetes related symptoms (β=0.64; p=0.00), which by themselves already explain 42.5% of the variance. The burden of adjusting the insulin dosage (β=0.10; p=0.03) is also significantly related to fatigue and explains an additional 1.0% of the remaining variance. Diabetes type (β=-0.08; p=0.10), disease duration (β=0.09; p=0.05), burden of the nutritional self-care activities (β=0.08; p=0.11), burden of glucose control (β=0.04; p=0.40), burden of injecting insulin (β=-0.01; p=0.92), and seriousness of disease (β=0.08; p=0.10) do not contribute significantly to fatigue (table 3).

Table 4 presents the results of the final analysis with the selected diabetes and work related variables, and their interaction terms.

Work characteristics explain 19.1% of the variance in fatigue: lack of support (β=0.10; p=0.05) and the interaction of job demands and decision latitude (β=0.42; p=0.02) contribute significantly. When the interaction term between demands and decision latitude was added in the regression model, no main effect was left over for job demands (β=-0.08; p=0.49) and decision latitude (β=-0.13; p=0.35).

Table 3. Results of stepwise multiple regression analysis, fatigue predicted by diabetes-related variables

Predictors	β	p value of t-test	R^2
Variables entered in model:			0.435
Diabetic symptoms	0.640	0.000	
Burden adjusting insulin dosage	0.099	0.033	
Variables removed from model:			
Disease duration	0.090	0.053	
Burden nutritional self-care	0.081	0.109	
Diabetes type	-0.077	0.104	
Burden blood glucose control	0.041	0.397	
Burden injecting insulin	-0.005	0.924	
Seriousness of disease	0.080	0.103	

Estimated standardized regression coefficients (β) and variance explained (R^2) are presented

Table 4. Results of multiple regression analysis, fatigue predicted by diabetes related variables and work characteristics, including the interaction effects

Predictors	β final model	p value of t-test	R^2	R^2 change	Sig. R^2 change
Block 1 (enter)			0.165	0.165	0.000
Job demands	-0.078	0.489			
Lack of decision latitude	-0.129	0.347			
Lack of support	0.104	0.047			
Block 2 (stepwise)			0.191	0.026	0.004
Job demands x lack of decision latitude	0.416	0.016			
Block 3 (enter)			0.480	0.290	0.000
Diabetic symptoms	0.863	0.000			
Burden adjusting insulin dosage	-0.204	0.120			
Block 4 (stepwise)					
Job demands x diabetic symptoms	-0.418	0.012	0.493	0.013	0.012
Job demands x burden adjusting insulin dosage	0.306	0.024	0.503	0.010	0.024

Estimated standardized regression coefficients (β) and variance explained at the specific step (R^2) are presented

Figure 1 shows the interaction. When much decision latitude is reported, there is no difference in fatigue between the groups with high and low job demands. When decision latitude is more restricted, fatigue is more severe in the group with high job demands compared to the group with low job demands. No interactions between support and demands (β=0.05; p=0.75), between support and decision latitude (β=0.03; p=0.84), and no three way interaction for demands, control, and support (β=0.03; p=0.84) were found.

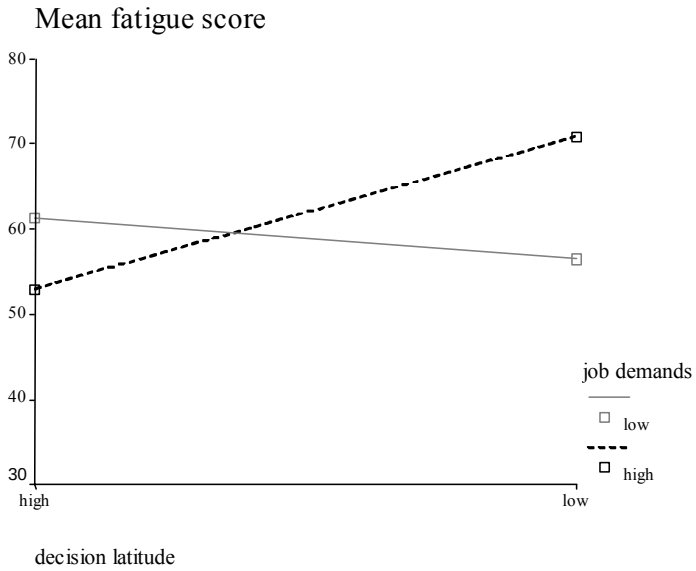

Figure 1. Interaction between job demands and decision latitude on fatigue.

Diabetes related factors explain another 29.0% of the variance, with the focus on diabetes related symptoms (β=0.86; p=0.00). No main effect was left over for the burden of adjusting insulin dosage to circumstances (β=-0.20; p=0.12) after addition of the interactions between work and diabetes related variables. The interaction between the two diabetes-related variables, diabetic symptoms, and burden of adjusting insulin, does not contribute significantly to the explanation of fatigue (β=0.03; p=0.80) and was therefore not added into the regression model when we used the stepwise method for regression analysis. In the last block, interaction terms between work and diabetes related variables were added. This resulted in a significant effect of the interaction between demands and diabetic symptoms (β =-0.42; p=0.01), and between demands and the burden of adjusting the insulin dosage (β =0.31; p=0.02) on fatigue. No interaction effects were found for decision latitude and diabetic symptoms (β =0.18; p=0.18), for decision latitude and the burden of adjusting insulin dosage to circumstances (β=-0.01; p=0.97), for support and diabetic symptoms (β =-0.16; p=0.19), and for support and the burden of adjusting insulin dosage to circumstances (β =0.08; p=0.44).

Figures 2 and 3 present graphically the significant interaction effects. Groups have been established on the basis of the mean score on job demands: higher or lower than the mean score. The other variables have also been divided in two groups: people who have scores lower (when no or few problems are reported) or higher than the value corresponding to the 25th centile. When people report a low level of diabetic symptoms, there is no difference in fatigue between the groups with high and low demands. But when diabetic symptoms increase, more fatigue is reported in the group

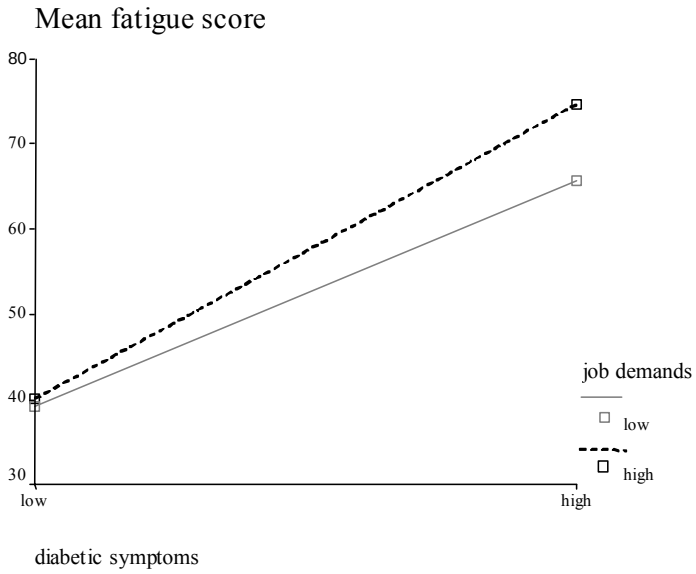

Figure 2. Interaction between job demands and diabetic symptoms on fatigue.

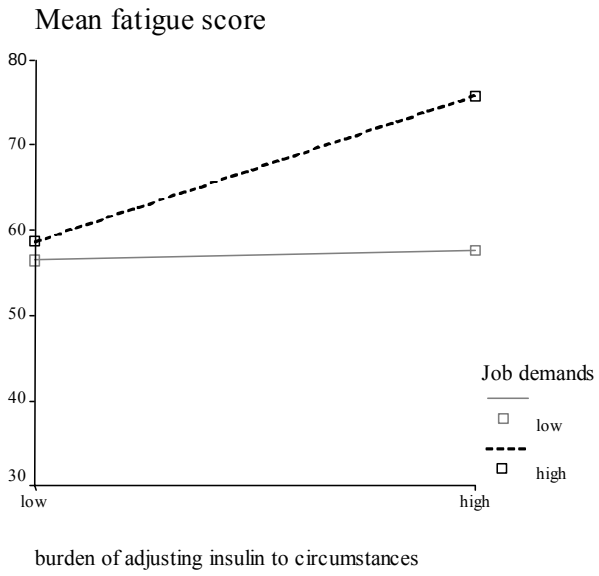

Figure 3. Interaction between job demands and burden of adjusting insulin dosage on fatigue.

with high job demands compared to the group with low job demands (fig 2). Figure 3 illustrates that when people do not perceive adjusting their insulin dosage to circumstances as a difficulty, there is no difference in the level of fatigue between high and low job demands groups. When they do perceive adjusting insulin as a burden, more fatigue is reported in the group with high job demands compared to the group with low job demands. This is in agreement with the other interaction effects that were found (see figs 1 and 2).

Conclusions and discussion

Half of the reported fatigue symptoms of employees with diabetes relates to their work situation and their disease: 20% can be explained by factors in the workplace and 30% by diabetes related factors.

Fatigue is more likely to be present when colleagues and direct superiors show little support, when job demands are high, and decision latitude is lacking. These results are as expected from the JDCS model.[14,15] However, there seems to be no interaction between support and the other two work characteristics. De Jonge and Kompier[16] concluded that the interaction hypothesis of the JDCS model is not often supported. Of interest in our study is that an interaction between job demands and decision latitude was actually found. It may be that people with diabetes are able to use the decision latitude to decrease the adverse effects of work demands, from what they have learned from coping with their disease. Employees with diabetes may be more inclined to cope actively with high demands.

Additionally, diabetes related symptoms have a major impact on fatigue. This is in line with Moos and Schaeffer, who mention that dealing with symptoms is the first task with which people with a chronic disease are confronted, besides the special stressors of treatment procedures.[26] Regarding self-care activities, in our study, only the burden of adjusting the insulin dosage to circumstances proved to be important in relation to fatigue. This may be due to the fact that injecting insulin is a necessary activity for people with insulin dependent diabetes; it is a skill that has to be mastered and will become a routine. The same reasoning may apply for blood glucose control. Nutritional self-care may be seen as less necessary and an experienced burden will therefore not affect health to a great extent. Adjusting the insulin dosage is not a routine action, because it requires flexibility and responsibility from the person, who must decide how and when to carry out these activities. Waclawski and Gill point to the positive aspects of flexible regimens with multiple injection treatment, which allows for greater variation in the timing of meals, and a better quality of life. Furthermore, careful regulation of insulin dosage together with blood glucose monitoring reduces the risk of hypoglycemia and enables individuals to cope more easily with variations in daily work patterns.[27] When adjusting the insulin dosage is perceived as a difficult task, the positive effects of it could be counterbalanced. Surprisingly, seriousness of disease was not related to fatigue in our study, while studies show that as chronic conditions increase, the risk of developing fatigue also increases.[6,28] This finding might be explained by the fact that 56% of the people with diabetes in our study had no major diabetes-related complications. Seriousness of disease was also moderately related to the diabetic symptom levels. This explains the

fact that seriousness of disease does not add much to the variance in fatigue in addition to diabetic symptoms.

It was also found that high job demands by themselves are not relevant, but are a problem when employees also experience little control at work, report many diabetic symptoms, and have difficulty adjusting the insulin dosage to specific circumstances. Significant interactions between diabetes related variables and work are in accordance with the literature. Because of a chronic condition, problems in the work situation may exacerbate the general burden of stress.[26] Moreover, stressors – for example, in the workplace – may affect the blood glucose levels,[29] and therefore the health perception of people with diabetes.

In addition to diabetes related variables and work characteristics, other factors outside the workplace also influence people's health status. Coping, social support in the private setting, and self-efficacy fulfil a mediating role in explaining health[16,30,31] and can influence the risk of chronic fatigue states. A multifactorial approach is probably best in relation to fatigue states.[1] Van der Doef and Maes, for example, concluded that gender differences are evident in relation to the JDCS model. They also suggest that subpopulations should be studied, because not all occupational groups benefit from the same work situation.[17] Furthermore, data were based on self reports of participants. Medical data on diabetes related complications were not available. This may result in a less objective index for seriousness of disease. Another concern is that fatigue is not only an outcome of the diabetic burden, but it is also a symptom of the disease: of hypoglycaemia and hyperglycaemia as well.[20] In this study these symptoms were part of the total diabetic symptom index, which is one of the independent variables. Therefore, and because of the cross sectional design, at this stage it is difficult to draw conclusions on causality. Results will also be limited due to the non-response, but the response rate here is comparable to those found in other studies on fatigue in employees[32] and in diabetes samples.[33] Therefore, we assume that generalisability of results will not be more problematic here than in other studies.

In general, it can be concluded that fatigue is more severe when support at work is low and more disease symptoms are present. Furthermore, fatigue is also more severe when decision latitude is lacking and adjusting insulin is seen as a burden, in combination with high job demands. Physicians, in examining the health status of people with diabetes, should be aware of the role and impact of work in relation to experienced fatigue symptoms in employees with diabetes. At the same time, supervisors and occupational physicians should examine the work situation of employees with diabetes within the context of diabetes. It is important to focus on lowering job demands, increasing control, and improving support, especially when diabetic symptoms are reported. These topics should also be raised –by both

professions- in the communication with people with diabetes. When fatigue can be detected at an early stage, it is still possible to look for the determinants and to intervene in the workplace. By changing the work situation, the risk of fatigue and consequently the risk of sickness absence and work disability can be reduced.[9,13] Furthermore, the findings of this study are relevant to the vocational rehabilitation of people with diabetes who reintegrate into work. When their (future) jobs are characterised by high social support and much decision latitude without high workload, reintegration may be more successful, leading to lower levels of fatigue.

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Chapter 5

Frequency and perceived burden of diabetes self-management activities in employees with insulin-treated diabetes: relationships with health outcomes

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Abstract

We explored the relationship between frequency and perceived burden of different self-management activities and HbA_{1c}%, symptoms of diabetes, fatigue, depression, and quality of life in 292 employees between 30 and 60 years of age with insulin-treated diabetes. Participants completed questionnaires that assess self-management and health-related variables. t-Tests were performed for type 1 (DM1) and type 2 diabetes (DM2) separately to compare the mean health scores of individuals who frequently or infrequently perform self-management activities and who do or do not perceive this as a burden. Participants frequently perform their self-management activities, particularly injection of insulin (96.1%), following dietary guidelines (70.8%) and eating regularly (65.6%). Dietary self-management is most often seen as a burden (70.4%), while injecting insulin is seen as least burdensome (12.8%). The perceived burden of self-management is more strongly related to health than the frequency of self-management. Frequency of self-management especially relates to HbA_{1c}% in DM1. People with DM2 who frequently follow the dietary guidelines have more positive health outcomes. Participants who perceive dietary self-management and injecting insulin as a burden have more negative health outcomes. Because different relationships were found between frequency and perceived burden of self-management and health indicators, both aspects should be assessed and considered separately when evaluating self-management and examining patient's health.

Introduction

Self-management is an important issue in daily life for people with diabetes.[1,2] The main components of a diabetes treatment regimen include self-monitoring of blood glucose, using medication properly, complying with an appropriate eating plan, engaging in regular exercise, and adjusting medication, food and exercise on the basis of circumstances and blood glucose levels.[3] The aim of blood glucose-lowering treatment is to optimize glycaemic control in order to prevent and minimize long-term diabetes complications[4-6] and to enhance the quality of life.[7]

Self-management activities require a great deal of effort,[6] may be difficult to incorporate into one's daily life,[3] and their results are not always clear immediately.[8] Flexibility in self-management is important, but it may also make large demands on people.[9] Consequently, self-management may be perceived as burdensome, frustrating, and even overwhelming,[10] and therefore also affect health negatively.[11,12]

The methods for assessing self-management are diverse.[6] Previous studies sometimes calculated a total score for self-management,[13,14] but researchers now agree that different aspects of self-management should be assessed separately because of its multidimensional nature.[15-17] A variety of questionnaires have been developed, most of which focus on the *frequency* with which people perform their self-management tasks in a variety of areas. Another approach to self-management and a way to measure it is to focus on the experienced *burden* of performing self-management activities. This is in line with stress-coping theories,[18,19] which take the appraisal of the situation into account in relation to one's health status and not only the 'objective' situation. The questionnaire in this field that does not exclusively rely on frequencies concerns the perceived difficulties in adherence,[20] but adherence is not the same as self-management. Whereas self-management implies that patients are responsible for managing their disease in collaboration with their health professionals, adherence refers to patients behavior in relation to clinical recommendations of health care providers.[1,21,22] However, in our opinion actual self-management behavior should be assessed (the number of occurrences) as well the perceived burden of performing these behaviors.

In this paper, we start with exploring the relationship between frequency and burden of self-management. Next, we report about the relationship between self-management in insulin-treated patients and diabetes regulation and the following health-related variables: diabetes-related symptoms, fatigue, depression, and quality of life. For the different types of self-management activities that were studied, the following aspects were taken into account: the *frequency* with which people perform self-management activities and the perceived *burden* of performing this behavior at home, at work, and

during social occasions. We hypothesize, based on theories and assumptions regarding self-management,[4-6,23] that performing self-management activities frequently is related to positive health outcomes. For the burden of self-management, we hypothesize that a higher experienced burden will be related to poorer health.

Methods

Study population

We approached employed people with insulin-treated diabetes mellitus (types 1 and 2) between 30 and 60 years of age who attended three outpatient diabetes clinics in the Netherlands to participate in the study. This study is part of a larger project on fatigue in the diabetes working population and consequently only employees (who are gainfully part-time or full-time employed or self-employed) were invited to take part.[24] The age range was chosen, because most employees in this category have a stable working position. Internists selected patients in this age range with DM1 and DM2 (diagnosis based upon their own judgement) who injected insulin from their patient's records. From the 626 employees who were approached and met the inclusion criteria, 347 were willing to participate (response rate 55.4%) and gave their informed consent. At baseline (m1), 317 participants (166 with DM1 and 151 with DM2) completed the set of questionnaires. Data of 25 of them were not analyzed because they were unemployed (n=10), were pregnant (n=1), had not worked for more than 6 weeks due to illness (n=8), did not fill in the questionnaire properly due to different reasons (n=6). The Medical Ethics Committees of the University Medical Center Utrecht approved the study design.

Measures

Participants completed a variety of questionnaires that measured diabetes self-management activities and four health-related variables: (1) diabetes symptoms, (2) fatigue, (3) depressive symptoms and (4) health-related quality of life. In addition, data on HbA_{1c}% were retrieved.

Diabetes self-management activities

The Multidimensional Diabetes Self-management Checklist (MDSC), which was composed by the authors[25] measures four domains of self-management activities for individuals with insulin-treated diabetes: (1) dietary self-management (following dietary guidelines, eating regularly); (2) injecting insulin (the recommended frequency, the recommended dosage of insulin); (3) blood-glucose monitoring; (4)

adjusting the insulin dosage to specific circumstances. These four self-management activities have been selected because they may be difficult to plan for and interfere with one's daily routines. The checklist measures the frequency with which people perform self-management activities (one item per activity) as well as the experienced burden of performing the activity at home, at work, and during special occasions (e.g., a party, a day out, vacation). Questions about the frequency ('How often do you ….., e.g., check your blood glucose level?') had six response categories: less than once a month (0); once a month (1); a few times a month (2); once a week (3); a few times a week (4); every day or a few times a day (5). People who reported that they performed self-management behaviors every day were considered as being 'frequent self-managers', whereas people who performed self-management activities a few times a week or less were regarded as 'infrequent self-managers'. Each question about the perceived burden of different self-management activities had four response categories: no, I (almost) never perceive it as a burden (0); sometimes (1); often (2); yes, most of the time I perceive it as a burden (3). These items were recoded into '(almost) never perceived as a burden' (0) and 'sometimes to most of the time perceived as a burden' (1) as follows: when more than half of the items regarding a specific activity had a score of 1, it was considered that performing the specific activity was perceived as a burden.

Health-related variables

HbA_{1c}% was used as a measure of glycaemic control (HPLC, immunogenic, normal range 4-6%).

The score on the Diabetes Symptom Checklist-Revised (DSC-R) was used as a measure of symptom severity.[26] A composite score (ranging from 0 to 100) was established on the basis of eight underlying dimensions: hyperglycemic, hypoglycemic, psychosocial-cognitive, psychosocial-fatigue-related, cardiovascular, neurological-pain-related, neurological-sensory, and ophthalmologic complaints. A coefficient α of 0.83 was found for this scale. Higher scores indicate more reported symptoms.

General fatigue was measured by the Checklist Individual Strength (CIS).[27] Scores range from 20 to 140. Higher scores indicate more reported fatigue symptoms. Employees scoring >76 were defined as probable cases of prolonged fatigue.[28]

The Center for Epidemiologic Studies Depression Scale (CES-D)[29] was used to assess depressive symptomatology. Scores range from 0 to 60. Higher scores indicate more depressive symptoms in the last week. Participant with scores higher than 16 are considered as possibly deformed.[30]

The Medical Outcomes Study Short-Form General Health Survey (MOS-SF20)[31] derived from the full-length MOS Health Survey was used. This questionnaire was designed to assess the impact of chronic disease on quality of life.[32] The SF-20 assesses six dimensions of health status: physical functioning, role functioning, social functioning, mental health, perceived health, and physical pain. Explorative factor analysis showed that all subscales loaded on one factor (variance explained by this factor: 53.8%). Therefore, we used a composite score (ranging from 0 to 100) based on the different subscales (coefficient $\alpha = 0.81$), which is a global indicator for health-related quality of life. Higher scores indicate better functioning.

Statistical analyses

To analyze the data, we used SPSS version 10.0.5. Differences in scores between participants with DM1 and DM2 were calculated by means of t-tests and chi-square tests. t-Tests were performed to analyze the relationships between self-management and health variables for people with DM1 and DM2 separately. For the frequency of injecting insulin, t-tests could not be applied because of the minimal variance.

Results

Study population

Table 1 shows the characteristics of the study population. In Table 2, the percentages of participants who frequently perform their self-management activities and who perceive this as a burden are shown. Participants with DM2 inject the prescribed number of insulin injections more frequently than those with DM1 (chi^2=6.54; p=0.011). In contrast, people with DM1 check their blood glucose level (chi^2= 13.54; p=0.000) and adjust their insulin dosages more frequently (chi^2= 22.88; p=0.000). With regard to the perceived burden of self-management, no significant differences were found between participants with DM1 and DM2 (Table 2).

Table 1. Study population: characteristics

	Total (292)		DM1 (159)		DM2 (133)	
Age (years)	44.6	(8.8)	40.3	(7.6)	49.7	(8.8)
Gender (% men)	66.8		59.0		74.6	
Disease duration (years)	16.1	(10.7)	21.1	(10.7)	10.1	(7.2)
Educational level:						
% Lower	35.2		26.9		45.6	
% Middle	32.0		32.7		31.2	
% Higher	32.7		40.4		23.2	

Table 2. Description of the frequency and perceived burden of performing self-management activities

	Total (292)	DM1 (159)	DM2 (133)	Difference (DM1-DM2)
Frequency				
Following dietary guidelines	70.8%	73.0%	68.2%	chi^2= 0.80
Eating regularly	65.6%	63.5%	68.2%	chi^2= 0.69
Injecting insulin	96.1%	93.3%	99.2%	chi^2= 6.54*
Blood glucose testing	47.8%	57.6%	35.9%	chi^2=13.54***
Adjusting insulin dosages	54.3%	67.1%	38.9%	chi^2=22.88***
Burden				
Dietary self-management	70.4%	66.0%	75.8%	chi^2= 3.27
Injecting insulin	12.8%	11.3%	14.5%	chi^2=0.63
Blood glucose testing	54.0%	54.7%	53.0%	chi^2=0.08
Adjusting insulin	32.8%	28.3%	38.3%	chi^2=3.21

Data are percentages of participants who frequently perform self-management activities and percentages of participants who perceive performing self-management activities as a burden. Differences between DM1 and DM2 were tested. In the last column, chi-squares are shown.
* P<0.05, *** P<0.001.

Table 3. Description of health-related variables

	Total (292)	DM1 (159)	DM2 (133)	Difference (DM1-DM2)	Reference group	Difference (total-reference group)
HbA_{1c}%	8.20 (1.21)	8.12 (1.12)	8.30 (1.31)	t=-1.16	-	-
Diabetes Symptoms	18.64 (14.07)	16.25 (11.59)	21.50 (16.15)	t=-3.14**	-	-
Fatigue	62.01 (26.45)	60.53 (26.41)	63.78 (26.49)	t=-1.05	41.5 (19.8)	t=13.25***
Depressive symptoms	9.73 (8.83)	9.16 (8.48)	10.42 (9.22)	t=-1.21	8.2 (7.2)	t= 2.95**
Health-related quality of life, total score	72.36 (19.73)	74.14 (18.13)	70.26 (21.35)	t= 1.65	-	-
Physical functioning	78.77 (27.36)	83.96 (23.56)	72.56 (30.23)	t= 3.54***	67.8 (29.6)	t= 6.85***
Role fulfillment	82.29 (34.15)	85.48 (31.71)	78.57 (36.56)	t= 1.70	73.7 (41.3)	t= 4.27***
Social functioning	83.88 (22.77)	84.84 (21.53)	82.73 (24.18)	t= 0.79	80.9 (25.7)	t= 2.22*
Mental health	71.61 (18.27)	70.70 (17.43)	72.69 (19.24)	t=-0.92	76.0 (18.9)	t=-4.09***
Perceived health	55.51 (26.34)	58.10 (25.78)	52.44 (26.77)	t= 1.83	67.6 (24.8)	t=-7.79***
Physical pain	37.76 (32.21)	38.21 (32.05)	37.22 (32.51)	t= 0.26	30.4 (31.1)	t= 3.90***

Data are means (S.D.). Differences between DM1 and DM2 were tested by t-tests (fifth column). Also, differences between the total population and reference groups were tested (one sample t-tests). These results are shown in the last column.
* P<0.05, ** P<0.01, *** P<0.001.

Table 3 shows the mean scores of the health-related variables under study. Participants with DM2 reported more diabetes-related symptoms compared to participants with DM1 (t=3.14; p=0.002). However, no difference was seen in

HbA_{1c}%, the level of fatigue, depressive symptoms, and total quality of life. With regard to the different dimensions of quality of life, participants with DM2 reported worse physical functioning (t=3.54; p=0.000). However, analysis of variance shows that in physical functioning there is no difference between DM1 and DM2 when corrected for age.

Mean scores and standard deviations from different reference groups are also shown in Table 3. People with diabetes reported more fatigue and more depressive symptoms than healthy individuals. In contrast to individuals in the age category 57-99, people with diabetes reported better physical functioning, better role fulfillment and social functioning, but worse mental health, worse experienced health and more physical pain.

Relationship between frequency and burden of performing self-management activities

We also explored the relationships between the frequency with which participants perform their self-management activities and the perceived burden of doing so. Results are shown in Table 4. For the total population, significant relationships were found between the frequency of a specific self-management activity and its perceived burden. In addition, significant relationships were also found between frequency of complying with dietary guidelines and perceived burden of blood glucose control and between frequency of eating at regular times and perceived burden of injecting insulin. In DM1, the perceived burden of blood glucose testing and adjusting insulin are not related to the frequency of blood glucose testing and adjusting insulin, but to the frequency with which dietary guidelines were followed. In all cases, participants who do not perceive performing self-management activities as a burden are more likely to perform these activities frequently.

Table 4. Relationship between frequency and burden of self-management

	Burden dietary self-management			Burden injecting insulin			Burden blood glucose testing			Burden adjusting insulin		
	Total	DM1	DM2	Total	DM1	DM2	Total	DM1	DM2	Total	DM1	DM2
Frequency												
Dietary guidelines	6.38*	3.01	3.10	0.05	2.02	2.31	4.27*	5.39*	0.34	2.22	5.34*	0.10
Eating regularly	15.16***	16.56***	1.75	6.54*	3.79	2.99	2.37	1.99	0.50	1.21	1.72	0.12
Injecting insulin	2.21	2.54	0.33	10.67**	8.58**	5.84*	0.42	0.11	0.89	1.15	0.36	0.64
Blood glucose testing	0.44	0.14	0.76	0.60	0.06	1.21	8.01**	1.77	8.78**	0.19	0.55	0.83
Adjusting insulin dosage	0.15	2.67	0.21	0.40	0.98	0.08	1.85	0.84	1.37	5.50*	0.20	5.49*

Data are presented as chi squares with significance levels.
* p<0.05, ** p<0.01, ***p<0.001

Frequency of self-management in relationship to health outcomes

Participants with DM2 who followed the dietary guidelines frequently reported fewer diabetic symptoms, were less fatigued, less depressed and had a higher quality of life. HbA_{1c}% did not differ from the level of those patients with DM2 who did not follow the dietary guidelines frequently. Also, participants with DM2 who frequently eat at regular times have a better quality of life than those who do not. For participants with DM1, HbA_{1c}% was higher when they reported eating at regular times daily and lower when they frequently tested their blood glucose levels and adjusted their insulin dosages (Table 5).

Table 5. Differences between infrequent vs. frequent self-management and low vs. high perceived burden of self-management in relation to HbA_{1c}%, diabetic symptoms, fatigue, depression, and health-related quality of life

	HbA_{1c}%		Diabetic symptoms		Fatigue		Depression		Quality of Life	
	DM1	DM2	DM1	DM2	DM1	DM2	DM1	DM2	DM1	DM2
Frequency										
Dietary guidelines	1.26	1.26	0.49	-2.35*	-1.18	-3.22**	-0.37	-2.09*	-1.55	2.35*
Eating regularly	2.37*	1.11	0.78	-0.78	-1.03	-1.76	-0.87	-1.62	-0.05	2.67**
Blood glucose testing	-2.42*	-1.38	1.54	-0.17	1.39	0.71	0.66	0.17	-0.13	0.26
Adjusting insulin dosage	-2.64**	-0.92	0.28	-1.03	0.98	-0.91	1.46	-1.01	-0.68	0.02
Burden										
Dietary self-management	-2.15*	1.24	2.52*	2.39*	2.62**	2.45*	2.00*	1.38	-0.69	-1.69
Injecting insulin	1.34	2.57*	3.57***	3.12**	1.50	3.69***	1.37	3.07**	-2.70**	-3.03**
Blood glucose testing	0.58	1.87	1.29	1.22	1.61	1.33	3.38**	0.78	-0.56	-1.71
Adjusting insulin	0.35	1.76	0.65	1.31	2.26*	1.86	2.03*	1.73	-1.45	-0.72

Data are t-values and shown for DM1 and DM2 separately. Positive t-values indicate that the mean scores of people who frequently perform self-management are higher than of those who infrequently perform self-management activities. Also, positive t-values indicate that the mean scores of people who perceive self-management as a burden are higher than for those who do not perceive self-management as a burden.

* $p<0.05$, ** $p<0.01$, *** $p<0.001$.

Perceived burden of self-management in relationship to health outcomes

A high perceived burden of dietary self-management was associated to more diabetic symptoms and more fatigue in participants with DM1 and DM2. In DM1, a high perceived burden of dietary self-management was also related to lower HbA_{1c}% and more depression. A high perceived burden of injecting insulin was associated with more diabetic symptoms for participants with DM1 as well as DM2 and a worse quality of life. In DM2, a high burden of injecting insulin was also related to higher HbA_{1c}%, more fatigue and more depressive symptoms. No differences in health scores were found for participants with DM2 who do or do not perceive blood-glucose

monitoring and insulin adjustment as a burden. In DM1, a high burden of blood glucose monitoring and adjusting insulin was associated with more depression. A high burden of adjusting insulin was also related to more fatigue in DM1 (Table 5).

Discussion and conclusions

Most people who inject insulin daily perform self-management activities. As could be expected, almost all participants inject insulin frequently. Many of them also follow dietary guidelines frequently and eat at regular times, as was shown in several other studies.[33,34] Most people with DM2 do not test their blood glucose levels frequently, nor do they adjust their insulin dosages. They often do not learn how to adjust their insulin dosages, but the majority of participants do not perceive injecting insulin and adjusting insulin as a burden. People with DM1 check their blood glucose levels and adjust their insulin dosages more frequently. Probably for this reason they injected less frequently the prescribed number of insulin injections. These results may explain why they reported less diabetes symptoms and tend to have lower Hba_{1c} levels. Their self-management probably is better. It was also found that participants who do not perceive self-management as a burden perform their self-management activities more frequently. It could have been expected that performing self-management activities on a daily basis is burdensome for patients and that people who perform these activities frequently would therefore be more likely to perceive it as a burden. Although the results of our study do not support this, they are in line with the results of another study.[35] People may perform self-management more often when they find it easier. They tend to make decisions on the basis of current symptoms instead of the long-term benefits of self-management actions.[8] Also, when people feel able to perform self-management activities (self-efficacy), it is possible that they will perform their self-management more frequently[36,37] and at the same time do not perceive it as a burden. Other factors may also be related to both frequency and burden of self-management, such as social support, coping styles, optimism, and a person's energy level. It would be very interesting to untangle the primacy and directions of effect between frequency and perceived burden of self-management.

When we studied relationships between self-management and a diversity of health indicators, it was shown that more relationships were found between the perceived burden of self-management and health than between frequency of self-management and health. There was not much variation in scores with regard to frequency of self-management. This may explain the poor relationships that were found. Substantial relationships between the frequency of self-management activities and glycaemic

control were found, but only in persons with DM1 and not always in the expected direction. HbA_{1c}% was higher when people with DM1 reported frequently eating at regular times. People with poorly controlled diabetes may follow their diabetes treatment more rigidly compared to people with good control.[38] We cannot explain the differences between DM1 and DM2. Probably, participants with DM1 cope differently with poor control than participants with DM2.

Following the dietary guidelines daily is, as it was hypothesized, related to less diabetic symptoms, less fatigue, less depressive symptoms, and better quality of life for persons with DM2 but not for persons with DM1. This may be so because individuals with DM2 are confronted with the disease at a later stage of their life. Therefore, a dietary advice might be seen as a more important aspect and will thus positively influence health when people actually follow dietary guidelines. For the perceived burden of self-management, all relationships found were in the expected direction: the perceived burden of self-management is related to a less favorable health status.

Due to the cross-sectional design, this study does not allow us to draw causal conclusions. The results might suggest that self-management affects one's health status, but it also may be possible that for people who feel tired, or have depressive symptoms it may be more difficult to perform self-management activities frequently. They also may have more negative self-evaluations in most self-management areas. It will therefore be more burdensome for them to perform self-management activities. Diabetes-related symptoms may have a different relationship with the other variables under study compared to the above mentioned health indicators. Due to better health status it may be easier to perform self-management activities, which may result in less diabetes symptoms. In addition to the inability to draw causal conclusions, the results of this study may be limited due to the relatively high non-response, although the response rate is comparable to those found in other studies on related topics.[39,40] Therefore, we assume that generalizability of results will not be more problematic here than in other studies. Generalizability of results may, however, be limited because people with tablet-treated diabetes and those who were unemployed were not included in this study. We suggest that future research should focus on the relationships between frequency as well as the burden of self-management and different health outcomes in different diabetes subpopulations.

Practical implications

We conclude that health-care providers should not just stress the importance of performing self-management tasks. In addition to asking patients about the frequency of performing self-management tasks, health-care providers should also ask patients

how demanding self-management activities are. When it turns out that they perceive certain activities as a burden, more information about the specific situation and the reasons for their perception could guide the counseling and thus lead to an improvement of psychological health, quality of life, and diabetic symptoms. Furthermore, physicians should be aware that patients with depressive symptoms, or with other (psychological) health complaints, may be more likely to perceive aspects of their self-management as a burden. Because frequency and burden of self-management relate to health outcomes differently, it can also be concluded that self-management measures should include items on the perceived burden of performing activities. The focus should not be primarily on the number of occurrences. In this respect we agree with other authors, who also advocate the assessment of the impact of diabetes, such as the interference of diabetes on daily life,[41] and the emotional adjustment to life with diabetes.[42]

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Chapter 6

The role of work-related and personal factors in diabetes self-management

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Abstract

The aim of this study was to investigate how factors in the workplace and personal factors are related to the frequency with which people with diabetes perform self-management activities and the degree to which they do or do not experience the performing of self-management activities as a burden. Two hundred and ninety-two employees with insulin-treated diabetes completed questionnaires on socio-demographic and illness-related background variables, work experience, diabetes self-efficacy, social support outside of work, coping styles and self-management activities. The results indicate that employees who reported a high workload were more likely to perceive injecting insulin as a burden. The level of social support was positively related to the frequency of dietary self-management in type 2 diabetes and negatively related to the sense of being burdened by dietary self-management in type 1 diabetes. With respect to personal factors, we found that a diabetes avoidance coping style was associated particularly with infrequent blood glucose monitoring and a high sense of being burdened by blood glucose monitoring. Individuals with a low level of self-efficacy were more likely to perceive all types of self-management activities as a burden. These results may guide health professionals when counseling individuals with diabetes.

Introduction

Diabetes is, to a great extent, a self-managed disease, which means that patients need to perform various activities by themselves. These activities include self-monitoring of blood glucose, proper use of medication, an appropriate eating plan, balancing and adjusting insulin medication, food and exercise (based on the circumstances and blood glucose levels) and engaging in regular exercise.[1,2]. Daily self-management may be perceived as a burden, because of the effort required to perform these various activities[3] in addition to the need for flexibility.[4] Moreover, it may also be a frustrating task[5] because the results of self-management are not always immediately obvious.[6] It is much easier to fulfill and continue behaviors that offer results in the short-term. When positive effects are only experienced in the long term, the motivation to perform self-management activities as frequently as necessary may be diminished. The counseling of employees with diabetes by health-care professionals thus requires awareness of all those factors which make self-management easier. Psychosocial factors that have been described as determinants of self-management are: self-efficacy,[7,8] social support,[8-10] and coping styles.[11,12] Nevertheless, it continues to be difficult to determine how these factors influence self-management. Most studies that reported on factors related to self-management focused on (inter)personal factors, to the exclusion of other factors. In this context, Glasgow and Eakin highlight the role of the family and other important mediators such as the health-care system, the workplace environment, the working organization, and sociological and cultural factors of the community as a whole.[1]

Because most self-management tasks have to be performed several times a day, self-management is also an important issue in the workplace. It can only be performed successfully if it is smoothly integrated into the working life. There is a scarcity of studies that focus on self-management in the working diabetic population and on the barriers to self-management in the workplace.[13] But about one-third of the Human Resource staff queried, indicated that there are jobs in their company that make it difficult to carry out self-management tasks.[14] On the basis of interviews with endocrinologists, it was concluded that ‘objective’ work conditions related to work schedule (e.g. shift work, overtime, irregular hours, and timing of meals) could most certainly be regarded as barriers to self-management. Physical facilities, flexibility, degree of control by the worker, a set routine, and a consistent activity level seemed to make self-management at work easier.[15] In another study in which 19% of the participants neglected their self-management, one of the most common reasons for doing so was the irregular working hours.[16] Other factors in the workplace that were supposed to have an influence on self-management are work pressure, lack of control,

attitudes and behavior of superiors and the individual sensitivity of co-workers.[14] There is no quantitative data on the relationship between work experience and self-management. This study examines the relationship between work-related factors, as described by the Job Demand-Control-Support (JDCS) model,[17-19] and self-management. The main components of this model are job demands, decision latitude, and support, both from colleagues and superiors.

In this paper, we will report on how background variables (age, gender, educational level, marital status, working hours per week, number of colleagues in the department and severity of disease) and work characteristics as defined by the JDCS model[17] are related to both the frequency of performing self-management activities and the degree to which self-management is perceived as a burden. First, it is hypothesized that less favorable working situations according to the JDCS model (i.e., high demands, low control, or low support) are related to infrequent self-management and a high perception of self-management as a burden. This is in line with the results of Peyrot et al. who concluded that people with diabetes have difficulty maintaining their self-management activities when they are stressed.[11] Therefore, we assume that job stress, as induced by high demands, low control, or low support impedes self-management activities. Because the literature suggested that personal and social factors have an influence on diabetes self-management, we explored the additional role of coping, self-efficacy, and social support.

Methods

Study population

The participants were employees with insulin-treated diabetes mellitus (types 1 and 2) aged between 30 and 60 years who were selected from three outpatient diabetes clinics (academic hospital, regional hospital, centre specializing in diabetes consultation) in the Netherlands. Employees in this age category have a relatively stable working position. Internal physicians selected patients with types 1 and 2 diabetes requiring insulin medication (diagnosis based on their own judgment). They did not select any patients from whom they knew that they were not employed. In one clinic, all patients were invited to take part, and one of the researchers (IW) selected, at random, a group of patients from each of the other two clinics. It was our intention to invite an equal number of people with types 1 and 2 diabetes. They received a letter from their physician inviting them to participate in our study. They also received information about the study and a form to confirm their participation. Of the 626 patients who were approached to participate in our study and who met the inclusion criteria, 347 were

willing, and filled in the informed consent form (response rate 55.4%). In total, 317 persons (166 with type 1 and 151 with type 2 diabetes) filled in and returned the set of questionnaires. A reminder was sent after 4 weeks. Data on 25 subjects were rejected because they did not meet the inclusion criteria or they did not fill in the questionnaire properly. Consequently, our results are based on data from 292 participants.

Measures

Seven questions concerned background variables of age, gender, educational level, having a partner, hours per week worked, number of colleagues in the department and self-reported long-term complications of diabetes. On the basis of self-reported long-term complications of diabetes, we established an index of disease severity: 0 'no complications', 1 'micro- or macro-vascular complications' and 2 'micro- as well as macro-vascular complications'. This index was also used in a study on quality of life in Dutch diabetes patients.[20]

Job characteristics were assessed by using five scales of the questionnaire on the experience and assessment of work (Dutch abbreviation: VBBA).[21,22] Based on the JDCS model,[17-19] psychological demands of work were measured using the 'work pace and amount of work' scale (11 items, e.g. 'Do you have to work under time pressure?'), decision latitude using the 'job autonomy' scale (11 items, e.g. 'Are you allowed to decide the order in which you perform your tasks?') and the 'participation in decision making' scale (8 items, e.g. 'Do you have any influence on what is and what isn't part of your task?'), social support using the 'support from colleagues' scale (9 items, e.g. 'Do you have a good relationship with your colleagues?') and the 'support from the direct superior' scale (9 items, e.g. 'Can you rely on your supervisor when you experience problems in your work?'). The job autonomy and participation in work scales (measure of decision latitude) were combined to establish one score as well as the support from colleagues and support from superior scales (measure of social support)[17,18]. A 4-point response scale was used, ranging from 0 'never' to 3 'always'. In accordance with the test manual,[21] scores for each VBBA subscale were converted into 0-100 scores. High scores indicate a lot of problems regarding the specific dimension. Cronbach's Alphas for the job demands, decision latitude, and support scales were respectively, 0.88, 0.94, and 0.89.

Coping was measured using a diabetes-specific coping measure, the diabetes coping measure (DCM)[23] and a general coping scale, the coping inventory for stressful situations (CISS).[24] The DCM consists of four scales: tackling spirit coping (5 items), avoidance coping (5 items), passive resignation coping (5 items), diabetes integration coping (6 items) (5-point Likert scaling, ranging from 1 'disagree' to 5 'agree strongly'). Mean subscale scores were converted into 0-100 scores. High scores on the

diabetes integration and tackling coping spirit indicate more adaptive coping. High scores on the avoidance and passive resignation scales indicate poor coping. The CISS assesses three coping dimensions: task-oriented (7 items), emotion-oriented (7 items), and avoidance-oriented (7 items). Items can be rated on a 5-point frequency scale, ranging from 1 'not at all' to 5 'very much'. Scores for all scales range from 7 to 35.

Social support from the social environment (family, friends) was assessed using a scale based on the co-worker and supervisor support scales of the VBBA. Scores range from 0 to 100, with high scores indicating a lack of support. Coefficient α for this scale is 0.87.

The diabetes management self-efficacy scale for patients with diabetes was used to measure the level of self-efficacy in relation to diabetes self-management: nutritional self-management, weight control, medical treatment, physical exercise, and blood sugar control.[7] We adapted this 20-item scale for individuals with insulin-treated diabetes mellitus, by replacing items related to taking tablets by items related to insulin injections (coefficient α: 0.91). Self-efficacy was measured with the phrase 'I think I'm able to…', scored on a 5-points scale: 1 'yes, surely'; 2 'probably yes'; 3 'maybe yes/maybe no'; 4 'probably not'; 5 'no, surely not'. High scores indicate low feelings of self-efficacy.

The multidimensional diabetes self-management checklist (MDSC) was developed by the authors to measure the frequency of performing self-management and perceived burden of doing so.[25] Four domains of self-management for individuals with insulin-treated diabetes were differentiated, which may be difficult to plan for, and interfere with one's daily routines: dietary self-management (following dietary guidelines, eating regularly), injecting insulin (frequency and dose), blood glucose monitoring, and adjusting the insulin dosage to specific circumstances. For each activity, the frequency of self-management was assessed by means of one item, formulated as: 'How often do you … (e.g., monitor your blood glucose level yourself)?', with six response categories ranging from 1 'less often than once a month' to 6 'every day'. The checklist also included items on the perceived burden of self-management. Items were formulated about the perceived burden in three life domains: home, work, and special occasions. For each activity, the burden was assessed by means of the phase 'Is it difficult for you to …. ', for each life domain separately. Each item had four response categories: 0 'no, I (almost) never perceive it as a burden'; 1 'sometimes'; 2 'often'; 3 'yes, it is most of the time'. For each type of self-management, a burden sum score was established on the basis of the corresponding items, which range from 0 to 100. Regarding the burden of dietary self-management, a sum score was calculated based on the items about following dietary guidelines as well as about eating regularly,

with a coefficient α of 0.75. For the other burden scales coefficient α was 0.77 (insulin injection), 0.79 (blood glucose monitoring), and 0.90 (adjusting insulin).

Data analysis

SPSS 10.0.5 was used to analyze the data. For the analyses, variables on the original MDSC were dichotomized into high (every day) or low frequent (less often than every day) self-management and high or low perceived burden of performing self-management.

Step 1 – t-tests

In order to reduce the number of variables for logistic regression analyses, we first conducted t-tests. In the t-tests we determined differences in means for background variables, work characteristics, and personal factors for participants who frequently or less frequently perform self-management activities and those who perceive this as a burden or not. These analyses were conducted for each type of self-management activity and for persons with type 1 (DM1) and type 2 diabetes (DM2) separately. Those variables that were selected had two or more t-values with a p-value < 0.10, for frequency and/or burden of self-management. Because the sample sizes per group regarding the frequency of insulin injections were too small, analyses were not performed for this variable. Correlation coefficients between all independent variables were calculated to check for colinearity.

Step 2 – logistic regression analyses

Multivariate logistic regression analyses were performed in three steps to examine the association between background variables, work characteristics, personal factors and self-management. All the selected background variables (step 1) were first entered into the model. Next, all the work factors were entered. Finally, personal factors (coping, social support, and self-efficacy) were entered stepwise into the model to find out whether these variables were related to self-management while controlling for the other variables. In order to improve the interpretation of the odds ratios in relation to each other, continuous variables were divided by their own standard deviation.[26] Analyses have been conducted for persons with DM1 and DM2 separately because the effects of behavioral and psychosocial factors may be different for different disease states.[11]

Results

Characteristics of the study sample are shown in Table 1. Of the total population, which comprised 292 subjects, 54.5% had type 1 diabetes (mean age 40.32; SD=7.60) and 45.5% had type 2 diabetes (mean age 49.72; SD=7.17).

On the basis of t-tests (step 1), it was concluded that, in respect to background variables, the participants' educational level, age, working hours per week, and seriousness of disease were relevant in relation to self-management, while gender, having a partner, and the number of employees in the department were not. All work-related factors were relevant to self-management. In regard to personal factors, diabetes coping styles - except diabetes tackling spirit coping - were related to self-management as well as self-efficacy and support from family and friends. General coping styles were not relevant to either frequency of self-management or perceived burden of self-management, nor were they selected for further regression analyses.

The selected variables were low to moderately interrelated. Correlation coefficients range from 0.00 to 0.49. Three coefficients were higher than 0.40, namely with regard to relations between support at work and support from family and friends (r=0.44), between decision latitude and support at work (r=0.42), and between integration coping and passive resignation coping (r=-0.49). Based on the results, colinearity is not likely to play a role.

Relationships with frequency of performing self-management activities

Background variables

Multivariate analyses showed that there were few relationships between background variables (educational level, age, seriousness of disease, and working hours per week) and frequency of self-management (see Table 2). A higher level of education was associated with more frequent blood glucose monitoring in DM1 and more adjusting of insulin dosages in DM2. Conversely, employees with DM1 and DM2 with a higher educational level were less likely to report frequent regular eating patterns. Being older was related positively to the frequency of following recommended nutritional guidelines and regular eating in DM1.

Work-related factors

The results indicated that few work-related variables had relationships with self-management behavior. For persons with DM2, little support at work corresponded to the less diligent following of an appropriate eating plan. A higher workload corresponded to more frequent adjustments of insulin dosages to existing

Table 1. Study population (N=292): description of: (a) background variables and personal factors, and (b) work-related factors

	Total (292)	DM1 (159)	DM2 (133)
(a) Background variables and personal factors			
Age (yrs)	44.55 (8.78)	40.32 (7.60)	49.72 (7.17)
Gender (% male)	66.8%	59.7%	75.2%
Educational level:			
Lower	35.2%	26.9%	45.6%
Middle	32.0%	32.7%	31.2%
Higher	32.7%	40.4%	23.2%
Having a partner (yes)	86.0%	84.8%	87.5%
Seriousness of disease:			
No complications	56.2%	56.6%	55.6%
Micro- or macrovascular complications	37.7%	38.4%	36.8%
Micro- and macrovascular complications	6.2%	5.0%	7.5%
HbA1c%	8.20 (1.21)	8.12 (1.12)	8.30 (1.31)
Diabetes tackling spirit coping (0-100)	66.61 (14.64)	66.34 (14.09)	66.94 (15.32)
Diabetes avoidance coping (0-100)	26.26 (22.15)	25.90 (21.64)	26.70 (22.82)
Diabetes passive resignation coping (0-100)	25.20 (21.15)	23.67 (20.04)	27.03 (22.35)
Diabetes integration coping (0-100)	65.23 (20.92)	66.51 (20.97)	63.70 (20.84)
Avoidance coping (7-35)	17.81 (4.67)	17.81 (4.80)	17.82 (4.52)
Task-oriented coping (7-35)	20.74 (3.94)	21.08 (3.82)	20.34 (4.07)
Emotion-oriented coping (7-35)	19.59 (4.44)	20.03 (4.26)	19.06 (4.61)
Lack of support from family and friends (0-100)	29.26 (18.53)	21.11 (12.51)	29.76 (19.49)
Lack of self-efficacy (20-100)	33.57 (10.24)	31.63 (9.29)	35.84 (10.86)
% Frequent following dietary guidelines	70.8%	73.0%	68.2%
% Frequent regular eating patterns	65.6%	63.5%	68.2%
% Frequent injecting of insulin	96.1%	93.3%	99.2%
% Frequent blood glucose monitoring	47.8%	57.6%	35.9%
% Adjusting insulin	54.3%	67.1%	38.9%
% Burden of dietary self-management	70.4%	66.0%	75.8%
% Burden of injecting insulin	12.8%	11.3%	14.5%
% Burden of blood glucose monitoring	54.0%	54.7%	53.0%
% Burden of adjusting insulin	32.8%	28.3%	38.3%
(b) Work-related factors			
Occupational groups:			
Public services (Education, culture, healthcare, government)	23.2%	26.6%	19.6%
Agrarian, industry, and transportation	27.0%	24.3%	32.3%
Services (Business, sales workers, general administrative)	43.9%	46.8%	40.6%
Other	5.9%	2.6%	7.5%
Number of colleagues in the department:			
1-5	35.2%	28.4%	43.4%
6-20	32.4%	36.1%	27.9%
21-100	26.8%	31.0%	21.7%
100-1000	5.3%	4.5%	6.2%
>1000	0.4%	0.0%	0.8%
% colleagues that know about their diabetes:			
All colleagues know	75.0%	76.1%	73.6%
Some colleagues know	21.9%	22.0%	21.7%
None of the colleagues know	3.1%	1.9%	4.7%
% superiors that know about their diabetes:	92.3%	93.3%	91.0%
Working hours per week	36.38 (14.63)	34.90 (12.51)	38.15 (16.70)
Workload (0-100)	45.23 (16.59)	44.23 (16.41)	46.44 (16.79)
Lack of decision latitude (0-100)	37.45 (21.13)	38.27 (17.57)	36.44 (24.87)
Lack of support at work (0-100)	21.86 (13.74)	21.11 (12.51)	22.84 (15.21)

Data in percentages and means (SD).

Table 2. The relationship between background variables, work factors, personal factors, and frequency of performed self-management activities

	DM1		DM2	
	B	Odds ratio (95% CI)	B	Odds ratio (95% CI)
Following dietary guidelines:				
Educational level	0.18	1.20 (0.73-1.98)	-0.33	0.72 (0.41-1.27)
Age (per SD increase)	0.70**	2.01 (1.18-3.43)	0.46	1.58 (0.89-2.81)
Working hours per week (per SD increase)	0.27	1.31 (0.77-2.22)	0.58	1.78 (0.75-2.08)
Seriousness of disease	0.08	1.09 (0.54-2.19)	-0.33	0.73 (0.34-1.56)
Workload (per SD increase)	-0.12	0.89 (0.58-1.37)	0.35	1.42 (0.86-2.33)
Lack of decision latitude (per SD increase)	0.13	1.14 (0.65-1.99)	-0.07	0.93 (0.58-1.49)
Lack of support at work (per SD increase)	-0.02	0.98 (0.59-1.65)	-0.54*	0.58 (0.36-0.93)
Diabetes avoidance coping	-0.45*	0.64 (0.43-0.96)	---	---
Eating regularly:				
Educational level	-0.52*	0.60 (0.36-1.00)	-0.69*	0.50 (0.28-0.89)
Age (per SD increase)	0.51*	1.67 (1.02-2.72)	0.26	1.30 (0.73-2.32)
Working hours per week (per SD increase)	-0.09	0.91 (0.54-1.53)	-0.12	0.88 (0.60-1.31)
Seriousness of disease	0.14	1.15 (0.58-2.31)	-0.55	0.58 (0.26-1.26)
Workload (per SD increase)	-0.19	0.83 (0.53-1.27)	-0.14	0.87 (0.54-1.41)
Lack of decision latitude (per SD increase)	-0.16	0.85 (0.48-1.51)	0.04	1.04 (0.65-1.66)
Lack of support at work (per SD increase)	-0.15	0.86 (0.52-1.42)	-0.08	0.92 (0.57-1.49)
Lack of support family/friends (per SD increase)	---	---	-0.49*	0.61 (0.38-0.99)
Lack of self-efficacy (per SD increase)	-0.58**	0.56 (0.36-0.87)	---	---
Blood glucose monitoring:				
Educational level	0.72**	2.06 (1.24-3.40)	0.20	1.23 (0.70-2.14)
Age (per SD increase)	-0.35	0.70 (0.44-1.13)	-0.27	0.77 (0.45-1.32)
Working hours per week (per SD increase)	0.06	1.06 (0.64-1.75)	0.20	1.22 (0.82-1.82)
Seriousness of disease	0.36	1.43 (0.71-2.89)	0.41	1.51 (0.72-3.17)
Workload (per SD increase)	0.15	1.16 (0.77-1.75)	0.17	1.19 (0.74-1.91)
Lack of decision latitude (per SD increase)	0.22	1.25 (0.73-2.13)	0.29	1.33 (0.85-2.09)
Lack of support at work (per SD increase)	0.14	1.15 (0.72-1.86)	-0.09	0.91 (0.59-1.42)
Diabetes avoidance coping (per SD increase)	-0.94***	0.39 (0.24-0.63)	-0.70**	0.50 (0.30-0.82)
Diabetes integration coping (per SD increase)	-0.48*	0.62 (0.40-0.97)	---	---
Adjusting insulin:				
Educational level	0.28	1.32 (0.82-2.14)	0.74*	2.10 (1.19-3.72)
Age (per SD increase)	-0.15	0.86 (0.54-1.38)	-0.31	0.74 (0.41-1.32)
Working hours per week (per SD increase)	0.41	1.51 (0.91-2.52)	-0.03	0.98 (0.63-1.51)
Seriousness of disease	0.36	1.44 (0.71-2.90)	-0.58	0.56 (0.24-1.30)
Workload (per SD increase)	0.14	1.15 (0.76-1.74)	0.73**	2.08 (1.24-3.47)
Lack of decision latitude (per SD increase)	0.14	1.15 (0.67-1.97)	-0.20	0.82 (0.51-1.32)
Lack of support at work (per SD increase)	0.05	1.05 (0.65-1.69)	-0.38	0.69 (0.42-1.13)
Diabetes avoidance coping (per SD increase)	-0.55**	0.59 (0.38-0.87)	---	---
Diabetes integration coping	-0.53*	0.59 (0.38-0.92)	---	---

B values with significance levels and odds ratios (with 95% confidence interval), final model. Type 1 and type 2 diabetes separately.
* $p<0.05$; ** $p<0.01$; *** $p<0.001$

circumstances in DM2. For persons with DM1, no relations were found between the way employees with diabetes perceived their workload, decision latitude and support at work and self-management.

Personal factors

Several relationships were found between personal factors and frequency of self-management. Diabetes avoidance coping was related to the frequency with which people with DM1 follow recommended dietary guidelines and to the adjustment of their insulin dosages. Avoidance coping was also related to the frequency of blood glucose monitoring in both types of diabetes. In all cases, individuals with an avoidance coping style were less likely to perform self-management activities frequently. Few other relations were found between personal factors and the frequency of self-management. People with DM2 who considered that they received more support from family and friends and people with DM1 with a high sense of self-efficacy ate frequently and regularly. Furthermore, more diabetes integration coping was associated with less frequent blood glucose monitoring and adjusting insulin in DM1.

Relationships with perceived burden of self-management

Background variables

Few relationships were found between background variables and burden of self-management. Contrary to findings with regard to frequency of self-management, age, and educational were not related to the burden. Employees with DM1 with more working hours per week were more likely to perceive injecting insulin as a burden than people who work less hours per week. In the case of DM2, a more serious disease state was related to those who experienced it to be a burden to adjust insulin (see Table 3).

Work-related factors

Some relationships were found between work-related factors and the perceived burden of self-management. People with both types of diabetes who experience a high workload are more likely to perceive injecting insulin as a burden. People with DM1 who experience a lack of support at work perceive dietary self-management more as a burden.

Personal factors

Several relations were found between personal factors and the burden of self-management. It turned out that the level of self-efficacy especially had many relationships with the perceived burden of performing self-management activities. Strong feelings of being able to perform the different types of self-management activities related to a low perceived burden of performing these activities. Furthermore, people with DM2 with a diabetes integration coping style were less

likely to perceive injecting insulin as a burden. People with DM1 with a low sense of self-efficacy were more likely to perceive blood glucose monitoring as a burden.

Table 3. The relationship between background variables, work factors, personal factors and perceived burden of self-management activities

	DM1		DM2	
	B	Odds ratio (95% CI)	B	Odds ratio (95% CI)
Burden of dietary self-management:				
Educational level	0.27	1.31 (0.80-2.13)	-0.52	0.59 (0.30-1.17)
Age (per SD increase)	-0.23	0.79 (0.50-1.26)	-0.57	0.56 (0.24-1.32)
Working hours per week (per SD increase)	0.33	1.39 (0.83-2.32)	0.03	1.03 (0.55-1.91)
Seriousness of disease	-0.07	0.93 (0.46-1.87)	-0.05	0.95 (0.35-2.58)
Workload (per SD increase)	0.00	1.00 (0.66-1.51)	-0.14	0.87 (0.49-1.55)
Lack of decision latitude (per SD increase)	-0.02	0.98 (0.56-1.71)	-0.21	0.81 (0.45-1.48)
Lack of support at work (per SD increase)	0.54*	1.71 (1.04-2.80)	0.21	1.23 (0.67-2.24)
Lack of self-efficacy (per SD increase)	0.66*	1.94 (1.15-3.26)	1.67***	5.30 (2.21-12.71)
Burden of injecting insulin:				
Educational level	-0.23	0.79 (0.31-2.00)	-0.28	0.76 (0.34-1.70)
Age (per SD increase)	-0.36	0.69 (0.31-1.57)	0.08	1.08 (0.48-2.42)
Working hours per week (per SD increase)	1.11*	3.02 (1.10-8.31)	0.07	1.08 (0.69-1.67)
Seriousness of disease	0.49	1.63 (0.57-4.61)	-0.48	0.62 (0.20-1.88)
Workload (per SD increase)	0.83*	2.29 (1.01-5.17)	0.77*	2.15 (1.06-4.36)
Lack of decision latitude (per SD increase)	-0.22	0.80 (0.29-2.23)	0.12	1.13 (0.61-2.10)
Lack of support at work (per SD increase)	0.70	2.01 (0.88-4.58)	-0.18	0.84 (0.44-1.60)
Lack of self-efficacy	0.81*	2.24 (1.11-4.50)	0.91**	2.48 (1.27-4.84)
Diabetes integration coping	---	---	-0.82*	0.44 (0.21-0.92)
Burden of blood glucose monitoring:				
Educational level	0.40	1.50 (0.92-2.45)	0.12	1.12 (0.63-2.00)
Age (per SD increase)	0.14	1.15 (0.72-1.83)	0.12	1.13 (0.65-1.97)
Working hours per week (per SD increase)	0.48	1.61 (0.96-2.70)	0.10	1.10 (0.75-1.62)
Seriousness of disease	0.02	1.02 (0.52-2.02)	0.32	1.38 (0.64-2.95)
Workload (per SD increase)	0.05	1.05 (0.70-1.58)	0.26	1.30 (0.82-2.08)
Lack of decision latitude (per SD increase)	0.38	1.47 (0.84-2.57)	0.20	1.22 (0.77-1.93)
Lack of support at work (per SD increase)	-0.10	0.91 (0.57-1.45)	-0.19	0.83 (0.52-1.32)
Diabetes avoidance coping	0.63**	1.88 (1.22-2.90)	1.06***	2.90 (1.62-5.18)
Lack of self-efficacy	0.51*	1.66 (1.04-2.66)	---	---
Burden of adjusting insulin:				
Educational level/	0.39	1.48 (0.83-2.63)	-0.06	0.94 (0.55-1.63)
Age (per SD increase)	0.09	1.09 (0.63-1.88)	-0.12	0.89 (0.50-1.56)
Working hours per week (per SD increase)	0.13	1.13 (0.65-1.99)	0.01	1.01 (0.69-1.48)
Seriousness of disease	0.07	1.08 (0.49-2.35)	0.76*	2.15 (1.01-4.57)
Workload (per SD increase)	-0.18	0.84 (0.52-1.35)	0.01	1.01 (0.63-1.61)
Lack of decision latitude (per SD increase)	0.23	1.25 (0.66-2.37)	0.32	1.38 (0.88-2.17)
Lack of support at work (per SD increase)	0.22	1.25 (0.73-2.14)	-0.19	0.83 (0.52-1.32)
Lack of self-efficacy	1.25***	3.48 (2.05-5.89)	0.64**	1.89 (1.17-3.05)

B values with significance levels and odds ratios (with 95% confidence interval), final model. Type 1 and type 2 diabetes separately.
* $p<0.05$; ** $p<0.01$; *** $p<0.001$

Discussion and conclusion

Discussion

Up to now, this is the first study describing relationships between work experience, personal factors, and self-management in a diabetes working population. For this reason, we chose a cross-sectional design to explore which factors are likely to be important for performing self-management tasks frequently and for performing tasks without perceiving it as burdensome. First, relationships were studied between background variables and self-management. Age and the level of education were related to the frequency of self-management, while the number of working hours per week and seriousness of disease were related to the burden of self-management. The relationships between educational level and frequency of self-management were not consistent; employees with a higher level of education, plan their meals less rigidly, monitor their blood glucose more often, and also adjust their insulin more often. It can be speculated that employees with a higher education may be unable to eat regularly because they have less structured functions and have no fixed breaks. It is also possible that they have more flexible jobs and more control over their work and are therefore more flexible in their self-management strategies. They probably have greater success in self-regulation during working hours, which is one of the challenges for employees with diabetes. Moreover, physicians probably give more structured advice, especially about their eating patterns to patients with less education.

Second, we investigated whether, and if so which, factors in the workplace were related to performing self-management activities in employees with diabetes as well as to the perceived burden thereof. Our results indicated that the frequency with which employees perform self-management activities and the level of workload, control, and support at work were relatively independent of each other. However, it appears that employees with both types 1 and 2 diabetes who have a higher workload are more likely to perceive injecting insulin as a burden than employees who have a lower workload. It is probable that workload was only related to the perceived burden of this type of self-management behavior because injecting insulin is necessary and unavoidable, even when there is time pressure. This is in agreement with the finding that 93% of people with DM1 and 99% of people with DM2 inject the recommended amount of insulin daily. In another European study,[16] it was also found that 99% frequently injected insulin: 84% of the participants daily injected their insulin as scheduled and 15% almost daily. Based on the literature,[15,16] it was expected that control over one's work is important for the performance of self-management activities. However, in our study the lack of decision latitude was related neither to the frequency of self-management nor to the perceived burden of self-management. This

may be due to the fact that most items on decision latitude are restricted to control over tasks and work-related activities (e.g. 'Can you decide how you perform your work?'). Probably, the fact that employees have less control over their work does not automatically imply that they cannot plan their self-management behavior. Furthermore, when people have no control over their work they may possibly perform self-management activities nonetheless, e.g. during the lunch or coffee break. Social support at work was only related to dietary self-management. More support was linked to more frequent self-management in DM2 and to a lower perceived burden in DM1. This finding, contrary to other types of self-management, can be explained by the fact that nutritional behavior is mostly embedded in a social context.

Additionally, we were interested in relations between a person's coping style, self-efficacy, and perceived social support and self-management. It turned out that personal factors were more relevant in relation to self-management than were factors on work experience. We will therefore discuss these results extensively. Many relations were found between self-efficacy and the burden of self-management. Contrary to theories on self-efficacy,[27] our study showed that self-efficacy had a limited relationship to the frequency with which people perform self-management activities. Only, people with DM1 and a high level of self-efficacy were more likely to have regular eating patterns. However, we did find a number of links between avoidance coping and the frequency of self-management.

Employees with both types of diabetes and a diabetes avoidance coping style were less likely to monitor their blood glucose level frequently. They were also more likely to perceive blood glucose self-monitoring as a burden. Individuals with a diabetes avoidance coping style distract themselves with activities or thoughts that have nothing to do with diabetes to distract themselves from diabetes issues. Blood glucose monitoring gives direct feedback about the blood glucose level and this type of self-management activity may therefore be particularly confrontational for people with a diabetes avoidance coping style. Self-management behaviors and the perceived burden thereof are unrelated to subjects' general coping styles. We were not surprised by this finding because diabetes self-management was measured using a disease-specific questionnaire while coping relates to all manners of situations, including those unrelated to diabetes. In the literature, including literature pertaining to other research areas, the same conclusions were drawn in respect to specificity of measurement instruments.[28,29] These findings underline the importance of disease-specific (coping) measures.

Furthermore, support from family and friends seemed only to be important for employees with DM2 in that they eat more frequently at regular times when they experience support. This is in line with the findings in respect to social support at

work. Although they know themselves that they have to follow the nutritional guidelines, as we concluded earlier, support from family and friends possibly facilitates this because it is part of a social event. We did not find other relationships with social support, whereas other studies, such as a study by Toljamo and Hentinen,[10] did find that support from family and friends was associated with adherence to self-care. However, results cannot be adequately compared because of differences in methodology. We did not made a distinction between different kinds of support - emotional, instrumental, informational - and appraisal[30] and certain types of social support may facilitate self-management while others may not. Therefore, in future research, more specific measures are preferable in order to detect the relationship between support and self-management.

As for the limitations of the study, it should be noted that because of the explorative character of our study, we studied a variety of relationships. Although this implies that significant results need to be interpreted carefully because of the phenomenon of multiple testing, the most prominent results were consistent for the different measures of self-management and diabetes types. For the results regarding the relationship between self-efficacy, diabetes avoidance coping, and self-management, the risk of unjustified significant results is minimal. Because self-report measures were used to assess the frequency with which employees perform self-management tasks, there is a risk that the results do not reflect their actual behavior. The percentage of people who daily inject their insulin may be overestimated, for example. Furthermore, cross-sectional data were used for the analyses, which implies that causal conclusions cannot be drawn. Although one can state that there are relationships to self-management, nothing can be said about the direction of effects. A further comment regards the assembly of the study population. Because we had a heterogeneous study population, there is no reason to assume that the results cannot be generalized to the general Dutch diabetes population. Patients of various ages who live in different regions of the Netherlands with different educational background and a variety of jobs participated. However, we cannot comment upon how representative our study is of the whole population.

Conclusion

From the findings of this study, it can be concluded that personal factors play a more prominent role in relationship to self-management than the way in which employees perceive their work situation. Employees in a work situation with a high workload, little decision latitude, and little support are no more likely to neglect their self-management compared to those in a more favorable situation. However, employees with an avoidance coping style do monitor their blood glucose level less frequently

and also perceive this self-management task as a burden. Individuals who have a lower sense of self-efficacy feel more burdened by performing all self-management activities.

Practice implications

This explorative study gives rise to suggestions for further prospective research resulting in conclusions about various short-term and long-term relationships between work characteristics, personal factors, and self-management. Our results indicated that for some employees, it would be important to reduce the workload to make injecting insulin (at work) more feasible. Moreover, indications were found that increasing support at work helps to promote dietary self-management and makes it easier for employees to perform. It is recommended that it be ascertained whether factors in the workplace restrict self-management and make it more difficult. As Detaille et al. also concluded, occupational physicians should address and focus on self-management issues.[31] As we indicated in the discussion, people who are more highly educated may have more flexibility in their work and may therefore better succeed in self-management. To regulate the blood glucose levels adequately, flexibility in self-management is seen as more important than it was in earlier decades.[32] Therefore, these aspects should be emphasized in self-management training programs. Lower educated employees can also be trained how to become more flexible in their disease management (at work).

Personal factors were found to be especially relevant in relation to self-management. Therefore, we think there is a prominent role for professionals (especially internal physicians, diabetes nurses, and psychologists) to identify problems with performing self-management activities. Results showed that a lack of self-efficacy and avoidance coping were particularly important factors in relation to self-management. This was also concluded from Bandura's social learning theory and from the literature.[27,33] Enhancing people's sense of self-efficacy, by setting achievable targets, should be one of the essential elements and goals of self-management interventions. These interventions may include enhancing skill mastery, modeling, social persuasion, and the ability to re-interpret symptoms.[34] For the same reason that it is important to enhance self-efficacy, awareness of a diabetes avoidance coping style by professionals is of paramount importance in order to avoid infrequent self-management behavior and to prevent patients from perceiving the task of checking their blood glucose as a burden. Thus, during a consultation, the focus should not only be on self-management activities themselves, but also on the way patients think about their capacities to actually perform certain types of behavior and the way they cope with diabetes. To make self-management more manageable, it may be necessary to

refer individuals to a psychologist for individual coaching or to a diabetes education program. If self-management in employees with diabetes is a problem, the focus should in the first place, be on identifying personal factors.

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Chapter 7

Do work experiences and fatigue-related symptoms influence each other? A longitudinal study of insulin-treated diabetes patients

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Abstract

Objective*: To examine relations between job components, as defined by the Job Demands Control Support model, and fatigue-related health complaints to find out about the causality in the working diabetes population.*

Research Design and Methods*: 225 employees with insulin-treated diabetes completed questionnaires at two points in time with a one-year interval in between. The measurements related to work experience (i.e. job demands, decision latitude and social support at the workplace), fatigue and diabetes symptoms. A series of LISREL analyses was conducted. In each analysis the fit was tested between a two-wave-two-variables model and the covariances of the variables. Analyses were performed for types 1 and 2 diabetes and for employees with few and many diabetes complaints separately.*

Results*: For employees with many diabetes symptoms, a lack of social support was positively related to the level of fatigue over time. The relationship between lack of support and fatigue for the sample with few diabetes symptoms was reversed. This relationship was weak and should be interpreted cautiously. The same applies for the impact of fatigue on job demands within the type 1 diabetes sample.*

Conclusions*: It is clear that the level of support at the workplace affected the level of fatigue over time for employees with many diabetes symptoms. Employees who experience many symptoms resulting from their disease need support from their colleagues and their superior.*

Introduction

Diabetes is a medical and social problem of increasing importance.[1] The number of employees with diabetes is increasing as well. Most studies about job stress, as well as work stress theories, focus on the general working population. It is not known whether the principles upon which theories are based also apply to the diabetic working population. This study aims to increase the insight into the causal relationships between work-related factors and fatigue in a sample of employees with insulin-treated diabetes.

In the Netherlands, chronic fatigue at work is prevalent among employees.[2] While employees with diabetes have to manage their disease in addition to the usual job stress their risk of fatigue and fatigue-related complaints may be higher than that of healthy employees. Moreover, fatigue may also result directly from physiological processes inherent in the diabetes,[3] from the burden associated with treatment and from long-term diabetes-related complications.[4]

According to the Job Demands Control Support (JDCS) model, jobs that are unfavorable are associated with more health complaints. It assumes that a work situation affects health negatively when it is characterized by high demands, a lack of control and a lack of support.[5] In an earlier study among workers with diabetes mellitus,[6] we indeed found that fatigue was more severe in the event of a lack of social support at work and in the event of high job demands in combination with a lack of decision latitude. Besides, fatigue proved to be related to high job demands when reported in combination with diabetic symptoms.

However, conclusions about causality could not be drawn because of the cross-sectional design. The JDCS model and other work stress models assume that there is a one-directional relationship between work factors and health outcomes: unfavorable working conditions will result in more health complaints. However, this concept may be too limited. Reversed causation should be tested to find out whether, conversely, health complaints affect employees' experience of the work situation.[7-9]

Some evidence was found for reversed causation as well as for reciprocal causal relationships. For example, when employees feel tired their work may be more burdensome and therefore experienced as less favorable. Fatigued employees may for example 1) perceive their work more negatively[10] or 2) see their job conditions worsen due to their reactions[11] or they may drift into worse jobs.[12] Moreover, the work environment might be changed as a result of health complaints.[9,12] For employees with diabetes, it is possible that because of their decreased ability to meet work demands due to physical reasons, their work may feel more burdensome, resulting in a more negative experience of their work situation.

The aim of the present study was to disentangle cause and effect. We examined the relationships between job components as defined by the JDCS model and fatigue-related health complaints to find out about the causality in the working diabetes population. We used a two-waves-two-variables design measuring work experience, fatigue and diabetes symptoms on two occasions separated by a one-year interval. We hypothesize that unfavorable working conditions (high demands, low control, low support) at Measurement 1 would result in more fatigue-related complaints at Measurement 2. However, a reversed causal relationship could also be expected and should be ruled out in order to be able to make practical recommendations. Therefore, the alternative hypothesis was that because of fatigue-related complaints at measurement 1, employees evaluated their work situation at Measurement 2 more negatively. Because of pathophysiologic differences between the two disease types, relationships may be different for employees with type 1 and 2 diabetes. Therefore, we also investigated whether, in the case of employees with type 1 and type 2 diabetes, work-related symptoms were related differently to fatigue. Differences between employees with few and many diabetes-related symptoms were also investigated. In an earlier study,[6] diabetes-related symptoms explained much of the variance of fatigue, also in combination with high job demands. This makes it useful to take diabetes-related symptoms into account when studying relationships between work characteristics and fatigue as well as to check for differences between the groups with regard to work characteristics and fatigue.

Methods

Study population

Participants were workers with insulin-treated diabetes mellitus (types 1 and 2) between 30 and 60 years of age, who attended 3 outpatient diabetes clinics in the Netherlands. Diabetologists selected patients (diagnosis based on their own judgment) from their patient records. The age range referred to was chosen because most employees in this range have stable employment. The study was approved by the Medical Ethics Committees of the University Medical Center Utrecht.

Of the 626 employees who fulfilled the inclusion criteria, 347 agreed to participate (response rate 55.4%). Questionnaires were sent by postal mail. A reminder was sent once after 4 weeks. At baseline (m1), 317 participants (166 with type 1 and 151 with type 2 diabetes) filled out the set of questionnaires. Twenty-three of them did not meet the inclusion criteria because they were unemployed (n=10), not being treated with insulin (n=4), pregnant (n=1), or had not worked for more than 6 weeks due to illness

(n=8). Two participants did not fill out the questionnaire properly. Of the first measure, data from 292 participants was analyzed. One year later, 257 participants out of the 317 who filled out the first measure (81.1%) filled out the follow-up questionnaire (m2). The data of 25 people was not suitable for analysis: 3 were no longer being treated with insulin, 12 had no work at the time they filled out the second questionnaire, 8 had not been working for more than 6 weeks due to illness and 2 were pregnant. We checked for selective drop-out and found that there was no significant difference between participants who did fill out both questionnaires properly (N=225) and those who filled out the first measure but who did not complete the second measure (N=67) as regards demographic factors, disease characteristics and health status. With regard to work-related factors, it appeared that participants who did not complete the second measure were at m1 less satisfied with their job (t=2.32; p=0.021), experienced a higher workload (t=-3.10; p=.002) and received less support from colleagues (t=-2.14; p=.035) as well as from their superior (t=-2.38; p=.018). No differences were found with respect to lack of involvement and lack of autonomy.

Measures

Seven subscales of the Questionnaire on the Experience and Evaluation of Work (Dutch abbreviation: VBBA)[13,14] were used to assess *work experience*: measures of job demands: workload (11 items), psychological demands (7 items), emotional demands (7 items); measures of decision latitude: lack of participation in work (8 items), lack of job autonomy (11 items); and measures of support at work: lack of support colleagues (9 items), lack of support superior (9 items). Scores for each subscale range from 0 to 100, higher scores indicating more problems at the specific dimension.

Prolonged fatigue was assessed using the Checklist Individual Strength (CIS).[15] This scale measures four dimensions of fatigue: subjective fatigue (8 items), reduction in concentration (5 items), reduction in motivation (4 items), and reduction in physical activity (3 items). Scores for all items range from 1 to 7, higher scores indicating more experienced symptoms of fatigue. A composite score for general fatigue was used. Scores range from 20 to 140. Higher scores indicate more reported fatigue symptoms. Employees scoring >76 were defined as probable cases of prolonged fatigue.[16]

The score with regard to the Diabetes Symptom Checklist-Revised (DSC-R) was used as a measure of *symptom severity.*[17] A composite score (ranging from 0 to 100) was established on the basis of eight underlying dimensions: hyperglycemic, hypoglycemic, psychosocial-cognitive, psychosocial-fatigue related, cardiovascular, neurological-pain-related, neurological-sensory, and ophthalmologic complaints. Higher scores indicate more reported symptoms. Scores were dichotomized for the

analyses. Participants were indicated as having many diabetes symptoms when they reported 17 or more of the 36 symptoms that were listed in the DSC-R.

Data Analysis

In order to examine the mutual relationship between work-related variables and health problems, a series of LISREL analyses was conducted. In each analysis the fit was tested between a two-wave-two-variables model and the covariances of the variables measuring the constructs involved the following samples: (a1) patients with type 1 diabetes mellitus, (a2) patients with type 2 diabetes mellitus, (b1) patients with few diabetes complaints and (b2) patients with many diabetes complaints. In each of the analyses, one of the constructs was *fatigue*, which was assessed on two occasions, while the second construct, which was assessed on the same two occasions, was varied and included *job demands*, *lack of decision latitude* and *lack of support*. Thus, the results of 4 x 3 (i.e., samples x work related constructs) analyses will be reported (see Table 4). The work-related constructs were measured by multiple indicators: *job demands* was measured with the variables workload, psychological job demands and emotional job demands, *lack of decision* was measured by lack of participation in work and lack of job autonomy and *lack of support* was measured by lack of support from colleagues and lack of support from the superior. *Fatigue* was measured by means of four variables: *subjective fatigue, reduction in concentration, reduction in motivation*, and *reduction in physical activity*.

As is usually found, the within-variable across-time intercorrelations were higher than the across-variable intercorrelations. In general, accounting for this effect by relaxing the within-variable across-time error covariances, caused a good fit between model and data. However, in many cases, relaxing all the within-variable across-time error covariances caused reproduction of a too large variance in one of the items, resulting in a negative error variance. In such cases, we decided to assume a zero across-time error covariance. The effect of varying the assumptions regarding the across-time error covariances on the fit of the model or on the resulting values of the structural parameters proved to be negligible. Therefore, detailed information on these assumptions is not reported in Table 4. Fit indices were calculated which are indicators of the degree to which the model fits the data well. The four indices that were used were the chi square, the root-mean square error of approximation (RMSEA), the non-normed fit index (NNFI), and the standardized root mean square residuals (St.RMR). It is recommended that practitioners use a cut-off value close to 0.95 for NNFI in combination with a cut-off value close to 0.09 for SRMR to evaluate "model fit".[18] For RMSEA, a cut-off value of 0.06 is often established to be acceptable.

Results

Table 1 describes the characteristics of the employees who filled out both questionnaires. Most participants with few diabetes symptoms had type 1 diabetes (61.8%), while most participants who reported many diabetes symptoms had type 2 diabetes (69.2%). Employees with type 2 diabetes experienced more diabetes complaints compared to employees with type 1 diabetes and they were lower educated. Employees with type 1 diabetes had a longer disease duration than employees with type 2 diabetes (t=8.69; p=0.000) and employees with many diabetes complaints had a shorter disease duration than those with few diabetes complaints (t=2.74; p=0.007).

The mean scores of the variables under study with standard deviations for the different samples are shown in Table 2. At M1 many similarities were found in the scores of participants with type 1 and type 2 diabetes. Most differences were found in the scores at M2. At M2, participants with type 1 diabetes reported a greater lack of job involvement, a greater lack of job autonomy and less fatigue than participants with type 2 diabetes. More differences were found between participants with few and many diabetes symptoms. At M1 as well as at M2, people with many diabetes symptoms reported a higher workload, higher emotional demands, less social support from colleagues and more fatigue. At M2 they also reported less support from their superior than participants with few diabetes symptoms. Furthermore, differences between mean

Table 1. Study population at Measurement 1

	DM1 (123)	DM2 (102)	t / chi^2	p-value	DSC0 (173)	DSC1 (52)	t / chi^2	p-value
Diabetic symptoms	16.21 (11.95)	20.86 (15.92)	-2.44	0.016	12.69 (8.29)	37.06 (13.04)	-12.73	0.000
Diabetes type (% type 1)	-	-	-	-	61.8	30.8	15.59	0.000
Mean age in years (SD)	40.17 (7.66)	50.34 (6.60)	-10.69	0.000	44.10 (9.00)	47.04 (7.75)	- 2.30	0.023
Gender (% men)	57.7	76.5	8.76	0.003	66.5	65.4	0.02	0.884
Educational level:			14.33	0.001			5.31	0.070
% lower	27.5	47.4			32.5	50.0		
% middle	29.2	32.0			31.4	27.1		
% higher	43.3	20.6			36.1	22.9		
Working hours per week	34.33 (12.28)	38.78 (17.60)	-2.22	0.028	36.47 (13.22)	35.93 (20.10)	0.18	0.857
Disease duration in yrs (SD)	21.44 (10.68)	10.58 (7.71)	8.69	0.000	17.62 (10.62)	12.95 (11.00)	2.74	0.007
Seriousness of disease:			0.46	0.796			8.12	0.017
% no complications	58.5	55.9			61.8	42.3		
% micro- or macrovascular complications	36.6	37.3			34.1	46.2		
% micro- and macrovascular complications	4.9	6.9			4.0	11.5		
Hba1c%	8.03 (1.06)	8.30 (1.30)	-1.61	0.110	8.06 (1.14)	8.48 (1.26)	-2.16	0.032

The data consists of means with standard deviations or percentages. Differences between DM1 (Type 1 diabetes) and DM2 (Type 2 diabetes) and between DSC0 (participants with few diabetes symptoms) and DSC1 (participants with many diabetes symptoms) were tested. T-values and chi-squares are presented with significance levels

scores at the first and second measurement were calculated. There were no significant differences between the samples, with the exception of the differences in fatigue. The level of fatigue decreased for employees with type 1 diabetes and increased for those with type 2 diabetes.

Tables 3a and 3b show the correlations between the variables under study at M1 and M2. M1-M2 test-retest correlations were medium to high and ranged from 0.42 (support superior, DSC1) to 0.88 (psychological demands, DSC1). The across-time stabilities were lowest for the support variables.

Table 2. Description of work-related variables and fatigue at two measures

		M 1				M 2				M 2 – M 1			
		Mean	SD	t	p-value	Mean	SD	t	p-value	Mean	SD	t	p-value
Workload	DM1	42.58	15.90			40.74	15.00			-1.83	11.30		
	DM2	44.85	16.53	-1.04	0.299	42.57	16.00	-0.88	0.377	-2.21	11.09	0.26	0.798
	DSC0	**41.96**	15.01			**40.26**	14.15			-1.69	11.07		
	DSC1	**49.15**	18.79	-2.51	0.015	**45.92**	18.67	-2.02	0.048	-3.05	11.61	0.76	0.449
Psychological	DM1	73.24	18.70			70.54	18.46			-2.87	13.91		
demands	DM2	76.93	19.82	-1.43	0.155	75.26	17.82	-1.94	0.054	-1.49	13.98	-0.73	0.464
	DSC0	73.86	18.38			72.38	17.89			-1.59	14.78		
	DSC1	78.45	21.78	-1.50	0.136	73.67	19.75	-0.45	0.656	-4.45	10.37	1.29	0.199
Emotional	DM1	33.33	16.15			31.43	15.17			-1.84	10.98		
demands	DM2	33.19	15.03	0.07	0.946	31.30	14.81	0.06	0.950	-1.98	13.20	0.08	0.934
	DSC0	**31.77**	15.01			**30.09**	14.79			-1.64	11.91		
	DSC1	**38.43**	16.43	-2.69	0.008	**35.62**	14.92	-2.36	0.019	-2.81	12.39	0.61	0.545
Lack of job	DM1	42.85	21.24			**41.86**	22.11			-0.89	17.17		
involvement	DM2	36.88	25.79	1.82	0.070	**34.90**	25.61	2.15	0.032	-1.19	19.95	0.12	0.906
	DSC0	39.30	22.88			38.29	22.63			-0.89	17.81		
	DSC1	43.40	25.64	-1.06	0.292	40.15	28.02	-0.43	0.667	-1.52	20.56	0.21	0.836
Lack of job	DM1	33.77	18.90			**35.73**	19.29			1.82	12.81		
autonomy	DM2	29.26	23.37	1.56	0.120	**27.82**	21.47	2.90	0.004	-1.46	13.69	1.84	0.067
	DSC0	30.95	19.61			31.63	19.29			0.58	13.12		
	DSC1	34.34	25.60	-0.87	0.385	33.77	24.76	-0.57	0.569	-0.51	13.95	0.51	0.610
Lack of support	DM1	20.30	11.56			21.82	12.25			1.64	12.36		
colleagues	DM2	21.16	14.00	-0.50	0.621	22.51	14.47	-0.38	0.703	0.66	11.48	0.59	0.553
	DSC0	**19.35**	12.09			**21.16**	12.96			1.60	11.79		
	DSC1	**25.28**	13.75	-2.93	0.004	**25.37**	13.84	-1.99	0.048	-0.15	12.57	0.89	0.373
Lack of support	DM1	20.60	15.41			21.28	14.83			1.72	14.47		
superior	DM2	20.56	16.75	0.02	0.985	23.51	19.02	-0.91	0.364	1.91	16.52	-0.09	0.931
	DSC0	19.46	15.13			**20.23**	15.91			1.37	14.13		
	DSC1	24.43	18.16	-1.89	0.060	**29.11**	17.83	-3.24	0.001	3.24	18.90	-0.71	0.478
Fatigue	DM1	60.80	25.67			**58.43**	25.17			**-2.16**	17.98		
	DM2	61.46	24.13	-0.20	0.843	**65.35**	25.77	-2.02	0.044	**3.62**	20.62	-2.23	0.027
	DSC0	**54.96**	23.09			**55.42**	23.48			0.53	18.75		
	DSC1	**81.54**	19.44	-7.54	0.000	**81.76**	21.85	-7.20	0.000	0.22	21.72	0.09	0.926

The data consists of means, standard deviations (SD) and results of t-tests for people with type 1 diabetes (DM1), type 2 diabetes (DM2), few diabetes symptoms (DSC0) and many diabetes symptoms (DSC1) separately.

Results of LISREL analyses are presented in Table 4. Only one significant relationship with a p-value <0.05 (one-tailed) was found between work-related factors at M1 and fatigue at M2, namely the relationship between a lack of support and fatigue within the sample of participants with many diabetes complaints. Figure 1 presents the model and the results concerning this relationship. For this group, a lack of social support was positively related to the level of fatigue over time. The relationship between lack of support and fatigue for the sample with few diabetes symptoms was reversed, i.e. more support was related to more fatigue after one year. Such a relationship is unexpected on the basis of the JDCS model and is therefore not detected with one-sided testing. Since the relationship was weak, it is only designated as significant at a high significance level (0.10<p<0.20, two-sided). For that reason, it should be interpreted cautiously. The same applies for the impact of fatigue at M1 on job demands at M2 within the type 1 diabetes sample. We found no other evidence that fatigue influences the experience of work over time.

Table 4 also shows that, with regard to the group of participants with many diabetes symptoms, the stability of fatigue over time was much lower compared to the people with few diabetes complaints. The across-time stabilities of fatigue were all high. The fit indices indicated that the model we used, based on theories about relationships between work factors and fatigue, fitted the empirical data.

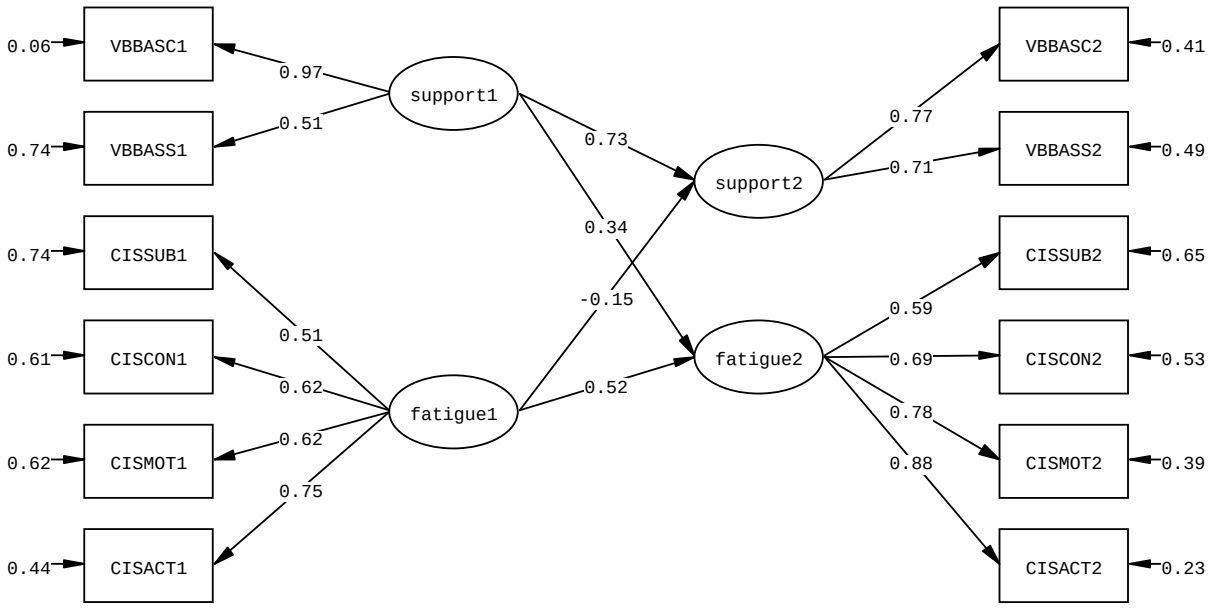

Figure 1 Example of a path diagram: Cross-lagged relationships between lack of social support (VBBASC: colleagues; VBBASS: superior) and fatigue (CISSUB: subjective; CISCON: concentration; CISMOT: motivation; CISACT: physical activity) for participants with many diabetes complaints. Note: Across-time error covariances are not represented

Table 3a. Relationships between study variables at M1 and M2

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
M1																
1. Workload	DM1															
	DM2															
2. Psychol. demands	DM1	0.33***														
	DM2	0.32***														
3. Emotional demands	DM1	0.29**	0.29***													
	DM2	0.38***	0.37***													
4. Job involvement	DM1	-0.11	-0.03	-0.19*												
	DM2	0.05	-0.23*	-0.18												
5. Autonomy	DM1	0.09	-0.03	-0.08	0.59***											
	DM2	0.20*	-0.04	-0.04	0.72***											
6. Support colleagues	DM1	0.27**	-0.11	0.23*	0.24**	0.17										
	DM2	0.30**	-0.16	0.07	0.23*	0.14										
7. Support superior	DM1	0.21*	0.05	0.13	0.41***	0.25**	0.45***									
	DM2	0.29**	0.11	-0.00	0.44***	0.44***	0.63***									
8. Fatigue	DM1	0.20*	-0.06	0.05	0.26**	0.20*	0.20*	0.19*								
	DM2	0.20*	0.02	0.11	0.12	0.14	0.24*	0.25*								
M2																
9. Workload	DM1	0.74***	0.17	0.24**	-0.14	0.01	0.23**	0.19*	0.14							
	DM2	0.77***	0.34***	0.32***	0.01	0.19	0.14	0.31**	0.17							
10. Psychol. demands	DM1	0.23*	0.72***	0.17	-0.10	-0.05	-0.32**	0.06	-0.21*	0.21*						
	DM2	0.24*	0.73***	0.27**	-0.07	0.04	-0.21*	0.07	-0.14	0.28**						
11. Emotional demands	DM1	0.25**	0.27**	0.76***	-0.30***	-0.21*	0.17	0.11	-0.02	0.35***	0.28**					
	DM2	0.32***	0.30	0.61***	-0.09	-0.07	-0.05	-0.04	0.08	0.39***	0.23*					
12. Job involvement	DM1	-0.08	-0.11	0.01	0.69***	0.34***	0.22*	0.30***	0.22*	-0.07	-0.11*	-0.14				
	DM2	0.10	-0.17	-0.14	0.70***	0.59***	0.31**	0.30**	0.07	0.03	-0.20*	-0.14				
13. Job autonomy	DM1	0.09	0.02	0.03	0.57***	0.78***	0.21*	0.29**	0.17	0.13	0.04	-0.12	0.61***			
	DM2	0.21*	-0.07	0.02	0.54***	0.82***	0.18	0.33**	0.15	0.25**	-0.13	0.01	0.70***			
14. Support colleagues	DM1	0.13	-0.13	0.13	0.28**	0.17	0.46***	0.37***	0.17	0.21*	-0.07	0.25**	0.42***	0.24**		
	DM2	0.21*	-0.16	-0.01	0.21*	0.15	0.68***	0.49***	0.18	0.11	-0.18	0.06	0.36***	0.21*		
15. Support superior	DM1	0.18*	-0.09	0.17	0.36***	0.10	0.35***	0.52***	0.17	0.21*	-0.14	0.18*	0.54***	0.22*	0.66***	
	DM2	0.32**	-0.07	-0.04	0.29**	0.33**	0.65***	0.57***	0.25*	0.23**	-0.11	-0.05	0.55***	0.41***	0.69	
16. Fatigue	DM1	0.19*	-0.01	-0.00	0.27**	0.13	0.18*	0.18*	0.75***	0.27**	-0.05	0.07	0.30***	0.25**	0.35***	0.32***
	DM2	0.14	-0.02	0.13	0.06	0.13	0.12	0.12	0.66***	0.17	-0.09	0.06	0.10	0.17	0.19	0.24*

The data consists of correlation coefficients with significance levels for people with type 1 (DM1) and type 2 diabetes (DM2) separately

Table 3b. Relationships between study variables at M1 and M2

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
M1																
1. Workload	DSC0															
	DSC1															
2. Psychol. demands	DSC0	0.31***														
	DSC1	0.33*														
3. Emotional demands	DSC0	0.27***	0.24**													
	DSC1	0.40**	0.50***													
4. Job involvement	DSC0	-0.09	-0.11	-0.21**												
	DSC1	0.05	-0.25	-0.17												
5. Autonomy	DSC0	0.04	-0.05	-0.12	0.65***											
	DSC1	0.32*	-0.05	0.03	0.71***											
6. Support colleagues	DSC0	0.26**	-0.11	0.18*	0.25**	0.18*										
	DSC1	0.25	-0.25	-0.05	0.14	0.03										
7. Support superior	DSC0	0.22**	0.07	0.10	0.37***	0.30***	0.54***									
	DSC1	0.25	0.05	-0.13	0.53***	0.42**	0.49**									
8. Fatigue	DSC0	0.16*	-0.05	0.02	0.13	0.13	0.18*	0.20*								
	DSC1	0.06	-0.17	-0.07	0.33*	0.24	0.05	0.12								
M2																
9. Workload	DSC0	0.71***	0.17*	0.23**	-0.15	0.00	0.18*	0.18*	0.09							
	DSC1	0.81***	0.41**	0.32*	0.08	0.26	0.09	0.33*	0.09							
10. Psychol. demands	DSC0	0.17*	0.67***	0.14	-0.07	-0.01	-0.23**	0.04	-0.21**	0.18*						
	DSC1	0.39**	0.88***	0.41**	-0.19	-0.04	-0.20	0.11	-0.21	0.41**						
11. Emotional demands	DSC0	0.27***	0.19*	0.68***	-0.18*	-0.13	0.07	0.08	-0.03	0.35***	0.19*					
	DSC1	0.24	0.53***	0.70***	-0.30*	-0.22	-0.12	-0.16	-0.16	0.35*	0.48***					
12. Job involvement	DSC0	-0.08	-0.10	-0.04	0.69***	0.46***	0.25**	0.30***	0.16*	-0.10	-0.14	-0.12				
	DSC1	0.14	-0.30*	-0.14	0.71***	0.65***	0.28	0.27	0.11	0.09	-0.25	-0.22				
13. Job autonomy	DSC0	-0.00	-0.07	0.03	0.55***	0.77***	0.20*	0.29***	0.16*	0.06	-0.08	-0.03	0.60***			
	DSC1	0.40**	0.01	-0.01	0.59***	0.85***	0.12	0.32*	0.13	0.41**	-0.03	-0.16	0.78***			
14. Support colleagues	DSC0	0.18*	-0.15	0.10	0.27**	0.18*	0.56***	0.45***	0.20*	0.21**	-0.14	0.19*	0.41***	0.24**		
	DSC1	0.07	-0.18	-0.12	0.12	0.07	0.59***	0.32*	-0.11	-0.02	-0.09	-0.04	0.30*	0.14		
15. Support superior	DSC0	0.17*	-0.7	0.05	0.29***	0.15	0.45***	0.57***	0.16*	0.17*	-0.13	0.05	0.49***	0.21**	0.69***	
	DSC1	0.30*	-0.12	0.03	0.37*	0.35*	0.61***	0.42**	-0.03	0.25	-0.06	-0.02	0.67***	0.48**	0.60***	
16. Fatigue	DSC0	0.10	-0.03	-0.05	0.10	0.09	0.02	0.10	0.68***	0.17**	-0.03	0.03	0.19*	0.18*	0.23**	0.21**
	DSC1	0.14	-0.11	0.04	0.21	0.11	0.27	0.14	0.45**	0.22	-0.16	-0.13	0.15	0.19	0.26	0.21

The data consists of correlation coefficients with significance levels for participants with few (DSC0) and many diabetes symptoms (DSC1) separately

Table 4. Regression coefficients in structural equation models of cross-lagged relationships between work demands, lack of decision latitude and lack of support versus fatigue

	Work demands				Lack of decision latitude				Lack of support			
	DM1	DM2	DSC0	DSC1	DM1	DM2	DSC0	DSC1	DM1	DM2	DSC0	DSC1
Regression coefficients:												
Stability work factor	0.78	0.96	0.80	0.99	0.82	0.84	0.79	0.95	0.65	0.83	0.71	0.73
Stability fatigue	0.77	0.62	0.70	0.50	0.74	0.60	0.68	0.45	0.75	0.64	0.72	0.52
Work m1 on fatigue m2	-0.01	0.01	-0.05	0.09	0.06	0.10	0.02	0.05	0.04	-0.07	-0.13*	0.34**
Fatigue m1 on work m2	-0.14*	-0.05	-0.10	-0.04	0.04	0.03	0.09	-0.13	0.02	0.06	0.06	-0.15
Fit indices:												
Chi-square	97.4	67.1	87.7	73.1	57.6	40.1	49.7	52.4	55.5	42.4	58.8	46.0
Df	64	64	64	64	42	45	43	42	42	43	42	43
RMSEA	0.07	0.03	0.05	0.06	0.06	0.00	0.03	0.08	0.05	0.00	0.05	0.04
NNFI	0.94	0.99	0.96	0.88	0.96	1.00	0.99	0.87	0.97	0.99	0.98	0.95
St.RMR	0.09	0.08	0.07	0.10	0.06	0.06	0.04	0.09	0.05	0.06	0.06	0.08

* $0.10<p<0.20$ (two-sided), ** $p < 0.05$ (one-sided); Results for different samples are shown: DM1 = Type 1 diabetes mellitus (N = 110), DM2 = Type 2 diabetes mellitus (N = 77), DSC0 = Few diabetes complaints (N = 145), DSC1 = many diabetes complaints (N = 42); Four Fit indices are presented: chi square, RMSEA (=Root-mean square error of approximation), NNFI (=Non-normed fit index), St.RMR (=standardized root mean square residuals)

Conclusions and discussion

This study partly supports the assumptions of the JDCS model, which supposes that work situations characterized by high demands, low control and low social support result in more health complaints. Only the level of support had an impact on the level of fatigue over time, but only for employees with many diabetes symptoms. More social support leads to less fatigue one year later.

The results for employees with few diabetes symptoms should be interpreted with caution because the relationship was weak and not in accordance with the assumptions of the JDCS model. More support appeared to increase the risk of developing fatigue. It would be advisable and interesting to study the reversed relationships because a recent Dutch study also found that support at the workplace in itself is not always positive.[19] It is possible that complaining may be stimulated in employees who do not have many diabetes complaints. It is possible that the seriousness and importance of their disease is stressed too much when they receive too much support at the workplace. Further research using a larger study population is required for further conclusions. Because employees with many diabetes symptoms face real problems due to their disease, they may need support in order to function satisfactorily in their jobs. There is probably no necessity to change the work situation or seek social support when diabetes is ‘under control’ and people do not feel different from other ‘healthy’

employees. When diabetes is invisible, employees might not need extra support. However, according to the JDCS model, support would be helpful for all employees and, therefore, lower job demands and high control were also expected to have a positive influence on fatigue. Nevertheless, assumptions used in the JDCS model are not always supported by empirical data.[20,21] It is possible that subgroup analyses yield more information, as others also have suggested.[20]

Although the results cannot be interpreted reliably, it was suggested that employees with type 1 diabetes and higher levels of fatigue experienced fewer job demands one year later. These results were also weak and not as was expected. As we indicated in the introduction, the starting point of various studies and theories[7,9] is that more health complaints will lead to, for example, higher job demands over time. However, it appeared that more health complaints can probably lead to fewer job demands. This may suggest that fatigued employees actively seek out possibilities to reduce their job demands. Coping may be an important confounding factor in further explaining relationships between components of the JDCS model and health complaints. Further research is needed to explore these reversed relationships.

In general, there were no significant causal relationships between factors at the workplace and fatigue when a differentiation was made between types 1 and 2 diabetes. The mean scores also show that employees with both types of diabetes had comparable work experience and health statuses. It can be concluded that it is not necessary in this research field to make a distinction between insulin-treated people. Whether results can also be generalized to people with type 2 diabetes without insulin medication is not known.

Most people who were indicated as having many diabetes complaints had type 2 diabetes. It was also obvious that people with many diabetes complaints had very high levels of fatigue. Their mean scores for fatigue are even higher than the cut-off point of 76, which indicates an at-risk state for work disability and sick leave.[16] Therefore, preventing diabetes-related complaints by striving for (near) normal blood glucose levels may be effective in reducing fatigue. Employees with many diabetes symptoms also reported a higher workload, higher emotional demands and less social support from colleagues than employees with few diabetes symptoms. Furthermore, the stabilities for fatigue for this group were much lower than for the other groups, which may indicate that the levels of fatigue vary more often when people experience a lot of complaints due to diabetes.

Limitations of the study

It is likely that only a few significant longitudinal relationships were found due to the relative small sample sizes, especially with regard to the group with many diabetes

complaints. Many of the coefficients were low and this may be explained to a great extent by the fact that there were few changes in the work situation and the health status of participants. Because self-reported measures were used to assess work-related factors and fatigue, data may not reflect the objective work situation. However, as we stated earlier, we tried to find out whether fatigue possibly influenced *the experience* of the work situation. Moreover, stress coping theories[22] assume that the objective situation alone does not predict people's behavior and their feelings, but rather the appraisal of the situation. Therefore, self-reported measures seem to have disadvantages as well as advantages.

Not taking individual differences of the employee into account can also be one of the reasons for a lack of support for the model,[23] because there are many more factors that play a role in the diverse processes of stress development. The focus of the JDCS model primarily lies on environmental factors. Other, personal factors have not been taken into account. Stress coping theories regarding health care[22,24] emphasize the prominent role of personal factors with regard to the relationship between stress and outcome measures. It would possibly be useful to integrate these aspects (such as coping) in studies on job stress.

Study implications

The results clearly show that the level of support at the workplace affected the level of fatigue over time in the case of employees with many diabetes symptoms. Employees who experience many symptoms resulting from their disease need support from their colleagues and their superior. In an earlier cross-sectional study, it was also shown that high job demands are associated with more fatigue in employees with many diabetes symptoms.[6] Both results suggest that this group needs special attention from clinicians as well as professionals at the workplace. Support has a neutral, or even a negative, effect on employees with diabetes who do not experience many complaints due to their disease support.

It seems unnecessary to differentiate between type 1 and type 2 diabetes in studies of job stress and fatigue. It is more important to distinguish between 'disease severity' or the burden related to diabetes symptoms. When comparing the work situation and the health status of employees with diabetes with those of healthy employees and employees with other chronic conditions, it proved useful to distinguish between diabetes with or without co-morbidity.[25]

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Chapter 8

Flexibility at work: a challenge or a threat for employees with diabetes. A qualitative study on fatigue at work

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Abstract

In a qualitative study differences were explored between high-fatigued and low-fatigued employees in a high-risk diabetic working population with many diabetic symptoms, with special attention for personal factors.

The sample is a selection from the total research population of 225 diabetic employees of the studies of Weijman and colleagues. The selected sample enclosed employees with a relatively high level of diabetes-related complaints, and consists of a subsample of employees with a high level of fatigue (n=8) and a subsample of employees with a low level of fatigue (n=9). Both subsamples were stratified on the basis of gender, age, educational level, profession and type of diabetes.

Data was gathered using face-to-face in-depth interviews on facts, experienced burdens, appraisal processes, coping strategies and support concerning diabetes-related symptoms, self-management, fatigue, and work(stress). The stories and the statements of the respondents were subject to a qualitative analysis in accordance with the Grounded Theory of Glaser and Strauss (1976).

Major differences between the two subsamples were found with respect to coping and attribution strategies. Low-fatigued employees tend to use more active and problem-oriented coping strategies. They seem to appreciate a high level of flexibility at work, which confronts them with challenges as regards fitting the demands of their disease into their working lives. High-fatigued employees, on the other hand, appear to feel more helpless and use resigning strategies. They seem to be overwhelmed by the constraints of their illness. They judge high flexibility at work as a threat for a structured and regular life, which in their opinion is necessary for living with diabetes. The findings underline the importance of person-related factors, besides work and disease-related factors, when it comes to studying fatigue in a diabetic population. However, no unequivocal explanations as regards causality could be given.

Introduction

Fatigue is a prevalent problem affecting employees in general, and people with diabetes in particular.[1-3] However, it is a normal phenomenon linked to demanding activities. Physical and/or psychological efforts are required to achieve an appropriate work performance and in time, this results in fatigue. Fatigue is a temporary symptom which can be rectified after a period of recuperation. It only becomes problematic when it is prolonged and compensation mechanisms (such as recovery) are insufficient.[4]

Fatigue is strongly related to diabetes as well. It may directly result from physiological processes and it is a symptom of hypoglycemia as well as hyperglycemia.[5,6] Furthermore, fatigue can result from the burden associated with self-management efforts and from long-term diabetes-related complications affecting the eyes, kidneys, nerves or the heart and blood vessels.[7] Hence, it is assumed that – compared to employees without a chronic medical problem – the risk they face of fatigue and fatigue-related health complaints will be higher. Employees with diabetes have to cope not only with ordinary job demands, but the burdens of their disease and its treatment as well.

According to current work stress theories, unfavourable work situations are associated with increasing health complaints. The Job Demands Control Support (JDCS) model, which is a widely used model in occupational psychology, supposes that high workload, low decision latitude and low social support are risk factors for the development of stress reactions and a broad range of health complaints in the workplace.[8-10]

In an earlier study among employees with diabetes it was shown that both work and diabetes-related factors are related to fatigue.[11] Fatigue is more severe in the event of many diabetes-related symptoms, a lack of social support at work, high job demands in combination with a lack of decision latitude, high job demands in combination with a perceived burden as regards adjusting insulin dosage to circumstances and in combination with diabetic symptoms. Prevalence of diabetic symptoms is related to prevalence of fatigue. In a sample of diabetic employees with few diabetic symptoms, only 10% were fatigued, whereas in the sample with a lot of diabetic symptoms 50% were fatigued.[12] This implies that 50% of the employees with many diabetes-related symptoms did not experience excessive levels of fatigue. Neither samples differed with respect to work characteristics. Therefore, other factors must play a role.

In contrast to most work stress theories, Stress-coping theories give personal factors a more prominent role. According to these theories environmental and personal factors generate stress in a complex interaction with each other and produce negative

outcomes.[13] Coping and cognitive appraisal are two important factors in the stress process.[14-17] The stress-coping approach also assumes that people who are confronted with stressors in general (adaptive tasks) will make a compensatory effort to regulate stress resulting from this confrontation (the coping process).[13] The way these adaptive tasks are dealt with affects well-being, either positively or negatively. In the stress coping approach, social support is also an important factor. Social support is valued as a coping resource, but may also directly affect well-being.[13,18-20]

In this qualitative study differences will be explored between high-fatigued and low-fatigued employees in a high-risk diabetic working population with many diabetic symptoms, with special attention for factors unrelated to diabetes or work.

Methods

Sample

The sample is a selection from the total research population of 225 diabetic employees of the studies of Weijman and colleagues who completed questionnaires at two measurement moments with an interval of one year.

The first selection criterion was the level of diabetes-related complaints.[11] The selected sample consisted of employees with a relatively high level of diabetes-related complaints, as measured with the Diabetes Symptom Checklist-Revised (DSC-R).[21] A score of total symptom severity has been established, based on eight underlying dimensions: hyperglycemic, hypoglycemic, psychosocial-cognitive, psychosocial-fatigue related, cardiovascular, neurological-pain related, neurological-sensory and ophthalmologic complaints. Scores range from 0 to 170. The mean score for the 225 members of Weijmans' total population at the second measurement was 17.75 (sd 14.60). The criterion for the selected sample was a score above this mean.

The second criterion for selection was the level of fatigue. The selected sample consists of a subsample of employees with a high level of fatigue and a subsample of employees with a low level of fatigue. Fatigue was measured using the Checklist Individual Strength (CIS).[22] This questionnaire measures four components of fatigue, namely subjective fatigue, reduced concentration, reduced motivation and reduced activity. The total score of the CIS can be used to measure general fatigue. The composite CIS score can vary from 0 to 140, with a cut-off of 76. Earlier studies revealed that a score of 76 was an indication of serious fatigue and a high risk of sick leave and work disability.[1] The subsample of high-fatigued employees produced a score of above 76 and the subsample of low-fatigued employees of below 76 at the second measurement.

The third criterion for selection was the similarity of both subsamples according to other relevant variables. Therefore both subsamples were stratified on the basis of gender, age, educational level, profession and type of diabetes.

In the informed consent procedure of Weijman's study the participants were informed about the fact that some of the participants would be asked to take part in an interview, after having filled in two questionnaires.[11] All the participating diabetic employees agreed with this procedure. Twenty respondents (ten low-fatigued, ten high-fatigued) were invited by telephone to a face-to-face interview at a location chosen by the respondent.

Interviews

Data was gathered using face-to-face in-depth interviews carried out by two interviewers. The interviews took place on the basis of a topic list of relevant themes. Relevant themes were facts, experienced burdens, appraisal processes, coping strategies and support concerning diabetes-related symptoms, self management, fatigue, work and work stress. These themes were introduced at the start of the interview, so that the main subjects of the interview could be defined. The interviews were not structured in such a way that the moment a theme came into consideration was not fixed but depended instead on the natural course of the interview. The interviewer started with some short questions about sociodemographic and diabetes-related facts. Thereafter the interviewer continued with an open initial question:

'We invited you to an interview because your answers in the questionnaires showed that you have experienced quite a lot of complaints about your diabetes. Can you tell me something about this?'

According to Boeije, the introduction of the themes and the open initial question were designed to invite the respondents to tell their own stories using the themes most relevant to them.[23] Subsequently, the interviewer was able to pursue the subject or subjects referred to by the respondent, or introduce a new theme from the topic list.

Analysis

The interviews were audiotaped. The stories and the statements of the respondents were subject to a qualitative analysis in accordance with the Grounded Theory.[24] This approach has been shown to be especially appropriate for studying personal experiences, cognitions and beliefs in changing and challenging circumstances.[25] The themes of the topic list offer the sensitisising concepts as a guideline for interpretation. Interview fragments were coded and labeled. Based on the findings, new themes and subthemes were defined during the process of interpretation. The labeled and coded

statements of the respondents were ultimately summarized in an overview scheme, to facilitate comparisons with each other.

In order to acquire adequate data it is necessary that both interviewers use the same interviewing method. Therefore, the interviews were listened to and evaluated in their entirety by both interviewers and the project leader, with special attention being paid to structure and the method of interviewing. The evaluation of the complete interviews continues for as long as is necessary. In order to check the continuity of satisfactory interviewing, parts of randomly selected interviews conducted later were evaluated.

On behalf of the reliability of the process of interpretation of the data, two researchers coded the interviews independently of each other and discussed the results of their individual codes with each other. When sufficient coherence with respect to interpretation between both researchers was shown, one researcher coded the interviews and summarized the results in an overview scheme. The summarized results were discussed by both the researchers and the project leader. In the event of a lack of clarity or disagreement, the interviews were listened to again.

Results

Sample

Twenty employees with diabetes (ten high-fatigued and ten low-fatigued) were asked for an interview. Two employees refused to participate. One had recently had an accident and had too many symptoms as a result of that accident. The other one refused without specific reasons. The data pertaining to one respondent could not be analyzed due to technical problems. The eventual sample consisted of 17 employees with many diabetes-related symptoms. Nine were low-fatigued (mean CIS-total 47, sd 15.5, scores varying between 20-62), and eight were high-fatigued (mean CIS-total 103, sd 17.0, scores varying between 87 and 132).

Table 1 shows the characteristics of both subsamples. There are no differences between both subsamples as regards the demographic variables age, level of education and sector of occupation and the diabetes-related variables of type of diabetes and the time since the diagnosis of diabetes. The high-fatigued subsample included more females and had a higher level of diabetes complaints and microvascular and/or macrovascular complications, as compared with the low-fatigued subsample.

Outcomes

Differences between the high-fatigued and low-fatigued subsamples were found with respect to the themes health, fatigue, work and coping.

Health - The respondents were selected for having a high level of diabetes related symptoms. Besides, respondents frequently reported anxiety with regard to complications, cognitive disturbances and neuropathological symptoms on eyes, hands, feet and kidneys. Also they were regularly confronted with hypoglycemic attacks. The subsamples did not differ with respect to these symptoms.

The presence of non diabetes-related somatic co-morbidity was similar in both subsamples. Cardiovascular disorders, rheumatoid arthritis, high blood pressure and incidental other diseases were mentioned. Some differences existed with respect to psychosocial morbidity. Half of the high-fatigued subsample was found to have a history of depression, whereas no one did so in the low-fatigued subsample.

Table 1. Sociodemographic and illness-related characteristics

			LF	HF
N			9	8
Gender	Male		5 - 55.6%	6 – 75 %
	Female		4 - 44.4%	2 – 25 %
Educational level	Lower		3 - 33.3%	3 - 37.5%
	Middle		3 - 33.3%	3 - 37.5%
	Higher		3 - 33.3%	1 - 12.5%
	Other			1 - 12.5%
Type diabetes	DM type 1		4 - 44.4%	3 - 37.5%
	DM type 2		5 - 55.6%	5 - 62.5%
Professional Sector	Education/ Health Care		2 - 22.2%	1 - 12.5%
	Industry		3 - 33.3%	4 - 50.0%
	Economics/ Administration/ Commercial		4 - 44.4%	3 - 37.5%
Illness-related	Disease duration in yrs (SD)		15.73 (15.63)	18.01 (13.84)
Variables	Diabetes symptoms (0-170)		25.80 (8.3)	33.5 (10.8)
	Severity of disease	No complications	4 - 44.4%	2 - 25.0%
		Micro- of macrovascular compl.	5 - 55.6%	4 - 50.0%
		Micro- and macrovascular compl.		2 - 25.0%
	Fatigue (0-140)		47.1 (15.5)	103.5 (17.0)
	Depression CES-D (0-60)		6.6 (6.0)	15.5 (10.4)

Results presented as 'number - percentage' or 'mean - standard deviation (SD)'
LF, low-fatigued; HF, high-fatigued

Fatigue - The subsamples were defined on the basis of the level of fatigue measured with the CIS. However, in the high-fatigued subsample two respondents did not mention fatigue as a severe symptom, whereas in the low-fatigued subsample one respondent reported fatigue as a symptom of diabetes.

In the high-fatigued subsample nearly all respondents are familiar with fatigue, which they attribute to the diabetes in general without a specific cause and without possibilities for influence.

Low-fatigued respondents also experience fatigue, but they evaluate this state as a normal phenomenon of a temporary nature with a clear cause. Fatigue occurs after a day of hard work, or as a symptom during or shortly after a hyper- or hypoglycemic attack.

> *'It is normal tiredness at the end of a working day. … Sometimes I sleep badly and then I am tired at the end of the day. There is not much else wrong.' (LF)*

> *'After a hypo or hyper it feels like you have just done a triathlon and you are completely and utterly exhausted. … Once the blood sugar levels have been restored, the tiredness also dissipates quickly.' (LF)*

Low-fatigued respondents see possibilities to influence their fatigue and they take action in the form of physical exercise.

> *'I can relax by dancing and through social contacts established while dancing … and that gives me energy.' (LF)*

> *'The most important thing is that I am able to jog. If I have time to run or to let off steam, that has a positive effect on the insulin and I can get rid of the stress of work.' (LF)*

The consequences of fatigue are more serious in the high-fatigued respondents. They report negative effects on concentration, productivity at work, social life and mood.

> *'When I get home in the evening I am really deadbeat … My home and private life suffer as a result and that is not what I want.…I do not have enough energy to do things in the evening.' (HF)*

> *'I have more plans buzzing round my head than I can implement. In the evenings I come home and then I do nothing for the rest of the evening. … it's hopeless. … I am too tired to do anything and am almost too wasted to stand up and make a cup of coffee. Incidentally, coffee does help.' (HF)*

High-fatigued respondents appeared to be helpless. They feel they are unable to influence their fatigue and tend to accept this state and to resign themselves to it, although they were aware of adequate alternative behaviors.

'I do not know how I should avoid it. I have it and can do nothing about it. … If I am tired I just chill out and lie down on the couch.' (HF)

'If you do nothing you just get even more tired because your blood sugar levels then increase. It would therefore be better, in fact, to do something in the evening, but getting started is difficult.' (HF)

Work - The interviews show a great variation in job characteristics. Most respondents evaluate their job as highly demanding (physically and/or psychologically stressful, high speed, hectic organization) but some report moderate job demands (low physical or psychological stress, routine activities). In addition, the respondents characterize their job as flexible, with a lot of decision latitude. Neither subsample differs from each other as regards the actual presence of these characteristics. However, differences exist with respect to their appraisal, especially with respect to flexibility.

Low-fatigued respondents pinpoint the challenges of flexibility and the opportunities for planning their work by themselves. When low-fatigued respondents describe a work situation that would be ideal for them they accentuate the importance of decision latitude with respect to time and pace, with opportunities for their self-management tasks. They display a need to adapt their work situation to the constraints of their disease.

'Running your own business is a lot of hard work, but when it is quiet it is easier to take time off.' (LF)

'Flexibility is a requirement of my work. Often I do not know beforehand what sort of work I am going to do, but I actually quite like the unpredictability.' (LF)

'I have a flexi job which means I can, to a certain extent, determine myself which assignments I take on and when I carry these out.' (LF)

'As far as I am concerned I think it is ideal that I can organise my work independently and can adapt my working hours if that is necessary for my self-management activities.' (LF)

The high-fatigued respondents highlight the constraints of flexibility and pinpoint unpredictability, unsteadiness, irregularity and difficulties as regards planning. In describing their ideal work situation, they accentuate regularity and predictability.

'I have my own business. I am dependent on supply and demand and people have to be able to contact me at all times… that is sometimes very difficult and tiring.' (HF)

'Hectic work… then some things come up that have to be dealt with which cannot be planned and I still want to finish my work and that is sometimes difficult to combine.' (HF)

'I need regularity in my work. Having the same schedule every day is ideal for my self-management activities'. (HF)

Coping - Differences between both subsamples exist with respect to appraisal, coping strategies and attributional processes. Low-fatigued respondents tend to use social comparison strategies. They compare themselves to healthy persons, to other diabetics, or to people with another chronic somatic condition, and conclude that their situation is not so bad.

'I think that I am even less tired than a normal person. If I compare things with people around me, I exercise more than average and I have no additional fatigue problems.' (LF)

'When you see other people in hospital, you ought to be happy that you 'only' have diabetes. Things could be a lot worse.' (LF)

'I just happen to be a diabetic, someone else has heart problems and yet another has back problems and we all have to find ways of coping.' (LF)

Some low-fatigued respondents show an urge to prove that their situation is not so bad.

'… for me it is a constant battle to prove that I can carry on functioning while being diabetic. … That is why I do so much sport, to demonstrate that, despite the diabetes, I can still play three hours of tennis. That is my mentality: no moaning, just keep on going.' (LF)

High-fatigued respondents use fewer social comparison strategies and, if they use them they compare themselves to people with worse conditions.

'If this is the worst thing that can happen … there are a lot more serious health problems you can come up against.' (HF)

However, their statements show that their lives are dominated by their diabetes. The impact of the disease is overwhelming.

'It is a twenty-four hour a day task. The longer I have it, the more time I spend dealing with it.' (HF)

'It completely dominates your way of thinking.' (HF)

'I have had to adjust my expectations of the future based on the fact that my body could not manage.' (HF)

'I am someone who likes to see how far he can go at work. I like to find out how I can do more, how I can achieve more and where my own limits are. These are very definitely determined by my diabetes and my rheumatism. Whether the limit is a psychological or a physical one, once I have found it, it simply exists and I just have to accept it. That is something I am very realistic about.'

'Diabetes is a full-time job. You are constantly arranging things.'

Conclusion and discussion

The aim of this explorative and qualitative study was to detect differences between low-fatigued and high-fatigued diabetic employees with a high level of diabetic-related complaints and similar work situations.

The results show major differences with respect to coping and attribution strategies. Low-fatigued employees tend to use more active and problem-oriented coping strategies. They evaluate their stressors as manageable with concrete causes and feel they are able to influence fatigue and other symptoms. They compare themselves with others and they conclude that diabetes has relatively little impact on their lives. They seem to appreciate a high level of flexibility at work. Flexibility is related to decision latitude, which confronts them with challenges as regards fitting the demands of their disease into their working lives. High-fatigued employees, on the other hand, appear to feel more helpless and use resigning strategies. They seem to be overwhelmed by the constraints of their illness and feel unable to influence the stressors they encounter. These employees show a need for structured and regular jobs, which help them to cope with the demands of their illness and the demands of their work. They seem to judge high flexibility at work as a threat for a structured and regular life, which in their opinion is necessary for living with diabetes.

Both groups differ as regards the impact of disease. High-fatigued employees demonstrate that their lives are dominated by the symptoms and the demands of the diabetes. The disease and the related tasks might intrude in other thoughts and activities. They primarily seem to live life as a patient and secondarily as an employee. Low-fatigued employees, on the other hand, seem to live life primarily as an employee and secondarily as a patient.

A main theme seems to be the feeling of controllability of the illness. Low-fatigued employees demonstrate a high level of internal control. They have a strong belief in

opportunities for exerting influence by themselves on the stresses they encounter in their lives, whereas the high-fatigued employees demonstrate a low level of internal control, demonstrated by their expressions of helplessness. This result is in line with the findings in the literature about the relationship between locus of control and quality of life in chronic diseases. Higher levels of internal control were shown to be associated with higher levels of behavioral or emotional wellbeing and fewer symptoms.[16]

Subsamples differ with respect to coping. High fatigued employees are characterized by helplessness and resigning coping, whereas low fatigued tend to use more active and problem-oriented coping strategies. This is in line with the differences in appraisal. The appraisal of a situation is related to coping.[13,14] If a situation is felt to be a severe threat, there is a tendency to use emotion-avoidant coping strategies. Pessimistic people who are chronically ill, who have a weak fighting spirit and/or who believe that they can exert little influence on their situation have a tendency to regard situations as more threatening, more negative and more uncontrollable. This type of appraisal causes these patients to fall back on a passive-avoidant way of dealing with emotions, whereby they become enmeshed in a downward spiral. If a situation is assessed as manageable and controllable, people tend to make greater use of active-approach strategies. Active-approach coping strategies, whether aimed at tackling the situation or at dealing with emotions seem to be more fruitful than passive-avoidant coping strategies.[13]

In this study we explored differences between high-fatigued and low-fatigued diabetic employees with a high level of diabetes-related symptoms. Unequivocal explanations for the differences cannot be given. The results suggest that differences in appraisal and coping may be responsible for the differences in fatigue. This is in line with other findings on coping and appraisal in chronic diseases.[13,16] On the other hand, one might suggest that the high-fatigued group was not successful in coping with the demands of the disease, as indicated by a high level of fatigue. They may perhaps have become disappointed in their attempts to cope well and may have developed a pessimistic attitude characterized by low internal control and a passive coping style.

It is possible that high-fatigued employees have different ideas about performing self-management than low-fatigued individuals and maybe they feel unable to or anxious about adjusting their insulin for example. On the other hand, their perceptions might also be influenced by their mood state. For example, fatigued employees perceive their work more negatively.[26]

Moreover, some differences between both groups have to be taken into account. Although both subsamples show high levels of diabetes symptoms, the high-fatigued group shows slightly more symptoms. Moreover, a greater proportion of the high-

fatigued group suffer from one or more microvascular and/or macro vascular complications. Several studies have shown that relationships exist between physical symptoms and fatigue.[7,13,27,28]

Another difference exists with regard to co-morbidity. Neither subgroup differs as regards physical co-morbidity, but they do with respect to psychosocial co-morbidity. Four out of eight high-fatigued people are or have been depressed, whereas no one in the low-fatigued group had a history of depression. The relationship between depression and fatigue is well known, as well as the relationship between diabetes and depression.[29-31]

In conclusion, this explorative study showed remarkable differences in person-related variables between high-fatigued and low-fatigued diabetic employees with many symptoms. The differences primarily concern appraisal processes, control and coping style. The findings underline the importance of person-related factors, besides work and disease-related factors, when it comes to studying fatigue in a diabetic population. However, no unequivocal explanations could be given. Further research may offer more insights.

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Chapter 9

Conclusions and general discussion

This chapter presents an overview and the general conclusions, implications for further research and practical suggestions derived from the studies presented in the previous chapters. The practical implications are subdivided into two parts: information for use in clinical practice (such as diabetologists, nurses, diabetes educators, psychologists) and for working organizations (employers, supervisors, coaches and occupational physicians). Our studies focus on the phenomenon 'Diabetes at Work' and its various aspects. In the previous chapters, the specific focuses were on job stress, diabetes symptoms, self-management and fatigue. The research addressed three main research questions that were formulated in the general introduction (Chapter 1). The answers to these questions are discussed in this concluding chapter.

1. What are the prevalences of fatigue and fatigue-related health problems in the diabetes working population compared to other groups of employees?
2. Which work-related, which diabetes-related factors and which personal factors are related to fatigue in employees with insulin-treated diabetes?
3. Which work-related and which personal factors are associated with performing self-management activities in employees with diabetes who inject insulin?

Overview

The first research study investigated whether employees with chronic disorders such as diabetes may be at a higher risk of developing fatigue because, on top of their job demands, they have to deal with the symptoms and demands of their chronic disease (see Chapter 1). To study the impact of this burden (research question 1), it was explored whether or not the work situation and the health status of employees with diabetes differed from healthy employees and employees with other chronic diseases (described in Chapter 3).

The relationships between diabetes-related factors, work-related factors and fatigue (research question 2) have been described in Chapters 4, 5, 7 and 8. This research is one of the few studies in the field of organizational psychology which focuses on employees with chronic diseases and which is based on assumptions of work stress models; in our study this was the Job Demands Control Support (JDCS) model.[1,2] The relationship of components of the JDCS model (job demands, decision latitude, social support) and fatigue in diabetes populations is explored in Chapters 4 and 7. Diabetes-related variables are also taken into account in these studies.

In chapters 5, 6 and 8, diabetes-related and personal factors were even more central elements.

While diabetes is largely a self-managed disease, at home and in the workplace, an investigation was carried out to ascertain whether or not different aspects of self-

management are associated with the health status of employees with diabetes (see Chapter 5). With this objective in mind, the investigation also focused on whether workplace characteristics are associated with diabetes self-management (research question 3, see Chapter 6). To understand how diabetic employees coped with their illness and their work, selected participants were invited for additional in-depth interviews. The results of these interviews provide a insight into relationships between various personal factors and the level of fatigue in employees who experience many diabetes complaints (see Chapter 8).

Principal findings

The prevalences of fatigue and fatigue-related health problems in the diabetes working population, in comparison to other groups of employees

Employees with diabetes are expected to be at a higher risk of developing fatigue and other health complaints in comparison to employees who do not have chronic disorders. Fatigue is prevalent in the general working population[3,4] and is strongly related to diabetes as well.[5-7] We hypothesized that because employees with diabetes have to deal with the demands of both their disease and their jobs, they would report more symptoms of fatigue than healthy employees. This finding was partly confirmed in our research. Analyses of the Maastricht Cohort Study data[8] showed that employees with diabetes who have no other chronic disease were *not* at a higher risk of developing fatigue and related complaints than healthy employees, with the exception of depressive symptoms (see Chapter 3). Of employees with diabetes without co-morbidity, 18% reported a range of chronic fatigue symptoms compared to 17% of the healthy employees. Scores on the Checklist Individual Strength above the cut-off point were indicated as scores of chronic fatigue, which implied that they were 'at risk' of subsequent sickness absence or work disability.[9] However, the presence of one or more other chronic diseases increased the risk of developing fatigue significantly: 41% of the employees with diabetes and co-morbidity experienced chronic fatigue symptoms. In this respect it is important to discriminate between diabetes-related complications such as neuropathy and diabetes-independent co-morbidity such as asthma. Cardiovascular diseases are considered to be diabetes-related co-morbidity. In our study, diabetes-independent co-morbidity was studied.

The findings suggest that diabetes without co-morbidity does not increase the medical cost risk for employees. Employees with diabetes were not only compared with healthy employees, but also with employees with other chronic diseases. Most importantly, people with diabetes without co-morbidity differ from patients with other

non-diabetic chronic diseases (migraine, COPD, back pain and rheumatoid arthritis) without co-morbidity. The latter group reported more general health complaints compared to healthy employees. This finding is different from the earlier assumption that diabetes is one of the most burdensome diseases.[10] Diabetes is likely to be not interfering with most daily life events when it is well controlled and without diabetes-related complications. In a situation of stable blood glucose levels through appropriate self-management that has been integrated smoothly into employees' daily life routines (i.e. it has become a sort of automatism), people appear not to have difficulties coping with a chronic disease. This finding has already been observed in previous studies.[11] In contrast to diseases like migraine, rheumatism, COPD, or chronic back pain, physical pain or discomfort are usually not present in diabetes without complications. Therefore, employees with diabetes who maintain a healthy lifestyle, without this being experienced as a burden, stay healthy and at no higher risk than employees without chronic illness.

Polin provides an explanation for the finding that co-morbidity increases the risk of developing fatigue and fatigue-related health complaints. She observed the impact of additive effects of stressors and coping. When people have to cope with more than one stressor almost everybody feels overwhelmed.[12] It might be expected that diabetes in itself can be regarded as a stressor. Diabetes treatment with its self-management and risks of future complications is supposed to be demanding.[10] Our research, however, did *not* indicate that performing diabetes self-management is inevitably a burden. The fact that all employees with diabetes have to perform self-management activities in addition to the demands they share with healthy colleagues alone did *not* constitute an additional risk for developing fatigue-related health complaints. This can be concluded from Chapter 3 as well as from Chapter 5. However, despite this outcome, performing self-management can be a real stressor when it is perceived as burdensome.

When performing self-management was perceived as burdensome, it did have an impact on people's fatigue-related health status. The research in Chapter 5 offers an explanation for our finding that diabetes in itself is not a special risk factor leading to the development of fatigue, although the negative perception of it is or can be. In general, the health status of people who perform self-management was frequently in general not different from the health status of people who perform self-management activities less frequently. This is very probably due to the fact that the behavioral management of diabetes is routine, very automatic and can often be easily managed. Consequently, employees who perform self-management activities were often less likely to perceive self-management as a burdensome task. This implies that performing self-management in itself is not necessarily perceived as a burden and is self-evident, like brushing your teeth. On the other hand, people who perceive performing self-

management tasks as burdensome are more likely to 'forget' performing these tasks. Thus, people may perform self-management more often when they find it easier and perform it as a routine procedure. They tend to make decisions, for example about monitoring and medication, on the basis of actual symptoms instead of long-term benefits of self-management actions.[13] Decisions can also be made on the basis of the sense of self-efficacy. Literature has shown that when people feel able to perform self-management activities (i.e., they have a high sense of self-efficacy), they will perform their self-management tasks more frequently.[14,15] It is very likely that they consequently do not perceive these tasks as a real burden.

Factors related to fatigue in employees with insulin-treated diabetes

Various studies that are presented in this thesis have explored relationships between work-related factors, diabetes-related factors, personal variables and fatigue. It turned out that the presence of co-morbidity, experienced symptoms of diabetes, job demands and social support at the workplace, the burden experienced by performing self-management tasks and self-efficacy appeared to be important factors in relation to fatigue in employees. These aspects are described one-by-one in the next section.

Co-morbidity

It is obvious from the findings (Chapter 3) that, in the case of employees with a chronic disease, co-morbidity increases the risk of developing fatigue and fatigue-related health complaints. As the prevalence of fatigue is very high, our research also explored what other factors contributed to the development of fatigue. These factors may also play a role in explaining fatigue, whether co-morbidity is present or not.

Diabetes symptoms

The Diabetes Symptoms Checklist measured eight symptom categories: hyperglycemic, hypoglycemic, psychosocial-cognitive, psychosocial-fatigue related, cardiovascular, neurological-pain related, neurological-sensory and ophthalmologic complaints.[16] Symptoms of diabetes are most often experienced as a result of hyperglycemia and/or long-term diabetes complications (such as neuropathy or vision disturbances). The severity of diabetes symptoms was strongly related to the experience of fatigue (see Chapter 4). It seems that symptoms resulting from diabetes make the disease burdensome (see Chapters 4 & 7). If little diabetes-related complaints are reported, diabetes is not perceived as a stressful disorder and therefore appears not to influence people's energy level beyond the common, known factors that affect all people such as physical or mental effort related to a task.[17] However, experiencing many diabetes symptoms may increase the stress, since dealing with

symptoms is the first task with which people with a chronic disease are confronted, whereas the special stressors of treatment procedures come second.[18]

Job demands and social support at the workplace

In addition to exploring the positive relationships between increased fatigue, increased co-morbidity and diabetic symptoms, work-related factors were also explored. Our research suggested that fatigued employees more often had a work situation that is characterized by receiving little social support at the workplace from colleagues or the supervisor, or high job demands in combination with little decision latitude. On the other hand, factors in the workplace alone proved not to be the main reason for developing fatigue-related complaints in insulin-treated people with diabetes. Diabetes-related factors explained the majority of the variance in fatigue as well as the interaction effects between work-related and diabetes-related factors (see Chapter 4).

Chapters 4 and 7 show that the work situation implied an extra risk of developing fatigue when many diabetes symptoms were present. These results support the previous cited research of Polin[12] that people can cope with one stressor, but that it may become more difficult when they are confronted with additional stressors. Job demands and social support at the workplace were especially relevant in explaining fatigue when experienced in combination with many diabetes symptoms. However, longitudinal relationships between job demands and fatigue were not found. Our research showed that the level of social support did have an impact on fatigue one year later. Employees with many diabetes symptoms who received low levels of social support from their colleagues and their supervisor were more likely to develop fatigue in the subsequent year (see Chapter 7).

On the other hand, social support seemed to have an opposite effect on people with few diabetes symptoms. Support in itself is not always positive, it may not be helpful if others are too concerned. A recent study among employees showed that imposed social support can have a negative or neutral effect on health.[19] Awareness of the disease and too much support may encourage dependence in employees who experience few diabetes complaints. Probably, these patients do not normally focus on their diabetes. The excessive social concern can shift the focus from health to illness.

To summarize, our study showed that high job demands were associated with higher levels of fatigue when people experienced many diabetes complaints. In the case of those employees with many complaints, the risk of developing fatigue was also higher when they received little social support.

Personal factors: coping styles and attribution

To understand the subjective experience of diabetes, participants with many diabetes complaints were selected for supplementary interviews. 40% of the participants reported more than average levels of diabetes-related symptoms. Although high levels of diabetes symptoms are generally associated with many symptoms of fatigue, quantitative data showed that some employees (around 50%) with many diabetes symptoms experienced few symptoms of fatigue. The in-depth interviews explored factors that might explain why employees with many diabetes symptoms experienced different fatigue levels.

The most important aspect was the sense of a personal feeling of control. In general, qualitative analyses demonstrated that employees with low levels of fatigue were more likely to cope actively with their diabetes and experienced flexibility in their work as positive. On the other hand, employees with high levels of fatigue experienced high levels of flexibility as uncontrollable and disconcerting. Thus, flexibility related to work in itself appears to be independent of the experience of fatigue. It is the perception of control that is critical. Highly fatigued individuals appeared to be more likely to perceive their diabetes and work situation as negative and thus seemed to feel more helpless. This might even make decision-making difficult (see Chapter 8).

The work situations and other characteristics of the group employees that were highly fatigued were comparable to the group employees with few symptoms of fatigue. But both groups experienced more than average symptoms of the disease. Even though other factors might also influence the levels of fatigue (such as job insecurity, family circumstances, life events), our results imply that coping styles and interpretations or appraisals of the situation are more important than the actual situation in itself. This is in line with the reasoning of stress-coping theories,[20,21] which state that an event or situation does not influence people's health variables directly, but that a personal appraisal of the situation affects the behavioral and health-related consequences. Yet, from the interviews, nothing can be concluded about causality. It is possible that a specific coping style or a specific way of thinking affects the mental health status and people's moods states. On the other hand, when individuals experience a low energy level, situations may be perceived as more negative than vice versa since negative moods lead to an increased recall of negative information[22] and also a more frequent recall of uncontrollable events.[23] Hence, the experience of the work situation can also be influenced by these mood states.[23,24] Fatigued employees may 1) perceive their work more negatively[25], 2) their job conditions worsen due to their reactions[23] or 3) they drift into less fulfilling jobs.[26] These relationships were not explored in the interview and the data from our longitudinal research study could not

demonstrate reversed causality (fatigue influencing the perception of the work situation) (see Chapter 7).

To summarize, what can be concluded is that negative evaluations or thinking patterns are associated with increased fatigued. Therefore, changing cognitions could be a proposed treatment approach. The cognitive-behavioral therapies, such as Rational Emotive Behavioral Therapy (REBT),[27] are based on the assumption that the way people think about a specific situation significantly impacts their feelings and behavior. Challenging one's personal beliefs and substituting irrational thoughts by more rational thoughts-- independent of causalities--can have a positive effect. We recommend that this be part of the treatment approach in the case of fatigued people with diabetes, since they gave the impression that they thought that their levels of fatigue were uncontrollable. REBT techniques in combination with knowledge transfer and/or, for example, blood glucose awareness training[28,29] or interventions to promote self-efficacy (for a recent review: Van der Laar and Van der Bijl, 2001[30]) might be helpful.

The burden of performing diabetes self-management tasks

Employees with diabetes frequently performed self-management activities, especially injecting insulin, following dietary guidelines and eating regularly (see Chapter 5). It was expected that HbA1c levels would improve and fewer diabetes symptoms would occur the more frequently this was done. On the other hand, the infrequent performance of self-management activities was expected to be associated with fatigue, depression, and decreased quality of life. Our research did not support this hypothesis. With regard to fatigue, we did observe that following dietary guidelines was frequently related to lower levels of fatigue in employees with type 2 diabetes. Surprisingly, both the diabetes-related health indicators as well as the general health outcomes proved to be determined to a greater extent by the degree to which people perceived performing self-management activities as burdensome (see Chapter 5). Probably, injecting insulin influenced diabetes-related health factors most directly. However, this could not be determined because the relationships between insulin injection and health complaints could not be analyzed for methodological reasons. Most importantly, when self-management activities are performed routinely, they are not perceived as burdensome. This is in line with previous research.[31] If you feel that self-management is easy or if you feel able to perform tasks (self-efficacy), you are more likely to perform them.[14,15] Moreover, the more the person successfully performs the activity, the more the person feels able to perform this activity.[20,32]

Factors associated with performing self-management activities in employees who inject insulin

Our research showed that the perceived burden of performing diabetes self-management activities (e.g., monitoring blood glucose levels and injecting insulin multiple times a day) was more related to health complaints than the frequency with which people perform their self-management activities (see Chapter 5).

People with a higher workload were more likely to perceive injecting insulin as burdensome (see Chapter 6) since the self-management activities often have to be performed during working hours. Insulin injections are crucial to keep blood glucose levels at a tolerable level and are essential for survival in the case of type 1 diabetes. Other self-management tasks are more or less avoidable and can be planned less stringently. Therefore, whether people work under time pressure or not, they need to inject insulin. However, under time pressure the activity will be perceived as more burdensome. Yet, the level of decision latitude proved to be unrelated to the level at which people perceived the self-management activities as burdensome. The level of decision latitude was also unrelated to the frequency with which people perform self-management tasks (see Chapter 6). This finding was surprising and in opposition to other studies that concluded that inflexible work schedules in particular may interfere with diabetes management.[33] Taking sufficient breaks when needed seems to be important for employees with diabetes.[34] The differences between these studies and the study described in Chapter 6 may be due to differences in assessment methods. The measurement of decision latitude in this thesis concentrated on control of tasks and work-related activities. Decision latitude was therefore approached differently to the ability to plan self-management behavior and was investigated using a questionnaire. The questionnaire also included items about task characteristics that are important for the ability to perform self-management at the workplace. Because a broader definition of decision latitude was used in our study, relationships between decision latitude and self-management may be weakened. We speculated that people who have no control over their work may still perform self-management activities during their lunch or coffee breaks, which makes it less necessary to adjust the work situation.

Although work-related factors are associated with the performance of self-management activities when self-management was perceived as burdensome, in our research personal characteristics were more important. Chapter 6 concluded that an avoidance coping style and especially the level of self-efficacy, were more important in relation to diabetes self-management than the work-related factors. An avoidance coping style was associated particularly with infrequent blood glucose monitoring and a high sense of being burdened by blood glucose monitoring. Individuals with a low

level of self-efficacy were more likely to perceive all types of self-management activities as burdensome.

Besides work-related and personal factors described above, background variables were also explored in relation to performing self-management tasks. The socio-demographic variables, except level of education, were to a small extent related to the frequency with which employees perform self-management activities and to the burden of performing these activities. One of the most obvious findings was that a higher level of education was associated with more frequent blood glucose monitoring in people with type 1 diabetes and more adjusting of insulin dosages in people with type 2 diabetes. Conversely, employees with type 1 and type 2 diabetes with a higher educational level were less likely to report frequent regular eating patterns. A possible explanation for this relationship includes the possibility that employees with a higher educational level have a work situation that allows flexibility and space for self-management and that people with higher education already have a higher level of self-control and self-efficacy.

Methodological considerations

Although the conclusions that can be derived from this study may be applicable for most people with diabetes, there are methodological considerations that potentially limit the generalization of the findings. These limitations include a non-representative employee pool in comparison to the general population and exclusion of non-medicated diabetics.

Participants in the studies (except for the study in chapter 3) were employees with insulin-treated diabetes between 30 and 60 years old from three different diabetes outpatient clinics. The study population is not representative of the general diabetes working population because of restrictions in the age range and the restriction to employees with insulin medication. Therefore, the results cannot be generalized and applied to younger adults and employees over the age of 60. It is possible that these employees have to cope with different or additional problems, such as finding a job or, if they are older, the prospect of (early) retirement.

Neither can our results be generalized and applied to all people with type 2 diabetes. Employees without medication or with oral diabetic medication did not participate. It is not clear whether results can be generalized and applied to people with type 2 diabetes who are treated with oral hypoglycemic agents or by diet alone. It may be the case that diabetes is less controllable and more stressful for them because they have less direct control as regards modulating blood glucose. In other words, if blood

glucose tests show that blood glucose levels are too high, it is not possible to lower blood glucose levels directly by injecting insulin. On the other hand, patients who use oral hypoglycemic agents or diet do not differ to a great extent from people with type 2 diabetes using insulin medication because the vast majority of type 2 diabetes patients do not use short-acting insulin. We also found that injecting insulin was perceived as the least burdensome self-management tasks (see Chapter 5). It would therefore be interesting to study differences between people with and without insulin medication with regard to the prevalence of fatigue and the subjective impact of the disease.

Because of the limitations cited above, it would be preferable to judge our data against a norm group. However, to our knowledge, no data is available on the general diabetic working population. The closest comparison group was the diabetes sub sample of employees in the Maastricht Cohort Study (MCS) (see Chapter 3). The MCS studied a large sample of employees and is therefore supposed to be more representative than our study. Compared to the MCS our percentage of participating men was lower (approximately 67%) in comparison to the MCS (more than 80%). In addition, employees' educational levels were equally divided between low, median and high in comparison to the MCS which involved more employees with median educational levels. In relative terms, our population was more highly educated that the general Dutch population.[35] The higher education level may explain why employees with diabetes without co-morbidity were not at a higher risk of developing fatigue-related health complaints. This was probably due to the fact that employees with a higher education have more flexible work situations. In addition, employees in our study with type 1 diabetes were more highly educated than employees with type 2 diabetes. This can be explained by the fact that type 2 diabetes is often associated with unhealthy lifestyles. These are observed more frequently in lower educated populations.[36] It is therefore uncertain whether our results can be generalized and applied to groups of employees with a lower education.

Despite the limitations and the fact that the population is not a random sample from the general diabetic working population, the population was heterogeneous. Also, the risk for selective dropout regarding specific subpopulations is not likely. The study population was composed of patients of various ages living in different regions of the Netherlands with different educational backgrounds and a wide variety of jobs.

An additional confounding variable is that the two variables used (diabetic symptoms and fatigue) overlap and have common characteristics. Fatigue is one of the symptoms related to diabetes. The Diabetes Symptom Checklist-Revised (DSC-R) - which was used as a measure of disease severity - covers hyperglycemic, hypoglycemic, psychosocial-cognitive and psychosocial-fatigue related complaints while the Checklist Individual Strength assesses general components of fatigue. It is

not possible to determine whether the symptoms reported on the DSC-R were actually due to diabetes.[37] Therefore, these measures may overlap. Developing a scale that only assesses diabetic symptoms including fatigue that were caused by diabetes is challenging.[37] There may be differences in the way fatigue is experienced due to everyday effort or diabetes. The quantitative scales were not designed to separate out these components. Thus, qualitative methods may be more informative.

With regard to relations between diabetes symptoms and fatigue, correlation analysis at Time 1 data (not shown in earlier chapters) shows that coefficients were indeed highest for relationships between psychosocial-fatigue related complaints, and psychosocial-cognitive complaints with fatigue. However, correlation coefficients between the other DSC-R subscales and fatigue were all significant. The correlation between the composite score for diabetes symptoms and fatigue is high. When a total score is established on the basis of the different subscales excluding psychosocial-fatigue and psychosocial cognitive related complaints, the correlation with fatigue remains high. This may mean that the relationship between diabetes symptoms and fatigue may be overestimated, but this is not entirely due to inclusion of the DSC-R fatigue subscales. Future research should focus on developing a more specific diabetes symptoms questionnaire.

Finally, the findings, except for the study in Chapter 7, do not indicate causality. They only show synchronicity and suggest possible patterns that would need to be investigated in long-term follow up studies.

Implications derived from this study

In analyzing the research data from the study, numerous implications to utilize the findings were uncovered. These implications included suggestions for further research, implications for supervisors and Human Resources staff, and implications for clinical practice

Implications for further research

The outcome data from this research study suggests numerous areas for further research. These include assessment of self-management, differences between type 1 and type 2 diabetes and difference between activity-related fatigue and diabetes-related fatigue.

Assessment of self-management

The literature already reveals that different self-management activities should be assessed separately because there are important differences between the diabetes self-management tasks of injecting insulin, monitoring blood glucose levels, following dietary guidelines, regular eating patterns, adjusting insulin.[38-40] This study not only proved the importance of assessing the frequency with which people perform activities for each specific self-management task separately, but also for additionally assessing the degree to which they perceive this as a burden. The burden of one type of self-management is not necessarily related to the burden of other types of self-management. This also implies that in the case of measurements that assess burdensomeness, the different aspects of self-management should be evaluated separately.

Interestingly, the research found that the extent to which the person perceived self-management as a burden related to the general health status. It is less important how frequently people perform self-management activities. Probably what is more important is to what extend a chronic illness impacts the person's life style and constraints or limits activities and behaviors. Devins et al. who studied the interference of chronic diseases in thirteen daily life domains[41] introduced the concept of illness intrusiveness that refers to 'illness-induced disruptions to lifestyles, activities, and interests that compromise quality of life'. It is important to note that the disruption includes both the illness and treatment components. We suggest that the Illness Intrusiveness Rating Scale might also be a tool that could be used to determine why people with diabetes experience their self-management as burdensome. In addition, other diabetes-specific questionnaires may also be helpful in this context, for example the Problem Areas in Diabetes questionnaire. This questionnaire assesses diabetes-specific emotional distress.[42] Because our study revealed that performing self-management activities in social settings was perceived as more burdensome than performing self-management activities at work we recommend that future research explores the process why self-management is perceived as a burden and then develop intervention approaches that reduce the burden or teach people with diabetes how to cope better.

Differences between type 1 and type 2 diabetes

Type 1 and type 2 diabetes are different phases of illness and probably should be investigated or analyzed differently as we did in various studies (see Chapters 5, 6, 7).

Insulin-treated employees with type 2 diabetes appeared to be less flexible in performing self-management tasks than employees with type 1 diabetes and they make much lesser use of the possibilities to regulate their blood glucose levels flexibly (see

Chapter 5). Also, the relationships between self-management and other variables were different for the two types of diabetes. Relationships between the frequency of self-management activities and glycemic control were only found in persons with DM1, although not always in the expected direction, while following the dietary guidelines daily was related to better health, but only in the case of people with type 2 diabetes (see Chapter 5).

In a study about relationships between job stressors and fatigue it was concluded that differentiations between the level of diabetes complaints reported (few or many complaints) appeared to be more valuable than the differentiation between type 1 and type 2 diabetes (see Chapter 7). Nevertheless, we would like to recommend for further research to analyze data for both types of diabetes separately.

Diabetes-related fatigue vs. activity-related fatigue

Fatigue is the central focus of our study. Although more insight into relationships between diabetes-related factors, work-related factors and fatigue has been generated, fatigue in itself remains a complex phenomenon. Various definitions and differentiations in types of fatigue have been described such as psychological and physical fatigue.[17] Differences are based on the symptomatology and the nature of activities that lead to the symptoms of fatigue.[17]

Fatigue is not necessarily a result of effort and performing activities, but can also be related to the perception of (imagined) activities in the future.[17] In all probability, fatigue can develop by just thinking or worrying. These processes are common in all people, healthy or chronically diseased.

It appears that some types of fatigue are specifically related to diabetes and these need to be studied more in detail. At present, fatigue measures are confused between a symptom of diabetes and emotional state. People with diabetes may feel fatigue due to too low or too high glucose levels. The subjective feeling of these types of fatigue is supposed to be different from other common types of fatigue because diabetes-related fatigue may be less predictable and may thus contribute to anxiety and even to phobia or panic. We recommend that questionnaires are developed that can discriminate between too high or too low glucose level induced fatigue and non-glycemic fatigue.

Comparison with the work of Thayer on tiredness is useful in this respect who differentiates moods in four major categories. He identifies two types of tiredness: tense-tiredness and calm-tiredness.[43] The other two mood states are tense-energy and calm-energy. These categories are based on combinations of tiredness or energy and relaxation and stress. Calm-energy is the optimal mood state for performance which transforms during the day to calm-tiredness. Calm-tiredness is the signal that the body needs rest in order to return to the optimal mood state of calm-energy. On the other

hand, when people feel tense-energetic the mind is unfocused and the body and muscles feel tense. However, this is the state most people experience when they focus at work. When this mood state is prolonged, it leads to tense-tiredness. The tense-tired or exhaustion without regular regeneration may even lead to depression or even burnout without regular regeneration. People who habitually stay in the state of tense-tiredness are likely to develop unhealthy lifestyles.[43]

Fatigue as a result of diabetes may be experienced as tense tiredness because it may feel far more unpleasant than tiredness due to activities and it may be less predictable. Because of its very nature, diabetes-related fatigue is also more variable because it is related to unbalanced blood glucose levels. Moreover, fatigue can also be related to apparent diabetes-related long-term complications such as neuropathy and cardiovascular disorders.

It seems to be important for patients to be able to distinguish between the different states of fatigue, because injecting insulin or exercise may be a good idea when fatigue is a result of high blood glucose levels. Changing tasks or taking breaks may be most effective when fatigue is a consequence of the (work) activities performed.

It would appear to be worthwhile to study the mood-concepts of Thayer from a patient's perspective of self-management, but also for research purposes aimed at guidelines for prevention, assessing and treating type 2 diabetes. We recommend that research is initiated to proof or disproof this hypothesis by measuring, glucose levels and self-rating on the Thayer scale.

In future research, this scale could also be related to diabetes-related fatigue. Such a scale could also be related to the mood-unbalancing experiences of hypoglycemia and hyperglycemia. We recommend studying the mood states that people with diabetes feel when their blood glucose levels are low or high and to explore the differences in thinking associated to experienced levels of tense-tiredness. We expect that results of these studies would contribute to a better understanding of the psychology of people with diabetes and thereby offer enhanced therapeutic intervention.

Implications for supervisors and HR staff

Our studies suggest recommendations for promoting job performance of employees with diabetes, i.e. to enhance the ability to function without being hindered by diabetes symptoms and fatigue-related health complaints.

Preventing discrimination

Our research found that employees with diabetes without many diabetes-related symptoms are not automatically at higher risk of developing fatigue and other general health complaints compared to other, healthy employees. Overall, diabetes is not

problematic in itself. This is supported by the Americans with Disability Act of 1990 (ADA), in which the rights of persons with disabilities are formulated. It states that people with diabetes should be assessed on an individual basis for employment and should not be discriminated against because of their disease. They should be eligible for any employment for which they are otherwise qualified.[44] Some data suggests that diabetic employees may exhibit more positive work ethics than non-diabetic employees because they tend to exhibit trustworthiness, a healthy diet, and a general health-conscious life style. These characteristics and behaviors may result in an above average concern for healthy working styles.[44] The work record of people with diabetes is excellent. They are employees who perform well.[45]

Attention for employees who experience many diabetes-related symptoms

Employees with many diabetes-related symptoms or those who have more than one chronic disease probably are more at risk and may need work adjustments: increasing support and preventing high job demands in combination with little control. Employees with more than one chronic disease and employees who experience many diabetes symptoms need special attention, because they are at a higher risk of developing chronic fatigue, and therefore at higher risk of absence due to illness or disability.

We recommend, in cases where diabetic control is more challenging, that employers and employees develop collaborative work strategies to allow self-management of the disease. Employers should promote these work adjustments, with the purpose of making regulation of blood glucose levels possible and, thereby preventing hypoglycemia and hyperglycemia. This is especially important if employees have co-morbid medical conditions. Because of the complexity of the disease experience and management, it is preferable that therapeutic interventions (such as creating favorable working conditions and increasing self-efficacy) include both the employee and supervisor. This becomes even more important when the disease burden is changing. The situation at work can be repeatedly evaluated. Ideally, the work situation can be adapted to the disease situation.

Relevance of lowering job demands & increasing support at the workplace

From various results from our studies, it can be concluded that preventing diabetes symptoms and long-term complications, by keeping blood glucose levels to near-normal, appears to be of special importance. It may be that people's abilities to deal with stressors have deteriorated as a result of diabetes-related complications, diabetes-related symptoms or concomitant diseases. However, the results also highlighted the

fact that we cannot generalize about employees with diabetes. Individual differences should be considered.

The findings of this study are also relevant to the vocational rehabilitation of people with diabetes who return to daily work. From the research in Chapter 4, it can be speculated that lower levels of fatigue are achieved when their (future) jobs are characterized by higher levels of social support. However, the level of support should be dependent on the level of diabetes symptoms of an employee. The level of job demands and decision latitude need to be attuned. It is clear that high job demands in combination with low control are related to a high level of fatigue. If the work situations are characterized by the above-mentioned aspects, reintegration may be more successful.

Implications for clinical practice

In addition to recommendations for professionals at the workplace, our studies suggest recommendations for clinical professionals.

Some employees need special attention from professionals

Employees with multiple chronic disorders experience more fatigue-related complaints. Therefore, this group needs special attention from professionals. This also applies to employees with a lower educational level. People with a higher educational level planned their meals less rigidly, monitored their blood glucose more often and also adjusted their insulin more often. They probably have greater success in self-regulation during working hours, which is one of the challenges for employees with diabetes. Therefore, the need for flexibility should be emphasized in self-management training programs. Employees with a lower education may also be trained in how to become more flexible in their disease management (at the workplace). Our study showed that more people with type 2 diabetes had a lower educational level compared to people with type 1 diabetes. This might partly explain why people with type 1 and type 2 diabetes differ in the way they manage their disease. *Employees with type 2 diabetes* are less flexible in their disease management. They probably make insufficient use of the possibilities to regulate their blood glucose levels. This might be due to a lack of knowledge, inexperience or worrying about possible hypoglycemias. It seems advisable to provide people with type 2 diabetes with extra support and coaching in order to enable them to manage their disease in a more flexible way.

Attention for the perceived burden of performing self-management

When studying literature it appears that most studies about self-management in a diabetes population focus on the frequency with which people perform self-

management activities. This study demonstrated that when self-management is perceived as a burden, this affects the health status to a greater extent than the actual frequency with which they perform their self-management activities.

It was also found that participants who do not perceive self-management as a burden performed their self-management activities more frequently. Instead of only stressing the importance of performing self-management tasks, diabetic professionals should ask about patient's experiences and beliefs about their capacities to perform all or some self-management activities and the way they cope with diabetes. Whether performing self-management is perceived as a burden depends on individual characteristics and is assumed to be independent of the objective burden of performing self-management tasks. When it turns out that patients perceive certain activities as a burden, more information about the specific situation and the reasons for their perception could guide the counseling. As a consequence, reducing the perceived burden of performing self-management activities might also be coupled to an improvement of well-being, quality of life and diabetic symptoms. The burden of one type of self-management is not necessarily related to the burden of other. This implies that the different aspects of self-management should be evaluated separately.

Attention for coping styles and self-efficacy

Because it turned out that a high perceived burdensomeness of the disease is associated to higher levels of health complaints, it is useful for professionals to know which factors contribute to this burden to be able to intervene. Results showed that a lack of self-efficacy as well as avoidance coping were particularly important factors in relation to self-management. Enhancing people's sense of self-efficacy by setting achievable targets, should be one of the essential elements and goals of self-management training programs.

For the same reason why it is important to enhance self-efficacy, awareness of a diabetes avoidance coping style by professionals is of paramount importance in order to prevent insufficient self-management behavior and to prevent patients from perceiving the task of checking their blood glucose as a burden. To make daily tasks more manageable, it may be advisable to refer individuals to a psychologist for individual coaching or to a diabetes education program. If self-management in employees with diabetes is a problem, the focus should not only be on work-related factors (job demands), but also (during a consultation) on identifying personal factors and especially determining the level self-efficacy.

Depression among people with diabetes

Finally, we want to stress the importance of screening for depression in people with diabetes another time. Various previous studies have already demonstrated that depressive symptoms are often reported by people with diabetes.[46] The study presented in chapter 3 of this thesis also supports these findings. Most health complaints were only more prevalent in employees with diabetes compared to healthy employees when they had more than one chronic disease. However, depressive symptoms were also reported frequently when diabetes was the only chronic medical problem. This implies that all people independent of the disease state are at risk of developing depressive symptoms. Because of the fact that depressive symptoms or disorders can often be treated well, it is important to underscore their possible severity. This is even more important because it affects people's daily life, including their working life.

To conclude

This thesis has provided a greater insight into the risk factors for developing fatigue as well as possible mechanisms for reducing fatigue notwithstanding possible disease-related stressors.

- Diabetes in itself is not a main risk factor for developing fatigue. Therefore, diabetes may not be automatically problematic in the work situation.
- If other chronic diseases or many diabetes-related symptoms are reported, or if self-management is perceived as burdensome, coaching by employers, occupational physicians and diabetes professionals is advisable.
- For persons with diabetes, it is necessary to keep the disease manageable, that is preventing diabetes symptoms and trying to make performing self-management less burdensome.
- To prevent perceiving performing self-management as burdensome, it is important to increase the level of self-efficacy. Coaching by employers as well as other professionals can be used to accomplish this.
- If diabetes symptoms are reported, both the employees with diabetes and their employers should search for possibilities to reduce work demands and improve social support. At the same time, the employee and his physician should actively seek possibilities to reduce the symptoms.
- Increasing the level of decision latitude does not seem to be advantageous in itself, but may be advisable in some cases, especially when the workload is high.

- Fatigued and non-fatigued employees with many diabetes symptoms differ in the way they perceive and cope with their disease and their work situation from. Employees who feel in control are less likely to experience fatigue. Therefore, in the case of fatigued individuals challenging one's personal beliefs can have a positive effect, possibly in combination with knowledge transfer.
- Increasing social support at the workplace has positive effects on the level of fatigue in the case of employees with many diabetes complaints. Too much support might have opposite effects in the case of employees with few diabetes symptoms. Therefore, individual differences should be considered when coaching employees with diabetes.

Hopefully, the studies in this thesis and the implications that were derived form these studies have improved the knowledge of aspects of employment in people with diabetes. It was concluded that there is no evidence that they perform worse than other employees. However, some groups need special attention. With (individually considered) accommodations and disease management aimed at stable blood glucose levels, most employees with diabetes may keep on working with healthy energy levels.

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Summary

Samenvatting (in Dutch)

Summary

This thesis is about employees with diabetes and insulin therapy between the ages of 30 to 60 years. Diabetes may have many consequences for employees in the working situation and is expected to become an even bigger major health problem, because the number of people with diabetes, and therefore the number of employees with diabetes, is growing considerably. The impact of self-management in diabetes care is relatively large, because the daily responsibility for managing diabetes rests with the patient. Almost all self-management activities (e.g., injecting insulin, eating regularly, complying with nutritional guidelines, monitoring blood glucose levels, and attuning these activities to each other) also need to be performed during working hours.

In addition to diabetes in the workplace, the focus of this thesis is also on fatigue. In the Netherlands, about one third of those who are incapacitated for work (under the Disablement Insurance Act, Dutch abbreviation: WAO) suffer from mental problems, of which chronic fatigue is a core aspect. Employees with a chronic disease may be at even higher risk of developing fatigue, because on top of the regular demands of their job, they have to deal with the additional demands of their disease. So far, few studies in the field of organizational psychology have focused on employees with a chronic disease. For instance, despite that the Job Demands Control Support (JDCS) model has been investigated extensively, very few empirical studies explored this model in a sample of employees with a chronic disease. According to the Job Demands Control Support (JDCS) model, jobs that are unfavorable are associated with more health complaints. It assumes that a work situation affects health negatively when it is characterized by high demands, a lack of control and a lack of support. In case of employees with a chronic disease, it may be assumed that they have to deal with higher demands, both work-related as well as disease related. One of the aims of this thesis is to contribute to a better understanding of the relationships between components of the JDCS Models and fatigue among employees with diabetes. Furthermore, because diabetes is to a great extent a self-managed disease with implications during working hours, we explored whether self-management activities are associated with the health status of employees with diabetes, and whether workplace characteristics are associated with diabetes self-management.

Except for the study that is described in Chapter 3, participants were employees with insulin-treated diabetes mellitus (Types 1 and 2; DM1 and DM2, respectively) between 30 and 60 years of age, who attended three outpatient diabetes clinics in the Netherlands. The age range was chosen, because most employees in this category have a stable working position. Internists and some family physicians selected patients in this age range with DM1 and DM2 (diagnosis based upon their own judgment) who

injected insulin from their patient's records. From the 626 employees who were approached and met the inclusion criteria, 347 were willing to participate (response rate 55%) and gave their informed consent. At baseline (m1), 317 participants (166 with DM1 and 151 with DM2) completed the set of questionnaires. Data of 25 questionnaires were not analyzed because of different reasons. One year later, 257 participants out of the 317 who filled out the first measure (81%) filled out the follow-up questionnaire (m2). Again, the data of 25 questionnaires was not suitable for analysis, 225 participants (123 with type 1 and 102 with type 2) filled out both questionnaires properly. The set of questionnaires surveyed background variables, work-related variables (job demands, decision latitude, social support from colleagues and superior), diabetes related variables (symptoms, Hba_{1c}%, complications, coping, self-efficacy), and personal factors (way of coping, social support outside the work context). The Medical Ethics Committees of the University Medical Center Utrecht approved the study design.

In **chapter 2**, an outline of the literature on diabetes and employment is given. Studies about unemployment rates, absenteeism, and work disability are reviewed. The chapter also examines the characteristics that make people with diabetes highly valuable employees. In addition, the problems that people with diabetes encounter at the workplace, relationships between work-related factors and diabetes regulation, and possibilities for work adjustments are described. It was concluded that diabetes has a negative effect on employees, although results of the various studies are not consistent. Most studies concluded that employees with diabetes, in comparison with healthy employees, have more absenteeism, are more often disabled, and are more often unemployed. Older employees and employees working in specific jobs might be at higher risk of developing work-related problems. Yet, it remains unclear whether adjustments of the work situation, if necessary, need to focus on the working conditions themselves or whether the focus has to be on personal or diabetes-related factors. More information about mechanisms linking patient-, disease- and work-related factors at the workplace and valuable (work) adjustments is needed.

To start with, we explored whether our assumption that employees with diabetes differ from healthy employees could be confirmed. The aim of **chapter 3** was to compare the work situation and fatigue-related complaints of employees with diabetes (N=141) with those of 'healthy' employees (N=8,946), as well as with a group employees with other chronic diseases (migraine, rheumatism, COPD, or chronic back pain; N=1,883). Baseline data from a Maastricht Cohort Study (MCS) on fatigue at work were used to test differences in background variables, work characteristics,

lifestyle factors, and fatigue-related complaints. The MCS surveys a large heterogeneous cohort of employees from 45 different companies and organizations and followed them for three years. Odds Ratios were calculated for severe fatigue, need for recovery, burnout, and psychological distress. Results showed that employees with diabetes are working more during daytime hours and perform less overtime than healthy employees and employees with other chronic diseases. Employees with diabetes but no co-morbidity (the presence of one or more additional chronic diseases), are *not* more likely to report fatigue-related complaints than 'healthy' employees, except for depressed mood. Co-morbidity is associated with increased fatigue-related complaints. Therefore, it was concluded that especially diabetic employees with one or more other diseases would need special attention from employers and healthcare professionals.

Chapter 4 describes a study that explores relationships between components of the JDCS model, diabetes-related burden (symptoms, seriousness of disease, self-management activities, and disease duration), and fatigue in employees with diabetes mellitus. Variables were assessed by means of self-administered questionnaires.

Data of 292 employees with insulin-treated diabetes were analyzed. It was found that both work- and diabetes-related factors are related to fatigue in employees with diabetes. Regression analyses revealed that work characteristics (lack of support from colleagues and superior and the interaction of job demands and job control) explain 19% of the variance in fatigue. Diabetes related factors explain another 29% of the variance in fatigue, with diabetes-related symptoms and the burden of adjusting insulin dosage to circumstances as the most relevant predictors. Fatigue is more severe in the case of lack of social support at work, high job demands in combination with a lack of decision latitude, a higher burden of adjusting the insulin dosage to changing circumstances, and more diabetic symptoms. Furthermore, regression analysis revealed that diabetic symptoms and the burden of adjusting the insulin dosage are especially relevant in combination with high job demands. Some interaction effects between these variables were found as well. From this study, it was concluded that both diabetes and work should be taken into consideration - by (occupational) physicians and supervisors alike.

Chapter 5 describes the relationships between self-management activities (the frequency with which employees with diabetes perform self-management activities and whether or not they perceive this as burdensome) and a variety of health-related outcomes: HbA_{1c}%, symptoms of diabetes, fatigue, depression, and quality of life. Student's t-tests were performed for type 1 and type 2 diabetes separately to compare

the mean health scores of individuals who frequently (every day) or infrequently (a few times a week or less) perform self-management activities, and who do or do not perceive this as a burden.

Study participants (N=292) frequently perform their self-management activities, particularly injection of insulin (96%), followed by dietary guidelines (71%), and eating regularly (66%), respectively. Most employees perceive dietary self-management as burdensome (70%), while only a small percentage of employees perceive injecting insulin as burdensome (13%). The perceived burden of self-management is more strongly related to health than the frequency of self-management. Frequency of self-management especially relates to HbA_{1c}% in employees with type 1 diabetes. Employees with type 2 diabetes who frequently follow the dietary guidelines exhibit more positive health outcomes. Participants who perceive dietary self-management and injecting insulin as a burden show more negative health outcomes, especially more diabetes symptoms, suffer more from fatigue and report more depressive complaints. Different relationships were found between frequencies and perceived burdens of self-management and health indicators. In type 1 diabetes, frequencies were only related to HbA_{1c}% and in type 2 diabetes only frequencies of dietary self-management were related to most health outcomes. With regard to the burden of self-management, many other relations were found with health outcomes. Therefore, both frequency of performing self-management activities and the burden associated with it should be assessed and considered separately when evaluating self-management and examining patient's health.

Many factors may constitute a barrier to self-management of employees with diabetes. Therefore, in **chapter 6**, a study that explores relationships between demographic variables, JDCS components, coping, social support outside work, and self-efficacy with self-management (frequency and perceived burden) is presented. The aim of this study was to investigate how factors in the workplace and personal factors are related to the frequency with which employees with diabetes perform self-management activities, and to the degree to which they experience the performing of self-management activities as a burden. Participants (N=292) filled out questionnaires on socio-demographic and illness-related background variables, their work experience, diabetes self-efficacy, social support outside work, coping styles, and self-management activities. Employees who reported a high workload were more likely to perceive injecting insulin as a burden. The level of social support was positively related to the frequency of dietary self-management in type 2 diabetes and negatively related to the sense of being burdened by dietary self-management in type 1 diabetes. From the findings of this study, it can be concluded that personal factors play a more prominent

role in relationship to self-management than the way in which employees perceive their work situation. Employees with an avoidance coping style do monitor their blood glucose level less frequently and also perceive this self-management task as a burden. Individuals who have a lower sense of self-efficacy feel more burdened by performing all self-management activities.

To find out whether unfavorable working conditions result in more fatigue or whether fatigue influences the level of job demands, job control and social support over time, longitudinal relationships between these variables were studied and presented in **chapter 7.** Two-hundred twenty five employees with insulin-treated diabetes completed questionnaires at two points in time with a one-year interval in between. The measurements related to work experience (i.e. job demands, decision latitude, and social support at the workplace), fatigue, and diabetes symptoms. A series of LISREL analyses was conducted for type 1 and type 2 diabetes separately, and for employees with few and many diabetes symptoms separately. The various constructs were assessed on two occasions. Based on these data, causalities between each of the job characteristics and fatigue were tested. In each analysis the fit to the data was tested of a two-wave-two-variables model. For employees with many diabetes symptoms, lack of social support was positively related to the level of fatigue over time. That is, employees who experienced a lack of support at their workplace reported higher levels of fatigue one year later. The relationship between lack of support and fatigue for the sample with few diabetes symptoms was reversed, that is higher levels of fatigue resulted in more social support one year later. However, this relationship was very weak and should therefore be interpreted cautiously. The same applies to the impact of fatigue on job demands in the type 1 diabetes sample: more fatigue was related to less job demands after one year. This may suggest that fatigued employees actively seek out possibilities to reduce their job demands or to increase social support. The most obvious result from the longitudinal analysis is that for employees with many diabetes symptoms the level of support at the workplace positively affected their level of fatigue over time. Employees who experience many symptoms resulting from their disease need support from their colleagues and their superior.

On the basis of findings of the quantitative studies, some of the participants were selected for additional interviews to further explore and clarify relationships found in earlier studies. Another purpose was to gain more insight into the personal experiences of the participants regarding their work and diabetes. The selected sample included employees with a relatively high level of diabetes-related complaints. From the quantitative studies we concluded that they are most at risk for developing fatigue.

Employees with a high level of fatigue (n=8) were compared with employees with a low level of fatigue (n=9). They were stratified on the basis of gender, age, educational level, profession and type of diabetes.

The results of this qualitative study are presented in **chapter 8**. Data was gathered using face-to-face, in-depth interviews on background variables, experienced burdens, appraisal processes, coping strategies and support concerning diabetes-related symptoms, self-management, fatigue, and work(stress). Major differences between the two sub-samples were found with respect to coping and attribution strategies. Low-fatigued employees tend to use more active and problem-oriented coping strategies. They seem to appreciate a high level of flexibility at work. This confronts them with challenges as regards matching the demands of their disease to their working lives. High-fatigued employees, on the other hand, appear to feel more helpless and use resigning strategies. They seem to be overwhelmed by the constraints of their illness in combination with job-related duties. They judge high flexibility at work as a threat for a structured and regular life, which in their opinion is necessary for living with diabetes. These findings underline the importance of person-related factors, besides work- and disease-related factors, when fatigue needs to be prevented in a working diabetes population.

In **chapter 9**, the results of the different studies described above are discussed. This chapter also includes methodological considerations, recommendations for further research as well as practical implications. Limitations with regard to representativeness, generalizability to employees with type 2 diabetes without insulin therapy, overlap between measures of fatigue and diabetes symptoms, and causality are discussed. With regard to implications for further research, it was for example suggested that the assessments of self-management should not only include the frequency with which people perform their self-management tasks, but also the perceived burden of performing these tasks. Furthermore, research about differences between activity-related fatigue and diabetes-related fatigue would be very useful for a better understanding of the phenomenon of fatigue in individuals with diabetes. Practical recommendations for occupational physicians, supervisors, employers, coaches and other professionals in the workplace are described. Based on the results it was suggested that discrimination solely on the basis of the disease should be prevented. But they should be attentive to employees with many diabetes complaints. Especially for these employees possibilities and needs for lowering job demands and increasing support at the workplace should be evaluated. In addition to recommendations for professionals at the workplace, our studies suggest recommendations for clinical professionals. It is argued that special attention for

employees with more than one chronic disease and with a lower educational level may be needed, because they may be at higher risk of developing fatigue. While the a high experienced burden of performing self-management is related to worse health, physicians are advised to be aware of the burdensomeness of advises regarding self-management tasks. Furthermore, it may be useful to assess employee's coping styles and to consider the level of self-efficacy to be able to adjust advises to the specific needs of each patient which may consequently make the performance of self-management tasks less burdensome.

In conclusion, we believe that people with diabetes can be valuable employees when necessary with some support from colleagues and superiors, especially when they experience many diabetes symptoms. Also, keeping blood glucose levels balanced is one of the challenges in preventing fatigue. At the end of this chapter the most striking conclusions are summarized, which are relevant to empower employees with diabetes at work.

Samenvatting

Dit proefschrift beschrijft een aantal studies over de relaties tussen werk, diabetes en vermoeidheid. Diabetes kan verschillende consequenties hebben voor het werk dat mensen verrichten. Met het oog op het nog steeds toenemende aantal mensen met diabetes, en daarmee het toenemende aantal werknemers met diabetes, wordt verwacht dat diabetes in de toekomst een nog groter gezondheidsprobleem wordt. Mensen met diabetes zijn grotendeels zelf verantwoordelijk voor de behandeling van hun aandoening door middel van het uitvoeren van zelfmanagementactiviteiten (spuiten van insuline, met regelmaat eten, rekening houden met voedingsrichtlijnen, controleren van bloedsuikerwaarden en het op elkaar afstemmen van deze activiteiten). De invloed van deze activiteiten op het dagelijkse leven is groot en beperkt zich niet alleen tot de privé-situatie, want het is ook een extra belasting tijdens het dagelijkse werk.

Naast diabetes is vermoeidheid een belangrijk onderwerp in dit proefschrift. In Nederland ontvangt een derde van het aantal mensen met een WAO-uitkering deze uitkering op basis van psychische klachten, waarvan vermoeidheid een belangrijk symptoom is. Aangenomen wordt dat werknemers met een chronische aandoening een groter risico lopen om vermoeidheidsklachten te ontwikkelen, omdat zij niet alleen om moeten gaan met de eisen die het werk aan hen stelt, maar ook met de eisen van hun ziekte.

Relatief weinig studies binnen de arbeids- en organisatiepsychologie hebben tot nu toe aandacht besteed aan werknemers met een chronische aandoening. Er is bijvoorbeeld weinig onderzoek gedaan naar het Job Demands Control Support (JDCS) model onder deze groep werknemers. Dit model gaat er vanuit dat er een verband bestaat tussen ongunstige werksituaties en gezondheidsklachten. Een ongunstige werksituatie kenmerkt zich in dit model door hoge werkeisen, weinig regelmogelijkheden en weinig sociale steun. Deze factoren beïnvloeden de gezondheid volgens het JDCS model negatief. Het is aannemelijk dat werknemers met een chronische ziekte met een hogere belasting te maken hebben, zowel met betrekking tot het werk als met betrekking tot de ziekte.

De studies die zijn beschreven in dit proefschrift hadden onder andere ten doel om een beter inzicht te krijgen in de relaties tussen componenten van het JDCS model en vermoeidheid bij werknemers met diabetes. Omdat zelfmanagement een belangrijk onderdeel is bij de behandeling van diabetes werd ook onderzocht of het uitvoeren van zelfmanagementactiviteiten invloed heeft op de gezondheid van werknemers en of factoren in de werksituatie samenhangen met de aspecten van zelfmanagement.

Dertig- tot zestigjarige insulineafhankelijke werknemers met diabetes (type 1 en type 2) hebben deelgenomen aan het onderzoek. Zij werden benaderd via internisten van drie verschillende diabetes(poli)klinieken en via een aantal huisartsen in Nederland. Vanwege de verwachte stabiliteit in de werksituatie van mensen in de leeftijd van 30 tot 60 jaar is voor deze leeftijdscategorie gekozen. De studie die is beschreven in hoofdstuk 3 is echter gebaseerd op data van de Maastrichtse Cohort Studie.

347 van de 626 werknemers die we uitnodigden en die voldeden aan de inclusie-criteria waren bereid deel te nemen aan het onderzoek (respons: 55%). 317 personen (166 met type 1 en 151 met type 2 diabetes) hebben op het eerste meetmoment (m1) de ingevulde vragenlijst geretourneerd. Vanwege diverse redenen konden data van 25 deelnemers niet worden geanalyseerd. 257 van de 317 personen hebben op het tweede meetmoment, na een jaar, de vragenlijst opnieuw ingevuld (81%). Data van 25 van hen waren niet geschikt voor analyse. Uiteindelijk bleken de gegevens van 225 werknemers (123 met type 1 en 102 met type 2 diabetes), die beide vragenlijsten hadden ingevuld, geschikt om te analyseren (zie hoofdstuk 7). Met de vragenlijsten werden verschillende variabelen gemeten: werkgerelateerde factoren (werkeisen, regelmogelijkheden, sociale steun van collega's en leidinggevende), diabetes-gerelateerde factoren (diabetessymptomen, Hba_{1c}%, complicaties op de lange termijn, coping en 'self-efficacy'), persoonlijke factoren (algemene copingstijl, sociale steun in de privé-situatie) en gezondheidsuitkomsten (vermoeidheid, depressieve klachten, kwaliteit van leven). De Medisch Ethische Toetsingscommissie van het Universitair Medisch Centrum Utrecht heeft goedkeuring gegeven voor de onderzoeksopzet.

Hoofdstuk 2 geeft een overzicht van de literatuur op het gebied van diabetes en werk. Allereerst werden onderzoeken naar werkloosheidspercentages, arbeids-ongeschiktheid en verzuim beschreven. Daarnaast werden de kenmerken van mensen met diabetes beschreven die maken dat zij zeer waardevolle werknemers zijn. Tevens komen de problemen die werknemers met diabetes in het werk tegen kunnen komen aan bod, alsook relaties tussen werkgerelateerde factoren, diabetesregulatie en mogelijkheden voor aanpassingen in het werk. Die aanpassingen bevorderen optimaal functioneren. Op basis van de literatuur kan geconcludeerd worden dat diabetes zeker invloed heeft op de werksituatie van mensen met diabetes, hoewel de resultaten van verschillende studies niet consistent zijn. De meeste studies geven ook aan dat werknemers met diabetes, in vergelijking met gezonde werknemers, vaker verzuimen, vaker (gedeeltelijk) arbeidsongeschikt worden verklaard en vaker werkloos zijn. Het lijkt erop dat oudere werknemers en werknemers in specifieke beroepsgroepen een groter risico dragen. Uit de literatuur wordt echter niet duidelijk waarop eventuele

verbeteringen zich zouden moeten richten: op de werksituatie, op de persoonsgebonden, of op diabetesgerelateerde aspecten. Dit geeft aan dat er meer kennis en inzichten nodig zijn over werkgerelateerde processen en de verbetering daarvan.

Werknemers met diabetes verschillen van gezonde werknemers omdat ze meer risico lopen op vermoeidheid en vermoeidheidsgerelateerde klachten. Dat is de aanname die we allereerst in onze studies hebben willen onderzoeken. De studie zoals beschreven in **hoofdstuk 3** bevat een vergelijking van de werksituatie en de gezondheidssituatie van werknemers met diabetes (N=141) met die van gezonde werknemers (N=8946) en werknemers met andere chronische aandoeningen (migraine, reuma, COPD, of chronische rugklachten; N=1883). Op basis van gegevens van het eerste meetmoment van de Maastrichtse Cohort Studie (MCS) naar vermoeidheid in de werksituatie zijn verschillen tussen de groepen in achtergrondvariabelen, werkkenmerken, leefstijl, en vermoeidheidsgerelateerde gezondheidsvariabelen onderzocht. De MCS onderzocht gedurende drie jaar een heterogene steekproef van werknemers die werkzaam zijn bij 45 verschillende organisaties in Nederland. Odds Ratio's werden berekend voor chronische vermoeidheid, herstelbehoefte, burnout en 'distress'. De resultaten lieten zien dat werknemers met diabetes vaker op regelmatige tijden werken en minder vaak overwerken dan andere groepen van werknemers. Wanneer er geen sprake is van co-morbiditeit (de aanwezigheid van één of meer andere chronische aandoeningen) rapporteren werknemers met diabetes niet meer gezondheidsklachten dan gezonde werknemers, met uitzondering van depressieve klachten. Co-morbiditeit hangt samen met een duidelijke toename van vermoeidheidsgerelateerde klachten. Dit is de reden dat we professionals adviseren extra aandacht te besteden aan werknemers met meerdere chronische aandoeningen.

In **hoofdstuk 4** wordt een studie beschreven naar de relaties tussen werkgerelateerde factoren zoals gedefinieerd door het JDCS model (taakeisen, regelmogelijkheden en sociale steun), diabetesgerelateerde belasting (symptomen, ernst van de aandoening, zelfmanagementactiviteiten en ziekteduur) en vermoeidheid. Data van 292 werknemers met diabetes werden geanalyseerd. Zowel werk- als diabetesgerelateerde variabelen bleken samen te hangen met vermoeidheid. Regressieanalyses lieten zien dat 19.1% van de variantie van vermoeidheid verklaard wordt door de werkgerelateerde factoren. Gebrek aan sociale steun en de interactie tussen taakeisen en gebrek aan regelmogelijkheden dragen significant bij aan de verklaring van vermoeidheid. Daarnaast verklaren diabetesgerelateerde variabelen nog eens 29.0% van de variantie, waarvan de ervaren symptomen van de ziekte het belangrijkste deel verklaren. Daarnaast is de belasting die aanpassing van

insulinemedicatie aan de omstandigheden met zich meebrengt van belang. Er is sprake van meer vermoeidheid wanneer werknemers minder steun ervaren van collega's en de leidinggevende, er sprake is van hoge werkeisen gecombineerd met weinig regelmogelijkheden, het aanpassen van insuline aan de omstandigheden als belastend wordt ervaren en bij meer diabetesgerelateerde symptomen. Verder bleek dat veel diabetesgerelateerde symptomen en een hoge ervaren belasting van het aanpassen van de insulinedosering vooral samenhangen met vermoeidheid wanneer er ook nog sprake is van hoge taakeisen. Op basis van deze studie kan worden geconcludeerd dat werkgevers en leidinggevenden, maar ook bedrijfsartsen en internisten, zowel werk- als diabetesgerelateerde factoren in het oog moeten houden bij de begeleiding van werknemers met diabetes.

In **hoofdstuk 5** worden de relaties tussen verschillende aspecten van zelfmanagement en gezondheidsuitkomsten onderzocht. Bij zelfmanagement gaat het dan over de frequentie waarmee men activiteiten uitvoert en de mate waarin dit als last(ig) wordt ervaren. Gezondheidsuitkomsten betreffen HbA_{1c}%, diabetesgerelateerde symptomen, vermoeidheid, depressieve klachten en ervaren kwaliteit van leven. Afzonderlijke t-toetsen werden uitgevoerd voor werknemers met diabetes type 1 en type 2, om de gemiddelden op de gezondheidsmaten te vergelijken tussen werknemers die frequent dan wel infrequent zelfmanagementtaken uitvoeren en tussen werknemers die dit wel of niet als lastig ervaren. In de eerste plaats blijkt dat de meeste werknemers frequent (dat wil zeggen dagelijks) de verschillende activiteiten uitvoeren. Dit betreft injecteren van insuline (96.1%), rekening houden met voedingsrichtlijnen (70.8%) en regelmatig eten (65.6%). Zelfmanagement gerelateerd aan voeding wordt als meest lastig ervaren (70.4%), terwijl het injecteren van insuline als minst lastig wordt gezien (12.8%). De ervaren belasting blijkt meer gerelateerd aan gezondheidsmaten dan de frequentie waarmee men zelfmanagementactiviteiten uitvoert. De frequentie is bij werknemers met type 1 diabetes voornamelijk gerelateerd aan HbA_{1c}%. Werknemers met type 2 diabetes die zeer regelmatig rekening houden met de voedingsrichtlijnen rapporteren een betere gezondheid. Deelnemers die taken gerelateerd aan voeding en het spuiten van insuline lastig vinden, rapporteren een slechtere gezondheid. Aangezien de frequentie en belasting van het uitvoeren van zelfmanagementactiviteiten verschillende verbanden vertonen met de gezondheidsmaten, kunnen beide aspecten daarom beter apart worden gemeten. Ook zullen tijdens een evaluatie- of coachingsgesprek zowel de frequentie als de belasting apart bij de betrokken werknemer nagevraagd moeten worden.

Verschillende factoren kunnen het uitvoeren van zelfmanagementactiviteiten bemoeilijken. Dat is de reden dat in **hoofdstuk 6** een studie wordt beschreven naar relaties tussen demografische factoren, componenten van het JDCS model, coping, sociale steun in de privé-situatie en 'self-efficacy' in relatie tot het zelfmanagement van diabetes. Het voornaamste onderzoeksdoel was te bepalen of en hoe werk-gerelateerde en meer persoongebonden factoren samenhangen met de frequentie waarmee mensen zelfmanagementactiviteiten uitvoeren en met de ervaren belasting daarvan. De resultaten geven aan dat werknemers met een hoge werkdruk het injecteren van insuline als meer belastend ervaren dan werknemers met een lage werkdruk. Sociale steun hangt bij mensen met type 2 diabetes positief samen met de frequentie waarmee met voedingsrichtlijnen rekening gehouden wordt en hangt bij mensen met type 1 diabetes negatief samen met de ervaren belasting ervan. Met betrekking tot persoonlijke factoren blijkt dat een vermijdende copingstijl vooral samenhangt met het minder frequent controleren van de bloedsuikerwaarde en met een grotere ervaren belasting van het controleren van de bloedsuikerwaarden. Personen die zichzelf niet in staat achten om zelfmanagementtaken uit te voeren (een lage mate van 'self-efficacy') vinden het uitvoeren van alle zelfmanagementactiviteiten over het algemeen lastiger dan personen met een hoge mate van 'self-efficacy'.

Om een beter beeld te krijgen van de causaliteit van de relaties tussen werkfactoren en vermoeidheid werd een longitudinale studie uitgevoerd, die staat beschreven in **hoofdstuk 7.** Er werd onderzocht of ongunstige werksituaties na een jaar leiden tot meer vermoeidheid of dat vermoeidheid invloed heeft op de ervaren werkeisen, regelmogelijkheden en sociale steun. Voor het onderzoek werden vragenlijstgegevens gebruikt van 225 werknemers met diabetes die insuline injecteren en die tweemaal de vragenlijst hebben ingevuld met een interval van een jaar. De vragenlijsten hebben betrekking op de ervaren werksituatie (taakeisen, regelmogelijkheden en sociale steun op het werk), vermoeidheid en diabetesgerelateerde symptomen. De variabelen werden tweemaal gemeten. Op basis van deze gegevens werden met verschillende LISREL-analyses causale verbanden getest tussen de aparte werkgerelateerde variabelen en vermoeidheid. De fit van de data bij de verschillende modellen werd getoetst met behulp van een 'two-wave-two-variables model'. De analyses werden apart uitgevoerd voor werknemers met type 1 en type 2 diabetes en voor werknemers met weinig en met veel diabetesgerelateerde symptomen. Een gebrek aan sociale steun bleek in de tijd positief samen te hangen met vermoeidheid bij werknemers met veel diabetessymptomen. Dit betekent dat deze groep werknemers, die weinig steun ervaren op het werk, een jaar later meer vermoeidheid rapporteren. De relatie tussen sociale steun en vermoeidheid bij werknemers met weinig symptomen bleek omgekeerd.

Wanneer zij veel vermoeidheid rapporteren, ervaren zij een jaar later meer steun van collegae en leidinggevende. Aangezien deze relatie zwak is, moeten de resultaten met voorzichtigheid geïnterpreteerd worden. Hetzelfde geldt voor de invloed van vermoeidheid op de werkeisen bij werknemers met type 1 diabetes. Bij hen leidde vermoeidheid tot minder taakeisen een jaar later. Dit zou erop kunnen wijzen dat vermoeide werknemers actief naar mogelijkheden zoeken om hun werkeisen te verminderen en succesvol zijn in het genereren van sociale steun. Het meest in het oogspringende resultaat uit deze longitudinale studie is het feit dat sociale steun voor mensen met veel diabetessymptomen een positief effect heeft op het vermoeidheids-niveau na een jaar. Werknemers die veel klachten ervaren van hun ziekte zijn blijkbaar gebaat bij steun van hun collega's en leidinggevende. Dit geldt niet zondermeer voor andere werknemers.

Een aantal deelnemers werd op basis van de hierboven vermelde resultaten geselecteerd voor een aanvullend interview. De interviews hadden tot doel de kwantitatieve resultaten verder te exploreren en te verhelderen. Daarnaast konden ze meer inzicht geven in de persoonlijke beleving van de ziekte en de werksituatie. Alleen diegenen die veel diabetesgerelateerde symptomen rapporteerden werden geselecteerd aangezien we uit eerdere studies concludeerden dat zij een hoger risico lopen op het ontwikkelen van vermoeidheidsklachten. Werknemers met veel (n=8) en weinig vermoeidheidsklachten (n=9) werden met elkaar vergeleken. Beide groepen waren vergelijkbaar qua sekseverdeling, leeftijd, opleidingsniveau, werksituatie en type diabetes. De resultaten van deze studie zijn te vinden in **hoofdstuk 8**.

De gegevens werden verzameld door middel van open interviews, waarin werd gevraagd naar achtergrondgegevens, ervaren belastingen door werk en diabetes, cognities, copingstijl en sociale steun met betrekking tot diabetesgerelateerde symptomen, zelfmanagement, vermoeidheid en (werk)stress. Belangrijke verschillen tussen mensen met veel en weinig vermoeidheidsklachten werden gevonden met betrekking tot coping met het werk, diabetes en betekenisverlening. Weinig vermoeide werknemers zijn eerder geneigd te zoeken naar actievere, probleemgerichte copingstrategieën. Door hen wordt flexibiliteit in het werk als positief ervaren. Mogelijk geeft deze wens opties om de eisen die de ziekte aan hen stelt te integreren in hun werkleven. Vermoeide werknemers daarentegen lijken zich eerder hulpeloos te voelen en zijn geneigd meer passieve copingstrategieën te hanteren. Hun gedrag lijkt te worden beheerst door de dubbele belasting van hun ziekte en de eisen die het werk stelt. Flexibiliteit in het werk lijkt op het eerste gezicht te conflicteren met het gestructureerde en regelmatige leven dat zij nodig hebben om medisch verantwoord met diabetes om kunnen gaan. Deze resultaten onderstrepen het belang van de

aandacht voor persoonsgebonden factoren naast het belang van werk- en diabetesgerelateerde factoren wanneer we vermoeidheid willen voorkomen of verminderen bij werknemers met diabetes.

In **hoofdstuk 9** worden de resultaten van de hierboven beschreven studies in samenhang beschouwd. Daarnaast worden methodologische overwegingen en aanbevelingen voor verder onderzoek en de praktijk beschreven. Beperkingen van het onderzoek hebben betrekking op de representativiteit van de onderzoekspopulatie, de generaliseerbaarheid naar werknemers met type 2 diabetes die niet met insuline worden behandeld, de overlap tussen metingen van vermoeidheid en diabetesgerelateerde symptomen en uitspraken over causaliteit. Wat betreft de implicaties voor verder onderzoek konden we vaststellen dat vragenlijsten die zelfmanagement van mensen met diabetes meten niet alleen de frequentie waarmee zelfmanagement-activiteiten uitgevoerd worden in kaart moeten brengen, maar ook moeten vaststellen hoe lastig mensen dit vinden. Daarnaast zou onderzoek naar de verschillen tussen vermoeidheid gerelateerd aan het uitvoeren van activiteiten, fysiek en mentaal, en vermoeidheid samenhangend met diabetes beter zicht kunnen geven op het fenomeen vermoeidheid bij mensen met diabetes. Verder zijn praktische aanbevelingen geformuleerd voor bedrijfsartsen, leidinggevenden, werkgevers, coaches op het werk en andere professionals op de werkplek. De resultaten van onze studies ondersteunen de visie dat mensen met diabetes niet automatisch op basis van hun ziekte gestigmatiseerd zouden moeten worden. Wel moet men extra alert zijn op en aandacht schenken aan die werknemers die veel klachten ervaren door hun diabetes. Juist bij deze groep zullen behoeften en mogelijkheden om de werkdruk te verlagen en (extra) sociale steun te genereren effectief zijn. Zo kan onnodige instroom in de ziektewet en de WAO worden voorkomen. Naast aanbevelingen voor professionals op de werkplek zijn ook aanbevelingen voor de klinische praktijk beschreven. Er is alles voor te zeggen om extra aandacht te schenken aan werknemers met meerdere chronische aandoeningen en aan werknemers met een lager opleidingsniveau, aangezien zij meer kans hebben om vermoeidheidsklachten te ontwikkelen. Het is goed wanneer artsen zich bewust blijven van de kracht van hun adviezen met betrekking tot zelf-management en manieren om dit makkelijker te integreren in het dagelijkse leven. Dat is vooral van belang voor werknemers die het uitvoeren van zelfmanagement-activiteiten lastig vinden, aangezien zij een slechtere gezondheid rapporteren. Ook kan het voor het vergemakkelijken van zelfmanagement en het aanpassen van adviezen bevorderlijk zijn na te gaan hoe mensen met diabetes omgaan met stressoren en of zij het gevoel hebben dat zij in staat zijn goed met hun diabetes om te gaan.

Op basis van de resultaten uit dit proefschrift concluderen we dat mensen met diabetes zeer waardevolle werknemers kunnen zijn, zo nodig met extra steun van collega's en leidinggevende. Deze steun hebben zij vooral nodig wanneer zij veel symptomen van de diabetes ervaren. Om vermoeidheid te voorkomen blijft het daarnaast een uitdaging om bloedsuikerwaarden in balans te houden. Aan het eind van hoofdstuk 9 worden de meest opvallende conclusies nog eens samengevat. Alles overziende kan worden gesteld dat wanneer bepaalde aandachtspunten in het oog worden gehouden, werknemers met diabetes goed kunnen functioneren en competente werknemers zijn.

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Curriculum vitae

Iris Weijman werd op 18 maart 1976 geboren in Utrecht. Van 1988 tot 1994 doorliep zij het VWO aan het Baarnsch Lyceum te Baarn. Daarna startte zij met de opleiding psychologie aan de Universiteit Utrecht en koos voor de studierichting gezondheidspsychologie. In haar stage kwam ook de interesse voor de arbeids- en organisatiepsychologie aan bod. Nadat zij de opleiding in 1998 afrondde en begin 1999 haar doctoraaldiploma in ontvangst nam, is zij kort daarna met haar promotieonderzoek bij het Universitair Medisch Centrum Utrecht begonnen. Hier kwamen de interesses voor de verschillende gebieden binnen de psychologie weer bij elkaar. Vanaf begin 2004 heeft zij het onderzoek afgerond naast haar nieuwe baan als persoonlijk begeleider bij de afdeling Werkhervatting en Reïntegratie van OCA.

Naast het onderzoek is zij betrokken geweest bij de Werkgroep Onderzoekers in de Psychologie (WOP) van het Nederlands Instituut voor Psychologen (NIP). Tevens was zij lid van de promovendiraad van de onderzoeksschool Psychology and Health (P&H), waar zij tevens enige tijd de promovendi heeft vertegenwoordigd in het bestuur van P&H. Vanaf 1998 tot heden is zij redactielid van het Praktijkboek Gezond Werken, dat wordt uitgegeven door Reed Business Information.