

Willem van Rhenen

From stress to engagement

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ArboNed B.V.

Coronel Institute, AMC, University of Amsterdam

Opgedragen aan mijn gezin en mijn ouders.

Funding: The studies in this thesis are supported by
ArboNed B.V. and by a grant of ZonMW

Coverillustration: Lydia van Rhenen
Lay-out and design: Pre Press Buro Booij, Huis ter Heide
Published by: ArboNed B.V.
Printed by: Ponsen & Looijen bv, Wageningen
ISBN/EAN: 978-90-813145-1-0

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From stress to engagement

Academisch Proefschrift

ter verkrijging van de graad van doctor
aan de Universiteit van Amsterdam
op gezag van de Rector Magnificus
prof. dr. D.C. van den Boom
ten overstaan van een door het college voor promoties
ingestelde commissie,
in het openbaar te verdedigen in de Aula der Universiteit
op woensdag 25 juni 2008, te 14:00 uur

door

Willem van Rhenen
geboren te Driebergen

Promotiecommissie

Promotores: Prof. dr. F.J.H. van Dijk
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Contents

Chapter 1	<i>Introduction</i>	7
Chapter 2	<i>The Four-Dimensional Symptom Questionnaire (4DSQ): Measuring distress and other mental health problems in a working population</i> Work and Stress 2004;18(3):187-207 Terluin B, Van Rhenen W, Schaufeli WB, De Haan M.	23
Chapter 3	<i>Distress or no distress, that's the question: A cutoff point for distress in a working population</i> J Occup Med Toxicol 2008;3:3 Van Rhenen W, Van Dijk FJH, Schaufeli WB, Blonk RWB.	53
Chapter 4	<i>The effect of a cognitive and a physical stress-reducing programme on psychological complaints</i> Int Arch Occup Environ Health 2005;78(2):139-48 Van Rhenen W, Blonk RWB, van der Klink JJL, van Dijk FJH, Schaufeli WB. . .	71
Chapter 5	<i>Can sickness absence be reduced by stress reduction programs: on the effectiveness of two approaches</i> Int Arch Occup Environ Health 2007;80(6):505-15 Van Rhenen W, Blonk RWB, Schaufeli WB, van Dijk FJH.	91
Chapter 6	<i>Coping and sickness absence</i> Int Arch Occup Environ Health 2008;81(4):461-72 Van Rhenen W, Schaufeli WB, van Dijk FJH, Blonk RWB	115
Chapter 7	<i>Do job demands, job resources and personality predict burnout and work engagement? A two-sample study</i> Submitted Van Rhenen W, van Dijk FJH, Schaufeli WB	139
Chapter 8	<i>Discussion</i>	163
Chapter 9	<i>Summary</i>	183
Chapter 10	<i>Samenvatting</i>	195
	Curriculum vitae	207
	Naschrift.	209

Chapter 1

Introduction

The main objectives of this thesis are to evaluate the assessment of stress complaints in occupational health surveillance; to evaluate the extent to which two stress-reducing programs are able to reduce psychological complaints and sickness absence; to study the role of coping in the sickness absence process; and to identify predictors of burnout and work engagement. As these objectives make clear, stress and the management of stress are central themes of the thesis.

Job stress: A short introduction

The roots of modern occupational health services can be traced back to doctors in the late-19th century who not only treated patients with work-related injuries or illnesses, but also recommended preventive measures (Gochfeld 2005a). Thackrah (1831), for example, recognized that dust affected the lungs of miners and metal workers, and drew a connection between trades involving high levels of exposure to dust and tuberculosis. He wrote a treatise on the removal of workplace hazards and campaigned to promote longevity. Thackrah is an exponent of an era in which particular attention was paid to social and physical occupational health issues, such as setting limits on the number of hours that women and children could work, workers' compensation, and compensability of various diseases (Josephson, 1934). In addition, it was an era in which occupational health services were developed in a number of industries in the United States (Gochfeld 2005b).

The practice of the occupational physician has evolved since that time, keeping pace with the needs of society, organizations, employers, and the modern workforce (Hooker 2004). The focus of occupational health has changed as a result. Occupational health services are now driven by one of the hallmarks of modern society: the fact that organizations and self-employed workers have to adapt to rapidly-changing markets,

increased competition and growing demand. This transition has had negative consequences for managers and employees, however. Changing conditions have generated high levels of job stress for many managers and employees, impacting on their health and well-being, and resulting in particular attention being paid to what had been a relatively new area in occupational health practice.

To counter the negative aspects of modern labor conditions, occupational health services are increasingly focused on issues such as mental workload, job stress, and the resulting strain and consequences for workers' health. And not without reason; the *Fourth European Working Conditions Survey* (Parent-Thirion et al. 2007), which was commissioned by the European Foundation for the Improvement of Living and Working Conditions, reveals that job stress affects more than two out of every ten (22.3%) European workers. In the Netherlands, the figures are even more alarming: in 2006, circa 29% of employees reported working under stress (Van den Bossche et al. 2007). Moreover, the societal costs of related absenteeism and disability are enormous. The percentage of sickness absence due to work- and stress-related Repetitive Strain Injuries, and work- and stress-related mental disorders in the Netherlands is estimated to be 3.8-6.2% and 3.6-6.3% respectively (Blatter et al. 2005).

In order to limit the economic costs of treatment, more prevention and health promotion is needed. Treatment of stress in the workplace has been predominantly studied from the perspective of the individual, with the aim of reducing the effects of stress, instead of dealing with actual stressors in the workplace (Jordan et al. 2003). One reason for this may be that in general, managers only act when forced to do so and when clear intervention strategies are available. Nevertheless, several authors (Jordan et al. 2003; Elo et al. 1998) promote the merits of preventive interventions at earlier stages in the process, maintaining that it is better to prevent than to cure. Little research exists, however, on the effectiveness of preventive interventions, and those findings that are available are inconclusive (Houtman 2005).

Very recently, the focus of job-related stress practice and research shifted in the opposite direction, towards "work engagement", a state characterized by high levels of energy, dedication, and immersion in work activities (Schaufeli and Salanova 2007). This new focus is in line with health-promotion programs

and coincides with the rise of so-called “positive psychology”, which focuses on individuals’ strengths and optimal functioning. Unfortunately, the potential positive effects of work, such as work engagement, are still underestimated in occupational health practice.

The economic consequences of job stress

Stress has become a major problem in the Netherlands, especially for organizations, employees, and employers. In Dutch organizations, work-related stress has increasingly become a mental, rather than physical, phenomenon (Van der Klink and Van Dijk 2003). Nearly 30% of employees are working under stress in the Netherlands (Smulders and Van den Bossche 2007). This corresponds with earlier research carried out by Bültmann et al. (2002), which found a stress prevalence of 23% in a large cohort of workers in the Netherlands; and by Verhaak (1995), who estimated a 15-25% prevalence of stress in western populations in the mid-1990s. Despite these figures, and despite the impact of stress on workers’ performance and productivity, and on organizations’ profitability and success (Tangri 2003), many organizations feel uncomfortable when it comes to dealing with stress. This is partly due to the fact that stress can appear nebulous and hard to quantify. Another reason is that the causes of stress can be linked to personal issues that are not related to an individual’s job.

Stress has an effect on people’s health, and thus on employees. A number of mental and physical disorders have been linked to stress, including: depression (Munce et al. 2006; Wiesner et al. 2005; Wang and Patten 2001); anxiety (Melchior et al. 2007); hypertension (Peter and Siegrist 1997; Luders et al. 2006); susceptibility to infections (Mohren et al. 2003); heart attacks (Kivimaki et al. 2006; Hemingway and Marmot 1999); cancer (Bryla 1996); rheumatoid arthritis (Straub et al. 2005); and multiple sclerosis (Heesen et al. 2007; Mohr 2007). Curiously, only one meta-analytic study (Yu et al. 2007) has addressed job stress and general health outcomes for diseases other than coronary heart disease. This study analyzes 354 journal articles and dissertations that investigate the association between stress and health in Taiwan between 1980 and 2003. Meta-analytic correlations between general stress and general health, as well as between general stress and various health indicators, show an average of 0.36. According

to Cohen's guidelines (Lipsey and Wilson 2001), this can be qualified as a "medium" size effect ($r \geq 0.25$), bordering on "large" ($r \geq 0.40$).

Lastly, aside from its impact on employees' health and well-being, stress also has a significant economic impact on organizations. Sickness absence in the Netherlands due to work- and stress-related RSI, and to work- and stress-related mental disorders, results in annual costs of 2.1 billion euros and 4 billion euros respectively (Blatter et al. 2005). This corresponds with data from Koningsveld et al. (2003), who calculate that 45% of the total costs of absenteeism and disability in the Netherlands (12 billion euros) is due to job stress-related sick-leave and disability. A survey of employers in the UK reveals that absenteeism costs business around 10.5 billion pounds annually (CBI/PPP 2000). The UK Health and Safety Executive (HSE) estimates that 10.5 million working days were lost in Britain in 2005-2006 due to stress, work-related depression, or anxiety (HSE 2006). Since job stress appears to lead to diagnosable depression and anxiety in previously healthy workers (Melchior et al. 2007), these figures are in line with a European work-related public health report on cardiovascular diseases and mental ill-health (Bödeker and Klindworth 2007). In this report, mental disorders are associated with a loss of three times more working days than for people with no mental disorder, and constitute 30% of the total number of early retirements in Sweden and Germany. Mental disorders are also responsible for poor workplace performance or loss of productivity ("presenteeism"). In the Netherlands, one in four employees report complaints suffered during sickness absence as (largely) work-related (Houtman et al. 2006). According to this latter study, the main work-related causes of sickness absence (35%) are job demands and job stress.

We should briefly comment on estimations of stress-related costs. The *New York Times* reported on 5 September 2004 that "workplace stress costs the nation more than 300 billion dollars each year in health care, missed work and the stress-reduction industry that has grown up to soothe workers and keep production high". At the same time, the International Labour Organization (ILO) cites a study by the European Agency for Safety and Health at Work which states that half of the 550 million working days lost each year due to absenteeism are stress-related. These figures result from taking different approaches to the same problem. The 300 billion-dollar price tag comes from the American Institute of Stress (AIS), which explains that this figure includes: "accidents, absenteeism, employee

turnover, diminished productivity, direct medical, legal, and insurance costs, workers' compensation awards as well as tort and FELA [Federal Employers' Liability Act] judgments". Notably, the AIS derives its statistics from Albrechts' book, *Stress and the Manager* (1979). In this book, the author warns that, "Any attempt to estimate a dollar cost of chronic stress in a business organization or in American business in general, would of course involve gross guesswork and speculation". Consequently, the author himself speculates as follows: he *guesses* an absenteeism rate due to stress; *guesses* a turnover rate due to stress; *guesses* an "overstaffing" cost for reduced productivity due to stress; and estimates a cost per absentee day per worker. Taken as a whole, then, our suggestion would be not to over-state the accuracy of such figures.

The management of job stress: The need for care

It is clear that giving guidance on how to manage job stress, including the resulting strain, health problems, and in particular the mental workload, has become increasingly important. Companies, governments, occupational health care services, and other health organizations are trying to cope with these problems by developing interventions to prevent or reduce work-related stress. These interventions can be roughly categorized as organizational-focused programs (aiming to change the occupational environment) and individual-focused programs (aiming to increase individual mental resilience) (Van der Klink et al. 2001). These are usually referred to as "job redesign" and "stress management training" respectively (Murphy et al. 1995; Semmer 2006). Although the term "stress management training" implies a relatively uniform set of intervention strategies, it generally refers to a mixture of treatment techniques. In practice, two main intervention types can be distinguished: psychological interventions, such as cognitive-behavioral and client-centered approaches; and physical interventions, such as muscle relaxation and physical exercise. Both types of programs aim to improve mental health, but each uses a different approach. Interventions including muscle relaxation and physical exercise aim to improve mental health by reducing physiological arousal (Benson et al. 1975; Salmon 2001; Byrne and Byrne 1993; Folkins and Sime 1981; Plante and Rodin 1990). By contrast, individual-focused interventions based on cognitive behavioral therapy-oriented techniques aim to reduce complaints by means of changing appraisal processes (cognition) and enhancing

coping skills (behavior) (Lazarus and Folkman 1984; Meichenbaum and Deffenbacher 1988a; Meichenbaum and Deffenbacher 1988b).

The management of job stress: From cure to prevention

Until now, in their attempts to reduce “stress” in the work setting, occupational physicians have mainly focused on the reduction of the psychological, social, medical, and economic effects, instead of dealing with the early signs of stress (such as initial feelings of strain) and related interventions, or interventions to control the stressors themselves. This is reflected in companies’ and employers’ investments. Most companies have invested substantially in stress management programs, such as individual stress management training that is focused on individuals suffering from stress or its consequences, without giving due attention to sources of strain or stress in the organization. One reason for this might be that no evidence-based strategies are available to deal with particular stressors or the first indications of strain (Cooper et al. 2001).

When dealing with the prevention of stress in the workplace, several options are available. These can be termed primary, secondary, and tertiary levels of stress intervention (Murphy 1988). *Primary prevention* eliminates the sources of stress in organizations by focusing on changing the physical and psychosocial environment. One logical consequence of this, for example, is to match work to individual needs, and to grant workers more control over their work environment (Cooper et al. 2001). Improving communication processes, redesigning jobs, and involving employees in decision-making processes are all examples of primary prevention interventions. *Secondary prevention* helps at-risk workers to manage stress as the first point of departure, with or without trying to eliminate or modify job stressors themselves. Stress management programs help workers to identify symptoms of stress and to acquire or improve their coping skills. *Tertiary prevention* strategies aim to assist individuals who are experiencing ongoing problems arising either from the work environment or from their jobs. The purpose of such programs is to adapt individual behavior and lifestyles, with little reference to job stressors.

According to Kompier and Cooper (1999), stress intervention practice is currently more focused on secondary and tertiary prevention strategies

than on primary prevention. That is, practice is concentrating on reducing the effects of stress on individuals, and failing to reduce actual stressors from work. Interventions designed to reduce occupational stress that aim to change the occupational context are relatively scarce, and difficult to analyze. The absence of a widely-accepted taxonomy for organizational interventions makes it difficult to analyze their effectiveness (Wensing et al. 2006). Moreover, it is difficult for the occupational physician to analyze and influence the wide range of organizational approaches to changing occupational contexts, such as those focusing on leadership, process redesign, breakthrough series, organizational culture interventions, organizational learning, and so forth. Organizational interventions are therefore not the first concern of this thesis.

The management of job stress: From prevention to health promotion

Until recently, occupational health services were predominantly concerned with ill-health and lack of well-being. Despite the many publications on stress, burnout, depression, anxiety disorders such as post-traumatic stress disorders, and related interventions indicated above, our knowledge of how optimal, “healthy” employees function is still very limited. Tetrick (2002) argues that it is unlikely that the same mechanisms underlying ill-health also constitute healthy and optimal functioning. Hence, traditional models that are based on malfunctioning and disorders need to be supplemented by “wellness” models that focus on positive aspects of occupational health. One such recent construct is that of “work engagement” (see Schaufeli and Salanova, 2007, for a review). Work engagement is a state characterized by high levels of energy, dedication, and immersion in work activities. Indeed, work engagement is considered to be the opposite of burnout, which is characterized by exhaustion and cynicism. By contrast, engaged workers are proactive, committed, and take initiative. Such employees are not classified as workaholics, however, because the latter are propelled by an inner drive that they cannot resist, rather than being intrinsically motivated (Schaufeli and Bakker 2004). Recent research has shown that work engagement is positively linked to job resources (e.g. social support), self-efficacy, good work performance, and positive attitudes (e.g. organizational commitment) (Schaufeli and Salanova, 2007). It is assumed that work engagement plays a crucial role in the motivational process that

leads to positive outcomes, such as high levels of performance at work (Schaufeli and Salanova, 2007).

The origins of this thesis

This thesis grew out of the “stress research line” that started during the 1980s, as outlined in the excellent account by Schaufeli and Kompier (2001). In the 1990s, the Dutch government initiated research programs on job stress in order to develop instruments, tools, and knowledge for professionals. The government did so in response to the fact that sickness absence and work disability rates due to work-related mental problems were rising at an alarming rate. One result of this investment was the *Work Stress Handbook* (Kompier and Marcelissen 1990), which provided both a theoretical and practical framework for the prevention of job stress at company level. It pleaded for a systematic and step-by-step approach, and for stress audits as a basis for preventive measures. Several instruments were developed, such as a practical instruction manual on stress prevention by which employers could measure stress and identify high-risk groups (Kompier et al. 1990). A number of studies on identifying risk factors and high-risk groups were carried out (Houtman and Kompier 1995), and questionnaires on job stress were developed (Houtman et al. 1998). The development of evidence-based practice guidelines for occupational health physicians was a key aim.

One such project was carried out in the Dutch telecommunications company, KPN Telecom, and the research items resulted in this thesis. A health survey was organized for KPN Telecom that was based on a manual written by Janssen et al. (1996), which contained detailed guidelines on how to set up programs in organizations to reduce job stress and to promote workers' health. The manual puts forward a step-by-step approach. The five steps are: (1) preparation and introduction of the project; (2) problem identification and risk assessment; (3) choice of measures and planning of interventions; (4) implementation of interventions; (5) evaluation of interventions. In line with these steps, work on this thesis commenced in 1998. The immediate cause of the study was a request from the Board of KPN Telecom to perform an occupational health surveillance study that would focus on identifying stressed employees, so that KPN Telecom could offer them a stress reduction program.

KPN Telecom was, and still is, offering telecommunications services to both private consumers and business customers in the Netherlands. Its core activities are the provision of telephone and data services via the fixed network, and mobile telecommunications services. Almost two decades ago, the company was privatized. Due to market liberalization, it became increasingly important for the company to reduce prices, accommodate customer demands, and improve efficiency. As a consequence, KPN Telecom underwent many reorganizations, resulting in massive redundancies. This prompted the company to take even further-reaching measures, such as reassessing alliances, accelerating restructuring processes, and further reducing its workforce, all of which resulted in stress and strain for employees. Despite this, most employees loved their work and had long tenures with the company.

Given this situation, KPN's Executive Board requested its occupational health services to establish a new occupational health surveillance service, focusing initially on occupational stress, and later on work engagement. At that time, KPN's employees, managers, and executives were working under stressful circumstances. In addition to their daily work, the telecoms managers had to manage redundancy programs and mitigate the adverse effects of redundancy. Moreover, they had to coach the remaining employees and deal with fairness issues arising from the redundancies. Such managerial tasks called for social leadership whereas, as in many companies, most managers had been promoted because they were good at their jobs and had technical backgrounds.

The emergence of this thesis

There is an impressive body of published knowledge on stress, stress management, strain, stress-related problems, and its opposite, work engagement. Despite this, some questions remain. Within the context of occupational health surveillance, it has been possible to identify and address a number of these questions.

First, there has been relatively little research into instruments for assessing stress in occupational health care settings. A few years before this thesis commenced, Van der Klink et al. (2003) developed practice guidelines for occupational physicians in the Netherlands in relation to

mental health problems, with particular relevance to workers at KPN Telecom. The guidelines provided classification via a four-dimensional questionnaire (4DSQ) and recommendations for guidance and treatment on the basis of existing evidence and agreed procedures (Van der Klink and Van Dijk 2003). However, there was no evidence to demonstrate the psychometric properties of the 4DSQ in the general working population. In addition, it was not known how reliable this questionnaire would be as a screening instrument for psychological problems in the general working population. Adjusting the 4DSQ for the occupational health care setting identified the need of a cut-off point for distress that would be helpful for identifying high-risk groups for inclusion in preventive stress management programs. The validation of the 4DSQ, including the selection of a reliable cut-off point, could make a valuable contribution to evidence-based occupational health and is therefore the primary objective of this thesis.

Second, the effectiveness of the interventions needs to be addressed. To date, cognitive-behavioral interventions are considered to be superior to programs using relaxation techniques (Van der Klink 2001). Comparative outcome studies on the effectiveness of various interventions are rare, however. Comprehensive physically-oriented intervention programs have not been compared with cognitively-oriented intervention programs, for example. Furthermore, with a view to efficiency, a compact intervention program with a minimal number of sessions would be of interest. The second aim of this thesis, therefore, is to test the hypothesis that a compact, four-session, cognitively-oriented intervention is superior to a comparable physically-oriented intervention program.

The third issue to be addressed is the need to modify stress intervention programs to accommodate individual differences. A stressed employee's decision to go on sick leave or continue working, for example, is not just the result of his or her health status, but also depends on factors such as the extent to which the employee is able to cope with job stress, and the employee's personality. Identifying the mechanisms by which interventions are able to improve outcomes will facilitate the development of more effective and efficient prevention programs. Therefore, the final aim of this thesis is to study the role played by coping in the sickness absence process, and the role played by work characteristics and personality in the development of burnout and engagement.

Overview of the contents

In *chapter one*, the psychometric properties of the 4DSQ for a working population are evaluated. The results of an exploratory and confirmatory factor analysis are presented and discussed.

In the *second chapter*, a cut-off point for the 4DSQ's distress scale is established with a view to a challenging specificity and an appropriate negative predictive value.

The *third chapter* investigates the outcome effectiveness of the various interventions, in terms of the reduction of psychological complaints. The clinical significance of the effects is calculated.

In the *fourth chapter*, the effectiveness of cognitive- and physical-oriented interventions on sickness absence is evaluated. Five different measures of sickness absence periods are used: frequency, incidence rate, duration, length, and absenteeism-free intervals.

The *fifth chapter* looks at the role played by coping in the sickness absence process. Using the five dimensions of the Utrecht Coping List (UCL), the relationship between problem-solving coping strategies, reactive-passive coping strategies, and several sickness absence parameters is analyzed.

Chapter six identifies those job demands, job resources and personality factors that predict burnout and work engagement. This chapter reflects the shift in focus from a negative, disease-based orientation towards a positive, health-based orientation.

Lastly, the *seventh chapter* offers an overview of the main findings and conclusions from the previous chapters. The results are discussed at a more general level, and suggestions and recommendations are made regarding practical implications and future research.

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The Four-Dimensional Symptom Questionnaire (4DSQ): measuring distress and other mental health problems in a working population

Terluin B¹, Van Rhenen W², Schaufeli WB³, De Haan M¹

Work and Stress 2004;18(3):187-207

¹ Department of General Practice, Institute for Research in Extramural Medicine, VU University Medical Centre, Amsterdam, The Netherlands

² Coronel Institute, University of Amsterdam, Amsterdam, The Netherlands, and Department of Occupational Health Services, ArboNed, Utrecht, The Netherlands

³ Research Institute for Psychology & Health, Utrecht University, Utrecht, The Netherlands

Abstract

In non-clinical (working) populations it is important to differentiate between general distress, on the one hand, and psychiatric symptoms – depression, anxiety and somatization – on the other hand. The Four-Dimensional Symptom Questionnaire (4DSQ) is a relatively new instrument that measures these four symptom dimensions (Terluin, 1996). This study aimed to investigate the psychometric properties of the 4DSQ in a working population. A postal stress and health survey was sent to all employees of a Dutch telecom company, 51% of whom responded (N = 3,852). The mailing included the 4DSQ, a set of questionnaires concerning job stress (e.g. psychological demands), coping style (e.g. problem-focused coping, avoidant coping), and indicators of strain (e.g. emotional exhaustion, fatigue). Cronbach's α of the four sub-scales of the 4DSQ ranged from .79 to .90. Factor analysis showed four factors corresponding to the four scales of the 4DSQ: distress, depression, anxiety, and somatization. The validity of the 4DSQ was assessed using (partial) correlations with job stress, coping, and strain. As expected, the Distress scale showed the strongest correlations with the indicators of strain, as well as with job stress and coping. In conclusion, the 4DSQ is a reliable and valid instrument that can be used in a working population to distinguish between stress-related symptoms and psychiatric illness.

Keywords: four-dimensional symptom questionnaire; 4DSQ; distress; depression; anxiety; somatization; occupational stress; psychometric properties.

Introduction

Background

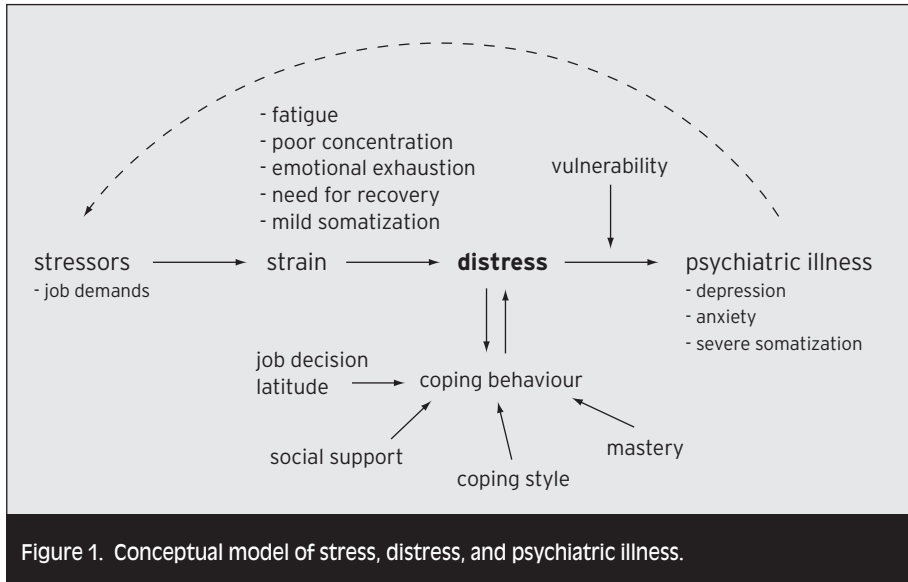
Psychological health complaints are highly prevalent, both in the community and in general medical settings (Goldberg and Huxley 1992). Based on data obtained from screening questionnaires, such as the General Health Questionnaire (GHQ) (Goldberg and Williams 1988), Verhaak (1995) reports the prevalence of psychological distress in the western world to be 15-25% in the community, and 25-45% in general practice. Also based on the GHQ, a 23% prevalence of psychological distress has been established in a Dutch working population of 12,000 employees (Bültmann et al. 2002). In most cases these complaints do not fit into a psychiatric classification system such as the Diagnostic and Statistical Manual of Mental Disorders, fourth edition (DSM-IV) (American Psychiatric Association 1994) or the International Classification of Diseases, tenth edition (ICD-10) (World Health Organization 1992). In fact, most people with psychological complaints are affected by the adverse effects of life stress, and only a minority suffers from psychiatric illness (Heath 1999; Middleton and Shaw 2000).

In primary care patients, Terluin (1994) identified four symptom dimensions that proved to be necessary and sufficient to describe the whole range of common psychological complaints: 'distress', 'depression', 'anxiety' and 'somatization'. The 'distress' dimension represents symptoms that result from the strain that is elicited by a stressor, as well as from the effort that has to be put into dealing with that stressor and maintaining an acceptable level of psychosocial functioning (Lazarus 1980). The 'depression' dimension represents depressive thoughts (including suicidal ideation) and loss of pleasure (anhedonia), i.e. symptoms that are characteristic of clinical depression (i.e. mood disorder) (Beck et al. 1979; Snaith 1987). The 'anxiety' dimension encompasses symptoms such as free-floating anxiety, panic attacks, phobic anxiety, and avoidance behaviour, i.e. symptoms that are characteristic of clinical anxiety (i.e. anxiety disorder) (American Psychiatric Association 1994). The 'somatization' dimension comprises 'psychosomatic' symptoms that represent bodily stress reactions when they are relatively few and mild, but psychiatric illness (i.e. somatization disorder or hypochondria) when the complaints are many and disruptive (Katon et al. 1991; Clarke and Smith 2000).

Terluin (1996) developed the Four-Dimensional Symptom Questionnaire (4DSQ) in order to measure these four symptom dimensions. In general practice, the 4DSQ enables the physician to distinguish between psychiatric illness and uncomplicated stress-related disorders (Terluin 1998). Although the 4DSQ was originally developed for use in primary care, it may also be useful in an occupational health care setting, e.g. in work stress surveys, and as a diagnostic tool to assess employees who are on sick leave for psychological reasons. In order to evaluate its reliability and validity in a working population, we included the 4DSQ in an occupational health survey among all employees of a large Dutch telecom company.

Conceptual framework

Figure 1 outlines the conceptual framework of stress, distress, and psychiatric illness, that is used in this paper. Essentially, this model distinguishes between distress and psychiatric illness. More specifically, distress is what people generally experience when they are ‘under stress’, whereas psychiatric illness is characterized by specific mental symptoms, such as anhedonia in the case of depressive illness, or uncontrollable fears in the case of anxiety disorder. With the word ‘stressors’ we refer to events or situations that potentially threaten a person’s well-being and habitual functioning. The direct effects of these stressors in terms of the psycho-biological changes in the individual are called ‘strain’. Some changes, like elevated blood pressure and altered immune responses, may go unnoticed by the individual under stress for a long time. Other changes, like reduced energy, tachycardia, and increased muscle tone, are more readily perceived, e.g. as fatigue, heart pounding, and myalgia. Distress refers to the psychological sequelae of strain. One component of distress is the conscious experience of strain that motivates a person to apply coping behaviour in order to minimise the influence of the stressor, and to mitigate strain and distress (Lazarus 1980). However, the appraisal of the situation and the effort that a person has to put into coping with the situation may also contribute to the distress. Worrying is an example of coping behaviour that usually increases distress. Hence, the experience of distress results partly from the strain and partly from the coping behaviour it promotes. To a certain extent, strain and distress are overlapping concepts. For instance, fatigue and poor concentration are clearly indicators of strain, but at the same time these symptoms are part of the subjective experience of distress.



While successful coping results in less distress, unsuccessful coping results in increased distress. Severe distress may ultimately result in a breakdown of coping, i.e. demoralization (Kates and Craven 1998; Frank 1973). This condition is generally called a 'nervous breakdown' by lay people, when they feel themselves unable to maintain their habitual level of social functioning (Rapport et al. 1998; Pfeffer and Waldron 1987). Interestingly, general practitioners and occupational physicians in the Netherlands use the term 'nervous breakdown' – also indicated by the French word 'surmenage' (i.e. 'over-strain') – as a diagnostic label in much the same way (Terluin et al. 1992). Indeed, patients who suffer from a 'nervous breakdown' are characterized by severe distress symptoms (Terluin 1994).

In some people, however, distress may cause psychiatric illness, depending on the presence of certain vulnerability factors that may be biological or psychological in nature (Mazure and Druss 1995; Dohrenwend 1998; Surtees and Wainwright 1999). In turn, psychiatric illness may act as a stressor that increases strain and distress. Therefore, individuals with mood or anxiety disorders exhibit a combination of distress and depression, or distress and anxiety symptoms (Clark and Watson 1991), along with a variable degree of somatization symptoms (Simon and Von Korff 1991). People suffering from a 'nervous breakdown' need reassurance and counselling with respect

to their life stress, and generally have a favourable prognosis (Van der Klink et al. 2003). On the other hand, individuals suffering from a psychiatric illness often need pharmacological intervention and specialized mental health care, and generally have a less favourable prognosis. While distress is something that every person experiences at some point in time, not everyone will experience a psychiatric illness.

Since this paper focuses on employees, psychological job demands are considered as stressors, and fatigue, poor concentration, emotional exhaustion and need for recovery are classified as indicators of strain. Furthermore, coping style, job decision latitude, social support and mastery are considered to be determinants of coping behaviour. Coping behaviour, which is an important element of the model, was not included in the present research. It should be noted, however, that we did not intend to test the model depicted in Figure 1. In this paper we focus on the psychometric properties of the 4DSQ. The model is presented as a conceptual framework to predict relationships between the 4DSQ-scales and other variables. The model will now be described in more detail.

Psychological job demands refer to psychological stressors involved in accomplishing the work load, stressors related to unexpected tasks, and stressors of job-related personal conflict (Karasek 1979). Although job demands are not necessarily negative, they may become job stressors when the effort required to meet those demands is high, and is therefore associated with high physiological and/or psychological costs that elicit distress. Accordingly, our model predicts a positive relationship between job demands and distress that is stronger than the relationship between job demands and psychiatric illness (depression, anxiety, and somatization). Moreover, the model predicts that the relationship between job demands and psychiatric illness is mediated by distress.

Job decision latitude refers to the employees' potential control over their tasks and the way in which they handle their work during the working day (Karasek, 1979). Job decision latitude increases the employee's possibilities to choose the most appropriate coping behaviour. Therefore, our model predicts a negative relationship between job decision latitude and distress that is stronger than that between job decision latitude and psychiatric illness, and that the relationship between job decision latitude and psychiatric illness is mediated by distress.

Social support refers to the perceived emotional and instrumental support received from co-workers and supervisors. Our model of stress, distress, and psychiatric illness predicts a negative relationship between social support and distress that is stronger than that between social support and psychiatric illness, and that the relationship between social support and psychiatric illness is mediated by distress. Hence, our expectations are in accordance with the Demand-Control-Support model that predicts high levels of distress when job demands are high, decision latitude is low, and social support is poor (Karasek et al. 1998).

People have many different ways of coping with the burdens that life puts upon them. Some ways of coping are more successful than others, also depending on the specific stressor(s) involved. Moreover, people are known to have certain preferences for the way in which they usually deal with their duties and difficulties; this is referred to as *coping style* (Schreurs et al. 1988). A number of coping styles have been found to be positively or negatively related to distress. For instance, ‘emotional coping’ refers to disclosing, expressing, and acting-out one’s emotions; ‘avoidant coping’ refers to a tendency to avoid being confronted with problems; ‘palliative coping’ refers to efforts to control negative emotions by means of distraction, or the use of psychoactive substances; ‘problem-focused coping’ refers to confronting the stressors and actively trying to find solutions; ‘social coping’ refers to seeking help and comfort from others (Schreurs et al. 1988). Generally speaking, ‘approach coping’ (i.e. problem-focused coping) (Roth and Cohen 1986) is associated with lower levels of distress (Higgins and Endler 1995). On the other hand, ‘avoidance coping’ (i.e. emotional coping, avoidant coping, and palliative coping) (Roth and Cohen 1986) is generally associated with higher levels of distress (Higgins and Endler 1995). Social coping is only weakly associated with distress (Penley et al. 2002). Our model predicts that the relationships between coping styles and distress are stronger than those between coping styles and psychiatric illness, and that the relationships between coping style and psychiatric illness are mediated by distress.

Personal psychological resources are considered to buffer negative consequences of psychosocial stressors (Pearlin and Schooler 1978). The concept of *mastery* refers to a particular personality trait, i.e. the extent to which one regards one’s life-changes as being under one’s own control,

in contrast to being ruled by fate. Our model predicts a relationship between mastery and distress that is stronger than that between mastery and psychiatric illness, and that the relationship between mastery and psychiatric illness is mediated by distress.

Emotional exhaustion is a feeling of being emotionally drained by an excess of (work) stress. It is thought to be a part of the burnout syndrome (Maslach et al. 2001). Like emotional exhaustion, *fatigue*, *poor concentration* and *need for recovery* are considered to be manifestations of strain (Beurskens et al. 2000; Jansen et al. 2002). Our model predicts relationships between these strain indicators and distress that are stronger than those between these strain indicators and psychiatric illness, and that the relationships between these indicators of strain and psychiatric illness are mediated by distress.

Methods

Participants

Within the framework of an occupational health survey with special focus on occupational stress, a set of questionnaires was mailed to all employees of a Dutch telecom company (N = 7,522). An accompanying letter explained that the purpose of the survey was to assess the employees' job stress, health, and well-being. The questionnaires were completed and returned by 3,852 employees (response rate 51%). The participants differed from the non-participants with respect to age, gender and salary group. The mean age of the participants was 43.9 (SD 8.1) compared to 40.7 (SD 9.3) for the non-participants ($p < .001$). Women (9% vs. 14%, $p < .001$) and employees in the lower salary group (41% vs. 53%, $p < .001$) were slightly under-represented.

Accidentally, one of the questionnaires, the Utrecht Burnout Scale (UBOS; see Section 2.2.) was not included in the mailing to the first 45% of the study population. Employees who had filled in the UBOS differed from the other participants in that women were under-represented (7% vs. 11%, $p < .001$), and blue collar workers were over-represented (45% vs. 35%, $p < .001$).

The Checklist Individual Strength (CIS; see Section 2.2.) was sent to a sub-sample of 792 employees as part of an invitation to participate in a

stress intervention-prevention programme. The sub-sample consisted of all employees with a 4DSQ-Distress score > 10 and an equally large random sample of employees with Distress scores ≤ 10 . The CIS was filled in by 361 employees (response rate 46%). The median interval between the mailings of the 4DSQ and the CIS was 45 days (range 2-221 days). The employees who had filled in the CIS differed from the other employees in that they had a higher level of education (high level of education 30% vs. 22%, $p < .001$) and a higher job position (blue collar workers 33% vs. 42%, $p < .01$).

Measurements

The following instruments were included in the survey.

- The Dutch version of the Four-Dimensional Symptom Questionnaire (4DSQ) with four scales: Distress (16 items, score range 0-32), Depression (6 items, score range 0-12), Anxiety (12 items, score range 0-24) and Somatization (16 items, score range 0-32) (Terluin 1996). The 50 items are scored on a 5-point response scale using the response categories: 'no', 'sometimes', 'regularly', 'often', and 'very often or constantly'. However, every symptom is rated as absent ('no'; 0 points), present at a clinically significant level ('regularly/often/very often'; 2 points), or doubtfully present ('sometimes'; 1 point). In clinical practice, this trichotomization is more useful than the more differentiated scoring in five categories. In an earlier study in general practice, based on this trichotomization, cut-off points that discriminate between 'cases' and 'non-cases' were established for Distress (score > 10) Somatization (score > 10), Depression (score > 2), and Anxiety (score > 8) (Terluin 1998). Although we have noticed that most people appreciate the differentiation that a 5-point scoring system offers, a more differentiated way of scoring assigns substantial weight to subjectively experienced severity of the symptoms. Such a scoring system gives room for response tendency, which is related to personality and situational factors. Some people habitually tend to exaggerate, while others tend to belittle their symptoms. Therefore, differences between people in response tendencies may spuriously increase correlations between variables. However, when clinicians are assessing symptoms, trying to arrive at a diagnosis, they tend to ignore most of the subjective colouring of response tendencies. For instance, a clinician translates 'unbearable headache' into 'headache: present'. The 'clinical' way of scoring symptoms therefore implies that the sum-score of the scale reflects primarily the number of symptoms rather than their subjective severity.

- Three scales of the Dutch version of the Job Content Questionnaire (JCQ): Psychological job demands (9 items, Cronbach's α .70), Job decision latitude (9 items, Cronbach's α .77), and Social support (the sum of 'co-worker support' and 'superior support', 8 items, Cronbach's α .79) (Karasek et al. 1998). The response options for each item vary on a 4-point scale from 'strongly disagree' (1) to 'strongly agree' (4). High scores signify high psychological job demands, high decision latitude, and high social support, respectively. We expected positive correlations with the 4DSQ-scores for Psychological job demands, whereas we expected negative correlations with the 4DSQ-scores for Job decision latitude, and Social support.
- The Utrecht Coping List (UCL), a validated Dutch questionnaire measuring five different habitual coping styles: Emotional coping (2 items, Cronbach's α .65), Avoidant coping (3 items, Cronbach's α .67), Palliative coping (4 items, Cronbach's α .68), Problem-focused coping (5 items, Cronbach's α .81), and Social coping (5 items, Cronbach's α .77) (Schreurs et al. 1988). The 4-point response scale ranges from 'rarely or never' (1) to 'very often' (4). High scores indicate a high tendency to apply the specified coping style. We expected positive correlations with the 4DSQ-scores for Emotional coping, Avoidant coping, and Palliative coping, whereas we expected negative correlations with the 4DSQ-scores for Problem-focused coping. We had no specific expectations with regard to Social coping.
- The Dutch version of the Pearlin Mastery Scale, a questionnaire with 7 items (Cronbach's α .79) (Pearlin and Schooler 1978). The items are scored on a 5-point scale ranging from 'strongly disagree' (1) to 'strongly agree' (5). High scores indicate a strong sense of control over one's life, and we expected mastery to correlate negatively with the 4DSQ-scores.
- The Need for Recovery scale (Jansen et al. 2002), a validated Dutch questionnaire assessing the subjective need for recovery from work at the end of a working day – for example, does the employee still feel fit after supper or is (s)he only able to relax after a second day off work? The Need for Recovery scale consists of 11 dichotomous items: 'yes' (1), 'no' (0) (KR20 coefficient .87). High scores indicate an increased need for recovery at the end of a working day. We expected Need for recovery to correlate positively with the 4DSQ-scores.

- The Emotional exhaustion scale of the Utrecht Burnout Scale (UBOS), a Dutch adaptation of the Maslach Burnout Inventory (MBI) (Maslach and Jackson 1986) with established reliability and validity (Schaufeli and Van Dierendonck 2000). The Emotional exhaustion scale consists of 5 items with response options varying on a 7-point scale from 'never' (0) to 'every day' (6) (Cronbach's α .87). High scores indicate a high level of emotional exhaustion. We expected a positive correlation between Emotional exhaustion and the 4DSQ-scores.
- The Fatigue and Poor concentration scales of the Checklist Individual Strength (CIS), a validated Dutch multidimensional fatigue questionnaire (Beurskens et al. 2000). The items are scored on a 7-point scale ranging from 'no, that is not true' (1) to 'yes, that is true' (7). The Fatigue (8 items) and Poor concentration (5 items) scales had Cronbach's α coefficients of .93 and .85, respectively. High scores indicate high levels of fatigue, and impaired concentration, respectively. We expected positive correlations with the 4DSQ-scores for both variables.

Analysis

Descriptives. Mean scores and standard deviations were calculated for the 4DSQ-scales of the study population. Moreover, the variance of the 4DSQ-scales associated with age was determined by calculating squared Pearson correlation coefficients. The variance of the 4DSQ-scales associated with gender, education and position was investigated by calculating squared Eta correlation coefficients. These squared coefficients provide estimates of the proportion of explained variance.

Reliability. The reliability of the 4DSQ-scales was calculated using Cronbach's internal consistency coefficient α . Cronbach's α is a conservative estimate of the proportion of the observed variance that can be attributed to the 'true score' (Streiner and Norman 1995).

Validity. The present paper mainly focuses on the construct validity of the 4DSQ-Distress scale. Construct validity refers to the validity of a theoretical construct such as distress. Since it is impossible to directly measure distress, construct validity depends on demonstrating relationships between tests measuring different phenomena that are assumed (not) to correlate on theoretical grounds (Streiner and Norman 1995). The correlations between the 4DSQ-scales, the factorial structure of the 4DSQ,

and the correlations between the 4DSQ-scales and job stress, measures of strain, and determinants of coping behaviour, are all aspects of construct validity.

Correlations between the 4DSQ-scales. Psychological symptom questionnaires tend to correlate with each other, often to a substantial degree (Clark and Watson 1991). Moreover, our conceptual model predicts correlations between distress and psychiatric symptoms (depression, anxiety, and somatization). Therefore, we expected that the 4DSQ-scales are correlated. The correlations between the 4DSQ-scales were investigated by calculating Pearson correlation coefficients, and by studying scatter-plots. Furthermore, we investigated whether or not each of the 4DSQ-scales covered some unique domain within the range of common psychopathology. For that purpose, Cronbach's α was calculated on the residuals of the items of the target 4DSQ-scale, after subtracting the variance explained by the remaining three 4DSQ-scales by means of multiple regression techniques. A Cronbach's α value of the item residuals exceeding .50 indicates that the scale covers a unique part of the symptom spectrum (Dohrenwend et al. 1980).

Factorial structure. The items of the 4DSQ are supposed to tap four underlying symptom 'dimensions'. In order to evaluate the dimensional structure of the 4DSQ we adopted a two-stage approach. First, an exploratory factor analysis (EFA) was performed on a randomly selected half of the sample. The factors were extracted by means of principal components, and their number was a priori limited to four. The factors were then rotated, using the varimax method. Secondly, the data of the remaining half of the sample was subjected to a confirmatory factor analysis (CFA), using the AMOS software programme (Arbuckle 1997). The hypothesized four-factor model of the 4DSQ was first tested and compared to a one-factor model that assumes that all items load on one single underlying 'general well-being' dimension. Based on the so-called Modification Indices, alternative or adjusted models were tested to identify causes of imperfection in the four-factor model. The goodness-of-fit of the models was evaluated using the following indices: the χ^2 goodness-of-fit statistic, the Root Mean Square Error of Approximation (RMSEA), the Goodness-of-Fit Index (GFI), the Adjusted Goodness-of-Fit Index (AGFI), the Normed Fit Index (NFI), the Tucker Lewis Index (TLI), and the Comparative Fit Index (CFI) (Jöreskog and Sörbom 1986; Marsh et

al. 1996). Non-significant χ^2 -values indicate that the hypothesized model fits the data. However, this index is sensitive to sample size, implying that the probability of rejecting a hypothesized model increases as the sample size increases (Bentler 1990). A RMSEA-value smaller than .08 is indicative of an acceptable fit (Cudeck and Browne 1993). As a rule of thumb, NFI, TLI, and CFI-values greater than .90 indicate a good fit (Hoyle 1995). Higher GFI and AGFI-values indicate a better fit of the model; however, no statistical test or critical value is available for these indices (Jöreskog and Sörbom 1986).

Correlations with strain, job stress and determinants of coping behaviour. This aspect of the construct validity of the 4DSQ was investigated by calculating Pearson correlation coefficients of the 4DSQ-scales with the UBOS-Emotional exhaustion scale, the CIS-scales, the Need for Recovery scale, the JCQ-scales, the UCL-scales, and the Mastery scale. To test the assumption that the correlations between these variables and Depression, Anxiety and Somatization were mediated by the correlations with Distress, we calculated partial (third order) correlation coefficients, in which case the correlations with the target 4DSQ-scale was corrected for the influence of the remaining three 4DSQ-scales (e.g. the partial correlation between 4DSQ-Distress and UBOS-Emotional exhaustion had been corrected for the variance shared with 4DSQ-Depression, Anxiety and Somatization). If a significant zero-order correlation dropped to a non-significant third-order correlation, it can be inferred that the zero-order correlation was in fact mediated by the shared variance with the other variables.

Results

Descriptives

Table 1 shows the mean scores (and standard deviations) of the 4DSQ-scales for the total sample of employees. Furthermore, table 1 indicates that very little variance of the 4DSQ-scores (no more than 1%) was accounted for by age, gender, education and job position. The distributions of the 4DSQ-scores turned out to be rather asymmetric with skewness measures for Distress, Somatization, Depression and Anxiety of 2.0, 1.8, 5.3, and 4.6, respectively. A 'normal' symmetric distribution has a skewness measure of zero; values exceeding 1 indicate a non-normal distribution. The positive skewness values of the 4DSQ-scores indicate that a relatively large number

Table 1. Mean scores (and standard deviations) of the 4DSQ-scales of employees (N = 3,852), and the variance of the 4DSQ-scores explained by demographic variables; squared Pearson's coefficients R^2 , and squared Eta coefficients Eta^2 .

Scale	Range	Mean (SD)	Age R^2	Gender Eta^2	Education Eta^2	Position Eta^2
Distress	0-32	4.2 (5.2)	.0027	.0056	.0019	.0077
Depression	0-12	0.4 (1.2)	.0044	.0003	.0058	.0048
Anxiety	0-24	0.7 (1.8)	.0031	.0046	.0067	.0117
Somatization	0-32	3.7 (4.1)	.0049	.0119	.0076	.0108

Table 2. Reliability and inter-correlation of the 4DSQ-scales (N = 3,852), internal consistency (Cronbach's α) and Pearson's correlation coefficients r .

	α scale	α residuals	r DIS	r DEP	r ANX
Distress	.90	.76			
Depression	.82	.72	.67		
Anxiety	.79	.65	.64	.57	
Somatization	.80	.69	.59	.39	.50

DIS = Distress, DEP = Depression, ANX = Anxiety

of participants had (very) low scores, and only a few employees had high scores that indicate clinically significant symptoms. The percentages of employees with scores above the cut-off points on the 4DSQ-scales were 11% and 7% for Distress (score > 10) and Somatization (score > 10), and 4% and 1% for Depression (score > 2) and Anxiety (score > 8). These figures illustrate the relatively good mental health in this sample of the working population. Approximately 10% of the employees experienced a certain amount of clinically significant distress, but clinical depression and anxiety disorders were rare.

Reliability and inter-correlations

Table 2 (first column) shows the Cronbach's α coefficients of the 4DSQ-scales. The internal consistency of the 4DSQ-scales was found to be good, since all values of α meet the criterion of .70 (Nunnally and Bernstein, 1994). Table 2 also shows the correlation matrix of the 4DSQ-scales, from which it is apparent that there were substantial correlations between the four scales. The highest correlations were with Distress, which is in line with the assumption that distress increases the risk for psychiatric illness. Inspection of the scatter plots showed an interesting pattern in the associations between the Distress scores, on the one hand, and

the Depression, Anxiety and Somatization scores, on the other hand. Employees with high scores for Depression, Anxiety or Somatization all had high scores for Distress, but the reverse was not true. Hence, it appeared that Distress was 'underlying' Depression, Anxiety and severe Somatization.

We also investigated whether each of the 4DSQ-scales covered a unique part of the spectrum of common psychological symptoms. Table 2 shows Cronbach's α values of the residuals of the items of each 4DSQ-scale after all variance shared with the remaining three 4DSQ-scales had been removed through multiple regression. From these alpha values, which were all well above .60, it is apparent that, despite the substantial inter-correlations between the scales, each of the 4DSQ-scales did, indeed, cover a unique domain of psychopathology.

Factorial structure

Table 3 shows the result of the exploratory factor analysis (EFA). The four factors that were labelled on the basis of the highest loading items (i.e. Depression, Distress, Somatization, and Anxiety), explained 39 percent of the variance. Forty-three items had factor-loadings $\geq .40$ on the factors corresponding with their scales. Two Somatization items had factor loadings $< .40$ on the somatization factor (items 3 and 6). Three Anxiety items had factor loadings $< .40$ on the anxiety factor (items 23, 44 and 50). Two Distress-items had factor-loadings $< .40$ on the distress factor (items 31 and 36), but these items loaded high on the depression factor. Six items, one on the Anxiety scale (item 21) and five on the Distress scale (items 17, 22, 29, 32, and 37), had factor-loadings $\geq .40$ on two factors. A total of seven Distress items had factor-loadings $\geq .40$ on the depression factor. Evidently, there was a substantial overlap between the Distress and Depression scales.

Table 4 shows the results of the confirmatory factor analysis. The hypothesized four-factor model fitted the data significantly better than the one-factor model ($\Delta\chi^2 = 4582$; $df = 8$; $p < .001$). Because the correlation between the latent Distress factor and Depression factor was as high as .81, a three-factor model was tested, in which Distress and Depression had been combined into one factor. It appeared that the fit of the four-factor model was significantly superior to that of the three-factor model ($\Delta\chi^2 = 835$; $df = 3$; $p < .001$). However, the four-factor model did not match the fit indices, with the exception of the RMSEA. The Modification Indices suggested that

Table 3. Four-Dimensional Symptom Questionnaire (4DSQ)^a: items, scales, frequencies of scores (N = 3,852), and factor loadings from an exploratory factor analysis (in bold print if $\geq .40$) (N = 1,922)

item no.	item	scale ^b	frequencies (%)			factor loadings			
			0	1	2 ^c	Dep	Dis	Som	Anx ^b
During the past week, did you suffer from:									
1.	dizziness or feeling light-headed?	Som	80.4	15.2	4.3	.14	.26	.44	.13
2.	painful muscles?	Som	63.8	23.1	13.1	.01	.29	.48	-.03
3.	fainting?	Som	98.8	0.8	0.3	.10	-.10	.08	.23
4.	neck pain?	Som	71.6	17.2	11.2	.05	.25	.49	-.02
5.	back pain?	Som	63.7	22.8	13.4	.03	.24	.44	.01
6.	excessive perspiration?	Som	78.5	14.3	7.2	.04	.18	.37	.14
7.	palpitations?	Som	92.4	6.5	1.1	.17	-.00	.48	.15
8.	headache?	Som	64.0	26.7	9.3	.12	.33	.44	-.04
9.	a bloated feeling in the abdomen?	Som	78.7	15.8	5.5	.10	.13	.51	.01
10.	blurred vision or spots in front of your eyes?	Som	81.2	14.7	4.2	.15	.25	.44	.06
11.	shortness of breath?	Som	92.5	5.9	1.6	.06	.04	.45	.29
12.	nausea or an upset stomach?	Som	87.2	9.5	3.3	.12	.11	.47	.15
13.	pain in the abdomen or stomach area?	Som	87.4	9.6	3.1	.13	.07	.54	.08
14.	tingling in the fingers?	Som	89.4	7.6	3.0	-.02	.06	.42	.17
15.	pressure or a tight feeling in the chest?	Som	89.6	8.6	1.8	.10	.02	.60	.23
16.	pain in the chest?	Som	93.4	5.5	1.1	.11	-.03	.60	.15
17.	feeling down or depressed?	Dis	82.2	14.3	3.5	.40	.53	.28	.15
18.	sudden shock for no reason?	Anx	93.5	5.4	1.1	.15	.21	.21	.43
19.	worry?	Dis	57.8	30.7	11.4	.18	.65	.27	.08
20.	disturbed sleep?	Dis	59.2	29.6	11.2	.07	.64	.24	.06
21.	indefinable feelings of fear?	Anx	88.1	9.1	2.8	.29	.41	.18	.48
22.	listlessness?	Dis	79.4	16.0	4.5	.43	.52	.22	.04
23.	trembling when with other people?	Anx	96.4	2.7	0.9	.15	.16	.13	.38
24.	anxiety or panic attacks?	Anx	96.4	2.7	0.9	.10	.09	.20	.65
During the past week, did you feel:									
25.	tense?	Dis	62.3	29.2	8.6	.23	.63	.26	.03
26.	easily irritated?	Dis	69.9	25.2	4.9	.21	.56	.21	.10
27.	frightened?	Anx	94.0	4.7	1.3	.25	.30	.13	.62
28.	that everything is meaningless?	Dep	90.0	8.0	1.9	.56	.30	.06	.13
29.	that you just can't do anything anymore?	Dis	87.7	9.9	2.4	.53	.43	.14	.17
30.	that life is not worth while?	Dep	96.2	2.9	0.9	.75	.11	.09	.23
31.	that you can no longer take any interest in the people and things around you?	Dis	88.2	10.1	1.7	.59	.28	.15	.12
32.	that you can't cope anymore?	Dis	90.7	7.7	1.6	.56	.41	.12	.21
33.	that you would be better off if you were dead?	Dep	98.0	1.7	0.3	.71	-.05	.08	.25
34.	that you can't enjoy anything anymore?	Dep	93.8	4.7	1.4	.66	.25	.16	.17
35.	that there is no escape from your situation?	Dep	94.9	3.7	1.4	.68	.22	.12	.12
36.	that you can't face it anymore?	Dis	93.5	5.3	1.2	.64	.38	.15	.20
During the past week, did you:									
37.	no longer feel like doing anything?	Dis	86.9	11.1	2.0	.62	.41	.19	.06
38.	have difficulty in thinking clearly?	Dis	81.1	16.3	2.6	.35	.47	.30	.06
39.	have difficulty in getting to sleep?	Dis	74.0	20.4	5.5	.07	.58	.22	.12
40.	have any fear of going out of the house alone?	Anx	99.0	0.6	0.4	.11	.00	.10	.44
During the past week:									
41.	did you easily become emotional?	Dis	78.2	18.1	3.6	.13	.57	.08	.18
42.	were you afraid of anything when there was really no need for you to be afraid? (for instance animals, heights, small rooms)	Anx	94.7	4.0	1.3	-.00	.19	.02	.50
43.	were you afraid to travel on busses, trains or trams?	Anx	98.4	1.2	0.4	.10	-.02	.05	.51

44. were you afraid of becoming embarrassed when with other people?	Anx	88.9	9.9	1.1	.22	.33	.13	.26
45. did you ever feel as if you were being threatened by unknown danger?	Anx	96.9	2.5	0.6	.20	.22	.06	.59
46. did you ever think "if only I was dead"?	Dep	97.9	1.6	0.4	.64	-.11	.12	.27
47. did you ever have fleeting images of any upsetting event(s) that you have experienced?	Dis	78.1	17.3	4.6	.14	.49	.03	.27
48. did you ever have to do your best to put aside thoughts about any upsetting event(s)?	Dis	86.8	9.7	3.5	.15	.52	-.04	.32
49. did you have to avoid certain places because they frightened you?	Anx	98.7	1.1	0.3	.10	.13	.09	.52
50. did you have to repeat some actions a number of times before you could do something else?	Anx	94.4	4.6	0.9	.13	.26	.15	.26

^a English version. Both the Dutch and English versions of the 4DSQ are available at <http://www.emgo.nl/researchtools/4DSQ.asp> or can be obtained from the first author.

^b Dis = Distress, Dep = Depression, Anx = Anxiety, Som = Somatization

^c 0 = 'no', 1 = 'sometimes', 2 = 'regularly', 'often', or 'very often or constantly'

Table 4. Results of the confirmatory factor analysis of the 4DSQ: goodness-of-fit indices χ^2 , GFI, AGFI, TLI, NFI, CFI, RMSEA (see text) (N = 1,930).

Model	χ^2	df	GFI	AGFI	TLI	NFI	CFI	RMSEA
1-factor	14522	1178	.71	.68	.60	.60	.71	.08
4-factor	9940	1170	.81	.79	.74	.73	.75	.06
3-factor ^a	10775	1173	.78	.76	.71	.70	.73	.07
4-factor ^b	6535	1148	.87	.86	.84	.82	.85	.05
4-factor ^{b,c}	6228	1100	.88	.86	.84	.83	.85	.05
4-factor ^{b,c,d}	5554	1093	.89	.88	.86	.85	.87	.05

df = degrees of freedom

^a Distress and Depression combined into one factor

^b correlations allowed between the error of 23 item pairs (only within the same factor)

^c item 3 omitted

^d six items allowed to load on the Distress and Depression factor

the fit of the four-factor model could be improved by allowing the error variance of 23 item pairs to correlate. These correlations were allowed only for item pairs belonging to the same scale, and only if such correlations were theoretically plausible. For example, the error variance of two items concerning sleeping problems was allowed to correlate. Indeed, this adjustment improved the model significantly ($\Delta\chi^2 = 4240$; $df = 25$; $p < .001$). Furthermore, item 3 ('fainting') was omitted because of its low factor-loading (.21), whereas the remaining items had factor-loadings exceeding .40, with the exception of two items, which had loadings between .30 and .40. Omitting item 3 further improved the fit of the four-factor model ($\Delta\chi^2 = 307$; $df = 48$; $p < .001$), with the RMSEA meeting its criterion of .08, and the other goodness-of-fit indices approaching .90.

Finally, the Modification Indices suggested that six Distress items (items 17, 29, 31, 32, 36 and 37) should load on the Depression factor. Subsequently, these items were allowed to load simultaneously on the Distress and Depression factors. This final adjustment further improved the fit of the model to the data ($\Delta\chi^2 = 674$; $df = 7$; $p < .001$), the revised four-factor model now meeting the criterion for the RMSEA, and marginally meeting the criteria for the TLI, NFI, and CFI. It was not possible to improve the model further.

Correlations with strain, job stress and determinants of coping behaviour

Table 5 shows the (partial) correlations between the 4DSQ-scales and the UBOS-Emotional exhaustion scale, the CIS-scales, the Need for recovery scale, the JCQ-scales, the UCL-scales, and the Mastery scale. With respect to the strain measures, the 4DSQ-Distress scale showed – as expected – the strongest correlations with Emotional exhaustion, Fatigue, Poor concentration, and Need for recovery (all r 's $> .50$). The 4DSQ-Depression

Table 5. Correlations between the 4DSQ-scales and indicators of strain, stressors, and determinants of coping behaviour: zero-order correlation coefficients r_0 , partial third-order correlation coefficients r_p^a

	N	Distress		Depression		Anxiety		Somatization	
		r_0	r_p^b	r_0	r_p^c	r_0	r_p^d	r_0	r_p^e
<i>Indicators of strain</i>									
Need for Recovery	3852	.56	.37	.33*	-.06	.35*	-.04	.45*	.19
UBOS-Emotional exhaustion	2131	.57	.37	.35*	-.03	.35*	-.04	.43*	.16
CIS-Fatigue	361	.53	.37	.30*	-.05	.28*	-.11	.42*	.18
CIS-Poor concentration	361	.53	.32	.39*	.07	.34*	-.04	.35*	.06
<i>Stressors</i>									
JCQ-Psychological demands	3852	.21	.17	.08*	-.07	.10*	-.02	.14*	.03
<i>Determinants of coping behaviour</i>									
JCQ-Decision latitude	3852	-.19	-.07	-.15*	-.02	-.16*	-.04	-.16*	-.05
JCQ-Social support	3852	-.22	-.12	-.16*	-.02	-.14*	-.01	-.15*	-.02
UCL-Emotional coping style	3852	.10	.05	.08	.02	.05*	-.02	.09	.04
UCL-Avoidant coping style	3852	.30	.14	.23*	.03	.25*	.06	.19*	.01
UCL-Palliative coping style	3852	.14	.08	.08*	-.02	.09*	.01	.11*	.03
UCL-Problem-focused coping style	3852	-.13	-.03	-.12	-.02	-.14	-.07	-.10*	-.01
UCL-Social coping style	3852	-.01	.02	-.05	-.05	-.02	.00	-.01	-.00
Mastery	3852	-.49	-.24	-.40*	-.10	-.37*	-.04	-.32*	-.04

* r_0 significantly different from the r_0 -value in the Distress column (one-sided $p < .05$)

^a coefficients in bold print if $p < .001$ and $r > .10$

^b controlling for Depression, Anxiety and Somatization

^c controlling for Distress, Anxiety and Somatization

^d controlling for Distress, Depression and Somatization

^e controlling for Distress, Depression and Anxiety

and Anxiety scales had lower, but still substantial correlations with the comparison measures (r 's ranging between .28 and .39). Yet, after removing the variance shared with the other 4DSQ-scales, especially with the Distress scale, the (third-order) correlations dropped to non-significant and non-relevant values. This means that symptom clusters that were measured uniquely by the 4DSQ-Depression and Anxiety scales did not correlate with the comparison measures. The zero-order correlations appeared to depend largely on the variance that Depression and Anxiety, and the comparison measures, shared with Distress. The 4DSQ-Somatization scale took an intermediate position between Distress and Depression/Anxiety with respect to its correlations with fatigue-like measures (fatigue, exhaustion and need for recovery).

With respect to work stress and determinants of coping behaviour, our expectations, i.e. that there would be stronger correlations for the 4DSQ-Distress scale than for the other 4DSQ-scales, were confirmed in 6 out of 9 cases. For example, the 4DSQ-Distress scale had the strongest correlation (-.22) with Social support, whereas the other 4DSQ-scales had correlations ranging between -.14 and -.16. After controlling for the variance shared with the other 4DSQ-scales, the picture became even more clear: Distress continued to correlate with Social support ($r = -.12$), but the other 4DSQ-scales no longer showed significant correlations. Three findings were not in accordance with our expectations: Problem-focused coping style correlated with all four symptom dimensions to approximately the same extent, while the correlations were relatively small. Emotional coping style and Social coping style did not correlate to a significant or relevant extent with any of the four symptom dimensions of the 4DSQ.

Discussion

Reliability of the 4DSQ-scales

Based on the values of Cronbach's α (table 2), the internal consistency of the 4DSQ-scales appears to be good. The internal consistency of the 4DSQ in the current working sample was slightly lower than in a sample of general practice patients (in which Cronbach's α ranged from .84 to .94 (Terluin 1996), which is probably due to a lower prevalence rate of psychological symptoms. Some Depression and Anxiety symptoms were found to have extremely low prevalence rates in the present study (table 3).

Inter-correlations between the 4DSQ-scales

The Pearson correlation coefficients (table 2) indicate that the Distress scale shares 35-45% of its variance with the other 4DSQ-scales. Nevertheless, even when all variance that is shared with the other 4DSQ-scales is removed, sufficient internal consistency remains (as indicated by Cronbach's α of the residuals). This signifies that the Distress scale measures a unique aspect of the employee's symptomatology that is not covered by the other scales. The same is true for the Depression, Anxiety and Somatization scales. Thus, the 4DSQ-scales do correlate with each other, but, at the same time, they also cover different unique aspects of the common psychological symptomatology that is observed in this working sample. Apart from that, the scatterplots indicated a special relationship between Distress, on the one hand, and Depression, Anxiety and severe Somatization, on the other hand. These plots suggested a hierarchical relationship between Distress and Depression/Anxiety/Somatization. While elevated scores for Depression/Anxiety/Somatization are almost invariably combined with elevated Distress scores, the reverse is not true. Foulds (1976) has described this non-reciprocal relationship between 'higher' and 'lower' psychopathological states earlier in his 'hierarchical model of personal illness'.

Factorial structure of the 4DSQ

Although the four-factor structure of the 4DSQ was largely confirmed, factor analysis showed that the 4DSQ does not contain four 'clean' dimensions. Instead, it seems that Distress and Depression overlap to a certain extent. Six items of the Distress scale were found to load on the depression factor as well. Yet, a three-factor model, in which the Depression and Distress factors were combined into one factor, proved to be inferior to the four-factor model (table 4). The items that load on two factors are depressed mood (item 17), loss of interest (item 31), feelings of impotence (items 29 and 37), and demoralization (items 32 and 36). Although, in a non-clinical sample, most people with a depressed mood suffer from distress, and not from a depressive illness, depressed mood is considered to be one of the key symptoms of clinical depression (American Psychiatric Association 1994). Likewise, loss of interest, representing the milder manifestation of anhedonia, is prevalent in many cases of 'nervous breakdown' (Terluin 1994), but almost invariably present in depressive illness (American Psychiatric Association 1994). Feelings of impotence and demoralization (i.e. failure to cope) are related to stress-related disorders in general, and

to 'nervous breakdown' in particular (Pfeffer and Waldron 1987; Terluin 1994; Dohrenwend et al. 1980; Frank 1973). However, the current study indicates that these phenomena are somehow also associated with depressive illness. Hence, we conclude that distress and depression may be conceptualized both as separate dimensions, and as the two ends of a continuum.

Conceptually, distress and depression can be considered as distinct dimensions (see Section 1.2). In particular, if the cross-loading items are omitted, this becomes quite obvious. There seems to be a 'pure' depression dimension, consisting of depressive thoughts and anhedonia (loss of pleasure), and a 'pure' distress dimension, consisting of milder symptoms such as worrying, feeling irritable and tense, and disturbed sleep. However, if we retain the cross-loading items, it becomes apparent that there is something 'in between' distress and depression. Our results suggest that there is a fluent transition from distress to depression via feelings of impotence and demoralization, with 'pure' distress and 'pure' depression being the two ends of the continuum. Based on our clinical experience, and on our conceptual model of distress and depressive illness, we believe that this continuum reflects the development of depressive illness from distress in susceptible individuals. When we consider a person who is 'under stress' (i.e. under the influence of a stressor), we can expect that (s)he is experiencing some degree of distress. If the stressor is severe and/or the person's coping behaviour is unsuccessful, (s)he may develop severe distress, including feelings of impotence and demoralization (nervous breakdown), at which point (s)he has already developed some degree of depression (i.e. depressed mood and loss of interest). However, until (s)he develops substantial anhedonia and depressive cognitions, there is no depressive illness involved.

Technically speaking, one can argue that 'ambiguous' items – i.e. items that are loading on more than one factor – should be discarded. However, doing so in the case of the 4DSQ would result in omitting such theoretically and practically important symptoms as impotence and demoralization (Frank 1973). For instance, Dohrenwend et al. (1980) considered demoralization to be a key element of the 'non-specific distress' dimension of common psychopathology. The findings of the present study suggest that distress and depression constitute not only separable dimensions, but also a continuum.

When two symptom clusters constitute one continuum, the boundary between these dimensions becomes arbitrary. Furthermore, factor analysis cannot tell us exactly which factor the cross-loading items ‘really’ belong to. The exact boundary between the distress and depression factors depends on the relative numbers of distress and depression items analysed. As yet, we consider demoralization and the other overlapping symptoms to pertain to the distress syndrome, i.e. the psychological consequences of strain.

Now that we have identified a continuum between distress and depression, would it not be easier to regard distress as the minor variant of depressive illness? The answer is no, because distress is not only related to depression, but also to anxiety and severe somatization. The only difference is that the 4DSQ does not contain any ‘transitional’ symptoms in between distress and anxiety, or in between distress and severe somatization. Although distress increases the risk for an anxiety disorder as well as for severe somatization, much in the same way as it increases the risk for a depressive illness, the transition between distress and anxiety disorder or severe somatization does not involve feelings of impotence and demoralization, as it does in the case of depressive illness. Apparently, other variables that are not included in the 4DSQ are also involved.

The overlap between the 4DSQ-Distress and Depression scales might create difficulties for those who are trying to assess the associations of these constructs with other variables. Two methods can be used to unravel the relative contributions of Distress and Depression: the use of partial correlations and the use of multiple regression techniques. With these methods, it is possible to correct the contribution of distress for the contribution of depression, and vice versa. For example, table 5 shows that an avoidant coping style is correlated with both Distress and Depression, but when Depression is corrected for Distress, the correlation with avoidant coping style disappears. In this case, some of the variance in the lower (less severe) range of the Depression scale that is associated with the Distress score, is taken out. When the Distress score and the Depression score are entered simultaneously in a regression analysis to predict any dependent variable, the overlapping variance of Distress and Depression is divided between these two predictors, resulting in Distress mainly representing pure distress, and Depression mainly representing the symptoms of clinical depressive illness.

Correlations with strain, job stress and determinants of coping behaviour

As expected, the strain measures – need for recovery, emotional exhaustion, fatigue, and poor concentration – correlated mainly with Distress and, after correction for Distress, not with Depression and Anxiety. The fatigue-like measures showed some residual correlation with Somatization (table 5). This points to the fact that fatigue may constitute an important link between distress and somatization. Distressed persons, especially those who suffer from a ‘nervous breakdown’, often complain of persistent fatigue, causing them to abandon social roles, such as the work role. Debilitating fatigue is also a major complaint in burnout and chronic fatigue syndrome (Maslach et al. 2001).

There was a mean interval of 45 days between the administration of the 4DSQ and the CIS. Assuming that there was no substantial change in either the 4DSQ or the CIS-scores, the correlation coefficients represent valid estimates of the (dis)similarity between the scales. However, should one or more symptoms have been subject to change, the correlation coefficients could give an under-estimation if the relationship between distress and fatigue/poor concentration weakened over time, or they could give an over-estimation if distress led to fatigue and poor concentration over time.

Although not all our expectations were confirmed, the overall picture is clear. Whenever job stress and coping-related measures correlate with psychological symptoms, they correlate mainly with Distress and, after correction for levels of Distress, not with Depression, Anxiety and Somatization. Overall, the correlation coefficients were rather small (except for mastery) which means that work stress and coping style explain only a small proportion of the variation in symptom scores in this sample of employees. However, most importantly with respect to the 4DSQ-scales, we have been able to determine that the small association between work stress/coping styles and symptoms was mainly with Distress. This finding strongly supports our hypothesis that the 4DSQ-Distress scale measures specifically the symptoms caused by the stress-coping process.

Relevance of distress as a dimension of psychological symptoms

Clark, and Watson (1991) have reviewed the evidence for the existence of a ‘general, non-specific distress’ factor underlying anxiety and depression. They proposed the ‘tripartite model’ with the dimensions distress, anxiety

and depression. Their distress dimension, that included symptoms such as irritability, poor concentration, insomnia, fatigue, and demoralization, is strikingly similar to the 4DSQ-Distress dimension. We have come to believe that distress not only reflects the effort an individual has to put into coping with psychosocial – life – stress (e.g. work stress), but that distress also results from coping with other stressors such as psychiatric disease (e.g. clinical depression or anxiety disorder), or even physical disease. Whenever circumstances threaten a person's habitual psychosocial functioning, distress symptoms arise as the person is trying to keep his or her head above water. Distress indicates no more and no less than how hard a time someone is having, irrespective of the specific stressors involved. Although there is an abundance of questionnaires to measure psychological symptoms, most of them fail to distinguish between general distress and anxiety/depression. In fact, only two questionnaires do make such a distinction: the Mood and Anxiety Symptom Questionnaire (MASQ) (Watson et al. 1995; Keogh and Reidy 2000) and the Depression Anxiety Stress Scales (DASS) (Lovibond and Lovibond 1995). However, these questionnaires use an approach that is different from ours with respect to the measurement of depression and, furthermore, they do not distinguish between anxiety and somatization (Bedford 1997; Brown et al. 1997).

Limitations and strengths

This study has some limitations. First of all, the cross-sectional design of the study should – strictly speaking – make us cautious about making causal inferences. However, the only causal relationship that we have inferred is the one between job stressors and psychological complaints, and this particular relationship has been studied extensively and is currently widely accepted (Quick and Tetrick 2002). Secondly, our study is restricted to self-reported data, which carries the risk of inflating correlations by using the same measurement method. However, by using partial correlations we have shown that some correlations actually do not significantly differ from zero, and we have based our conclusions largely on the different correlational patterns of the Distress scale and the other 4DSQ-scales. It is not likely that these different patterns can be ascribed to the common method of measurement. Thirdly, the sample was exclusively restricted to employees of one specific company, and can therefore not be considered to be representative of the working population in general. Moreover, in this particular company, men outnumbered women by 9 to 1. Fourthly, the response rate was only 51%, and the response was further affected by practical problems with the

first mailing of the questionnaires. However, one of the strengths of this study is that data has been collected from several thousands of employees with various levels of education and various job positions. Although this specific study population may be subject to selection bias, it is unlikely that this has caused major deviations in the psychometric properties of the questionnaire under study. Nevertheless, our findings with regard to the reliability and validity of the 4DSQ cannot safely be extrapolated to entirely different populations, such as psychiatric patients.

Finally, this study offered only a limited opportunity to investigate the validity of the 4DSQ, since it only included stress-related measures, and no measures related to depression, anxiety or somatization. As for the validity of the 4DSQ-Depression, Anxiety and Somatization scales, we have shown that these scales measure something different from general distress. For the time being, the face validity of the items should be considered. It seems difficult to imagine that the Depression items (e.g. loss of pleasure, and suicidal ideation) could refer to anything else but clinical depression. A similar reasoning can be applied to the Anxiety and Somatization scales.

Conclusion

This study has shown the 4DSQ to be a reliable self-report questionnaire in a working population. We have shown that the four scales – Distress, Depression, Anxiety and Somatization – measure different dimensions of the spectrum of common psychological symptoms. Furthermore, we have shown that Distress is associated with job stressors and indicators of strain. While distress was not particularly uncommon in our sample of working people, our data indicate that clinical depression and anxiety were rare conditions. Somatization took an intermediate position in this respect. When screening for psychological problems in an unselected population, we would recommend a two-stage approach. At first, it will suffice to administer only the Distress and Somatization scales, since low Distress scores exclude clinical depression and anxiety. Subsequently, the Depression and Anxiety scales can be administered, but only to people with elevated Distress scores (> 10). In an occupational health care setting, when caring for employees who are on sick leave for psychological reasons, a physician or nurse can administer the whole 4DSQ to assist in

differentiating between purely stress-related conditions and psychiatric disorders. With respect to research, we hope that the 4DSQ may be helpful in facilitating communication between (work) stress researchers and psychiatric (epidemiological) researchers. In stress research, almost every psychological symptom is considered to be a consequence of stress, whereas in psychiatric (epidemiological) research almost all psychological symptoms are considered to arise from anxiety and depression. The 4DSQ provides an indication of which symptoms are stress-related, and which are due to psychiatric disorders.

Note

The 4DSQ is available in 2 language versions, the original Dutch version and an English version. This paper is based on the Dutch version of the 4DSQ. The English version is the result of a professional translation, followed by an independent re-translation into Dutch, and consensus discussion of discrepancies between the original text and the re-translated text. Both language versions are available at www.emgo.nl/researchtools/4dsq.asp or can be obtained from the first author.

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Distress or no distress, that's the question: A cutoff point for distress in a working population

Van Rhenen W^{1,2}, Van Dijk FJH¹, Schaufeli WB³, Blonk RWB^{3,4}

J Occup Med Toxicol 2008;3:3

¹ Academic Medical Center, Coronal Institute of Occupational Health,
University of Amsterdam, Amsterdam, The Netherlands

² Department of Occupational Health Services, ArboNed Utrecht, Utrecht, The Netherlands

³ Utrecht University, Department of Psychology and Research
Institute Psychology & Health, Utrecht, The Netherlands

⁴ TNO Work and Employment, Hoofddorp, The Netherlands

Abstract

Background

The objective of the present study is to establish an optimal cutoff point for distress measured with the corresponding scale of the 4DSQ, using the prediction of sickness absence as a criterion. The cutoff point should result in a measure that can be used as a credible selection instrument for sickness absence in occupational health practice and in future studies on distress and mental disorders.

Methods

Distress is measured using the Four Dimensional Symptom Questionnaire (4DSQ), a 50-item self-report questionnaire, in a working population with and without sickness absence due to distress. Sensitivity and specificity were compared for various potential cutoff points, and a receiver operating characteristics analysis was conducted.

Results and conclusions

A distress cutoff point of ≥ 11 was defined. The choice was based on a challenging specificity and negative predictive value and indicates a distress level at which an employee is presumably at risk for subsequent sick leave on psychological grounds. The defined distress cutoff point is appropriate for use in occupational health practice and in studies of distress in working populations.

Background

Distress is a heterogeneously defined and imprecise term that refers to unpleasant subjective stress responses (Matthews 2000). Verhaak (1995) estimated the prevalence in the general population in western communities as 15-25%. In a clinical population of cancer patients, Keller et al. (2004) reported clinically relevant distress in about 25% of patients (across other studies this figure ranges from 5% to 50%). In the working population, Bültmann et al. (2002) documented a prevalence of psychological distress as 21.8% for men and 25.9% for women. Distress and stress-related disorders are widespread among working and non-working populations and are responsible for high costs in terms of human suffering, disability and economic losses.

Despite the high prevalence and costly consequences, distress still goes unrecognized by health professionals. In clinical settings comparing the patient-reported distress to the doctor's rating, the vast majority of the cases go unrecognized (Fallowfield et al. 2001). Although figures for occupational health physicians are unknown, we assume that these will be similar to those in clinical settings.

The underrating of distress is not surprising since in health care the focus is not on distress, but on depression and anxiety disorders and their consequences. Contrary to distress, both disorders seem well-defined (Crawford and Henry 2003; Terluin 2004; Keogh and Reidy 2000; Clark and Watson 1991). Both are highly prevalent, contributing to almost 13% of the total world disease burden (Murray and Lopez 1996; WHO 2002), ranging in different studies from 12% to 49% for one-year prevalence rates and lifetime prevalence for depression, and from 8% to 29% (US Department of Health and Human Services 2001; Australian Institute of Health and Welfare and Commonwealth Department of Health and Family Services 1997; WHO International Consortium in Psychiatric Epidemiology 2000; Alonso et al. 2004) for anxiety disorders. Measured using the Hospital Anxiety and depression (HAD) Scale in the Netherlands, the one-year prevalence of depression and anxiety in the working population is 7.1% and 8.2% for males and 6.2% and 10% for females (Andrea et al. 2004). For the recognition, prevention and treatment of mental health problems, the underestimation of distress can be regarded as unfavorable for several reasons.

The first reason is the imminent concomitance of distress and sickness absence. Distress as a main cause of sickness absence can be labeled under 'adjustment disorders' following the DSM IV classification (Van der Klink et al. 2003). In the Netherlands, approximately 30% of the employees who visit the occupational physician for sickness absence report mental health problems (Schaufeli and Kompier 2001) including common mental health problems like adjustment disorders, but also psychiatric disorders such as anxiety and depressive disorders. The majority of the employees absent for mental health reasons can be classified as having an adjustment disorder (Veerman et al. 2002). Nieuwenhuijsen et al. (2003) demonstrated a percentage of 59% in employees absent for mental health problems. Prevention of – at least a part – of sickness absence through a reduction in high levels of distress is a challenge for the occupational health professional and can be a benefit for employees and companies.

A second reason for a focus on distress is the high concurrence with anxiety and mood disorders (Andrews 1996; Brown 1996; Brown and Barlow 1992), which in turn show a high degree of intercorrelation (Zinbarg et al. 1994; Stavrakaki and Vargo 1986; Gotlib and Cane 1989). Distress symptoms such as concentration problems, irritability and fatigue are common to both anxiety and depression in the DSM IV diagnostic criteria (APA 1994).

A third reason for discerning distress is the implication for treatment and guidance. The reduction of distress presumably has its own typical approach. In the past, 20% of patients reporting themselves sick with an adjustment disorder due to distress did not return to work within one year (Schroër 1993). Van der Klink et al. (2003) demonstrated that an activating intervention based on the principles of time contingency and cognitive behavioral treatment was successful in reducing sick leave duration by 25-30% compared with 'care as usual'. Another study (Van Rhenen et al. 2005) among working employees showed that specific (preventive) cognitive and physical interventions are equally effective in reducing distress levels by 50-60%.

In the last two decades, several questionnaires have been developed to measure distress. The Mood and Anxiety Symptom Questionnaire (MASQ) established by Clark and Watson (1991) and the Depression Anxiety Stress Scale (DASS) originated by Lovibond and Lovibond (1995) are based on

the tripartite model of Clark and Watson (1991). Recently, Terluin (2004) introduced the Four Dimensional Questionnaire (4DSQ) developed to differentiate distress from two psychiatric illnesses (depression and anxiety) and from somatization. Together, these four symptom clusters account for the majority of the mental health problems in primary health care. According to Terluin, distress is the psychological squeal of strain caused by unsuccessfully coping with a stressor. Stressors can be the common cause for distress and depression or anxiety. Under less favorable conditions, distress might be a precursor for more serious psychiatric disorders. On the other hand, psychiatric illness can act as a stressor that aggravates strain and distress. That may explain why individuals with depression and anxiety in many cases also exhibit distress.

The 4DSQ, a 50-item self-report questionnaire, has been developed for clinical and non-clinical populations with psychological complaints and has been validated in primary health care (Terluin 1994; Terluin et al. 1995) and in occupational health care (Terluin et al. 2004; Van Rhenen et al. 2005). The four scales of the DSQ are internally consistent, with Cronbach's alphas ranging from .79 to .90. The subscale distress, the focus of this study, is associated with job stressors and indicators of strain, which supports the utility of the questionnaire for screening purposes. Since working employees with a high rate of distress as a consequence of job stressors and strain, run a high risk of sickness absence, a cutoff point for distress can be helpful for the identification—and maybe even monitoring—of employees at risk for sickness absence and for the selection of cases for support like stress management programs or treatment in order to prevent absenteeism.

The use of a cutoff point (Bültmann et al. 2002; Duijts et al. 2006) for inclusion in preventive stress management programs has remarkably not been reported until now. Because of the size of the problem, reducing sickness absenteeism by applying interventions to reduce work-related stress is of great importance. Individually focused programs aim to increase the employee's mental resilience (Van der Klink et al. 2001), usually referred to as a stress management training (Murphy et al. 1995; Semmer 2003). And although the term stress management training may suggest a rather uniform set of intervention strategies, it usually refers to a mixture of treatment techniques. To a certain extent these (work-related) stress interventions claim to reduce psychological complaints

(Sheffield et al. 1994; Salmon 2001; Kagan et al. 1995; Rose et al. 1998), to increase individual quality of life (Byrne and Byrne 1993; Maes et al. 1998; Murphy 1996), to reduce stress-related health care costs (Colditz 1999; Groth-Marnat and Schumaker 1995) and to reduce absenteeism (Michie 1996; Proper et al. 2002; Schaufeli and Kompier 2001). Although such effects of stress management interventions have been shown, the effects on absenteeism are still subject to debate. Differences between the intervention programs as well as methodological differences between these studies—such as the lack of a control group, inadequate collection of data or different study designs with different measures—are brought forward to explain these inconsistent results. However, another important cause may be the lack of a cutoff point in most studies for selecting participants (Van der Klink et al. 2001). It is a lamentable omission for current stress management programs and guidelines that we miss clear criteria for the referral of employees with a certain level of distress to occupational health physicians or psychosocial care teams.

In addition, the distress dimension of the 4DSQ and a cutoff point can be used as a valid estimator for the prevalence of distress across demographic and occupational subgroups (Van Rhenen et al. 2005). A well-founded cutoff point can be used as a criterion to classify cases for research purposes. “Cutoff scores are used in a wide variety of settings to divide a score scale or other set of data into two or more categories, with inferences made or actions taken on the basis of this classification” as has been stated by Dwyer (1996). The choice of such a categorization represented by one or more cutoff points, however, is a result of judgments. One of the unwanted side-effects of this process of decision making may be the emergence of different cutoff points in different studies (Altman et al. 1994). This makes comparisons across studies extremely difficult or even impossible.

Consequently, clarification of the process of decision making is indispensable. In this article we therefore describe explicitly the process by which we selected an optimal cutoff score of a risk factor that gives the best separation between employees with high distress levels related to the risk for subsequent sickness absence due to psychological complaints on the one hand, and employees who are not at risk on the other. By doing this, the results of this study can be compared with the results of other studies. In conclusion, the objective of the present study is to establish an optimal cutoff point for distress measured using the corresponding scale of the

4DSQ, with the prediction of sickness absence as a criterion. The cutoff point should result in a measure that can be used as a credible selection instrument for stress management programs or other interventions to prevent sickness absence due to psychological complaints in occupational health practice and in future studies on distress and mental disorders.

Method

Sample

Two samples of employees with presupposed differences in distress were used. Both employee samples worked in a large telecom company in the Netherlands and were approached by the company's Department of Occupational Health.

The first sample, representing the 'healthy working employees', were participants in an occupational health survey with a focus on occupational stress. Questionnaires were mailed to all employees of the company ($N = 7,522$). The questionnaires were completed by 3,852 employees (response rate 51%). The sample consisted mainly of men (91%), medium- or highly-educated employees (74%), and had a mean age of 43.9 years. At the moment at which the employees filled in the questionnaire, 247 (6.4%) were on sick leave; these were excluded from the sample resulting in 3605 employees.

The second sample consisted of 280 employees who had been on sick leave for at least two weeks and, in accordance with the procedure, were referred to their occupational physician. To be included in the sample, employees had to be on their first sickness leave because of stress at work or a stress-related disorder due to a recent identifiable psychosocial stressor at work. The employees had to demonstrate at least eight out of 16 distress symptoms of the 4DSQ scale (at level one or higher) that represent the main symptom categories of the DSM IV adjustment disorder (Van der Klink et al. 2003). Exclusion criteria were a psychiatric diagnosis such as an anxiety disorder or a depressive disorder and physical co-morbidity.

Measure

The 4DSQ is a 50-item self-report questionnaire (Terluin et al. 2004) that identifies four symptom dimensions: distress (16 items, e.g. "Did you feel easily irritated?"), depression (6 items, e.g. "Did you feel that you can't

enjoy anymore?”), anxiety (12 items, e.g. “Were you afraid of anything when there was really no need for you to be afraid?”) and somatization (16 items, e.g. “Did you suffer from excessive perspiration?”). Participants are instructed to indicate how they felt during the previous week, and the items are scored on a 5-point Likert scale (from 0 = ‘No’ to 4 = ‘Very often’). In the application of the 4DSQ, to reduce the influence of aggravating response tendencies on sum scores, all item scores of ‘3’ and ‘4’ are recoded into a score of ‘2’ before calculating sum-scores per dimension. Thus, symptoms are rated as absent (‘no’: 0 points), doubtfully present (‘sometimes’: 1 point) or present at a clinically significant level (‘regularly/often/very often’: 2 points). The factor score for distress ranges from 0-32, where a high scores indicates substantial distress. The value for Cronbach’s alpha for distress is .90.

Analyses

Distress scores (means, standard deviations and percentile scores) were calculated for both samples. Considering the aim of identifying employees in a working environment at risk for sickness absence due to psychological complaints, and applying the recommendations of Dwyer (1996), we first explore the test threshold which can discriminate well between distressed employees without sickness absence due to psychological problems and employees on sick leave because of stress or a stress-related disorder. A Receiver Operating Characteristic (ROC) analysis was used to define a cutoff point, displaying the predicted probability of the target event—sickness absence. The ROC shows a range of cutoff points with corresponding sensitivity and specificity.

To find with the ROC analysis the most optimal cutoff point that discriminates best between both groups, we formed in the first place a purposefully created artificial study population with an equal number of employees from both samples: 280 ‘healthy working employees’ randomly selected from the first sample, and in addition the total second sample of 280 employees on sick leave. Together, both populations form what we called the ‘equal sample study population’, in total 560 employees.

Secondly and in order to check, using a ROC analysis, the described ROC curve and its cutoff point in a representative population, we formed a second artificial study population similar to a working population with a normal prevalence of sickness absence due to psychological complaints (2%).

Therefore we added 72 employees (2% of 3605) randomly selected from the population on sick leave for psychological reasons, to the 3605 healthy working employees, thus adhering better to the conditions in practice. This study population is called the ‘representative study population’.

For use in occupational health practice, it is not only important to find nearly all employees-at-risk, but also to exclude false-positive employees. Therefore, during the evaluation, the establishment of an optimal cutoff point is based on an optimal trade-off between sensitivity and specificity. In a screening situation, however, where the prevalence of absence due to distress is low (2%), specificity is more crucial than sensitivity. Increasing the specificity at the expense of sensitivity will lead to a substantial increase of the positive predictive value, while the considerable reduction in sensitivity decreases the negative predictive value only marginally. Beforehand, we had made the choice to set specificity at above 90%. Applied to a working population, a screening test with this specificity can exclude a large majority of persons not at risk.

Results

The demographics are specified in Table 1. For the first sample, questionnaires were mailed to all employees of the company ($N = 7,522$). The questionnaires were completed by 3,852 employees (response rate 51%). The sample consisted mainly of men (91%), medium- or highly-educated employees (74%), and had a mean age of 43.9 years. At the moment at which the employees filled in the questionnaire 247 (6.4%) employees were on sick leave; these were excluded from the sample. The second sample ($n=280$) who had been on sick leave for at least two weeks because of stress or stress-related disorder, consisted of 66% men, 66% medium- or highly-educated employees, and the mean age was 41.9 years.

Table 1. Characteristics of the samples ‘healthy working employees’ and ‘employees on sick leave due to psychological complaints’

Sample	n	Age		Gender % Female	Marital status % Married	Level of education		
		Mean years	SD			% Low	% Medium	% High
Healthy working employees	3605	43.9	8.1	9	78	26	49	25
Employees on sick leave due to psychological complaints	280	41.9	8.1	34	66	34	41	25

Table 2. Levels of distress (mean and SD score on 4DSQ distress scale) in the samples of 'healthy working employees' and 'employees on sick leave due to psychological complaints'

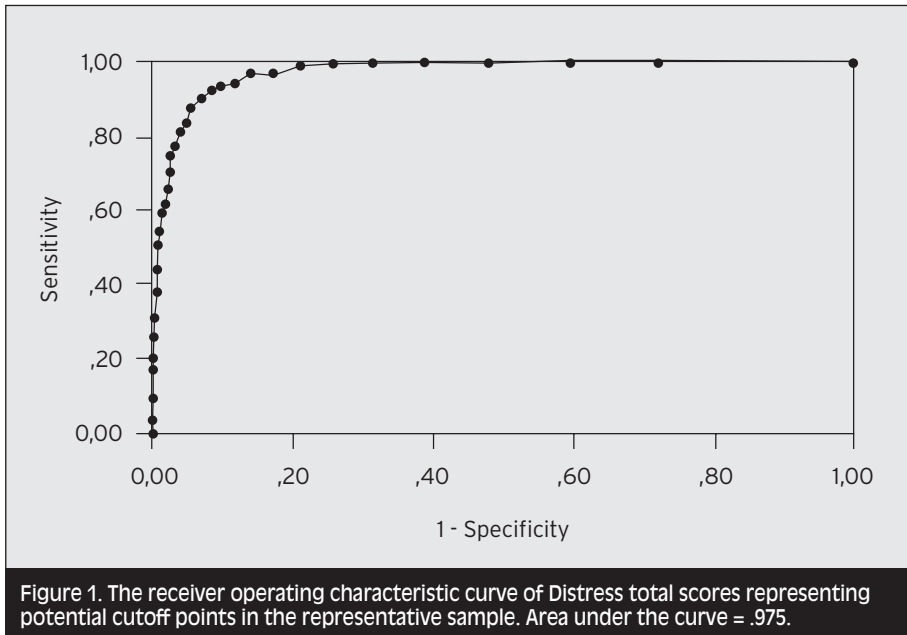
Sample	n	Mean	SD	Distress (range 0-32)				
				Percentile				
				5	25	50	75	95
Healthy working employees	3605	4.0	5.0	0.0	0.0	2.0	6.0	14.0
Employees on sickness absence due to psychological complaints	280	22.3	6.7	9.0	18.0	24.0	28.0	31.0

Table 3. Sensitivity and specificity of alternative cutoff points in the 'equal sample population' and the 'representative sample population'

Equal sample population (n=560): 280 healthy working employees plus 280 employees on sick leave for psychological complaints			Representative sample population (n=3677): 3605 healthy working employees plus 72 employees on sick leave for psychological complaints		
Cutoff	Sensitivity	Specificity	Cutoff	Sensitivity	Specificity
7.50	.979	.854	7.50	.973	.830
8.50	.975	.882	8.50	.973	.863
9.50	.950	.893	9.50	.945	.884
10.50	.939	.914	10.50	.945	.905
11.50	.929	.921	11.50	.932	.918
12.50	.907	.936	12.50	.890	.932
13.50	.882	.954	13.50	.877	.945

Table 2 shows the means, standard deviations, and the percentile scores of distress for both samples ($N = 3605$ and $N = 280$). As expected, employees on sickness absence due to psychological complaints scored significantly higher on distress (Mean = 22.3, SD = 6.7) than the sample of healthy working employees (Mean = 4.0, SD = 5.0) (T-test; $p < .000$).

As can be seen from Table 3, the optimal cutoff score for distress, given a specificity that exceeds 90%, equals 10 in the equal sample study population ($N = 560$). As expected, in the case of the representative study population ($N = 3677$), the cutoff score equals 11, with the same restriction for specificity. Table 2 shows that the cutoff score of 11 is located between the 75th and 95th percentile of the distribution of distress scores in the population of healthy working employees: most healthy employees have less distress. In the sample of employees on sickness absence, this cutoff score is located close to the 5th percentile, which means that the overall majority exceeds this distress level in this population.



In the representative study population ($N = 3677$), a cutoff point equal to or higher than 11 has as a consequence that 69 of 72 absent employees are correctly classified as being absent due to psychological complaints, corresponding with a sensitivity of 95%. Within the population of 3605 employees without sickness absence, 3261 employees are classified as not distressed, corresponding with a specificity of 90%. The positive predictive value is .17, whereas the negative predictive value is .998. In addition, Table 3 shows the sensitivity and specificity of alternative cutoff points.

The Area Under the ROC Curve (AUC) statistic (Fig 1) has been obtained by comparing the full range of possible cutoff scores. The area under the curve was 0.98, which is excellent, because in that case the positive likelihood ratio ($LR+$: the probability to find a positive test result in stressed employees compared with employees who are not stressed) is 10 or more and the negative likelihood ratio ($LR-$: the probability to find a negative test result in stressed employees compared with employees who are not stressed) is 0.1 or less. This means that employees who score above the chosen cutoff score are far more likely to report sick compared with employees who score under the cutoff score.

Discussion

In the present study, a cutoff point ≥ 11 was chosen for the distress scale of the 4DSQ to measure distress in a working population. This cutoff point corresponds with a sensitivity of 95% and a challenging specificity of 90% and negative predictive value of .998, and indicates a distress level that puts an employee “at risk” for subsequent sick leave on psychological grounds.

Two issues require some discussion here. One issue is that we used as our study population employees working for a telecom company, which in potential restricts the generalizability of the cutoff point to other working samples. Therefore, we recommend that more studies be undertaken with a clear reference to the populations studied.

The second issue that should be kept in mind when implementing the results of this paper is that psychological complaints range from zero to many, therefore distress can be best viewed as a continuum as opposed to a dichotomy. Applying a cutoff point to this continuum potentially reduces information (Bültmann et al. 2000). If the purpose of a study is to explore the etiology of distress, it is more informative to use a range of distress scores. A dichotomy, however, is useful when the prevalence of distress has to be compared in different subgroups or when employees have to be selected for stress management or treatment.

Unfortunately, there is no other study to compare with, which reported a cutoff point based on the AUC statistic for identifying cases of sickness absence related to distress in a working population. It is noteworthy that the use of a cutoff point for inclusion in preventive stress management programs has not often been reported until now. Moreover, in the meta-analysis of van der Klink et al. (2001), only four studies out of forty-eight involved participant selection with regard to high baseline stress levels.

The choice of a cutoff point of 11 results in a measure that can be used as a cutoff point in future studies on distress and mental disorders, and is appropriate for use in occupational health practice as a credible selection instrument for stress management or other interventions to prevent sickness absence.

The cutoff point of 11 corresponds with a sensitivity of 95% and a specificity of 90% in a representative study population as created (a population with 2% sickness absence due to psychological complaints). The positive predictive value of the cutoff point in this study population is 17%, whereas the negative predictive value is 99.8%. This means that there is a one in six chance that an employee in a working population who scores on or above the cutoff score of 11 may really turn out to go on sick leave for psychological reasons. On the other hand, in case of a negative test outcome there is only a two-tenths of a percent chance of a false negative result. This issue is mentioned by Dwyer (1996) as the problem of 'misclassification' as an inevitable consequence of dividing a sample of employees into those at risk and not at risk.

The occupational health physician can be confident that the employee is actually free of the chance to be absent for psychological problems when the test result is negative. On the other hand, the large majority of the selected population with a cutoff point greater than 11 does not belong to the population on sick leave, which is a reason for further considerations. In our opinion this finding may be acceptable. Since the 4DSQ is inexpensive, easy to administer, poses little risk and causes minimal discomfort for the employee, the overestimation of positive results can be corrected by embedding the test procedure in a broader program that includes a further study of each positive finding. A second test, for example an individual interview, can distinguish more precisely whether an employee needs an intervention or not. This serial multi testing (Fletcher et al. 1996) is quite popular in the regular health care field, and can also be implemented in the practice of occupational health care.

Furthermore, an argument in favor of the application of the chosen cutoff point is the assumption that the induction of interventions can be useful for all stressed employees. Interventions based on a physically-oriented approach like relaxation and physical exercise aim at improving mental health by reducing physiological arousal (Salmon 2001). There is good evidence from randomized controlled trials that relaxation techniques can reduce psychological complaints related to stressful situations (Vickers and Zollman 1999). Positive effects of cognitively-oriented interventions have been reported extensively (Van der Klink et al. 2001). Changing appraisal processes and enhancing coping skills are the fundamentals for coping with stress more effectively. Therefore, learning a method

for managing demands and stressors, and altering how one responds to inevitable and necessary demands will benefit employees instead of harming them. One issue to discuss is the effect of labeling on public attitudes toward people with stress. Angermeyer and Matschinger (2003) found out that labeling people with mental problems has an impact on public attitudes only if there is particularly a link with the stereotype of dangerousness (e.g. schizophrenia). By contrast, 'distress', denoting a wide range of mental health problems, is generally accepted by the public and therefore not perceived as a danger. A critical note might be that, in some companies, labeling can be a problem, especially during periods of downsizing (Vahtera et al. 2004; Dragano et al. 2005).

Finally, there is an issue of costs. In our opinion, a program for screening a working population using the 4DSQ, including interventions, is far less expensive than sickness absence due to psychological problems. Costs due to the consequences of stress in the Netherlands are estimated at 6.1 billion Euros a year (TNO), 2.7 billion of which is due to sickness absence and allowances. This is comparable with over 1% of the Gross National Product of the Netherlands.

Conclusion

A distress cutoff of ≥ 11 was defined. This cutoff point will result in a measure that can be used as a credible selection instrument for interventions such as stress management programs to reduce distress and sickness absence due to psychological complaints in occupational health practice and as a well-founded cutoff point in future studies on distress and mental disorders.

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The effect of a cognitive and a physical stress reducing program on psychological complaints

Van Rhenen W^{1,2}, Blonk RWB^{1,3}, van der Klink JIL¹,
van Dijk FJH¹, Schaufeli WB⁴

Int Arch Occup Environ Health 2005;78(2):139-48

¹ Academic Medical Center, Coronel Institute, University of Amsterdam,
Meibergdreef 9, 1105 AZ Amsterdam, The Netherlands

² Department of Occupational Health Services, ArboNed Utrecht,
Zwarte Woud 10, 3524 SJ Utrecht, The Netherlands

³ TNO Work and Employment, Polarisavenue 151, 2132 JJ Hoofddorp, The Netherlands

⁴ Utrecht University, Department of psychology and Research
Institute Psychology & Health, Heidelberglaan 1, 3584 CS Utrecht, The Netherlands

Abstract

Objectives

To investigate the short-term and long-term effectiveness of two, brief, preventive, work stress management programmes. One programme was a cognition-focused programme, the other was a newly developed intervention in which physical exercise and relaxation were combined. It was hypothesised that the newly developed intervention would be more effective in reducing psychological complaints than the cognitive intervention. Both programmes consisted of four sessions in a period of 10 weeks.

Methods

From a working population engaged in a periodic health check-up, employees above a minimum stress level ($n=396$) were invited to participate in a randomised comparative outcome study with pre-trial, post-trial and 6-month follow-up measures. After giving informed consent 130 participants entered the study (response rate 33%). Outcome measures consisted of three self-reported questionnaires on psychological complaints.

Results

It was found that both interventions revealed a positive impact on psychological complaints, burnout and fatigue, both at short-term and at 6-month follow-up. No statistical interaction effects between the two interventions were found. Calculation of the clinical significance of the effects indicated that 50% of the employees with psychological complaints who participated in the physical intervention and 60% of the employees who participated in the cognitive intervention improved and returned to functioning within normal range both in the short term and in the long term at 6 months.

Conclusion

The data indicate that interventions were equally effective on psychological complaints, burnout and fatigue.

Keywords: stress management, combined intervention, physical Relaxation, cognitive behavioural, clinical significance

Introduction

This paper reports a long-term follow-up assessment of two strategies in relation to their effectiveness in stress management. The specific aim of both interventions, a cognitive intervention versus a combined intervention of physical exercise and relaxation, is to reduce health complaints that result from job stress.

In Western countries job stress is considered a major concern, especially during the past decades. As in other countries (Paoli and Merllie 2000), in the Netherlands, disablement for work as a result of health complaints due to job stress is one of the main political and economical concerns. It is estimated that two-thirds of sick leave may be attributed to job stress (Houtman et al. 1994; Stichting van de Arbeid 2002).

As a result of prolonged job stress, employees may suffer from various health complaints, such as depression symptoms, anxiety, physical symptoms and distress, malaise or burnout (Cooper et al. 2001). Several stressreducing interventions have been developed over the years to counter these problems. The focus of these job stress interventions can be an individual, an organizational or a combined approach (van der Klink et al. 2001). In this study we consider, especially, the effectiveness of an individual approach.

There is a great diversity concerning the content and duration of individual-focused interventions. Interventions based on a physical approach, such as relaxation and physical exercise, aim at improving mental health by reducing physiological arousal (Salmon 2001). According to Murphy (1996) relaxation is involved in approximately 75% of stress-management programmes. There is good evidence from randomised controlled trials that relaxation techniques can reduce psychological complaints, especially anxiety related symptoms related to stressful situations (Vickers and Zollman 1999).

Another physical approach, physical exercise, may also have a positive effect on psychological complaints, especially for depressive symptoms and the ability to cope with (job) stress (Salmon 2001; Gauvin and Spence 1995; Byrne and Byrne 1993). Recently several studies have consistently associated physical exercise with better mental health

(Stephoe and Butler 1996). In a review Salmon (2001) stated that the clearest evidence of improvement of these psychological complaints by exercise training has been found with relatively mildly, non-clinically impaired subjects.

As noted above, employees with job stress report various psychological complaints, including depression and anxiety. Therefore, a combined intervention of relaxation and physical exercise is of special interest. We hypothesise that a combined intervention might have a synergistic effect. To our knowledge outcome studies with a combined intervention of relaxation and physical exercise have not been conducted thus far and are, therefore, one of the aims of the present study.

Individual-focused interventions based on cognitive techniques aim at reducing complaints through changing appraisal processes (cognition) and/or enhancing coping skills (behaviour) (Lazarus and Folkman 1984; Meichenbaum and Deffenbacher 1988). This type of intervention can be described as a time-limited, present orientated approach that teaches employees cognitive and behavioural coping skills (Heimberg 2002). The positive effects of cognitive interventions have been extensively reported with regard to patients with depressive (Scott 2001) and/or anxiety disorders (Heimberg 2002; Fedoroff and Taylor 2001). Guidelines (Agency for Health Care Policy and Research 1993; American Psychiatric Association 1993) suggest that the best candidates for these interventions are individuals with mild-to-moderate depression as observed in highly distressed employees (Scott 2001).

Recently, a meta-analysis that assessed the effect sizes of job stress management was conducted (van der Klink et al. 2001). Moderate effect sizes were found for individual-focused programmes (Cohen's $d=0.44$). A small but significant effect size was reported for programmes with relaxation techniques across different outcome measures ($d=0.35$). However, as expected, relaxation was shown to have a large effect size on psychophysiological complaints. For programmes with a cognitive-behavioural approach the effectiveness ($d=0.68$) across all outcome measures was significantly larger than that of relaxation techniques. This supports the interpretation that cognitive intervention is superior to a physical intervention.

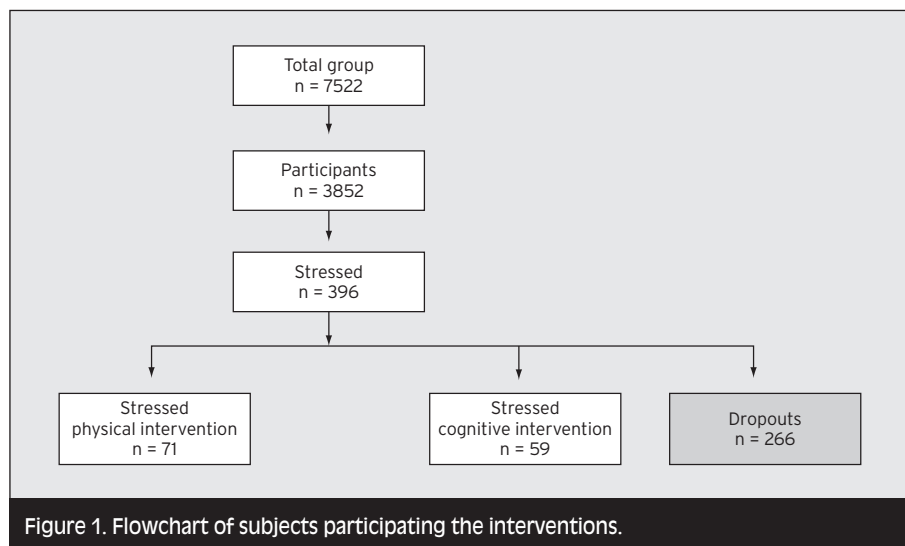
In the meta-analysis a number of gaps in our knowledge is considered with regard to stress-reduction intervention programmes (van der Klink et al. 2001; Murphy 1996; van der Hek and Plomp 1997). Comparative outcome studies on the effectiveness of various interventions are rare. For example, comprehensive programmes that include physical exercise and relaxation techniques have not been compared with a cognitive programme. The aim of this study was to test the hypothesis that the newly developed, combined physical intervention is more effective in reducing psychological complaints than a cognitive intervention. Another issue was the lack of a participant selection criterion in the majority of the studies: participants who applied were included irrespective of their levels of complaints. In only a few studies were participants selected above a minimum stress level. As is argued by Murphy (1996) this may be due to the subclinical levels of stress in a healthy and working population. However, from a preventive point of view, selection of participants may enlarge effectiveness and efficiency (Tallant et al. 1989). Further, from the point of view of efficiency a compact programme that includes a minimum of sessions is of interest. Finally, a very important issue is to perform studies with a long-term assessment, given its relevance for the impact of the intervention.

This study tries to meet the need for studies. By obtaining new data and considering some of these issues. We conducted a trial that compared two four-session interventions. One intervention consisted of a combined programme of physical exercise and relaxation, the other was a cognitive intervention. The participants in the study were included on the condition that they exceeded a certain level of stress complaints. Both short-term and long-term effects were investigated.

Method

Participant selection and design

The study was designed as a randomised clinical trial with pre-trial, post-trial and 6-month follow-up measures. Employees working in a telecommunications company in The Netherlands were invited to participate in a screening programme on health experience and perceived work environment. The programme was introduced as a periodic health check-up. From a working population of 7,522 employees, 51% ($n=3,852$) agreed to participate and filled out a questionnaire (Fig. 1).



This sample comprised 3,497 men and 355 women; their ages ranged from 18 years to 63 years. Of these employees, 396 reported a high rate of distress, which was defined as a distress score above 0.32 on the Four-Dimensional Symptom Questionnaire (4DSQ) (Terluin 1994). This cutoff point is based on data obtained from approximately 700 employees that participated in stress-reducing programmes. Of the most distressed employees, 10% rated higher than 0.32.

After giving informed consent the employees with a score above 0.32 were randomly assigned to one of two conditions: physical and relaxation exercises (FYS) or cognitive intervention (COG). Of the employees, 71 started in the FYS group and 59 in the COG group (time 1 [T1]). The company did not permit dropout research with questionnaires.

After the training period (time 2 [T2]), approximately 10 weeks later, subjects of the intervention groups had to fill out a post-session questionnaire. Six months after the program ended (time 3 [T3]) participants were requested to fill out the follow-up questionnaire (Fig. 1).

The interventions

Physical exercise and relaxation

The aim of the physical intervention was to provide awareness and introduction of physical and relaxation exercises in daily work activities. The level and intensity of the exercises were modified in such a way that

it met the physical capability of each individual. The sessions took place during working hours, and the participants were supposed to continue their work afterwards. The exercise programme was designed, and the protocol set and conducted, by authorised physical therapists. Four training sessions, each lasting for 1 h, were given over a period of 8 weeks. The intervals between the sessions were 2 weeks, 2 weeks and 4 weeks.

Every session consisted of four main parts: introduction, warming-up and physical exercise, relaxation exercise and an assignment. During the introduction of session 1 the term “stress” and its effects on physical, psychological and behavioural level were clarified. Further, the possibility of coping by physical activities was emphasised. Next, the participant started with warming up and keep fit exercises. The relaxation exercise was designed as progressive muscle relaxation, according to Jacobson (1929). At the end of the session the participant was asked to implement the relaxation exercise during daily stressful situations. The second session started with an assessment of the past 2 weeks and included the implementation of the relaxation exercise. The fitness exercise was focused on the relationship of heart rate and strain and ended with a breathing exercise (Roesel 1928) and muscle stretching. The participant was urged to use the knowledge learned. The third session consisted of an assessment, a keep-fit exercise, a focus on work stress and autogenous training (Schultz 1935). The participants planned their daily exercise and scored their own progression. In the fourth and final session the different physical exercises and relaxation techniques were reviewed, including meditation (Lowenstein 2002). The session ended with advice on the prevention of relapse.

Cognitive intervention

The aim of the cognitive intervention was to restructure irrational beliefs. The theme of the first session was education. The term “stress” was explained by a description of the signals and course of the complaints. The complaints were placed in a positive framework, e.g. backache as body language for heavy stress load. The participants were presented with specific coping techniques, such as focusing on problems and seeking social support. For homework they made a list of (jobrelated) stressors. The second session started with a discussion of this list. The participants were asked to read a popularised scientific book on rational emotive therapy (RET) (Ellis and Grieger 1986). The theme of the third session

was RET: irrational reasoning as a pitfall, and adjustment by rational reasoning. The participants were sent away with the instruction to make themselves familiar with this skill. The fourth and final session was a review of the specific skills and advice on the prevention of relapse. The cognitive interventions were conducted by psychologists and were of the same frequency and duration as the physical exercise programme and conducted during working hours.

Measurements

Psychological complaints

The 4DSQ (Terluin 1994, 2004) measures psychological complaints. It consists of four dimensions: distress (16 items), depression (six items), anxiety (12 items) and somatisation (16 items). The items are scored on a 5-point Likert scale for occurrence during the past week and describe the complaint with five response categories, from no complaints (last week I did not worry) to very often/continuously (last week I worried continuously). The internal consistency (Cronbach's alpha) of the entire questionnaire in our study was 0.88; for each of the four subscales it was 0.75 for somatisation, 0.70 for distress, 0.71 for depression and 0.79 for anxiety.

Burnout

Burnout, used as an outcome variable, is measured by the UBOS. The UBOS is the Dutch version (Schaufeli and Van Dierendonk 2000) of the Maslach Burnout Inventory General Survey (MBI-GS) (Maslach et al. 1997). It consists of 16 items, which represent emotional exhaustion (five items), cynicism (five items) and professional efficacy (six items). Each item is rated on a 7-point scale ranging from 0 (working all day is never a strain to me) to 6 (working all day is a strain to me every day). The internal consistency (Cronbach's alpha) for the three subscales in the present study was 0.84 (exhaustion), 0.72 (professional efficacy) and 0.68 (cynicism).

Fatigue

Fatigue, as an outcome variable, was measured by the Checklist Individual Strength (CIS) (Vercoulen et al. 1994). The CIS is a 20-item multi-dimensional self-report questionnaire that measures fatigue. It consists of four dimensions: the subjective experience of fatigue (eight items), reduction in activity (three items), reduction in concentration (five items) and reduction in motivation (four items). The complete questionnaire

consists of 20 statements for which the person has to indicate, on a 7-point scale, to what extent the particular statement applies to him or her. The statements refer to aspects of fatigue experienced during the previous 2 weeks (for example, I feel tired). Cronbach's alpha for the total CIS was 0.91, and for the scales the α ranged from 0.79 to 0.91, in accordance with results reported in the literature (Beurskens et al. 2000).

Statistical analysis

Firstly, a check of the randomisation was conducted by a multivariate analysis of variance (MANOVA) on the pre-test scores. Furthermore, selection effects were checked by dropout analysis. Secondly, we tested the effectiveness of the interventions with repeated measures MANOVA on pre-test to post-test scores, on pre-test, post-test and follow-up scores and post-test to follow-up scores. The intervention was the between-subject factor, whereas time was used as the within-subject factor. Thirdly, to compare our results with that in the literature, we calculated the effect sizes (Cohen's d) as a standardised measure of change. Finally, conceptualizing the process of employees returning to normal functioning, we calculated the clinical significance of the interventions as proposed by the method of Jacobson (Jacobson and Truax 1991). In this method the two steps towards establishing clinically significant change are: establishing a cut-off point between a dysfunctional and a functional population and establishing an index for measuring whether or not the change during the course of the intervention is reliable (McGlinchey and Jacobson 1999). The dysfunctional population is defined as ± 1 SD above the mean of the functional (in our case the not stressed) population.

The index to calculate the reliability of change represents the difference of a subject's post-test score minus the subject's pre-test score divided by the standard error of difference between the two test scores. An index larger than 1.96 would be unlikely to occur ($P < 0.05$) without actual change.

Results

The results are presented in three sections: the description of characteristics of the participants, a dropout analysis and the analysis of the effectiveness of both programmes.

Participants

At T1 130 employees were participating in the programme. The mean age of this group was 44.2 years ($SD=7.4$), and the group consisted of 117 (90%) men and 13 (10%) women. On average they had 21.1 years ($SD=9.8$) of work experience. The work of the employees was diverse and could be divided in four categories: executive, administrative, managerial or advisory. Following the training period, after 2 months [T2], 44 (62%) subjects of the FYS group and 46 (78%) subjects of the COG group filled out the postsession questionnaire. At T3, another 6 months later, 54 (76%) subjects of the FYS group and 46 (78%) subjects of the COG group filled out the follow-up questionnaire.

Of the 130 employees who started the intervention 75 (58%) [COG 36 of 59 (=61%); FYS 39 of 71 (=55%)] completed the intervention and filled out all three questionnaires. Only participants with complete data records were included in the analysis ($n=75$).

Selection effects

As noted earlier, of the 396 employees who were advised to participate in the intervention programme, 67% dropped out before the first session. The question is whether these dropouts differed significantly from those who continued to participate in this study. To answer this question we conducted two MANOVAs. We compared dropouts and completers on the outcome measures at T1. The self-report measure on psychological complaints (4DSQ) showed no significant differences at the multivariate level: Pillai's $F(4.391)=0.69$, $P=0.991$. No significant differences were found between dropouts and completers on age, work experience and gender ($F(1.390)=0.744$, $P=0.389$; $F(1.390)=0.101$, $P=0.751$; $\chi^2(1)=2.327$, $P=0.127$, respectively).

Thus, no selection effects could be demonstrated for the completers. In a next phase the FYS and COG subgroups were distinguished still at T1. We examined possible selection effects by carrying out MANOVAs. For psychological complaints (4DSQ) and burnout (UBOS) there were no significant differences: Pillai's F was $(4.70)=0.185$, $P=0.945$ and $(3.69)=2.046$, $P=0.116$, respectively. By contrast, for fatigue (CIS) we found a difference: Pillai's $F(4.68)=4.667$, $P=0.002$. All scales of the CIS differed significantly: fatigue, $P=0.001$, motivation, $P=0.011$, activity, $P=0.014$, concentration, $P=0.003$.

Table 1. Homogeneity and correlations between the subscales before the test (Cronbach's alpha)

	dist	somat	depres	anxiet	exhau	cynic	comp	fatig	activ	conc	motiv
PSYCH.COMPLAINTS											
distress	$\alpha=.70$										
somatization	,518**	$\alpha=.75$									
depression	,618**	,359**	$\alpha=.71$								
anxiety	,431**	,590**	,452**	$\alpha=.79$							
BURNOUT											
exhaustion	,264*	,291*	,274*	,189	$\alpha=.84$						
cynicism	,153	,102	,347**	,254*	,404**	$\alpha=.68$					
reduced competence	,042	,046	,225	,271*	,410**	,444**	$\alpha=.72$				
FATIGUE											
subjective fatigue	,077	,165	-,022	,011	,614**	,145	-,180	$\alpha=.90$			
reduced activity	,026	,024	-,024	,066	,292*	,308**	,484**	,300**	$\alpha=.79$		
reduced concentration	,314**	,235*	,254*	,148	,339**	,288*	,437**	,272*	,607**	$\alpha=.85$	
reduced motivation	,212	,055	,221	,053	,512**	,309**	,403**	,548**	,470**	,561**	$\alpha=.82$

α = (Cronbach's alpha)

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

In conclusion, a difference in fatigue between the groups resulted as a side effect from a randomised procedure to fill up the groups. Employees who were selected in the FYS group experienced more fatigue. Given the fact that the difference between groups is mainly caused by the entity "fatigue" we checked the intercorrelations between the outcome variables.

As can be seen in Table 1 the intercorrelations between the subscales of the different questionnaires range from small to moderate, which fits with their conceptual dependence. The conceptual independence of psychological complaints and burnout plus fatigue is exemplified by the low intercorrelations between these variables. Given the randomisation of the intervention groups the selection effect must be a coincidence.

Intervention effects

Means and standard deviations on the outcome measures are presented in Table 2. The data were subjected to repeated measures MANOVA. The results of these analyses are represented in Table 2.

Short-term effects (pre-test to post-test analysis)

Psychological complaints

As can be seen in Table 2, for both groups, a decline in psychological complaints was found. Repeated measures MANOVA indicated a significant

Table 2. Means, standard deviation and statistics on the outcome measures before the test, after the test and at follow-up

Physical (FYS)			Cognitive (COG)			short term			follow-up				
pre test	post test	follow-up	pre test	post test	follow-up	(T1, T2)			overall (T1,T2,T3)		longterm (T2,T3)		
T1	T2	T3	T1	T2	T3	F	p		F	p	F	p	
PSYCH. COMPLAINTS (n=37/36)						group	(4,70) 0,42	.79	(4,68) 0,81	.52	(4,68) 1,72	.16	
						time	(4,70) 9,30	.00	(8,64) 8,69	.00	(4,68) 0,66	.62	
						g x t	(4,70) 1,67	.17	(8,64) 0,88	.53	(4,68) 0,93	.54	
Distress						group	(1,73) 1,00	.32	(1,71) 1,22	.27	(1,71) 1,65	.20	
Mean	0,54	0,41	0,36	0,53	0,33	0,32	time	(1,73) 37,4	.00	(2,142) 29,7	.00	(1,71) 1,20	.28
SD	0,15	0,25	0,22	0,16	0,24	0,27	g x t	(1,73) 2,05	.16	(2,142) 0,97	.38	(1,71) 0,39	.53
Somatization						group	(1,73) 0,14	.71	(1,71) 0,11	.74	(1,71) 0,30	.59	
Mean	0,27	0,25	0,23	0,28	0,21	0,23	time	(1,73) 6,31	.01	(2,142) 5,10	.01	(1,71) 0,07	.79
SD	0,16	0,21	0,16	0,17	0,17	0,19	g x t	(1,73) 2,82	.10	(2,142) 1,33	.27	(1,71) 2,01	.16
Depression						group	(1,73) 0,96	.33	(1,71) 0,50	.48	(1,71) 0,65	.42	
Mean	0,22	0,17	0,13	0,21	0,10	0,13	time	(1,73) 10,6	.00	(2,142) 7,11	.00	(1,71) 0,05	.83
SD	0,21	0,23	0,20	0,19	0,15	0,24	g x t	(1,73) 1,29	.26	(2,142) 0,99	.37	(1,71) 1,92	.17
Anxiety						group	(1,73) 0,01	.93	(1,71) 0,06	.80	(1,71) 0,42	.52	
Mean	0,15	0,10	0,07	0,14	0,11	0,10	time	(1,73) 6,92	.01	(2,142) 6,85	.00	(1,71) 1,50	.23
SD	0,16	0,11	0,13	0,14	0,14	0,17	g x t	(1,73) 0,61	.44	(2,142) 0,84	.43	(1,71) 0,36	.55
BURNOUT (n=39/33)													
Exhaustion						group	(1,71) 3,35	.07	(1,70) 2,17	.14	(1,71) 1,31	.26	
Mean	3,41	3,07	3,13	2,75	2,64	2,92	time	(1,71) 4,30	.04	(2,140) 1,76	.18	(1,71) 1,78	.19
SD	1,24	1,51	1,47	1,22	1,37	1,45	g x t	(1,71) 0,67	.42	(2,140) 1,61	.20	(1,71) 0,68	.41
Cynicism						group	(1,71) 0,10	.76	(1,70) 0,33	.57	(1,71) 0,58	.45	
Mean	2,27	2,18	2,11	2,28	2,24	2,41	time	(1,71) 0,54	.47	(2,140) 0,20	.82	(1,71) 0,12	.73
SD	1,11	1,07	1,12	0,97	1,01	1,08	g x t	(1,71) 0,08	.78	(2,140) 0,95	.39	(1,71) 0,82	.37
Reduced professional efficacy						group	(1,71) 0,67	.42	(1,70) 0,10	.32	(1,71) 1,49	.23	
Mean	2,00	1,81	1,84	1,82	1,65	1,61	time	(1,71) 4,29	.04	(2,140) 2,87	.06	(1,71) 0,00	.94
SD	1,00	0,91	0,88	0,87	0,83	0,94	g x t	(1,71) 0,01	.92	(2,140) 0,07	.93	(1,71) 0,15	.70
FATIGUE (n=39/34)						group	(4,68) 3,17	.02	(4,68) 2,50	.05	(4,69) 1,47	.22	
						time	(4,68) 5,78	.00	(8,64) 3,43	.00	(4,69) 1,13	.35	
						g x t	(4,68) 1,07	.38	(8,64) 0,73	.66	(4,69) 0,73	.57	
Subjective fatigue						group	(1,71) 8,79	.00	(1,71) 7,71	.00	(1,72) 4,39	.04	
Mean	5,04	4,25	4,39	3,96	3,59	3,64	time	(1,71) 19,6	.00	(2,142) 9,25	.00	(1,72) 1,20	.28
SD	1,09	1,37	1,40	1,51	1,51	1,86	g x t	(1,71) 2,51	.12	(2,142) 1,15	.32	(1,72) 0,04	.84
Reduced activity						group	(1,71) 4,60	.04	(1,71) 5,13	.03	(1,72) 3,20	.08	
Mean	3,93	3,18	3,44	3,06	2,84	2,79	time	(1,71) 8,71	.00	(2,142) 4,42	.01	(1,72) 0,72	.40
SD	1,32	1,29	1,46	1,63	1,32	1,58	g x t	(1,71) 2,58	.11	(2,142) 1,19	.31	(1,72) 0,43	.51
Reduced concentration						group	(1,71) 8,15	.01	(1,71) 6,02	.02	(1,72) 3,27	.08	
Mean	4,39	3,96	3,72	3,44	3,34	3,34	time	(1,71) 3,24	.08	(2,142) 3,25	.04	(1,72) 0,26	.61
SD	1,16	1,28	1,34	1,43	1,45	1,55	g x t	(1,71) 1,15	.29	(2,142) 1,59	.21	(1,72) 1,19	.28
Reduced motivation						group	(1,71) 7,36	.01	(1,71) 5,84	.02	(1,72) 4,67	.03	
Mean	4,14	3,80	3,83	3,28	3,09	3,34	time	(1,71) 3,63	.06	(2,142) 1,52	.22	(1,72) 1,12	.29
SD	1,38	1,30	1,52	1,43	1,37	1,53	g x t	(1,71) 0,27	.60	(2,142) 0,75	.48	(1,72) 0,78	.38

main effect for time, but no main effect for group or the interaction of group and time. As for the four subscales, a significant effect for time and not an effect of the intervention type for both groups is on stress reduction. The effect sizes, shown in Table 3, displayed, for the COG group, a large effect size (Cohen's *d*) for distress, a medium effect size for somatization and depression and a small effect size for anxiety. There was a medium effect for the four subscales for the FYS group, except for somatisation. This effect size was small. Depending on the subscales, return to normal functioning varies from 44% to 54% in the FYS group and from 50% to 61% in the COG group (Table 4).

Burnout

For both groups Table 2 indicates a decrease for exhaustion, cynicism and reduced professional efficacy. In time the decrease is significant for exhaustion and reduced professional efficacy but not for cynicism. The groups differ nearly significantly for exhaustion: a decrease in the FYS group and no clear orientation in the COG group. For the two groups there is no significant effect of intervention type for exhaustion, cynicism and reduced professional efficacy. The effect size (Cohen's *d*) of FYS and COG on the subscales is small (Table 3). Depending on the subscales, return to normal functioning ranges from 38% to 49% in the FYS group and 31% to 47% in the COG group (Table 4).

Fatigue

The scores on subjective fatigue, reduced motivation, reduced activity and reduced concentration decreased (Table 2). The reduction in time is significant for subjective fatigue and reduced activity, and marginally significant for reduced motivation and reduced concentration. The groups differ significantly for the CIS (fatigue) and the four subscales, but no significant intervention effect can be observed. There was a small effect size (Cohen's *d*) in the FYS group for fatigue, with a medium effect size in the COG group (Table 3). Depending on the subscales, return to normal functioning varies from 33% to 51% in the FYS group and 47% to 61% in the COG group (Table 4). The recovery of employees for subjective fatigue in the COG group is significantly better than for the FYS group.

Follow-up effects (effects 6 months later)

Psychological complaints

The positive reduction in psychological complaints remained stable

Table 3. The effect sizes on the subscales at short and long term

	Cohen's d					
	short term (T1-T2)	cognitive follow-up (T2-T3)	overall (T1,T2,T3)	short term (T1-T2)	physical follow-up (T2-T3)	overall (T1,T2,T3)
PSYCH.COMPLAINTS						
distress	.98	.05	.96	.60	.19	.90
somatization	.41	-.09	.28	.16	.16	.27
depression	.63	-.14	.37	.24	.13	.39
anxiety	.22	.06	.25	.40	.23	.57
BURNOUT						
exhaustion	.11	-.20	-.13	.24	-.04	.20
cynicism	.04	-.14	-.12	.08	.06	.14
reduced prof. efficacy	-.20	-.04	-.14	-.19	.03	-.17
FATIGUE						
subjective fatigue	.25	-.12	.19	.64	-.10	.52
reduced activity	.15	-.02	.16	.35	-.19	.35
reduced concentration	.07	-.05	.07	.25	.18	.53
reduced motivation	.14	-.21	-.03	.57	-.01	.21

Table 4. The clinically significant change on the subscales for both types of intervention

	short term (T1-T2)					follow-up (T1-T3)				
	Physical (n=39)		Cognitive (n=36)		χ^{2*}	Physical (n=39)		Cognitive (n=36)		χ^{2*}
	no recovery	recovery	no recovery	recovery		no recovery	recovery	no recovery	recovery	
PSYCH.COMPLAINTS										
somatization	22 (56%)	17 (44%)	17 (47%)	19 (53%)	.43	19 (49%)	20 (51%)	16 (44%)	20 (56%)	.71
distress	21 (54%)	18 (46%)	18 (50%)	18 (50%)	.74	19 (49%)	19 (49%)	14 (39%)	22 (61%)	.34
depression	20 (51%)	19 (49%)	16 (44%)	20 (56%)	.55	19 (49%)	19 (49%)	14 (39%)	22 (61%)	.34
anxiety	18 (46%)	21 (54%)	14 (39%)	22 (61%)	.53	13 (33%)	24 (62%)	12 (33%)	24 (67%)	.87
BURNOUT										
exhaustion	24 (62%)	15 (38%)	18 (50%)	17 (47%)	.38	27 (69%)	12 (31%)	21 (58%)	14 (39%)	.41
cynicism	24 (62%)	15 (38%)	24 (67%)	11 (31%)	.53	24 (62%)	15 (38%)	21 (58%)	14 (39%)	.89
reduced prof. efficacy	20 (51%)	19 (49%)	18 (50%)	17 (47%)	.99	22 (56%)	17 (44%)	15 (42%)	20 (56%)	.24
FATIGUE										
subjective fatigue	25 (64%)	14 (36%)	14 (39%)	21 (58%)	.04	25 (64%)	14 (36%)	18 (50%)	18 (50%)	.22
reduced activity	19 (49%)	20 (51%)	13 (36%)	22 (61%)	.32	20 (51%)	19 (49%)	13 (36%)	23 (64%)	.19
reduced concentration	23 (59%)	16 (41%)	14 (39%)	21 (59%)	.10	24 (62%)	15 (38%)	15 (42%)	21 (58%)	.09
reduced motivation	26 (67%)	13 (33%)	18 (50%)	17 (47%)	.18	25 (64%)	14 (36%)	20 (56%)	16 (44%)	.45

* Pearson Chi-Square Asymp. sig. (2-sided)

6 months after the last session (Table 2). Repeated measures MANOVA indicated a significant main effect for time, attributable to short-term effects. After session four the effect of the type of intervention was maintained. There was a large effect size of FYS and COG on distress,

and a medium effect on somatisation, depression and anxiety (Table 3, overall). Depending on the subscales, recovery to normal functioning in the FYS group was 49% and higher and in the COG group 56% and higher (Table 4).

Burnout

The FYS group still demonstrated substantially lower levels of exhaustion, cynicism and reduced professional efficacy. The COG group demonstrated an increase for exhaustion and cynicism (Table 2). However, significant differences between both groups in the adjusted means were not found, except for reduced professional efficacy. There was no effect from the type of intervention. There was a small effect size (Cohen's *d*) of FYS and COG on the subscales (Table 4). Depending on the subscales, return to normal functioning in the FYS group was 31% and higher and in the COG group 39% and higher. In the FYS group employees relapsed to abnormal for exhaustion and professional efficacy, and in the COG group only for exhaustion (Table 4).

Fatigue

As can be seen in Table 2 the decrease found at T2 is maintained and significant. The significant effect of time is still there and can be attributed to short-term effects. The effect of intervention type is not significant. The effect size (Cohen's *d*) in the COG group on the four subscales is small, whereas the effect size of FYS on subjective fatigue, reduced activity and reduced concentration remains at a medium level (Table 3). Depending on the subscales, return to normal functioning in the FYS group is 36% and higher and in the COG group 44% and higher, which means that some employees reverted to abnormal functioning (Table 4).

Discussion and conclusions

The aim of the present randomised trial was to investigate whether a physical, combined, intervention of relaxation and physical exercise has a more positive effect on the reduction of psychological complaints than a cognitive intervention. No differential effect between the two conditions was demonstrated. It was found that both interventions revealed a positive impact on psychological complaints, burnout and fatigue, both in the short term and at 6-months' follow up.

The decrease in psychological complaints, burnout and fatigue for the physical and cognitive intervention is consistent with our expectations and previous research. However, the fact that both programmes were likewise effective, plus the lack of a control group, urged us to assess the clinical significance of the results. Jacobson et al. (1984) introduced the idea that, for psychological interventions, clinically significant change is a good measure of the return to normal functioning. Although the difference between both interventions was not significant, with regard to psychological complaints approximately 50% of the employees that participated in the physical intervention and 60% that participated in the cognitive intervention improved and returned to normal function. On burnout and fatigue the improvement was less. For exhaustion, 31% of the employees in the physical intervention returned to normal functioning and 39% in the cognitive intervention. For subjective fatigue the percentages were 36 and 50, respectively.

As noted above, no (statistical) interaction effect between the two interventions was found. That both interventions were equally effective is remarkable in the light of previous research such as the meta-analysis of van der Klink et al. (2001). Their meta-analysis revealed a small effect for the relaxation techniques on psychological complaints such as anxiety and depression and a significantly larger effect for cognitive interventions on these complaints.

There may be two explanations for this result: the length and duration of the interventions and the content of the interventions. The first explanation for the lack of a differential effect of both intervention types may be attributed to the length and duration of the intervention period necessary to improve psychological complaints. Four sessions may be too short for an intervention to provide a differential effect. How long these interventions should be is subject to debate. For cognitive interventions a large range of results is described in the literature with regard to the length and duration of the intervention. For instance, Mueser et al. (1997) reported poor results of short-term interventions for psychiatric rehabilitation, contrary to Barkham and Shapiro (1990), who reported a reliable and clinically significant improvement for mild depression after two sessions only. Further, van der Klink et al. (2001) stated that the mean number of sessions for the cognitive interventions with a large effect on complaints such as anxiety and depression is seven. Similar effects are

found for relaxation programmes and physical exercise (van der Klink et al. 2001; McIntyre et al. 1990; Yeung 1996; Raglin and Wilson 1996; Steptoe et al. 1998).

Summarised, the reduction of psychological complaints, burnout and fatigue, in our study, by four sessions underlines the possibility of success through a brief intervention and confirms the finding of Barkham and Shapiro (1990) with regard to the effectiveness of a brief therapeutic intervention. The second explanation for the lack of an interaction effect is the content of the interventions. In this study a combined intervention of relaxation and physical exercise was been introduced. The effect size of this combination of relaxation and physical exercise on psychological complaints, especially distress, appears larger than the effect size of relaxation alone in the meta-analysis by van der Klink et al. (2001). However, the effect size of the physical intervention might be overestimated by the lack of a control group. Despite that, relaxation and physical exercise are each known for their positive effect on minor psychological complaints. In accordance with Benson et al. (1975) is the postulation that exercise may also be a form of meditation that triggers a more relaxed state or a form of biofeedback that teaches people to regulate their autonomic arousal. From this point of view a combination of physical exercise and relaxation may have caused the relatively large effect size. To confirm this hypothesis new research with three types of interventions—relaxation, physical exercise and control—is needed.

There are a number of potential limitations in this study. The first limitation of the present design is the lack of a control group. Therefore, selection effects and effects of regression to the mean cannot be excluded. However, the lack of a control group is a considerable problem in field studies. If an intervention proved to be beneficial, withholding it from employees in need is an important ethical issue (Goldenhar and Schulte 1994). However, an experimental design for field studies is more favourable than semi-experimental designs for the generalisation of the results.

A second limitation for the generalisation of the results concerns a selection effect of the physical intervention. Despite the randomisation procedure the employees in this condition had significantly more complaints about fatigue. It emphasises, again, the need for a controlled study.

In conclusion, the present study is one of the few that has a long-term assessment of two interventions randomly assigned to highly stressed employees. A newly designed physical intervention is compared with a cognitive intervention. Both interventions were equally effective for psychological complaints, burnout and fatigue. Moreover, 50% of the employees with psychological complaints that participated in the physical intervention and 60% that participated in the cognitive intervention improved and returned to scores with normal range. The present study emphasises the importance of the study of effects in a field setting.

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Can sickness absence be reduced by stress reduction programs: on the effectiveness of two approaches

Van Rhenen W^{1,2}, Blonk RWB^{3,4}, Schaufeli WB⁴, van Dijk FJH¹

Int Arch Occup Environ Health 2007;80(6):505-15

¹ Coronel Institute, Academic Medical Center, University of Amsterdam, Meibergdreef 9, 1105 AZ Amsterdam, The Netherlands

² Department of Occupational Health Services, ArboNed Utrecht Zwarte Woud 10, 3524 SJ Utrecht, The Netherlands

³ TNO Work and Employment, Polarisavenue 151, 2132 JJ Hoofddorp, The Netherlands

⁴ Utrecht University, Department of psychology and Research Institute Psychology & Health, Heidelberglaan 1, 3584 CS Utrecht, The Netherlands

Abstract

Objectives

The aim of the study was to evaluate the effectiveness of two brief preventive stress reduction programs - a cognitive focused program and a combined intervention of physical exercise and relaxation - on sickness absence in stressed and non-stressed employees working in various jobs in a telecom company.

Methods

The study was designed as an a priori randomized trial and the follow-up period for sickness absence was one year. Sickness absence data of 242 employees were analyzed with respect to spells of sickness (frequency, incidence rate), days (length, duration), and time between intervention and first subsequent absent spell.

Results

For stressed employees this study suggests that the illness burden represented by absenteeism is not affected by the interventions. There is no substantial difference in effectiveness between the cognitive and physical interventions. However, in comparison with the physical intervention the cognitive intervention decreases the period between the intervention and the first recurrence of a sick leave period with 144 days (marginal significant).

Conclusion

The illness burden represented by absenteeism is effected in detail but not substantially by the interventions.

Keywords: physical intervention, cognitive intervention, sickness absence, occupational health

Introduction

Stress is increasingly being recognized as a psychological hazard facing working people today. High levels of stress may result in increased staff turnover (de Croon et al. 2000; Jamal 1999; Kirchmeyer and Cohen 1999), diminished productivity (Yeh et al. 1986), higher accident rates (Boyce et al. 1998), more physical ill-health (Black and Garbutt 2002; Johnson and Hall 1988; Karasek et al. 1981), more psychological ill-health (Evans and Steptoe 2002; Sheffield et al. 1994) and absenteeism (Evans and Steptoe 2002). Absenteeism in particular has become a major concern in industrialized countries because of its economical consequences. For instance, sickness absence figures show that the loss of working days for industry in the United States amounts to about 550 million (3 - 7%) each year (Elkin and Rosch 1990) and for the UK this figure is 3,7% of the total number of working days (Confederation of British Industry 2003). UK figures from the Office for National Statistics Labour Force Survey, released in early 2002, show that more working days than ever before (2.2 million per trimester) are being lost due to sickness absence (Wigham 2002).

Sickness absence is defined as “temporary, extended or permanent incapacity for work as a result of sickness or infirmity” (Gründemann and van Vuuren 2002). In the Netherlands, for legal reasons, temporary work incapacity refers to absenteeism limited to the first 104 weeks of disability, whereas extended or permanent work disability refers to a period thereafter.

Mental and musculoskeletal disorders are the two main categories of illness responsible for sickness absence (Calnan et al. 2001; Frese 1985; Gillespie et al. 2001; Leitner 1993), a substantial part is work-related. A self-report study among 40,000 employees in the UK demonstrated that 25% of the employees (implying a national prevalence of about half a million affected individuals) complained about work-related mental disorders (Griffiths 1998). In the Netherlands, the prevalence of psychological complaints in a working population during one year is 36% (Veerman et al. 2001), whereas 12% (Veerman et al. 2001; Houtman 1996) of the employees attribute their absenteeism to mental or psychological disorders. Although women may have a higher incidence of sickness absence for mental disorders, men may take up more sickness absence days due to longer

spells. (Hensing et al. 2000; Hensing et al. 1996; Laitinen-Krispijn and Bijl 2000). Furthermore, in the Netherlands, for one-third of the population with extended incapacity for work, mental or psychological disorders are the cause (Houtman 1996).

Sickness absence is multifactorial and complex. The decision to be absent depends on—and is influenced by—several factors, including the perception of behavior in response to illness, potential wage reduction, dispensability at work, unfairness at work, and informal and formal norms about acceptable levels of absence among colleagues and management (de Boer et al. 2002; Kristensen 1991; North et al. 1996). Therefore, absenteeism may be considered as a passive and individual strategy for coping with work related problems (Peter and Siegrist 1997), whereas prevention of absenteeism or resuming work after sick leave may be considered as an active strategy for coping. The ‘advantage’ for an employee to use absence as a coping strategy is reduced exposure to job stressors and recuperation from (physical and mental) strain (Kristensen 1991).

Because of the size of the problem, reducing sickness absenteeism by developing interventions to reduce work-related stress is of great importance. The workplace measures and individual interventions are usually referred to as job redesign and stress management training, respectively (van der Klink et al. 2001; Murphy et al. 1995; Semmer 2003). Although the term stress management training may suggest a rather uniform set of intervention strategies, it usually refers to a mixture of treatment techniques. In practice, two main intervention types can be distinguished: psychological interventions such as cognitive-behavioral and client-centered approaches, and physical interventions such as relaxation methods and physical exercise. In our study we compare a psychological focused program with a physical focused program. Both programs aim at improving mental health but use a different approach. Interventions based on physical-oriented approaches such as relaxation and physical exercise aim at improving mental health by reducing physiological arousal (Benson et al. 1975; Byrne and Byrne 1993; Folkins and Sime 1981; Plante and Rodin 1990; Salmon 2001), whereas individual focused interventions based on cognitively-oriented techniques aim at reducing complaints through changing appraisal processes (cognition) and/or enhancing coping skills (behavior) (Lazarus and Folkman 1984; Meichenbaum and Deffenbacher 1988).

To a certain extent these (work-related) stress interventions claim to reduce absenteeism (Cooper and Sadri 1991; Michie 1996; Proper et al. 2002; Schaufeli and Kompier 2001), although the effects on absenteeism are still subject to debate. A comprehensive meta-analysis (van der Klink et al. 2001) on the benefits of work-related stress interventions, showed that in only four out of forty-eight studies absenteeism was conducted as an outcome measure. Neither a cognitive approach nor relaxation appeared to be successful. These findings were confirmed by Reynolds (1997), Kawakami et al. (1999), Peters and Carlson (1999) and Nurminen et al. (2002) but contradicted by other recent studies (Maes et al. 1998; Bond and Bunce 2001; Kawakami et al. 1997; Lechner et al. 1997; Munz et al. 2001), which revealed a significant decline in the number of sick days. Differences between the intervention programs and methodological differences between these studies may explain the inconsistent results.

To resolve some of these problems in sickness absence studies, firstly a reference or control population is required to correct for a potential general trend of sickness absence in a company, branch or country. A second useful design is the comparison of two or more alternative intervention programs.

Secondly, the collection of sickness absence data has to be adequate. According to van Poppel et al. (2002) data on sick leave gathered from company records are clearly preferable to data obtained from questionnaires or interviews, since self-administered questionnaires have a high specificity but a low sensitivity (Agius et al. 1994; Burdorf et al. 1996; Frederiksson et al. 1998). Furthermore, there is a tendency to underestimate short episodes of sick leave (van der Weide et al. 1997), particularly when the recall period is longer than two to six months (Severens et al. 2000).

Finally, the implications of different quantitative measures of sick leave, such as sick leave days or sick leave spells, for the interpretation of the results have to be considered seriously. In their literature review Hensing et al. (1998) pointed out the multi-interpretability of sick leave indicators. They recommended five basic measures (frequency, length, duration, incidence rate, and cumulative incidence) to encompass the full spectrum of the sickness absence phenomenon. The use of common terminology and of a standardized set of measures in research and practice would

provide the opportunity to compare outcome data from various studies. Recently, a study by Landstad et al. (2001) affirmed this line of reasoning by concluding that different forms of absenteeism need to be studied together, in order to distinguish changes in sickness absence pattern correctly.

Another matter for attention is the target population. So far, it is not clear whether already stressed employees are the most optimal target group. It may be postulated that a stress-reducing intervention should be performed as a primary preventive measure before adverse effects become apparent (van der Klink et al. 2001). Therefore, we included two populations in the study: stressed and non-stressed employees.

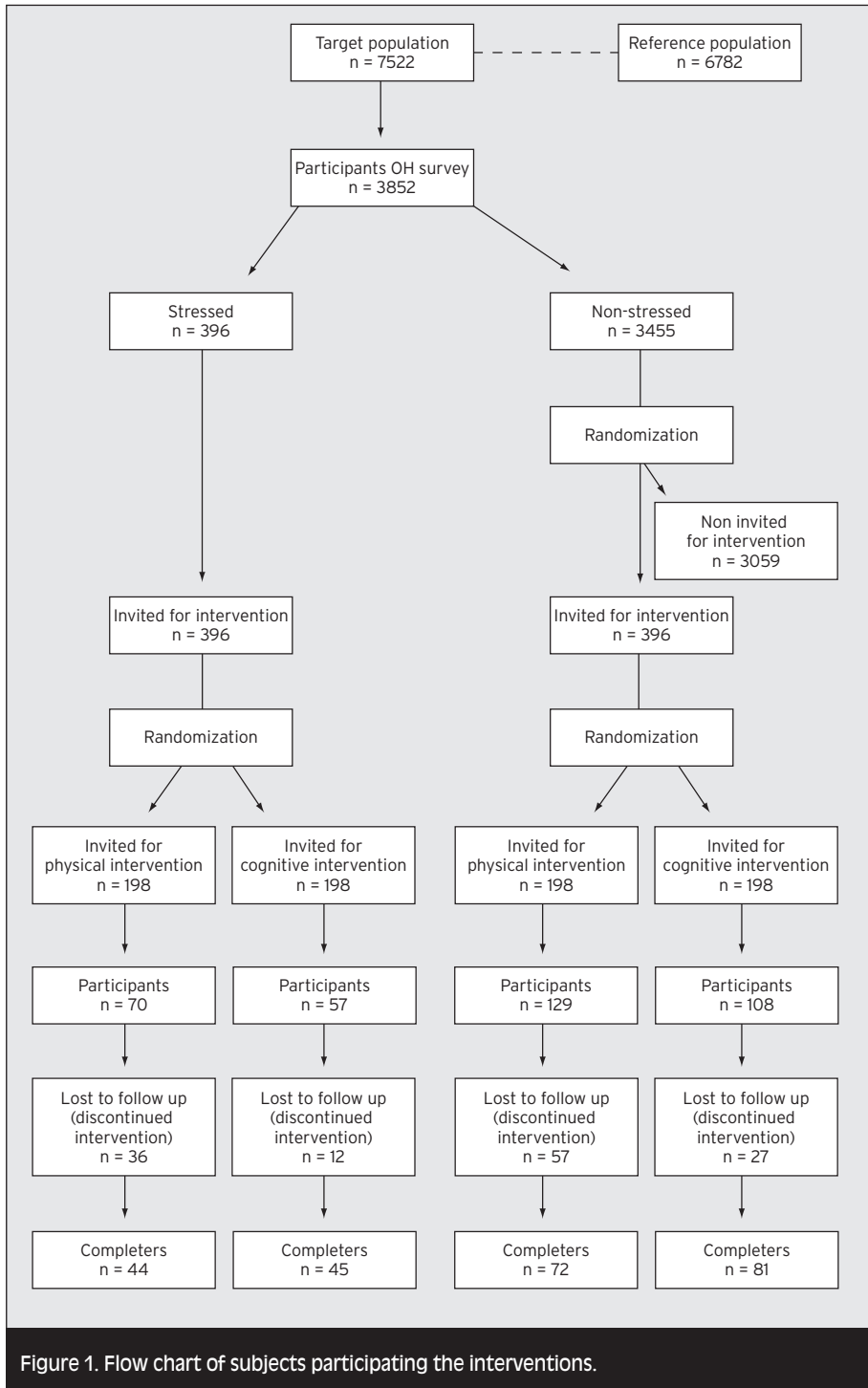
The aim of the present study is to investigate whether a brief cognitive intervention is more successful than a brief physical intervention on the reduction of sickness absence in stressed respectively non-stressed employees. We used sickness absence data from the medical company records and applied comprehensive sickness absence measurements in order to assess more precisely the effects on sickness absence of both interventions. In addition, the sickness absence of a large reference population has been used to compare findings with general developments in sickness absence.

Subjects and methods

Study population

The present study was designed as a randomized controlled trial. Participants were recruited (Fig. 1) during an occupational health survey with the focus on occupational stress in a large Dutch telecom company ($n=7522$). The study population consisted of a mixture of employees from several jobs in a telecom company, including e.g. engineers, desk workers and office staff. The response rate was 51% ($n = 3852$).

A total number of 792 employees were invited to participate in a stress intervention-prevention program. First, all employees with elevated levels of distress were identified ($n=396$) and selected to be invited for the intervention. Second, a random sample of the same size of employees without elevated levels of distress has been selected ($n=396$).



To distinguish between high and normal levels of distress, a cut-off point of .32 on the 4DSQ-Distress subscale (Terluin 1994) was used. This cut-off point is based on data obtained from employees participating in previous stress reduction programs in the same company (van der Klink et al. 2003). In this population, ten percent of the employees rated higher than .32 on the 4DSQ-Distress subscale (Terluin 1994; Terluin et al. 2004).

Potential participants in both groups of stressed and non-stressed employees were a priori randomly assigned to one of two treatment methods: physical intervention or cognitive intervention. Of the 396 stressed employees 70 ultimately participated in the physical intervention group and 57 in the cognitive intervention group. Of the 396 non-stressed employees, the numbers of participants were 129 and 108 respectively. Table 1 presents baseline characteristics of the intervention groups. The intention to treat group ($n = 364$) comprised 330 men, aged 27-60 years (mean age = 44,6, SD = 7,3) and 34 women, aged 28-57 years (mean age = 41,1, SD = 8,1). The intervention groups were monitored for one year by a self-administered questionnaire and through absenteeism data from the company files.

From the intention to treat group, 242 completed the intervention. Of the stressed employees, 44 employees in the physical and 45 in the cognitive intervention group completed the intervention. The number of non-stressed employees who completed the intervention was 72 for the physical and 81 for the cognitive intervention group.

The invitation to participate in the intervention was not accepted by 269 stressed employees (73%) and by 159 non-stressed employees (43%).

To compare sickness absence with general trends in time the total population of the company was used as a reference population. Because of the follow-up time of 1 year, missing data reduced the total sample of 7522 employees to 6782 employees (6035 men [mean age 43,8, SD = 7,9] and 747 women [mean age 38,8, SD = 8,7]).

Interventions

The stress intervention program revealed both a physically-oriented and a cognitively-oriented approach. Meichenbaum's so-called 'stress inoculation training' (SIT) (Meichenbaum and Deffenbacher 1988;

Meichenbaum 1993) was used as the guiding principle for both types of interventions. SIT consists of three training stages. The goal of phase one, focusing on education and information is to help understand the nature of stress and its effects. The second phase of skill acquisition focuses on the development and practicing of problem-solving strategies for causes of stress. In the final phase, these coping skills are applied to practical situations at work and at home, and an attempt is made to extend the range of activities to include more demanding ones.

The aim of the cognitive intervention was to restructure irrational beliefs. After making an inventory of complaints and placing them in a positive framework, participants were introduced to specific coping techniques and exercises of rational reasoning, resembling the Rational Emotive Therapy (RET), after which the session ended with a homework assignment.

The aim of the physical intervention was to increase awareness of stress symptoms and to introduce physical and relaxation exercises in daily activities. Every session consisted of an introduction, a warming-up and physical exercise, a relaxation exercise, and a homework assignment. The ultimate purpose of both interventions was the reduction of stress symptoms and, as a consequence, the reduction of absenteeism. Both training programs consisted of four one-hour sessions given during working hours over a period of eight weeks.

Sickness absence data

In the present study, sickness absence is reported in terms of spells and days. According to the classification of Hensing et al. (1998) for spells, the following definitions emerged (1) "frequency of sick leave" = current or new sick-leave spells during the study period (365 days) / number of persons in the study group and (2) "incidence rate" = new sick leave spells during the study period (365 days) / number of persons at risk * number of days in study period minus all sick leave days in current and new spells during the study period emerged. Similarly, the following definitions for days were applied: (1) "length of absence" = sick leave days in current and new spells during study period (365 days) / number of sick-listed persons in current and new spells during study period and (2) "duration of absence" = sick leave days in new spells during study period / number of new sick leave spells during study period.

Sickness absence data were provided by the sickness absence records of the employees filed in the database of ArboNed, the occupational health service of the telecom company. All spells of sickness absence were centrally reported and registered by the executive manager. Absence spells longer than two weeks were verified by a company doctor by inviting the employee that had reported sick. Therefore, the validity of the absence data is assumed to be high.

Statistical analysis

All data were checked and analyzed using the Statistical package for the Social Sciences (SPSS-14.0). All data were analyzed based on the groups as randomized. Descriptive data were determined for the baseline characteristics. Differences in baseline characteristics were tested with t-tests for continuous data and χ^2 tests for ordinal data.

Due to skewed sickness absence data, nonparametrical statistical analyses were performed. First, to evaluate differences in frequency, incidence rate, duration and length of absenteeism before and after the intervention, we analyzed the data of the four treatment groups using the Kruskal Wallis test, a nonparametric equivalent of one-way ANOVA. Second, a before-after intervention difference score was calculated for frequency, incidence rate, duration and length of absenteeism using the Wilcoxon signed-ranks test, also a nonparametric procedure. Due to multiple testing for before-after comparisons tested with Wilcoxon signed-ranks test, p-values are set at $p < 0.01$ for these tests. Third, the difference scores were compared between the physical and cognitive intervention groups for both the stressed and non-stressed groups by means of a two-sample Mann-Whitney U test.

The period between the intervention and the beginning of a new period of absenteeism was evaluated using survival analysis. "Survival" here means that the event of interest, the beginning of absenteeism, has not occurred. Kaplan-Meier analyses have been used to obtain means, medians, and confidence intervals of the survival.

Results

Non-response

Of the 792 invited employees (396 stressed and 396 non-stressed), ultimately 364 persons accepted the invitation to participate in the

intervention, comprising 127 stressed employees (response rate 27 %) and 237 non-stressed employees (response rate 57%). Chi-square and t-tests were used to compare stressed and non-stressed groups on sociodemographic characteristics. Although significantly more employees dropped out of the stressed employees group compared with the non-stressed group, no significant differences were found between the groups regarding age, gender, work experience or educational status. The mean age for the stressed group was 44.3 years (SD = 7.3), 91% of this population was male, 85% had more than 10 years of work experience and 29% had only an elementary occupational education. In the non-stressed group, the characteristics were similar.

The number of participants in the physical intervention was 199, in the cognitive intervention 165. No significant differences were found between these groups regarding age, gender, work experience and educational status. This confirms that the randomization procedure was successful, at least as far as these variables are concerned.

From the initial participants, 242 employees (66%) completed the intervention. Comparing the completers with the initial participants no significant differences were found for age, work experience and absenteeism history. However, significant differences were found for gender ($\chi^2_1 = 10.78$, $p = .00$) and education ($\chi^2_2 = 9.09$, $p = .01$). More than 16% of the 'lost to follow-up group' comprised women, in contrast with just 6% of the group who completed the intervention. Almost 41% of

Table 1. Baseline characteristics for the intervention groups and reference population

Intervention type		Stressed		Non stressed		P*	Reference population (n=6782)
		Physical (n=70)	Cognitive (n=57)	Physical (n=129)	Cognitive (n=108)		
Gender	Men (%)	90	91	89	93	NS	89
	Women (%)	10	9	11	7		11
Age	Mean	44,2 (SD7,0)	44,6 (SD7,8)	44,9 (SD6,9)	43,6 (SD8,0)	NS	43,3 (SD8,1)
Work experience	< 10 years %	14	16	15	21	NS	17
	> 10 years %	86	84	85	79		83
Education	Elementary %	24	33	25	18	NS	27
	Middle %	44	41	46	47		49
	High %	32	26	29	35		24

* NS, not statistically significant, $p < .05$

the 'lost to follow-up group' were higher educated employees compared with just 26% of the group who finished the intervention.

The number of employees who completed the intervention was 116 for the physical group and 126 for the cognitive group. No significant differences were found between these groups regarding age, gender, work experience, education or absenteeism history ($\chi^2_1 = .12, p = .73$).

Intervention effects

As can be seen in Tables 2 and 3, the pattern of changes in sickness absence in the treated group is in most cases identical with the changes in the intention to treat group.

Differences between the four intervention groups in sickness absence before the intervention

As demonstrated in Tables 2 and 3, there is a tendency for stressed employees to have a higher frequency, incidence rate, duration, and length of sickness absence compared with non-stressed employees (and the reference group). For frequency and length, the differences between the four intervention groups are significant ($\chi^2_3 = 8.30, p = .04$ and $\chi^2_3 = 15.03, p = .00$ respectively). For incidence rate and duration, the differences are not significant ($\chi^2_3 = 3.86, p = .28$ and $\chi^2_3 = 5.19, p = .16$ respectively). For the treated group the results are similar (χ^2_3 frequency = 7.74; $p = .05$, χ^2_3 length = 10.02, $p = .02$; χ^2_3 incidence rate = 4.63, $p = .20$; χ^2_3 duration = 8.30, $p = .32$).

Differences between the four intervention groups in sickness absence after the intervention

The differences between the groups after the interventions are not significant (Results for the intention to treat group are: frequency, $\chi^2_4 = 6.19, p = .19$; incidence rate, $\chi^2_4 = 7.75, p = .10$; duration, $\chi^2_4 = 4.30, p = .37$; length, $\chi^2_4 = 4.04, p = .40$).

Effects in time and effects of the intervention (interaction)

As can be seen in Table 2 and 3 a significant effect in time was demonstrated for the reference group for all four sickness absence measures. For stressed employees with a physical intervention a marginal significant decline was found for frequency and incidence rate. The observed marginal significant reduction of duration and length in the 'intention to treat group' (non-

stressed physical intervention) disappeared in the ‘treated group’. As a consequence we consider these changes as marginal and potentially influenced by participants who did not complete the intervention. No interactions effects were found (frequency $F(2.99) = 1.452$, $p = .21$, incidence rate $F(0.000) = 1.467$, $p = .21$, duration $F(1982.05) = 1.045$, $p = .38$ and length $F(1462.53) = 0.422$, $p = .79$).

Table 2. Means and medians of absenteeism in four intervention groups (intention to treat) and the reference population

	Before intervention		After intervention		Before-after comparisons tested with Wilcoxon p	After intervention score corrected with pre-intervention score		Mann- Whitney U test
	mean	median	mean	median		mean	median	
Frequency (times/year)								
stressed physical intervention	1.80	1.00	1.43	1.00	.05	-0.37	0.00	P = .52
stressed cognitive intervention	2.11	2.00	1.82	2.00	.36	-0.28	0.00	
non-stressed physical intervention	1.39	1.00	1.40	1.00	.98	0.01	0.00	P = .52
non-stressed cognitive intervention	1.47	1.00	1.36	1.00	.44	-0.11	0.00	
reference population	1.34	1.00	1.28	1.00	.00*	-0.06	0.00	
Incidence rate (x10⁻⁴)								
stressed physical intervention	2.65	1.56	2.03	1.56	.02	-0.62	-0.04	P = .28
stressed cognitive intervention	3.15	3.11	2.74	1.56	.44	-0.41	-0.00	
non-stressed physical intervention	2.13	1.56	2.12	1.56	.56	-0.02	0.00	P = .56
non-stressed cognitive intervention	2.28	1.56	2.08	1.56	.35	-0.20	0.00	
reference population	1.99	1.56	1.87	1.56	.00*	-0.13	0.00	
Duration (days/spell)								
stressed physical intervention	21.2	5.3	26.8	6.0	.38	6.6	1.3	P = .97
stressed cognitive intervention	13.4	6.5	25.3	5.8	.37	15.6	1.0	
non-stressed physical intervention	10.8	5.0	16.6	6.0	.04	10.6	2.3	P = .19
non-stressed cognitive intervention	9.4	4.5	17.0	5.0	.97	10.1	1.0	
reference population	12.5	5.1	15.6	6.0	.00*	7.2	2.0	
Length (days/person)								
stressed physical intervention	40.6	12.5	51.3	14.0	.75	14.9	1.0	P = .69
stressed cognitive intervention	39.1	20.5	46.6	16.5	.40	13.1	1.5	
non-stressed physical intervention	17.0	11.5	28.0	11.0	.03	14.5	3.5	P = .26
non-stressed cognitive intervention	19.7	8.5	26.9	10.0	.80	11.0	2.0	
reference population	26.7	11.0	29.8	11.0	.00*	9.4	3.0	

* = significant ($p < 0.01$)

Table 3. Means and medians of absenteeism in four intervention groups (treated) and the reference population.

	Before intervention		After intervention		Before-after comparisons tested with Wilcoxon p	After intervention score corrected with pre-intervention score		Mann- Whitney U test
	mean	median	mean	median		mean	median	
Frequency (times/year)								
stressed physical intervention	1.75	2.00	1.36	1.00	.03	-0.39	0.00	P = .37
stressed cognitive intervention	1.98	2.00	1.87	2.00	.65	-0.11	0.00	
non-stressed physical intervention	1.40	1.00	1.28	1.00	.44	-0.13	0.00	P = .79
non-stressed cognitive intervention	1.40	1.00	1.32	1.00	.63	-0.07	0.00	
reference population	1.34	1.00	1.28	1.00	.00*	-0.06	0.00	
Incidence rate (x10-4)								
stressed physical intervention	2.60	2.31	1.89	1.56	.02	-0.71	-1.54	P = .20
stressed cognitive intervention	3.03	3.11	2.82	1.56	.58	-0.21	-0.00	
non-stressed physical intervention	2.14	1.56	1.94	1.56	.35	-0.20	0.00	P = .97
non-stressed cognitive intervention	2.16	1.55	2.01	1.56	.58	-0.15	0.00	
reference population	1.99	1.56	1.87	1.56	.00*	-0.13	0.00	
Duration (days/spell)								
stressed physical intervention	24.1	6.0	15.6	6.0	.87	-5.3	1.0	P = .93
stressed cognitive intervention	14.6	6.5	15.0	5.0	.67	4.4	0.9	
non-stressed physical intervention	7.5	5.4	16.9	5.5	.95	11.0	0.0	P = .54
non-stressed cognitive intervention	11.2	4.5	9.0	4.8	.36	1.2	0.8	
reference population	12.5	5.1	15.6	6.0	.00*	7.2	2.0	
Length (days/person)								
stressed physical intervention	43.5	13.5	45.8	12.0	.84	7.0	0.0	P = .52
stressed cognitive intervention	23.4	16.0	39.5	16.5	.34	16.2	1.0	
non-stressed physical intervention	14.0	10.0	26.1	10.0	.49	13.7	2.0	P = .43
non-stressed cognitive intervention	24.3	8.0	19.8	9.0	.27	1.5	1.0	
reference population	24.9	9.0	29.8	11.0	.00*	9.4	3.0	

* = significant (p <0.01).

Effects on the beginning of a new period of absenteeism.

During the first year after the intervention, the median time for the onset of a new episode of absenteeism was significantly decreased for the group of stressed employees with a cognitive intervention (144 days), compared with the reference group. Compared to the physical intervention, the onset of a new episode of a absenteeism is marginally significant. For the other groups, this conditional probability to report

Table 4. Absenteeism-free intervals. Kaplan-Meier: summary statistics and statistical test for the four intervention groups (physical and cognitive interventions for stressed and non-stressed employees) plus comparison to the reference population.

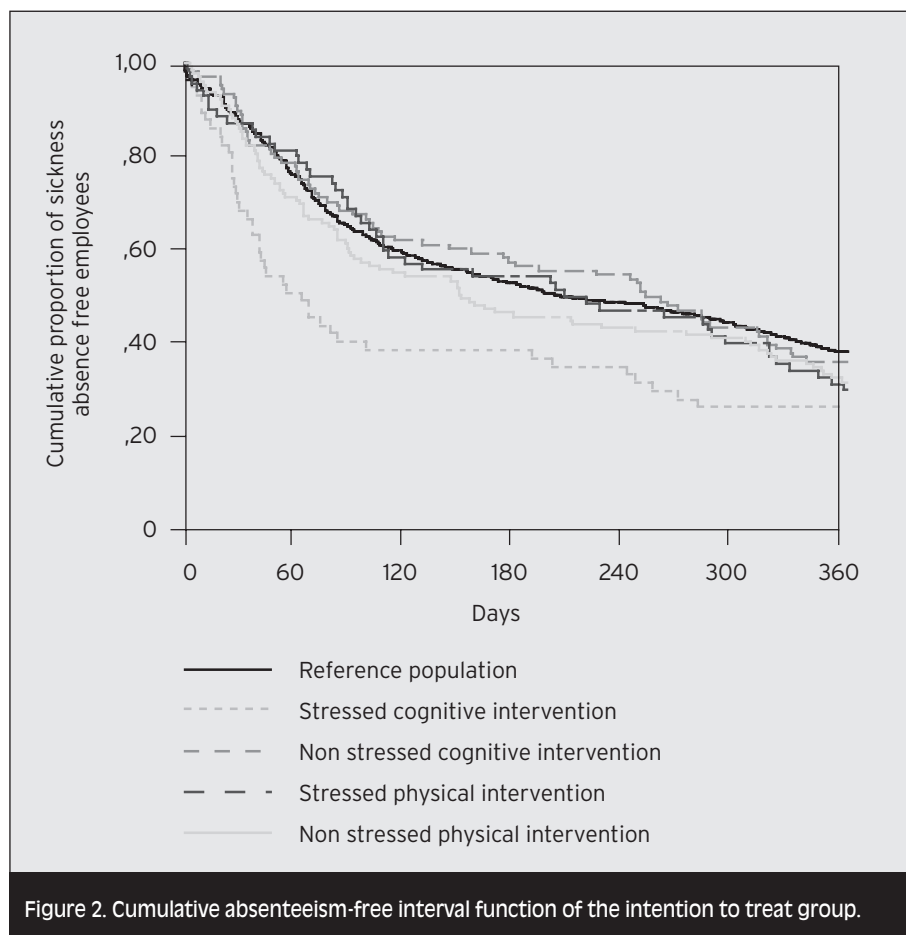
	Intention to treat						treated					
	median	SE	95%CI	stat	logrank df	sign	median	SE	95%CI	stat	logrank df	sign
Stressed												
physical intervention	209	81	50-368	2.98	1	.08	209	83	45-373	.85	1	.36
cognitive intervention	65	16	33-97				65	20	26-104			
Non-stressed												
physical intervention	153	43	69-237	.93	1	.33	152	57	40-264	.69	1	.41
cognitive intervention	254	39	177-331				262	31	201-323			
Reference population												
x stressed phys int	211	8	195-227				211	8	195-227			
x stressed phys int	209	81	50-368	.73	1	.39	209	83	45-373	1.32	1	.25
x stressed cogn int	65	16	33-97	10.96	1	.00	65	20	26-104	6.44	1	.01
x non stressed phys int	153	43	69-237	2.37	1	.12	152	57	40-264	1.03	1	.31
x non stressed cogn int	254	39	177-331	.01	1	.94	262	31	201-323	0.02	1	.89

oneself sick during the first year after the intervention did not differ significantly from the reference group (Table 4; Fig. 2).

Discussion

We found that for stressed employees, the physical intervention marginally decreased the frequency and incidence rate of sickness absence, although we could not find significant effects on duration or length, nor on the period between the intervention and first new sickness absence spell. In contrast, there was a significant effect for stressed employees of the cognitive intervention on sickness absence by shortening the period before the first new sickness absence spell after the intervention. On the other hand, this outcome was not accompanied by a significant prolongation of days of sickness absence, i.e. “length” or “duration”, nor by a significant effect on spells, i.e. “frequency” and “incidence rate”.

The results of our study once more bring in focus the arguments for stress management programs. An important reason for implementing stress management interventions in companies is the assumed cost-effectiveness of these interventions. From this perspective of cost control, our results may appear discouraging at first glance. After all, the interventions did not alter or modify the cost burden of absenteeism significantly because



the length and duration of absenteeism—variables that contribute strictly towards the expenditures that employers face—are not obviously affected. This finding may challenge the widely-held beliefs about the absenteeism-reducing efficacy of stress management interventions (Francis and Pennebaker 1992; Murphy and Sorenson 1988; Seamonds 1982; Seamonds 1983; Toivanen et al. 1993) and undermines the arguments for sales.

The most common type of stress management intervention is the combination of muscle relaxation and a cognitively-oriented training. This is, in combination with a solid cognitive training, generally accepted as the most effective intervention across all types of outcome measures (van der Klink et al. 2001; Murphy 1996). In our study, the effectiveness of the physical intervention for stressed employees with respect to duration of

sick leave was similar to that of the cognitive intervention, which may be due to a synergistic effect of exercise and relaxation, possibly by diminishing complaints related to depression and anxiety (Craft, 1998; Vickers, 1999). The effect on frequency and incidence was even marginal significantly better.

Based on the understanding that characteristics of the individual are strongly associated with sickness absence, some theories regard frequent short-term sickness absence as a coping strategy (Kristensen 1991; Alexanderson 1998). By using this coping strategy, Kristensen (1991) asserted that an employee achieves either reduction of work-related strain or recovery from work. The purpose of this strategy for an employee may be to prevent more serious diseases. Therefore, we expected a reduction of the frequency of sickness absence in the intervention groups of participants especially those with high levels of distress. Apparently, the expected change in coping did not contribute to a specific reduction in the number of spells in the intervention groups. Unfortunately, we do not have data on whether the exercises conducted in the treatment setting are also conducted outside the treatment setting. Future outcome research on stress management interventions may add this subject of 'transfer of change' to the study design.

The shortening of the sick-leave-free period of stressed employees attending the cognitive intervention was unexpected. It was assumed that the coping strategy of the employee was modified by the cognitive intervention in such a way that he was able to reinterpret the stressful situation. Redefining the situation could prevent the employee from taking up sickness absence. However, in the present study, it may be more likely that the shortening of the sick leave-free period is a result of awareness of stress and the decision "to stop for a while" to recuperate rather than a cognitive restructuring that encourages realistic assessments of hazardous situations. In that case, "to stop for a while" may be an accurate response to the situation and may therefore be a positive coping self-statement (Alexanderson 1998).

The major increase in length of absenteeism for stressed employees with intervention further underlines the relevance of using distinguished sickness absence data. In this study, only focusing on length of absenteeism may have lead to misinterpretations of the sick leave pattern. Length of

absence is, according to its definition, based on sick leave days and is a measure of the cumulative individual illness burden during the study period. The illness burden of all stressed employees with or without intervention in our study seems to have increased. This is in contrast to the decreasing trend for duration and frequency. Because the numerator of these measures (new sick leave days and total sick leave spells, respectively) is similar or has decreased, the only explanation for the increase in length (total sick leave days / sick-listed persons) may be the difference in current spells in the numerator of length. This indicates that the sick leave days of sick-listed persons in current spells—thus at the beginning of the intervention—are represented disproportionately.

To the authors' knowledge, this is the first intervention study with four sick leave outcome measures to reveal a more complete picture of changes in the sick leave pattern. In line with Isacson et al. (1992) we can conclude that "adding more measures gives a more comprehensive picture of sickness absenteeism and of differences between groups".

One strong point of our study is the design. Randomized controlled trials have proved to be the most valid study design for producing valid information on the effectiveness of an intervention.

A second quality of the present study is the detailed description of the sickness absence data. Thus far, very little attention has been paid to the implications of different quantitative measures of sickness absence for the interpretation of intervention studies. As far as we know, this is the first intervention study in which the data processing has been carried out in such a detailed way. In addition, we did not rely on self-reported sickness absence data, which are less precise and more prone to bias. Moreover, self-reported data could increase the problem of common method variance.

Despite methodological rigor of the present study, such as RCT and refined absence data, there are two limitations that should be addressed in future research on this topic. The first limitation of the study is the nature of the study sample. All groups were occupational cohorts of personnel working in a telecom company consisting mainly of men. Therefore, this population is not necessarily representative of the general working population.

The second limitation is the relatively small sample size of the intervention groups. Some caution must be applied when interpreting the results of this study, because the small groups may easily negatively influence the authority of the study, whereby an association that is actually present might be missed (type II error). Despite these limitations, the results of this study suggest that the illness burden represented by absenteeism is effected in detail but not substantially by the interventions.

Acknowledgment

This research was supported by grants from Zorg Onderzoek Nederland and ArboNed N.V., project number 2200.0113. We thank dr. A.G.E.M. de Boer for her recommendations in statistics and methodology.

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Coping and sickness absence

Van Rhenen W^{1,2}, Schaufeli WB³, van Dijk FJH¹, Blonk RWB^{3,4}

Int Arch Occup Environ Health 2008;81(4):461-72

¹ Academic Medical Center, Coronel Institute, University of Amsterdam,
Meibergdreef 9, 1105 AZ Amsterdam, The Netherlands

² Department of Occupational Health Services, ArboNed Utrecht
Zwarte Woud 10, 3524 SJ Utrecht, The Netherlands

³ Utrecht University, Department of psychology and Research
Institute Psychology & Health, Heidelberglaan 1, 3584 CS Utrecht, The Netherlands

⁴ TNO Work and Employment, Polarisavenue 151, 2132 JJ Hoofddorp, The Netherlands

Abstract

Objectives

The aim of this study is to examine the role of coping styles in sickness absence. In line with findings that contrast the reactive-passive focused strategies, problem-solving strategies are generally associated with positive results in terms of well-being and overall health outcomes; our hypothesis is that such strategies are positively related to a low frequency of sickness absence and with short lengths (total number of days absent) and durations (mean duration per spell).

Methods

Using a prospective design, employees' (N = 3628) responses on a self-report coping inventory are used to predict future registered sickness absence (i.e., frequency, length, duration, and median time before the onset of a new sick leave period).

Results and conclusions

In accordance with our hypothesis, and after adjustment for potential confounders, employees with an *active problem-solving* coping strategy are less likely to drop out because of sickness absence in terms of frequency, length (longer than 14 days), and duration (more than 7 days) of sickness absence. This positive effect is observed in the case of *seeking social support* only for the duration of sickness absence and in the case of *palliative reaction* only for the length and frequency of absence. In contrast, an *avoidant* coping style, representing a reactive-passive strategy, increases the likelihood of frequent absences significantly, as well as the length and duration of sickness absence. *Expression of emotions*, representing another reactive-passive strategy, has no effect on future sickness absenteeism. The median time before the onset of a new episode of absenteeism is significantly extended for active problem-solving and reduced for avoidance and for a palliative response.

The results of the present study support the notion that problem-solving coping and reactive-passive strategies are inextricably connected to frequency, duration, length and onset of sickness absence. Especially, active problem-solving decreases the chance of future sickness absence.

Keywords: coping, UCL, sickness absence, duration, length, frequency.

Introduction

A strong association exists between ill health and sickness absence, particularly for long absence spells (Marmot et al. 1995; Hensing et al. 1997). However, the decision of an employee to go on sick leave or to stay at work is not just the result of his or her (ill) health status alone (Aronsson et al. 2000; Rosvold and Bjertness 2001; Sandanger et al. 2000; Whitaker 2001; Anonymous 1979; Johansson and Lundberg 2004) but depends also on a number of demographic, social, and economic determinants (Johansson and Lundberg 2004; Voss et al. 2001; Eshoj et al. 2001). For instance, age (Sandanger et al. 2000), gender (Evans and Steptoe 2002), marriage (Mastekaasa 2000), level of education (Eshoj et al. 2001), salary (Chevalier et al. 1987), and sickness absence history (Landstad et al. 2001) are known to be associated with sickness absence behaviour. In addition, the way the individual deals with stressful situations (at work) is likely to affect his or her decision to report ill. In this article we focus on the role of this kind of so-called employee coping behaviour.

The relationship between coping and illness behaviour has been a major research focus over the past two decades (Somerfield and McCrae 2000). A variety of conceptual coping-frameworks have been proposed and numerous measures have been developed to assess ways of coping (McWilliams et al. 2003). Pioneering work in the field of coping has been carried out by Folkman and Lazarus (Folkman and Lazarus 1980) who define coping as “the cognitive and behavioral efforts made to master, tolerate, or reduce external and internal demands and conflicts among them”. In their opinion, coping has to be considered as behaviour that is primarily determined by environmental demands, that is, coping is an individual response to a stressful environment. In contrast, other scholars (Holahan et al. 1996; Moos and Holahan 2003) consider coping primarily as a trait or as a resource. The former refers to a relatively stable personal characteristic: that is, similar coping strategies are used across a wide variety of situations (Parker and Endler 1992; Carver and Scheier 1994). The latter refers to the use of particular social and personal characteristics: that is, personal resources on which the individual may draw upon when dealing with stressful situations (Pearlin and Schooler 1978). This trait- or dispositional approach of coping implies a stable coping style or a coping resource regularly used.

As early as four decades ago, Kahn et al. (Kahn et al. 1964) distinguished between two general coping strategies: problem-solving strategies and reactive-passive strategies. Their idea of two general coping strategies has been worked out by Lazarus and Folkman (Lazarus and Folkman 1984) in what nowadays is probably the most popular and widely-accepted conceptualization of coping behaviour. Problem-solving coping refers to active strategies that are directly targeted at solving the problem at hand, whereas reactive-passive focused coping refers to those strategies that reduce the negative emotions that are evoked by the stressful situation (Elfering et al. 2005).

Much research on coping strategies reveals that both reactive-passive strategies and avoidance strategies result in psychological and physical symptoms (Terry et al. 1996; Pisarski et al. 1998; Penley et al. 2002), whereas active, problem-solving coping generally has a positive impact on well-being and overall health outcomes (Penley et al. 2002). However, in their recent review, Austenfeld and Stanton (2004) criticize this popular and almost generally accepted conclusion. They identified over a hundred articles examining the relationship between reactive-passive coping and adjustment (Stanton et al. 2002^b) and found that hardly any of the coping instruments contained the same set of coping strategies, which made it practically impossible to aggregate the findings. Furthermore, the association between reactive-passive strategies and psychological and physical symptoms appeared to be related to the way these strategies had been operationalized (Stanton et al. 2002^a). It appeared that corruption of the original coping items as well as the use of item formulations that include the expression of emotional distress or self-deprecation result in spurious correlations.

Studies on coping and sickness absence are scarce. Kristensen (1991) was among the first to investigate this relationship and he asserted that sickness absence itself should be regarded as coping behaviour reflecting the individual's perception of health or illness. Sickness absence itself, in his opinion, is a functional coping strategy, used by employees to reduce work-related strain by avoiding the workplace and thus creating for themselves the opportunity for recuperation. Kristensen was one of the first not to primarily focus on determinants of sickness absence, but rather tried to understand sickness absence from a coping perspective. By doing so, he went beyond existing concepts of coping by considering sickness

absence “a type of coping behaviour” (Kristensen 1991). As he stated: “sickness absence can well be a rational coping behaviour seen in the light of a person’s wish to maintain his/her health and working capacity: as such it is the opposite of withdrawal behaviour”. Clearly, this approach differs from considering coping as a personality trait or resource.

In the present study, coping is conceptualized and measured as a trait or disposition i.e., it is assumed that individuals tend to use rather similar coping strategies across a wide variety of situations. The Utrecht Coping List (UCL) (Schreurs et al. 1993) was selected to assess the employees’ coping style. This well-validated self-report questionnaire is the most widely used coping inventory in the Netherlands, both in research and in practice (Schreurs et al. 1993; Schaufeli and Van Dierendonck 1992; Norberg et al. 2005; Buitenhuis et al. 2003).

Like the COPE questionnaire of Carver, Scheier and Weintraub (1989), the UCL asks individuals how they deal with stressful situations; that is, how often they engage in various exertions encountering problems or unpleasant occurrences. The UCL distinguishes between five coping styles that can be grouped together into two higher-order coping styles: active, problem-solving and a reactive-passive style (Schaufeli and Van Dierendonck 1992). Hence, the UCL offers the possibility to investigate employees’ coping styles at a more detailed level, at the same time taking into account the conceptual distinction between problem-solving and reactive-passive coping.

Sickness absence has been measured in terms of frequency, (total) length of sickness absence, (mean) duration of sickness absence spells as well as by the sickness absence free interval. These sickness absence measures are defined in accordance with recommendations of Hensing et al. (1998) who pleaded for a more standardized international description of sickness absence measures. In their literature review, Hensing and his colleagues pointed out the multi-interpretability of sick leave indicators and recommended basic measures to encompass the full spectrum of the sickness absence phenomenon to make studies more accessible for international comparisons. Recently, a study by Landstad et al. (2001) confirmed this line of reasoning by concluding that different forms of absenteeism need to be studied simultaneously, in order to distinguish changes in sickness absence pattern correctly.

In summary then, the aim of the study is to examine the role of coping styles in sickness absence. Based on the fact that, contrary to reactive-passive strategies, problem-solving strategies are generally associated with positive results in terms of well-being and overall health outcomes, our hypothesis is that such strategies are positively related to a low frequency of sickness absence and with short lengths and durations. Reactive-passive strategies, on the other hand, are not expected to be related to sickness absence.

Subjects and methods

Study population and participants

Participants were employees of a large Dutch telecom company. An occupational health survey was sent to all 7,522 employees, including an assessment of coping strategies (response rate 51%; $N=3,852$). Sickness absence of the participants was followed up for one year after the survey. Due to missing sickness absence data, the sample was reduced to 3,628 employees (3,302 men [mean age 44,7 yrs, $SD = 7,5$] and 311 women [mean age 39,7 yrs, $SD = 8,7$]). A description of the sample is shown in Table 1. During the first quarter after the start of the study, 64% of the participants have not been absent because of sickness, whereas, 7% of the participants have been absent for more than 14 days (length). Compared to non-participants, participants were predominantly male, older, better paid, and were less absent for sickness (see Table 2).

Measures

Coping Style

We assessed the coping strategy of the participants using the shortened 19-item version of the original 30-item Utrecht Coping List (UCL) (Schreurs et al. 1993). This questionnaire was designed to measure the coping strategies people use in stressful situations, either life events or daily hassles. Each item is rated on a four-point Likert scale ranging from one (never) to four (very often).

The UCL includes five dimensions; (1) active problem focusing (5 items, e.g. thinking of different possibilities to solve a problem), (2) seeking social support (5 items, e.g. seeking comfort and sympathy), (3) palliative reaction pattern (4 items, e.g. looking for distraction), (4) avoidance behavior (3 items, e.g. complying to avoid problematic situations) and

Table 1. Demographics and absenteeism of participants

Variable	
Male	91%
Age, mean (SD) (min-max) years	44.2 (7.7) (22-63)
Marital Status	
married or cohabiting	79%
single	17%
divorced or separated	4%
Educational level	
lower vocational education	27%
intermediate vocational education	50%
higher vocational education and university	21%
missing/something else	2%
Working years present job	
1 yr	30%
>1-5 yr	43%
>5-10 yr	14%
>10 yr	14%
Sickness absence first quarter	
0 days	64%
1-7 days	22%
8-14 days	6%
>14 days	7%
Function	
blue collar (executive)	41%
office workers (administrative)	30%
supervisors	6%
consultants	16%
managerial staff	7%

Table 2. Demographics and absenteeism of participants and non-participants

	Participants (n=3628)	Non-participants (n = 3670)	T-Test p	χ^2 p
Gender (%women)	8.6	14.1	.000	
Age, mean (SD) in years	44.2 (7.7)	40.7 (9.3)	.000	
Salary (%)				.000
- low	40.6	53.2		
- medium	42.9	33.3		
- high	16.5	13.5		
Absenteeism				
- length mean (SD) days	14.9 (39.9)	22.9 (59.3)	.000	
- frequency	1.20 (1.31)	1.31 (1.46)	.000	

(5) expression of emotions (2 items, e.g. showing frustrations). The first three coping styles were found to cluster into a second-order active problem-solving factor, whereas both final styles clustered into a reactive-passive factor (Schaufeli and Van Dierendonck 1992). According to the test manual, the internal consistencies as well as the test-retest reliability are satisfactory (Schreurs et al. 1993). In order to assess the factorial

validity of the shortened UCL in our employee sample, a confirmative factor analysis was carried out.

Sickness absence

Sickness absence data were taken from the sickness absence records of the employees filed in the database of ArboNed, an occupational health service (OHS) serving the telecom company. All spells of absence for medical reasons were centrally reported and registered by the executive manager of the company. Absence spells longer than two weeks were verified by an occupational physician by inviting the employee on sick leave for an interview. Therefore, the validity of the absence data is assumed to be high.

Measures used are (1) (total) *length* of sickness absence in current and new spells during the study period (one year) per sick listed person (i.e. total number of days absent) (2) *frequency* of sickness absence (new sick-leave spells during the study period (one year) and (3) (mean) *duration* of sickness absence (sick-leave days in new spells during the study period (one year) per spell). The duration of sickness absence is classified into more or less than 7 days. In our sample, short term sickness (less than 7 days) accounts for 75% of the absences and mainly represents minor ailments. Finally, we assessed the median time before the onset of a new sick leave period after the occupational health survey.

Statistical analysis

Confirmatory Factor Analysis (CFA), using the AMOS 5 software program (Arbuckle, 2003) was used to test the fit of two competing models: M1 that assumes that all 19 items load on one general coping factor, and M2 that assumes that the items load on the five hypothesized correlated factors. Maximum likelihood estimation methods were used and the input for each analysis was the covariance matrix of the items. The goodness-of-fit of both models was evaluated using the χ^2 goodness-of-fit statistic and the Root Mean Square Error of Approximation (RMSEA). However, χ^2 is sensitive to sample size so that the probability of rejecting a hypothesized model increases when sample size increases, even if the difference between the fitted model and the "true" underlying model is very small. To overcome this problem, the computation of relative goodness-of-fit indices is strongly recommended (Bentler, 1990). Three relative goodness-of-fit indices were computed: the Normed Fit Index (NFI), the Non-Normed Fit Index (NNFI)

and the Comparative Fit Index (CFI). The latter is particularly recommended for model comparison purposes (Goffin, 1993). For all relative fit-indices, as a rule of thumb, values greater than .90 are considered as indicating a good fit (Byrne, 2001, pp. 79-88), whereas values smaller than .08 for RMSEA indicate acceptable fit (Cudeck & Browne, 1993). Next, Cronbach alphas were calculated for the UCL-subcales.

In a next step, scale scores for different coping strategies were calculated and transformed into scale scores ranging from 0 to 100. Finally, tertiles of the distribution of the 0-100 scale scores were used to distinguish between low-, medium- and high levels of the coping strategies.

To examine the relationship between coping and sickness absence, odds ratios and corresponding 95% confidence intervals were calculated using logistic regression analysis.

Stepwise multiple logistic regression analysis was used to study the (confounding) influence of sociodemographic factors and other determinants on the relationship between coping and sickness absence. The magnitude of the (confounding) effects was assessed by calculating the proportion of the excess risk (OR minus 1.0) explained when fitting these terms in the model.

Finally, the period between the health surveillance and the onset of a new period of absenteeism was evaluated using survival analysis. Since we wish to estimate the probability of absenteeism at a designated time interval (conditional probability) the Kaplan-Meier methodology (Kaplan and Meier 1958) has been applied. With this statistical technique, means, medians and confidence intervals of the 'survival' (in this study: the onset of absenteeism) are calculated without making assumptions about the survival distribution.

Results

UCL factor structure

As can be seen from Table 3, Confirmatory Factor Analysis (CFA) corroborated the underlying five factor structure of the short form of the UCL. More particularly, all fit-indices of M2 – the hypothesized model

Table 3. Fit indices of one-factor (M1) and two-factor (M2) models of coping (UCL-19)

Model	χ^2	df	GFI	AGFI	RMSEA	NFI	NNFI	CFI
M1	1030.29	152	.69	.61	.14	.43	.36	.43
M2	184.07	142	.95	.93	.06	.90	.88	.90
Null model	17976.60	171	.54	.49	.17	--	--	--

Notes: GFI = Goodness of Fit Index; AGFI = Adjusted Goodness of Fit Index; RMSEA = Root Mean Square Estimate of Approximation; NFI = Normed Fit Index; NNFI = Non-Normed Fit Index; CFI = Comparative Fit Index; all χ^2 , $p < .001$.

with five correlated factors – sufficed their respective criteria, except NNFI that approached its criterion of .90. The mean correlation between the five factors was .24, ranging from -.04 to .45. Moreover, the fit of M2 was superior to that of M1 that assumed that all items load on one undifferentiated coping factor ($\Delta\chi^2 = 10146.22$; $df = 10$; $p < .001$). Hence the factorial validity of the UCL-15 was demonstrated.

The Cronbach alphas for the subscales avoidance behaviour, expression of emotions, seeking social support, active problem focusing and palliative reaction in this study were .67, .65, .76, .81 and .68, respectively. Although some values are slightly below the .70 that is recommended for established scales, all values are well above .60, which is deemed satisfactory for newly developed scales (Nunnally and Bernstein 1994).

Sickness absence and demographics

As can be seen from Table 4, length (total number of days absent) and duration (mean duration per spell) of sickness absence are associated with gender (i.e., women), being divorced or single, having an intermediate or lower education, a shorter period working in the present (current) job, lower salary, higher age, and a history of sickness absence both for length and frequency. Likewise, a higher frequency of sickness absence was associated with gender (i.e., women), being divorced, an intermediate salary and a history of sickness absence both for length and frequency. In our sample there is no association between absence frequency and level of education, the period working in the current job, or age.

Sickness absence and ways of coping

As displayed in Table 5, a greater length (total number of days) of sickness absence is predicted by low- or medium-active problem focusing, avoidance behaviour and a medium- or high palliative reaction. The frequency and the duration of sickness absence are associated in a similar way, however,

Table 4. Associations of demographics and sickness absence^(a)

	length >14 days		Sickness absence duration >7days		frequency >2x	
	OR	95% CI	OR	95% CI	OR	95% CI
Gender						
woman	1.00		1.00		1.00	
man	.49	.38-.62	.66	.51-.85	.42	.32-.55
Married						
married	1.00		1.00		1.00	
single	.83	.66-1.03	1.25	1.03-1.52	1.05	.82-1.36
divorced	1.73	1.24-2.41	2.18	.54-8.81	1.54	1.04-2.28
Education						
university	1.00		1.00		1.00	
higher vocational education	.88	.59-1.33	1.13	.72-1.78	1.00	.63-1.59
interm. vocational education	1.42	1.00-2.00	1.93	1.30-2.86	1.16	.78-1.72
lower vocational education	2.07	1.45-2.96	2.84	1.90-4.24	1.30	.86-1.96
Present (current) job						
>10 yr	1.00		1.00		1.00	
5-10 yr	.98	.74-1.28	1.02	.78-1.34	1.04	.74-1.46
<5 yr	.67	.54-.83	.61	.49-.76	.91	.69-1.19
Salary						
low 4-6	1.00		1.00		1.00	
intermediate 7-9	.50	.43-.60	.49	.41-.59	1.71	1.28-2.28
high >9	.38	.30-.49	.33	.25-.44	1.07	.79-1.44
Age						
<35 yr	1.00		1.00		1.00	
35-45	1.38	1.07-1.78	1.54	1.17-2.02	1.20	.90-1.60
>45 yr	1.48	1.16-1.88	1.79	1.38-2.32	.93	.70-1.22
History sickness absence in days (length) 1 yr before						
0	1.00		1.00		1.00	
1-7	1.57	1.24-2.01	1.19	.95-1.50	3.07	2.18-4.31
8-14	3.68	2.85-4.74	2.65	2.08-3.39	6.30	4.44-8.95
> 14	9.72	7.75-12.2	4.26	3.43-5.29	12.9	9.40-17.8
History frequency (1 yr before)						
0x	1.00		1.00		1.00	
1-2x	2.77	2.26-3.41	1.91	1.58-2.32	3.96	2.91-5.40
>2x	8.66	6.81-11.02	3.83	3.04-4.84	17.47	12.6-24.2

^(a) n ranges between 3575 - 3606 due to missing values

the latter showing a relation with low seeking social support rather than a palliative reaction. Table 5b summarizes the significant associations between various sickness absence measures and ways of coping (Table 5). It can be seen from this table that the crude ORs of the active and avoidant coping styles show the most consistent patterns of associations across all sickness absence measures.

Sickness absence, and demographics and ways of coping

Of course, the question arises whether or not the association between coping and sickness absence could be explained by previous sickness

Table 5. Associations of coping and sickness absence

	length > 14 days		Sickness absence duration > 7 days		frequency > 2x	
	OR	95% CI	OR	95% CI	OR	95% CI
Problem solving						
active problem-focusing						
- low	1.00		1.00		1.00	
- medium	.84	.70-.99	.83	.69-.99	.84	.68-1.04
- high	.61	.49-.75	.69	.56-.86	.78	.53-.87
seeking social support						
- low	1.00		1.00		1.00	
- medium	.98	.82-1.17	.97	.80-1.16	1.01	.80-1.26
- high	.92	.75-1.12	.81	.66-.99	1.15	.90-1.45
palliative reaction						
- low	1.00		1.00		1.00	
- medium	1.22	1.01-1.49	1.15	.94-1.41	1.43	1.13-1.81
- high	1.33	1.11-1.59	1.19	.99-1.43	1.40	1.12-1.74
Reactive-passive						
avoidance behaviour						
- low	1.00		1.00		1.00	
- medium	1.11	.92-1.32	1.14	.94-1.37	1.22	.98-1.51
- high	1.35	1.10-1.65	1.32	1.07-1.63	1.39	1.09-1.67
expression of emotions						
- low	1.00		1.00		1.00	
- medium	1.05	.87-1.28	1.21	.99-1.48	.91	.72-1.14
- high	1.19	.95-1.50	1.13	.89-1.44	1.29	.99-1.69

Table 5b Summary table 5

	length	Sickness absence duration	frequency
Problem-solving			
active problem-focusing	x	x	x
seeking social support	-	x	-
palliative reaction	x	-	x
Reactive-passive			
avoidance behaviour	x	x	x
expression of emotions	-	-	-

absence and by demographics. Therefore, table 6 displays the ORs for the three sickness absence measures with coping strategies after adjustment for previous sickness absence and the demographics mentioned in Table 4.

Length

Adjustment for sickness absence history increases the excess risk to be absent for more than 14 days in one year by 22% for active problem-focusing (thus, sickness absence history reduces the effect of active

Table 6. Odds ratios (95%CI) for sickness absence (length > 14 days, frequency >2x, duration >7days) associated with different coping styles measured at the start of a one year follow-up study (n = 3575^a).

Adjustments	length >14days		duration > 7days		frequency >2x	
	OR	95% CI	OR	95% CI	OR	95% CI
PROBLEM SOLVING						
Active problem focusing						
No adjustments (crude OR)	.63	(.51-.77)	.71	(.57-.80)	.69	(.54-.89)
History sickness absence length	.71	(.56-.88)	.78	(.63-.97)	.71	(.55-.93)
History sickness absence length + gender (female)	.72	(.58-.90)	.79	(.63-.98)	.73	(.55-.95)
History sickness absence length + gender + salary (high)	.77	(.61-.97)	.86	(.69-1.07)	.74	(.57-.98)
History sickness absence length + gender + salary + education (high)	.79	(.63-.99)	.88	(.71-1.10)	.74	(.57-.98)
History sickness absence length + gender + salary + education + marital status (married)	.79	(.62-.99)	.88	.70-1.10)	.74	(.57-.98)
Seeking social support						
No adjustments (crude OR)	.90	(.73-1.09)	.80	(.65-.98)	1.14	(.90-1.45)
History sickness absence length	.95	(.78-1.16)	.81	(.66-1.00)	1.06	(.83-1.37)
History sickness absence length + gender (female)	.83	(.67-1.03)	.78	(.63-.97)	1.01	(.78-1.30)
History sickness absence length + gender + salary (high)	.87	(.70-1.08)	.83	(.67-1.02)	1.03	(.80-1.33)
History sickness absence length + gender + salary + education (high)	.88	(.71-1.10)	.84	(.68-1.04)	1.03	(.80-1.34)
History sickness absence length + gender + salary + education + marital status (married)	.88	(.71-1.10)	.84	(.68-1.04)	1.03	(.80-1.34)
Palliative reaction						
No adjustments (crude OR)	1.32	(1.10-1.58)	1.19	(.99-1.43)	1.37	(1.10-1.72)
History sickness absence length	1.24	(1.02-1.50)	1.16	(.96-1.41)	1.18	(.93-1.50)
History sickness absence length + gender (female)	1.20	(.99-1.45)	1.14	(.94-1.38)	1.15	(.91-1.46)
History sickness absence length + gender + salary (high)	1.20	(.99-1.46)	1.14	(.94-1.38)	1.15	(.91-1.45)
History sickness absence length + gender + salary + education (high)	1.21	(1.00-1.47)	1.15	(.95-1.40)	1.15	(.91-1.46)
History sickness absence length + gender + salary + education + marital status (married)	1.22	(1.00-1.48)	1.16	(.96-1.41)	1.15	(.91-1.46)
REACTIVE-PASSIVE						
Avoidance behaviour						
No adjustments (crude OR)	1.36	(1.11-1.66)	1.33	(1.07-1.64)	1.37	(1.07-1.75)
History sickness absence length	1.24	(.99-1.54)	1.29	(1.04-1.60)	1.37	(1.05-1.78)
History sickness absence length + gender (female)	1.23	(.99-1.53)	1.28	(1.03-1.59)	1.36	(1.04-1.77)
History sickness absence length + gender + salary (high)	1.22	(.98-1.52)	1.27	(1.02-1.57)	1.35	(1.04-1.75)
History sickness absence length + gender + salary + education (high)	1.21	(.97-1.51)	1.26	(1.02-1.57)	1.35	(1.03-1.75)
History sickness absence length + gender + salary + education + marital status (married)	1.22	(.97-1.52)	1.27	(1.02-1.58)	1.35	(1.03-1.75)
Expression of emotions						
No adjustments (crude OR)	1.17	(.97-1.40)	1.01	(.83-1.22)	1.41	(1.13-1.75)
History sickness absence length	1.07	(.88-1.31)	.98	(.80-1.19)	1.34	(1.06-1.68)
History sickness absence length + gender (female)	1.06	(.87-1.29)	.97	(.79-1.18)	1.32	(1.05-1.67)
History sickness absence length + gender + salary (high)	1.07	(.87-1.30)	.98	(.80-1.19)	1.33	(1.05-1.67)
History sickness absence length + gender + salary + education (high)	1.08	(.88-1.31)	.99	(.81-1.20)	1.33	(1.05-1.67)
History sickness absence length + gender + salary + education + marital status (married)	1.08	(.88-1.31)	.99	(.81-1.20)	1.33	(1.05-1.67)

^a All odds ratios are based each time on the same 3575 employees without missing values on each variable in the model

coping), while reducing it by 25% and 33% for palliative reaction and avoidance coping, respectively. After adjustment for gender and sickness absence history, the excess risk for length in addition to palliative reaction and sickness absence history decreases by 17%.

The excess risk for length adjusted for salary in addition to active problem-focusing, sickness absence history and gender increases by 18%. In summary then, adjusted for several confounding variables, the length of sickness absence is effectively influenced by active problem-focusing and palliative reaction.

Frequency

Adjustment for sickness absence history barely minimizes the risk for frequency by coping considering active problem focusing and avoidance behaviour. For palliative coping, the reduction for the excess risk amounts to 51%. When adjusted for gender, in addition to sickness absence history, the risk of high frequency in association with palliative reaction reduces by another 16%. In sum, adjusted for several confounding variables the frequency of sickness absence is effectively influenced by active problem-focusing, avoidance behaviour and expression of emotions.

Duration

Adjustment for sickness absence history reduces the excess risk of active problem-focusing by 24%, of seeking social support and palliative reaction by 16%, and of avoidance behaviour by 12%. Adjustment for gender in association with seeking social support affects the excess risk of duration by 16%. In summary then, adjusted for several confounding variables, the duration of sickness absence is effectively influenced by active problem-focusing, avoidance behaviour and seeking social support.

Effects on the onset of a new period of absenteeism

During the first year, the median time before the onset of a new episode of absenteeism is significantly shorter for those low in active problem-focusing, high in avoidance, and high in a palliative response. For the two remaining coping styles, no significant results were found (Table 7). This means that employees who are used to solving problems actively instead of avoiding problems or engaging in alternative behaviours, enter sick leave later the next time.

Table 7. Kaplan-Meier: the relation between different coping styles and the onset of absenteeism in the year after coping assessment

	Median (days)	SE	95%CI	stat	Log Rank df	sign
PROBLEM SOLVING						
active problem-focusing						
low	152	7	137-167	9.44	2	.01
medium	170	13	145-195			
high	176	14	149-203			
seeking social support						
low	168	10	148-188	0.45	2	.80
medium	165	8	148-182			
high	155	17	122-188			
palliative reaction						
low	182	14	155-209	13.65	2	.00
medium	155	12	132-178			
high	146	7	131-161			
REACTIVE-PASSIVE						
avoidance behaviour						
low	182	11	160-204	14.6	2	.00
medium	151	11	130-172			
high	144	10	125-163			
expression of emotion						
low	165	10	146-184	0.98	2	.61
medium	167	11	145-189			
high	156	12	133-179			

Discussion

In accordance with our hypothesis, and after adjustment for potential confounders, employees with an active problem-solving coping strategy are less likely to drop out because of sickness absence in terms of frequency, length (total number of days absent, longer than 14 days), and duration (mean duration per spell, more than 7 days) of sickness absence. This positive effect is observed in the case of 'seeking social support' only for duration of sickness absence, and in the case of 'palliative reaction' only for length and frequency of sickness absence. In contrast, an avoidant coping style, representing a reactive-passive strategy, significantly increases the likelihood of frequent absences, as well as the duration of sickness absence. Expression of emotions, representing another reactive-passive strategy, has no effect on sickness absence. The median time before the onset of a new episode of absenteeism, finally, is significantly extended for active problem-solving and reduced for avoidance and for a palliative response.

In summary, we conclude that in accordance with our hypothesis, a problem-solving coping strategy, in contrast to a reactive-passive coping strategy, significantly reduces sickness absence. This result seems to corroborate other research findings that showed that problem-solving coping is associated with well-being and overall health outcomes (Kohn 1996). On the other hand, our results are at odds with research findings that document a positive relationship between reactive-passive coping and health (Austenfeld and Statton 2004, Coyne and Racioppo 2000). Austenfeld et al. (2004) have argued that the negative effect of reactive-passive coping on health may partly be attributed to the operationalization of this construct, and therefore recommended a clear description of the reactive-passive coping items used. The idea is that reactive-passive coping can be separated into two factors, namely emotional expression and emotional processing (Lazarus 1993). The former factor is an active attempt to acknowledge, to explore meanings or to come to an understanding of one's emotions. Items measuring emotional processing, however, focus on the acknowledgement of emotions, the validity and importance of feelings, the delving into the feelings. Especially emotional processing has a positive association with health, although how the influencing occurs is still unclear. The items that tap reactive-passive coping in the UCL refer to the expression of emotions and not to their processing. This probably explains the indifferent and negative effect on sickness absence by 'emotional expression' and 'avoidance behaviour' respectively. A second possible explanation can be that reactive-passive strategies have a positive relationship to health but not necessarily with sickness absence.

Our study partly refutes the assumption of Kristensen (1991) that sickness absence is a coping strategy by itself. Kristensen claimed that employees who use sickness absence as a coping strategy would experience less work-related strain, especially in jobs with poor decision latitude. Accordingly, because they are no longer exposed to their stressful jobs, employees would recuperate during sickness absence, especially in the case of psychosomatic symptoms. In our study, sickness absence history that can be considered a proxy of the coping strategy of sickness absence had only a minor impact on sickness absence given a general coping style. And although the effect is less strong, the measured coping strategies of the UCL still have an effect on sickness absence.

The favourable outcome of problem-solving coping in relation to sickness absence can be attributed to being engaged in active transactions between person and environment with the aim of alleviating stress-inducing situations (Lazarus 1993; Huizink et al. 2002; Roesch and Weiner 2001). Efforts to remove the stressor, gathering information, and finding possible solutions for the problems are a few examples. In general, these strategies are associated with self-confidence and perceived control, and are observed in individuals who are persistent and assertive, self-efficacious, and less anxious and depressed (Heppner 1988; Heppner and Baker 1997).

Two factors in the evaluation of problem-solving coping should be commented upon. Men are believed to be more likely to confront a problem with active coping, whereas women are believed to exhibit a more reactive-passive response (Pearlin and Schooler 1978; Hamilton and Fagot 1998). For instance, a meta-analysis of Tamres et al. (2002) showed that compared to men, women are more likely to use indirect strategies that involve verbal expression or to seek emotional support. Huizink et al. (2002), however, argue that the presumed effectiveness of problem-solving strategies is based on the assumption that male-gender role behaviour is superior. She suggests that studies, as a result of gender bias, have failed to identify other styles of coping as potentially effective. In our study, however, considering several styles, the adjustment for gender barely effects the influence of coping on sickness absence measures.

Another complicating factor in the evaluation of the effectiveness of problem-solving coping may be that reviewers group several distinct coping behaviours under this one single coping category in an effort to simplify the findings (Tamres et al. 2002). For instance, problem-solving coping may be composed of different behaviours. This is underscored by our finding that different problem-solving strategies have different outcomes on sickness absence. Seeking social support, for example, affects only duration (marginally), whereas active problem-focusing affects length, duration and frequency. The difference in outcome for different sickness absence measures in the case of seeking social support may be clarified by Stansfeld (1997) who argues that social support may influence absence-related behaviour and encourage a person to take absence at a time of illness. Contrarily, one may postulate that social support also shortens sickness absence. Both postulations may result in the absence of a substantial effect.

To the authors' knowledge, this is the first study with four sick leave outcome measures in relation to coping that reveals a more comprehensive picture of changes in the sick leave pattern. In line with Isacson (1992), we can conclude that "adding more measures gives a more comprehensive picture of sickness absenteeism and of differences between groups". For instance, the present study demonstrates a relation between a palliative coping reaction and length of sickness absence in contrast with the duration of sick leave. Without the differential pattern for sickness absence, the differential effects of several coping strategies would remain invisible. Another, and perhaps even more important, argument to use different measures of sickness absence is the accessibility of this study for international comparisons in future research.

Finally, the multi-factorial aetiology of sickness absence requires discussion. Alexanderson (1998) pointed out that different disciplines and scientific traditions deal in different ways with absenteeism. In medical science, for instance, the focus of research is on occurrence, etiology and intervention, whereas the focus in medical sociology is on interacting factors within a pre-circumscribed model. She and other authors (Whitaker 2001; Alexanderson 1998), therefore categorized the many factors of sickness absence in three levels: macro/national level (Alexanderson 1995) (e.g., insurance systems), organizational level (Jeurissen and Nyklicek 2001; Vahtera et al. 1996) (e.g., job demands, resources) and individual level (e.g., gender, education). Recognizing this phenomenon, our analyses were adjusted for several known risk factors at the level of the individual. Since the present study was conducted in one Dutch company, the influence of organizational and socioeconomic factors was equally present in all groups and in this sense controlled for.

A strong point of our study is the detailed way in which sickness absence is assessed, using objective archival data. Thus far, relatively little attention has been paid to the implications of different quantitative measures of sickness absence. Moreover, a prospective design was used that allowed for predicting future sickness absenteeism.

A limitation of the study is the non-recurring measurement of coping in our study. Therefore, we cannot rule out the possibility that sickness absence might influence the way employees cope with stressful situations. Although, coping styles, as measured with the UCL, have proven to be

relatively stable in time (Norberg et al. 2005), reversed causation cannot be ruled out.

A second limitation could be the Cronbach's alpha of some subscales of the UCL (slightly below the .70). However, the criterion of .70 is an arbitrary value that is not universally accepted as the minimum level of acceptability. As an example of the arbitrariness of this criterion, Nunnally (1967) mentioned that α 's ranging from .50-.60 would be acceptable, but in the second edition of that book he suggests that .70 is the minimally acceptable value – without further justification (Nunnally 1978). Moreover, the minimally required degree of reliability is a function of the research purpose; for individual-level, diagnostic research α should be much higher than for the basic, group-level research reported in our study (Peterson, 1994). Hence we used a minimum threshold for coefficient α of .65 as was recently proposed by De Vellis (2003).

In spite of these limitations, the results of the present study support the notion that problem-solving coping and reactive-passive strategies are inextricably connected with frequency, duration and length of sickness absence. Especially 'active problem-focusing' decreases the chance of future sickness absence.

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Do job demands, job resources and personality predict burnout and work engagement? A two-sample study

Van Rhenen W^{1,2}, Schaufeli WB³, van Dijk FJH¹

Submitted

¹ Academic Medical Centre, Coronel Institute of Occupational Health, Universiteit van Amsterdam, Meibergdreef 9, 1105 AZ Amsterdam, The Netherlands

² Department of Occupational Health Services, ArboNed Utrecht
Zwarte Woud 10, 3524 SJ Utrecht, The Netherlands

³ Department of Psychology and Research Institute Psychology & Health
Utrecht University, Heidelberglaan 1, 3584 CS Utrecht, The Netherlands

Abstract

Objective

The principal objective of this study is to demonstrate that, as hypothesised in the Job Demands-Resources (JD-R) model, job demands and lack of job resources predict future burnout, whereas job resources predict future work engagement. Second, we investigate the extent to which personality adds to this prediction. Finally, we evaluate the short-term (one-year) and long-term (two-year) effects of combinations of job characteristics and personality traits on burnout and work engagement.

Methods

Longitudinal data were gathered from two independent groups ($n = 201$ and $n = 151$) of middle managers and executives from a Dutch telecoms company, who participated in an extensive survey on employee health and well-being. Hierarchical multiple regression analyses were carried out in order to test our hypotheses and identify relevant predictors.

Results

As hypothesised, job demands, especially work-home interference and emotional demands, and lack of job resources, especially opportunities to learn and autonomy, predict future levels of burnout. Moreover, job resources, especially social support, opportunities to learn, and autonomy, predict future levels of engagement. Neuroticism predicts both burnout (positive) and engagement (negative), whereas extraversion also predicts engagement (positive) and the burnout component of exhaustion (negative). Finally, as expected, the predictive effects are more powerful across the shorter time period of one year than across the longer time period of two years.

Conclusions

Our findings support the JD-R model, and suggest that the model should be supplemented with personality traits in order to increase its predictive power. Furthermore, the predictions also hold after a relatively long time interval of two years.

Keywords: job demands-resources (JD-R) model, predictor, personality, occupational health, health surveillance.

Introduction

Our principal objective in this study is to demonstrate that job demands and lack of job resources predict future burnout, whereas job resources predict future work engagement. Second, we investigate the extent to which personality adds to this prediction, the expectation being that neuroticism predicts burnout, whereas extraversion predicts work engagement. The predictive power of the combination of job characteristics and personality traits is also examined. Finally, two studies using similar samples but different time intervals allow us to evaluate the short-term (one-year) and long-term (two-year) effects of combinations of job characteristics and personality traits on burnout and work engagement.

We use the Job Demands-Resources (JD-R) model (Demerouti 2001b; Schaufeli and Bakker 2004) as the theoretical framework for this study. Although this model has been used in at least a dozen studies (Bakker and Demerouti 2007), virtually all of the existing studies are cross-sectional in nature, meaning that a rigorous longitudinal test remains an important undertaking. Moreover, the JD-R model does not include personality characteristics. So instead of merely replicating previous results, the current study goes beyond previous JD-R research in that it includes personality traits and predicts future burnout and work engagement.

The field of occupational and environmental health has traditionally focused on health complaints, injury, disorder or disease, accidents, and disability. Since its emergence in the mid-1970s, burnout has been a much-studied topic among both practitioners and researchers. The term 'burnout' originally referred to exhaustion, depersonalisation and reduced personal accomplishment as a syndrome manifest among those doing 'people work' of some kind (Maslach and Schaufeli 1993). The concept has subsequently been extended to include other professionals and occupational groups (Taris et al. 1999; Schutte et al. 2000), whereby its three dimensions – exhaustion, cynicism and professional efficacy – have been broadened to encompass both social as well as non-social aspects of employment. Its scope was recently extended even further by research focusing on 'work engagement,' the presumed opposite of burnout (Schaufeli and Bakker 2004; Demerouti et al. 2001a; Schaufeli et al. 2002a). Work engagement is defined as a positive, fulfilling, work-related state of mind that is characterised by vigour (high levels of energy while working, willingness to invest effort

in work, and persistence in the face of difficulties); dedication (a sense of enthusiasm, inspiration, pride, and challenge); and absorption (the ability to concentrate and happily engross oneself in one's work, whereby time passes quickly and one has difficulty detaching oneself from work). Just as exhaustion and cynicism are considered to constitute the 'core of burnout' (Green et al. 1991; Schaufeli and Taris 2005), vigour and dedication are the core dimensions of work engagement (Bresó et al. 2007). In particular, exhaustion and cynicism are the direct opposites of vigour and dedication, respectively (González-Romá et al. 2006). This is not to suggest, however, that the antecedents of burnout (exhaustion and cynicism) are similar but inverse to those of work engagement (vigour and dedication).

Research using the JD-R model (Bakker and Demerouti 2007) has shown that burnout and work engagement relate differently to job characteristics. Work engagement is positively related to job resources, such as social support from colleagues, autonomy, supervisory coaching, opportunities for learning and development, and performance feedback (Schaufeli and Bakker 2004; Bakker et al. 2003c; Hakanen et al. 2006; Llorens et al. 2006). The term 'job resources' refers to those physical, psychological, social or organisational aspects of a job that reduce job demands, are functional in achieving work goals, and stimulate personal growth, learning and development (Demerouti et al. 2001b; Demerouti et al. 2001a). Job resources are thus not only necessary for dealing with job demands and 'getting things done,' but they also are important in their own right due to their motivating potential (Hobfoll 2002). Job resources may play either an intrinsic motivational role (fostering employees' growth, learning and development), or an extrinsic motivational role (being instrumental in dealing with job demands and achieving work goals). Not surprisingly, then, job resources are – via work engagement – related to organisational commitment, intention to stay and sickness absence (Schaufeli and Bakker 2004; Bakker et al. 2003a). A motivational process thus seems to exist, whereby work engagement plays a mediating role between job resources and positive organisational outcomes. Four job resources were included in the current study, owing to their special relevance to the managers studied: social support from colleagues, job control, opportunities to learn and develop, and performance feedback.

In addition to a motivational process, the JD-R model assumes a health impairment process that may be evoked by job demands (Bakker and

Demerouti 2007; Bakker et al. 2003b). The term ‘job demands’ refers to aspects of a job that require sustained physical and psychological effort. Job demands are not necessarily negative, but when the efforts demanded exceed an employee’s capabilities, the latter’s energy is drained and burnout and subsequent health problems are likely to follow (Schaufeli and Bakker 2004; Demerouti et al. 2001a; Hakanen et al. 2006; Llorens et al. 2006). In addition to job demands, poor resources also play a role in the health impairment process, albeit that the association of job demands with burnout is usually much stronger than that of poor resources (Schaufeli and Bakker 2004; Hakanen et al. 2006). Four job demands were included in the current study, due to their special relevance to the managers studied: work overload, emotional demands, cognitive demands, and work-home interference.

The sceptical reader might question whether the associations between job characteristics (that is, demands and resources) and employee wellbeing (that is, burnout and engagement) may be confounded by the employees’ personalities, resulting in so-called information bias. It is possible that certain personality traits may render an employee more vulnerable or more resilient to job demands, or more liable or predisposed to the impact of job resources. Swickert et al. (2002), for instance, demonstrated that positive correlations exist between extraversion and perceived availability of support, enacted support and social network characteristics. In a study using a multi-level design, Griffin (2001) found that the proportion of between-group variance in job satisfaction increased when neuroticism and extraversion were included in the analysis. On a slightly different note, Scollon and Diener (2006) showed in a longitudinal study that increased work satisfaction was accompanied by decreases in neuroticism and increases in extraversion over time. In a similar vein, Langelan et al. (2006) reported that high levels of neuroticism are positively related to burnout, whereas neuroticism is negatively related and extraversion is positively related to work engagement. The former result has been obtained in a number of other studies (Cano et al. 2005; Mills and Huebner 1998; Zellars et al. 2004).

Despite the impressive volume of publications on burnout and the growing number of publications on engagement, three issues remain unresolved. First, virtually all research on burnout and work engagement that uses the JD-R model has been cross-sectional in nature, so that no causal inferences can be made. Second, the ‘Big Two’ personality characteristics

(neuroticism and extraversion) have not been added or integrated into the JD-R model so far. Third, most longitudinal studies use only one time interval, so that longitudinal effects cannot be compared with longer or shorter time intervals in other studies. Little information is available concerning the amount of time that is needed for job characteristics to influence employee well-being (Taris and Kompier 2003). As a result, recommendations concerning length of follow-up in etiological studies are inconsistent (De Lange et al. 2003). The current study addresses these issues by using a longitudinal design with two time intervals of one and two years, respectively. Moreover, in addition to job characteristics (demands and resources), neuroticism and extraversion are included as independent variables in order to explain future employee well-being (burnout and work engagement).

More specifically, we hypothesise that:

1. Job demands (that is, work overload, emotional demands, cognitive demands, and work-home interference) and a lack of job resources (that is, autonomy, opportunities to learn, performance feedback and social support) predict future burnout.
2. Job resources (that is, autonomy, opportunities to learn, performance feedback and social support) predict future work engagement.
3. Neuroticism predicts future burnout.
4. Extraversion (positively) and neuroticism (negatively) predict future engagement.
5. The effects of hypotheses 1-4 are stronger for the shorter, one-year time period than for the longer, two-year time period.

Method

Samples

The study, which was profiled as an extensive employee health and well-being survey, was carried out among two independent groups of middle managers and executives of a Dutch telecoms company. These two samples were invited to participate in the study during two consecutive periods.

Sample 1. At Time 1 (T1), a total of 420 employees were invited to participate (response rate 85%; N = 355). One year later, at Time 2 (T2), 17 respondents had dropped out due to turnover and pensioning. As a result,

338 managers and executives were invited to participate in the follow-up (response rate 59%; $N = 201$). Hence, 57% (201/355) of the initial sample was included.

Sample 2. At the same time as T2 of Sample 1, a second group of 702 managers was invited to participate (T1; response rate 64%; $N = 450$). At follow-up two years later, 170 managers had dropped out due to a large, ongoing reorganisation process that had prompted turnover, outplacements and early pensioning. As a result, after two years (T2), 280 managers were approached (response rate 54%; $N = 151$). Hence, 36% (151/420) of the initial sample was included.

The majority of participants in Samples 1 and 2 are male (90% and 87%, respectively). For Sample 1, about 90% live with a partner, 56% hold at least a college degree, 35% completed vocational training, and 7% attended secondary school only. The mean age of Sample 1 is 42.9 years ($SD = 7.9$), and on average, the managers have worked 18.4 years for the company ($SD = 10.7$), but only 1.9 years ($SD = 2.3$) in their current jobs.

For Sample 2, about 87% live with a partner, 78% hold at least a college degree, 15% completed vocational training, and 4% visited secondary school only. The mean age of Sample 2 is 42.0 years ($SD = 7.0$), and on average, the managers have worked 15.2 years for the company ($SD = 9.6$), but only 2.3 years ($SD = 1.8$) in their current jobs.

Our research thus uses a typical managerial sample consisting of predominantly middle-aged and married men. The level of education is high (that of Sample 2 being significantly higher than that of Sample 1; $\chi^2(7) = 52.7$, $p = .00$), and the employees have spent a significant number of years working for the company (for Sample 1, this time is notably shorter than for Sample 2; $p = .00$). In contrast, the time that they have spent in their current jobs is short (Sample 1 significantly shorter than Sample 2; $p = .00$).

Selective dropout over time for Sample 1 was observed for age and duration of employment in the company. Compared to the drop-outs, the participants at T2 were slightly older ($M = 44.4$ versus $M = 41.0$; $t(349) = 3.96$; $p = .000$) and had been employed for longer ($M = 19.9$ versus $M = 16.4$; $t(351) = 3.10$; $p = .002$). This might be due to the fact that older managers are more loyal towards the organisation (Patel 1999) and keener to participate in the

survey. No selective dropout was found for gender, mode of cohabitation, level of education, and work experience in the current job.

Selective dropout for Sample 2 was only observed for gender. Comparing T1 and T2, the percentage of men was significantly higher (93% versus 87%; $\chi^2(1) = 6.84$, $p = .00$). No selective dropout was observed for the other demographics.

Procedure

All participants received a questionnaire with an accompanying letter from an independent occupational health service, which invited them to participate in the health and well-being survey, explained its purpose, guaranteed confidentiality, and emphasised that participation was voluntary. Participants were asked to complete the questionnaire and to return it to the occupational health service.

Measures

Job resources. The survey included various (shortened) scales from the Questionnaire on the Experience and Evaluation of Work (QEEW), which is widely used by the Dutch occupational health services and also by researchers (Van Veldhoven and Meijman 1994; Van Veldhoven et al. 2002; Van Veldhoven and Broersen 2003). More specifically, four job resources were assessed: social support from colleagues (three items; $\alpha_{S1T1} = .86$; $\alpha_{S1T2} = .86$; $\alpha_{S2T1} = .86$; $\alpha_{S2T2} = .84$); job control (three items; $\alpha_{S1T1} = .78$; $\alpha_{S1T2} = .80$; $\alpha_{S2T1} = .70$; $\alpha_{S2T2} = .72$); opportunities to learn and develop (four items; $\alpha_{S1T1} = .87$; $\alpha_{S1T2} = .84$; $\alpha_{S2T1} = .82$; $\alpha_{S2T2} = .85$); and performance feedback (three items; $\alpha_{S1T1} = .84$; $\alpha_{S1T2} = .81$; $\alpha_{S2T1} = .79$; $\alpha_{S2T2} = .79$). Examples of items include: 'If necessary, can you ask your colleagues for help?' (social support); 'Do you have freedom in carrying out your work activities?' (autonomy); 'Do you learn new things in your work?' (opportunities to learn and develop); 'Does your work provide you with direct feedback on how well you are doing?' (performance feedback).

Job demands. Using the QEEW, the following job demands were assessed: work overload (five items; $\alpha_{S1T1} = .84$; $\alpha_{S1T2} = .84$; $\alpha_{S2T1} = .84$; $\alpha_{S2T2} = .87$), emotional demands (three items; $\alpha_{S1T1} = .72$; $\alpha_{S1T2} = .76$; $\alpha_{S2T1} = .80$; $\alpha_{S2T2} = .80$), and cognitive demands (five items; $\alpha_{S1T1} = .75$; $\alpha_{S1T2} = .79$; $\alpha_{S2T1} = .72$; $\alpha_{S2T2} = .81$). In addition, work-home interference was measured according to the scale developed by Peeters et al. (2004) (seven items; $\alpha_{S1T1} = .85$;

$\alpha_{s1T2} = .89$; $\alpha_{s2T1} = .89$; $\alpha_{s2T2} = .91$). Examples of items include: 'Do you have to work very fast?' (work overload); 'Does your work put you in emotionally upsetting situations?' (emotional demands); 'Does your work demand a lot of concentration?' (cognitive demands); 'How often does it occur that you have so much to do at work that you cannot fulfil duties at home?' (work-home interference). All items assessing job resources and job demands were scored on a 5-point rating scale ranging from 1 ('never') to 5 ('always').

Work engagement was assessed according to two scales from the Utrecht Work Engagement Scale (UWES) (Schaufeli et al. 2002b): vigour (six items; $\alpha_{s1T1} = .81$; $\alpha_{s1T2} = .86$; $\alpha_{s2T1} = .83$; $\alpha_{s2T2} = .81$); and dedication (five items; $\alpha_{s1T1} = .91$; $\alpha_{s1T2} = .91$; $\alpha_{s2T1} = .89$; $\alpha_{s2T2} = .92$). Example of items include: 'At work, I feel like I am bursting with energy' (vigour), and 'I find that the work that I do is full of meaning and purpose' (dedication). All items were scored on a seven-point scale ranging from 0 ('never') to 6 ('always').

Burnout was assessed according to two scales from the Dutch version (Schaufeli and Van Dierendonck 2000) of the Maslach Burnout Inventory-General Survey (MBI-GS) (Schaufeli et al. 1996): exhaustion (five items; $\alpha_{s1T1} = .87$; $\alpha_{s1T2} = .85$; $\alpha_{s2T1} = .85$; $\alpha_{s2T2} = .88$) and cynicism (five items; $\alpha_{s1T1} = .77$; $\alpha_{s1T2} = .78$; $\alpha_{s2T1} = .77$; $\alpha_{s2T2} = .83$). Example of items include: 'Working all day is really a strain for me' (exhaustion), and 'I have become less interested in my work since I started this job' (cynicism). The burnout items were scored in a same way to those of work engagement.

Personality. The two personality dimensions, extraversion and neuroticism, were assessed according to the Dutch version (Hoekstra et al. 1996) of the Neo-Five Factor Inventory (NEO-FFI) (Costa and McCrae 1992). This had 12 items for both extraversion (for example, 'I really like to talk to people', $\alpha_{s1T1} = .77$; $\alpha_{s1T2} = .78$; $\alpha_{s2T1} = .80$; $\alpha_{s2T2} = .79$) and neuroticism (for example, 'I often feel tense and nervous', $\alpha_{s1T1} = .83$; $\alpha_{s1T2} = .77$; $\alpha_{s2T1} = .81$; $\alpha_{s2T2} = .82$). Items were scored on a 5-point scale ranging from 1 ('totally disagree') to 5 ('totally agree'). According to the Dutch manual (Hoekstra et al. 1996), the NEO-FFI's psychometric properties (such as construct validity, for example) are sufficient.

The internal consistencies of all scales meet the criterion of .70, a value that is used as a general indication for sufficient reliability (Nunally and Bernstein 1994).

Analyses

Hierarchical multiple regression analyses were carried out in order to test our hypotheses and to identify relevant T1 predictors (job resources, job demands and personality) of T2 engagement (vigour and dedication) and burnout (exhaustion, and cynicism), respectively. To control for the effects of demographics, Step 1 of the analyses included age, gender, education, and work experience. Next, in Step 2, job characteristics (demands and resources) were added to the regression model; and in Step 3 personality traits (extraversion and neuroticism) were added. In order to explore possible interactions between job characteristics and personality, all 12 interaction terms were added to the regression model in Step 4. Finally, to assess the effects of baseline levels, in Step 5, the managers' T1 scores on vigour, dedication, exhaustion, and cynicism were included in the respective analyses.

Results

The means, standard deviations, and correlations for all study variables for both samples are displayed in Table 1. Scores on the burnout and work engagement scales are relatively stable across time, with test-retest correlations ranging from .63 to .75 across a one-year interval (Sample 1), and ranging from .53 to .63 across a two-year interval (Sample 2).

The results of the four stepwise hierarchical multiple regression analyses are summarised in Tables 2 and 3, for Sample 1 and Sample 2, respectively. As can be seen from Table 2, vigour at T2 (Sample 1) is predicted by work experience, social support, neuroticism and extraversion at T1 (Step 4). That is, the shorter period of the manager's work experience, the more social support he receives from his colleagues, the lower he scores for neuroticism, the higher for extraversion, and the more vigorous he feels one year later. Taken together, the T1 predictors explain 30% of the variance of T2 vigour. After vigour at T1 has been introduced in the final step of the original predictors, however, only the effects of work experience and social support remain significant. Finally, 58% of the variance in T2 vigour is explained, of which 28% is accounted for by T1 vigour.

Dedication at T2 (Sample 1) is predicted by opportunities to learn, a lack of work-home interference, social support, and low neuroticism, explaining

Table 1. Means (M), standard deviations (SD) and inter-correlations among the study variables of Sample 1 (n=201/below diagonal) and Sample 2 (n=151/above diagonal).

	Mean	SD	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	S1	S1	S2	S2																		
1 T1																						
Social support	3.8	.83	3.9	.85		.26**	.32**	.40**	-.10	-.09	-.08	-.26**	.32**	-.18*	-.15	-.28**	.23**	.36**	-.15	-.14	.20*	.26**
2 T1																						
Autonomy	3.8	.64	4.0	.52	.25**		.31**	.38**	-.12	-.00	-.08	-.16*	.14	-.09	-.18*	-.23**	.24**	.23**	-.22**	-.10	.31**	.26**
3 T1																						
Opportunity	3.6	.71	3.7	.68	.35**	.53**		.42**	-.11	-.06	-.12	-.17*	.10	-.07	-.07	-.37**	.34**	.56**	-.12	-.27**	.28**	.39**
4 T1																						
Feedback	3.9	.66	4.0	.56	.33**	.48**	.51**		-.03	-.14	-.05	-.08	.24**	-.21*	-.15	-.37**	.40**	.48**	-.10	-.18*	.25**	.34**
5 T1																						
Work overload	3.2	.73	3.1	.75	-.11	-.26**	-.22**	-.16**		.39**	.52**	.51**	.04	.24**	.51**	.26**	-.12	-.14	.28**	.22**	-.09	-.16*
6 T1																						
Emot demands	2.3	.57	2.3	.66	-.02	-.27**	-.19**	-.10	.48**		.46**	.33**	-.12	.41**	.29**	.18*	-.10	-.18*	.16*	.28**	-.18*	-.24**
7 T1																						
Cogn. demands	3.5	.59	3.5	.64	.07	-.08	.01	.06	.37**	.31**		.35**	-.12	.28**	.41**	.05	-.09	-.07	.28**	.13	-.16	-.18*
8 T1																						
Work-home	2.1	.60	2.2	.69	-.13	-.22**	-.10	-.20**	.49**	.36**	.29**		-.17*	.39**	.53**	.21*	-.11	-.17*	.35**	.15	-.21**	-.19*
9 T1																						
Extraversion	45.5	5.22	45.8	5.49	.30**	.19**	.22**	.22**	-.11	-.13	-.08	-.15*		-.43**	-.25**	-.30**	.37**	.26**	-.22**	-.16	.45**	.24**
10 T1																						
Neuroticism	24.9	6.23	23.2	5.41	-.23**	-.43**	-.36**	-.38**	.32**	.33**	.15*	.34**	-.39**		.74**	.40**	-.43**	-.34**	.36**	.25**	-.39**	-.29**
11 T1																						
Exhaustion	1.4	.98	1.2	.79	-.14	-.21**	-.26**	-.23**	.50**	.37**	.29**	.53**	-.33**	.50**		.44**	-.33**	-.25**	.63**	.25**	-.33**	-.27**
12 T1																						
Cynicism	1.0	.78	1.1	.91	-.30**	-.42**	-.46**	-.42**	.38**	.31**	.17*	.37**	-.30**	.55**	.56**		-.50**	-.69**	.33**	.53**	-.36**	-.44**
13 T1																						
Vigour	4.3	.72	4.3	.74	.27**	.32**	.39**	.35**	-.22**	-.25**	-.03	-.23**	.43**	-.52**	-.47**	-.46**		.74**	-.27**	-.24**	.54**	.39**
14 T1																						
Dedication	4.4	.82	4.4	.87	.36**	.46**	.55**	.46**	-.27**	-.24**	-.01	-.27**	.39**	-.48**	-.44**	-.63**	.75**		-.23**	-.40**	.46**	.57**
15 T2																						
Exhaustion	1.2	.81	1.0	.70	-.09	-.13	-.22**	-.22**	.30**	.29**	.17*	.43**	-.29**	.31**	.67**	.38**	-.31**	-.33**		.35**	-.42**	-.37**
16 T2																						
Cynicism	1.1	.89	1.9	.86	-.21**	-.27**	-.28**	-.33**	.34**	.27**	.18*	.40**	-.23**	.47**	.50**	.63**	-.33**	-.43**	.53**		-.47**	-.70**
17 T2																						
Vigour	4.4	.77	4.3	.77	.32**	.31**	.37**	.33	-.23**	-.19**	.02	-.32**	.37**	-.42**	-.39**	-.45**	.75**	.68**	-.43**	-.54**		.75**
18 T2																						
Dedication	4.4	.93	4.5	.93	.31**	.32**	.41**	.36**	-.24**	-.15**	-.07	-.32**	.31**	-.38**	-.38**	-.50**	.57**	.66**	-.42**	-.66**	.79**	

27% of the variance. After introducing T1 dedication in step five, only the negative effect of work-home interference remains significant. In total, 44% of the variance of T2 dedication is explained after T1 dedication is included in the regression equation, an increase of 17%.

Exhaustion at T2 (Sample 1) is predicted by work-home interference and extraversion, which together explain 23% of the variance. Having introduced T1 exhaustion, however, both significant effects disappear, leaving only T1 exhaustion as a significant predictor that explains 45% of the variance.

Table 2. Stepwise hierarchical regression analysis of Sample 1 (n=201); Step 1 demographics (age, gender, education, work experience), Step 2 job characteristics (demands and resources), Step 3 personality traits (extraversion and neuroticism), Step 4 interaction terms (job characteristics and personality), Step 5 T1 scores of outcome data (vigour, dedication, exhaustion, cynicism).

Vigour					Exhaustion				
	Variable	Beta	Sig	Adjusted R square		Variable	Beta	Sig	Adjusted R square
Step 1	Work experience	-.25	.00	.06	Step 1	-			
Step 2	Work experience	-.25	.00	.21	Step 2	W-H interference	.41	.00	.20
	Social support	.24	.00			Opportunity	-.16	.02	
	Feedback	.19	.00						
	Work overload	-.16	.02						
Step 3	Work experience	-.24	.00	.30	Step 3	W-H interference	.39	.00	.23
	Social support	.17	.01			Extraversion	-.20	.03	
	Neuroticism	-.23	.00						
	Extraversion	.18	.01						
Step 4	Work experience	-.24	.00	.30	Step 4	W-H interference	.39	.00	.23
	Social support	.17	.01			Extraversion	-.20	.03	
	Neuroticism	-.23	.00						
	Extraversion	.18	.01						
Step 5	Work experience	-.16	.00	.58	Step 5	Exhaustion	.60	.00	.45
	Social support	.11	.04						
	Vigour	.66	.00						
Dedication					Cynicism				
	Variable	Beta	Sig	Adjusted R square		Variable	Beta	Sig	Adjusted R square
Step 1	Work experience	-.16	.03	.02	Step 1	Gender ^s	.17	.02	.02
Step 2	Opportunity	.28	.00	.24	Step 2	Gender	.18	.00	.24
	W-H interference	-.27	.00			W-H interference	.29	.00	
	Social Support	.17	.02			Opportunity	-.22	.00	
Step 3					Step 3	Work overload	.16	.03	
	Opportunity	.21	.00	.27		Gender	.15	.02	.30
	W-H interference	-.20	.00			W-H interference	.22	.00	
	Social Support	.16	.02			Neuroticism	.30	.00	
Step 4	Neuroticism	-.21	.00		Step 4				
	Opportunity	.21	.00	.27		Gender	.14	.02	.31
	W-H interference	-.20	.00			W-H interference	.23	.00	
	Social Support	.16	.02			Opportunity	-.14	.04	
Step 5	Neuroticism	-.21	.00			Neuroticism	.28	.00	
	W-H interference	-.15	.01	.44		W-H Int*Neurot	.13	.04	
	Dedication	.55	.00		Step 5	Gender	.13	.02	.44
						W-H interference	.15	.02	
						Cynicism	.48	.00	

^s Cynicism male 1.02 / Cynicism female 1,57

Table 3. Stepwise hierarchical regression analysis of Sample 2 (n=151). Step 1 demographics (age, gender, education, work experience), Step 2 job characteristics (demands and resources), Step 3 personality traits (extraversion and neuroticism), Step 4 interaction terms (job characteristics and personality), Step 5 T1 scores of outcome data (vigour, dedication, exhaustion, cynicism).

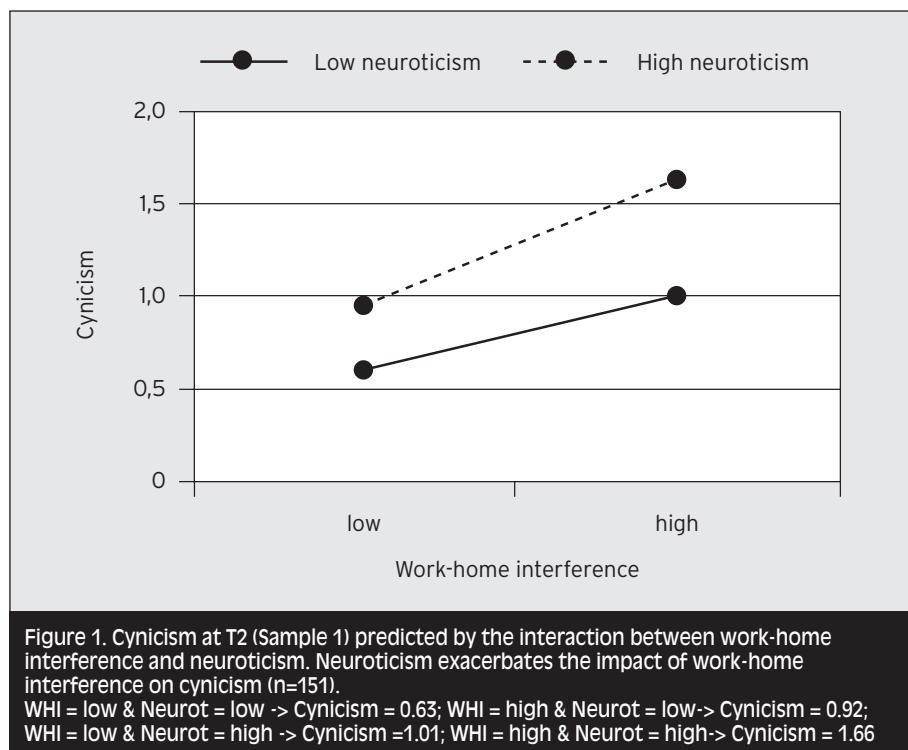
		Vigour					Exhaustion		
	Variable	Beta	Sig	Adjusted R square		Variable	Beta	Sig	Adjusted R square
Step 1	-				Step 1	-			
Step 2	Opportunity	.21	.01	.13	Step 2	W-H interference	.32	.00	.14
	Autonomy	.21	.01			Autonomy	-.17	.03	
	Emot Demands	-.16	.04						
Step 3	Opportunity	.19	.01	.29	Step 3	W-H interference	.24	.01	.18
	Autonomy	.17	.02			Autonomy	-.17	.03	
	Extraversion	.30	.00			Neuroticism	.23	.01	
	Neuroticism	-.91	.03						
Step 4	Opportunity	.19	.01	.29	Step 4	W-H interference	.24	.01	.18
	Autonomy	.17	.02			Autonomy	-.17	.03	
	Extraversion	.30	.00			Neuroticism	.23	.01	
	Neuroticism	-.91	.03						
Step 5	Autonomy	.14	.05	.37	Step 5	Exhaustion	.60	.00	.41
	Extraversion	.24	.00						
	Vigour	.34	.00						
		Dedication					Cynicism		
	Variable	Beta	Sig	Adjusted R square		Variable	Beta	Sig	Adjusted R square
Step 1	-				Step 1	-			
Step 2	Opportunity	.32	.00	.22	Step 2	Emot demands	.26	.00	.12
	Emot demands	-.21	.01			Opportunity	-.25	.00	
	Autonomy	.19	.01						
Step 3	Opportunity	.31	.00	.24	Step 3	Emot demands	.26	.00	.12
	Autonomy	.19	.02			Opportunity	-.25	.00	
	Neuroticism	-.18	.03						
Step 4	Opportunity	.31	.00	.24	Step 4	Emot demands	.26	.00	.12
	Autonomy	.19	.02			Opportunity	-.25	.00	
	Neuroticism	-.18	.03						
Step 5	Autonomy	.15	.03	.35	Step 5	Emot demands	.18	.01	.30
	Dedication	.44	.00			Cynicism	.46	.00	

Cynicism at T2 (Sample 1) is predicted by gender (female), work-home interference, lack of learning opportunities, neuroticism, and the interaction between work-home interference and neuroticism, which together explain 31% of the variance. After T1 cynicism has been introduced in the final step, however, only the effect of gender (female) and work-home-

interference remains significant, explaining 44% of the variance. Figure 1 displays the interaction effect and shows how neuroticism exacerbates the impact of work-home interference on cynicism. That is, when work-home interference is high, those managers with high levels of neuroticism feel particularly cynical.

As can be seen from Table 3, vigour at T2 (Sample 2) is predicted by opportunities to learn, autonomy, extraversion and low neuroticism, explaining 29% of the variance. After introducing T1 vigour in the final step, only the effects of autonomy and extraversion remain significant. In total, 37% of the variance in T2 vigour is explained, of which 8% is accounted for by vigour at T1.

Dedication at T2 (Sample 2) is predicted by opportunities to learn, autonomy and low neuroticism, explaining 24% of the variance. After the introduction of dedication at T1, only autonomy remains in the model. Dedication at T1 and autonomy both explain 35% of the variance of dedication at T2, 11% added by dedication at T1.



Exhaustion at T2 (Sample 2) is predicted by work-home interference, lack of autonomy and neuroticism, explaining 18% of the variance. After introducing T1 exhaustion in the final step, all other significant effects disappear. T1 exhaustion accounts for 41% of the variance of exhaustion of T2.

Cynicism at T2 (Sample 2) is predicted by emotional demands and the lack of opportunities to learn, explaining 12% of the variance. The introduction of T1 cynicism leaves only the effect of emotional demands, explaining 30% of the variance.

Table 4 summarises the results of the eight regression analyses and allows us to evaluate our hypotheses. Hypothesis 1, which states that burnout is predicted by job demands and lacking job resources, is confirmed, at least as far as some demands and resources are concerned. Work-home interference (Samples 1 and 2) and emotional demands (Sample 2) predict exhaustion and cynicism, albeit that the effect of work-home interference on exhaustion in Sample 1 disappears after controlling for exhaustion at baseline. In a similar vein, a lack of opportunities to learn (Samples 1 and 2) and a lack of autonomy (Sample 2) predict exhaustion and cynicism, but this effect disappears after controlling for baseline burnout levels.

Hypothesis 2, which states that engagement is predicted by job resources, is partly confirmed. Before introducing baseline vigour and dedication,

Table 4. Summary of the hierarchical regression of both samples (S1 and S2). Double plus means still present in Step 5, and single plus means present until Step 4.

		Vigour		Dedication		Exhaustion		Cynicism	
		S1	S2	S1	S2	S1	S2	S1	S2
Demographics	Work experience	--							
	Gender (male)							++	
Resources	Social support	++		+					
	Opportunity to learn		+	+	+			-	-
	Autonomy		++		++		-		
Demands	Work-home interference			--		+	+	++	
	Emotional demands								++
Personality	Neuroticism	-	-	-	-		+	+	
	Extraversion	+	++			-			
Interaction	W-H Interference*Neurot							+	

we find that social support (Sample 1), opportunities to learn (Samples 1 and 2) and autonomy (Sample 2) predict T2 vigour and dedication. After controlling for baseline engagement levels, the effect of learning opportunities disappears. Unexpectedly, work-home interference negatively predicts T2 dedication (Sample 1).

Hypothesis 3, which states that neuroticism predicts burnout, is confirmed as far as exhaustion (Sample 2) and cynicism (Sample 1) are concerned, but only when not controlled for baseline levels. Unexpectedly, extraversion predicts exhaustion negatively (Sample 1), but again, this is only the case when not controlled for baseline levels.

Hypothesis 4, which states that engagement is predicted by extraversion and low neuroticism, is confirmed. Neuroticism has a negative impact on vigour and dedication (Samples 1 and 2), but only when not controlled for baseline levels. Extraversion predicts vigour in both samples, but only in Sample 2 does the effect remain significant after controlling for baseline level.

Hypothesis 5, which states that the effects of the previous hypotheses are stronger for Sample 1 than for Sample 2, is confirmed, both in terms of the number of significant effects (see Table 4) as well as in terms of percentages-explained variance (see Tables 2 and 3). Thus as expected, predictions across a one-year period were more numerous and stronger than those across a two-year period.

Discussion

The aim of the current study was to demonstrate that, in line with the JD-R model, the presence of job demands and the absence of job resources predict future burnout, whereas the presence of job resources predicts future work engagement. Furthermore, we aimed to evaluate the additional predictive power of two personality traits (neuroticism and extraversion). Finally, we aimed to compare predictions across two different time periods (one and two years).

As expected and as stated in Hypothesis 1, job demands (especially work-home interference and emotional demands) and lack of job resources

(especially opportunities to learn and autonomy) predict future levels of burnout (exhaustion and cynicism). Also as expected (Hypothesis 2), our results demonstrate that job resources, especially social support, opportunities to learn, and autonomy, predict future levels of engagement (vigour and dedication). In addition, we made the unexpected finding that work-home interference negatively predicts future dedication. Moreover, the observed effects of personality on future burnout (Hypothesis 3) and engagement (Hypothesis 4) largely corresponded with our expectations. That is, neuroticism predicts both burnout (positive) and engagement (negative), whereas extraversion also predicts engagement (positive). One exception is the unexpected finding that extraversion negatively predicts future exhaustion, which can be explained by pointing to the fact that energy is considered to be a facet of extraversion (Costa and McCrae 1992).

Finally, and also as expected, the predictive effects that were specified in Hypotheses 1-4 are more powerful across the shorter time interval of one year (Sample 1) than across the longer time interval of two years (Sample 2). Nevertheless, however, the percentage of explained variance in burnout and engagement remains relatively high, even after two years; on average, 20% without controlling for baseline, and 35% after controlling for baseline. For the shorter time period of one year, these rates are 27% and 47%, respectively.

Taken together, our findings support the JD-R model (Hypotheses 1 and 2) and suggest that the model should be supplemented with personality traits (Hypotheses 3 and 4) in order to increase its predictive power. Despite the fact that our results are generally in line with expectations, however, some unexpected findings warrant further discussion.

First, according to our study, work overload does not predict future burnout. This finding does not agree with the health impairment process in the JD-R model, which states that job demands may lead to mental exhaustion. Nevertheless, as for other studies (Schaufeli and Bakker 2004; Bakker et al. 2005; Santavirta et al. 2007), relatively strong cross-sectional correlations between work overload and exhaustion were found: $r = .50$ and $.51$ for Sample 1 and Sample 2, respectively. Instead of T1 work overload, however, other demands such as work-home interference and emotional demands predict T2 burnout. This might be partly caused by the

overlap between the various job demands. For instance, the correlations between workload and work-home interference are relatively substantial ($r = .49$ and $.51$ for Sample 1 and Sample 2, respectively), as are those between workload and emotional demands ($r = .48$ and $.39$ for Sample 1 and Sample 2, respectively). As far as work-home interference is concerned, this finding is compatible with the Effort-Recovery theory (Meijman and Mulder 1998), which assumes that job demands will lead to fatigue and eventually exhaustion when recovery from the efforts is insufficient. In the case of work-home interference, job stress spills over into other life domains, thereby simultaneously undermining recovery from work and fostering exhaustion. It can thus be speculated that instead of work overload, poor recovery from work is predictive of burnout.

The second issue to address is the finding that feedback, being a job resource, does not predict engagement. This contrasts with the findings of Llorens et al. (2006), which suggest that the motivational process of the JD-R model starts with job resources, including feedback, leading to work engagement and consequently to high levels of organisational commitment. According to Bakker et al. (2006), feedback may play an intrinsic motivational role because it fosters employees' growth, learning and development, thereby increasing job competences. The overlap between feedback and 'opportunities to learn' is therefore not surprising, and is underscored by high inter-correlations with this variable ($r = .51$ and $.42$ for Sample 1 and Sample 2, respectively). This overlap might explain why opportunities to learn, rather than feedback, predict work engagement.

A third issue concerns the (in)consistency of the results across Sample 1 and Sample 2. The short-term (one year) outcome of burnout was mainly related to gender, lack of opportunities to learn, work-home interference, neuroticism, and low levels of extraversion. For engagement, short-term relationships were demonstrated for work experience, social support, opportunities to learn, low levels of neuroticism and extraversion. Some of these variables, in particular lack of opportunities to learn, work-home interference and neuroticism (all for burnout), and opportunities to learn, extraversion and low levels of neuroticism (all for engagement), also influenced long-term outcomes (two years). Not much is known about the length of time that is needed for job characteristics to have an effect on employees' health and well-being (Taris and Kompier 2003),

and the recommendations arising from research on the length of this time period are inconsistent. De Lange et al. (2003) therefore suggest considering the choice of a particular time period based on interim effects (did a manager change his/her job?), maturation effects (is there more exposure during a certain period?) and seasonal effects (is it spring or autumn?). In our study, selection of time intervals was mainly due to practical concerns and arrangements made with the employer. Although the fact that we opted for a one- and two-year follow-up period means that seasonal effects can be virtually discounted, interim and maturation effects cannot be ruled out. We can nevertheless conclude that a short-term prediction is possible for demographics (such as work experience and gender) and social support in particular, whereas for other variables selected during the hierarchical regression analysis, prediction of long-term effects may be useful.

A fourth issue concerns the evaporation of some predictive variables after the introduction of the dependent variable at baseline T1 into the regression model. This phenomenon is most pronounced for exhaustion – no predictive variables are left after T1 exhaustion is introduced – but was also observed for the other dependent variables. The reason for this is that all dependent variables have relatively high stabilities, with test-retest coefficients ranging between .63 and .75, and between .53 and .63 (Table 1), for the one-year and a two-year time periods respectively. Such levels of stability leave little scope for other predictors to have a significant effect.

Taris et al. (1999) also report similar strong longitudinal associations, usually referred to as ‘stability effects’ or ‘autocorrelations.’ In Taris et al.’s 5 study, workers exhibiting relatively high levels of exhaustion (depersonalisation/personal accomplishment) also reported high levels of exhaustion (depersonalisation/personal accomplishment) at a later stage, seemingly irrespective of the length of the time-interval between study waves. In her thesis, Hallberg (2006) offers two interpretations of this phenomenon. Her first suggestion is that, following Kanungo (1979) and Hobfoll (1998), a large amount of variance in burnout is explained by personality factors, and only a small part of the variance is left for contextual variables. A second possible interpretation can be found in Zapf et al.’s (1996) model, which suggests that strain occurs following accumulated exposure to a stressor that leads to further increase in the

stress response, even after the stressor has been removed. A period of high work stress can thus correspond with no experience of burnout, but tipped over the edge high work stress will maintain burnout reactions for a long time.

It is possible that both are (partially) true, and that in our study, the stability of the dependant variables might have masked the impact of correlated independent variables. The introduction of the strong predictor, exhaustion, at baseline during the last step of the regression analysis could have masked the impact of neuroticism on the future development of exhaustion, with its consecutive practical implications. One practical implication, for instance, is that identification of employees with a high neuroticism score might still constitute a good way to start preventing exhaustion. This might be an appropriate approach for when jobs are still 'virtual,' as in case of an assessment situation and the consequent provision of support to applicants. A second implication is that other arguments might be used to guide the choice of intervention. For example, a company might consider the introduction of more learning opportunities to be a more attractive option than direct attempts to change employees' dedication levels.

The final issue that we would like to address concerns the interaction between work-home interference and neuroticism. Managers who suffer from work-home interference are particularly likely to feel cynical when they score high for neuroticism. This finding is in line with the research carried out by Langelaan et al. (2006), which found that high neuroticism is a core characteristic of burnout. Neuroticism reflects stress sensibility (Suls 2001) and is therefore a vulnerability factor for managers. 'Neurotic' managers perceive their work environment to be more threatening, which in turn is likely to lead to more negative emotions and poor performance (Schneider 2004). Moreover, for these managers, the negative effect of job demands on burnout is stronger. Bolger and Schilling (1991) describe a tendency to experience more exhaustion in exposure and reactivity to daily stressors. This fact, combined with the findings of van Hooff et al. (2006) that (strain-based) work-home interference acts as a precursor of health impairment, may explain the interaction of work-home interference and neuroticism. In other words, those employees scoring high for neuroticism are more vulnerable to work-home interference.

The current study also has some limitations. First, data were obtained by means of self-report questionnaires, and the findings may be contaminated by common method variance as a result. Some researchers have found that this method of measurement results in bias, which can lead to inaccurate measures of usage and relationships with other constructs (Delone and McLean 2003). In this respect, further research into more 'objective' behavioural measures, such as absenteeism and work performance as results of burnout and engagement, might be helpful. In addition, both samples mostly consisted of male employees of a telecoms company. One therefore has to be careful with regard to generalisation of the results. Despite these limitations, however, the present study has a number of strong points: a longitudinal design, two different samples, two different time intervals, and the introduction of the 'Big Two' personality factors into the design.

In conclusion, our findings largely support the JD-R model, and suggest that the model should be supplemented with personality traits in order to increase its predictive power.

Acknowledgements

We would like to thank Dr. A.G.E.M. de Boer for her recommendations concerning statistics and methodology.

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Chapter 8

Discussion

The present thesis is situated in the context of occupational health care and its focus on the reduction of stress complaints and the development of work engagement. More particularly, its context is the assessment of stress complaints in an occupational health surveillance program, the development of a cut-off point for the distress scale of the 4DSQ, the comparison of a cognitive and a physical oriented stress management intervention on stress complaints and sickness absence, the role of coping in the sickness absence process, and a search for predictors of burnout and work engagement.

In this closing chapter, an overview of the main findings and conclusions will be given. Subsequently, the results from the various studies will be discussed at a more general level, including possible underlying mechanisms and implications for occupational health physicians and other experts, such as occupational psychologists and occupational health nurses.

Principal findings

The relevance of job stress and its negative consequences for the health of employees and the economics of organizations and countries is pointed out in chapter 1. This impact underlines the need for an instrument that assesses stress in occupational health care settings and which is validated for diagnosis and study. In chapter 2, the Four-Dimensional Symptom Questionnaire (4DSQ), a relatively new instrument originally developed in the Netherlands for family physicians to measure general distress, depression, anxiety and somatization, was psychometrically evaluated within a working population. The 4-factor structure of the 4DSQ was largely confirmed, indicating that the four scales measure different dimensions of the spectrum of common psychological symptoms. However, distress and depression showed some overlap. Six items on the distress scale were found to load on the depression factor as well.

Nevertheless, a 3-factor model, in which the depression and distress factors were combined into one factor, proved to be inferior to the original 4-factor model. Furthermore, it was demonstrated that distress is associated with job stressors and other indicators of strain, suggesting that the 4DSQ is a reliable and valid instrument to measure distress and other common psychological problems in the working population. When screening for mental health problems takes place in an unselected population, a two-stage approach is recommended. At first, it will suffice to administer only the distress and somatization scales to identify “stressed” employees. To those with elevated distress scores the depression and anxiety scales can be added to further refine the assessment.

In chapter 3, a cut-off point for the distress scale of the 4DSQ was established. Two samples of employees who differed in levels of distress were used; one sample representing “healthy, working employees” and one sample consisting of employees who had been on sick leave for more than two weeks because of a stress-related disorder due to a recent identifiable psychosocial stressor at work. A cut-off point of ≥ 11 was established as a credible (first phase) selection criterion for interventions such as stress management programs, as well as a validated cut-off point for future studies on methods such as occupational health interventions to reduce distress and mental health disorders.

Chapter 4 describes an a priori randomized trial that sought to evaluate the short-term and long-term effectiveness of two brief preventive stress reduction programs – a program focused on cognitive techniques, and a combined intervention including physical exercise and relaxation – on psychological problems in stressed employees. No differential effect between the two interventions could be demonstrated. It was found that both conditions revealed a positive impact on psychological complaints, burnout, and fatigue, both in the short term (post-test) and at a 6-month follow-up. However, the lack of a control group receiving no intervention or receiving “care as usual” stimulated us to calculate the clinical significance of the results. Approximately 50% of the employees participating in the physical intervention and 60% participating in the cognitive intervention improved and returned within six months to functioning within normal range. As far as burnout and fatigue were concerned the improvement was less dramatic. For exhaustion (the core dimension of burnout) 31% of the employees receiving the physical intervention returned to normal

functioning compared to 39% for the cognitive intervention. For subjective fatigue the percentages were 36 and 50, respectively. This justifies the conclusion that reduction of psychological complaints, burnout and fatigue, and returning to normal functioning at work is successful for brief physical and cognitive interventions. The lack of a non-treatment control group may be a limitation although this is a considerable problem in many field studies. Withholding beneficial interventions from employees in need will always be an important ethical issue.

Chapter 5 relates the evaluation of the same two preventive stress reduction programs on sickness absence by stressed and non-stressed employees over the next full year, as described in the previous chapter. Non-parametrical statistical analyses were performed to evaluate differences in: 1) frequency (total number of periods of absence); 2) incidence of the absence rate (number of new periods of absence); 3) absence duration (mean number of days per period of absence); 4) length (total days in one year) of absenteeism; and 5) the beginning of a new period of absenteeism after the intervention. We found that for stressed employees, the physical intervention marginally decreased the frequency and incidence rate of sickness absence. No significant effects were found on duration, length, or onset of a new period of sickness absence. The cognitive intervention had a significant effect on shortening the onset of a new period of sickness absence but not on the other sickness absence measures. In comparison with the physical intervention the cognitive intervention decreased the period between the intervention and the first recurrence of a new sick leave period by 144 days. We could find no other substantial differences in effectiveness between the two interventions. We therefore had to conclude that in general the differences are marginal and that the illness burden represented by absenteeism is equally affected by both interventions.

In chapter 6, the role coping plays in sickness absence is evaluated, using a prospective design spanning one year. After assessing the factorial validity of the Utrecht Coping List (UCL) by Confirmative Factor Analysis (CFA), odds ratios were calculated using logistic regression analysis to examine the relationship between coping with stress and sickness absence. Five ways of coping are distinguished: “active problem-solving coping”, “seeking social support”, “palliative reaction”, “avoidance behavior”, and “expression of emotions”. Sickness absence was operationalized by

length (total days in one year), duration (mean number of days per period of absence), frequency (number of periods of absence), and the time before the onset of a new episode of absenteeism. After adjustment for potential confounders, it was found that employees who use an “active problem-solving” coping strategy are less likely to drop out because of sickness, as measured by terms of frequency, length and duration. This positive effect is observed for “seeking social support” only as far as duration of sickness absence is concerned and for “palliative reaction” only as far as length and frequency of sickness absence are concerned. In contrast, an avoiding coping style, representing a reactive-passive strategy, significantly increases the frequency, length and duration of sickness absence. Expression of emotions, a reactive-passive strategy, has no effect on future sickness absence. The median length of time before the onset of a new episode of sickness absence is significantly extended for active problem-solving (24 days later for high active compared with low active employees) and is reduced for avoidance (38 days earlier for high avoidant compared with low avoidant employees) and for a palliative response – e.g. looking for distraction – (36 days earlier for high palliative compared with low palliative employees).

In chapter 7, attention shifted towards a positive portrayal of health by examining work engagement, the assumed opposite of burnout. Research questions to be answered in this chapter were: 1) whether job demands and job resources can predict future burnout and engagement; 2) whether burnout and engagement are positively related to neuroticism and extraversion respectively; and 3) whether the explained variance of burnout and engagement by job demands and job resources is higher in a sample with a one-year time-lag compared with a sample with a two-year time lag. Using (stepwise) hierarchical regression analysis, our results showed that high levels of job resources, especially social support, opportunity to learn, and autonomy, predict positive future levels of engagement (i.e. vitality and dedication). Simultaneously, high levels of job demands, especially work-home interference and emotional demands, but also lack of job resources, such as an opportunity to learn and autonomy, predict future levels of burnout (exhaustion and cynicism) Low levels of work-home interference (job demands) predict future dedication. Furthermore, the role of personality is unambiguous. A high level of extraversion predicts vitality (positive) and exhaustion (negative). High levels of neuroticism predict burnout and low levels of work engagement. Finally, our results show that

long-term effects (at two years) are less explicit than short-term effects (at one year), and that an important part of the variance of the outcomes (i.e., vitality, dedication, exhaustion and cynicism) found at follow-up can be explained by baseline levels, indicating their stability across time.

Weakness and strengths

The present study has certain limitations that need to be taken into account when drawing conclusions.

A first limitation is the cross-sectional design used in chapter 2 and 3 of the study, the evaluation of the 4DSQ and its cut-off point. Strictly speaking, causal inferences cannot be made for the relationships investigated. However, the cross-relationship between job stressors and psychological complaints that was observed in the case presented in chapter 2 is corroborated by other – longitudinal – studies (Spector et al. 1988; Van der Ploeg et al. 2003; Hurrell et al. 1998; Kasl 1998), and in Chapter 7 and is generally accepted today.

A second limitation is the lack of a no treatment control group “care as usual” group in the effect study of our stress reducing programs (chapter 4). Therefore, effects that stem from “care as usual” and artifacts such as regression to the mean, (i.e. effects related to the natural course of stress problems, which is spontaneous recovery), cannot be excluded in this study. After intensive deliberations the management team of the telecom company and the research group decided not to withhold an intervention in a planned third control group, since the literature (van der Klink et al. 2001) made clear that interventions would be helpful in reducing complaints. To withhold an intervention that had been proved to be beneficial from employees in need was regarded as an important ethical issue. To partially overcome this issue, we calculated effect sizes to compare our results with those in the literature (van der Klink et al. 2001) and we calculated the clinical significance of the intervention in order to concretize the process of employees returning to normal functioning.

A third weakness might be the generalizability of our findings. Our study populations are derived from the work force of a large telecom company and therefore cannot be considered to be representative of the working

population in general. In validating the questionnaire, establishing a cut-off point and evaluating the effect, we did our research within the framework of an occupational health survey for the telecom company's employees. Although this is a heterogeneous working population consisting of technicians, administrators, project managers and many other occupational groups, these employees consisted mainly of men and are derived from only one company. The study of prediction of burnout and engagement by job demands and job resources has been carried out in a group of managers working for the same company. The majority of this study population was also male and better educated compared with the working population in general. The relationship between burnout and gender, for example, has recently been demonstrated by Stenlund et al. (2007) and should be dealt with by interpreting our results. Stenlund et al. (2007) reported that "there are some differences in working conditions and social networks between women and men with burnout." In their study men reported a more restricted social network and reported working more overtime than women.

Another limitation of this study is that some data were obtained by self-report questionnaires and, consequently, the results may be contaminated by the common method variance. This variance is attributable to the measurement method rather than to the constructs the measure represents (Nunnally and Bernstein 1994). Podsakoff et al. (2003) cite literature in which approximately one-quarter of the variance in a typical research measure might be due to systemic sources of measurement error, such as common method biases. The amount, however, varies considerably by discipline and the type of construct being investigated. Typical job performance measures, for example, contain an average of 23% method variance. Method variance can either inflate or deflate observed relationships between constructs, thus leading to type I and type II errors. In other words, if the dependent and independent variables are measured with the same instrument, self-report bias may occur when the respondent provides the measure of both the predictor and criterion variable (Mossholder and Bedeian 1983). Consistency of motives and social desirability might explain this phenomenon of common method variance. However, in our case, except for sickness absence it is practically impossible to examine the relationships between two or more variables by obtaining measures of these constructs from alternative sources, i.e. there is no way around asking employees *themselves* how they *experience* their work.

A final limitation is the low response rates for the effect studies. Low response rates are a problem particularly in field studies. However, previous studies in primary care practices have found few differences between groups especially when demographic characteristics are examined. Furthermore, Schalm and Kelloway (2001) calculated the relationship between response rate and effect size in occupational health psychology research. Only a negligible (not significant) relationship between the response rate of a survey and the reported effect size between variables was reported. Nevertheless it is always necessary to check for non-response bias. As much as possible, findings from the non-response groups have been reported in our study and did not differ essentially from the groups that were examined. (Van Rhenen 2007).

A strength of the studies is that they are field studies in an occupational health care setting. Despite several shortcomings, field experimentation is highly important for many reasons. In our case we made use of a nationwide health survey taken in a Dutch telecom company and invited at-risk employees to participate in our intervention program. This represents a real-world situation and therefore provides an extra argument in favor of implementation elsewhere. Furthermore, it is important that, in line with many recommendations (e.g. Tunnell 1977) we must not only conduct more field experimentation but also make our relevant variables operational in real-world terms. This is what we have done. We are therefore able to conclude that for testing models and theories, field experimentation provides solutions to real-world (workers' health or occupational health) problems. For example, in our study we validated and operationalized a questionnaire plus cut-off point and created two stress management programs for at-risk employees.

A second strong point of the study is its randomized controlled trial design. These trials have proved to be the most valid study design for producing reliable information on the effectiveness of interventions (Altman 1997).

A final strength of this thesis is the longitudinal design of the effect studies (chapter 4 and 5), the coping study (chapter 6) and the study on the prediction of burnout and engagement (chapter 7). The advantages of longitudinal studies are well known. They include the possibility of studying the potential effects of an intervention and differentiating cause from effect. In this thesis, we have demonstrated that the interventions

might have a significant effect on psychological complaints, but that there is no differentiated effect between a physical and a cognitive oriented intervention.

Practical relevance and some applications

The first point to discuss is the relevance of the Four-Dimensional Symptom Questionnaire for occupational health. Although there is an abundance of questionnaires to measure psychological symptoms, most of them fail to distinguish between general distress and anxiety or depression. Moreover, the existing questionnaires, such as the Mood and Anxiety Symptoms Questionnaire (MASQ; Keogh and Reidy 2000; Bruckby et al. 2007), the Depression Anxiety Stress Scale (DASS; Brown et al. 1997; Page et al. 2007) and the Four-Dimensional Symptom Questionnaire (4DSQ; Terluin et al. 2006) have only been proved on a limited basis in an occupational health setting (Nieuwenhuijsen 2003). Until now, most psychometric research with these questionnaires has been done with students or clinical samples. In our study, we administered the 4DSQ to a large group of employees and validated the questionnaire. Consequently, we established an optimal cut-off point for distress in a working population using sickness absence as a criterion. The 4DSQ can therefore be administered to employees who are absent due to sickness but can also be used when screening an unselected population, for example as part of a preventive occupational health surveillance program (ILO 1998; MacDonald 2000). The 4DSQ has proven to be useful as a screening tool in general practice (Terluin 1994) and appears to be related to job stressors and strain. As these parameters are associated with sickness absence, the 4DSQ could be used as a screening indicator of sickness absence. The principal advantage in using the 4DSQ as a screening tool lies in the simplicity of calculating test scores and, as a consequence of the cut-off point selected, in the straightforward classification of an individual's risk for sickness absence. However, additional studies should be undertaken using different occupational and demographic groups, including women.

The second point concerning practical relevance is the consequence of using a cut-off point, described in chapter 3. According to Dwyer (1996) "cutoff scores are used in a wide variety of settings to divide a score

scale or other set of data into two or more categories, with inferences made or actions taken on the basis of this classification". However, each cut-off point selected, which divides a sample of employees into those who are at risk and those who are not at risk leads inevitably to misclassifications. In our sample the specificity was 90%, thus 10% of the employees who were "not at risk" are misclassified as being "at risk" (false positive). The sensitivity of 95% implies that 5% of the employees "at risk" are not discovered. With a one-year rate (prevalence) of absence due to distress of 2%, the positive predictive value is about 16% and the negative predictive value is 99.9%. This means that only one in every six of those in the working population who score above the cut-off score of 11 may really become absent due to distress. Five out of six employees could therefore receive an unnecessary intervention when the choice is made to focus especially on sickness absence as a preventable outcome; this is after all a rather stringent and arbitrary choice given the assumed impact of high stress levels on health (Blatter 2005) and on presenteeism (Kivimäki 2005). The more stringent approach of focusing particularly on sickness absence urges the use of what we might call "serial multi-testing". Serial multi-testing is a potentially cost-effective testing modality that differentiates stressed employees who are not at risk and stressed employees who are at risk, i.e. sickness absence due to distress. Therefore, after screening with the 4DSQ and using the aforementioned cut-off point, all employees selected could be offered an interview with an occupational health physician or occupational nurse to identify additional risk factors (personality, coping, risk factors at work) during a second phase, with the aim of preventing the occurrence of false positives.

Another issue, mentioned by Dwyer (1996), is the problem of "judgment". The choice of a categorization represented by one or more cut-off points is a result of judgments. An unwanted side-effect of this process of decision making is the emergence of different cut-off points in different studies (Altman 1994). This makes comparisons across studies extremely difficult and even impossible. For this reason, clarification of how the process of decision making is carried out is indispensable. In this study we therefore described the process in great detail, selecting an optimal cut-off score for a quantitative risk factor that distinguishes between employees with high distress levels who are at risk for sickness absence and employees who are not at risk.

A third point for discussion is the number of intervention sessions we conducted, described in chapters 4 and 5. We conducted two four-session interventions, one consisting of a combined program of physical exercise plus relaxation, the other a cognitive intervention. Brief interventions are of special interest in the context of secondary prevention, as they have proven to be effective as a secondary prevention strategy (Moffett et al. 2006), especially for lifestyle interventions (Ballesteros et al. 2004). For psychological complaints, Van der Klink et al. (2001) in a meta-analysis of the benefits of interventions for work-related stress regarding cognitive-behavioral interventions, found an inverse relation between the number of sessions and effect size. The authors detected no optimum number of interventions, but calculated that the mean number of sessions for studies with a large effect size was 6.8. In our study we conducted 4 sessions. Despite this relatively low intervention rate, our study suggests that brief interventions to reduce stress in a working population are nevertheless effective.

Brief interventions have two advantages: cost-efficiency and easy to implement. First, they can be highly cost-efficient due to the minimal costs of the intervention and the breadth of its scope, including serious and costly problems such as presenteeism. The costs of presenteeism can be derived from a study by Kivimäki et al. (2005), who demonstrated that 17% of unhealthy employees took no sickness absence during a 3-year follow-up period, with potentially harmful effects for their health such as serious coronary events. A study by Aronsson (2000) showed that 37% of the examined employees reported that they had gone to work two or more times during the previous year despite the feeling that they should have taken sick leave. The productivity costs traditionally known as the “indirect costs” of health-related productivity loss are quantifiable, and found to be much more “direct” in their cost structure (health-related productivity costs are typically two to three times the amount of medical costs) than previously assumed (Brady 1997; Loeppke 2003; Loeppke 2006). The calculation of productivity costs gives us a better economic basis upon which to promote brief interventions. For example, migraine headaches are responsible for an estimated 12 billion dollars of lost productivity annually in the United States, with 60-70% of this cost of impaired performance while at work (Schwartz et al. 1997; Loeppke et al. 2003). For seasonal allergies the figures are 2.8 billion and 90%, respectively (Ross 1996). For psychological problems, Loeppke et al.

(2007) demonstrated in a study of four companies participating in “the Health and Productivity as a Business Strategy Study” that the costs of loss of productivity while still at work are about four times that of medical and pharmacy costs. Moreover, in their Top Ten of medical conditions that cause productivity loss while still at work, fatigue and depression are the numbers one and two, and anxiety is the number ten (Loeppke et al. 2007).

Second, brief interventions are relatively easy to implement. With an increased knowledge of factors that influence psychological problems, there has also been a gradual destigmatization of individuals with (stress-related) psychological problems and greater access to a wider range of treatment options. The result has been a slow but gradual shift in attention away from treating employees on sick leave exclusively, toward occupational health efforts targeting at-risk employees who are still working. This shift in orientation widened the scope for interventions at the secondary prevention level and yielded research on early detection and screening. Since psychological problems often have a chronic course, there are ample opportunities to intervene effectively at early stages.

Another issue to discuss here is the use of the Utrecht Coping List (UCL) to measure coping and the role of coping in our interventions. Coping is arguably one of the most frequently studied concepts in the behavioral sciences (Penley et al. 2002). The focus has been on multiple aspects of coping including the nature and structure of coping processes and the medical and psychological health implications of coping (Carver and Scheier 1994; Lazarus 1991; Lazarus and Folkman 1984; O’Leary 1990). Like many coping researchers, in our study we relied on the UCL, a self-report questionnaire that assesses different ways of coping. Assuming a 0-3 response scale, the questionnaire measures subjective reports on how individuals deal with stressful situations.

We not only measured coping to evaluate the effect on sickness absence - active coping behavior was also a main focus of our interventions. According to the transactional theory of stress and coping (Lazarus 1984) and coping effectiveness training (Chesney et al. 2003), the reduction of distress depends upon the “goodness of fit” between the coping strategy employed and the demands of the stressful situation. Based on

this knowledge, coping had a prominent place in our interventions. The first session of the cognitive intervention, for example, informed the participants about different ways of coping. In our physical intervention employees were trained to use physical and relaxation exercises to cope with stress, which might be considered a palliative strategy. After all, when an employee faces a period of uncertainty during a reorganization, which was common at that time in the telecom company, a coping strategy aiming at minimizing any emotional distress is likely to be more effective than a strategy targeting the reorganization, the stressor itself. That palliative coping strategies were effective was demonstrated by Wells and Matthews (1995) who found that active distraction was of benefit to people with mental health problems. Moreover, the active distraction from unwanted distressing thoughts has also been found effective for reducing physical and psychological distress in patient groups faced with short-term pain and health problems (Diette et al. 2003; Fauerbach 2002; Harvey 2002). It is therefore not surprising that in our study a palliative coping strategy was effective in reducing the frequency and length of sickness absence. Additionally, in our study other active coping strategies proved to have a positive effect on sickness absence: active problem-solving reduced sickness absence, whereas seeking social support especially reduced absence duration. Reactive-passive coping strategies such as avoidance increased sickness absence, whereas the expression of emotions had no effect on future sickness absence.

The last issue to discuss is the differentiation between non-stressed and engaged employees. Currently, an important focus in modern organizations is on the management of human capital. This is not surprising, since an organization's workforce and its human capital processes typically comprise the most critical element of businesses, especially high-performance businesses. Generally the total cost of human capital amounts from 25% to more than 45% of an organization's revenue, according to a 2005 annual global survey by Accenture (one of the world's leading management consulting bureaus) (Jacobs 2005). Not only private but also public sector organizations expect their employees to excel, to demonstrate dynamic initiative and tenacity, to be proactive, to be a team player, to take charge of their own development and to be loyal and committed to the company. Obviously, these objectives will not be achieved with employees who are merely non-stressed, just "normal" or "healthy" in the traditional sense.

Traditionally, engaged employees or the development of engagement are not the focus of occupational health physicians. Their aim is the promotion and restoration of health, the prevention of illness and injury, and the protection of workers from work-related, environmental or task-related hazards. In other words, occupational health physicians help to protect employees from unsafe conditions and the acts of others. The American College of Occupational and Environmental Medicine underlines this statement in their mission as “the medicine specialty devoted to prevention and management of occupational and environmental injury, illness and disability, and promotion of health and productivity of workers, their families, and communities” (retrieved from www.acoem.org/vision.aspx). The benefits of these activities, when effective, are obvious, not only for employees when diseases can be prevented, but also for companies because healthy workers are more productive and better motivated. In practice, the activities of occupational physicians are predominantly concerned with the restoration or prevention of ill-health and unwell-being, and less with the promotion of health and productivity. This emphasis means one may increase health in the sense of symptom-free employees, but not necessarily in terms of engagement – in the sense of motivated employees who perform to the best of their abilities. Therefore, the traditional OH orientation can be enriched or supplemented by a distinct and explicit wellness model that focuses on optimal functioning, which means both healthy and productive functioning.

One might assume that when employees join an organization, they are usually enthusiastic, committed, and ready to represent and promote their new employer. Moreover, motivation and engagement are normally selection criteria for a temporary or permanent appointment within an organization. For many organizations that ends the matter. Often, keeping newly hired employees fully engaged in what they do is not a priority. Research by the Gallup Organization (2007), a reputable institute that studies organizational behavior, reveals that the longer an employee stays with a company, the less engaged he or she becomes. And that drop in engagement costs businesses and public enterprises, such as healthcare and educational organizations, significantly in lost profits and sales, in lower output quality, and in lower customer, patient and pupil satisfaction. Gallup estimates that actively disengaged employees cost the American economy up to 350 billion dollars per year in lost productivity.

Whatever this figure may express, it is clear that engaged employees are of crucial importance to organizations, both in the public and private sector. In a meta-analysis by Harter et al. (2002) about the relationship of engagement and business outcome, the strongest effects were found relative to employee turnover, customer satisfaction and - surprisingly, and relevant for occupational health - to safety. Correlations were positive and generalizable in relation to relative productivity and profitability criteria. A straightforward conclusion is that engagement is related to meaningful business outcomes. In addition, engaged employees seem to enjoy good mental and psychosomatic health (Demerouti et al. 2001; Hallberg and Schaufeli 2006; Schaufeli et al. in press). This phenomenon has recently been underscored by a study by Schaufeli et al. (submitted) in which engagement predicts a low frequency of registered sickness absence. Furthermore, engagement of employees is positively related to self-efficacy (Salanova et al. 2002). Self-efficacy can be defined as "... beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura 1997). Self-efficacy may precede, as well as follow, engagement (Llorens et al. 2007; Salanova et al. 2005) suggesting the existence of an upward spiral.

All this reinforces the idea that occupational health professionals should focus not only on the recognition, prevention and reduction of stress but also on engagement and antecedents of this state of mind. The final chapter of our study about the predictors of burnout and engagement symbolizes this transition.

Implications for occupational health care and for organizations

In western industrialized countries, including the Netherlands, labor has become not only the most valuable but also the most expensive factor for organizations (Rüdiger 2003). This has consequences for current occupational health care.

Occupational health care, especially in the Netherlands, has committed itself, after a long period of concentration on the assessment and prevention of traditional occupational and work-related diseases, to working systematically towards the reduction of sickness absence. An important focus of all these activities is on traditional risks and hazardous

exposures, and on the monitoring and management of employees on sick leave. Unfortunately, in many cases the prevention of work-related musculoskeletal disorders and mental health complaints is still regarded as a supposititious child.

In line with other results in the scientific literature this dissertation revealed that secondary prevention of the consequences of work stress is still valuable for employees and employers. Although the illness burden represented by absenteeism after an intervention is not effected substantially but only in detail, there was a positive impact on psychological complaints, burnout and fatigue. Therefore we propose three relevant implications for occupational health care and organizations.

The first implication for occupational health care might be the recommendation to use regular occupational health surveys based on the 4DSQ. The 4DSQ appears to be a valid instrument to measure distress, depression, anxiety and somatization. The distress scale demonstrated the strongest correlations with job stress and indicators of strain. We defined a cut-off point which can be used as a valid selection instrument for stress management programs. As we realize that with this cut-off point most selected employees do not belong to the population that will be on sick leave within one year, we have proposed a second test. This second test has to be developed carefully. It might include, for example, an interview to distinguish more precisely whether or not an employee needs a specific kind of intervention. In this phase a questionnaire or interview can be applied to identify a specific coping style, or personality traits such as extraversion and neuroticism, or the presence of risk factors at work such as bullying or having a job that does not fit the employee, in order to detect at-risk employees more accurately.

Secondly, we demonstrated that our stress management interventions had a positive impact on complaints but not on absenteeism. Still, and in line with the literature, we recommend stress intervention programs – at least for the reduction of complaints. The type of intervention is of less importance since both physically or cognitively oriented interventions were equally effective. The low impact on sickness absence due to stress might be caused by the low number of sessions (four) in this study. More sessions might increase effectiveness in terms of sickness absence and would have to be elaborated in another study.

A third important implication of this study is the supplementation of personality traits to the job demands-resources (JD-R) model to increase its predictive power. The JD-R model has proven to be an adequate theoretical framework for the motivating potential of job resources, but also for a health impairment process induced by job demands. In addition, low scores on neuroticism and high levels on extraversion predict future engagement, whereas high scores on neuroticism and low levels on extraversion predict future burnout.

A final important implication of this study is the use of coping strategies during interventions. Our results revealed reliable prediction of individual coping strategies on sickness absence. In general, active problem-focused coping strategies reduce the frequency, length and duration of sickness absence, whereas reactive-passive coping strategies produce the opposite. Therefore, an intervention focusing on active coping strategies will be more successful for the reduction of sickness absence than interventions without such strategies.

Taken together, to prevent complaints or sickness absence due to stress, we first recommend regular health surveys based on the supplemented JD-R model with use of the 4DSQ and UCL, as well as a questionnaire on risk factors at the workplace, to detect at-risk employees. Second, we recommend a stress intervention program, cognitively or physically oriented, of at least four sessions for at-risk employees. Third, active coping strategies are indispensable for successful interventions in matters of sickness absence. Finally, to keep or make employees more engaged, the focus of occupational health care and organizations has to change from job demands towards job resources.

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Chapter 9

Summary

The main aims of this thesis were to evaluate the assessment of stress complaints in an occupational health surveillance program; to evaluate the extent to which two stress-reducing interventions might reduce psychological complaints and sickness absence; to study the role of coping in the sickness absence process; and to identify predictors of burnout and work engagement. As is clear from these objectives, stress and the management of stress are the central themes of the thesis. There are good arguments for this choice. In the Netherlands in 2006 about 29% of employees reported working under stress. Aside from its impact on employees' health and well being in terms of distress, depression, anxiety, hypertension, and cardiovascular disease, job stress also has a significant economic impact on organizations. It is estimated that 45% of the total costs of absenteeism and disability in the Netherlands (12 billion Euros) is due to job stress-related sick leave and disability. Therefore the management of job stress, including the resulting strain, health problems, and in particular the mental workload, has become increasingly important. Stress management programs, focused on the organization or on the individual, can help to prevent or reduce work-related stress. The current thesis mainly focuses on the effects of programs for individual workers. However, prevention is not enough. There is also a plea for health promotion in the sense that employees need to be engaged in their work in order to excel.

This thesis is rooted empirically in occupational health surveillance and intervention programs that have been conducted by KPN Telecom, the largest Dutch telecom company. Several questions have been addressed in the studies presented in this thesis. First, we wanted to know how reliable a particular screening instrument for psychological problems is in the general working population and which cut-off point can be used to determine potential future cases from healthy employees. Second, the effectiveness of two different, brief stress management programs

was examined. Finally, the role played by coping in the sickness absence process was evaluated as well as the role played by work characteristics and personality in the development of burnout and engagement.

In *chapter 2* the Four-Dimensional Symptom Questionnaire (4DSQ) was psychometrically evaluated in a working population. Terluin developed the 4DSQ in 1994 to measure four symptom dimensions in primary care patients that proved to be necessary and were sufficient to describe the whole range of common psychological complaints: Distress, Depression, Anxiety and Somatization. A total of 7,522 employees of KPN Telecom were invited to participate in an occupational health surveillance program with a special focus on job stress. Altogether, 3,852 employees (response rate of 51%) completed and returned the baseline questionnaire. Reliability, correlations between the 4DSQ scales, the factorial structure, intercorrelations between the four scales, and correlations of these scales with job stress, strain, and coping behavior were calculated. The internal consistency of the 4DSQ scales was found to be good, since all values of α met the criterion of .70. Furthermore, to find out whether each of the 4DSQ scales covered a unique part of the spectrum of common psychological symptoms, Cronbach's α values of the residuals of the items of each scale were calculated. These values were all above .60 and therefore cover a unique domain of psychopathology. The four-factor structure of the 4DSQ was largely confirmed, indicating that the four scales measure different dimensions of common psychological symptoms. However, Distress and Depression showed some overlap. Six items on the Distress scale were found to load on the Depression factor as well. Nevertheless, a three-factor model, in which the Depression and Distress factors were combined into one factor, proved to be inferior to the original four-factor model.

Furthermore, it was demonstrated that Distress is associated with job stressors and other indicators of strain, suggesting that the 4DSQ is a reliable and valid instrument with which to measure Distress and other common psychological problems in the working population. When screening for mental health problems takes place in an unselected population, a two-stage approach is recommended. At first, it will suffice to administer only the Distress and Somatization scales to identify "stressed" employees. To those with elevated Distress scores the Depression and Anxiety scales can be added to further refine the assessment.

In *chapter 3*, a cutoff point for the Distress scale of the 4DSQ was established. Remarkably, the use of a cutoff point for inclusion in preventive stress management programs or other interventions to prevent sickness absence due to psychological complaints in occupational health practice has not been reported until now. Besides being used to select participants for a preventive stress management program, a cutoff point can be used to estimate the prevalence of Distress across demographic and occupational subgroups. Furthermore, a well-founded cutoff point can be used as a criterion to classify cases for research purposes. The criterion used to establish the cutoff point was the prediction of sickness absence.

Two samples of employees who differed in levels of Distress were used; one sample representing healthy, working employees ($N = 3,852$) and one sample consisting of employees who, over a period of 14 months, had been on sick leave for more than two weeks because of a stress-related disorder due to a recent identifiable psychosocial stressor at work ($N = 280$). 4DSQ Distress scores were calculated for both samples. To identify employees in a working environment at risk for sickness absence due to psychological complaints we first explored the test threshold which discriminates between distressed employees with and without, respectively, sickness absence due to stress at work or due to a stress-related disorder related to a recent identifiable psychosocial stressor at work (adjustment disorder). A Receiver Operating Characteristic (ROC) analysis was used to define the cutoff point. To establish a cutoff point that discriminates best between both groups, we first created a study population with equal proportions of both samples, consisting of 280 employees per group. Secondly, we formed a study population similar to a working population with a normal prevalence of sickness absence due to psychological complaints ($N = 3677$). The establishment of an optimal cutoff point, using ROC analysis, was based on an optimal trade-off between sensitivity and specificity. However, due to the low prevalence of sickness absence as a result of distress, the specificity was considered to be more crucial than the sensitivity.

A cutoff point of ≥ 11 was established as a credible (first phase) selection criterion for interventions such as stress management programs, as well as for future studies on occupational health interventions to reduce distress and mental health disorders. The cutoff point of 11 corresponds with a sensitivity of 95%, a specificity of 90%, a positive predictive value

of 17% and a negative predictive value of 99.8%. This means that there is a one-in-six chance that an employee in the working population who scores at or above the cutoff score of 11 may actually go on sick leave for psychological reasons in the next year. Therefore, a second test (as part of serial multi-testing), for example an individual interview, may distinguish more accurately whether or not an employee should be included in an intervention.

Chapter 4 describes an a priori randomized trial that sought to evaluate the short-term and long-term effectiveness of two brief preventive stress reduction programs—a combined intervention including physical exercise and relaxation, and a cognitive focused program—in reducing psychological problems in stressed employees. Both interventions consisted of four training sessions, each lasting for one hour, which were given over a period of eight weeks. The intervals between the sessions were two weeks, two weeks and four weeks. The last session concluded with advice on the prevention of relapse. The study was designed as a randomized clinical trial with pre-trial, post-trial and six-month follow-up measures.

The aim of the physical intervention was to increase awareness and to introduce physical and relaxation exercises in daily work activities. Every session consisted of four parts: (1) an introduction explaining the notion of stress and its physical, psychological and behavioral effects, discussing ways of coping through physical activities and assessments of the previous weeks; (2) warm-ups and other physical exercise (keep fit exercises, fitness exercises that focus on the relationship between heart rate and strain); (3) relaxation exercise (progressive muscle relaxation, breathing exercises, muscle stretching, autogenous training, meditation); and (4) an assignment to be completed at home.

The aim of the cognitive intervention was to restructure irrational beliefs. The theme of the first session was education (didactical stress management) and employees were asked to make a list of stressors, both job-related and non-job-related. In the second session this list was discussed with the Counsellor. The theme of the third session was Rational Emotive Therapy (RET) and employees were given training to familiarize themselves with this skill. The final session was a review of the specific skills for which employees had received training in the previous sessions.

A working population of 7,522 employees from KPN was invited to participate in a periodic health check-up. About 51% (N=3,852) agreed to participate and filled out the questionnaire. The most distressed employees, about 10% of the study population (N = 396), corresponding with a cutoff point of 11, were randomly assigned to one of two conditions, as portrayed above. Psychological complaints were measured with the 4DSQ, the Utrecht Burnout Score (UBOS) for burnout and the Checklist Individual Strength (CIS) for fatigue.

The effectiveness of the interventions was tested on pre-test, post-test and follow-up scores. To compare these results with those described in the literature, the effect sizes (Cohen's d) as a standardized measure of change were calculated. Finally, the clinically significant change was calculated, according Jacobsen's method.

No differential effect between the two interventions could be demonstrated. It was found that both conditions revealed a positive impact on psychological complaints, burnout, and fatigue, both at the short term (post-test) as well as at the 6-months' follow-up.

More specifically, the *short-term effects* we found were that (1) there was a significant decline after both interventions, for psychological complaints (4DSQ), for exhaustion and professional efficacy (UBOS), and for subjective fatigue and reduced activity (CIS). (2) A large effect-size was found for Distress in the cognitive intervention group. Medium effect-sizes were found for Depression, Somatization and fatigue in the cognitive intervention group, and for Distress, Depression and Anxiety in the physical intervention group. (3) The short-term return to normal functioning ranged from 31-61% in the cognitive intervention group and from 37-54% in the physical intervention group, depending on the outcome data.

The *follow-up effects at six months* showed a similar pattern. (1) The positive reduction in psychological complaints remained stable six months after the last session for both groups. For burnout the physical intervention group still demonstrated substantially lower levels of exhaustion, cynicism and reduced professional efficacy, whereas the cognitive intervention group demonstrated the opposite, an increase in exhaustion and cynicism. For fatigue, the significant reduction for subjective

fatigue and reduced activity was still there in both groups, and might be attributed to short-term effects. (2) A large effect size was demonstrated for Distress in both intervention groups. Medium effect sizes were apparent for Depression, Anxiety and Somatization in both intervention groups and for subjective fatigue, reduced activity and reduced concentration in the physical intervention group. (3) Approximately 50 - 60 % of the employees with psychological complaints who participated in one of the intervention groups improved and returned within six months to functioning within normal range. As far as burnout and fatigue were concerned the improvement was less substantial. For exhaustion 31 - 39 % of the employees in both groups returned to normal functioning; the percentages for subjective fatigue were somewhat higher.

These results justify the conclusion that both a brief physical and a brief cognitive intervention are successful in reducing psychological complaints, burnout and fatigue, and in stimulating a return to normal functioning at work.

Chapter 5 describes the evaluation of the same two preventive stress management programs using a similar randomized study design but now on prospective sickness absence across the next year, in stressed and non-stressed employees. A comparison could be made with sickness absence figures in the year before the intervention. However, in the study described in this chapter results from non-stressed employees randomized over the two intervention programs could be incorporated as well. Furthermore, sickness absence was reported in terms of spells and days and was classified according to the system developed in 1998 by Hensing et al. Spells were distinguished in frequency (total number of absence spells) and incidence rate (new number of spells). For sickness absence days the following definitions were applied: length (total days) and duration (mean days per spell). Furthermore, the period between the intervention and the beginning of a new period of absenteeism (time to return to work) was evaluated.

Due to skewed sickness absence data non-parametrical statistical analyses were performed to evaluate differences in frequency, absence incidence rate, absence duration and length of absenteeism and the time period before the beginning of a new period of absenteeism after the intervention. In comparison with the year before the intervention no significant effects

were demonstrated for treated, non-stressed employees. For stressed employees however, the physical intervention significantly decreased the frequency and incidence rate of sickness absence. No significant effects were found on duration, length, or time to the onset of a new period of sickness absence. The cognitive intervention showed an unexpected, significant shortening of the time to the onset of a new period of sickness absence when employees are stressed. No effect on the other sickness absence measures was demonstrated.

For stressed employees, in comparison with the physical intervention the cognitive intervention decreased the time period between the intervention and the onset of a new period of sickness absence by 144 days. Since the other sickness absence measures are not affected, the shortening of the sick-leave-free period may be a result of an increased awareness of stress and the decision to stop for a while in order to recuperate early.

Because we found no other substantial differences in effectiveness between both interventions, it was concluded that in general the differences between both types of interventions are marginal and that the illness burden represented by absenteeism is equally affected by both of them. However, some caution must be applied when interpreting these results, because of the relatively small groups and the skewing of sickness absence data.

In *chapter 6*, the role of coping styles in sickness absence is evaluated, using a prospective design spanning one year. The same study population described before was used. The coping strategy of the participants was assessed by using the shortened 19-item version of the Utrecht Coping List (UCL). This questionnaire is designed to measure ways of coping people use in stressful situations, either major life events or daily hassles. Measures used for sickness absence were frequency (total number of absence spells), length (total days) and duration (mean days per spell), and the time before the onset of a new episode of absenteeism. The duration of sickness absence was classified into more than or less than 7 days.

Confirmatory factor analysis was used to test the fit of the model that assumes a five-factor structure of the short form of the UCL. Five ways of coping are distinguished: “active problem-solving coping,” “seeking social support,” “palliative reaction,” “avoidance behavior,” and “expression

of emotions.” “Active problem solving” and “avoidance behavior” show the most consistent pattern of associations across all sickness absence measures. More active coping is associated with less sickness absence and more avoidance coping with more sickness absence (e.g. there are 1.35 fold greater odds of length of sickness absence for high avoidance coping than for low avoidance coping). Adjusted for several confounding factors, the future length of sickness absence is predicted by “active problem-solving coping” and “palliative reaction,” e.g. looking for distraction. The future duration of sickness absence is predicted by “active problem-solving coping,” “avoidance behavior” and “seeking social support.” Next year’s frequency of sickness absence is predicted by “active problem-solving coping,” “avoidance behavior” and “expression of emotions.” The median time before the onset of a new sickness absence episode is significantly extended for those who use active problem-solving (24 days later for high active compared with low active employees) and is reduced for those who use avoidance coping (38 days earlier for high avoidant compared with low avoidant employees) as well as for those with a palliative response (36 days earlier for high palliative compared with low palliative employees).

In *chapter 7*, attention shifted towards positive health by including the examination of work engagement, the assumed opposite of burnout. The main purpose of the study in this chapter was to demonstrate that, as hypothesized by the Job Demands-Resources (JD-R) model, job demands and lack of job resources predict future burnout, whereas job resources predict future work engagement. Secondly, we investigated to what extent personality contributes to these predictions. Finally, we evaluated the short-term (one year) and longer term (two years) effects of job characteristics and personality traits, in different combinations, on future levels of work engagement and burnout.

Longitudinal data were gathered from two independent groups (sample 1 = one year; N = 201 and sample 2 = two years; N = 151) of middle managers and executives at KPN, who participated in an extensive survey on employee health and well-being. All participants received a questionnaire that included questions about job resources, job demands, burnout, work engagement, and personality. Four job resources were assessed: social support from colleagues, job control, opportunities to learn and develop, and performance feedback. Four job demands were assessed:

work overload, emotional demands, cognitive demands, and work-home interference. Work engagement was assessed with two scales (vigor and dedication) of the Utrecht Work Engagement Scale (UWES) and burnout was assessed with two scales (exhaustion and cynicism) of the Dutch version of the Maslach Burnout Inventory-General Survey. Personality was assessed with the dimensions extraversion and neuroticism from the Dutch version of the Neo-Five Factor Inventory.

As expected, burnout was predicted by high job demands and insufficient job resources. Work-home interference (Samples 1 and 2) and high emotional demands (Sample 2) predicted exhaustion and cynicism, albeit that the effect of work-home interference on exhaustion in Sample 1 disappeared after controlling for exhaustion at baseline. In a similar vein, lack of opportunities to learn (Samples 1 and 2) and lack of autonomy (Sample 2) predicted exhaustion and cynicism, but this effect disappears after controlling for baseline burnout levels.

That engagement is predicted by job resources is partly confirmed. Before introducing baseline vigor and dedication, it was observed that high social support (Sample 1), opportunities to learn (Samples 1 and 2) and high levels of autonomy (Sample 2) predicted T2 vigor and dedication. However, after controlling for baseline engagement levels, the effect of learning opportunities disappeared. Unexpectedly, high work-home interference predicted low T2 dedication (Sample 1). Furthermore, high neuroticism predicted burnout as far as exhaustion (Sample 2) and cynicism (Sample 1) are concerned, but only when not controlled for baseline levels. Unexpectedly, extraversion negatively predicts future exhaustion (Sample 1), but again, this is only the case when not controlled for baseline levels. As hypothesized, engagement was predicted by high extraversion and low neuroticism. Neuroticism had a negative impact on vigor and dedication (Samples 1 and 2), but only when not controlled for baseline levels. Extraversion predicted vigor in both samples, but only in Sample 2 does the effect remain significant after controlling for baseline levels. Thus, our findings support the JD-R model, but suggest that the model should be supplemented with personality traits in order to increase its predictive power.

The above-mentioned effects are stronger for Sample 1 than for Sample 2, both in terms of the number of significant effects as well as in terms of

percentages of explained variance. Thus, as expected, predictions across a one-year period were more numerous and stronger than those across a two-year period.

Finally, in *chapter 8*, the results of the studies were reviewed in a general discussion. Principal findings, weaknesses and strengths, practical relevance, some applications, and implications for occupational health care and for organizations are discussed.

It was concluded that, in line with other results in the scientific literature, this dissertation revealed that secondary prevention of the consequences of work stress is successful for employees. Based on the results, four implications for occupational health care and for organizations were stipulated. The first implication for occupational health care is the recommendation to use regular occupational health surveillance based on the 4DSQ. The Distress scale particularly demonstrated strong correlations with job stress and indicators of strain. We defined a cut-off point which can be used as a valid selection tool for stress management programs. Because we realize that with this cut-off point most employees are not identified as belonging to the population that will be on sick leave due to stress within a one-year period, we have proposed an additional second test.

Secondly, we demonstrated that the stress management interventions had a positive impact on complaints but not on absenteeism. The type of intervention seems not to be significant since both physical and cognitive interventions were about equally effective.

A third finding of this thesis is that the addition of personality traits to the job demands-resources (JD-R) model would increase its predictive power. The JD-R model has proven to be an adequate theoretical framework for explaining the motivating potential of job resources, but also for explaining a health impairment process induced by job demands. In addition, low scores on neuroticism and high levels on extraversion predict future engagement, whereas high scores on neuroticism and low levels on extraversion predict future burnout.

A final important finding of this thesis is the use of coping strategies in interventions. Employees with an active problem-solving coping strategy are less likely to drop out because of sickness. Influencing the means of

coping during an intervention, therefore, is important for the final result as far as sickness absence is concerned.

In summary, to prevent complaints or sickness absence due to job stress, we first recommend regular health surveillance based on the extended JD-R model with use of the 4DSQ and the UCL, as well as a questionnaire on risk factors at the workplace, to detect high-risk employees. Second, we recommend a stress intervention program for high-risk employees, cognitively or physically oriented, and lasting at least four sessions. Third, active coping strategies are indispensable for successful interventions as far as sickness absence is concerned. Finally, the emerging psychological concept of work engagement, a challenging new focus for occupational health care and organizations, is positively associated with job resources and high scores on extraversion. In our view, this knowledge and the recommendations we have made are important ingredients for a healthy and engaged organization.

Samenvatting

Dit proefschrift is het resultaat van een uitgebreide evaluatie van een Preventief Medisch Onderzoek (voorheen PAGO genoemd) met bijbehorende interventies binnen KPNTelecom, een groot telefoonbedrijf in Nederland. Verschillende onderzoeksvragen zijn geformuleerd. We wilden weten hoe betrouwbaar de 4 Dimensionale Klachten Lijst (4DKL) van Terluin, inclusief het gebruikte afkappunt, is voor het screenen van psychische klachten in een populatie werknemers. Daarnaast hebben we de effectiviteit vergeleken van twee verschillende interventies. Eén type interventie was fysiek georiënteerd, het andere type was cognitief georiënteerd. Beide interventies bestonden uit vier sessies van elk een uur. Tot slot is de rol van coping onderzocht in het verzuimproces en de rol van werkdeterminanten en van de persoonlijkheid bij de ontwikkeling van burnout en bevlogenheid.

In Nederland rapporteerden eind 2006 circa 29% van de werknemers last te hebben van werkstress. Stress heeft een grote invloed op de gezondheid en het welzijn van de werknemer, denk aan overspannenheid, depressie, angst, hoge bloeddruk en hartinfarcten. Daarnaast is een wezenlijke negatieve invloed aan te wijzen op de economische situatie van bedrijven en andere arbeidsorganisaties. Er is berekend dat 45% van de totale ziekte- en verzuimkosten in Nederland (12 miljard Euro per jaar) te wijten is aan werkstressgerelateerde ziekten en verzuim. Dat is een goede reden om meer aandacht te schenken aan het omgaan met werkstress en met de daarbij behorende spanningen, gezondheidsproblemen en mentale werkdruk. Organisatie- en individueel gerichte stress management programma's kunnen helpen om werkstress te voorkomen of te verminderen. Dit proefschrift zal zich richten op de individueel gerichte aanpak.

Het managen van stress door preventie, advisering en zorg is echter niet voldoende. In dit proefschrift wordt bepleit om daarnaast de mentale gezondheid van werknemers te versterken. Immers, alleen bevlogen werknemers zullen excellent presteren.

In *hoofdstuk 2* wordt de 4 DKL psychometrisch geëvalueerd binnen een populatie van werknemers. Terluin heeft dit instrument in de huisartsenpraktijk ontwikkeld om vier symptoom dimensies van psychische klachten in kaart te brengen: distress, depressie, angst en somatisatie. Binnen de context van een Preventief Medisch Onderzoek met de focus op werkstress, zijn 7522 medewerkers van KPN uitgenodigd om deel te nemen aan het onderzoek. Uiteindelijk hebben 3852 medewerkers (respons 51%) meegedaan en de vragenlijst ingevuld teruggestuurd. Betrouwbaarheid, correlaties tussen de schalen van de 4DKL, en de factorstructuur van de 4DKL zijn berekend. De validiteit van de 4DKL is onderzocht door de (partiële) correlaties met werkstress, mate van spanning en coping te berekenen.

De interne consistentie van de schalen van de 4DKL is goed, alle waarden van Cronbach's α zijn hoger dan .70. Om te onderzoeken of elke schaal van de 4DKL een uniek deel van het spectrum van psychische klachten beschrijft is vervolgens berekend wat de Cronbach's α is van de residuen van de items van elke schaal. Deze α 's scoren alle boven de .60 en representeren dus een uniek deel van het spectrum van psychische klachten. De vier-factor structuur van de 4DKL werd bevestigd, wat erop wijst dat de vier schalen verschillende klachten-dimensies meten. Distress en depressie vertonen weliswaar enige overlap: zes items van de distressschaal blijken ook te laden op de depressiefactor. Een drie-factoren model, waarbij de depressiefactor en de distressfactor worden gecombineerd in één factor, blijkt echter inferieur ten opzichte van het vier factoren model.

Verder is aangetoond dat distress samenhangt met werkstressoren en andere indicatoren van spanning, wat erop wijst dat de 4DKL een valide instrument is om distress te meten binnen een populatie van werknemers.

Voor een brede screening op mentale gezondheidsklachten in een aselecte populatie wordt een tweetraps benadering voorgesteld. Bij de eerste trede bevelen wij aan om alleen de distress en somatisatieschaal in te zetten om zo medewerkers met veel stress en somatisatie te kunnen identificeren. Bij een verhoogde score kunnen de depressie en angst schalen toegevoegd worden om het preventieve onderzoek te verfijnen.

In *hoofdstuk 3* wordt het afkappunt berekend van de distressschaal van de 4DKL waarbij werknemers een grote kans lopen om uit te vallen met verzuim vanwege psychische problemen en aandoeningen. Tot nu toe zijn in de literatuur nog geen afkappunten geëvalueerd of gerapporteerd, die geschikt zijn om te dienen als inclusiecriteria voor programma's om ziekteverzuim als gevolg van psychische klachten te voorkomen. Het afkappunt van de distressschaal kan daarnaast worden gebruikt als een betrouwbaar criterium om de prevalentie van distress in verschillende populaties vast te stellen zoals bij werknemers werkend in verschillende bedrijven en bedrijfstakken. Tot slot kan een goed afkappunt gebruikt worden als criterium om cases te classificeren voor verschillende andere onderzoeksdoeleinden.

Om het afkappunt te berekenen zijn twee groepen werknemers vergeleken die verschillen in stressniveau. De eerste groep bestond uit gezonde, werkende werknemers ($N = 3852$), de tweede groep uit werknemers die langer dan twee weken waren uitgevallen met ziekteverzuim met als diagnose een stressgerelateerde psychische stoornis ten gevolge van een recente, aanwijsbare psychosociale stressor op het werk ($N = 280$). Voor beide groepen zijn de distress scores berekend. Vervolgens is de drempelscore berekend die kan onderscheiden tussen beide groepen gestresste werknemers met of zonder ziekteverzuim als gevolg van psychische klachten. Bij deze berekening is gebruik gemaakt van een "Receiver Operating Characteristic" (ROC). De drempelscore, het afkappunt dat het beste onderscheid kan maken tussen beide groepen is berekend door eerst een studiepopulatie te creëren met gelijke proporties van beide onderzoeksgroepen, bestaande uit een groep van 280 verzuimende werknemers en een groep van 280 werkende werknemers. Vervolgens is een studiepopulatie gecreëerd die overeenkomt met een veelvoorkomende populatie van werknemers met een gemiddelde prevalentie van ziekteverzuim als gevolg van psychische klachten. Bij het bepalen van het optimale afkappunt is expliciet rekening gehouden met een goed evenwicht tussen sensitiviteit en specificiteit. Echter, door de lage prevalentie van ziekteverzuim als gevolg van distress, is de specificiteit van groter belang dan de sensitiviteit.

Een afkappunt van ≥ 11 op de distress schaal van de 4DKL blijkt een betrouwbaar 1e fase selectiecriteria te zijn voor interventies zoals een stress managementprogramma en een bruikbaar gevalideerd afkappunt voor toekomstig onderzoek naar bedrijfsgezondheidszorg interventies

om stress en psychische klachten te verminderen. Het afkappunt van 11 correspondeert met een sensitiviteit van 95% en een specificiteit van 90%, een positief voorspellende waarde van 17% en een negatief voorspellende waarde van 99.8%. Dit betekent dat aangenomen wordt dat slechts één op de zes werknemers die op of boven het afkappunt van 11 scoort binnen een jaar zal verzuimen vanwege psychische klachten. Het afnemen van een tweede test, uitgaande van het principe van ‘serial multi testing’, kan dit nadeel ondervangen. Via bijvoorbeeld een interview door een bedrijfsarts of psycholoog moet duidelijk worden of een interventie al dan niet nodig is.

In *hoofdstuk 4* wordt een a priori gerandomiseerd onderzoek beschreven dat beoogt de korte- en lange termijn effecten van twee korte preventieve stress management programma's te evalueren, gericht op vermindering van psychische klachten bij werknemers met veel stress. Het ene programma bestaat uit een cognitief georiënteerde interventie, het tweede programma is een gecombineerde interventie van fysieke inspanning en ontspanning. Beide interventies bestaan uit vier trainingssessies van elk een uur, die zijn gegeven over een periode van acht weken. De intervallen tussen de sessies waren respectievelijk twee, twee en vier weken. De laatste sessie eindigde met een advies dat moet helpen om niet terug te vallen in oude patronen (relapse prevention). De studie is opgezet als een gerandomiseerd onderzoek wat betreft de deelname aan een van beide interventies, met een voor- en nameting en een follow-up meting na zes maanden.

Het doel van de fysieke interventie was bewustwording van stressklachten en het bevorderen van fysieke activiteiten en ontspanningsoefeningen tijdens de dagelijkse werkactiviteiten. Iedere sessie bestond uit vier onderdelen: (1) een introductie met uitleg van het begrip stress en de effecten op fysiek-, psychisch- en gedragsmatig gebied en van de mogelijkheid om beter met stress om te gaan door fysieke activiteiten en oefeningen, (2) warming-up en fysieke oefeningen zoals conditie oefeningen en fitness oefeningen gericht op hartslag en spanning, (3) ontspanningsoefeningen zoals progressieve spierrelaxatie, ademhalingsoefeningen, autogene training en meditatie, en (4) een huiswerkopdracht.

Het doel van de cognitieve interventie was om de irrationele gedachten te herstructureren. Het thema van de eerste sessie was educatie (didactisch stress management), waarbij de werknemers werd gevraagd een lijst te

maken van werk- en niet-werk gerelateerde stressoren. Gedurende de tweede sessie is de lijst besproken met de behandelaar. De derde sessie stond in het teken van de Rationeel Emotieve Therapie (RET) waarbij de werknemers in staat werden gesteld om zich vertrouwd te maken met deze vaardigheid. De laatste sessie bestond uit een terugblik op de specifiek aangeleerde vaardigheden in de voorafgaande sessies.

Een populatie van 7.522 medewerkers van KPN is uitgenodigd te participeren in een preventief medisch onderzoek. Ongeveer 51% (N=3.852) deed mee en vulde de vragenlijst in. De 10% meest gestresste medewerkers (N=396), overeenkomend met een score van 11 of hoger op de distressschaal, zijn aselekt verdeeld over één van de twee genoemde interventies. De psychische klachten zijn gemeten met de 4DKL (distress, depressie, angst en somatisatie), de Utrecht Burnout Schaal (UBOS) voor burnout en de Checklist Individual Strength (CIS) voor vermoeidheid.

De effectiviteit van beide interventies is beoordeeld aan de hand van de scores voor en na de interventie en de follow-up scores. Om deze resultaten te kunnen vergelijken met die uit de literatuur zijn ook effect-sizes (Cohen's d) als een gestandaardiseerde maat voor verandering, berekend. Tot slot is ook, conform de methode van Jacobsen, de "klinische significantie" van de gemeten verandering berekend.

Er is geen significant verschil gevonden tussen het effect van beide interventies. Na beide interventies is een afname te zien van psychische klachten, burnout en vermoeidheid, zowel direct na de interventie, alsook na 6 maanden.

De korte termijn effecten zijn (1) een significante daling van psychische klachten (4DKL), van uitputting en het gevoel van afgenomen competenties (UBOS), en van vermoeidheid en afgenomen activiteit (CIS). (2) In de cognitieve interventiegroep een groot effect (op basis van de effect-size) voor distress en een matig effect voor depressie, somatisatie en vermoeidheid; in de fysieke interventiegroep een matig effect voor distress, depressie en angst. (3) Direct na de interventie is terugkeer naar het normale niveau van functioneren, een niveau dat "klinisch" normaal is voor een gemiddelde medewerker, aanwezig bij 31-61% van de deelnemers aan de cognitieve interventie (afhankelijk van de uitkomstmaat) en bij 37-54% van de deelnemers aan de fysieke interventie.

De follow-up effecten na zes maanden laten een vergelijkbaar patroon zien. Ten eerste is in beide groepen nog steeds een vermindering van psychische klachten zichtbaar. De fysieke interventiegroep vertoont nog steeds een substantieel lager niveau van uitputting, distantie en gevoel van afgenomen competentie. Bij de cognitieve groep is het tegenovergestelde te zien: een toename van uitputting en distantie. In beide groepen is na 6 maanden nog steeds een significante vermindering te zien van de subjectief ervaren vermoeidheid en afgenomen activiteit. Ten tweede, in beide groepen kon een groot effect worden aangetoond voor vermindering van distress, en een matig effect voor vermindering van depressie, angst en somatisatie. In de fysieke interventiegroep is een medium effect-size gevonden voor een verbetering op het gebied van subjectief ervaren vermoeidheid, afgenomen activiteit en afgenomen concentratie. Ten derde, circa 50-60% van de werknemers met psychische klachten (4DKL) die hadden deelgenomen aan één van de twee interventiegroepen keerden terug naar hun normale niveau van functioneren binnen zes maanden. Dit was anders voor burnout (UBOS) en vermoeidheid (CIS). De scores op de uitputtingsschaal van de UBOS laten na 6 maanden zien dat slechts 31-39% van de werknemers terugkeren naar hun normale niveau van functioneren. Voor de subjectief ervaren vermoeidheid (CIS) liggen de percentages iets gunstiger.

Deze resultaten rechtvaardigen de conclusie dat een korte fysieke of cognitieve interventie succesvol lijken te zijn in het reduceren van psychische klachten, burnout en vermoeidheid en in de terugkeer naar het normaal functioneren op werk.

Hoofdstuk 5 beschrijft de effecten van dezelfde twee preventieve stress management programma's op het verzuim het eerste jaar volgend op de interventie. Er is gebruik gemaakt van hetzelfde gerandomiseerd design als hierboven beschreven. In dit onderzoek is echter een vergelijking gemaakt tussen medewerkers met en zonder veel stress. Tevens kon een vergelijking gemaakt worden tussen het ziekteverzuim na de interventies en het verzuim in het jaar dat daaraan vooraf ging. Beide groepen, de medewerkers met en zonder stress, werden gerandomiseerd over beide typen interventies.

Het ziekteverzuim is gedefinieerd als het aantal keren en het aantal dagen dat men verzuimt, overeenkomstig het classificatiesysteem zoals

door Hensing en anderen in 1998 is voorgesteld. Het aantal keren dat men verzuimt kan worden aangeduid als de “frequentie” (totaal aantal keren dat een werknemer verzuimt in een jaar) en als de “incidentie” (het aantal nieuwe verzuimperiodes in een jaar). Het aantal dagen dat een medewerker verzuimt kan worden onderverdeeld in verzuimpercentage (totaal aantal dagen verzuim per jaar) en duur (gemiddeld aantal dagen verzuim per verzuimperiode). Verder wordt de tijd tussen de interventie en het begin van een nieuwe verzuimperiode geëvalueerd; de periode zonder verzuim.

Vanwege de scheve verdeling van de verzuimgegevens zijn non-parametrische toetsen toegepast om de verschillen in frequentie, incidentie, duur, verzuimpercentage en periode zonder verzuim te kunnen evalueren. Voor de behandelde werknemers zonder stress zijn na de interventie in vergelijking met het jaar daaraan voorafgaande, geen significante veranderingen in het verzuim aangetoond. Bij de werknemers met veel stress daarentegen verlaagde de fysieke interventie de frequentie en incidentie van het ziekteverzuim significant. Geen significante effecten zijn aangetoond voor verzuimpercentage, duur en periode zonder verzuim. De cognitieve interventie toonde een onverwachte significante verkorting aan van de periode zonder verzuim bij werknemers met veel stress. Op de andere ziekteverzuimmaten had de cognitieve interventie geen significant effect.

De verzuimvrije periode bij werknemers met veel stress was bij de cognitieve interventie in vergelijking met de fysieke interventie 144 dagen korter. Aangezien de andere ziekteverzuimmaten in essentie niet zijn veranderd, is de veronderstelling dat deze verkorting van de ziekteverzuimvrije periode een gevolg is van een versterkt bewustzijn van stressklachten waardoor de medewerker eerder besluit om een herstelperiode in te lassen.

Omdat er geen andere substantiële verschillen in effectiviteit tussen beide interventies konden worden aangetoond, is de conclusie dat de ziekteverzuimverschillen tussen beide interventies niet groot zijn en dat de ziektelast zoals zichtbaar in het verzuim door beide interventies ongeveer op gelijke wijze is beïnvloed. Desalniettemin moet er voorbehoud worden gemaakt bij de interpretatie van de resultaten vanwege de relatief kleine groepen in het onderzoek en de scheve verdeling van de verzuimgegevens.

In *hoofdstuk 6* wordt de rol van coping in het ziekteverzuimproces geëvalueerd. Met behulp van een prospectief design wordt dezelfde studiepopulatie van KPN (N= 3628) beschreven één jaar gevolgd. Vóór de start van dit jaar zijn de copingstrategieën van de deelnemers gemeten met de verkorte 19-item versie van de Utrechtse Coping Lijst (UCL). Deze vragenlijst is ontworpen om de manieren in kaart te brengen van omgaan met stressvolle situaties, belangrijke life events en dagelijkse sores. De maten die gebruikt worden voor ziekteverzuim zijn frequentie (totaal aantal keren verzuim per jaar), verzuimpercentage (totaal aantal dagen verzuim per jaar), duur (gemiddeld aantal dagen per verzuimperiode) en de periode zonder verzuim. De verzuimduur is onderverdeeld in een periode korter of langer dan 7 dagen.

Confirmatieve factoranalyse is gebruikt om de factorstructuur van de UCL te onderzoeken. Vijf manieren van copingstijlen kunnen worden onderscheiden: “actieve probleemoplossende coping”, “zoeken van sociale steun”, “palliatieve reactie” zoals het bewust zoeken naar afleiding, “vermijdend gedrag” en “uiten van emoties”. “Actieve probleemoplossende coping” en “vermijdend gedrag” tonen de sterkste samenhang met de gebruikte ziekteverzuimmaten. Een actieve copingstijl heeft een sterke samenhang met minder ziekteverzuim, terwijl een vermijdende stijl samenhangt met meer ziekteverzuim. Werknemers met een hoge score op een vermijdende stijl hebben een 1.35 maal grotere kans op veel verzuim (verzuimpercentage) in vergelijking met werknemers met een lage score. Gecorrigeerd voor verschillende mogelijke verstoringen blijkt het verzuimpercentage voorspeld te kunnen worden door “actief probleemoplossende coping” en “palliatieve reactie”. Verzuimduur kan voorspeld worden door “actief probleemoplossende coping”, “vermijdend gedrag” en het “zoeken van sociale steun”. De verzuimfrequentie wordt voorspeld door “actief probleemoplossende coping”, “vermijdend gedrag” en het “uiten van emoties”. De mediane tijd tot de volgende ziekteverzuimperiode is significant langer bij werknemers die een “actieve probleemoplossende coping” stijl hanteren: 24 dagen langer voor werknemers die hoog scoren in vergelijking met werknemers die laag scoren. De tijd is juist korter bij werknemers die “vermijdend gedrag” vertonen: 38 dagen korter voor diegenen die hoog scoren in vergelijking met hen die laag scoren; of palliatief reageren: 36 dagen korter voor diegenen die hoog scoren in vergelijking met hen die laag scoren.

In *hoofdstuk 7* vindt een verschuiving plaats naar een ruimere opvatting van gezondheid door de positieve component mee te nemen in de vorm van werkbevlogenheid. Doel van het onderzoek is om te onderzoeken, overeenkomstig met de hypothese van het Job Demands-Resources model, of werkstressoren en een gebrek aan werkmotivatoren burnout voorspellen, en of werkmotivatoren bevlogenheid voorspellen. In de tweede plaats is onderzocht in welke mate aspecten van de persoonlijkheid bijdragen aan een goede voorspelling van werkbevlogenheid en burnout. Tot slot is geëvalueerd wat de korte termijn (één jaar) en lange termijn (twee jaar) effecten zijn van werkkarakteristieken en persoonlijkheidskenmerken op werkbevlogenheid en burnout.

Er zijn longitudinale gegevens verzameld bij twee onafhankelijke onderzoekspopulaties. Beide onderzoekspopulaties bestonden uit medewerkers uit het middel en hoger management van KPN die meededen aan een uitgebreid gezondheids- en welzijnsonderzoek. Bij de eerste populatie (groep 1, $N = 201$) was de evaluatieperiode 1 jaar, bij de tweede populatie (groep 2, $N=151$) was de evaluatieperiode 2 jaar. Alle deelnemers ontvingen een vragenlijst met vragen over motivatoren, stressoren, burnout, bevlogenheid en persoonlijkheid. Vier motivatoren zijn onderzocht: sociale steun van collega's, autonomie, ontwikkelings- en ontplooiingskansen en het krijgen van feedback. Vier stressoren zijn onderzocht: werkdruk, emotionele belasting, geestelijke belasting en werk-thuis spanningen. Bevlogenheid werd vastgesteld met twee schalen van de Utrechtse Bevlogenheidsschaal (UBES): energie en toewijding. Voor burnout zijn de schalen uitputting en distantie gebruikt van de Nederlandse versie van de Maslach Burnout Inventory-General Survey (MBI-GS). Twee aspecten van de persoonlijkheid werden vastgesteld met de dimensies extraversie en neuroticisme van de Nederlandse versie van de Neo-Five Factor Inventory.

Zoals verwacht wordt burnout voorspeld door de aanwezigheid van veel stressoren en de afwezigheid van motivatoren. Werk-thuis interferentie (groep 1 en 2) en hoge emotionele belasting (groep 2) voorspellen uitputting en distantie, hoewel het effect van de werk-thuis interferentie op uitputting in groep 1 verdwijnt na controle voor uitputting op baseline niveau. Gebrek aan ontwikkelings- en ontplooiingskansen (groep 1 en 2) en gebrek aan autonomie (groep 2) voorspelt uitputting en distantie. Ook hier verdwijnt dit effect na controle voor burnout op baseline niveau.

Dat bevlogenheid wordt voorspeld door werkmotivatoren is in dit onderzoek gedeeltelijk bevestigd. Voordat energie en toewijding op baseline niveau worden geïntroduceerd, voorspellen sociale steun (groep 1), ontwikkelings- en ontplooiingskansen (groep 1 en 2) en hoge scores op autonomie (groep 2), energie en toewijding. Ook hier verdwijnt 'ontwikkelings en ontplooiingskansen' als predictor wanneer gecorrigeerd wordt voor de baseline bevlogenheid. Een onverwachte bevinding is dat de stressor 'werk-thuis interferentie' een lagere toewijding voorspelt.

Zoals verwacht voorspelt een hoge score op neuroticisme uitputting (groep 2) en distantie (groep 1), althans wanneer niet voor de baselinewaarde van burnout wordt gecontroleerd. Extraversie voorspelt, tegen de verwachting in, toekomstige uitputting (groep 1), een relatie die verdwijnt na controle voor het baseline niveau van uitputting. Bevlogenheid wordt zoals verwacht voorspeld door een hoge score op extraversie en een lage score op neuroticisme. Neuroticisme heeft een negatieve invloed op energie en toewijding (groep 1 en 2) wanneer niet gecorrigeerd is voor baseline niveaus. Extraversie voorspelt energie in beide groepen, maar wanneer gecorrigeerd wordt op baseline niveau blijft alleen het effect in groep 2 bestaan.

We concluderen dat onze bevindingen het Job Demands-Resources model grotendeels ondersteunen, en dat de voorspellende waarde kan verbeteren door het model uit te breiden met persoonskenmerken. Het aantal significante effecten en de percentages verklaarde variantie zijn groter in groep 1 dan in groep 2. Zoals verwacht zijn de effecten dus sterker bij het onderzoek waarbij de werknemers gedurende een jaar zijn gevolgd in vergelijking met het onderzoek waarbij de werknemers twee jaar zijn gevolgd.

In *hoofdstuk 8* tenslotte worden de resultaten van de verschillende studies besproken in een algemene discussie. Belangrijkste bevindingen, sterkten en zwaktes van de onderzoeken, praktische relevantie, toepassingen en implicaties voor de bedrijfsgezondheidszorg en organisaties/bedrijven in het algemeen worden besproken.

Er wordt geconcludeerd dat deze dissertatie, in overeenstemming met resultaten in de wetenschappelijke literatuur, opnieuw laat zien dat secundaire preventie ten aanzien van de gevolgen van werkstress succesvol

kan zijn, ten voordele van werknemers en organisaties. Gebaseerd op de resultaten, zijn vier aanbevelingen voor de bedrijfsgezondheidszorg en arbeidsorganisaties vastgesteld. De eerste aanbeveling voor met name de bedrijfsgezondheidszorg is om regelmatig periodieke gezondheidsonderzoeken (Preventief Medisch Onderzoek) in te zetten, gebaseerd op de 4DKL. Met name de distressschaal van de 4DKL heeft een sterke correlatie met werkstress en indicatoren van spanning. Er is een afkappunt gedefinieerd dat gebruikt kan worden als een valide selectie instrument voor stress management programma's. Omdat we ons realiseren dat een meerderheid van de geselecteerden niet binnen een jaar zal uitvallen met ziekteverzuim als gevolg van stress, stellen we een additionele tweede test voor.

In de tweede plaats toonden we aan dat stress management interventies een positieve uitwerking hebben op klachten maar niet op verzuim. De fysieke en de cognitieve interventie zijn beide even effectief gebleken.

Een derde bevinding van deze dissertatie is dat persoonlijkheidskenmerken de voorspellende kracht van het Job Demands-Resources model versterken. Het model heeft bewezen een adequaat theoretisch model te zijn om de positieve invloed van werkmotivatoren op bevlogenheid te beschrijven alsmede invloed van stressoren op gezondheidsverslechtering. Hieraan kan worden toegevoegd dat lage scores op neuroticisme en hoge scores op extraversie bevlogenheid voorspellen, en dat hoge scores op neuroticisme en lage scores op extraversie burnout voorspellen.

Een belangrijke bevinding van deze dissertatie is dat werknemers met een actieve probleemoplossende copingstrategie minder snel uitvallen door ziekteverzuim. Beïnvloeding van de copingstijl bij een interventie is derhalve belangrijk voor het uiteindelijke resultaat, ten minste voor zover het ziekteverzuim betreft.

Samenvattend adviseren wij om regelmatig een gezondheidsonderzoek uit te voeren gebaseerd op het uitgebreide Job Demands-Resources model met inclusie van de 4DKL en de UCL, met als doel om klachten of ziekteverzuim als gevolg van stress te voorkomen. Wij adviseren om vragen over de risicofactoren op de werkplek, zoals het ondervinden van sociale steun van collega's, het hebben van autonomie, ontwikkelings- en ontplooiingskansen, het krijgen van feedback, het ervaren van werkdruk,

emotionele belasting, geestelijke belasting en werk-thuis spanningen toe te voegen om high-risk medewerkers op te sporen. In de tweede plaats adviseren wij een stress interventie programma voor werknemers met veel stress, die cognitief of fysiek van aard is, en tenminste 4 sessies duurt. In de derde plaats adviseren wij om het aanleren van actieve copingstrategieën op te nemen in nieuwe interventies om het risico op ziekteverzuim te verlagen. Tot slot blijkt het nieuwe concept van werkbevlogenheid, een uitdagende nieuwe focus voor de bedrijfsgezondheidszorg, bedrijven en andere arbeidsorganisaties, positief samen te hangen met werkmotivatoren en met hoge scores op extraversie. Naar onze mening kan de kennis verworven in de onderzoeken zoals in dit proefschrift weergegeven, een belangrijke bijdrage leveren aan een kwalitatieve verbetering van de bedrijfsgezondheidszorg, aan een betere gezondheid van de werknemers en aan de ontwikkeling van gezonde en bevlogen arbeidsorganisaties.

Curriculum vitae

Willem van Rhenen is geboren op 11 december 1958 in Driebergen-Rijsenburg. Hij behaalde in 1977 zijn diploma Gymnasium β aan het Revis Lyceum te Doorn. Na zijn studie geneeskunde aan de Universiteit van Amsterdam en diverse studentikoze werkzaamheden kreeg hij de kans om in 1988 als Relief Doctor in Lesotho (Zuidelijk Afrika) te werken. Bij zijn terugkeer in Nederland is hij vervolgens aan het werk gegaan als arts-assistent in het streekziekenhuis van Bennekom. In 1991 heeft hij de overstap gemaakt naar de bedrijfsgezondheidszorg bij de GGD in Ede en Zeist. In 1994 een nieuwe overstap, maar nu naar KPN Arbo. Door de overname van KPN Arbo door ArboNed N.V. werkt hij sinds 1998 binnen deze Arbo-dienst als bedrijfsarts en stafarts. Vanaf 2005 maakt hij als Chief medical officer deel uit van het directieteam.

Naast deze hoofdactiviteiten voor het reguliere werk heeft Willem van Rhenen in de loop der jaren diverse nevenactiviteiten uitgevoerd. De meest recente nevenactiviteiten zijn: secretaris werkgroep lifestyle NVAB (2002 – heden), Stecr correspondent (2004-2007), Gastdocent Corvu, NSPOH, Care & Cure, PSW, RPMS (1998 – heden) en trainer Stressmanagement (1998 – heden). Verder was hij lid van de werkgroep “richtlijn alcoholmisbruik en afhankelijkheid” van het CBO (2005/2006), lid van de klankbordgroep van Stress Impact van TNO Arbeid (2004), lid van de klankbordgroep ten behoeve van onderzoek Universiteit Maastricht in opdracht van UWV: “arbeidsongeschiktheid, reïntegratie en etniciteit” (2002 – 2004), lid van de werkgroep richtlijn Preventief Medisch Onderzoek van de NVAB (2005), lid van de werkgroep herziening richtlijn psychische klachten van de NVAB (2005-2007), lid van de werkgroep “handelen van de bedrijfsarts bij psychische klachten” van de NVAB (2000) en mag hij regelmatig diverse presentaties geven met wellicht als hoogtepunt een presentatie op het 10e internationale congres voor “the International Commission for Occupational Health” in Amsterdam (2002).

Naschrift

*Mijn Wetenschap en mijn Geloof,
Die leven saam in onmin,
Want de eene houdt, wat de ander doet
En denkt en meent voor onzin.
Intusschen, beide heb ik lief,
Juist even trouw en innig,
En toch vindt ik mij-zelven niet
Onreedlijk noch krankzinnig*

(Uit: Leekedichtjens van Génestet, 1930, p. 285-286)

Vertrouwd met de wereld van het geloof (religie en geneeskunde) heb ik de laatste jaren ook de wereld van de wetenschap ontdekt. Het begon allemaal in 1998.

In 1998 kwam het verzoek van het toenmalige management van KPN Arbo om met de directie van KPN Operator Vaste Net te gaan praten over de prijs van een reeds verkocht Periodiek Arbeidsgezondheidskundig Onderzoek (PAGO). De verkoopprijs was onder de kostprijs uitgekomen, waardoor nieuwe onderhandelingen nodig waren. Vanwege mijn goede verstandhouding met de toenmalige directie van KPN OVN (waaronder Henk Camps, directeur Human Resources), viel mij de eer te beurt om opnieuw te onderhandelen.

Alleen een win-win situatie zou KPN Arbo weer aan de onderhandelingstafel kunnen brengen. Naar mijn idee zou een extra verdiepingsslag en uitbreiding van het PAGO het enige argument kunnen zijn om de directie van KPN OVN te overtuigen om extra fondsen aan te spreken. Ik heb toen voorgesteld om de medewerkers van KPN die als te gestresst uit het onderzoek zouden komen, een interventie aan te bieden. Het PAGO en de interventie zouden vervolgens wetenschappelijk geëvalueerd worden. De directie van KPN OVN bleek gevoelig voor de extra inbreng en besloot om de nieuwe begroting te accorderen. Een begroting die uiteindelijk

150% hoger zou uitvallen dan aanvankelijk was overeengekomen. Een fraai succes.

Na ondertekening van het akkoord is een projectteam samengesteld om de gemaakte afspraken uit te voeren. Mensen van KPN Arbo (Jac v.d. Klink, Peter Verkaart, Jan Willem Deen), van KPN Projectmanagement (Bert van Soest, Stefan van Someren), KPN OR en HR (Ron Besamusca, Oscar de Man, Chris Pronk), automatisering (Jos Roestenberg, Thomas da Ponte), statistiek (Rob Baarslag, Karel Schouten) en korte tijd later ook van de Universiteit (Frank van Dijk en Wilmar Schaufeli) hebben de opzet vastgesteld en de lijnen uitgezet. Het project werd ondergebracht bij de Gezonde Zaak (Geert-Jan van der Sangen). Psychologische medewerkers en fysiotherapeuten van de Gezonde Zaak hebben vol enthousiasme en animo geparticipeerd in het uitvoeren van de interventies. Daarna begon de wetenschappelijke evaluatie van de data. Deze loop der gebeurtenissen kan toeval lijken, maar dat “geloof” ik niet.

Ik wil dus als eerste mijn God bedanken. Ik geloof in een levende en scheppende God, een God die zorg en liefde heeft voor de mens. Een God die met me meedacht toen ik de keus moest maken om het wetenschappelijke traject wel of niet op te pakken. Een God die mij gesteund heeft in moeilijkheden, maar ook glimlacht als het goed met mij gaat. Deze God is voor mij een belangrijke bron van energie geweest, God zij dank.

Uiteraard wil ik ook mijn gezin bedanken. Ik dank mijn vrouw Lydia voor haar steun en liefde en de bereidheid om de motor te zijn van ons gezin. Dit heeft veel ruimte gecreëerd voor mij, mijn ontwikkeling en mijn carrière. In dat opzicht ben ik een zeer bevoorrecht onderzoeker. Bovendien hielp zij mij om teleurstellingen te verwerken en om te genieten op momenten dat er genoten kon worden. Ook stimuleerde zij mij om daar waar nodig tijd vrij te maken voor mijn gezin en vrienden. Hierdoor heb ik nog steeds een redelijk sociaal netwerk. Tot slot liet zij mij vaak merken dat een wetenschappelijke redenering al snel kon worden weerlegd met een simpel opgetrokken wenkbrauw of een simpele kus. *Omnia vincit amor* (liefde overwint alles) geldt zelfs voor de wetenschap. Lydia bedankt voor jouw liefde.

Jair is mijn oudste zoon en inmiddels bijna arts. Hierdoor “dwong” hij mij een goed voorbeeld te zijn als man, vader en arts. Immers, goed voorbeeld doet goed volgen was het idee. Dat Jair “goed” is geworden blijkt onder

meer uit zijn steun bij en realistische aanpak van tegenslag. Daar kan ik nog veel van leren. Zijn motto is: je kunt je er wel druk om maken, maar dat helpt toch niet. God takes care. Deze rust en zekerheid heeft mij altijd geholpen te relativiseren als het tegenzit. Jaïr, dank voor alle steun die je als zoon hebt gegeven.

Ruben, mijn jongste zoon en bezig met een commercieel technische opleiding, loopt vaak aan het eind van de avond nog even mijn werkkamer binnen om zijn verhaal te vertellen en te vragen of het goed met mij gaat. Beiden zijn we avondmensen. Beiden typen we 's nachts nog vaak op onze laptops. Ik voor mijn proefschrift, hij om nog eens een lekker muziekje te downloaden. Ik heb zo heel wat heerlijke deuntjes doorgestuurd gekregen, waar ik dan weer heerlijk bij kon werken. Ruben, dank voor je muziek en dank dat je altijd even kwam binnenlopen.

Voor beiden geldt: dank dat jullie niet altijd de tijd opgeëist hebben, die er eigenlijk voor vaderschap staat....

Werken is voor mij altijd een normaal gegeven geweest. Het voorbeeld van mijn vader, die als fabrieksarbeider jarenlang gewerkt heeft van 04.30 uur tot 19.30 uur zal waarschijnlijk een belangrijke rol gespeeld hebben. De lange werkdagen waren nodig, om met "overwerk" mijn studiekosten tijdens de lagere en middelbare school te bekostigen. Dank pa, want daardoor is de wetenschap weer een doctor rijker geworden. Ook mijn moeder wil ik bedanken voor de belangrijke rol die zij in mijn ontwikkeling heeft gespeeld. Werkzaam in de zorg heeft zij mij vaak meegenomen naar het werk en daar is waarschijnlijk mijn liefde voor het vak van dokter gegroeid. Bovendien heeft zij tijdens mijn schoolopleiding vaak geholpen door bij teleurstellingen mij altijd voor te houden dat er wel weer een nieuwe kans zal komen. Dank ma.

Ook mijn broer André was er altijd wanneer nodig. Ik heb op hem en zijn gezin kunnen rekenen wanneer dat nodig was. Zo'n zekerheid geeft het gevoel er nooit alleen voor te staan. Dank André.

Mijn werkomgeving is altijd een belangrijke bron van energie geweest. Na eerst in Lesotho en later in het Streekziekenhuis van Bennekom gewerkt te hebben, kon ik in 1991 de stap naar de bedrijfsgezondheidszorg maken. Han Koert Veerman, studiegenoot tijdens CORVU 12, was degene die mij

naar KPNArbo haalde. En zonder KPNArbo waarschijnlijk geen dissertatie. Dus dank daarvoor Han Koert.

Vanuit KPNArbo hebben diverse collegae mij een push in de goede richting gegeven. Astrid Bol Raap, Frans Ortlep, Herman Blom en Gerard Heuvelman hebben aan de wieg gestaan van het onderzoek en belangstellend naar het pasgeboren kind gekeken. Collegae Gaby Aarts, Ruud Eeuwen, George van der Kant, Adrie Philips, Albert Reynecke, Jeanne Gambon en Jan Willem Deen hebben geparticipeerd in de interventies. Direct of indirect hebben zij dus bijgedragen aan het tot stand komen van het onderzoek en mijn dissertatie. Dank daarvoor.

Na de overgang naar ArboNed in 1998 kreeg ik te maken met een andere directie en kwam er een nieuwe groep collegae bij. Het is mij in de nieuwe omgeving altijd gegund om daar waar nodig tijd te reserveren voor extra onderzoek of publicaties. De echte versnelling is evenwel pas gekomen bij de komst van het huidige directieteam in 2004. Er kwam een serieuze aandacht voor het concept van bevlogenheid. Dit heeft mij tijd en ruimte gegeven om naast een verdere wetenschappelijke ontwikkeling ook bezig te zijn met productvorming die regelrecht verband houdt met bevlogenheid. Zonder overdrijving durf ik nu dan ook te stellen dat ArboNed op het vlak van de mentale (en fysieke) vitaliteit koploper is geworden in Nederland. Ik ben Paul Verburgt, Richard Adamowicz en Marc Dijkstra dan ook zeer erkentelijk voor het feit dat ik onder de vlag van “het impresariaat voor de nieuwsgierigheid” mijn onderzoek verder heb mogen neerzetten en afronden.

Paul wil ik nog in het bijzonder danken voor de wetenschappelijke interesses en enthousiasme die hij heeft. Zijn afkeer van ambtelijke molens zijn er waarschijnlijk de oorzaak van dat hij zelf nog niet is gepromoveerd. Jammer, want zijn ideeën verdienen een wetenschappelijke validering. Maar wie weet, komt dat nog een keer.

Richard ben ik zeer erkentelijk voor zijn nuchtere en vriendschappelijke opmerkingen. Als wiskundige vindt hij mijn theoretische kaders toch vaak wat pover, maar gunt ze mij wel. Ik ben blij met zo’n baas.

Ook Marc wil ik afzonderlijk bedanken voor de extreme gedrevenheid waarmee hij de producten over bevlogenheid binnen Keurcompany in de

markt heeft gezet. Daarmee is mijn droom toch een beetje werkelijkheid geworden: een dienstverlening die zich focust op werkplezier en niet alleen meer op werk ellende. Chapeau.

Tot slot de wetenschappers. Uiteraard hebben zij een zeer belangrijke inhoudelijke rol gehad bij de totstandkoming van dit proefschrift. Als eerste Jac van der Klink. Hij was één van de interviewers bij mijn sollicitatie bij KPN Arbo, zat in de begeleidingscommissie van het PAGO project zelf en is nu mijn co-promotor. Fantastische inspirator en zeer attent mens. Jac heeft een belangrijk aandeel gehad in het neerzetten van het design, maar ook in de koppeling van mij aan Frank van Dijk en Wilmar Schaufeli. We zijn vooral in het begin van dit avontuur veel met elkaar opgetrokken, hebben veel gediscussieerd en zelfs samen gejogd in de Veluwe bossen. Dank voor je zeer menselijke en vriendelijk bejegening.

Bij het zoeken van een promotor had ik vanwege het onderwerp de mogelijkheid om te kiezen voor de arbeids en organisatiepsychologie of de bedrijfsgezondheidszorg. Ik kon niet kiezen en heb dus twee promotoren gekregen: Frank van Dijk en Wilmar Schaufeli.

Frank van Dijk was voor mij toch wel het icoon van de bedrijfsgezondheidszorg. In de eerste brief aan hem staat nog: "Ik hoop dat u gelegenheid vindt om met mij een afspraak te maken". De verwarde haardos, de spijkerbroek, maar vooral zijn innemende houding dwongen mij al snel om te tutoyeren en wat dichterbij te komen. Door zijn toedoen was de ivoren toren van de wetenschap voor mij ineens een stuk toegankelijker geworden. Ik kan mij de verwondering nog scherp herinneren. Inmiddels heb ik ervaren dat Frank een vlijmscherpe geest heeft, streeft naar absolute perfectie en eigenlijk voor het meest haalbare wil gaan. Soms leidde dit tot een kleine verzuchting, maar het artikel en ikzelf werden er toch altijd weer beter van. Frank, zeer veel dank voor je vasthoudendheid, steun en gestelde vertrouwen. Een groot leermeester.

Wilmar Schaufeli is als hoogleraar organisatiepsychologie voor mij (en vele anderen in Nederland) de goeroe op het gebied van de burnout en bevlogenheid. Het was dan ook een zeer opmerkelijke ervaring toen Wilmar aanbood om bij onze eerste afspraak naar de Mineurslaan te komen. Mijn werklocatie toentertijd. Nog verbaasder was ik toen ik zag dat hij op zijn fiets was gekomen. Professoren hadden voor mij altijd iets

magisch, iets onbereikbaars. Die magie was even weg. Het werd even gewoon. Maar de magie kwam weer snel terug toen hij vertelde bereid te zijn om mijn promotor te worden. En de magie is er nog steeds. Ik heb Wilmar zeer hoog. De manier waarop hij denkt, praat en schrijft (ook nog eens in diverse talen) maakt mij jaloers, niet afgunstig. Ik voelde me dan ook altijd zeer vereerd als hij met mij meereed naar een afspraak, meeliep bij een aantal keuringen en meedacht bij de ontwikkelingen van een aantal producten binnen ArboNed. Ik was dan ook very shocked, toen ik hoorde dat hij door een medische misser van een “soortgenoot” van mij in kritieke toestand in het ziekenhuis belandde. God zij dank gaat het al weer een stuk beter en ik hoop dat we nog heel veel jaren samen kunnen blijven werken. In ieder geval heel erg bedankt voor alle steun en vriendschap die je tot nu toe hebt gegeven.

Tot slot Roland Blonk. Roland werd al vrij snel vanuit het Coronel Instituut aan mij gekoppeld om de analyses en eerste opzetten van de artikelen te doen. Dat was blijkbaar zijn specialisme. Ik kan dat nu beamen. Op het gebied van statistiek en analyses vind ik hem toch wel een kei. Hij is dan ook niet voor niets professor geworden. Wat ik altijd bewonderd heb is zijn geduld bij het uitleggen van de statistiek. Als groentje had ik er niet veel kaas van gegeten. Maar hij beloofde dat ik binnen ArboNed nog eens een expert zou worden op dit vlak. Door zijn steun en niet aflatende zorg mag ik dat nu ook wel pretenderen, denk ik. Dank daarvoor. Maar ook de persoonlijke momenten. We hebben meerdere keren gepraat over geloof, relaties en werk. De twijfels, de zorgen die er speelden. Hij is altijd heel open geweest en ook hij bleek een heel normaal mens. Bovendien een mens waar ik altijd van op aan kon. Dat laatste vind ik heel belangrijk voor mij. Want als ik wel eens geremd werd door frustraties kon hij dit heel goed relativeren door te vertellen dat dit bij het proces hoorde en dat elke wetenschapper dit meemaakt. Zo’n uitspraak is goud waard. Ik hoop dat je het nog eens uitbetaald krijgt.

Uiteraard zijn er nog vele anderen die ik zou moeten bedanken. Mijn vrienden Pieter en Okko waar ik op gezette tijden gezellig mee kan uitgaan. En Okko: bedankt voor alle keren dat je even gezellig langs kwam buurten. Mijn oom Albert en neef Bert die mijn jeugdig brein gescherpt hebben met stevige debatten. De jongelui van de jeugdgroep in Huis ter Heide, die voor mij altijd een welkome afwisseling waren en mij af en toe het gevoel gaven de leeftijd te hebben van een “normale”

OIO (onderzoeker in opleiding). Edu, Frank, Tesfaye, Hans en partners die mij op spiritueel vlak scherp hielden. Collegae van ArboNed (echt te veel...) die mij vaak positieve feedback hebben gegeven. En ga zo maar door. Soms weet je niet waar je moet eindigen. Maar ga ervan uit dat wanneer ik u heb uitgenodigd om aanwezig te zijn op de verdediging van mijn academische proefschrift, ik u impliciet wil danken voor het feit dat ik u ken. En zoals eerder aangegeven: ik “geloof” niet altijd in toevallige ontmoetingen...

Ik weet dat velen alleen het dankwoord lezen. Op deze manier kan men de schrijver en zijn relaties ietsje beter leren kennen. Toch hoop ik dat dit u enigszins nieuwsgierig heeft gemaakt voor de verdere inhoud van dit boekje. Want dat is toch de bedoeling van de wetenschap en van het impresariaat voor de nieuwsgierigheid!

Bijna drie op de tien werknemers zegt last te hebben van werkstress. Willem van Rhenen bespreekt een effectieve manier om via een gezondheidsonderzoek medewerkers te traceren met een groot risico op ziekteverzuim.

Eenmaal getraceerd kan een medewerker een interventieprogramma worden aangeboden. De effectiviteit van twee programma's wordt beschreven: een cognitief georiënteerde interventie en een gecombineerde interventie van fysieke inspanning en ontspanning.

Verder wordt expliciet de rol van coping bij ziekteverzuim besproken. Tot slot is er een beschrijving van het nieuwe concept van werkbevlogenheid dat samenhangt met een aantal werkmotivatoren maar, naar nu blijkt, ook met de persoonlijkheid.

Willem van Rhenen is als onderzoeker verbonden aan het Coronel Instituut en als Chief medical officer aan ArboNed.