Working out fatigue

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Working out fatigue: Conceptualization, assessment, and theory

Helen J. Michielsen

Stellingen behorend bij het proefschrift:

Working out fatigue:
Conceptualization, assessment, and theory

Short Unidimensional (?) Fatigue scale (SUF) Guus©
Een vragenlijst op basis van liedteksten

De volgende tien uitspraken gaan over hoe U zich normaal gesproken voelt. U kunt per uitspraak kiezen uit 5 antwoordmogelijkheden variërend van Nooit tot Altijd, waarbij 1 = Nooit, 2 = Soms, 3 = Regelmatig, 4 = Vaak, 5 = Altijd.

	Nooit	Soms	Regelmatig	Vaak	Altijd
1. Mijn ogen zijn moe (Het grote TIKlied - D'n Egelantier)	1	2	3	4	5
2. Ik ben moe (Het is laat - Bløf)	1	2	3	4	5
3. Ik ben niet ziek, alleen maar moe (Hé Amsterdam - Drukwerk)	1	2	3	4	5
4. Ik voel me moe, maar voldaan (Annabel - Hans de Booij)	1	2	3	4	5
5. Ik ben liever lui dan moe (Nergens goed voor - De Dijk)	1	2	3	4	5
6. Ik heb zoveel te doen, maar ben zo moe (De koekoek in de klok - Herman van Veen)	1	2	3	4	5
7. M'n benen zijn zo moe (1 Grote liefde - Clouseau)	1	2	3	4	5
8. Ik ben moe en dat gaat nooit meer over (Rijden door de nacht - Bløf)	1	2	3	4	5
9. Van werken word ik veel te moe (Werken is ongezond - Pater Moeskroen)	1	2	3	4	5
10.Ik ben het leven nooit moe (Niemand sterft - Acda & de Munnik)	1	2	3	4	5

Items 4 en 10 moeten worden omgescoord. De schaalscore wordt verkregen door alle itemscores bij elkaar op te tellen.

Helen Michielsen, juni 2002

Working out fatigue:

Conceptualization, assessment, and theory

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Working out fatigue:

Conceptualization, assessment, and theory

Proefschrift

ter verkrijging van de graad van doctor
aan de Universiteit van Tilburg,
op gezag van de rector magnificus, prof. dr. F.A. van der Duyn Schouten,
in het openbaar te verdedigen ten overstaan van
een door het college voor promoties aangewezen commissie
in de aula van de Universiteit op vrijdag 13 september 2002 om 14.15 uur

door

Helena Johanna Michielsen

geboren op 18 april 1976 te Oosterhout (N.Br.)

Promotores: Prof. dr. G.L. van Heck
Prof. dr. T.M. Willemsen
Copromotor: Dr. J. de Vries

Aan mijn moeder

Voorwoord

Zoals u kunt zien op de titelpagina's van de hoofdstukken in dit proefschrift, heb ik dit proefschrift zeker niet alleen geschreven. Mijn promotores Guus van Heck en Tineke Willemsen, en copromotor Jolanda de Vries ben ik veel dank verschuldigd. Guus, jij gaat met een stofkam door onze teksten heen en zet nog heel wat puntjes op de overbekende i. Bovendien zorg je tijdens onze 'taskforce'-bijeenkomsten voor een vrolijke noot en relativeer je de wetenschap op een prettige manier. Tineke, je bent als laatste bij de taskforce gekomen, maar ook jouw aandeel was onmisbaar. Met jou heb ik me niet alleen op modern seksisme gestort, maar ook op het model van Taylor en Aspinwall. Je rust en hartelijkheid tijdens onze besprekingen waardeer ik zeer. Jolanda, jij bent degene die me na mijn afstuderen terug naar Tilburg hebt gelokt. In het begin was het vooral mijn taak de logistiek van het PVA-project te regelen, daarna heb je er samen met Guus voor gezorgd dat ik op dit project kon promoveren. Jij hebt me geleerd mijn ideeën korter en duidelijker op papier te zetten. Bovendien corrigeer je teksten met bovenmenselijke snelheid. Zonder jou had ik nooit in zo'n korte tijd kunnen promoveren! Ook de andere co-auteurs, Prof. Dr. Fons van de Vijver, Prof. dr. Klaas Sijtsma en Dr. Marcel Croon, bedank ik hartelijk voor hun onontbeerlijke (methodologische) input.

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Helen Michielsen
Tilburg, juni 2002

Contents

Chapter 1
Introduction

Introduction

Recently, fatigue has become a hot topic, primarily due to the recognition of the high prevalence of fatigue in the general population (Loge, Ekeberg, & Kaasa, 1998) and in primary care (Bates et al., 1993; Bensing, Hulsman, & Schreurs, 1996; Fuhrer, 1994; Lewis & Wessely, 1992). However, in the scientific community, there is still no general agreement about the definition of fatigue. Furthermore, studies are scarce in which an elaborated theoretical framework has been used to explore underlying factors of fatigue.

The present research addresses the conceptualization of fatigue, especially its dimensionality. Secondly, the project deals with the construction and psychometric evaluation of a new, unidimensional fatigue scale. Furthermore, the utility of a transactional stress-coping-fatigue model, developed by Taylor and Aspinwall (1996), is tested. This model is employed to identify factors which predict fatigue.

This chapter deals with the history and assessment of the fatigue concept, and relevant models that have been proposed thus far. Next, the theoretical framework and the design of the present study are described. This chapter ends with a brief overview of the remaining chapters of this dissertation.

Chronic fatigue

In everyday life, fatigue is a normal phenomenon, that is characterized by task-specificity. It can be reversed in the short term by rest, switching tasks, or by using particular strategies, for instance, working at a slower pace. In the psychological literature, this type of fatigue is referred to as *acute* fatigue (Meijman & Schaufeli, 1996). Although fatigue is common, one must beware of considering it to be a trivial complaint (Lewis & Wessely, 1992). The *chronic* form of fatigue is independent of a certain task and cannot be reduced by rest or sleep (Meijman & Schaufeli, 1996).

Chronic fatigue is a symptom of many chronic physical diseases, like multiple sclerosis, cancer, Parkinson's disease, rheumatoid arthritis, and psychiatric disorders such as depression (Lewis & Wessely, 1992). In the Chronic Fatigue Syndrome (CFS), fatigue is the core symptom. In addition, fatigue can also play a role in temporary physical conditions such as pregnancy and infections. Finally, the use of medication or medical treatments, such as chemotherapy, can evoke feelings of fatigue. Thus, profound fatigue is a common complaint in medical practice (e.g., Bensing et al., 1996). Along with headache, fatigue is the most frequently reported symptom in general practice (e.g., Foets & Sixma, 1991). Chronic fatigue is not only a frequent complaint in primary care. It is also an important public health problem associated with

disability comparable to that found in individuals suffering from a chronic illness (Kroenke, Wood, Mangelsdorff, Meier, & Powell, 1988).

Fatigue does not only lead to individual costs. Severe fatigue during a relatively long period can also lead to sick leave and work disability. For example, in the Netherlands over one-third of the recipients of work disability benefit is categorized as occupationally disabled on mental grounds (Houtman, 1997). The majority of these individuals suffers from chronic job stress and burnout. The most characteristic component of burnout (Schaufeli & Van Dierendonck, 1994) is emotional exhaustion, a fatigue-related concept. A possible reason for the increasing attention for fatigue could be the growing awareness of the high prevalence of fatigue and its potential detrimental effect on individuals' well-being (Smets et al., 1998). Therefore, in 1996, a multidisciplinary, six-year national research program named 'Fatigue at Work' was initiated by The Netherlands Organization for Scientific Research (NWO). It includes medical and psychological research on acute and prolonged fatigue among employees. The major goals of the program are to improve the scientific knowledge of mental fatigue and to develop research-based tools which can be used in occupational health settings. In the program, mental fatigue has been defined in terms of changes in the psychophysiological control mechanism that regulates task behaviour. These changes are conceived of as the result of preliminary mental and/or physical efforts, which have become burdensome to such an extent that individuals are no longer able to meet job demands regarding their mental functioning adequately. Frequently, individuals are only able to meet these demands at the cost of increasing mental effort and the surmounting of mental resistance (Meijman & Schaufeli, 1996). Thus, mental fatigue reflects lacking capability as well as motivation.

Mental fatigue has been studied in four research areas within the Fatigue at Work program. The first line, focussing on 'acute fatigue', has included projects on shift work, action regulation, and the psychobiology of fatigue. Secondly, chronic fatigue has been studied in projects on personality and temperament, spill-over, effort-reward imbalance, social comparison, and emotional contagion. In the third area, the epidemiology of fatigue has been the focus of study. Finally, the line 'occupational medicine and fatigue at work', which is particularly relevant for practitioners, has dealt with the development of diagnostic protocols, screening instruments, and the evaluation of treatment and rehabilitation programs.

At Tilburg University, the focus has been on the second research area, more specifically on spill-over effects, and the mediating and moderating roles of personality and temperament in the relationship between work stress and mental fatigue. Recently, De Vries and Van Heck (2000) stated in a review article on personality and emotional exhaustion that, although personality is considered a key factor in the development of burnout (Ganster &

Schaubroeck, 1991), not much research has been done to study the associations between personality and fatigue. In this dissertation, attention is given to this relationship. In this context, the dimensionality and predictors of chronic fatigue are studied. In addition, the development and evaluation of a new fatigue measure are described.

Fatigue, a fuzzy concept

Although fatigue is now an intensively studied construct, no general agreement exists on its definition. In the 19th century, fatigue was considered a strictly physical phenomenon. Based on experiments concerning physical fatigue, Mosso (1903) concluded that next to physical, also mental aspects influenced task performance. He was the first to describe a unitary view of fatigue, combining physical and mental aspects. Unfortunately, he considered fatigue as a rather vague sensation of tiredness. Attempts to measure mental fatigue as a reduction of mental energy failed and this, among other things, led Muscio (1921) to advise researchers to drop fatigue as a measurable phenomenon. Views such as these precluded the development of an adequate phenomenology of the feeling of fatigue and placed it beyond measurement. It was only after World War II, that Bartley and Chute (1947) suggested a new method to assess fatigue. In their opinion, fatigue could not be studied directly. However, the various phenomena to which fatigue was related could serve as standards instead of a single quantitative unit. In contrast, clinicians were encouraged to pay attention to the direct measurement of fatigue, because an increasing number of individuals reported unexplained feelings of fatigue (Jaspers, 1963).

Grandjean (1979) described the nature of fatigue as a state marked by reduced efficiency and a general unwillingness to work. In 1994, Brown defined fatigue as a disinclination to continue task performance. It involved an impairment of human efficiency, when work continued after people became aware of their fatigued state. Despite these and other attempts, today still no general agreement exists on the definition of fatigue. For a more precise conceptualization of fatigue, it is helpful to note that fatigue, theoretically, can be divided into physical and mental categories.

Mental fatigue is believed to be a gradual and cumulative process. It is thought to be associated with a disinclination for any effort, reduced efficiency and alertness, as well as impaired mental performance (Grandjean, 1979). Mental fatigue is a functional state, which is a continuum with, at the one end, sleep, and, at the contrast pole, a relaxed, restful condition. Both endpoints are likely to reduce attention and alertness. Physical fatigue, on the other hand, is characterized by reduced muscular power and movement. A number of researchers found support for the distinction mental-physical fatigue, basing their ideas on questionnaires, in which both types of fatigue are respresented

(Chalder et al., 1993; David et al., 1990; Ray, Weir, Philips, & Cullen, 1992; Smets, Garssen, Bonke, & De Haes, 1995; Vertommen & Leyssen, 1988). Some have proposed an even more fine-grained classification and have distinguished up to five facets of fatigue in their measures. For instance, Åhsberg (2000) initially divided perceived fatigue after work in lack of energy, physical exertion, physical discomfort, lack of motivation, and sleepiness. However, she demonstrated that, while distinguishing these five dimensions, lack of energy appeared to be a general latent factor. Vercoulen, Alberts, and Bleijenberg (1999) stated that fatigue consists of four aspects: subjective feelings of fatigue, reduction in concentration, lack of motivation, and physical activity level. Others (e.g., Desmond & Hancock, 2001; Gaillard, 1996; Studts, De Leeuw, & Carlson, 2001) claimed that fatigue should be treated as a unidimensional concept, due to complex interactions between physical and mental elements in task and job demands and consequences of effort (Gaillard, 1996). Furthermore, in a recent explorative study of the structure of fatigue, Studts et al. (2001) failed to find support for the distinction of cognitive, emotional, somatic, and general aspects of fatigue. Instead, they found a clear one-factor solution. This confusion about the dimensionality of fatigue makes clear that systematic research into the dimensions of fatigue is still necessary.

Due to a lack of agreement about the definition, fatigue is measured in different ways. Objective measures such as reaction time or number of errors (Åkerstedt, 1990), and subjective methods such as diaries (e.g., Vercoulen et al., 1996), interviews (e.g., Meesters & Appels, 1996), and questionnaires (e.g., Chalder et al., 1993) have been employed. In large-scale studies, such as the ones described in this dissertation, the use of questionnaires is a very common procedure. Until the nineties (Berrios, 1990), scales of fatigue were unidimensional. The complex nature of CFS is probably the reason for the rising need for more fine-grained, multidimensional measures. However, many fatigue questionnaires in the work field were developed on an ad hoc basis (De Vries & Van Heck, submitted). Consequently, the first aim of this dissertation was to focus on the dimensionality of fatigue. More specifically, the dimensionality of four frequently used fatigue questionnaires was examined and a new measure, the Fatigue Assessment Scale (FAS) was developed on the basis of a semantical analysis of these four questionnaires.

Predictors of fatigue

Although, or maybe because, fatigue is such a common phenomenon, so far not much systematic theorizing about fatigue has taken place. However, some authors (e.g., Bartley & Chute, 1947; Smets et al., 1995; Vercoulen et al., 1998) developed theories about the onset and perpetuation of fatigue. For example, Vercoulen et al. (1998) focussed on the persistence of fatigue in CFS-

patients. In their model of fatigue, attribution of complaints to a somatic cause results in low levels of physical activity, which in turn influences the severity of fatigue. Both sense of control over symptoms and focusing on bodily sensations affect fatigue directly. As an alternative, a biospychosocial approach, which takes into account the combined effects of physical, psychological, and behavioral factors, has been proposed as the most suitable way of examining fatigue (e.g., David et al., 1990; Lewis & Wessely, 1992; Ware, 1993). The view that fatigue is related to various types of extreme stimulation involving low as well as high physical and/or information-processing demands (De Rijk, Schreurs, & Bensing, 1999) and the belief that fatigue links with symptom perception models (e.g., Pennebaker, 1982) are also promising steps towards further theorizing.

The second part of this dissertation addresses the direct relationship between personality, temperament, and the Type A behavior pattern, on the one hand, and fatigue, on the other hand. In addition, a central role in this part of the dissertation is played by the model developed by Taylor and Aspinwall (1996). This model describes mediating and moderating processes of psychosocial outcomes, such as fatigue. In this dissertation, the mediating part of the model was tested. As depicted in Figure 6.1, this model includes external resources, personality, stressors, appraisal, social support, and coping. Taylor and Aspinwall (1996) define external resources as resources which comprise aspects of the individual's environment, shaping the demands and affordances of the situation. In addition to mundane external resources, such as time and money, a diverse set of environmental conditions, ranging from the physical environment to social roles and other aspects of the individual's place in social aggregates, are viewed as external resources. External resources may determine the kinds of stressors to which one is exposed, but may also influence appraisal and coping. Similarly, personal resources may affect exposure to and disengagement from situations, as well as appraisal and coping. In addition, personal resources may influence the availability, mobilization, and maintenance of social support. Social support, in turn, may affect coping indirectly through appraisal processes and directly through the provision of information and functional assistance. Finally, the model suggests that the effects of personal and external resources, stressor, appraisal, and social support on psychosocial outcomes are mediated substantially by ways of coping with stress.

The debate about the conceptualization of fatigue and the incomplete knowledge about the predictors of fatigue have led to the following research questions:

(i) Is fatigue among working people a unidimensional construct, or should fatigue be divided in at least a mental and a physical component?;

(ii) Which working individuals report a high level of profound fatigue?

Design of the present study

Two samples participated in this study: a group of working people and a general sample. The first sample consisted of two subsamples. Participants of this first subsample (n = 765 at the first measurement; n = 351 two years later) lived equally spread over the Dutch regions. They were recruited through random digit dialing. All selected respondents had a paid job for at least 20 hours per week. They were asked in the first test booklet to complete a number of questionnaires as part of a longitudinal study, consisting of five measurement points in two years. A smaller group of 111 respondents, who worked at an occupational health service, formed the second subsample. The latter subsample filled out only parts of the test battery that the first subsample was given. As a consequence, this subsample was only combined with the first subsample in the study reported in chapter 2. The first and second subsample of the working participants did not differ on any fatigue variable used, except on emotional exhaustion. In the total working sample, 452 men and 412 women participated at baseline (total response = 48%). Three hundred and twenty-five individuals returned a completed test booklet at all measurement points; 173 men and 150 women. Gender was unknown for two respondents. This sample could be considered representative, as no significant differences were found with regard to personality, temperament, and fatigue between individuals who only participated at the first measurement point and persons who were also involved in the last measurement point, two years later. Lower educated people were somewhat underrepresented and highly educated persons slightly overrepresented in the working sample. However, this is not uncommon for a survey study (Saris, 1988). With respect to gender, marital status, and age, the sample is representative for the Dutch working population (CBS, 1999). The data collection was performed with support from NWO, the Netherlands Organization for Scientific Research, within the framework of the nationwide project 'Fatigue at Work' (Grant: 580-02-204) and from WORC, the research institute of the Faculty of Social Sciences of Tilburg University.

Participants in the second sample (n = 1,893) completed a computer-administered questionnaire. CentERdata, an institute of Tilburg University specialized in data collection via the internet, supplied the data of this sample. This group was studied in order to test the psychometric qualities of the Fatigue Assessment Scale, the questionnaire developed in this study. All respondents were members of an internet-based telepanel. Every week a questionnaire from the telepanel's internet site was administered to this panel. The sample

consisted of 1,128 men and 765 women. Fifty-seven percent of this sample had a paid job. This sample is included in chapter 2.

Overview of this dissertation

Dimensionality of fatigue

In chapter 2, the results of two studies are presented. The goal of Study I was to examine the dimensionality of four frequently used fatigue questionnaires. The aims of Study II were to construct a new fatigue instrument, the FAS, and to explore its psychometric qualities. In this chapter, the extended working sample and the CentERdata samples were used. In the other chapters, only the data of the working sample were analyzed.

In chapter 3, the psychometric qualities of the FAS are further described. The scores on this scale were compared with (*i*) the four fatigue scales on which the FAS is based, measured two years after the start of the study, and (*ii*) a depression questionnaire (measured two years later) and an emotional stability scale, measured at baseline. In this way, internal consistency, convergent validity, and divergent validity were studied. Gender bias was tested in an exploratory way.

Predictors of fatigue

Chapter 4 is also based on two measurement points. Aim of this study was to examine whether temperament, personality, and a Type A behavior pattern could predict chronic fatigue. Analyses were performed with and without taking into account fatigue as measured at baseline. The data of the total sample as well as data for men and women separately were explored.

In chapter 5, the model of Taylor and Aspinwall (1996) is addressed. The main objective of this study was to test this model. Data concerning demographic variables, personality and temperament, work pressure and workload, perceived social support, perceived stress, coping, and emotional exhaustion, all measured at baseline, were included. Emotional exhaustion was the dependent variable in the model. In chapter 6, the model was tested in a similar way. However, instead of using only emotional exhaustion as the outcome variable, the FAS, a more general fatigue measure, was also employed. Moreover, fatigue measured two years later was included in the analyses in order to shed some light on which factors can predict fatigue over time. In this part of the study, a prospective design was applied.

Finally, chapter 7 provides a summary and a general discussion. It offers a description of the theoretical and practical implications of the present outcomes.

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Chapter 2

Examination of the dimensionality of fatigue: The construction of the Fatigue Assessment Scale (FAS)[•]

[•] Michielsen, H.J., De Vries, J., Van Heck, G.L., Van de Vijver, A.J.R., & Sijtsma, K. (submitted). Examination of the dimensionality of fatigue: The construction of the Fatigue Assessment Scale (FAS).

Introduction

This chapter reports two studies. The goal of Study I was to examine the dimensionality of existing fatigue scales. The aims of Study II were to construct a new self-report fatigue instrument and to examine its psychometric qualities. In Study I, respondents, who worked at least 20 hours per week, completed four fatigue questionnaires. The 10-item Fatigue Assessment Scale (FAS) was constructed in Study II and administered to a general sample.

Profound fatigue is a common complaint in medical practice (e.g., Bensing, Hulsman, & Schreurs, 1996). It is a symptom of many chronic physical diseases, like multiple sclerosis, cancer, Parkinson's disease, rheumatoid arthritis, and psychiatric disorders such as depression (Lewis & Wessely, 1992). In some diseases, fatigue is even the core symptom as, for example, in the Chronic Fatigue Syndrome (CFS). Moreover, fatigue can also play a role in temporary physical conditions such as pregnancy and infections. Finally, apart from being an indicator of disease, fatigue may also result from the use of medication or medical treatments, such as chemotherapy.

Although fatigue, along with headache, is the most frequently reported symptom in general practice (e.g., Foets & Sixma, 1991), not much systematic theorizing has taken place yet. However, some authors (e.g., Bartley & Chute, 1947; Smets et al., 1995; Vercoulen et al., 1998) developed a theory about the onset and perpetuation of fatigue. For example, Vercoulen et al. (1998) have focussed on the persistence of fatigue in CFS-patients. In their model of fatigue, attribution effects, level of physical activity, sense of control over symptoms, and focusing on bodily symptoms are central. As an alternative, a biopsychosocial approach was proposed as the most suitable way of examining fatigue (e.g., David et al., 1990; Lewis et al., 1992; Ware, 1993). The view that fatigue is related to various types of extreme stimulation involving low as well as high physical and/or information-processing demands (De Rijk, Schreurs, & Bensing, 1999), and the belief that fatigue links with symptom perception models (e.g., Pennebaker, 1982) are promising steps towards further theorizing (Finkelman, 1994).

In spite of the efforts to develop such frameworks, in most current fatigue studies the definition of the construct is poorly described (Barofsky & Legro, 1991). Nevertheless, fatigue is often divided into physical and mental components. Physical fatigue refers to (i) an acutely painful phenomenon which arises in overstressed muscles after exercise (Grandjean, 1979), and (ii) a symptom which emerges in circumstances such as prolonged physical exertion without sufficient rest or sleep disturbances due to medication (Rockwell & Burr, 1977). According to Meijman (1997), mental fatigue reflects reduced psychological capacity and less willingness to act adequately, due to earlier mental or physical effort. As a consequence, there are reduced

competence and willingness to develop or maintain goal-directed behavior aimed at adequate performances (Meijman & Schaufeli, 1996). Chalder et al. (1993) supported this distinction. Gaillard (1996) assumed fundamental distinctions between physical and mental fatigue. Be that as it may, it is difficult to separate these elements, due to complex interactions between physical and mental elements in task and job demands and consequences of effort.

There is no consensus about the value of the physical versus mental contrast. Before the 1990s, fatigue was seen as a unidimensional construct (e.g., Lee, Hicks, & Nino Murcia, 1991). Thereafter, mainly due to the fast growing body of studies on CFS, fatigue gained increased attention (Alberts, Vercoulen, & Bleijenberg, 2001). Nowadays, many authors conceive fatigue as a multidimensional construct (e.g., Gawron, French, & Funke, 2001; Smets et al., 1995). For instance, Smets et al. (1995) discerned five components: general fatigue, physical fatigue, reduction in activity, reduction in motivation, and mental (cognitive) fatigue. Others, for instance Schwartz, Jandorf, and Krupp (1993), developed three-dimensional scales. These authors distinguished the following fatigue dimensions: situation specific fatigue, consequences of fatigue, and response to rest/sleep.

Support for the multidimensionality has been obtained predominantly through factor analyses and the employment of the eigenvalue exceeding unity criterion (Kaiser, 1960) for determining the number of factors (e.g., Chalder et al., 1993; Vercoulen et al., 1994; Vertommen & Leyssen, 1988). However, this criterion often overestimates the number of dimensions by causing factors to split into bloated specifics (e.g., Kline, 1987; Rummel, 1970). In contrast, a few studies (e.g., Smets et al., 1995) have used confirmatory factor analysis to demonstrate multidimensionality. Interestingly, when Smets et al. (1995) tested both a five-factor solution and a four-factor solution, an equal goodness of fit was found. Whether a one-factor solution would fit the data equally well was not examined.

Some researchers expressed serious doubts regarding the putative superiority of a multidimensional structure of fatigue. In an explorative study of the structure of fatigue, Studts, De Leeuw, and Carlson (2001) failed to find support for distinguishing cognitive, emotional, somatic, and general aspects of fatigue. Åhsberg (2000) initially divided perceived fatigue after work in lack of energy, physical exertion, physical discomfort, lack of motivation, and sleepiness. However, she noted that, while distinguishing these five dimensions, lack of energy appeared to be a general latent factor, that represented a large proportion of the common variance. Taken these recent studies into account, it seems safe to conclude that the dimensionality of fatigue has not been convincingly demonstrated.

On account of the ongoing discussion about the definition and nature of fatigue, there is no standard way to measure the construct. Fatigue can be assessed using *objective* measures such as reaction time or number of errors (Åkerstedt, 1990), and *subjective* methods such as diaries (e.g., Vercoulen et al., 1996), interviews (e.g., Meesters & Appels, 1996), and questionnaires (e.g., Chalder et al., 1993). The application of questionnaires is a common procedure in large-scale studies. Recently, several questionnaires for measuring fatigue were reviewed by Friedberg and Jason (1998) and Alberts et al. (2001). These reviews demonstrated that most fatigue questionnaires were developed for specific patient groups, such as patients with cancer, multiple sclerosis, and CFS (e.g., Fisk et al., 1994; Ray, Weir, Phillips, & Cullen, 1992; Smets, 1997; Vercoulen et al., 1994), or for ill persons in general (Alberts et al., 1997; Krupp et al., 1989; Schwartz et al., 1993). Little is known about the applicability of these questionnaires in healthy populations. One of the few questionnaires developed for use in hospital populations as well as community populations is the Fatigue Scale (FS; Chalder et al., 1993). The two reviews also reveal that multidimensional fatigue scales are seen as more comprehensive, and hence as more adequate for providing a complete description of an individual's fatigue experience (Alberts et al., 2001). The rationale for such a view is that these scales take into consideration that persons with the same overall score nevertheless may differ substantially in their experience (Smets et al., 1995). However, it is admitted that disadvantages of multidimensional scales are their length and, not seldom, the contamination of fatigue with somatic illness. Furthermore, the overviews of fatigue assessment instruments show that fatigue is also frequently measured using subscales of broader measures. The Emotional Exhaustion scale in burnout questionnaires (e.g., MBI; Maslach & Jackson, 1996) and the Energy and Fatigue subscale of the World Health Organization Quality of Life assessment instrument (WHOQOL-100; WHOQOL group, 1995) are good examples of this approach.

Objectives of the present studies

The aim of Study I was to examine the dimensionality of four fatigue scales in a healthy population, in particular a sample that is representative of the working population. These four fatigue scales are reliable, valid, and frequently employed. In Study II, a new fatigue instrument was administered to a representative Dutch sample in order to examine its psychometric qualities and dimensionality.

Study I

Method

Participants

Sample 1 was used to test the dimensionality of fatigue. Participants (n = 876) lived equally spread over the Dutch regions and were obtained via random telephone calls. All selected respondents worked at least 20 hours per week, and agreed to complete a number of questionnaires as part of a longitudinal study. In total, 452 men (M = 41.44 years, SD = 9.27, range 20-63 years) and 412 women (M = 39.01 years, SD = 9.76, range 18-65) participated in this study. Gender was unknown for 12 respondents (total response = 48%). Of the respondents 27% (n = 234) were single, and 638 persons (73%) were married or lived together with a partner. Forty-six percent (n = 399) had a college education. Lower educated people were somewhat underrepresented and highly educated persons were slightly overrepresented in this sample. However, this is not uncommon for this kind of study (Saris, 1988). The sample is representative for the Dutch working population (CBS, 1999), with respect to gender, marital status, and age.

Measures

Sample 1 completed four fatigue scales: the Checklist Individual Strength (CIS; Vercoulen et al., 1999), the Emotional Exhaustion subscale (EE scale) from the Dutch version of the Maslach Burnout Inventory (MBI, Maslach & Jackson, 1986; MBI-NL; Schaufeli & Van Dierendonck, 1994), the Energy and Fatigue subscale from the World Health Organization Quality of Life assessment instrument (WHOQOL-EF; WHOQOL group 1995, Dutch version De Vries & Van Heck, 1995), and the Fatigue Scale (FS; Chalder et al., 1993; Dutch translation by De Vries, 1998).

The CIS consists of 20 statements and provides a total fatigue score, and scores for four components of fatigue: Subjective Experience of Fatigue (SEF; 8 items), Reduced Concentration (CON; 5 items), Reduced Motivation (MOT; 4 items), and Reduced Physical Activity level (PA; 3 items). Respondents use a 7-point rating scale (1, *yes, that is true*, to 7, *no, that is not true*). The reliability coefficient, estimated by lowerbound Cronbach's alpha, for the total score was .90; and for the subscales .88, .92, .83, and .87, respectively (Vercoulen et al., 1999). The CIS showed different scores for CFS-patients, MS-patients, and patients with abdominal pain. Moreover, the subscales of the CIS correlated significantly with comparable scales (Vercoulen et al., 1999). Although the CIS

was developed for CFS-patients, the questionnaire is claimed to be also appropriate for healthy populations (Beurskens et al., 2000).

The MBI-EE scale comprises five items, each with a 7-point rating scale ranging from 1, *never*, to 7, *always*. The scale has well-established validity and a high reliability (coefficient alpha = .83) (Schaufeli & Van Dierendonck, 1994).

The EF subscale of the WHOQOL-100 contains four items with a 5-point Likert scale (1, *never*, to 5, *always*); two positively phrased items using the word 'energy' and two negatively phrased items using the word 'fatigue'. Its Cronbach's alpha was .95 and the Energy and Fatigue scale correlated highly with the Fatigue and Vigor subscales of the POMS (De Vries & Van Heck, 1997).

The 11-item FS distinguishes between Mental Fatigue (4 items), describing cognitive difficulties, and Physical Fatigue (7 items). This measure uses a 5-point rating scale (1, never, to 5, always). It is also possible to calculate a total fatigue score. The scale was found to be both reliable and valid (Chalder et al., 1993) and showed sensitivity to treatment changes (Deale, Chalder, Marks, Wessely, 1997). Cronbach's alpha for the entire measure was .89; and for the subscales .82 and .85, respectively (Chalder et al., 1993).

Statistical procedure

Means, standard deviations, and Cronbach's alpha were calculated for each (sub)scale. The associations among the total scores of the eight (sub)scales were calculated using Pearson correlations. The dimensionality of the four fatigue scales was studied at the item level by conducting exploratory factor analyses (principal components analyses), followed by Mokken scale analyses (Mokken & Lewis, 1982; Sijtsma, 1998; Sijtsma & Molenaar, in press). Both exploratory factor analysis and Mokken scale analysis were also conducted using the complete set of items ($k = 40$) of the four scales. In addition, factor analyses were conducted (i) at the (sub)scale level of the four questionnaires, and (ii) with the total scores of the four questionnaires. For Mokken Scale Analysis, one can only use single item scores, not sum scores. Therefore, an analysis of the total scores of the (sub)scales coold not be performed using this procedure.

The scree plot (Cattell, 1966) of the exploratory factor analyses was examined to scrutinize the dimensionality of the fatigue scales. Mokken Scale Analysis was applied because factor analysis is vulnerable to the influence of differences in the items' frequency distributions (Nunnally, 1978), which may produce artifactual 'difficulty factors'. Mokken scale analysis is based on the scalability coefficient for item pairs, H (Molenaar, 1997), that equals the ratio of the items' covariance and their maximum covariance given the items'

univariate frequency distributions. In this way, the effect of different frequency distributions is eliminated. Thus, Mokken scale analysis does not produce artifacts due to differences in frequency distributions.

The computer program Mokken Scale analysis for Polytomous items (MSP; Molenaar & Sijtsma, 2000) uses cluster analysis for selecting unidimensional subscales from a larger set of items. Each subscale is selected to optimize the *scale H* for the subset of items selected (the *scale H* is a weighted mean of the *item pair H*s, as discussed before). For reliably ordering persons on a (sub)scale, the scale *H* has to be at least .3 (default in MSP; Molenaar & Sijtsma, 2000). However, higher values are desirable because they indicate higher measurement reliability, and a *scale H* > .5 is interpreted as indicative of a strong scale. The quality of individual items as contributors to reliable person ordering is guaranteed by only admitting items to a scale if the item scalability coefficient (*item H*; a weighted mean of all *item pairH*s in which the studied item figures) is at least .3 (Molenaar & Sijtsma, 2000). MSP is one of the few programs for item response theory analysis (Van der Linden & Hambleton, 1997) that has an automated item selection procedure.

Results

Means, standard deviations and Cronbach's alphas of the fatigue questionnaires are shown in Table 2.1. Inspection of these results reveals that no excessive high or low scores were found in this sample.

The scree plots (Cattell, 1966) based on exploratory factor analyses revealed that MBI-EE, WHOQOL-EF, and FS were each based on one factor (see Figure 2.1 for the scree plots). The single factors extracted from the separate scales explained between 40% (FS) and 69% (WHOQOL-EF) of the (observed) variance. The scree plot of the CIS suggested the extraction of either one factor or four factors. Mokken Scale Analyses, on the other hand, showed that each questionnaire formed one reliable scale (Table 2.2). Therefore, it was conluded that the CIS is also best conceived of as a unidimensional scale. The factor structure and the scalability, using coefficient *H* of the four questionnaires, were explored separately.

Exploratory factor analysis at the item level, using the total set of 40 items of the four scales together, yielded one factor, that explained 42% of the total variance. Based on recommendations by Hemker, Sijtsma, and Molenaar (1995), MSP was used with scalability lowerbounds of .0, .3, .4, and .5, respectively, for item selection using all 40 items. Following these authors' rules of thumb for interpreting the results from applying the cluster analysis four times using different lower bounds, it could be concluded that 37 items formed one reliable scale with *scale H* = .47 (Table 2.2). Values between .4 and .5 are usually interpreted as 'medium' results. Two CIS items (numbers 5 and

7) and one FS item (number 11) measured another trait than the 37 selected items. Table 2.2 shows that the *item Hs* varied from .34 to .56, meaning that items contribute differently to the reliability of the person ordering based on all 37 items.

Table 2.1
Mean, Standard Deviation, and Reliability Coefficient of the (Sub)scales

(Sub)scale	*M*	*SD*	Alpha
CIS Total	51.25	23.70	.94
CIS-Subjective Experience of Fatigue	22.59	22.59	.93
CIS-Reduction of Concentration	12.13	6.87	.88
CIS-Reduction of Motivation	10.04	5.25	.82
CIS-Reduction in Level of Physical Activity	6.60	4.16	.84
MBI-Emotional Exhaustion	2.57	1.12	.87
WHOQOL-Energy and Fatigue	10.08	2.75	.85
Fatigue Scale Total	19.80	5.86	.87
FS-Mental Fatigue	6.90	2.15	.76
FS-Physical Fatigue	12.90	4.45	.85

Note. CIS = Checklist Individual Strength, MBI = Maslach Burnout Inventory; WHOQOL = World Health Organization Quality of Life assessment instrument; FS = Fatigue Scale.

Table 2.2
Results of Mokken Scale Analyses per Scale (lowerbound = .3)

Scale	*K*	*n*	*H*	Min(*itemH*)-max(*itemH*)
Checklist Individual Strength	20	849	.47	.31 - .56
MBI-Emotional Exhaustion	5	872	.59	.51 - .66
WHOQOL-Energy + Fatigue	4	857	.70	.68 - .73
Fatigue Scale	10 (Item11 removed)	872	.48	.37 - .56
Complete set of 40 items	37	832	.47	.34 - .56
Fatigue Assessment Scale	10	1835	.47	.37 - .55

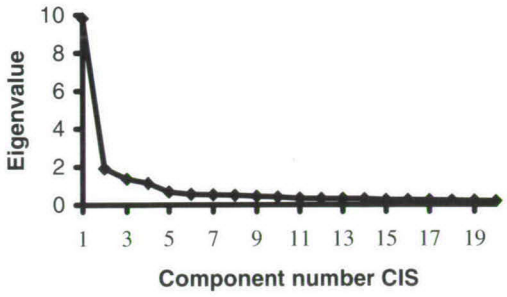
Note. MBI = Maslach Burnout Inventory; WHOQOL = World Health Organization Quality of Life assessment instrument; *k* = number of items; *n* = number of subjects; *H* = scalability coefficient; *itemH* = item scalability coefficient.

Table 2.3

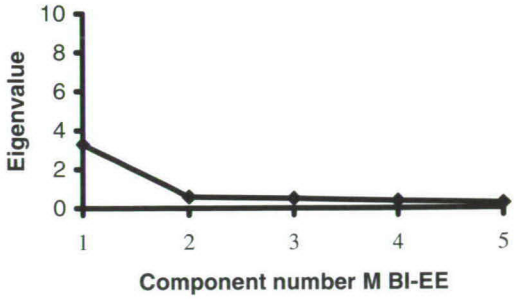
Correlations among the (Sub)scales

(Sub)scale	1	2	3	4	5	6	7	8
1. CIS-Subjective Experience of Fatigue	--	.58	.65	.49	.60	.78	.43	.78
2. CIS-Reduction of Concentration		--	.55	.54	.48	.51	.66	.54
3. CIS-Reduction of Motivation			--	.55	.49	.59	.44	.58
4. CIS-Reduction in Level of Physical Activity				--	.34	.48	.42	.44
5. MBI-Emotional Exhaustion					--	.62	.46	.63
6. WHOQOL-Energy and Fatigue						--	.44	.76
7. FS-Mental Fatigue							--	.54
8. FS-Physical Fatigue								--

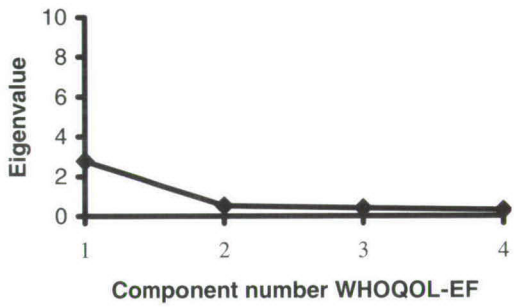
Note. All *p*s < .001. CIS = Checklist Individual Strength, MBI = Maslach Burnout Inventory; WHOQOL = World Health Organization Quality of Life assessment instrument; FS = Fatigue Scale.



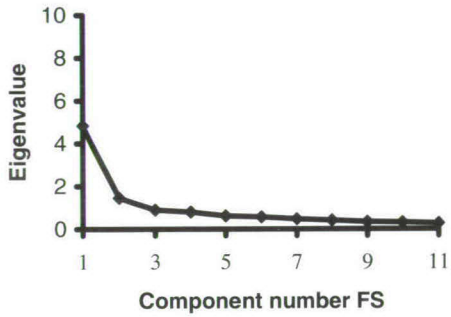
CIS = Checklist Individual Strength



MBI-EE = Emotional Exhaustion scale from the Maslach Burnout Inventory



WHOQOL-EF = Energy and Fatigue scale from the World Health Organization Quality of Life assessment instrument



FS = Fatigue Scale

Figure 2.1. Scree plot of the item-level factor analysis on the four fatigue questionnaires.

The correlations between the scores of the eight (sub)scales were moderate to strong, ranging from .34 to .78 (all *p*s < .001); see Table 2.3. The Cronbach's alpha of the used (sub)scales was satisfactory, with the alpha's ranging from .76 (FS-Mental Fatigue) to .94 (CIS Total). The scores of the four subscales of the CIS, the two subscales of the FS, the WHOQOL-EF, and the MBI-EE were subjected to a factor analysis, and the scree plot (Cattell, 1966) indicated as one factor. This factor explained 61% of the variance. Separate analyses, not reported here, revealed that the same strong one-factor solution was found, when the sample was split according to gender and age. The same results were also obtained when only the total scores of the four scales, ignoring subscales, were used (59% of the variance was explained).

To summarize, factor analyses consistently revealed one factor, both at the item as well as the (sub)scale level. Neither gender nor age groups influenced these outcomes. Mokken Scale Analyses also yielded a one-scale solution. So, the four questionnaires used in this study all seem to measure *one* construct: fatigue.

Discussion

Exploratory factor analyses for the four fatigue questionnaires consistently indicated one factor both at the item level and at the (sub)scale level. Mokken Scale analyses also resulted in a one-scale solution. So, the four questionnaires used in this study all seem to measure one unidimensional construct. The unidimensionality of the construct fatigue allows for the construction of a new, short, and easy to administer scale.

Study II

The aim of Study II was twofold: to construct a new self-report fatigue instrument and subsequently to test its content validity and reliability.

Method

Participants

Two large respondent groups participated in Study II. Sample 1 was used to construct the new fatigue scale; Sample 2 was the validation group. Sample 1 (n = 876) was described above. Participants in Sample 2 (n = 1,893), which was a representative sample of the Dutch population, completed a computer-administered questionnaire. The respondents of the latter sample were all members of an internet-based telepanel. Every week a questionnaire, which was downloaded from the telepanel's internet site, was administered to this panel of around approximately 2000 households. The sample consisted of 1,128 men (age: M = 46.37 years, SD = 15.44, range 16-87 years) and 765 women (age: M = 42.17 years, SD = 14.66, range 16-87 years). Fifty-seven percent of the total group had a paid job. Twenty-four percent (n = 454) had a college education.

Procedure

First, items were removed, which could only be completed by specific groups (e.g., workers), items asking two things at the same time, or items which had a low face validity. A semantical procedure was followed to select items from

the remaining item pool. The WHOQOL Group (1998) also used this method. Two reasons exist for selecting items for the FAS on a semantical basis. The FAS is constructed to represent all semantical fatigue categories. A purely statistical selection of items would not likely cover all kinds of different experiences of being tired. For instance, this could have led to a set of items that was only related to physical fatigue. Secondly, a statistical selection would be based on data of working respondents. It might be possible that a different statistical selection would be obtained when data of patients were analyzed. The generalizability of the selection would be questionable in this way. Thus, a content analysis of the questions was done in order to identify semantically equivalent questions. The number of questions was hereby reduced. Questions with limited face validity were deleted. The items were then grouped into categories reflecting a similar type of fatigue. Judgements by the first two authors regarding semantical equivalence and categorization were based on consensual agreement. After the semantical analysis, per semantical group the item with the highest factor loading on the one-factor solution of the 40 items was chosen. In addition, an extra item concerning mental exhaustion was included. The reason to include this particular item was to ensure that the two domains of fatigue, which are most often used (mental and physical fatigue), were asked about in a balanced way. Subsequently, the new 10-item scale, the Fatigue Assessment Scale (FAS), was presented to Sample 2. For examining the psychometric qualities of the FAS, Cronbach's alpha was calculated, and factor analysis and Mokken scale analysis were conducted at the item level.

Results

Twelve of the forty items were removed before the semantical analysis. Among these were five work-related items (e.g., MBI 'I feel used up at the end of the workday'), a question asking about two things at the same time (FS 'Do you feel sleepy or drowsy?'), and items which were not strongly related to fatigue (FS 'Do you make slips of the tongue when speaking?'). There appeared to be nine semantical groups of items: (i) being bothered by fatigue (two items; e.g., 'Do you have problems with tiredness' FS1), (ii) feeling physically tired (nine items; e.g., 'Physically, I feel exhausted' CIS4), (iii) speed of getting tired (two items; e.g., 'I get tired very quickly' CIS16), (iv) level of energy (three items, e.g., 'Are you lacking in energy' FS6), (v) concentration (five items; e.g., 'I can concentrate well' CIS11), (vi) inability of thinking clearly (two items; e.g., 'Do you have problems thinking clearly' FS10), (vii) quantity of daily activities (three items; e.g., 'I do quite a lot within a day' CIS7), (viii) problems to start things (one item; 'Do you have problems starting things' FS4), and (ix) feeling no desire to do anything (1 item; 'I feel no desire to do anything' CIS18). Subsequently, from each semantical group the item was selected with the

highest factor loading of the semantical group on the factor that was identified in the 40-item factor analysis, performed in Study I. As explained above, an extra item concerning mental fatigue was included in the test population. Thus, the FAS consists of ten items (see Appendix). A 5-point Likert frequency rating scale, ranging from *never* to *always*, was chosen to accompany the items.

Cronbach's alpha of the FAS was .87. Factor analysis indicated that the ten items measured one factor, explaining 48% of the variance (see Table 2.4 and Figure 2.2), also when men and women or age groups were separated. Based on item selection using several lower bound values for H, Mokken scale analyses revealed that the ten items formed one reliable scale ($H = .47$). Individual *itemH*s varied from .37 to .55 (Table 2.2). Also here, our conclusion is that the 10 items measure the same trait.

Discussion

The four fatigue questionnaires used in Study I all appeared to be unidimensional. Consequently, fatigue is assumed to be one construct. A new, 10-item fatigue measure, the Fatigue Assessment Scale (FAS), was constructed, based on a semantical analysis of the forty items of the four questionnaires, employed in Study I. The FAS has promising psychometric qualities.

The findings in Study I regarding the dimensionality of fatigue are in line with the ideas of Lewis and Wessely (1992), who conceived of fatigue as a continuum. However, they assumed that, when fatigue is measured with emotional, behavioral, and cognitive components, it is likely that the concept is multidimensional. The latter view also reflects the ideas of Smets et al. (1995) and Gawron et al. (2001), who argued that, despite the absense of a definition of fatigue, there is agreement that fatigue is a multidimensional concept. The present study does not support this position. For instance, the CIS, which is supposed to measure four separate dimensions of fatigue in patient populations as well as in the population of workers, showed a clear unidimensional structure in our sample. In relation to this, it is quite remarkable that the cut-off point for the multidimensional CIS, to indicate a fatigue level which shows that someone is at risk for sick leave or work disability, is fixed on the total score (Bültmann et al., 2000), and is not a combination of cut-off points for the four dimensions. This seems to support our findings.

A possible reason why the results of Study I do not support multidimensionality could be that, compared with groups of predominantly healthy persons, patients focus more on symptoms and, therefore, distinguish more aspects of fatigue. Maybe fatigue is unidimensional for non-patient groups and multidimensional for patients. However, Studts et al. (2001) found no difference in the dimensionality of fatigue between chronic pain patients

and healthy controls. Hopefully, the outcomes of Study I will reopen the discussion about the dimensionality of fatigue.

Table 2.4
Factor Loadings of the FAS-items, ordered by Size

FAS-item	Fatigue
I get tired very quickly	.78
Physically, I feel exhausted	.77
I am bothered by fatigue	.76
Mentally, I feel exhausted	.74
I feel no desire to do anything	.67
I don't do much during the day	.65
I have problems to think clearly	.65
I have problems to start things	.64
I have enough energy for everyday life *	.63
When I am doing something, I can concentrate quite well *	.57

* = recoded item.

For practical reasons, it was impossible to include all relevant fatigue questionnaires in Study I. Therefore, a selection of questionnaires had to be made. The four instruments that were chosen are reliable, valid, and frequently used in Western countries. To our knowledge, this selection of measures forms a good representation of the available unidimensional and multidimensional fatigue questionnaires. The use of other assessment instruments might have led to different results. It is interesting to note, however, that this study is not the only one, which found a one-factorial solution using purportedly multidimensional instruments. Studts et al. (2001) also found a one-factor solution in data obtained with several other ostensibly multidimensional fatigue questionnaires. In conclusion, fatigue seems to be a unidimensional construct.

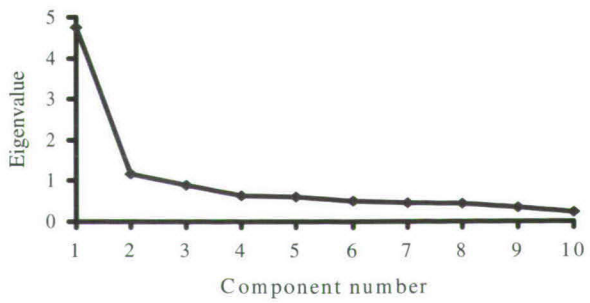


Figure 2.2. Scree plot of the factor analysis on the Fatigue Assessment Scale (FAS).

In Study II, a new, 10-item fatigue scale, the FAS, was constructed, based on semantical and empirical considerations. Subsequently, this instrument was tested in a large sample, representative for the Dutch population. The reliability of the FAS was satisfactory. In addition, it could be shown that the FAS measures one construct, namely *fatigue*. This outcome was also obtained when separate analyses were conducted on subgroups (gender or different age groups). Similarly, Mokken scale analyses revealed that the ten FAS-items formed one reliable scale. In sum, the FAS has shown good psychometric qualities in a representative Dutch population.

The test sample in this study was a representative sample from the Dutch population. Not much can be said about the applicability to other groups, for example, patients suffering from a lung disease, cancer patients, and so on. In future research it would be interesting to compare FAS-scores in healthy working people, working but ill people, and ill people who cannot work due to their disease. Furthermore, it could be argued that the difference in questionnaire administration (paper-and-pencil versus computerized) could lead to different response patterns. However, Mitchell, Klein, and Balloun (1996) found that mode of administration, paper-and-pencil or computerized, did not impact findings. In addition, in a study by Gaudron (2000), computer anxiety did not artificially modify scores during computer administration.

In conclusion, a 10-item unidimensional fatigue questionnaire (FAS) was developed, which is short and easy to use. Its psychometric qualities are promising, but require further examination in future research.

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Chapter 3

Psychometric qualities of a brief self-rated fatigue measure:

The Fatigue Assessment Scale (FAS)[•]

[•] Michielsen, H.J., De Vries, J., & Van Heck, G.L. (in press). Psychometric qualities of a brief self-rated fatigue measure: The Fatigue Assessment Scale (FAS). *Journal of Psychosomatic Research.*

Introduction

The main aim of the study described in this chapter was to scrutinize the dimensionality and psychometric qualities of the Fatigue Assessment Scale (FAS). The participants completed the FAS, four related fatigue measures, a depression questionnaire, and an emotional stability scale. The internal consistency and the convergent and divergent validity of the FAS were examined. Gender bias in the FAS-items was examined exploratively.

Fatigue is a non-specific symptom that is highly prevalent among patients in primary health care (e.g., Bates et al., 1993; Bensing, Hulsman, & Schreurs, 1996; Foets & Sixma, 1991). It is an important component of many physical diseases and psychiatric disorders. For instance, fatigue is one of the most pervasive symptoms experienced by patients suffering from chronic diseases like cancer (Okuyama et al., 2000) and multiple sclerosis (Krupp, LaRocca, Muir-Nash, & Steinberg, 1989). Hence, several, often multidimensional, fatigue questionnaires have been developed for specific populations such as cancer patients (Hann et al., 1998; Okuyama et al., 2000; Piper et al., 1998) and multiple sclerosis patients (Krupp et al., 1989). Fatigue also plays a substantial role in the healthy population. Severe fatigue during a relatively long period can lead to sick leave and work disability. For example, in the Netherlands, over one-third of the recipients of work disability benefit is occupationally disabled on mental grounds (Houtman, 1997). The majority of these individuals suffers from chronic job stress and burnout. The most characteristic component of burnout (Schaufeli & Van Dierendonck, 1994) is emotional exhaustion, a fatigue related concept. Several measures of fatigue are claimed to be useful in patient populations as well as in healthy individuals (Chalder et al., 1993; Smets, Garssen, Bonke, & De Haes, 1995a).

Due to the fast growing number of persons suffering from chronic fatigue syndrome in the nineties, interest in fatigue has expanded considerably. This has led to an intense debate about the conceptualization of fatigue, as well as its determinants, manifestations, and direct and indirect consequences. One vehemently debated issue is the dimensionality of fatigue. Nowadays, there is a tendency to claim that fatigue is best conceived of as a multidimensional construct (Åhsberg, 2000; Smets, Garssen, Bonke, Vercoulen, & De Haes, 1995b). However, so far, there is no convincing evidence for this view (Michielsen, De Vries, Van Heck, Van de Vijver, & Sijtsma, 2002). Statements regarding the multidimensionality of fatigue are based predominantly on the outcomes of factor analyses using the criterion of eigenvalues greater than 1.0 as indicator in order to choose the number of factors (e.g., Chalder et al., 1993; Vercoulen et al., 1994; Vertommen & Leyssen, 1988). However, this particular criterion greatly overestimates the number of factors and often causes factors to split into bloated specifics (e.g., Kline, 1987; Rummel, 1970). Other studies

have used confirmatory factor analyses to examine the dimensionality of fatigue (e.g., Åhsberg, 2000; Smets et al., 1995a) and claim a good fit for a multidimensional model. Smets and co-workers (1995a), however, did not examine whether a one-factor solution would have fit their data equally well. Furthermore, Åhsberg (2000) pointed to lack of energy as a general latent factor that represented much of the common variance in items also assessing physical exertion, physical discomfort, lack of motivation, and sleepiness. In line with these investigations, two recent studies examined the dimensionality of fatigue by factor analyzing broad sets of multidimensional fatigue questionnaires (Michielsen et al., 2002; Studts, De Leeuw, & Carlson, 2001). Neither exploratory factor analyses supported the differentiation of fatigue in cognitive, emotional, somatic, and general aspects of fatigue. Instead, clear one-factor solutions were found in a healthy population (Michielsen et al., 2002; Studts et al., 2001), as well as in a group of chronic pain patients (Studts et al., 2001).

Consequently, the Fatigue Assessment Scale (FAS), a measure of chronic fatigue, was developed (Michielsen et al., 2002). The initial item pool consisted of 40 items taken from four commonly used fatigue questionnaires: the Fatigue Scale (Chalder et al., 1993); the Checklist Individual Strength (Vercoulen, Alberts, & Bleijenberg, 1999), the Emotional Exhaustion subscale of the MBI-NL (Schaufeli & Van Dierendonck, 1994), and the Energy and Fatigue subscale of the WHOQOL-100 (WHOQOL-group, 1998). A semantical analysis (WHOQOL-group, 1998) was done in order to guide the selection of items from this item pool. Nine semantical groups were distinguished. One extra group was added, in order to have an even number of items representing mental fatigue and physical fatigue. The initial objective was not to develop a one-dimensional scale. At the end of the construction process, the FAS consisted of ten items (see Appendix). The first examination of the psychometric qualities of the FAS demonstrated high reliability. Furthermore, factor analysis revealed that the FAS measured one construct (Michielsen et al., 2002).

With regard to age differences in relation to chronic fatigue, the psychological literature is rather equivocal. Some researchers have found a sizeable effect of age on fatigue (Van Mens-Verhulst & Bensing, 1998), while others have reported only weak associations or even failed to observe any differences (Lewis & Wessely, 1992; Loge, Ekeberg, & Kaasa, 1998; Uttl, Graf, & Cosentino, 2000). For instance, David and co-workers (1990) have reported a positive, but low, correlation between age and fatigue, taking duration of fatigue into account.

In a comprehensive review article, Lewis and Wessely (1992) demonstrated convincingly that women report fatigue two to three times more often than men. Similar results were obtained in other studies (e.g., Bensing &

Schreurs, 1995). In constrast, a sizeable number of studies did not contain such outcomes (Cathébras, Robbins, Kirmayer, & Hayton, 1992; David et al., 1990). However, these inconsistent results can be caused by items with gender bias (Van de Vijver & Leung, 1997). An item is an unbiased measure of a theoretical construct (e.g., fatigue), if persons from different groups (e.g., males and females), who are equally tired, have the same average score. To date, no systematic research has been done to examine such bias in fatigue items. However, without checking item bias, it remains unclear whether results documenting gender differences in fatigue reflect true mean differences, gender item bias, or a combination of both.

The main aims of this study were to check the dimensionality of the FAS and to examine its reliability and validity. In order to study the validity of the FAS, four additional fatigue questionnaires, a depression scale, and an emotional stability scale were examined in relation to the FAS. The internal consistency of the FAS was expected to be high and the FAS was expected to be unidimensional. With regard to convergent validity, it was anticipated that the FAS would have high associations with related fatigue measures, even when correcting for overlap in items. In addition, it was expected that a factor analysis of the FAS and other fatigue questionnaires would show one factor. Concerning divergent validity, fatigue, depression, and emotional stability were assumed to be different constructs. In addition, gender and age differences were examined. Finally, gender item bias was explored.

Method

Participants

Randomly selected subjects received a telephone call and agreed to complete a number of questionnaires as part of a study with five measurement points. This prospective study focused on a population with a minimum employment of 50%. The data presented here were collected at the last measurement time point. Three hundred and fifty-one persons (55%) out of a group of 635 returned a completed test booklet; 183 men (M = 44.73 years; SD = 8.39) and 166 women (M = 43.22 years; SD = 9.50). The gender of two respondents was unknown.

Measures

The complete set of measures was sent by mail to the participants. The respondents were asked to complete five fatigue scales: the Fatigue Assessment Scale (FAS; Michielsen et al., 2002)), the Checklist Individual Strength-20 (CIS; Vercoulen et al., 1999)), the Emotional Exhaustion subscale (EE) from

the Dutch version of the Maslach Burnout Inventory (MBI-NL; Maslach & Jackson, 1986; Dutch version Schaufeli & Van Dierendonck, 1994), the Energy and Fatigue subscale (WHOQOL-EF) from the World Health Organization Quality of Life assessment instrument (WHOQOL-100; WHOQOL-group, 1998, Dutch version De Vries & Van Heck, 1997), and, finally, the Fatigue Scale (FS; Chalder et al., 1993; Dutch translation De Vries, 1998). In addition, the test booklet contained questionnaires to assess depression (CES-D; Radloff, 1977) and emotional stability (FFPI-ES, Hendriks, Hofstee, & De Raad, 1999).

The 10-item FAS is a new, unidimensional fatigue scale. Nine of the 10 items were selected from an initial item pool consisting of 40 items taken from four commonly used fatigue questionnaires: the Fatigue Scale (Chalder et al., 1993); the Checklist Individual Strength (Vercoulen et al., 1999), the Emotional Exhaustion subscale of the MBI-NL (Schaufeli & Van Dierendonck, 1994), and the Energy and Fatigue subscale of the WHOQOL-100 (WHOQOL-group, 1998). The instruction of the FAS is directed at how a person *usually* feels. The 5-point rating scale varies from 1, *never*, to 5, *always*. Cronbach's alpha of the FAS in the test population (n = 1835), representative for the Dutch population, was good (.87). Factor analysis showed that the FAS measured one construct. Mokken Scale Analysis (Mokken & Lewis, 1982; Sijtsma, 1998) also revealed that the FAS formed one reliable scale. The latter analysis is a method from item response theory (e.g., Van der Linden & Hambleton, 1997), which is very suitable for constructing scales for psychological constructs such as fatigue. To order persons reliable on a scale, the scalability coefficient H (Molenaar, 1997) has to be at least 0.3. However, higher values are desirable. In a previous study (Michielsen et al., 2002), the scalability coefficient H of the FAS was .47 (Michielsen et al., 2002).

The CIS consists of 20 items and provides a total score and scores for four subscales: Subjective Experience of Fatigue (SEF; 8 items), Reduction of Concentration (CON; 5 items), Reduction of Motivation (MOT; 4 items), and Reduced Level of Physical Activity (PA; 3 items). The items are scored on 7-point rating scales (1, *yes, that is true*, to 7, *no, that is not true*). The CIS appears to be reliable and valid for CFS-patients (Vercoulen et al., 1999). The reliability coefficient for the total score was .90; for the subscales it was .88, .92, .83, and .87, respectively (Vercoulen et al., 1999). The CIS yielded different scores for CFS, MS, and abdominal pain patients. The subscales of the CIS correlated significantly with comparable scales (Vercoulen et al., 1999). Although originally developed and validated for use with CFS-patients, it is claimed to be appropriate for use in healthy populations as well (Beurskens et al., 2000).

The EE scale from the MBI-NL has five items, each with a 7-point rating scale ranging from 1, *never*, to 7, *always*. The burnout component Emotional Exhaustion focusses on the feelings of being emotionally

overextended and drained of one's emotional resources. The psychometric properties are good (Schaufeli & Van Dierendonck, 1994). The internal consistency of the EE scale is .83, and the scale also has good construct validity (Schaufeli & Van Dierendonck, 1994).

The WHOQOL-100 is a multidimensionally conceptualized, generic, 100-item quality of life instrument (WHOQOL-group, 1998). The Energy and Fatigue subscale of the WHOQOL-100 (De Vries & Van Heck, 1997) contains four items with a 5-point response scale (1, *never*, to 5, *always*), two positively phrased items referring to 'energy' and two negatively phrased items containing the word 'fatigue'. The reliability and validity appear to be good (De Vries & Van Heck, 1997). Its Cronbach's alpha is .95 and the Energy and Fatigue scale correlates highly with the fatigue and vigor subscales of the POMS (De Vries & Van Heck, 1997).

The FS, with a 5-point rating scale (1, *never*, to 5, *always*), distinguishes Mental Fatigue (4 items) from Physical Fatigue (7 items). In addition, a total fatigue score can be calculated. The scale was found to be both reliable and valid (Chalder et al., 1993). The reliability coefficient for the total scale is .89; for the subscales, .82 and .85, respectively (Chalder et al., 1993).

The Center for Epidemiological Studies-Depression Scale (CES-D; Radloff, 1977) is a 20-item well-established self-report scale designed to measure the presence and degree of depression symptomatology in broad-based survey research populations. The rating scale ranges from 1, *seldom or never*, to 4, *(almost) always*. For the Dutch population, reliability and criterion validity are good (Beekman et al., 1997; De Rijk, Schreurs, & Bensing, 1999). Beekman and colleagues (1997) found excellent sensitivity for major depression in an older sample of the Dutch population. In addition, in a large Dutch patient population, Cronbach's alpha was .91 (De Rijk et al., 1999).

The Emotional Stability (FFPI-ES) scale of the Five Factor Personality Inventory (FFPI; Hendriks et al., 1999) consists of 20 items with a 5-point rating scale, ranging from 1, *never*, to 5, *always*. The scale is internally consistent (Cronbach's alpha = .85) and valid (Hendriks et al., 1999).

Statistical procedure

All analyses were done using SPSS 9.0 (SPSS, 1999). First, internal consistency analyses (Cronbach's alpha) were performed on all scales. To study the convergent validity, uncorrected associations as well as correlations adjusted for item overlap among the eight fatigue subcales and the FAS were calculated. Furthermore, a principal components analysis of the FAS and the eight subscales of the other fatigue questionnaires was performed. To examine the divergent validity of the FAS, Pearson correlations were determined and factor analyses were conducted concerning (i) fatigue and depression, and (ii)

fatigue and emotional stability. The scree plot of the principal components analysis was used to detect the number of factors. The extracted factors were varimax-rotated.

Possible gender and age-group differences on the FAS, and gender bias were exploratively tested at the item- and total score level, using conditional one-way analyses of variance and *t*-tests. To study age-group differences, four groups were formed with equal numbers of participants (age categories 21-37 yrs (n = 89; M = 32.61; SD = 3.98), 38-44 yrs (n = 90; M = 40.97; SD = 2.05), 45-51 yrs (n = 92; M = 47.97; SD = 2.09), and 52-65 yrs (n = 78; M = 55.88; SD = 3.44)). The conditional ANOVA and *t*-test were used for different reasons. In the conditional ANOVA, the item score is the dependent variable, while gender and score levels are the independent variables. By controlling for score level, the conditional ANOVA is able to detect gender bias. The one-sample *t*-test procedure tests whether the mean of a single variable differs from a specified constant. It is possible that the *t*-test will not find gender differences in the scores of a biased item (e.g., the mean of both women and men is 3.0). For example, due to gender bias, women are triggered to report more fatigue than they actually experience. In this example, women report more fatigue than they actually experience. The item mean of women without gender bias would be, for instance, 2. However, because of the gender bias, this gender difference is not reflected in the *t*-test, which tests the observed means of men and women. Therefore, it is necessary to perform both analyses.

Item bias analysis was performed using conditional ANOVA (Van de Vijver & Leung, 1997). Therefore, score level groups were formed containing at least 50 persons. When both the gender main effect and the interaction of score level and gender are nonsignificant, then an item is considered unbiased. A significant main effect of gender means that the item has uniform bias. Then, the difference in the means curve is consistently above or below zero. Uniform bias refers to influences of bias on scores that are more or less the same for all score levels. A significant interaction between score level and gender indicates that the difference between men and women is not invariant across score levels. In this case, the item has non-uniform bias. When some items are biased, a second total score has to be calculated by summing the unbiased items. Then, the difference between the means of the males and females is divided by the pooled standard deviation. This procedure has to be followed for both the normal total score and the revised total score with only unbiased items. When the difference in outome of these two procedures is negligible, the normal total score is valid.

Results

In Table 3.1, the means, standard deviations, and Cronbach's alpha coefficients of the various scales are presented. The internal consistency of the FAS was .90. Exploratory factor analysis of the FAS-items showed a unique factor supported by the scree plot. The factor loadings varied from .82 ('I am bothered by fatigue') to .55 ('When I am doing something, I can concentrate quite well'). The factor explained 53% of the variance. In addition, a factor analysis of the FAS Total and on the eight subscales of the other fatigue questionnaires also revealed one factor, explaining 67% of the variance (see Table 3.2). In the latter analysis, the FAS had the highest loading.

Pearson correlations between the FAS and the subscales of the other fatigue questionnaires were high and significant, ranging from .61 with the Reduced Level of Physical Activity scale of the CIS to .78 with the MBI-EE (all *p*s < .001). Table 3.3 presents these correlations. After controlling for overlap in items by removing the items used for the construction of the FAS, the correlations between the FAS and the various fatigue subscales were clearly similar, ranging from .60 (FAS versus the Reduced Level of Activity scale of the CIS) to .76 (FAS versus the CIS-SEF), all *p*s < .001 (see Table 3.3).

Table 3.1
Mean, Standard Deviation, and Reliability Coefficient of the (Sub)scales

(Sub)scale	*M*	*SD*	Alpha
CIS Total	53.75	25.58	.96
CIS-Subjective Experience of Fatigue	23.41	12.58	.96
CIS-Reduction of Concentration	12.73	7.24	.92
CIS-Reduction of Motivation	10.42	5.40	.87
CIS-Reduced Level of Physical Activity	7.22	4.42	.88
MBI-Emotional Exhaustion	2.49	1.11	.88
WHOQOL-Energy and Fatigue	10.18	2.91	.88
FS Total	19.95	5.81	.87
FS-Mental Fatigue	6.89	2.03	.72
FS-Physical Fatigue	13.11	4.39	.84
Fatigue Assessment Scale (FAS)	19.26	6.52	.90

Note. CIS = Checklist Individual Strength, MBI = Maslach Burnout Inventory; WHOQOL = World Health Organization Quality of Life assessment instrument; FS = Fatigue Scale.

Table 3.2
Factor Loadings of the FAS and the eight Subscales, sorted by Size

(Sub)scale and number of items	Fatigue
Fatigue Assessment Scale (FAS) (10 items)	.92
CIS-Subjective Experience of Fatigue (8 items)	.88
FS-Physical Fatigue (7 items)	.87
WHOQOL-Energy and Fatigue (4 items)	.84
CIS-Reduction of Concentration (5 items)	.81
MBI-Emotional Exhaustion (5 items)	.80
CIS-Reduction of Motivation (4 items)	.77
FS-Mental Fatigue (4 items)	.73
CIS-Reduced Level of Physical Activity (3 items)	.72

Note. CIS = Checklist Individual Strength, FS = Fatigue Scale, WHOQOL = World Health Organization Quality of Life assessment instrument, MBI = Maslach Burnout Inventory.

Concerning the divergent validity, the FAS correlated .65 ($p < .001$) with CES-D Total. The scree plot of the principal components analysis on the FAS-items and the CES-D-items showed a two-factor solution (Eigenvalues Factor I: 10.93; Factor II: 2.88; percentage explained variance: 46%). After varimax rotation, these factors clearly represented Fatigue and Depression. Four depression items had cross-loadings on the fatigue dimension (see Table 3.4). These items concerned the CES-D subscales Positive Affect ('I was happy', and 'I enjoyed life'), and Depressed Affect ('I felt depressed'). One CES-D item from the Somatic Retarded Activity scale ('I felt that everything I did was an effort'), had a higher factor loading on Fatigue than on Depression. Two CES-D-items ('I could not get ' going' ', and 'I had trouble keeping my mind on what I was doing') only loaded on the Fatigue factor. In addition, FAS Total correlated -.38 ($p < .001$) with Emotional Stability. The scree plot of a principal components analysis on the fatigue as well as the emotional stability items also pointed to a two-factor solution. The eigenvalues were 9.14 (Factor I) and 3.82 (Factor II), and together the two factors accounted for 43% of the variance. After varimax rotation, the analysis revealed separate Fatigue and Emotional Stability factors without any substantial cross-loadings (see Table 3.5).

No differences were found between men and women with respect to FAS Total. At the item-level, women had a significantly lower score on the item about level of energy than men (t (345) = -2.03, $p < .05$). No gender differences were found on the other nine FAS-items. Furthermore, when comparing age groups with oneway ANOVAs, no significant differences were found.

Eight of the ten FAS-items were clearly gender unbiased, the main effect of gender and the interaction of level and gender were nonsignificant. Two items, reflecting level of energy and quantity of daily activities, had uniform bias, showing a significant main effect of gender. To check whether the computation of the total score of the FAS would need to be adjusted for males and females separately, a new total score was calculated for the eight unbiased items. The mean difference between men and women was calculated separately for the normal and adjusted total scores and divided by the pooled standard deviation. For the 10-item total score, the result was .002; for the unbiased total score, .01. Thus, the difference in outcome is negligible, the effect size is equal.

Table 3.3
Correlations and corrected Correlations between the FAS and the eight Subscales

	FAS	
(Sub)scales	Correlations	Corrected correlations
CIS-Subjective Experience of Fatigue	.77	.76
CIS-Reduction of Concentration	.71	.71
CIS-Reduction of Motivation	.67	.63
CIS-Reduced Level of Physical Activity	.61	.60
MBI-Emotional Exhaustion	.78	-
WHOQOL-Energy and Fatigue	.76	.71
FS-Mental Fatigue	.66	.62
FS-Physical Fatigue	.79	.75

Note. All *ps* < .001. Because no items from the Emotional Exhaustion scale of the MBI-NL were used to design the FAS, no adjusted correlation was calculated. FAS = Fatigue Assessment Scale, CIS = Checklist Individual Strength, MBI = Maslach Burnout Inventory; WHOQOL = World Health Organization Quality of Life assessment instrument; FS = Fatigue Scale.

Discussion

The FAS has good internal consistency. In addition, factor analysis provided strong evidence for the unidimensionality of the FAS. Moreover, in a factor analysis of a set of well-established fatigue instruments, the FAS had the highest factor loading on a one-factor solution. In an earlier study (Michielsen et al., 2002), the reliability of the FAS appeared to be good for the general Dutch population. This initial evaluation also supported a unidimensional conceptualization. In the present study, evidence was obtained that these claims also hold in a working population. In addition, it was demonstrated that the

convergent validity of the FAS is good. Concerning divergent validity, it was revealed that fatigue and depression were related but distinct constructs. fatigue and emotional Stability were also found to be distinct concepts. Moreover, neither gender nor age differences were found with respect to FAS-scores. Two FAS-items were found to demonstrate evidence of gender bias. However, further analyses showed that the bias in these items did not cause appreciable

Table 3.4
Factor Loadings of the FAS-items and CES-D-items in a two-factor Solution

Items	Fatigue	Depression
I am bothered by fatigue	.82	-
Physically, I feel exhausted	.80	-
I get tired very quickly	.79	-
Mentally, I feel exhausted	.70	-
I have enough energy for everyday life	-.70	-
I have problems starting things	.68	-
I have problems thinking clearly	.67	-
I don't do much during the day	.65	-
I felt that everything I did was an effort	.64	.44
I feel no desire to do anything	.61	-
I could not get 'going'	.60	-
When I am doing something, I can concentrate quite well	-.49	-
I had trouble keeping my mind on what I was doing	.48	-
I felt lonely	-	.74
I felt sad	-	.74
I thought my life had been a failure	-	.72
I felt that I could not shake off the blues	-	.69
I had crying spells	-	.67
I talked less than usual	-	.63
I felt that people disliked me	-	.62
I felt fearful	-	.62
I enjoyed life	-.44	-.61
I was happy	-.42	-.60
I felt depressed	.44	.57
I felt hopeful about the future	-	-.57
I felt I was just as good as other people	-	-.53
People were unfriendly	-	.53
I was bothered by things that usually don't bother me	-	.38
My sleep was restless	-	.37
I did not feel like eating; my appetite was poor	-	-

Note. – means no factor loading higher than .40. Items in italics are FAS-items. The regular font style is used for the CES-D-items.

Table 3.5
Factor Loadings of the FAS-items and the FFPI-Emotional Stability-items in a two-factor Solution

Items	Fatigue	Emotional Stability
Physically, I feel exhausted	.81	-
I am bothered by fatigue	.81	-
I get tired very quickly	.76	-
Mentally, I feel exhausted	.75	-
I have enough energy for everyday life	-.69	-
I have problems starting things	.68	-
I have problems thinking clearly	.68	-
I don't do much during the day	.68	-
I feel no desire to do anything	.67	-
When I am doing something, I can concentrate quite well	-.51	-
You fear for the worst	-	.67
You readily overcome setbacks	-	.67
You invent problems for yourself	-	.66
You feel desperate	-	.65
You can take your mind off your problems	-	-.65
You keep a cool head	-	-.64
You worry about things	-	.63
You are sure of your ground	-	-.62
You are afraid that you will do the wrong thing	-	.61
You are able to see the best in a situation	-	-.61
You have a dark outlook on the future	-	.60
You look at the bright side of life	-	-.60
You can stand a great deal of stress	-	-.57
You burst into tears	-	.54
You loose your temper	-	.45
You keep your emotions under control	-	-
You know how to control yourself	-	-
You think that all will be well	-	-

Note. – means no factor loading higher than .40. Items in italics are FAS-items. The regular font style is used for the FFPI-items.

differences regarding the FAS total score. Therefore, correction for gender bias is not indicated.

In the present study, fatigue, measured using the FAS, and depression appeared to be two clearly separate factors. Only in a limited number of instances were substantial secondary loadings obtained; mostly in the case of depression items reflecting negative affect. Here, it should be kept in mind that it is plausible that being unhappy will influence one's experience of fatigue and

vice versa. Fatigue and depression are intertwined in a complex way. Fatigue is strongly related to depression (Frances, 1995), but is not a compulsory or core symptom of the diagnosis (Fuhrer & Wessely, 1995).

The relationship between fatigue and emotional stability is another important issue for the clarification of the concept of fatigue. Magnusson and colleagues (Magnusson, Nias, & White, 1996) examined the predictors of state and trait fatigue. They demonstrated that emotional stability was a negative predictor of state fatigue. In addition, Matthews and Desmond (1998) found that emotional stability was the main predictor of fatigue. According to them, neurotic individuals may be more fatigue-prone, given their general tendency towards stress symptoms (Matthews & Deary, 1998). Unfortunately, the authors did not perform a factor analysis to examine whether the constructs are separate dimensions or not.

Only a few FAS-items had uniform gender bias. Consequently, a change in computation of the total FAS-score does not seem necessary. Further research, however, is needed in order to examine whether these items or other combinations of items are consistently gender biased. Furthermore, it is interesting to check whether the calculation of the total score needs to be changed for men and women. Women did not have higher FAS total scores than men; women only appeared to have significantly less energy. No differences were found in the other nine FAS-items. Although this is in contradiction to the observation by Lewis and Wessely (1992), who claimed that women reported two or three times more fatigue than men, it is fully in line with recent findings reported by De Rijk, Schreurs, and Bensing (1999). A possible explanation for these inconsistent results might be that many of the studies cited by Lewis and Wessely measured fatigue using a single item and/or a dichotomous response format.

The finding that different age groups reported similar fatigue experiences might be explained by the healthy worker effect: the phenomenon that people who stay healthy are able to work until their retirement (Fletcher & Ades, 1984; Fox & Collier, 1976). Older respondents in the present study might have been healthier than their peers, who stopped working before the age of retirement. Another explanation has to do with early career burnout (Cherniss, 1995). This phenomenon implies that especially younger people, who are at the beginning of their careers, run a high risk of developing burnout. Thus, the younger participants might have had higher fatigue levels than they used to have, and, therefore, reported fatigue scores similar to those of the older participants in this study. Of course, it is also possible that a combination of the healthy worker effect and the early career burnout phenomenon has led to the present results.

In conclusion, the FAS is fundamentally unidimensional and has good psychometric qualities in a workers population. Given these psychometric

properties, its brevity, and ease of administration, it is a valuable tool for assessing fatigue. Future research focusing on other populations, like patient groups or specific working populations (e.g., white and blue collar workers), is needed to explore the psychometric qualities of the FAS; for instance, its test-retest reliability and criterion validity.

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Chapter 4

In search of personality and temperament predictors of fatigue:

A prospective study[•]

[•] Michielsen, H.J., De Vries, J., & Van Heck, G.L. (submitted). In search of personality and temperament predictors of fatigue: A prospective study.

Introduction

In this chapter, a prospective study was conducted to investigate the relationships between temperament, personality, and the Type A behavior pattern, on the one hand, and fatigue, measured by the FAS, on the other hand. The temperament variables were Pavlovian temperament traits. The personality variables were the Five-Factor-Model personality dimensions and hardiness. The participants completed two surveys. The first survey contained the temperament and personality questionnaires, the Type A scale, and the fatigue scale, while the second survey, two years later, included the fatigue scale. Firstly, by means of correlations and stepwise regression analyses, the direct influence of the former scales on fatigue were examined. Secondly, it was studied how much of the variance of fatigue would be explained by fatigue measured two years before.

Chronic fatigue is a common phenomenon, which can have a far-reaching influence on a person's life. Mental and physical exertion caused by, for instance, work or sport activities, induce acute fatigue. This form of fatigue is characterized by task specificity and short-term reversibility (Meijman & Schaufeli, 1996). In contrast, chronic fatigue cannot be reduced by switching to rest or another task (Meijman & Schaufeli, 1996). However, until now, there exists no general agreement on the determinants of chronic fatigue (Vercoulen et al., 1998). Vercoulen et al. (1998) pointed to the role of behavioral, cognitive, and affective factors in maintaining fatigue. Lewis and Wessely (1992) mentioned the influence of personality. Unfortunately, there is a scarcity of studies focussing on the impact of temperament and personality on fatigue. Recently, De Vries and Van Heck (2000) reviewed the literature on a specific form of fatigue: the burnout component emotional exhaustion. They found that affectivity, anxiety, and the Type A behavior pattern were positively, and hardiness and emotional stability were negatively associated with emotional exhaustion. In a second review, focussing on a broader conceptualization of fatigue, De Vries and Van Heck (2002) added introversion to this list of personality factors. Pointing at the limitations of cross-sectional studies, they recommended the use of a longitudinal design to examine the associations between temperament and personality, on the one hand, and fatigue, on the other hand.

The term 'temperament' refers to individual difference variables which often are considered as at least partly distinct from personality characteristics. When this distinction is made, temperament is mostly conceived of as denoting characteristics which (i) have a relatively strong and direct constitutional basis; (ii) tend to appear early in life; (iii) exert broad effects on behavior, and (iv) concern the more formal characteristics of behavior, such as tempo and endurance, rather than the specific content of behavior (Angleitner & Riemann,

1991; Kagan & Snidman, 1991; Strelau & Zawadzki, 1993; Thomas & Chess, 1985). One of the most influential temperament models has been constructed by Pavlov (1951-1952), and has been further developed by Strelau and co-workers (e.g., Strelau, Angleitner, & Newberry, 1999). The model is based on Pavlov's observations of individual differences in responses to conditioning situations and on the nervous system traits he postulated to account for these differences (Strelau, 1983). Strelau, Angleitner, and Newberry (1999) have described the nervous system and its properties extensively. Here, only a short description is given. Strength of excitation (SE) refers to the nervous system's capacity to work, particularly under prolonged or intense stimulation. It is connected with a high threshold for protective inhibition. Strength of inhibition (SI) is the system's ability to develop and maintain conditioned inhibition as seen in such phenomena as extinction, delay, and stimulus discrimination. Mobility of nervous processes (MO) refers to the ability to respond adequately to changes in stimulus conditions, including environmental demands. To our knowledge, only two studies examined the direct relationship between the Pavlov temperament variables and fatigue (Rudow & Buhr, 1986; De Vries & Van Heck, in press). In the study by Rudow and Buhr (1986), the only Pavlovian temperament variable that correlated highly and negatively with emotional exhaustion was SE. In line with this finding, De Vries and Van Heck (in press) also found that low scores on SE predicted high fatigue scores.

Besides temperament, personality is conceived of as an important factor in the development of chronic fatigue. Two personality 'systems', both well known for their associations with health-related measures, are the Big Five model and the multifaceted hardiness construct. Nowadays, there is general agreement about the view that personality, at least for descriptions at a rather global level, can be described adequately in terms of the Big Five dimensions: extraversion, agreeableness, conscientiousness, emotional stability, and openness to experience/autonomy (see, e.g., Digman, 1990; Goldberg, 1990). Extraversion reflects the disposition towards cheerfulness, sociability, and high activity. Agreeableness represents the inclination towards interpersonal trust and consideration of others. Conscientiousness summarizes the tendency towards persistence, sense of duty, industriousness, organizing, planning, and self-discipline. Emotional stability stands for the tendency to experience no distressing emotions such as fear, guilt, and frustration. Finally, openness/autonomy points at a receptive orientation towards varied experiences and ideas (see Costa & McCrae, 1989, for a more detailed description of these five basic factors). Hofstee, De Raad, and Goldberg (1992) have refined this representation of personality into the Abridged Big-Five Dimensional Circumplex (AB5C) model, which integrates simple structure and circumplex representations. Due to this less global structure, the AB5C-model is able to represent more nuances in trait meaning. Two recent reviews on relationships

between personality and work-related fatigue (De Vries & Van Heck, 2000; 2002) have suggested that individuals with high scores on scales for assessing emotional stability and extraversion report less fatigue than neurotics and introverts. For instance, Koller, Haider, and Recher (1984) as well as May and Kline (1988), and Montgomery (1983) found that extraverts reported less fatigue and emotionally unstable individuals reported more fatigue. It should be mentioned that in contrast to extraverts, who have the tendency to deny experiences of fatigue, there are some indications that emotionally unstable individuals experience more fatigue (May & Kline, 1988). Inconsistent results have been found with respect to the relationship between fatigue, i.e. the burnout component emotional exhaustion, and conscientiousness (Deary, Agius, & Sadler, 1996; Mills & Huebner, 1998). Furthermore, in two studies (Mills & Huebner, 1998; Piedmont, 1993), a negative relationship was found between agreeableness and emotional exhaustion. Finally, openness to experience/autonomy and emotion exhaustion seemed to be unrelated (Deary et al., 1996; Piedmont, 1993).

Hardiness, introduced by Kobasa (1979), is characterized by *commitment* to oneself and work, a sense of personal *control* over one's experiences and outcomes, and the perception that change represents *challenge*, and thus should be treated as an opportunity for growth. Hardy individuals have resistance to illness resulting from (i) perceiving life changes as less stressful (Kobasa, 1979), or (ii) having more resources at their disposal to cope with life changes (Kobasa, Maddi, & Kahn, 1982). In line with this, a direct relationship was found between hardiness, measured globally, and psychological distress (Nowack, 1985; Rhodewalt & Agustsdottir, 1984). When the components of hardiness were analyzed separately, commitment (Holt, Fine, & Tollefson, 1987; Papadatou, Anagnostopoulos, & Monos, 1994; Van Servellen, Topf, & Leake, 1994), control (Lee & Ashforth, 1990; Papadatou et al., 1994; Van Servellen et al., 1994), and challenge (Papadatou et al., 1994; Van Servellen et al., 1994) were all negatively related to emotional exhaustion. In most studies, it was found that components of hardiness were significantly related to emotional exhaustion. It should be noted, however, that only commitment is invariably related to this burnout component.

The Type A behavior pattern (TABP) is characterized by competitive drive, time urgency, and hostility (Friedman and Rosenman, 1974; Kawachi et al., 1998). Type A persons are claimed to run a higher risk of premature cardiovascular disease (Rosenman, 1993; Wright, 1988). The nature of the relationship between TABP and fatigue is still unclear, partly due to the use of different questionnaires to measure Type A. Because of this reason, negative (Weidner & Matthews, 1978) as well as positive (Nowack, 1991; Stern, Harris, & Elverum, 1981) relationships between TABP and chronic fatigue have been found. In addition, Offutt and Lacroix (1988) demonstrated an absence of

TypeA/B differences in fatigue. However, in general, emotional exhaustion and Type A appear to be related (De Vries & Van Heck, 2000).

In the present study, scales for the Pavlovian temperament variables were used as temperament indicators, and Big Five and hardiness instruments as personality indicators. It was hypothesized that the *temperament indicators* Strength of Excitation, Strength of Inhibition, and Mobility of Nervous Processes, the *Big Five factors* Emotional Stability, Extraversion, Agreeableness, and the *Hardiness* total score, as well as the three components Challenge, Commitment, and Control, would predict low scores on fatigue, two years later. Type A and the Big Five factors Conscientiousness and Openness/Autonomy were included as exploratively investigated variables. Gender differences in predictors of fatigue were also examined. Finally, it was expected that fatigue at measurement point 1 would explain a large proportion of the variance of fatigue, measured two years later.

Method

Participants and procedure

Participants, who worked at least 20 hours per week, randomly received a telephone call and agreed to complete a number of questionnaires as part of a two-year longitudinal study with five measurement points. The results presented here concern the first and the last measurement points. Three hundred and twenty-five (42%) out of a group of 765 individuals (first time point) returned a completed test booklet at both measurement points; 173 men (M = 44.82 years, SD = 8.37) and 150 women (M = 42.89 years, SD = 9.25). Gender was unknown for two respondents. Concerning the representativeness of this sample, no differences were found with regard to personality, temperament, and fatigue between individuals who only participated at the first measurement point and persons who also were involved at the second measurement point.

Measures

Respondents completed questionnaires for assessing temperament (PTS; Strelau et al., 1999), personality (FFPI; Hendriks, Hofstee, & De Raad, 1999; PVS; Maddi, 1997) the Type A behavior pattern (JAS; Jenkins, Zyzanski, & Rosenman, 1979), as well as a fatigue scale (FAS) at both time points (Michielsen et al., in press).

The Pavlovian-oriented temperament characteristics were measured with the Pavlov Temperament Survey (PTS; Strelau et al., 1999; Dutch version by Van Heck, De Raad, & Vingerhoets, 1993). This questionnaire contains 60

items designed to measure Strength of Excitation (SE), Strength of Inhibition (SI), and Mobility of Nervous Processes (MO). Each subscale is measured by 20 items on a 4-point likert scale, ranging from 1, *completely uncharacteristic*, to 4, *completely characteristic*. The internal consistency of the PTS scales is very satisfactory. In an earlier study with the Dutch version of the PTS, Cronbach's alpha coefficients were .88, .78, and .91 for SE, SI, and MO, respectively (Van Heck et al., 1993).

The Five-Factor Personality Inventory (FFPI; Hendriks et al., 1999) was used to assess the Five-Factor Model (FFM) personality characteristics: Extraversion, Agreeableness, Conscientiousness, Emotional Stability, and Openness to Experience/Autonomy. The FFPI consists of 100 brief and concrete statements (10 positively and 10 negatively phrased items for each of the five factors) with a 5-point response scale ranging from 1, *not at all applicable*, to 5, *totally applicable*. The psychometric properties are satisfactory (Hendriks et al., 1999). For instance, Hendriks et al. (1997) have reported internal consistencies ranging from .83 to .89 and test-retest reliabilities that ranged from .79 to .84. Also, a clear convergence was found (Hendriks, 1997) between the FFPI factors and the corresponding domain scales of other FFM personality inventories, such as the Revised NEO Personality Inventory (NEO-PI-R; Costa & McCrae, 1989; 1992).

To measure hardiness, the 50-item Hardiness scale (Personal Views Survey, Maddi, 1997; Kobasa, 1985; Dutch version by Van Heck & De Vries, 1994), with positive as well as negative items, was obtained to yield a total score for hardiness and scores for the Challenge (17 items), Commitment (16 items), and Control (17 items) subscales. The rating scale ranged from 0, *not at all true*, to 3, *completely true*. Previous studies have demonstrated adequate internal consistency for the total score (Bernas & Major, 2000) and the three subscales (Williams, Wiebe, & Smith, 1992). Reliability coefficients in the present study ranged from .58 (Control) to .68 (Challenge) for the subscales and .80 for the total score. To raise the alpha's of the subscales, one item (no. 27) was removed from the Challenge subscale (.72) and two items (nrs. 1 and 38) from the Commitment scale (.72). No reliability improvement could be observed by deletion of items of the Control subscale.

The 24-item version of the Jenkins Activity Scale (JAS; Jenkins et al., 1979; Dutch version by Appels, Mulder, & Van Houtem, 1995) yields a score for overall Type A. Scores at the positive end of the scale indicate Type A behavior. The rating scale is different for almost each question. Reliability and content validity are good (Appels, Mulder, & Van Houten, 1995; Jenkins et al., 1979).

The 10-item Fatigue Assessment Scale (FAS; Michielsen et al., in press) is a new, unidimensional fatigue scale, which was tested in a large (n = 1,835) sample, representative for the Dutch population. The items have a rating scale,

ranging from 1, *never*, to 5, *always*. Cronbach's alpha was good (.87). Both factor analysis and Mokken Scale analysis demonstrated that the FAS formed one reliable scale (Michielsen et al., 2002). In the present study, to control for fatigue at measurement point 1, a scale (FAS1) was employed, which was an earlier version of the scale, containing 9 out of the 10 items of the current version of the FAS (Michielsen et al., 2002).

Statistical procedure

First, means, standard deviations, and Cronbach alpha's were calculated for each temperament, personality, and fatigue scale. Second, gender and age differences (age categories 21-37, 38-44, 45-51, and 52-65 yrs) in temperament, personality, and fatigue scores were examined by *t*-tests and (post hoc comparison Scheffé) analyses of variance (ANOVA), respectively. Third, Pearson correlations were calculated (i) between the FAS1 and the FAS, (ii) among the temperament and personality variables, and (iii) between fatigue, on the one hand, and the temperament and personality (sub)scales, on the other hand. Then, two stepwise regression analyses were performed with fatigue, measured at the last measurement, as a dependent variable. In the first analysis, block 1 consisted of gender and age. In block 2, temperament and personality (sub)scales were included (with the exception of the Agreeableness and Conscientiousness scales, due to non-significant correlations between these particular FFPI scales and the FAS; see results). In the second regression analysis, block 1 included gender and age; block 2 contained the FAS1, and block 3 consisted of the temperament and personality (sub)scales. In addition to the analyses of the total sample, these two stepwise regression analyses were also done for men and women separately and for Hardiness Total and subscale.

Results

Means, standard deviations, and reliability coefficients of the used scales are presented in Table 4.1. Concerning gender differences, women scored significantly higher on Agreeableness (t (1, 299) = 3.53, $p < .001$) and the hardiness subscale Commitment (t (1,293) = 3.83, $p < .05$). Men scored higher on Strength of Excitation (t (1,302) = 2.55, $p < .01$) and Emotional Stability (t (1,299) = 4.52, $p < .001$). No gender difference was found on the FAS score. Age differences were only found for Hardiness Total ($p < .01$) and the three hardiness subscales: the youngest group (18-37 years) scored higher on Chalienge ($p < .05$), Commitment ($p < .01$) and Control ($p < .05$) than the oldest group (52-65 years).

The FAS1 and FAS correlated significantly ($r = .62$, $p < .001$). Correlations among the temperament and personality (sub)scales are shown in

Table 4.2. Especially Strength of Excitation and Mobility correlated strongly and positively with Extraversion, Emotional Stability, Openness/Autonomy, as well as the hardiness component Challenge. In general, all temperament and personality dimensions were negatively related to fatigue (see Table 4.2). Only Type A had positive relations with fatigue. Agreeableness and Conscientiousness did not correlate significantly with fatigue. Therefore, they both were not included in the following regression analyses.

Table 4.1
Means,Standard Deviations and Reliability Coefficients of the (Sub)scales

(Sub)scale	*M*	*SD*	Alpha
Pavlov Temperament Scale-Strength of Excitation	49.13	6.78	.84
Strength of Inhibition	52.22	5.41	.74
Mobility	56.81	7.40	.90
Jenkins Activity Survey	15.24	4.82	.70
Five Factor Personality Inventory-Extraversion	70.84	9.81	.91
Agreeableness	76.46	6.67	.80
Conscientiousness	74.04	8.32	.87
Emotional Stability	77.41	8.83	.91
Openness/Autonomy	72.05	7.45	.86
Personal Views Survey Total	101.70	8.04	.80
Challenge	46.26	5.83	.72
Commitment	47.83	4.71	.72
Control	51.04	4.71	.58
Fatigue Assesment Scale	19.08	6.43	.90

According to the first stepwise regression analysis, three dimensions predicted fatigue: Emotional Stability (β = -.23), Extraversion (β = -.26), and Strength of Inhibition (β = -.17). Together they explained 21% (adjusted R^2) of the variance of fatigue (F (3, 217) = 19.89, $p < .001$). Emotional Stability by itself explained 16% of the variance. When the components of hardiness were examined in a separate analysis, Commitment (β = -.14) was added as a predictor. Together the predictors explained 22% (adjusted R^2) of the variance of fatigue (F (4, 217) = 16.69, $p < .001$). When the predictors of fatigue were examined separately for men and women, Openness/Autonomy (β = -.48) and Type A (β = .21) explained 22% (adjusted R^2) of the variance of fatigue (F (2, 118) = 17.23, $p < .001$) for men, while for women only Emotional Stability (β = -.39) was a significant predictor (adjusted R^2 = .14; F (1, 101) = 17.87, $p < .001$). Including the hardiness components in the analyses instead of the total

Table 4.2

Correlations between the Temperament and Personality Variables

Scale	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. SE	--	.14*	.68***	.01	.32***	-.12*	-.03	.46***	.50***	.27***	.30***	.11	.23***	-.31***
2. SI		--	.06	-.35***	-.07	.40***	.20**	.22***	.03	.12*	.04	.12*	.14*	-.21***
3. MO			--	.06	.47***	-.06	-.14*	.42***	.50***	.31***	.37***	.12*	.23***	-.23***
4. JAS				--	-.01	-.34***	-.05	-.22***	.13*	.01	.02	-.03	.03	.15*
5. F1					--	-.08	-.01	.48***	.52***	.28***	.24***	.21***	.29***	-.34***
6. F2						--	.32***	.07	-.10	-.10	-.16**	-.04	.03	-.03
7. F3							--	.11	.10	-.12*	-.37***	.01	.08	-.11
8. F4								--	.60***	.35***	.28***	.18**	.38**	-.38***
9. F5									--	.37***	.30***	.20**	.38**	-.28***
10.Har										--	.81***	.82***	.77***	-.27***
11.Chal											--	.50***	.39**	-.15*
12.Com												--	.54***	-.26***
13.Contr													--	-.27***
14.FAS														--

Note. SE = Strength of Excitation; SI = Strength of Inhibition; MO = Mobility of Nervous Processes; JAS = Jenkins Activity Survey; F1 = Extraversion; F2 = Agreeableness; F3 = Conscientiousness; F4 = Emotional Stability; F5 = Openness/Autonomy; Chal = Challenge; Com = Commitment; Contr = Control; FAS = Fatigue Assesment Scale. *$p < .05$. **$p < .01$. ***$p < .001$.

score did not lead to different results.

In the second series of stepwise regression analyses, controlling for fatigue at the first measurement point, three variables appeared to predict fatigue: fatigue measured two years earlier ($\beta = .56$), Extraversion ($\beta = -.17$), and Strength of Inhibition ($\beta = -.11$). Together they explained 43% (adjusted R^2) of the variance of fatigue (F (3, 216) = 54.63, $p < .001$). However, fatigue alone already explained 40% of the variance. The analyses conducted separately for males and females revealed different patterns. For women, only fatigue measured two years earlier was a predictor of fatigue ($\beta = .60$; adjusted $R^2 = .35$; F (1, 100) = 55.57, $p < .001$). For men, earlier fatigue ($\beta = .60$) and Openness/Autonomy ($\beta = -.16$) were predictors, together explaining 45% (adjusted R^2) of the variance (F (2, 115) = 50.43, $p < .001$). These patterns remained the same when the hardiness components instead of Hardiness Total were entered in the analyses.

Discussion

In summary, in this prospective study all Pavlovian temperament variables and almost all personality variables correlated negatively with fatigue, while TABP had a positive correlation with fatigue. Emotional stability, extraversion, strength of inhibition, and commitment predicted fatigue. When controlling for fatigue experienced at the first measurement point, besides earlier fatigue, extraversion and strength of inhibition were predictors of fatigue measured two years later. The role of personality and temperament in the prediction of fatigue was, however, small, also when looking at men and women separately.

As expected, the three temperament aspects strength of excitation, strength of inhibition, and mobility of nervous processes had a negative correlation with fatigue. This is in line with findings by Rudow and Buhr (1986) and De Vries and Van Heck (in press). However, while the latter authors found that strength of excitation was one of the predictors of emotional exhaustion, a work-related kind of fatigue, in the present study, strength of inhibition was the only significant temperament predictor of fatigue. It should be noted that the studies by Rudow and Buhr (1986) and De Vries and Van Heck (in press) both had a cross-sectional design, in contrast to the present prospective study. More prospective research in this area, however, is needed to examine whether the present findings can be reproduced.

Although Type A correlated positively with fatigue, it was no substantial predictor of fatigue. The positive correlation is in accordance with the general conclusion in the review by De Vries and Van Heck (2002). However, the outcomes of the studies which were reviewed were rather inconsistent (see, e.g., Nowack, 1991; Offutt & Lacroix, 1988; Weidner & Matthews, 1978). Therefore, Type A was tested exploratively. Other

characteristics, such as extraversion and emotional Stability, were related more strongly to fatigue. Possibly, the influence of Type A on fatigue was masked by the high correlation between Type A and emotional stability. If, in future studies, this relationship between Type A and emotional stability is invariably found, one should consider measuring only emotional stability.

Emotional stability and extraversion were important predictors of fatigue. Also openness/autonomy was significantly associated with fatigue. Contrary to the expectations, agreeableness was not related to fatigue. The studies (Mills & Huebner, 1998; Piedmont, 1993) on which our hypothesis was based focussed on emotional exhaustion, a work-specific kind of fatigue. In contrast, the present study examined general fatigue. It is possible that this distinction caused the difference in outcomes. Furthermore, the hardiness total and all three hardiness components correlated significantly with fatigue (see, e.g., Papadatou et al., 1994; Van Servellen et al., 1994), while only commitment predicted fatigue. It should be remembered that this hardiness component was the only construct that was consistently related to emotional exhaustion in all studies mentioned in the introduction (Holt et al., 1987; Papadatou et al., 1994; Van Servellen et al., 1994).

Interesting was the finding that women reported more commitment than men. Not many studies can be found with separate subscale scores on the Personal Views Survey for women and men. However, in a study among adolescents attending school (Shepperd & Kashani, 1991), women reported more commitment than men. In the present study, the gender difference on commitment scores might be explained by the fact that working women are a self-selected group with above average work commitment (Fiorentine, 1987, Hakim, 1991). Although society has changed tremendously in the last decade, working women might still be more committed to their work than men. In the Netherlands, still a large proportion of the female population does not have a paid job (Geurts, Kompier, & Gründemann, 2000). A study by Scandura and Lankau (1997) revealed that women, who perceived their work environment as offering flexible work hours, reported higher levels of organizational commitment and job satisfaction than (i) men and (ii) women who did not perceive this flexibility. In the Netherlands, women are increasingly entering the workforce (Geurts et al., 2000), from 36% in 1988 to 49% in 1998, mainly in part-time jobs. This is partly due to the deliberate policy pursued by the Government and social partners to promote part-time work (Netherlands: The part-time work phenomenon, 1998). It is likely that Dutch women, motivated by the possibility of flexible working hours, have increased commitment to their work and the organization they work for.

It is noteworthy that in the present sample no gender difference in the total FAS score was found, although it is widely thought that women report more fatigue than men (e.g., Bensing & Schreurs, 1995; Lewis & Wessely,

1992; Skapinakis, Lewis, & Meltzer, 2000). It is likely that the women in the present study are not representative for women in the general Dutch population, because the criterion to be included in the study was having a paid job for at least 20 hours per week. Consequently, due to the healthy worker effect, in the present study women might be healthier than the average Dutch woman. Concerning age and fatigue, conflicting results have been obtained (see Michielsen et al., in press). Some researchers have found an effect of age on fatigue (e.g. Van Mens-Verhulst & Bensing, 1998), while others have reported only a weak association or have failed to observe any relationship at all (e.g. Lewis & Wessely, 1992; Loge, Ekeberg, & Kaasa, 1998; Uttl, Graf, & Cosentino, 2000). In the present study, age did not play a sizeable role in predicting fatigue. Again, this could be caused by the selection of respondents, who were all able to work. It would be interesting to examine whether our findings would hold in a population that also includes individuals who do not work because they are retired or because they receive work disability benefit.

When fatigue measured two years earlier was controlled for, emotional stability failed to predict fatigue. The correlation between emotional stability and fatigue measured at the first measurement point was higher than the correlation between emotional stability and fatigue measured two years later. Apparantly, emotional stability and fatigue have much common variance. On the other hand, the correlations between emotional stability and fatigue also make clear that the constructs, though related, are not identical.

When the predictors of fatigue were examined separately for men and women, some interesting patterns emerged. For men, two constructs, namely Type A and openness/autonomy, appeared to be predictors, while these two constructs were not identified as significant predictors in the analysis of the total sample. Studies have shown that men show the Type A behavior more than female adolescents (Keltikangas-Järvinen & Raikkonen, 1990; Keltikangas-Järvinen & Raikkonen, 1991; Sharpley, James, & Mavroudis, 1993), probably because the construct is based on male behavior (Friedman & Rosenman, 1974). However, when in the second regression analysis Fatigue measured two years earlier was controlled for, Type A disappeared as a predictor for men, while openness/autonomy remained significant. In a cross-cultural study, Williams, Satterwhite, and Best (1999) found that across 25 countries, men appeared to score higher on openness to new experiences. Trzcieniecka-Green and Steptoe (1994) found that openness was related to reduction in anxiety. Moreover, Sørlie and Sexton (2001) reported that openness predicted active coping, stressing the mediating effect of this Big Five factor. In the already mentioned study by Williams et al. (1999), women were less emotionally stable than men. In the analyses with women, emotional stability predicted fatigue, when fatigue at the first measurement was not included. However, overall, in the second analysis the role of personality or

temperament was not extremely important. Nevertheless, the present prospective study supports the idea that personality and temperament might be moderators in the stress-illness relationship (see e.g., Kobasa, 1979; Strelau, 1995).

A methodological explanation of the, sometimes, surprising findings may be the prospective design of this study. Until now, most research has been cross-sectional. This type of research does not allow making inferences about causality. In contrast, a prospective study like the present one overcomes this disadvantage and yields results which can give a clearer view on the causal relations. Therefore, the results of this study are considered to be important for further theorizing about the role of temperament and personality with respect to fatigue. The percentage of fatigue variance explained by personality and temperament, however, is quite low. It is believed that these constructs influence the experience of fatigue, but not directly. Therefore, future research should focus on the moderating effects of personality and temperament.

One shortcoming of the present study is that changed life circumstances were not measured. The fatigue score might be influenced by major life events such as pregnancy, a job switch, or the death of a spouse. In addition, although no differences between the samples of the two measurement points were found in, for instance, personality scores, there might be a selection bias. The group that agreed to complete the first questionnaire might be different from the group that refused to take part in this research altogether. Thirdly, subjects were part of a sample representative for the working population. It is unknown whether the data are generalizable to the general Dutch population.

The finding that fatigue measured at baseline was a good predictor of fatigue measured two years later indicates that the experience of fatigue is a rather stable feeling. This is in accordance with the longitudinal study by Janssen and Nijhuis (2001), who examined the stability of fatigue and emotional exhaustion, a work-related kind of fatigue. They found that these fatigue forms showed a large amount of stability over time. In an analysis (data not shown), using standardized scores separated in 10 equal groups of the baseline and last fatigue measurment point, it was found that the fatigue scores of almost three quarters of the participants differed at maximum two groups. This should encourage professionals to screen individuals for fatigue in the general practitioner or work context. In this way, it is possible to detect groups of individuals who are at risk to develop a chronic form of fatigue. Furthermore, the stability of fatigue could be partly explained by personality and temperament. Consistent adverse life circumstances or a combination of life circumstances and personal factors could also influence the stability of fatigue. Future research should pay attention to the determinants of the stability of fatigue.

In summary, all Pavlovian temperament variables, as well as almost all personality variables correlated negatively with fatigue. Emotional stability, extraversion, strength of inhibition, and commitment were significant predictors of fatigue. When controlling for fatigue measured two years earlier, the temperament and personality predictors made a small contribution to explaining the variance of fatigue, also when men and women were examined separately. In future research, it would be interesting to direct the attention to the moderating effects of appraisal and coping in the temperament/personality relationship with fatigue, instead of focussing on the direct effects of temperament and personality on fatigue.

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Chapter 5

Which constructs can predict fatigue?

A study into the determinants of fatigue[•]

[•] Michielsen, H.J., Croon, M.A., Willemsen, T.M., De Vries, J., & Van Heck, G.L. (submitted). Which constructs can predict fatigue? A study into the determinants of fatigue.

Introduction

The subject of the study described in this chapter is to test the model developed by Taylor and Aspinwall (1996) with fatigue as the outcome variable. This model describes mediators and moderators of psychosocial stress. The participants completed questionnaires concerning demographic variables, personality and temperament, work pressure and workload, perceived social support, perceived stress, coping, and emotional exhaustion. Structural equation modeling analyses were performed to gain some insight in the validity of the Taylor and Aspinwall model.

Profound fatigue is a common complaint in medical practice (e.g., Bensing, Hulsman, & Schreurs, 1996). It is a symptom of many chronic physical diseases, like multiple sclerosis, cancer, Parkinson's disease, rheumatoid arthritis, and psychiatric disorders such as depression (Lewis & Wessely, 1992). Sometimes fatigue is even the core symptom as, for example, in the Chronic Fatigue Syndrome (CFS). Moreover, fatigue can also play a role in temporary physical conditions such as pregnancy and infections. Finally, apart from being an indicator of disease, fatigue may also result from the use of medication or medical treatments, such as radiotherapy (Smets et al., 1998).

Due to the fast growing number of persons suffering from CFS in the nineties, interest in fatigue has expanded considerably. One of the vehemently debated themes concerns its determinants. Some authors (e.g., Bartley & Chute, 1947; Smets et al., 1995; Vercoulen et al., 1998) developed a theory about the onset and perpetuation of fatigue. For example, Vercoulen and colleagues (1998) focussed on the persistence of fatigue in CFS-patients. In their model of fatigue, attribution effects, level of physical activity, sense of control over symptoms, and focussing on bodily symptoms play substantial roles. Other theoretical perspectives reflect the thought that a biopychosocial approach is the most suitable way of examining fatigue (e.g., David et al., 1990; Lewis et al., 1992; Ware, 1993). The view that fatigue is related to various types of extreme stimulation involving low as well as high physical and/or information-processing demands (De Rijk, Schreurs, & Bensing, 1999), and the belief that fatigue links with symptom perception models (e.g., Pennebaker, 1982) are promising steps towards further theorizing (Finkelman, 1994).

A more general framework that is suitable for studying the antecedents of fatigue is the model developed by Taylor and Aspinwall (1996). This model concentrates on the mediating and moderating factors which influence psychosocial outcomes. In the present study, we focus on the mediating processes and the psychosocial outcome fatigue. As can be seen in Figure 5.1, this model includes external resources, personality, stressors, appraisal, social support, and coping.

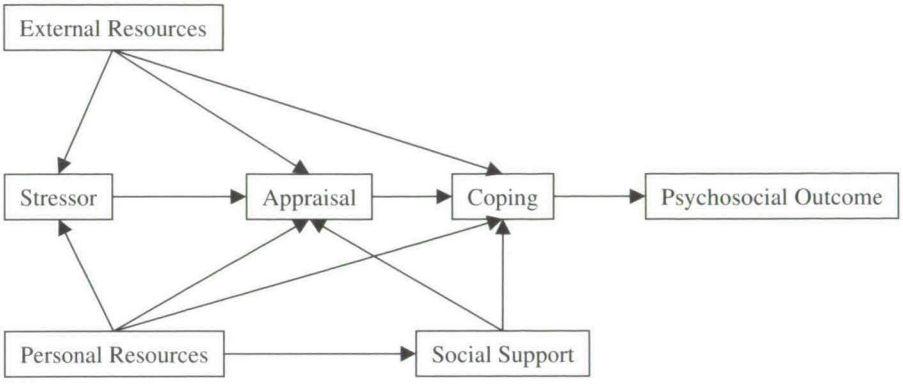

Figure 5.1. The Taylor and Aspinwall Model (1996, p. 98).

Taylor and Aspinwall (1996) define external resources as resources which comprise aspects of the individual's environment, shaping the demands and affordances of the situation. In addition to standard external resources, such as time and money, a diverse set of environmental conditions, ranging from the physical environment to social roles and other aspects of the individual's place in social aggregates, are viewed as external resources. As Figure 5.1 shows, external resources may determine the kinds of stressors to which one is exposed, but also appraisal and coping processes. Similarly, personal resources may affect exposure to and disengagement from situations, as well as appraisal and coping. In addition, personal resources may influence the availability, mobilization, and maintenance of social support. Social support, in turn, may affect coping indirectly through appraisal processes and directly through the provision of information and functional assistance. Finally, the model suggests that the effects of personal and external resources, stressor, appraisal, and social support on psychosocial outcomes are mediated substantially by ways of coping with stress.

Empirical support for the model

The model of Taylor and Aspinwall (1996) incorporates the transactional model of Lazarus and Folkman (1984). This transactional model is supported by a significant amount of research (see e.g., Lazarus, 1966, 1968; Lazarus & Folkman, 1984, 1987). The Lazarus and Folkman model includes primary appraisal of the stressor and secondary appraisal of the coping mechanisms available. Factors like gender, age, and social status are claimed to influence parts of the Taylor and Aspinwall model, namely the kind of stressor involved (e.g., Pearlin, 1989), appraisal of the event (see e.g., Brown & Fielding, 1993; Hunter, 1999; Sheets, Gorenflo, & Forney, 1993), and the preferred coping

styles (e.g., Endler & Parker, 1994; Griffith, Dubow, & Ippolito, 2000). It appears that the central part of the Taylor and Aspinwall model is supported by empirical findings. Furthermore, Taylor and Aspinwall (1996) assume that personal resources are important moderators of the effects of stress. This view is supported by research on personality (Kobasa, 1979) and temperament (Strelau, 1995).

Most prominent in this respect are studies emphasizing basic personality traits. There is now a growing consensus that personality can be adequately described with the Big Five factors: extraversion, agreeableness, conscientiousness, emotional stability, and openness to experience/autonomy (e.g., Digman, 1990; Goldberg, 1990). Extraversion reflects the disposition towards cheerfulness, sociability, and a high activity level. Agreeableness represents the inclination towards interpersonal trust and consideration of others. Conscientiousness summarizes the tendency towards persistence, sense of duty, industriousness, organizing, planning, and self-discipline. Emotional stability stands for the tendency to experience no distressing emotions such as fear, guilt, and frustration, while openness to experience/autonomy points at a receptive orientation toward varied experiences and ideas (see Costa & McCrae, 1989, for a more detailed description of these five basic factors). Two recent reviews of the relationship between personality and work-related fatigue (De Vries & Van Heck, 2000; De Vries & Van Heck, 2002) suggest that individuals scoring high on emotional stability and high on extraversion report less fatigue experiences. Inconsistent results were found with respect to the relationship between emotional exhaustion and conscientiousness (Deary, Agius, & Sadler, 1996; Mills & Huebner, 1998). In two studies (Mills & Huebner, 1998; Piedmont & Weinstein, 1993), a negative relationship was reported between agreeableness and emotional exhaustion. Openness to experience/autonomy and emotional exhaustion seemed to be rather unrelated to fatigue (Deary et al., 1996; Piedmont & Weinstein, 1993). All these studies concentrated on the direct effect of personality on fatigue. De Vries & Van Heck (2002) further acknowledge that our understanding of the moderating effects of the Big Five factors on fatigue or illness in general is still rather limited.

One of the more intensely studied personality constructs with a moderating influence on illness is hardiness, a concept reflecting resiliency, introduced by Kobasa (1979). Hardiness is characterized by *commitment* to oneself and work, a sense of personal *control* over one's experiences and outcomes, and the perception that change represents *challenge*, and thus should be treated as an opportunity for growth. Kobasa has claimed that hardy managers have more resistance to illness as a result of their inclination to perceive life changes as less stressful (Kobasa, 1979) or the availability of more resources to cope with such life changes (Kobasa, Maddi, & Kahn, 1982).

Sharpley and coworkers (1995) have found that hardiness was the most powerful exogenous variable of good overall health for a sample of Australian university staff. In a study by Beardslee and colleagues (1995), the hardiness component commitment, combined with supervisory support, tended to buffer the effect of stress on the job satisfaction of nurse educators. In a longitudinal study involving Israeli recruits, Florian, Mikulincer, and Taubman (1995) found that commitment and control, operating through appraisal and coping, had a positive impact on mental health. Commitment improved mental health by reducing the appraisal of threat and the use of emotion-focused strategies, and by increasing the expectations of successful coping. Control improved mental health by reducing the appraisal of threat, increasing the expectations of successful coping, and the use of problem-solving and support-seeking strategies.

A third personality variable, the Type A behavior pattern (TABP) is characterized by competitive drive, time urgency, and hostility (Kawachi et al., 1998). Type A persons are claimed to run a higher risk of premature cardiovascular disease (Rosenman, 1993; Wright, 1988). The nature of the relationship between TABP and fatigue is still rather unclear, partly due to the use of a wide range of different questionnaires to measure Type A. Therefore, negative (Weidner & Matthews, 1978) as well as positive (Nowack, 1991; Stern, Harris, & Elverum, 1981) relationships between TABP and fatigue have been found. In addition, Offutt and Lacroix (1988) found an absence of TypeA/B differences in fatigue. In general, however, emotional exhaustion and Type A appeared to be positively related (De Vries & Van Heck, 2000). To our knowledge, only one study (Byrne, 1990) focussed on the indirect effect of Type A on fatigue. Byrne found that the influence of Type A on fatigue was mediated by job satisfaction and psychological distress. In the present study, attention is also given to possible mediators of the personality – fatigue relationship.

Temperament can have a moderating effect on coping processes (Strelau, 1995). As an individual has a given temperament since birth, this is present before stressors and states of stress occur. Therefore, one may expect that temperament variables influence reactions to various stressors (Strelau, 1995). One of the most influential temperament models is constructed by Pavlov (Pavlov, 1951-1952), and further developed by Strelau and colleagues (1999). The model is based on Pavlov's observations of individual differences in responses to conditioning situations and the nervous system traits he postulated to account for them (Strelau, 1983). Strelau et al. (1999) described the nervous system and its properties extensively; here only a short description is given: Strength of Excitation (SE) refers to the nervous system's capacity to work, particularly under prolonged or intense stimulation. It is connected with a high threshold for protective inhibition. Strength of Inhibition (SI) is the

system's ability to develop and maintain conditioned inhibition as seen in such phenomena as extinction, delay, and stimulus discrimination. Mobility of nervous processes (MO) refers to the ability to respond adequately to changes in stimulus conditions, including environmental demands. Only a few studies examined the relationship between the Pavlovian temperament variables and fatigue (De Vries & Van Heck, 2002; Rudow & Buhr, 1986). In the study by Rudow and Buhr (1986), the only Pavlovian temperament variable that correlated highly negatively with emotional exhaustion was SE. In line with this finding, De Vries and Van Heck (2002) found that low scores on SE predicted high scores on all used fatigue (sub)scales. In addition, Klonowicz (1985, 1987) found that high-reactive individuals, who tend to react intensively to emotion generating stimuli expressed in high emotional sensitivity and low emotional endurance, show more fatigue when coping with highly stressful situations. However, the indirect relationship between temperament and fatigue has never been studied yet. Summarizing, the relationship between personality and temperament, on the one hand, and illness-related variables, in particular fatigue, on the other hand, has been established.

Another variable in the Taylor and Aspinwall model (1996) is social support. Reviews of the literature (Cohen & Wills, 1985; Uchino, Cacioppo, & Kiegolt-Glaser, 1996) suggest that social support has beneficial effects on a variety of physical and mental health outcomes, like blood pressure, catecholamines levels, and immune system function. Cohen (1988) directs the attention to the beneficial effects of social support on health through social (e.g., stress buffering), psychological (e.g., affective state), and behavioral (e.g., health promoting) mechanisms. There is empirical evidence to support this perspective (Uchino et al., 1996). Thus, there is empirical support for the part of the Taylor and Aspinwall model concerning social support and the other paths in the model. Surprisingly, until now the complete model has not been tested.

The objective of this study was to test the Taylor and Aspinwall model (1996) in a working population. Working individuals run a high risk to become ill or to develop burnout. For instance, in the Netherlands, about 30% of the recipients of work disability benefits is classified as occupationally disabled on mental grounds. They have an 'exogenous reaction' (Van Eck, 1991), which includes chronic job stress and burnout, a mental state closely related to mental fatigue. Because of its human and financial costs, research focussing on the multiple causes of emotional exhaustion in the working population is important. Therefore, in the present study participants were included who worked at least 20 hours per week. Emotional exhaustion was chosen as the psychosocial outcome of the Taylor and Aspinwall model.

Method

Participants

Respondents (N = 765) lived equally spread over the Netherlands. They were invited to participate through random telephone calls. Only respondents who worked at least 20 hours per week were selected for participation in the present study. In total, 409 men (M = 41.44 years, SD = 9.47, range = 20-63 years) and 346 women (M = 39.09 years, SD = 9.71, range = 18-64) participated in this study (total response: 48%). Gender was unknown for 10 respondents. Twenty-nine percent of the respondents were single (n = 218) and 544 persons (71%) were married or lived together with a partner. Forty percent (n = 325) had a college education. Lower educated people were somewhat underrepresented and highly educated persons were slightly overrepresented in this sample. However, this is not uncommon for this kind of study (Saris, 1988). With respect to gender, marital status, and age, the data were representative for the Dutch working population (CBS, 1999).

Measures

External Resources. The following variables were taken as exogenous: gender (0 = male, 1 = female), age, having children (0 = no children; 1 = having children), type of employment contract (0 = permanent work; 1 = temporary work), marital status (0 = having a partner; 1 = single), number of working hours per week, and being ill (0 = healthy; 1 = ill). Concerning being ill, the question was asked: were you ill the last week? People (n = 49) who were ill, indicated that they had a cold (n = 13), or other different health problems such as back pain, asthma, or a chronic illness.

Personal Resources. To measure hardiness, the 50-item third-generation Hardiness scale (Personal Views Survey, Maddi, 1997; Dutch version by Van Heck & De Vries, 1994) was used. This scale, with positive as well as negative items, yields scores for the Challenge (17 items), Commitment (16 items), and Control (17 items) subscales, and a total score, which is acquired by summing all items. Previous studies have demonstrated adequate internal consistency for the three subscales as well as the total Hardiness scale (Williams, Wiebe, & Smith, 1992). The rating scale ranged from 0, *not at all true,* to 3, *completely true*.

The Five-Factor Personality Inventory (FFPI; Hendriks, Hofstee, & De Raad, 1999) was used to assess the Big Five: Extraversion, Agreeableness, Conscientiousness, Emotional Stability, and Openness to experience/Autonomy. Each subscale leads to a summated score of 10 positively and 10 negatively phrased items with a 5-point response scale

ranging from 1, *not at all applicable*, to 5, *totally applicable*. The psychometric properties are satisfactory (Hendriks et al., 1999). For instance, Hendriks (1997) reported internal consistencies ranging from .83 to .89, and test-retest reliabilities that ranged from .79 to .84.

The 24-item version of the Jenkins Activity Scale (JAS; Jenkins, Zyzanski, & Rosenman, 1979); Dutch translation by Appels, Mulder, & Van Houtem, 1995) yields a score for overall Type A. Scores at the positive end of the scale indicate Type A behavior. The rating scale is different for almost each question. Reliability and content validity are good (Appels et al., 1985; Jenkins et al., 1979).

The Pavlovian-oriented temperament characteristics were measured with the Pavlov Temperament Survey (PTS; Strelau et al., 1999; Dutch version by Van Heck, De Raad, & Vingerhoets, 1993). This questionnaire contains 60 items designed to measure Strength of Excitation (SE), Strength of Inhibition (SI), and Mobility of Nervous Processes (MO). Each subscale contains 20 items with a 4-point Likert scale, ranging from 1, *completely uncharacteristic*, to 4, *completely characteristic*. The internal consistency of the Dutch version of the PTS scales was very satisfactory in an earlier study. Cronbach's alpha coefficients were .88, .78, and .91 for SE, SI, and MO, respectively (Van Heck et al., 1993).

Stressor. This component of the model was measured by two questionnaires. One scale, assessing Work Pressure, stems from a Dutch questionnaire with respect to psychosocial job demands on job stress (VBBA; Van Veldhoven & Meijman, 1994). The 11 items have a rating scale ranging from 1, *always*, to 4, *never*. The second scale, Workload, is a subscale from the Trier Inventory for the Assessment of Chronic Stress (TICS; Schulz & Schlotz, 1999; Dutch version by De Vries, 1999). The responses are given on a 5-point rating scale, ranging from 1, *never*, to 5, *very often*. Reliability and validity of this subscale are good (Schulz & Schlotz, 1999).

Appraisal. Appraisal was measured by the total score of the Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1983; De Vries, 1998a). The 14 items assess the degree to which situations within a person's life are appraised as stressful. Responses are given on a 4-point scale ranging from 1, *never*, to 4, *always*. This instrument has been used intensively in studies on stress and illness (Monroe & Kelley, 1995). The PSS has good reliability and validity (Cohen et al., 1983; Hewitt, Flett, & Mosher, 1992).

Social Support. The total score of the 12-item version of the Perceived Social Support Scale-Revised (PSSS; Blumenthal et al., 1987; De Vries, 1998b) was used to examine Social Support. The item's rating scale varied from 1, *very strongly disagree*, to 7, *very strongly agree*. Good reliability and validity have been demonstrated in patients undergoing coronary angiography (Blumenthal et al., 1987).

Coping. The 48-item Coping Inventory for Stressful Situations; (CISS; Endler & Parker, 1994); Dutch version by De Ridder & Van Heck, 1998) assesses three basic coping dimensions: Task- (coping by altering the situation), Emotion- (coping by regulating emotional distress), and Avoidance (coping by distraction or seeking other people's company)-oriented coping. The rating scale ranges from 1, *not at all*, to 5, *very much*. The summated scores of the five coping strategies were used in this study. Reliability and validity are good (Cook & Heppner, 1997; Endler & Parker, 1994).
Health outcome. The Emotional Exhaustion (EE) scale of the Dutch version (Schaufeli & Van Dierendonck, 1994) of the Maslach Burnout Inventory (Maslach & Jackson, 1986) was used. This EE scale concerns the extreme fatigue component of burnout. The EE scale is the summed score of five items, each with a 7-point rating scale ranging from 0, *never*, to 6, *always*. The psychometric properties are good (Schaufeli & Van Dierendonck, 1994).

Statistical analyses

The analyses, reported in this paper, were aimed at testing the Taylor and Aspinwall (1996) conceptual model, which is represented in Figure 5.1 as a recursive path model (Kaplan, 2000).

The model can be described in six levels of variables. The first level includes the exogenous variables Personal and External resources, the second the Stressor variables Work Pressure and Workload. The third level concerns the endogenous variables Social Support, the fourth Appraisal, the fifth Coping and its exogenous variables, and finally, the sixth level Psychosocial Outcomes and its exogenous variables.

The model has the variables External resources and Personal Resources as its basis. These may be mutually correlated, but these correlations are not explained by the path model itself. According to the model, variables at the Stressor level may be influenced by External Resources as well as by Personal Resources. However, Social Support, at the second level, is only influenced by Personal Resources. At the second level, there is also Appraisal, which is assumed to be influenced by all variables of the first level and Social Support. The third level features the Coping variables which, according to the path model, are all directly influenced by the variables in External and Personal Resources, Appraisal, and Social Support, but not by the Stressor variables. Finally, at the fourth level, the variable Psychosocial Outcome is predicted. The Taylor and Aspinwall model (1996) makes strong assumptions about the possible causes of Psychosocial Outcome. According to the model, only the Coping variables have a direct effect on it, while all other variables have only indirect effects.

Parameters must be estimated on the basis of the observed data. Because 262 out of 765 (34%) participants had missing data on at least one of the variables involved, the data were analyzed by means of the software package AMOS 3.6 (Arbuckle, 1997) which allows for the full information maximum likelihood (FIML) estimation of the parameters if the data are incomplete.

For each endogenous variable, a sequence of regression analyses was performed starting with the analysis in which it was regressed on all variables that belong to the previous level. These analyses are based on a saturated model in which none of the path coefficients of the former variables is constrained in any way. The value of the loglikelihood function for these saturated models provides a baseline against which the goodness-of-fit of simplified, more parsimonious models can be tested in which some of these path coefficients are set equal to zero.

In order to study which path coefficients could be set equal to zero in the equation for a particular endogenous variable, a backward elimination procedure was used for each endogenous variable separately. Starting from the results of the saturated model, the exogenous variable of which path coefficient had the lowest absolute critical ratio (CR) was removed from the model, and the endogenous variable was regressed again on the remaining predicting variables. The critical ratio is the ratio of the estimate of the path coefficient to its standard error. In the present study, only predicting variables with $|CR|<2$ were removed from the model. The fit of the simplified or reduced model was assessed by a statistical test based on the difference between the loglikelihood functions of the simplified and the saturated model. Since the simplified model is a submodel of the saturated one, the difference between their respective loglikelihood functions is asymptotically chi-square distributed if the simplified model holds true in the population. The degrees of freedom of this chi-square distribution are equal to the number of path coefficients that have been set equal to zero in the simplified model. By positioning the observed difference between the loglikelihood functions under the appropriate chi-square distribution, the probability level of the observed difference can be assessed. If this probability level was larger than .05, it was concluded that the simplified model provided an acceptable fit to the data, and the backward elimination procedure was continued till none of the remaining exogenous variables could be removed from the equation without causing a statistically worse goodness-of-fit. In this way a sequence of regression analyses yielded a parsimonious regression model for each endogenous variable. By following this method of testing the model, the total log likelihood function is already maximized, because the function is maximized per level. Therefore, it is not necessary to test the fit of the global model.

Results

Table 5.1 gives the results of the statistical goodness-of-fit test for the final regression model obtained by the backward elimination procedure for each observed dependent variable. This table shows that for each of the endogenous variables a regression model is obtained which fits the data well. For any of the endogenous variables removal of an additional exogenous variable resulted in a model with a statistically worse fit. For most of the endogenous variables the number of degrees of freedom of the final model is rather large. Since the number of degrees of freedom is equal to the number of path coefficients which can be set equal to zero without worsening model fit in a significant way, this shows that for most endogenous variables a parsimonious model with a limited number of exogenous variables was obtained.

Table 5.1
Goodness-of-fit for the final Regression Model

Dependent variable	Df	Test-value	*p*
Stressor	15	21.72	.12
Social Support	15	21.72	.12
Perceived Stress	14	12.51	.57
Avoidance-oriented coping	15	14.20	.51
Task-oriented coping	14	13.45	.49
Emotion-oriented coping	16	14.95	.53
Emotional Exhaustion	18	20.63	.30

Figs. 5.2 to 5.9 summarize the results of the regression analyses for the ten endogenous variables. The results shown in these figures should be compared with the premises of the Taylor and Aspinwall (1996) model. Figs. 5.2 and 5.3 show that the Stressor variables are predicted by External and Personal Resources. Workload and Work Pressure were both predicted by working many hours per week, not being hardy, being neurotic, being autonomous, being a Type A person and scoring low on SI. Figure 5.4 demonstrates that Social Support is not only predicted by Personal Resources, but by External Resources as well. Especially being older and not having a partner predicted the perception of less Social Support. As also described in Figure 5.5, Stressor (Workload), Personal Resources, and Social Support predicted Appraisal, while External Resources did not play a role. Being neurotic and experiencing a high workload were the main exogenous variables of Appraisal. External and Personal Resources, in various combinations, are important exogenous variables of all Coping styles, as depicted in the Figs. 5.6 to 5.8. Social support only predicted Avoidance, while Appraisal was a

significant exogenous variable of Task- and Emotion-oriented coping. Contrary to expectations, Emotional Exhaustion was not predicted by any of the coping styles (Figure 5.9). Instead, individuals with high scores on Workload and Work Pressure, who perceived a lot of stress, were emotionally exhausted. Overall, in many analyses the personality variables Emotional Stability, Extraversion, and Type A were the most important exogenous variables, as indicated by the high absolute value of the standardized coefficients. Emotional Exhaustion could not be predicted by the Big Five factors.

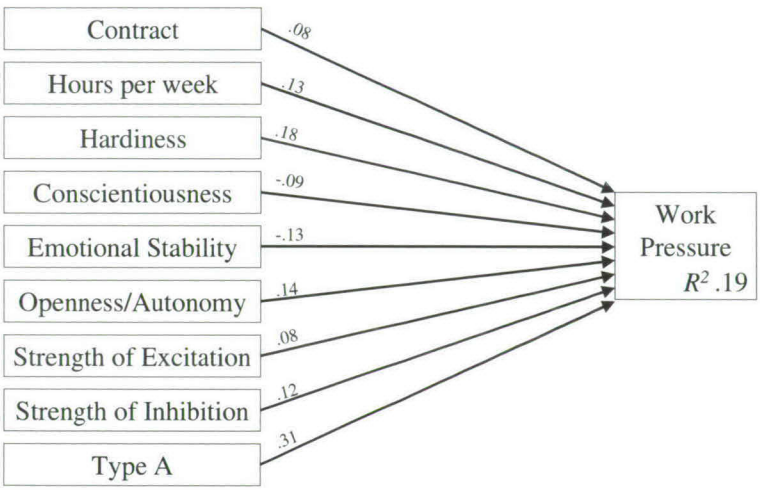

Figure 5.2. Predictors of Work Pressure.

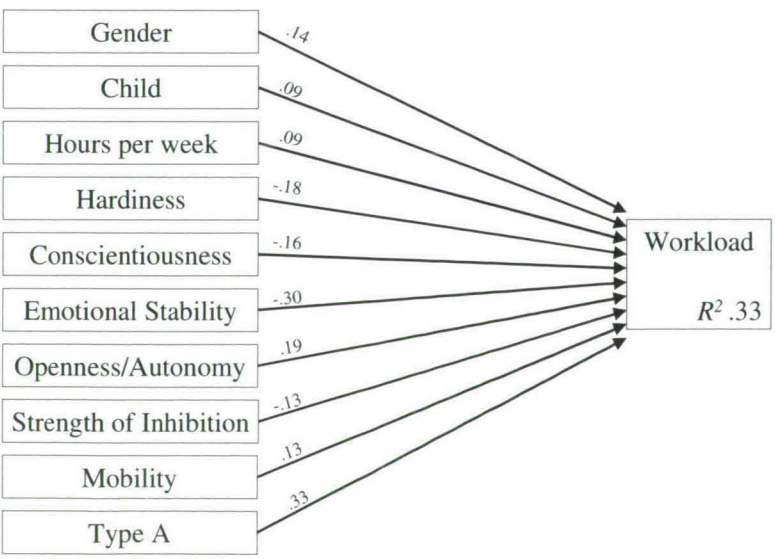

Figure 5.3. Predictors of Workload.

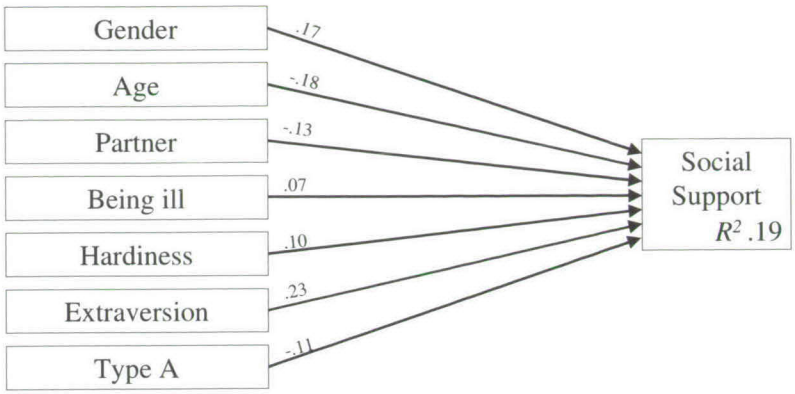

Figure 5.4. Predictors of Social Support.

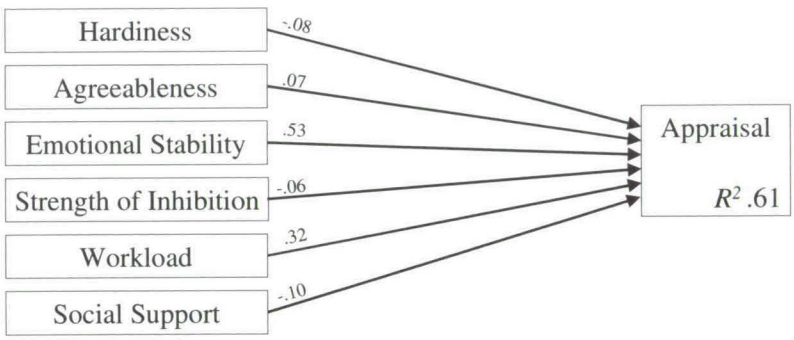

Figure 5.5. Predictors of Appraisal.

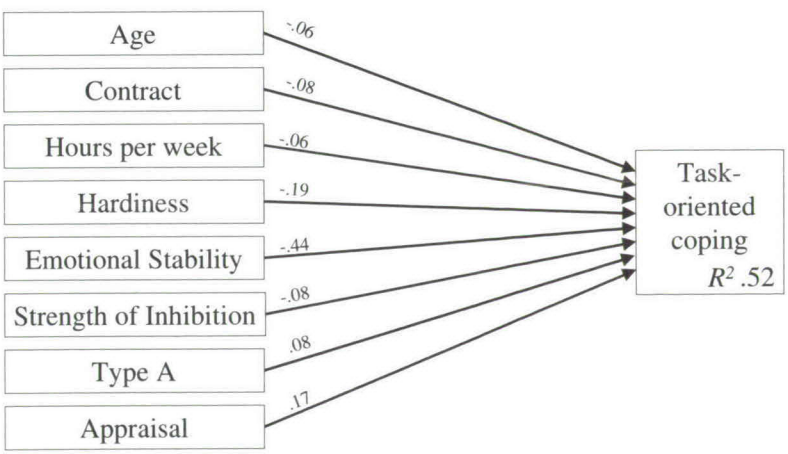

Figure 5.6. Predictors of Task-oriented coping.

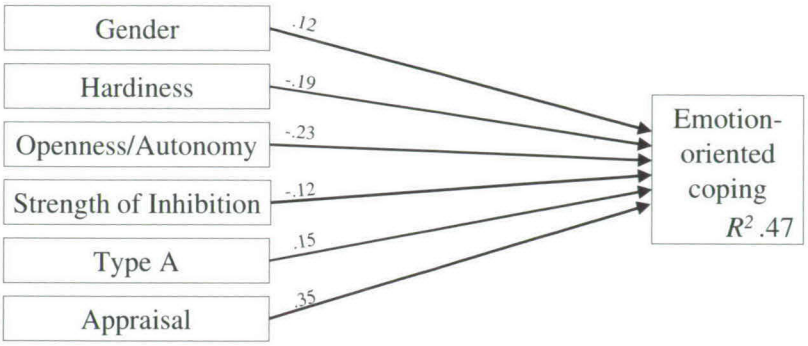

Figure 5.7. Predictors of Emotion-oriented coping.

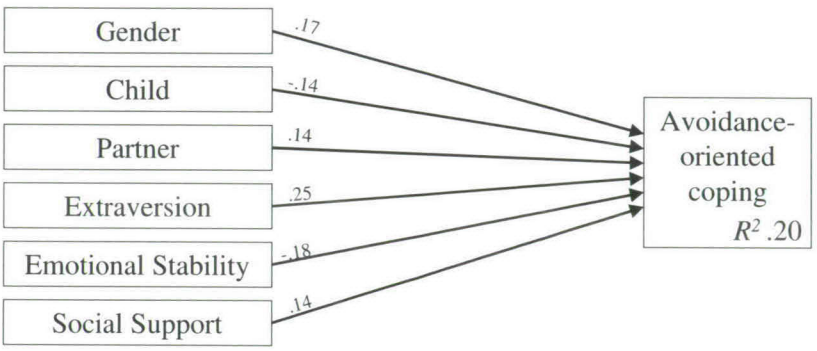

Figure 5.8. Predictors of Avoidance-oriented coping.

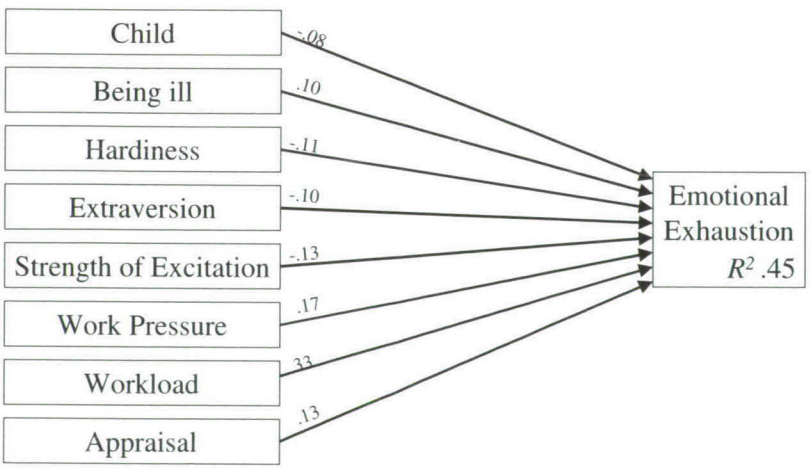

Figure 5.9. Predictors of Emotional Exhaustion.

The percentage explained variance was especially high in the models predicting Appraisal (61%) and Task-oriented coping (52%). The percentage explained variance was below 20 percent for the models predicting Workload and Social Support. In addition, when the analyses were performed including the Hardiness components instead of the total score, the patterns which emerged were in essence similar to the results described above. At all levels except for Social Support, Hardiness Total was replaced consistently by Commitment, alone or in combination with Challenge or Control. Hardiness Total was never replaced by all components.

Discussion

In general, the conceptual model of Taylor and Aspinwall (1996) was empirically confirmed. Stressor variables were predicted by both external and personal resources. In addition to personal resources, external resources played a role in predicting social support, while the latter failed to predict appraisal. However, in line with the theoretical model, stressor variables, personal resources, and social support predicted appraisal. All coping styles were predicted by both external and personal resources, while social support and appraisal were only important for some coping strategies. Finally, psychosocial outcome, i.e., emotional exhaustion, was not predicted by any of the coping styles. Two external resource variables, personal resource variables, stressor, and appraisal were the only exogenous variables of emotional exhaustion. No differences in results were found when using the total score of hardiness or the hardiness components. Especially the component commitment replaced the total score.

The outcomes of testing the second level of the model, with stressor as its endogenous variable, confirmed the model. Regarding the third level, social support was not only predicted by personality variables, but by external resources as well. In the present study, especially younger men with a partner experienced much social support. With regard to sources of support, in general one finds that men report more support from their spouses than women do (Antonucci & Akiyama, 1987), whereas women report more support from friends and neighbors (Allen & Stoltenberg, 1995; Robinson, 1995). The women in the present sample all had a paid job for at least 20 hours per week. Therefore, they may not have much time to spend with friends and neighbors and consequently perceived less support than men. In this situation, it is not surprising that, in addition to personality, external resources, like having a partner, have a significant influence on social support. As for age, other studies have found that older people receive less social support (Mardsen, 1987), which is in line with the present findings. Pugliesi and Shook (1998) reported that increasing age was associated with a larger number of closer ties, while

age exerted a negative effect on the frequency of interaction within the network. The relationship between age and social support seems to necessitate the division of social support into various components. In general, it appears that there is substantial empirical support to include an extra path from external resources to social support. Therefore, it is suggested that this extended Taylor and Aspinwall model should be tested in future research.

A striking result of the present study is that external resources did not predict the appraisal variable, perceived stress. In general, other studies have found that women perceive more stress than men (Brown & Fielding, 1993; Hunter, 1999; Sheets et al., 1993). Sixty percent of the women in the present sample had children, and therefore had the double burden of organizing their household and spending time at work (e.g., Bond & Sales, 2001; CBS, 1994). The present results are more in line with those of Duxbury and Higgins (1994), in which fathers and mothers with high work involvement had more control over both work and family domains, which facilitated their ability to balance work and family. In the present sample, almost half of the women and men had a college education and it is likely that they had high job involvement, which also could be a reason that women did not report more perceived stress than men. Moreover, the healthy worker effect, the phenomenon that people who stay healthy are able to work until their retirement (Fletcher & Ades, 1984; Fox & Collier, 1976), may also explain the finding that the women in the present sample did not differ from men in terms of perceived stress. Women who can cope with the demands of work as well as family, may be those healthy workers. Because of the specific characteristics of the present sample, it is speculated that these results cannot be generalized to the general population. Therefore, it is not advised to modify the model by deleting the path from external resources to appraisal.

In line with the expectations, external resources and personality predicted all coping styles. Social support only predicted avoidance-oriented coping, which was not predicted by appraisal, like the other coping styles. The avoidance-oriented coping style scale contains questions about seeking social support; thus, evoking positive correlations with social support. Appraisal was a significant exogenous variable for the other two coping strategies, task- and emotion-oriented coping. It is likely that social support concealed the predicting power of appraisal for the social support-related coping strategy.

The finding that none of the coping variables predicted emotional exhaustion is maybe the most fascinating outcome of this study. Concerning the relationship between coping styles and emotional exhaustion, inconsistent results have been found in other studies, probably due to the use of different coping questionnaires. Emotional exhaustion was related to, for instance, the coping style control (Lee & Ashforth, 1996), flight and avoidance (Thornton, 1992), and emotion-oriented coping (Deary et al., 1996). In contrast, Papadatou

and colleagues (1994) found no relationship between coping and emotional exhaustion. Future research is needed to clarify this outcome further. It is expected that, when a more general psychosocial outcome is chosen, like fatigue, the expected relations will be found. However, when in the future, other studies will consistently demonstrate the absence of this relationship, one should consider seriously to remove this path from the model. Although in our opinion the study is performed in a accurate way, there is not enough reason to modify the model at this moment, based on only the present findings.

Finally, concerning the use of the total hardiness score or the hardiness components, it was found that especially commitment was a consistent replacement for the hardiness total score, alone or in combination with challenge or control. Shepperd and Kashani (1991) found that commitment and control predicted health outcomes for men, but not for women. Commitment, control, gender and stress interacted in three different ways. Further research should focus on these complex relations, including more external resources, to broaden our knowledge of hardiness.

Methodological issues

In the present study, stressor was measured subjectively. Frese and Zapf (1999) dispute this approach on methodological grounds. Subjective features may lead to higher correlations than objective characteristics, due to biases and method variance. On the other hand, Perewé and Zellars (1999) note limitations of the objective approach, advocating a focus on subjective appraisal. They indicate that an individual's perception of the environment is crucial in the stress process, rather than the objective environment itself. It would be a challenge to replicate the present study with both a subjective and an objective stressor measure, as well as a subjective and an objective psychosocial outcome, enabling comparisons of the effects of objective and subjective measures.

Another problem may be the distinction between stressor, measured as perceived work stress, and appraisal, assessed by perceived general stress. Work stress could be part of the general perceived stress. However, an indication that the three questionnaires used in this study measure different aspects, is the finding that they are all three exogenous variables of the psychosocial outcome, emotional exhaustion. In addition, in a confirmatory factor analysis (not described in this paper) a three-factor model provided a better fit, compared to the two-factor (workload and work pressure, on the one hand, and perceived stress, on the other hand) and a one-factor solution. An already mentioned possible solution for this problem could be the objective measurement of stressors (e.g., Hassinger, Semenchuk, & O' Brien, 1999)

Up untill now, most research has been cross-sectional, as was the case with the present study. With this type of research, one must be cautious to

make inferences about causality (Kaplan, 2000). A prospective study may overcome this disadvantage, and may yield results that give a better insight in the causal relations involved.

Search strategies such as backward elimination or forward (or stepwise) selection cannot guarantee that the optimal subset of independent variables in linear regression analysis will be found (Miller, 1990). The only certain strategy for finding this optimal subset consists of performing systematically regression analyses for all subsets, and choosing the one with the largest squared multiple correlation coefficient (or a similar fit measure). This strategy was not feasible for the present study due to the large number of potential independent variables.

Finally, it is important to note that the series of regression analyses performed in this study assume that the correct causal order among the variables is known on substantive grounds. The present analyses show whether some paths from variables at a former level to variables at a later level can be removed from the model or should be added to the model. The validity of the classification of the variables in six levels, according to the Taylor and Aspinwall model (1996), cannot be assessed by any statistical test, but must be grounded on substantive theory. Consequently, feedback-loops or extra variables could be added to the model, provided that these are theoretically sound. Based on statistical and theoretical grounds, it is suggested that researchers should test one extra path, from external resources to social support, in a future study concerning this model.

In conclusion, on the basis of the present findings, some modifications on the outline of the Taylor and Aspinwall model (1996) should be made, but overall the empirical findings supported the model. One alteration of the Taylor and Aspinwall model was proposed. In the present study, Social support was predicted by external resources, and this was theoretically supported. It is suggested that a longitudinal study will be useful to test this elaborated model, preferably including objective measures of stressors and psychosocial health outcomes.

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Chapter 6

Predictors of fatigue and emotional exhaustion: A model-based prospective study

Introduction

The aim of the study highlighted in this chapter was again to test the Taylor and Aspinwall model (1996). However, emotional exhaustion was now measured two years later than the other variables. In addition, the FAS was included as well, because it was thought that, when a more general fatigue measure was used, the path from coping to the outcome variable would be found. Furthermore, by studying the difference in predictors of emotional exhaustion and fatigue, it was expected that some light would be shed on the unexplained variance between emotional exhaustion and fatigue.

Chronic fatigue is a common phenomenon, which can have huge personal as well as societal costs. In recent years, researchers have studied an extensive number of hypothesized causes of chronic fatigue, including the effects of treatment or substances in patients with a chronic disease (Andrykowski, Curran, & Lightner, 1998; Caldwell, Smythe, Leduc, & Caldwell, 2000), the influence of anxiety, mood states, and personality on driver fatigue (Lal & Craig, 2001; Sal & Craig, 2000), and the effects of shift work (Åkerstedt, 1990; Knutsson & Akerstedt, 1992). In spite of this growing body of literature, there still is a lack of general agreement on the definition of fatigue, a lack of studies based on theoretical models explaining fatigue, and an unsatisfying amount of prospective fatigue studies.

Definition of fatigue

At the beginning of the previous century, Mosso (1903) developed a unitary view of fatigue, including both physical and intellectual (mental) aspects. However, he conceived of fatigue as a rather vague sensation. Two decennia later, Muscio (1921) argued that the term 'fatigue' should be banished entirely from scientific discussion due to its far-reaching indistinctness. Views such as these precluded the development of an adequate phenomenology of the feeling of fatigue and placed it beyond measurement. Only after World War II, Bartley and Chute (1947) held the view that researchers could study fatigue effectively, be it not directly. In their opinion, researchers should resort to related constructs that could serve as standards. In contrast, clinicians made a thorough search for methods to measure fatigue directly (Jaspers, 1963), because of an ever increasing amount of individuals reported unexplained feelings of fatigue.

More recently, Grandjean (1979) defined fatigue as a state marked by reduced efficiency and a general unwillingness to work. In 1994, Brown conceived of fatigue as a disinclination to continue task performance. It involves an impairment of efficiency, when work continues after persons become aware of their fatigued state.

Until now, no agreement has been reached about the definition of fatigue. As a result of the inability to reach consensus regarding the definition of fatigue, current research has limitations, for there is no universally accepted standard to measure fatigue. Therefore, in the present study, two questionnaires have been employed to measure fatigue, more specifically fatigue and emotional exhaustion. Emotional exhaustion reflects feeling worn out and feeling empty because of the work situation. This component has been frequently used to measure fatigue in working populations. Emotional exhaustion is considered the core component of burnout (Lee & Ashforth, 1993; Leiter, 1993). Chronic fatigue is defined more general and is independent of a certain task (Meijman & Schaufeli, 1996). Both measures were included, in order to check whether emotional exhaustion and fatigue have different predictors, and, in this way, clearifying the fatigue construct.

Scarcity of theoretical models

A second issue in the fatigue debate is the infrequent occurrence of systematic theorizing. Fortunately, some authors (e.g., Bartley & Chute, 1947; Smets et al., 1995; Vercoulen et al., 1998) have developed theoretical notions about the onset and perpetuation of chronic fatigue. For example, Vercoulen et al. (1998) focussed on the persistence of fatigue in patients suffering from the chronic fatigue syndrome. The proposed framework deals with the influence of attribution effects, the level of physical activity, the sense of control over symptoms, and individuals' focussing on bodily symptoms. Various researchers proposed a biospychosocial approach as the most suitable way of examining fatigue (e.g., David et al., 1990; Lewis et al., 1992; Ware, 1993). This approach takes into account the combined effects of physical, psychological, as well as behavioral factors. However, a specified model has not been suggested yet. Others have focussed on more specific concepts which are thought to be related to fatigue. For instance, De Rijk, Schreurs, and Bensing (1999) hold the view that various types of extreme stimulation involving low as well as high physical and/or information-processing demands influence fatigue. Finally, also the belief exists that fatigue is related to symptom perception (e.g., Pennebaker, 1982). Concerning emotional exhaustion, some studies are based on theoretical models. For instance, Bakker, Schaufeli, Sixma, Bosveld, and Van Dierendonck (2000) tested views of social exchange and equity theory. Janssen and Nijhuis (2001) used the Demand-Control-Support model by Karasek and Theorell (1990). However, most studies focussed on the direct effects of independent variables on emotional exhaustion (Burke & Greenglass, 1995; Büssing & Glaser, 1999; Capel, 1991; Mills & Huebner, 1998; Piedmont, 1993). Exceptions are studies by Lee and Ashforth (1993) and Bakker and coworkers (2000), which also scrutinized indirect effects. For instance, Lee and

Ashforth (1993) found that work autonomy and social support were related to emotional exhaustion through role stress. Lack of reciprocity mediated the relationship between patient demands and emotional exhaustion in the study by Bakker and coworkers (2000). Testing a model, like the Taylor and Aspinwall model (1996), which includes some important concepts concerning fatigue and focusses on direct as well as indirect effects, can be helpful to add knowledge to the fatigue framework.

Psychological stress model

The present study examined the psychological stress model proposed by Taylor and Aspinwall (1996). This model includes direct effects as well as mediators of psychosocial outcomes. It was based on empirical evidence and integrates important predictors of psychosocial outcomes, such as personality and social support. It describes the relationships between external resources, personality, stressors, appraisal, social support, and coping strategies in relation to psychosocial outcomes. Figure 6.1 displays this model. According to Taylor and Aspinwall (1996), external resources comprise those aspects of the individual's environment, which influence the demands and affordances of the stream of situations people encounter in everyday life. In addition to standard external resources, such as time and money, a mixed set of environmental conditions, ranging from the facets of the physical environment to social roles and other aspects of the individual's place in social aggregates, are seen as external resources. External resources may influence the kinds of stressors which one can experience as well as appraisal and coping. Similarly, personal resources may determine exposure to and disengagement from situations, as well as appraisal and coping. In addition, personal resources may affect the availability, mobilization, and maintenance of social support. Social support, in turn, may influence coping indirectly through appraisal processes and directly through the provision of information and functional assistance. Finally, the model suggests that the effects of personal and external resources, stressor, appraisal, and social support on psychosocial outcomes are mediated by ways of coping with stress. The validity of this model has been tested in a cross-sectional study by Michielsen, Croon, Willemsen, De Vries, and Van Heck (2002a). In general, support was found for the ideas represented in the Taylor and Aspinwall model. Stressor variables were predicted by both external and personal resources. In addition to personal resources, external resources played a role in predicting social support, while the latter failed to predict appraisal. On theoretical and statistical grounds, it was suggested to add a path to the model, linking external resources to social support (Michielsen et al., 2002a). In line with the theoretical model, stressor variables, personal resources, and social support predicted appraisal.

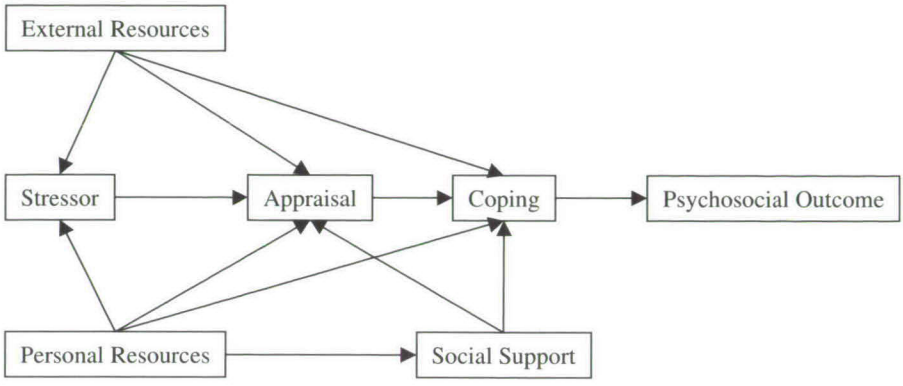

Figure 6.1. The Taylor and Aspinwall model (1996, p. 98).

Furthermore, coping preferences were influenced by both external and personal resources, while social support and appraisal were only important for some particular coping strategies. Contrary to expectations, psychosocial outcome, that is emotional exhaustion, was not predicted by any of the coping styles. External resource variables, personal resources, stressors, and appraisal were the only exogenous variables which were associated with emotional exhaustion. It was suggested that evidence for a specific path, linking coping to fatigue, would have appeared in case of a fatigue measure, instead of an emotional exhaustion scale, as outcome measure.

The present study explores fatigue of the same respondents (Michielsen et al., 2002a) two years later. With cross-sectional research, one must be cautious to make inferences about causality (Kaplan, 2000). A prospective study may overcome this disadvantage, and may yield results that give a better insight in the causal relations involved. The variables at the first levels of the model were measured at the baseline of the study, while emotional exhaustion and fatigue were measured two years later. We tried to overcome some of the weaker aspects of fatigue research. First, a theoretical model including mediators was used to lead the selection of variables and the analyses used in this study. Furthermore, by scrutinizing possible differences in predictors of fatigue and emotional exhaustion, we worked on a further refinement of a conceptual framework regarding fatigue. Finally, a prospective study design was employed to determine the strength of the predicting power of the variables used in this study, reflecting the theoretical model at hand.

Method

Participants and procedure

Participants were selected at random from the telephone directory and received a telephone call inviting them to participate. Only individuals who worked at least 20 hours per week were included in the study. The results presented here concern the first and the last measurement point, two years later. Three hundred and twenty-five out of a group of 765 individuals returned a completed test booklet at both measurement points; 173 men ($M = 44.82$ years, $SD = 8.37$) and 150 women ($M = 42.89$ years, $SD = 9.25$). Gender was unknown for two respondents. In the first questionnaire, participants were asked whether they were willing to complete additional questionnaires at various measuring points covering two years. Of the 765 participants, 599 agreed to fill in the four following questionnaires. Thus, the response rate was 54%. Fatigue and emotional exhaustion were measured at the fifth measurement point, the other variables at baseline, two years earlier. Concerning the representativeness of this sample, no significant differences were found with regard to personality, temperament, and fatigue between individuals who only participated at the first measurement point and persons who also were involved in the last measurement point. Fatigue was also measured at baseline.

Measures

External Resources. The following variables were taken as exogeneous: *gender* (0 = male, 1 = female), *age*, *having children* (0 = no children; 1 = having children), *type of employment contract* (0 = permanent work; 1 = temporary work), *marital status* (0 = having a partner; 1 = single), *number of working hours per week*, and *being ill* (0 = healthy; 1 = ill). Concerning being ill, the question was asked: were you ill the last week? People ($n = 25$) who were ill, indicated that they were having a cold ($n = 13$), or had a health problem such as back pain, asthma, or a chronic illness. These individuals were not excluded, because the illness was not severe enough that they had to stop working for more than a week.

Personal Resources. To measure hardiness, the 50-item third-generation Hardiness scale (Personal Views Survey, Maddi, 1997; Dutch version by Van Heck and De Vries, 1994) was used. This scale, with positive as well as negative items, yields scores for the Challenge (17 items), Commitment (16 items), and Control (17 items) subscales, and a total score, which is acquired by summing all items. The rating scale ranged from 0, *not at all true*, to 3, *completely true*. Previous studies demonstrated adequate internal consistency for the total score (Bernas & Major, 2000) and the three subscales separately (Williams, Wiebe, & Smith, 1992).

The Five-Factor Personality Inventory (FFPI; Hendriks, Hofstee, & De Raad, 1999) was used to assess the Big Five: *Extraversion*, *Agreeableness*, *Conscientiousness, Emotional Stability*, and *Openness to Experience/Autonomy*. Each subscale leads to a summated score of 10 positively and 10 negatively phrased items with a 5-point response scale ranging from 1, *not at all applicable*, to 5, *totally applicable*. The psychometric properties appear to be satisfactory (Hendriks et al., 1999). For instance, Hendriks (1997) reported internal consistencies ranging from 0.83 to 0.89, and test-retest reliabilities which ranged from 0.79 to 0.84.

The Pavlovian-oriented temperament characteristics were measured with the Pavlov Temperament Survey (PTS; Strelau, Angleitner, and Newberry (1999); Dutch version by Van Heck, De Raad, and Vingerhoets (1993). This questionnaire contains 60 items designed to measure Strength of Excitation (SE), Strength of Inhibition (SI), and Mobility of Nervous Processes (MO). SE refers to the functional capacity of the nervous system. SI refers to conditioned inhibition and MO can be understood as the ability to react quickly and adequately to changes in the surroundings. Each subscale is measured by 20 items on a 4-point Likert scale, ranging from 1, *completely uncharacteristic*, to 4, *completely characteristic*. The internal consistency of the Dutch version of the PTS scales was very satisfactory in an earlier study: Cronbach's alpha coefficients were 0.88, 0.78, and 0.91 for SE, SI, and MO, respectively (Van Heck et al., 1993).

The 24-item version of the Jenkins Activity Scale (JAS; Jenkins, Zyzanski, & Rosenman, 1979; Dutch translation by Appels, Mulder, & Van Houtem, 1995) yields a score for overall Type A. Scores at the positive end of the scale indicate Type A behavior. The rating scale is different for almost each question. Reliability and content validity are good (Jenkins et al., 1979; Appels, Mulder, & Van Houten, 1985).

Stressor This component of the model was measured by two questionnaires. One scale, assessing *Work Pressure,* stems from the Questionnaire on the Assessment and Experience of Work, a measure of psychosocial job demands and work stress (Vragenlijst Beleving en Beoordeling van de Arbeid; Van Veldhoven & Meijman, 1994). The 11 items, as, for instance, 'I find it hard to relax at the end of a working day' and 'I find it hard to show interest in other people when I just come home from work', have a rating scale ranging from 1, *always*, to 4, *never*. The second scale, *Workload*, is a subscale from the Trier Inventory for the Assessment of Chronic Stress (TICS; Schulz and Schlotz (1999); Dutch translation by De Vries (1999). The responses on the latter scale are given on a 5-point rating scale, ranging from 1, *never*, to 5, *very often*. The scale contained items like ' Having too many things to do' and ' There are too many obligations I have to fulfil' . Reliability and validity of this subscale are good (Schulz & Schlotz, 1999).

Appraisal. Appraisal was measured by the total score of the Perceived Stress Scale (Cohen, Kamarck, & Mermelstein, 1983; Dutch translation by De Vries, 1998b). The 14 items globally assess perceived stress, that is, the degree to which situations within a person's life are appraised as stressful. Responses are given on a 4-point scale ranging from 1, *never*, to 4, *always*. This instrument has been used frequently in studies on stress and illness (Monroe & Kelley, 1995). The PSS demonstrated good reliability and validity (Cohen et al., 1983; Hewitt, Flett, & Mosher, 1992).

Social Support. The total score of the 12-item version of the Perceived Social Support Scale-Revised (Blumenthal et al., 1987; De Vries, 1998a) was used to examine Social Support. The item's rating scale varied from 1, *very strongly disagree*, to 7, *very strongly agree*. Good reliability and validity were demonstrated in a sample of patients undergoing coronary angiography (Blumenthal et al., 1987).

Coping. The 48-item Coping Inventory for Stressful Situations; (CISS; Endler & Parker, 1994; Dutch version De Ridder & Van Heck, 1998) assesses three basic coping dimensions: *Task*-oriented coping (coping by altering the situation), *Emotion*-oriented coping (coping by regulating emotional distress), and *Avoidance*-oriented coping (coping by distraction or seeking other people's company). Avoidance-oriented coping is further divided into *Distraction* and *Social Diversion.* The rating scale ranges from 1, *not at all*, to 5, *very much.* The summated scores of the five coping strategies were used in this study. Reliability and validity of the CISS are good (Cook & Heppner, 1997; Endler & Parker, 1994).

Health outcome. The *Emotional Exhaustion* (EE) scale of the Dutch version (Schaufeli & Van Dierendonck, 1994) of the Maslach Burnout Inventory (Maslach & Jackson, 1986) was used. This EE scale concerns the extreme fatigue component of burnout. The EE scale provides the summed score of five items, each with a 7-point rating scale ranging from 0, *never*, to 6, *always*. The psychometric properties are good (Schaufeli & Van Dierendonck, 1994).

The second health outcome measure was the 10-item Fatigue Assessment Scale (FAS; Michielsen, De Vries, & Van Heck, in press). This is a new, unidimensional fatigue scale, which was tested in a large (N = 1,835) sample, representative for the Dutch population. The items have a rating scale, ranging from 1, *never*, to 5, *always*. Cronbach's alpha was good (.87). Factor analysis revealed that the FAS measures one construct. Also Mokken Scale Analysis supported the unidimensionality of this measure (Michielsen et al., in press).

Statistical analyses

Before testing the model, the mean, standard deviation, and Cronbach's alpha of the FAS and the Emotional Exhaustion scale were calculated. In addition, the correlation between fatigue and emotional exhaustion was calculated. Furthermore, a factor analysis was performed on the fatigue and emotional exhaustion items.

The Taylor and Aspinwall (1996) model, represented in Figure 6.1, is a recursive path model (Kaplan, 2000). It can be described in terms of six levels. The first level includes the exogenous variables Personal and External Resources, the second level contains the Stressor variables Work Pressure and Workload. The third level concerns the endogenous variables Social Support, the fourth Appraisal, the fifth Coping and its exogenous variables. Finally, the sixth level considers Psychosocial Outcomes and its exogenous variables.

The model has the variables External Resources and Personal Resources as its basis. These may be mutually correlated, but these correlations are not explained by the path model itself. According to the model, variables at the Stressor level may be influenced by External Resources as well as Personal Resources. However, Social Support, at the third level, is only influenced by Personal Resources. At the fourth level, there is also Appraisal, which is assumed to be influenced by all variables of the first three levels. The fifth level features the Coping variables which, according to the path model, are all directly influenced by the variables in External and Personal Resources, Appraisal, and Social Support, but not by the Stressor variables. Finally, at the sixth level, the variable Psychosocial Outcome is predicted. The Taylor and Aspinwall model (1996) makes strong assumptions about the possible causes of Psychosocial Outcome. According to the model, only the Coping variables have a direct effect on it, while all other variables have only indirect effects.

Parameters must be estimated on the basis of observed data. In Michielsen et al. (2002a), the data were analyzed by means of the software package AMOS 3.6 (Arbuckle, 1997). In the present study, the same method was employed to ensure comparability.

For each endogenous variable, a sequence of regression analyses was performed starting with the analysis in which the particular variable was regressed on all variables belonging to the previous level. These analyses are based on a saturated model in which none of the path coefficients of the former variables is constrained in any way. The value of the loglikelihood function for these saturated models provides a baseline against which the goodness-of-fit of simplified, more parsimonious models can be tested. In the simplified models, some of these path coefficients are set equal to zero.

In order to study which path coefficients could be set equal to zero in the equation for a particular endogenous variable, a backward elimination

procedure was used for each endogenous variable separately. Starting from the results of the saturated model, the exogenous variable which path coefficient had the lowest absolute critical ratio (CR) was removed from the model, and the endogenous variable was regressed again on the remaining predictor variables. The critical ratio is the ratio of the estimate of the path coefficient to its standard error. In the present study, only predictor variables with $|CR|<2$ were removed from the model. The fit of the simplified or reduced model was assessed by a statistical test based on the difference between the loglikelihood functions of the simplified and the saturated model. Since the simplified model is a submodel of the saturated one, the difference between their respective loglikelihood functions is asymptotically chi-square distributed if the simplified model holds true in the population. The degrees of freedom of this chi-square distribution are equal to the number of path coefficients that have been set equal to zero in the simplified model. By positioning the observed difference between the loglikelihood functions under the appropriate chi-square distribution, the probability level of the observed difference can be assessed. If this probability level was larger than 0.05, it was concluded that the simplified model provided an acceptable fit to the data. The backward elimination procedure was continued till none of the remaining exogenous variables could be removed from the equation without causing a statistically worse goodness-of-fit. In this way a sequence of regression analyses yielded a parsimonious regression model for each endogenous variable. By following this method of testing the model, the total log likelihood function was already maximized, because the function is maximized per level. Therefore, it is not necessary to test the fit of the global model.

Results

The FAS had a mean of 19.26 (SD = 6.43) and the MBI-EE of 1.49 (SD = 1.09). Reliability was good for both scales; Cronbach's alpha was .90 for the FAS, and .88 for the MBI-EE, respectively. The correlation between Fatigue and Emotional Exhaustion is .78 ($p < .001$). The exploratory factor analysis resulted in a one-factor solution, which explained 51% of the variance. Fatigue measured by the FAS and Emotional Exhaustion load on one single factor.

Table 6.1 presents the results of the statistical goodness-of-fit test for the final regression model obtained by the backward elimination procedure for each observed dependent variable. This table shows that for each of the observed endogenous variables a regression model is obtained which fits the data well. For any of the endogenous variables removal of an additional predictor variable resulted in a model with a statistically worse fit. For most of the endogenous variables, the number of degrees of freedom of the final model was rather large. Since the number of degrees of freedom is equal to the

number of path coefficients that can be set equal to zero without worsening model fit in a significant way, this demonstrates that for most endogenous variables a parsimonious model with a limited number of predictor variables was indicated.

Table 6.1
Goodness-of-fit for the final Regression Model

Dependent variable	Df	Test-value	*p*
Stressor	29	41.87	.06
Social Support	11	11.36	.41
Perceived Stress	15	11.88	.69
Avoidance-oriented coping	15	6.02	.98
Task-oriented coping	18	23.08	.19
Emotion-oriented coping	15	16.67	.34
Emotional Exhaustion	20	20.10	.45
Fatigue	19	20.05	.39

Figs. 6.2 to 6.10 summarize the results of the regression analyses for the ten endogenous variables. These results should be compared with the premises of the Taylor and Aspinwall model.

Figs. 6.2 and 6.3 show that the Stressor variables are predicted by Personal Resources, but not by External Resources. Workload and Work Pressure were both high for Type A individuals; Workload was also high for persons low on Emotional Stability, high on Openness/Autonomy and low on Strength of Excitation. Figure 6.4 demonstrates that Social Support is not only predicted by Personal Resources, but by External Resources as well. Especially having a partner, being an extravert and being hardy predicted the perception of more social support. As described in Figure 6.5, Stressor (Workload) and Personal Resources, especially Emotional Stability, predicted Appraisal, while External Resources and Social Support did not play a role. Personal Resources were important predictors of all Coping styles, as depicted in Figs. 6.6 to 6.8, in various combinations. Social Support only predicted Avoidance, while Appraisal was never a significant predictor of Coping. Task-oriented coping was the only coping style which was not predicted by any of the External Resources, while Emotion-oriented coping was predicted by a Stressor, namely Workload. Contrary to expectations, Emotional Exhaustion was not predicted by any of the coping styles (Figure 6.9). Instead, individuals with much Workload, who scored low on Extraversion, Openness/Autonomy and Hardiness, were emotionally exhausted. Extraversion and Workload predicted Fatigue (Figure 6.10) as well. Being ill, SE, and SI were significant predictors.

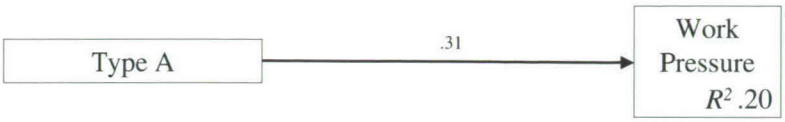

Figure 6.2. Predictor of Work Pressure.

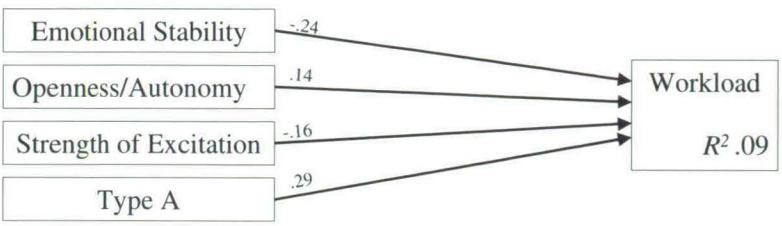

Figure 6.3. Predictors of Workload.

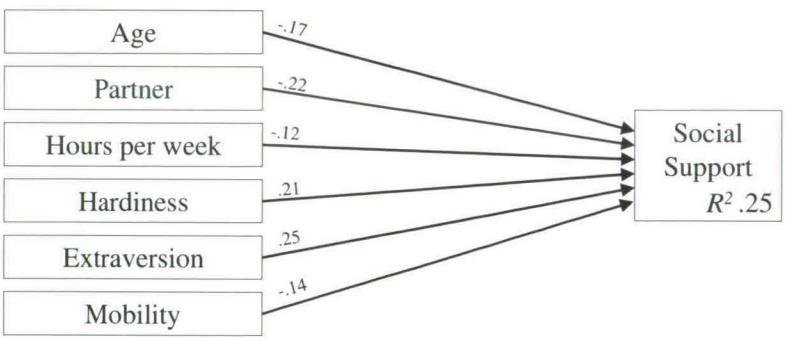

Figure 6.4. Predictors of Social Support.

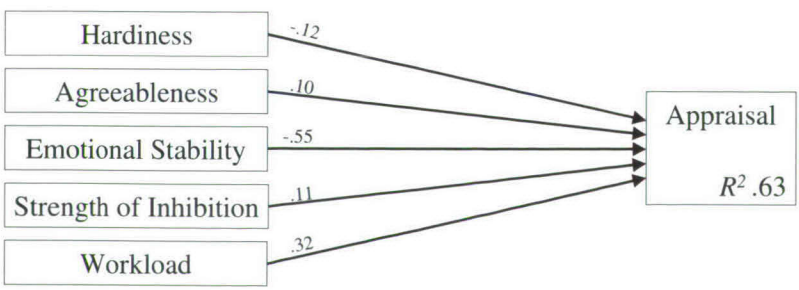

Figure 6.5. Predictors of Appraisal.

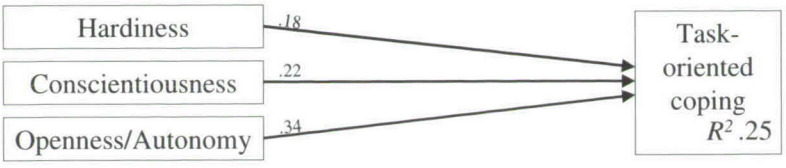

Figure 6.6. Predictors of Task-oriented coping.

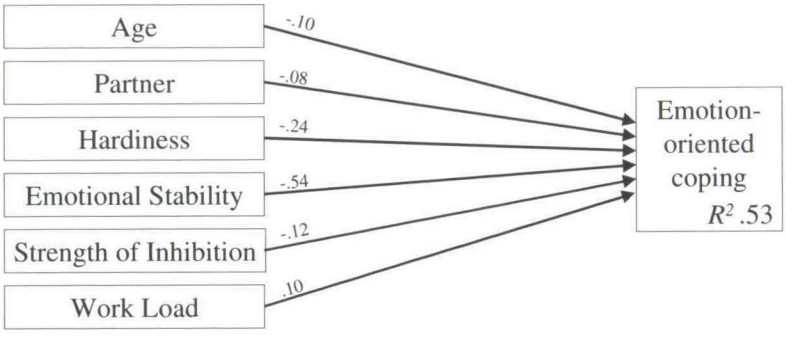

Figure 6.7. Predictors of Emotion-oriented coping.

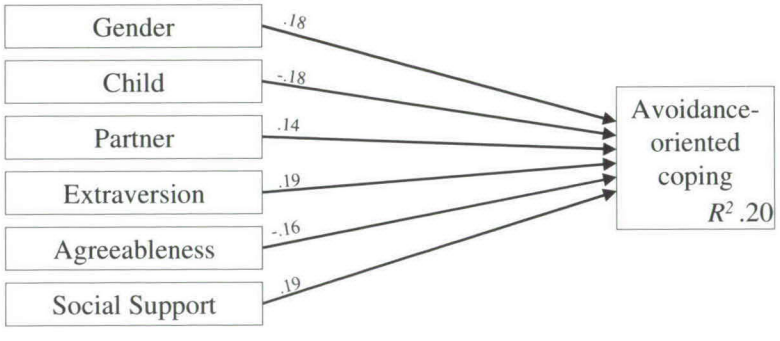

Figure 6.8. Predictors of Avoidance-oriented coping.

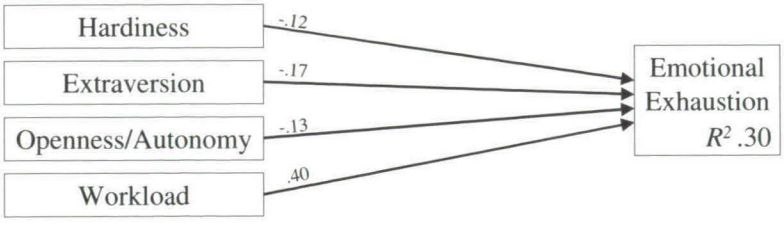

Figure 6.9. Predictors of Emotional Exhaustion.

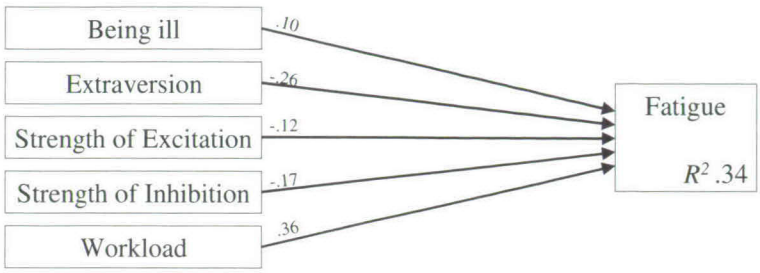

Figure 6.10. Predictors of Fatigue.

Overall, in many analyses the personality variables Emotional Stability, Extraversion, and Type A were the most important predictors, as indicated by the high value of the standardized regression coefficient. The percentage explained variance was especially high in the models predicting Appraisal (63%) and Emotion-oriented coping (53%). The percentage explained variance was 20 percent or less for the models predicting Workload (9%), Avoidance-oriented coping, and Work Pressure (both 20%). In addition, when the analyses were performed including the hardiness components instead of Hardiness Total, the patterns emerging were essentially similar to the results described above. At all levels except for Social Support, Hardiness Total was replaced consistently by Commitment, on itself or in combination with Challenge or Control. Hardiness Total was never replaced by all components.

Discussion

The correlation between the fatigue and emotional exhaustion scales was high. Moreover, the factor analysis showed a clear one-factor solution. The items of the different questionnaires seem to tap an almost identical concept. However, not all independent variables that predicted the two constructs were similar.

The Taylor and Aspinwall model (1996) was partially confirmed. However, empirical evidence for some paths was not found. Stressor was predicted by personal resources, but not by external resources. Only the stressor variable and personal resources predicted appraisal; external resources and social support failed to do so. None of the coping variables was predicted by external resources, personal resources, stressor, and social support. However, in various combinations all predictors were at least influencing one of the coping styles. Emotional exhaustion was predicted by personal resources and stressor variables, while fatigue, in addition, was predicted by external resources. None of the coping styles was a predictor of fatigue or emotional exhaustion. In general, no differences in results were found when using the

hardiness total score or the hardiness components. Especially the component commitment replaced the total score as a predictor.

In contrast to expectations from the model, none of the external resources predicted the stressor variables. Due to the reduced number of respondents compared with an earlier cross-sectional study (Michielsen et al., 2002a), and, therefore, reduced power, it is likely that variables had lost their importance in predicting the dependent variable. For instance, appraisal was predicted by personal resources and stressor variables, but not by social support or external resources. With regard to support, this is contradictory to expectations. In earlier cross-sectional studies (e.g., Hastings & Johnson, 2001; Steptoe, Wardle, Pollard, Canaan, & Davies, 1996), empirical support has been found for a substantial relationship between appraisal and social support. However, Steptoe et al. (1996) assessed social support availability and Hastings and Johnson (2001) distinguished two kinds of social support a family can receive. Thus, it seems important to differentiate various kinds of social support. In the present study, a general support measure was used. It is possible that future research with a questionnaire that takes various support forms into account, could verify the path between social support to appraisal.

None of the coping variables were predicted by external resources and personal resources, social support, and appraisal. However, in different combinations they all played a role. This is probably subsistent to differences in coping styles.

As in the first study in which the model was tested, coping did not predict emotional exhaustion. In that cross-sectional study (Michielsen et al., 2002a), only emotional exhaustion was used as a health outcome. In contrast, in the present study the psychosocial outcomes were measured two years after baseline. Inconsistent results have been found in other studies concerning the relationship between coping styles and emotional exhaustion. This may be due to the use of different coping questionnaires (Deary, Agius, & Sadler, 1996; Lee & Ashforth, 1996; Papadatou, Anagnostopoulos, & Monos, 1994; Thornton, 1992). It was expected that, in the case of a more general psychosocial outcome variable, like fatigue, coping would have been found to predict this variable. However, in the present study, coping did not predict fatigue. There are several reasons that might explain these findings. First, it could be that a situation specific coping questionnaire, aimed at assessing coping with a health problem (Endler, Parker, & Summerfeldt, 1998), would be a more appropriate measure. The possibility also exists that the causes of fatigue differed and, therefore, different coping styles are benefitional for different individuals. As a result, no relationship is found between coping and fatigue. Thirdly, different coping styles could be effective in different parts of the fatigue process. It is also possible that coping is not relevant for all health problems, or not in the context of a working population.

Other paths, for instance, the path linking personality to health outcome, are not advised to be added to the model, because these paths may depend on the particular health outcome chosen. Personality may not play a major role if a different variable is selected as the final outcome variable. However, when fatigue is selected as the outcome variable in a future study employing this model, one should include direct paths from personality and stressor to fatigue in the model to be tested.

It is interesting to compare the predictors of fatigue and emotional exhaustion. Extraversion and Workload were the strongest predictors of both emotional exhaustion and fatigue. The other independent variables played a relatively small role. Apparently, scores on the different fatigue-related measures have, to a large extent, similar predictors. This does not imply that the nature of fatigue and emotional exhaustion are identical. Although the factor analysis with two scales showed a one-factor solution and the correlation between emotional exhaustion and fatigue was high, there still remained some variance unexplained. Other variables, which were not included in the present study, may predict fatigue and not emotional exhaustion or vice versa. Furthermore, it is interesting that a combination of a personality factor and a situational variable plays a substantial role in the explanation of both fatigue forms. Burisch (2002) also found that both dispositional and environmental factors predicted emotional exhaustion. In the present study and the study by Burisch (2002), it was found that environmental factors, that is workload, were somewhat superior in predicting emotional exhaustion. It does not make a difference which subjective fatigue measure, the MBI or the FAS, was used. This partly reveals the reason why fatigue is quite a stable construct (Michielsen et al., 2002b), because personality is supposed to be a consistent construct. If the work situation of the respondents had not changed during the period of the study, it is likely that the workload has remained rather steady as well. It should be noted that, although there is general agreement about the stability of personality, the work situation can and should be changed if necessary. Future longitudinal research could examine whether the influence of this variable on fatigue is as strong in individuals with as in individuals without a change in work environment.

Methodological issues

In the present study, perceived work stress was measured. Frese and Zapf (1999), however, dispute this subjective approach on methodological grounds. In their view, subjective features may lead to higher correlations than objective characteristics, such as reorganizations or noise, due to biases and method variance. On the other hand, Perewé and Zellars (1999) note limitations of the objective approach, advocating instead a focus on subjective appraisal. The

latter authors indicate that an individual's perception of the environment is crucial in the stress process, rather than the objective environment itself. Given this controversy, it would be a real challenge to do a study similar to the present one, with a subjective as well as an objective stressor and psychosocial outcome measure, enabling comparisons of the effects of objective and subjective measures.

Another problem may be the distinction between stressor, measured as self-reported work stress, on the one hand, and appraisal, assessed by perceived general stress, on the other hand. Work stress may be considered a special case of general perceived stress. However, an indication that the respective questionnaires used in this study measure different aspects, can be found in the outcome that, in the study by Michielsen et al. (2002a) they seemed separate predictors of emotional exhaustion. In addition, in an analysis using structural equation modeling (not described in this chapter) a three-factor model with workload, work pressure, and perceived stress as separate factors provided a better fit, compared to the two-factor (workload and work pressure, on the one hand, and perceived stress, on the other hand) and to the one-factor solution. It may be questionable whether work stress was measured objectively enough. An already mentioned possible solution for this problem could be the objective measurement of stressors (e.g., Hassinger, Semenchuk, & O' Brien, 1999) Furthermore, attention should be paid to the way appraisal was measured in the present study. A general perceived stress scale was used instead of a scale on the taxation of individual workload and work pressure. Using more contextual appraisal strategies would be more in line with the transactional model of Lazarus and Folkman (1984) and the Taylor and Aspinwall model (1996), which is an elaboration of the former model. Possibly the relationships between personality and perceived stress, because of its more trait-like character, are stronger than associations between personality and appraisal, which is per definition more situation-specific. In addition, the general character of the perceived stress questionnaire could weaken the relationship between stressors and perceived stress in relation to the association between stressors and appraisal.

Search strategies such as backward elimination or forward (or stepwise) selection cannot guarantee that the optimal subset of independent variables in linear regression analysis will be found (Miller, 1990). The only certain strategy for finding this optimal subset consists of performing systematically regression analyses for all subsets, and choosing the one with the largest squared multiple correlation coefficient (or a similar fit measure). This strategy, however, was not feasible for the present study due to the large number of potential independent variables.

Finally, it is important to note here that the series of regression analyses performed in this study assume that the correct causal order among the

variables was known on substantive grounds. The validity of the classification of the variables in six levels, according to the Taylor and Aspinwall model (1996), cannot be assessed by any statistical test, but must be grounded on substantive theory. Consequently, feedback-loops or extra variables could be added to the model, provided that these are theoretically sound.

In conclusion, the outline of the Taylor and Aspinwall model (1996) should be changed, when one considers the findings of this study. However, the model should be tested in different populations, with different measures, and with different psychosocial outcomes to be more confident about modifications of the model. It is advised to incorporate now only one alteration, i.e. a path from external resources to social support. Furthermore, an important finding was the absence of the path from coping to fatigue with both fatigue measures. Coping does not seem to influence fatigue in the short term, nor in the long term. Furthermore, the relationship between coping and fatigue should be studied more in depth. Emotional exhaustion and fatigue appeared to be predicted by identical variables. Although the constructs are not entirely similar, they share a large proportion of variance. Both constructs were predicted by extraversion and workload.

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Chapter 7

Summary, conclusions, and discussion

Introduction

This research project is embedded in the national, multidisciplinary research program called 'Fatigue at Work', supported by The Netherlands Organization for Scientific Research (NWO). This dissertation focusses on the role of personality and temperament in the relationship between work stress and mental fatigue. It started with the assertion that clarification of the definition of fatigue and its dimensionality was needed. In order to examine the predicting power of personal and environmental resources, the direct influence of personality on fatigue was studied. Furthermore, an elaborated model, featuring personality, coping, social support, appraisal, and external resources, was tested. In this chapter, the main findings are described and conclusions are formulated regarding the dimensionality of fatigue and the prediction of this phenomenon. Moreover, methodological considerations concerning the design of the present study are addressed. Finally, some theoretical reflections, an outline for future studies, and implications for clinical practice are sketched.

Main findings and conclusions

The dimensionality of fatigue

The first research question focussed on the dimensionality of fatigue. In the last decades, fatigue was supposed to be at least a two-dimensional construct, comprising mental and physical fatigue. Moreover, some researchers hold the view that fatigue consists of four or five facets. Chapter 2 contains the reports of two studies. The goal of Study I was to examine the dimensionality of existing fatigue scales. The aims of Study II were the construction of a new self-report fatigue instrument and the exploration and evaluation of its psychometric qualities. In Study I, respondents completed a set of four fatigue scales. Each of these questionnaires were found to be unidimensional. Even more interesting, when all items of the four measures were combined and factor-analyzed, still one factor emerged, providing support for the view that fatigue, at least in working populations, should be measured unidimensional. Based on these analyses, a new measure, the 10-item Fatigue Assessment Scale (FAS), was constructed in Study II. The FAS was developed by analyzing the combined item pool of the four fatigue questionnaires semantically and selecting the item with the highest factor loading for each semantical group. Subsequently, the instrument was administered to an extensive sample representing the general population. The FAS showed good reliability (internal consistency) and content validity. In addition, strong support was obtained for the unidimensionality of the scale.

In chapter 3, the FAS again demonstrated a high internal consistency, now in the working sample. In addition, the scale correlated strongly with other fatigue scales. A factor analysis of five fatigue questionnaires revealed that the FAS had the highest factor loading in a clear one-factor solution. Moreover, factor analyses revealed that fatigue, on the one hand, and depression and emotional stability, on the other hand, were separate constructs. Finally, it was shown that eight out of the ten FAS-items were unbiased concerning gender; two questions had a uniform bias.

In summary, contrary to most of the current views on the dimensionality of fatigue, the present outcomes reveal that frequently used questionnaires, and also our fatigue scale, tap only one dimension. Furthermore, they measure an identical concept, fatigue, as the factor analysis on all 40 fatigue items indicates. The FAS has good reliability in both samples. Furthermore, it represents a potentially valuable assessment instrument with satisfactory internal consistency and validity. Gender bias in the FAS has no consequences for the use of the FAS. Finally, the FAS does not measure depression or neuroticism.

Predictors of fatigue

In chapters 4 to 6, the question concerning the predictors of fatigue was addressed. In the first prospective study, the relationships between temperament, personality, and Type A, on the one hand, and fatigue, on the other hand, were examined. The temperament variables stemmed from the Pavlovian temperament model (Pavlov, 1951-1952; Strelau, Angleitner, & Newberry, 1999). The personality variables were the Five-Factor-Model personality dimensions (Hendriks, Hofstee, & De Raad, 1999) and Hardiness (Kobasa, 1979; Maddi, 1997). Results indicated that fatigue scores were predicted by scores on the Five-Factor-Model personality dimensions Emotional Stability and Extraversion, the Pavlovian temperament variable Strength of Inhibition, and the Hardiness component Commitment (all negative ß-weights). After controlling for fatigue measured at baseline, Extraversion and Strength of Inhibition still predicted fatigue. Fatigue was rather stable, as indicated by the high correlation between fatigue measured at baseline and fatigue measured two years later. When men and women were examined separately, the same results emerged.

The model developed by Taylor and Aspinwall (1996) was tested both cross-sectionally and prospectively. In the cross-sectional study, emotional exhaustion was the outcome variable. In general, the structural equation modeling analyses provided some support for the validity of the Taylor and Aspinwall model (1996). On theoretical and statistical grounds one path was added to the model, linking external resources to social support. Furthermore, it

was demonstrated that coping did not predict fatigue. In the prospective study, the outcome variables emotional exhaustion and fatigue were measured two years after the independent variables. Coping did not predict the outcome variables, in this case emotional exhaustion and fatigue. In contrast, extraversion and workload did predict both outcome variables.

In conclusion, personality and temperament predict fatigue two years later. When fatigue measured at an earlier time is controlled for, the influence of personality on fatigue remains of interest.However, this relation is rather small. In this respect, the study provides evidence for the stability of fatigue. Parts of the Taylor and Aspinwall model (1996) were supported. One alteration of the model was proposed, namely adding a path connecting external resources to social support. Furthermore, no relationship could be found between coping strategies and fatigue. For the time being, this path, or other paths, could not be deleted or added to the model, because these paths may be strongly dependent on the particular health outcomes chosen.

Methodological considerations

In the studies described in this dissertation, two different groups of respondents participated. One group, the general population sample, completed only the FAS. The subsample of the working group, who had a paid job for at least 20 hours per week, were administered a larger set of scales. Participants in this group were followed for two years. The main assets of the present study were the large number of participants, representing the working population and the general population, and the longitudinal study design in case of the working individuals. Although by these assets of the present study some disadvantages of earlier studies were overcome, some limitations cannot be overlooked. These are discussed in the present section.

Sample

The longitudinal part of the study started with a relatively large number of participants (n = 765). Of these participants, 599 agreed to fill out the four questionnaires. At the last measurement point, 351 individuals returned a completed test booklet. Although there was a rather inevitable loss of participants, luckily it was not a selective drop. Individuals who completed the questionnaires at all five measurement points did not differ from the ones who only completed the first test booklet on personality, temperament, and fatigue. In addition, with more than 350 participants at the last measurement point, it was still possible to draw conclusions.

Another point of concern with respect to the present samples regards the representativeness. Potential participants in the working sample were

contacted by phone. In this way, also because the set of questionnaires used was self-administered, non-Dutch speaking individuals and individuals with a lower social economic status were excluded from the study. Furthermore, an exact reflection of the occupational sectors in the present sample could not be achieved. In addition, lower educated people were somewhat underrepresented and highly educated persons slightly overrepresented in this sample. However, this is not uncommon for this kind of study (Saris, 1988). With respect to gender, marital status, and age, the sample was representative for the Dutch working population (CBS, 1999). Therefore, it is believed that our working sample is a good representation of the Dutch working population.

It is obvious that in case of the general sample (self-)selection has taken place, due to the fact that the CentERpanel is an Internet-based telepanel. At home, the panel members filled out a questionnaire on the Internet. Individuals must have had a positive attitude towards this way of gathering data. In order to shed some light on the representativeness of the sample, the distribution on demographic variables of the CentERpanel (January, 2001) was compared with the distribution of the Dutch population (CBS, 2000). This analysis showed that the CentERpanel was representative of the Dutch population for age, gender, religion, education, region, and province. Unfortunately, nothing is known about their personality. Nevertheless, the sample is also considered to be a good representation, this time of the Dutch general population.

Design

A cross-sectional study design prevents researchers from making causal inferences. Therefore, a longitudinal design was chosen to analyze the factors that influence fatigue. When a longitudinal design is employed, it is important to select appropriate measurement points. For practical reasons, the period of data collection was limited to two years. Intervals of six months were chosen in order to be able to follow the particants intensively without putting a large burden on them. The studies presented in this dissertation are a first exploration of the extensive data set, examining only data gathered at the first and last measurement points. Future research, an outline of which is briefly sketched in this chapter, will scrutinize the entire dataset, including the intermediate measurement points.

Of course, reality is more complex than the model that has been tested in the present studies. Only unidirectional relationships, connecting variable A to variable B, were included in the present analyses. However, it is possible that various variables influence each other mutually. Consequently, using a longitudinal design is a necessary, but not sufficient condition to be able to state something meaningful about the causal relations. In order to be able to draw relevant conclusions, the analyses should be based on a sound theoretical

model. In the present study, both conditions were satisfied by employing the model of Taylor and Aspinwall (1996), that was based on empirical data.

Type of measures

To perform a large-scale study, like the one described in this dissertation, using questionnaires is the most likely method for gathering data. Every research method has its own drawbacks and the shortcomings of questionnaires are well known (Funder, 2001). By solely using questionnaires, common method variance, social desirability, and overlap between dependent and independent variables are a legitimate concern (e.g., Algera, 1992). However, most of the questionnaires used in the present study have been extensively validated.

In future studies, it would be interesting to include both subjective and objective fatigue measures in future studies. For instance, Andrykowski, Curran, and Lightner (1998) proposed to supplement subjective measures with objective assessments of grip strength, endurance, and activity level. At Tilburg University, within the framework of the Fatigue at Work project, Veldhuizen, Gaillard, and De Vries (2002) examine the process of work-related fatigue by combining facial EMG activity, heart rate measures, and fatigue questionnaires. According to Aldasheva, Chernook, Glushkova, and Kurmanalieva (1992) and Chalder et al. (1993), fatigue as an objective state need not be related to the subjective sensation of fatigue. The differences and correspondences in the individual's responses to the subjective and objective fatigue measures might provide a deeper insight into the concept of fatigue. Objective measures, such as blood composition, EEG variability, and muscle contractions, may show different patterns for specific samples, such as chronic fatigue patients, working individuals, or other groups reporting fatigue. By following individuals for a longer period of time, the physical pathway to chronic fatigue may be revealed. This can provide clues for screening, prevention, and treatment.

In the present study, workload consistently appeared to be a strong predictor of fatigue. In the present set of studies, workload was measured subjectively. As indicated in chapters 5 and 6, methodological objections can be raised against this approach (Frese & Zapf, 1999). On the other hand, others, like Perrewé and Zellars (1999), have indicated that an individual's perception of stressors is indispensable in the fatigue process. A future study with stressor and psychosocial variables measured subjectively as well as objectively may provide relevant data concerning the different and similar outcomes using these measures.

Theoretical reflections and future research

Dimensionality of fatigue

One of the main findings of the present set of studies concerned the dimensionality of fatigue. In the working population, four frequently used fatigue questionnaires, including two multidimensional ones, appeared to measure a similar, unidimensional construct. This is in sharp contrast with the current view of many researchers (e.g., Vercoulen, Alberts, & Bleijenberg, 1999; Chalder et al., 1993) on this issue. However, some researchers (Desmond & Hancock, 2001; Gaillard, 1996; Studts, De Leeuw, & Carlson, 2001) suggested that fatigue should be treated as a unidimensional concept. They argue that the mental and physical aspects of fatigue are closely related and intertwined in a very complex way. As a consequence, it is not worthwile to measure these aspects separately. Furthermore, in a recent explorative study of the structure of fatigue, Studts et al. (2001) found a one-factor solution, representing general fatigue, instead of a distinction between cognitive, emotional, somatic, and more general aspects of fatigue. Although the present set of studies needs to be replicated, it should be noted that the current sample was large and in general representative for the Dutch population.

If fatigue is found to be unidimensional repeatedly in a working population, this will have far-reaching implications for the conceptualization and measurement of fatigue. Therefore, if one defines fatigue at work, one should not only focus on the mental aspect of fatigue. Apparently, individuals tend to report experiences of mental and physical fatigue in the same amount, independently from the kind of work, for instance, more handicraft or more mental labour. Thus, the physical aspect of fatigue should also be included in the conceptualization of fatigue and, consequently, in fatigue measures.

Studies with different samples could lead to different conclusions. At first it was necessary to learn about fatigue in the general and the working population. Now, it is recommended to ask, for instance, psychiatric and medical patients to complete the fatigue questionnaires in order to test whether or not fatigue is also unidimensional in more specific samples. Pennebaker (1982) suggested that patients focus more on their bodily sensations than healthy persons. Therefore, it is interesting to explore the possibility that patients report, for instance, more physical fatigue than mental fatigue, or vice versa. Thus far, the FAS has been completed by sarcoidosis patients (De Vries, Michielsen, Van Heck, & Drent, 2002). This study confirmed the unidimensionality of fatigue. It should be noted that Studts et al. (2001) also found a one-factorial fatigue solution in a patient sample. However, the participation of other patient populations, like cancer patients, is needed to

enable drawing firm conclusions concerning the dimensionality of fatigue, and, more specifically, the FAS.

The FAS has a high reliability. Also, it measures the same construct as four other well-established fatigue questionnaires. Moreover, it definitively is not a measure of depression or emotional stability. Knowing that FAS total has the highest factor loading on the factor solution with all fatigue questionnaires, it seems that the FAS measures fatigue in the working population in a similar or even better way than the other scales. To be able to distinguish fatigued from non-fatigued individuals, the cut-off point of the FAS will be determined in future research. In addition, future research will be directed at the exploration of its clinical relevance. Only then, the FAS can be used as a valuable screening instrument to detect individuals who are at risk for chronic fatigue.

The semantical categorization of the fatigue items was made with great meticulousness. Moreover, the fact that the FAS showed the highest loading on the single factor that was found in a factor analysis with all fatigue questionnaires supports the selection of the FAS-items. Still, the question remains whether the same results would have been obtained if another method was chosen to guide the selection of the items. A sensible way to examine this would be to perform a similar study in different language/cultural regions. If differences in cultures were detected, and the cause of those dissimilarities were revealed, then this could tell us something about the core of the definition of fatigue, and/or the way it is measured. Recently, the FAS has been translated into the Croatic language. The dimensionality of the Croatic FAS will be examined in due course.

Predictors of fatigue

Personality and temperament appeared to have a direct influence on reporting of fatigue, even after controlling for fatigue at baseline. However, the different stages of fatigue, that is, onset, development, maintenance, and recovery were not taken into account. Perhaps certain personality variables are predictors in one particular phase, such as the onset, and others later on in the fatigue process. In a next phase of the present research project, predictors of fatigue will be examined more closely, taking into account the fatigue *process*. Consequently, a more detailed profile of individuals who are at risk for chronic fatigue will be developed. Future research could also start to follow up individuals in their twenties, or even earlier, to be sure of detecting the moment of onset of chronic fatigue.

The strong correlation between fatigue measured at baseline and two years later indicates that fatigue is a rather stable phenomenon. However, more robust analysis techniques are needed to obtain a closer view of the fatigue process. Duration of development, persistence, and possible recovery of fatigue

which are useful in practice. Despite this, the study has yielded a new, short, and easy to administer fatigue questionnaire, the FAS. The scale has good psychometric qualities. When its clinical relevance is proven, a valid cut-off point is determined, and the scale is administered to more patient samples, the FAS can be employed as a screening instrument in, for instance, the general practitioner practice or an occupational health service. Secondly, the importance of both personality and organizational factors, especially workload, needs to be stressed as predictors of fatigue. If the factors that influence the onset, development, maintenance, and recovery of fatigue are studied, these factors can be included in the screening, prevention, and treatment of fatigue. Finally, along this line, one could search for those individuals who would benefit most from prevention or treatment, and those who manage to stay healthy. It is emphasized that research should not only be aimed at 'worker'-variables as a cause of fatigue. This could lead to blaming the employee for being exhausted and ignoring another influentual group of factors: the 'work'-variables (Frese & Zapf, 1988; Kompier, 1996). Researchers, supervisors, general practitioners, and employees from an occupational health service are encouraged to pay attention to both sets of variables in prevention and treatment of chronic fatigue in order to reduce personal and societal damage.

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will be investigated, if cut-off scores for these phases are determined for the FAS. Although the present sample only covered two years, addressing these issues can provide clues what to look for in future research. Furthermore, the kind of effect a predictor can have in the fatigue process should be examined more carefully, i.e., whether a particular predictor has an immediate effect on a particular outcome or whether its effect is only visible after some time. Also, predictors might have short-term effects, long-lasting effects, (un)stable effects, or changing effects. That is, at first the variable has a positive effect, but after persistence of half a year this effect could become negative. Future research should address this issue. Thus, the finding that fatigue is rather stable does not lend support to the idea that it is sufficient to measure fatigue cross-sectionally. Longitudinal research is necessary to gain more insight in the phases of chronic fatigue.

By testing the Taylor and Aspinwall model (1996), more insight was gained into mediating variables as well as variables with a more direct effect on fatigue. Because workload still keeps playing an important role in predicting fatigue after controlling for fatigue measured at baseline, this variable cannot be neglected in future research. In addition, it should be noted that personality influences fatigue directly and indirectly, because personality has an effect on workload. If the present results are confirmed by other studies, only a small list of the included variables is needed to predict fatigue in the future.

Another interesting outcome of testing of the Taylor and Aspinwall model (1996) is the failure to predict fatigue on the basis of coping styles. This does not imply that coping does not influence fatigue at all. There are several possible reasons for this finding. First, a situation-specific coping questionnaire, aimed at assessing coping with a health problem (Endler, Parker, & Summerfeldt, 1998), could be a more appropriate measure. Secondly, the possibility exists that the causes of fatigue differed and, therefore, various coping styles are beneficial for different individuals. Finally, different coping styles may be effective in different phases of the fatigue process.

The present study is the first one which has used the model of Taylor and Aspinwall (1996) in the area of fatigue. Providing that other research with different samples and other health outcomes than not fatigue, support the present findings, a critical comment must be made about the structure of the model. In particular, the final path from coping to psychosocial outcomes should receive attention.

Practical implications

The nature of the present study has been more theoretical than practical. A large amount of future analyses, which have been described in this chapter, have to be performed to be able to translate the findings into recommendations

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Appendix

Fatigue Assessment Scale (FAS)

The following ten statements refer to how you usually feel. For each statement you can choose one out of five answer categories, varying from Never to Always.
1 = Never, 2 = Sometimes; 3 = Regularly; 4 = Often; and 5 = Always.

	Never	Sometimes	Regularly	Often	Always
1. I am bothered by fatigue (WHOQOL)	1	2	3	4	5
2. I get tired very quickly (CIS)	1	2	3	4	5
3. I don't do much during the day (CIS)	1	2	3	4	5
4. I have enough energy for everyday life (WHOQOL)	1	2	3	4	5
5. Physically, I feel exhausted (CIS)	1	2	3	4	5
6. I have problems starting things (FS)	1	2	3	4	5
7. I have problems thinking clearly (FS)	1	2	3	4	5
8. I feel no desire to do anything (CIS)	1	2	3	4	5
9. Mentally, I feel exhausted	1	2	3	4	5
10. When I am doing something, I can concentrate quite well (CIS)	1	2	3	4	5

Note. Between brackets, the questionnaire is given from which the item is taken. WHOQOL= World Health Organization Quality of Life assessment instrument; CIS=Checklist Individual Strength; FS=Fatigue Scale. Items 4 and 10 require reversed scoring. The scale score is calculated by summing all items.

FAS

De volgende tien uitspraken gaan over hoe U zich normaal gesproken voelt. U kunt per uitspraak kiezen uit 5 antwoordmogelijkheden variërend van Nooit tot Altijd, waarbij 1 = Nooit, 2 = Soms, 3 = Regelmatig, 4 = Vaak, 5 = Altijd.

	Nooit	Soms	Regelmatig	Vaak	Altijd
1. Ik heb last van vermoeidheid.	1	2	3	4	5
2. Ik ben gauw moe.	1	2	3	4	5
3. Ik vind dat ik weinig doe op een dag.	1	2	3	4	5
4. Ik heb genoeg energie voor het leven van alledag.	1	2	3	4	5
5. Lichamelijk voel ik me uitgeput.	1	2	3	4	5
6. Ik heb problemen om met dingen te beginnen.	1	2	3	4	5
7. Ik heb problemen om helder na te denken.	1	2	3	4	5
8. Ik heb geen zin om iets te ondernemen.	1	2	3	4	5
9. Geestelijk voel ik me uitgeput.	1	2	3	4	5
10. Als ik ergens mee bezig ben, kan ik mijn gedachten er goed bijhouden.	1	2	3	4	5

Items 4 en 10 moeten worden omgescoord. De schaalscore wordt verkregen door alle itemscores bij elkaar op te tellen.

Samenvatting

Vermoeidheid uitgewerkt: Conceptualisering, meting en theorie

Vermoeidheid is de laatste jaren steeds vaker onderwerp van onderzoek, voornamelijk door het groeiende besef dat vermoeidheid veel voorkomt in de algemene bevolking (Loge, Ekeberg, & Kaasa, 1998). In de gezondheidszorg is vermoeidheid dan ook een belangrijk fenomeen (Bates et al., 1993; Bensing, Hulsman, & Schreurs, 1996; Fuhrer, 1994; Lewis & Wessely, 1992). Langdurige vermoeidheid brengt niet alleen persoonlijke, maar ook aanzienlijke maatschappelijke schade met zich mee. De behoefte aan wetenschappelijk gefundeerde preventiestrategieën en het ontbreken van inzicht in risicofactoren voor het ontstaan en verloop van langdurige vermoeidheid hebben ertoe geleid dat met steun van de Nederlandse Organisatie voor Wetenschappelijk Onderzoek (NWO) in 1996 het onderzoeksprogramma 'Psychische Vermoeidheid in de Arbeidssituatie' (PVA) is gestart. Aan de Universiteit van Tilburg wordt in dat kader onderzoek uitgevoerd naar de mediërende en modererende rol van persoonlijkheid en temperament in de relatie tussen werkstress en langdurige vermoeidheid (hierna aangeduid als vermoeidheid). De studie die is beschreven in dit proefschrift is uitgevoerd in het PVA-kader en heeft twee doelen. Het eerste doel is het onderzoeken van de dimensionaliteit van vermoeidheid bij werkende mensen en het tweede het identificeren van variabelen die vermoeidheid voorspellen.

Ondanks de stijging van het aantal publicaties over vermoeidheid, is er nog steeds geen algemeen aanvaarde definitie van vermoeidheid. Met name de dimensionaliteit van vermoeidheid is een aspect van de definitie waarover discussie gaande is. In de literatuur wordt er een theoretisch onderscheid gemaakt tussen mentale en fysieke vermoeidheid. Mentale vermoeidheid wordt daarbij gekenmerkt door de weigering om nog moeite te doen voor een taak, door verminderde efficiëntie en waakzaamheid en door gebrekkige mentale prestaties. Fysieke vermoeidheid uit zich als gereduceerde spierkracht en spierbeweging (Grandjean, 1979). Sommige onderzoekers (Åhsberg, 2000; Vercoulen, Alberts, & Bleijenberg, 1999) geven er zelfs de voorkeur aan om vermoeidheid op te splitsen in termen van vier of vijf aspecten. Volgens Vercoulen et al. (1999) kan vermoeidheid bijvoorbeeld het beste worden verdeeld in subjectieve gevoelens van vermoeidheid, verminderde concentratie, gebrek aan motivatie en een lager niveau van lichamelijke activiteit. Tenslotte is een groep van onderzoekers van mening dat lichamelijke en mentale vermoeidheid empirisch niet te onderscheiden zijn (Desmond & Hancock, 2001; Gaillard, 1996; Studts, De Leeuw, & Carlson, 2001). Bovenstaande

discrepanties maken duidelijk dat verder systematisch onderzoek naar de dimensionaliteit van vermoeidheid noodzakelijk is.

In grootschalig onderzoek, zoals beschreven in dit proefschrift, vormen vragenlijsten de gebruikelijke onderzoeksmethode. Tot de negentiger jaren waren vermoeidheidsvragen-lijsten voornamelijk unidimensioneel (Berrios, 1990). Waarschijnlijk is de complexe aard van het Chronisch VermoeidheidsSyndroom (CVS) de aanleiding geweest voor het ontwikkelen van multidimensionele meetinstrumenten. Helaas zijn veel vragenlijsten voor gebruik in de werkcontext op een *ad hoc* manier geconstrueerd (De Vries & Van Heck, 2002).

In dit proefschrift is de dimensionaliteit van vier frequent gebruikte vermoeidheids-vragenlijsten onderzocht. Bovendien is er een nieuwe vragenlijst samengesteld, de Fatigue Assessment Scale (FAS), uitgaande van een semantische analyse van deze vier vragenlijsten.

Met betrekking tot het tweede doel van het project, het identificeren van krachtige voorspellers van vermoeidheid, zijn er nog niet veel studies uitgevoerd die gefundeerd zijn op een stevige theoretische basis. Niettemin hebben sommige onderzoekers (Bartley & Chute, 1947; Smets, Garssen, Bonke, & De Haes, 1995; Vercoulen et al., 1998) een aanzet gegeven voor modellen over het ontstaan en blijven bestaan van vermoeidheid. Zo hebben Vercoulen et al. (1998) zich gericht op het voortduren van vermoeidheid bij CVS-patiënten. In hun model leidt het toeschrijven van symptomen aan een lichamelijke oorzaak tot een verlaagde lichamelijke activiteit, die op haar beurt weer leidt tot meer vermoeidheid. Bovendien wordt vermoeidheid direct beïnvloed door het gevoel van controle over symptomen en de mate waarin aandacht wordt besteed aan lichamelijke gewaarwordingen. Als alternatief wordt een biopsychosociale benadering genoemd, waarin de gecombineerde effecten van lichamelijke, psychologische en gedragsfactoren een rol spelen (David et al., 1990; Lewis & Wessely, 1992; Ware, 1993). Ten derde bieden informatieverwerkingstheorieën (De Rijk, Schreurs, & Bensing, 1999) en het idee dat vermoeidheid in belangrijke mate wordt beïnvloed door symptoomperceptie (Pennebaker, 1982) ook veelbelovende perspectieven.

De Vries en Van Heck (2000) concludeerden in een overzichtsartikel over persoon-lijkheid en emotionele uitputting dat, hoewel persoonlijkheid wordt beschouwd als één van de belangrijkste factoren in de ontwikkeling van burnout (Ganster & Schaubroeck, 1991), er tot nu toe weinig systematisch onderzoek is gedaan naar mogelijke verbanden tussen persoon-lijkheid en vermoeidheid. In dit proefschrift is daarom in eerste instantie gekeken naar de directe invloed op vermoeidheid van persoonlijkheid, temperament en het Type A gedragspatroon. Vervolgens zijn deze variabelen onderzocht in twee studies, waarin het model van Taylor en Aspinwall (1996) getoetst werd, dat tevens demografische factoren, stressoren, taxatie, sociale steun en coping integreert.

Om aan de hierboven geformuleerde doelen tegemoet te komen, werd een vragenlijststudie opgezet. Twee groepen namen hieraan deel: mensen die tenminste 20 uur in de week betaald werk verrichten en een algemene groep. De eerste groep bestond uit twee deelgroepen. De eerste deelgroep (n = 765 op het eerste meetmoment; n = 351 twee jaar later) werd na het invullen van de vragenlijsten gevraagd of ze nog vier keer een set vragenlijsten wilden invullen. Deze groep participeerde in alle studies die zijn beschreven in dit proefschrift. De tweede deelgroep (n = 111) bestond uit werknemers van een Arbodienst. Deze namen alleen deel aan het eerste deel van het onderzoek (meetmoment 1). De analyse van deze gegevens is beschreven in Hoofdstuk 2. Dit deel van de dataverzameling werd uitgevoerd met behulp van fondsen verkregen via NWO (580-02-204) en van WORC, het onderzoeksinstituut van de Faculteit Sociale Wetenschappen van de Universiteit van Tilburg. De tweede groep deelnemers (N = 1.893) vulde de gecomputeriseerde versie van de FAS in (zie Hoofdstuk 2). Deze gegevens werden verzameld via CentERdata, een instituut van de Universiteit van Tilburg dat gespecialiseerd is in dataverzameling via internet.

Dimensionaliteit van vermoeidheid

Hoofdstuk 2 richt zich, ten eerste, op de vraag of vier frequent gebruikte vragenlijsten uni- of multidimensioneel zijn in een groep van werkende mensen. Uit de resultaten van de factor- en MSP analyses blijkt dat de vier vragenlijsten unidimensioneel zijn. Het is niet mogelijk op empirische gronden een vier- of zelfs een tweedeling in de items te bespeuren. Ten tweede wordt de constructie van een nieuwe vragenlijst beschreven, de *Fatigue Assessment Scale (FAS)*. De FAS werd als volgt ontwikkeld. Na een semantische analyse van de items van de vier vragenlijsten werden negen groepen items onderscheiden. Uit elke groep werd één vraag gekozen en een extra vraag werd toegevoegd aan de set vragen, waardoor er uiteindelijk vijf vragen gecategoriseerd konden worden als mentale vermoeidheid en vijf als fysieke vermoeidheid. De factor- en MSP-analyses toonden aan dat ook de FAS unidimensioneel is en hetzelfde construct meet als de andere vragenlijsten. Dit in weerwil van het feit dat de distinctie mentaal versus lichamelijk nadrukkelijk op een evenwichtige wijze in de items was aangebracht. Samengevat bleek in Hoofdstuk 2 dat werkende individuen zowel mentale als lichamelijke vermoeidheid rapporteerden en wel op een zodanige wijze dat deze vormen van vermoeidheid sterk samenhingen. Zij vormden, in psychometrisch opzicht, één dimensie.

In Hoofdstuk 3 worden de resultaten gepresenteerd van een studie naar de psychome-trische kwaliteiten van de FAS. De schaal werd allereerst via correlationele en factoranalyses vergeleken met de al eerder genoemde vier

vermoeidheidsvragenlijsten. Bovendien werd op dezelfde wijze onderzocht of de FAS niet de verwante concepten depressie of emotionele stabiliteit meet. Met uitzondering van een vragenlijst voor de meting van emotionele stabiliteit werden alle schalen twee jaar na de start van de studie afgenomen. De analyses gaven aanleiding tot de volgende gevolgtrekkingen. De FAS blijkt een hoge interne consistentie te hebben. Bovendien hing de FAS sterk samen met de andere vermoeidheidslijsten en meet de vragenlijst geen depressie of emotionele stabiliteit. De FAS had verder de hoogste factorlading in een 1-factor-oplossing bij een factoranalyse op de totaalscores van alle vijf vermoeidheids-vragenlijsten. Tenslotte is aangetoond dat mannen en vrouwen niet systematisch verschillend antwoordden op de FAS-items.

Voorspellers van vermoeidheid

Hoofdstuk 4 beschrijft het onderzoek naar de directe invloed van persoonlijkheid, tempera-ment en het Type A gedragspatroon op vermoeidheid na twee jaar. Scores op de persoonlijk-heidsfactoren 'emotionele stabiliteit', 'extraversie' en 'betrokkenheid' en de temperamentsva-riabele 'sterkte van inhibitie' voorspelden, met een negatief gewicht, vermoeidheid. Wanneer in de regressie-analyses werd gecontroleerd voor vermoeidheid op het eerste meetmoment, waren extraversie en sterkte van inhibitie goede voorspellers van vermoeidheid. Zij verklaarden echter maar een gering deel van de variantie. Dit was ook het geval, wanneer naar mannen en vrouwen afzonderlijk werd gekeken.

Het toetsen van het model van Taylor en Aspinwall (1996) met een structureel vergelijkingsmodel wordt gerapporteerd in Hoofdstuk 5 en 6. In Hoofdstuk 5 zijn alle variabelen die in het model zijn opgenomen gemeten op het eerste meetmoment. Emotionele uitputting was de uitkomstvariabele. In Hoofdstuk 6 waren emotionele uitputting en vermoeidheid (FAS) de afhankelijke variabelen, die beide twee jaar later dan de andere variabelen waren gemeten. In Hoofdstuk 5 boden de resultaten steun aan een deel van het model. De relaties tussen persoonlijke en externe bronnen, stressoren, sociale steun, taxatie en coping werden bevestigd. Er werd tevens een extra pad gevonden, dat externe bronnen aan sociale steun verbindt. In tegenstelling tot wat verwacht werd, bleek coping niet emotionele uitputting te voorspellen. Emotionele uitputting werd beïnvloed door levensomstandigheden, zoals het hebben van een kind, of ziek zijn, gehard en extravert zijn, de mate van sterkte van inhibitie, alsmede de subjectieve waarneming van werklast, werkdruk en stress. In het bijzonder rapporteerden personen met subjectieve gevoelens van spanning, hoge werklast en werkdruk emotionele uitputting. In Hoofdstuk 6 wordt beschreven dat emotionele uitputting en vermoeidheid voorspeld worden door extraversie en werklast. Verder bleek dat de directe invloed van

persoonlijkheid, temperament en het Type A gedragspatroon op vermoeidheid twee jaar later verminderde, wanneer er werd gecontroleerd voor vermoeidheid op het eerste meetmoment. Extraversie bleef echter ook onder die omstandigheden een substantiële voorspeller van vermoeidheid in het Taylor en Aspinwall model (1996). Ook de subjectief waargenomen werklast voorspelde vermoeidheid en emotionele uitputting twee jaar later.

In Hoofdstuk 7 zijn de resultaten samengevat, die voornamelijk gebaseerd zijn op een relatief grote steekproef van werkende mensen. De opzet van de deels longitudinale studie wordt nader beschouwd en de bevindingen worden in een theoretisch kader geplaatst. Ook worden praktische implicaties besproken, waarbij er met name op wordt gewezen dat er nu een handzame, korte vragenlijst is, de Fatigue Assessment Scale. Tenslotte wordt een korte schets gegeven van toekomstig onderzoek. Dit onderzoek zal met name gericht zijn op het identificeren van risicofactoren in elke fase van chronische vermoeidheid.

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Curriculum Vitae

Helen Michielsen, geboren op 18 april 1976, behaalde in 1994 het Gymnasiumdiploma aan het Sint Oelbert-gymnasium te Oosterhout. In de periode 1994 tot 1999 volgde zij de studie Psychologie aan de Universiteit van Tilburg met als specialisatie Psychologie in de Gezondheidszorg. Tijdens deze studie volgde zij tevens een semester aan Strathclyde University in Glasgow, Schotland, om kennis op te doen over Human Resource Management. Haar afstudeeronderzoek spitste zich toe op 'Burnout, hardiness, de Big Five en klachten: Een onderzoek bij docenten'. Na haar afstuderen startte zij haar loopbaan bij het Centrum Gezondheidsbevordering op de Werkplek, waar ze aan het opstellen van een gezondheidsprofiel heeft gewerkt. Hierna werd ze projectmedewerkster op de Universiteit van Tilburg voor onderzoek naar de behandeling van slachtoffers in opdracht van de Regiopolitie Midden en West-Brabant en voor de administratie van het project Psychische Vermoeidheid in de Arbeidssituatie (PVA). In april 2000 startte ze als onderzoeker bij de toenmalige departementen Klinische Gezondheidspsycholgie en Vrouwenstudies. Naast een onderzoek naar modern seksisme heeft zij in deze periode dit proefschrift geschreven en de cursus 'Beroepsvaardigheden: Dataverzameling' verzorgd. Momenteel werkt Helen als post-doc bij het departement Psychologie en Gezondheid om de PVA-data verder te analyseren.

Uitnodiging

Graag nodig ik u uit
voor het bijwonen van
de verdediging van mijn proefschrift:

Working out fatigue:
Conceptualization, assessment, and theory

op vrijdag 13 september 2002
in de aula van de
Universiteit van Tilburg
Warandelaan 2 te Tilburg

Inleiding: 14.00 uur
Academische zitting: 14.15 uur
Aansluitend is er een receptie
van 15.15 tot 16.30 uur

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